PRELIMINARY STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

MILL POINT SOLAR I PROJECT

TOWN OF GLEN
MONTGOMERY COUNTY, NEW YORK

IN COMPLIANCE WITH THE

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION GENERAL PERMIT GP-0-20-001
FOR
STORMWATER DISCHARGES FROM CONSTRUCTION ACTIVITIES

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Acronyms and Abbreviations

BMP	Best Management Practices
CN	Curve Number
CPv	Channel Protection Volume
CRIS	Cultural Resource Information System
DOW	Division of Water
ECL	Environmental Conservation Law
ERM	Environmental Resource Mapper
ESC	Erosion and Sediment Control
FEMA	Federal Emergency Management Agency
GP	General Permit
HDD	Horizontal Directional Drilling
HSG	Hydrologic Soil Group
IDF	Intensity Duration Frequency
IPaC	Information for Planning and Consultation
MS4	Municipal Separate Storm Sewer System
MW	Megawatt
NCBP	Net Conservation Benefit Plan
NLEB	Northern Long-eared Bat
NOI	Notice of Intent
NOT	Notice of Termination
NRCS	Natural Resources Conservation Service
NYCRR	New York Code, Rules and Regulations
NYS	New York State
NYSAGM	New York State Department of Agriculture and Markets
NYSDEC	New York State Department of Environmental Conservation
O&M	Operation and Maintenance
OPRHP	Office of Parks, Recreation, and Historic Preservation
ORES	Office of Renewable Energy Siting
Qf	Extreme Flood Control
Qp	Overbank Flood Control
RRv	Runoff Reduction Volume
S	Specific Runoff Reduction Factor
SDS	Safety Data Sheet
SMDM	Stormwater Management Design Manual
SMP	Stormwater Management Practice
SPDES	State Pollutant Discharge Elimination System

SSA	Sole Source Aquifer
SSESC	Standards and Specifications for Erosion and Sediment Control
SWPPP	Storm Water Pollution Prevention Plan
Tc	Time of Concentration
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WQV	Water Quality Volume

1.0 Introduction

This Stormwater Pollution Prevention Plan (SWPPP) has been prepared by TRC for ConnectGen Montgomery County, LLC (the Client) in regard to construction activities associated with the Mill Point Solar I Project (the Facility).

The purpose of this SWPPP is to establish requirements and instructions for the management of construction-related stormwater discharges from the Facility Site. Erosion and sediment controls have been designed and shall be installed and maintained to minimize the discharge of pollutants and prevent a violation of the water quality standards.

2.0 Regulatory Requirements

This SWPPP has been prepared in accordance with the “New York State Department of Environmental Conservation (NYSDEC) State Pollution Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Construction Activity” General Permit GP-0-20-001, effective January 29, 2020 through January 28, 2025. The NYSDEC requires coverage under GP-0-20-001 for any “construction activities involving soil disturbances of one or more acres; including disturbances of less than one acre that are part of a larger common plan of development or sale that will ultimately disturb one or more acres of land; excluding routine maintenance activity that is performed to maintain the original line and grade, hydraulic capacity or original purpose of a facility.”

The Facility is classified as a commercial scale solar project with an increase in impervious area. Per Table 2 of GP-0-20-001 Appendix B, the Facility involves construction activities that require the preparation of a SWPPP that includes post-construction stormwater management practices designed in conformance with Part III.B.2 of the permit. A copy of the General Permit GP-0-20-001 is provided in Appendix B of this SWPPP.

The Facility is located not within a regulated Municipal Separate Storm Sewer System (MS4) therefore, MS4 review and approval of the SWPPP is not required prior to submission of the Notice of Intent (NOI) to NYSDEC to obtain permit coverage.

The Facility is subject to the requirements of the Major Renewable Energy Development Law (94-c) under the Office of Renewable Energy Siting (ORES) under Matter No. 23-00034. The Facility shall comply with all applicable local, state, and federal regulations. Discharges to surface waters should be reported to the NYSDEC Division of Water per 6 NYCRR Part 750, including, but not limited to, discharges that cause a violation of water quality standards and discharges that are not permitted by the General Permit.

3.0 Permit Coverage Information

This SWPPP serves as the minimum requirements necessary to address soil exposure and stormwater management during construction activities. This SWPPP is a living document that may be amended for unforeseen circumstances. If unanticipated site conditions warrant changes or additions to existing practices, the Owner/Operator and the Contractor(s), in consultation with the Qualified Inspector or Project Engineer, will be required to implement those measures in accordance with the New York State Standards and Specifications for Erosion and Sediment Control (SSESC) and the New York State Stormwater Management Design Manual (SMDM) and amendments to the SWPPP shall be made as appropriate. The SWPPP and associated documentation must be kept current to ensure the erosion and sediment control practices are accurately documented.

In accordance with GP-0-20-001, documented site inspections will be performed to ensure the required erosion and sediment control measures have been installed properly and are in good condition. Inspections will occur for the duration of construction, until earth-disturbing construction activities have ceased, and final stabilization has been achieved.

4.0 SWPPP Amendments

This SWPPP has been prepared in accordance with the General Permit, SSESC and the SMDM. The SWPPP and associated documents must be kept current at all times. Amendments to the SWPPP and associated documents, including construction drawings, should be made:

- Whenever the current provisions are ineffective in minimizing impacts to the stormwater discharge from the Facility Site;
- Whenever there is a change in design or construction activities and sequencing that has or could have an impact to the stormwater discharge; and
- To address deficiencies or issues identified during monitoring and inspection.

Planned amendments and modifications to post-construction stormwater management practices proposed in the final SWPPP must be provided, in writing, to the NYSDEC Region 4 Division of Water (DOW) representative. The SWPPP amendments and modifications shall be reviewed and accepted by the NYSDEC representative prior to commencing construction activities for the associated practices.

This Preliminary SWPPP is being submitted as part of the Facility’s Section 94-c application and includes design and calculations for the anticipated stormwater management practices. This Preliminary SWPPP will be amended as necessary prior to Facility construction to detail the final proposed stormwater management practices to be installed (Final SWPPP). The Final SWPPP shall detail proposed stormwater management practices and provide stormwater analysis and design information. The Final SWPPP submitted as a Compliance Filing prior to construction of the Facility.

Refer to GP-0-20-001 for additional information on SWPPP amendment procedures and requirements. Amendments to the SWPPP shall be documented in Appendix M.

5.0 Facility Site Information

The Facility Site is located in the Town of Glen, Montgomery County, New York. The Facility Site is located within the NYSDEC Region 4 jurisdiction and the Randall and Tribes Hill United States Geological Survey (USGS) 7.5 Minute Topographic Quadrangles. The Facility Site location is depicted on Figure 1 in Appendix E.

The Facility proposes the installation of a 250 megawatt (MW) solar array and associated Facility infrastructure. The general scope of work for the Facility which may result in soil disturbance includes, but is not limited to, site clearing, grading, and installation of inverters, collection line, access roads, erosion and sediment control, and stormwater management practices.

The Facility Site consists of approximately 2,665.59 acres, of which approximately 1,270.41 acres are anticipated to be disturbed. The existing groundcover of the Facility Site is composed primarily of agricultural lands and forest. The site topography is relatively flat with slopes ranging from 0 to 8 percent. Steep slopes of greater than 25 percent are sporadically experienced throughout the Site. Refer to the Construction Drawings in Appendix F and the Section 94-c Application Exhibits for additional Facility Site land cover, environmental resources, and topographic information.

The Facility Site discharges to numerous wetlands and streams, ultimately discharging to the Mohawk River located north of the Facility. The Facility does not discharge to a 303(d) waterbody segment listed within Appendix E of GP-0-20-001 and is not located within a restricted watershed listed in Appendix C of GP-0-20-001, AA or AA-s waterbody, or a Sole Source Aquifer (SSA).

5.1 Soils Classification

Review of the United States Department of Agriculture's (USDA) Natural Resources Conservation Service (NRCS) Web Soil Survey was completed to determine the predominant soil series mapped within the Facility Site. Table 1, below, details the soils and the associated Hydrologic Soil Group (HSG).

Table 1 – Soils within the Facility Site

Map Unit Symbol	Map Unit Name	HSG Rating
AnB	Angola silt loam, 3 to 8 percent slopes	D
ApA	Appleton silt loam, 0 to 3 percent slopes	B/D
ApB	Appleton silt loam, 3 to 8 percent slopes	B/D
AZF	Arnot-Rock outcrop association very steep, 35 to 60 percent slopes	D
CFL	Cut and fill land, Gravelly loam, 0 to 15 percent slopes	A
ChA	Churchville Silty clay loam, 0 to 3 percent slopes	C/D
ChB	Churchville silty clay loam, 3 to 8 percent slopes	C/D
DaB	Darien silt loam, 3 to 8 percent slopes	C/D
FL	Fluvaquents gravelly silt loam, 0 to 2 percent slopes	B/D
Fo	Fonda muchly silty clay loam, 0 to 3 percent slopes	C/D
Ha	Hamlin gravelly silt loam, 3 to 8 percent slopes	B
HrB	Howard gravelly silt loam, 3 to 8 percent slopes	A
HrC	Howard gravelly silt loam, 8 to 15 percent slopes	A
HuB	Hudson silty clay loam, 3 to 8 percent slopes	C/D
IlA	Ilion silt loam, 0 to 3 percent slopes	C/D
IlB	Ilion silt loam, 3 to 8 percent slopes	C/D
LaB	Lansing silt loam, 3 to 8 percent slopes	B
LaC	Lansing silt loam, 8 to 15 percent slopes	B
LaD	Lansing silt loam, 15 to 25 percent slopes	B
LMF	Lansing and Mohawk soils gravelly silt loam, 25 to 60 percent slopes	B
Ma	Madalin silt clay loam, 0 to 3 percent slopes	C/D
MmB	Manheim silt loam, 3 to 8 percent slopes	C/D
MsB	Mohawk silt loam, 3 to 8 percent slopes	B
MsC	Mohawk silt loam, 8 to 15 percent slopes	B
MsD	Mohawk silt loam, 15 to 25 percent slopes	B

Map Unit Symbol	Map Unit Name	HSG Rating
PaB	Palatine silt loam, 3 to 8 percent slopes	C
PaC	Palatine silt loam, 8 to 15 percent slopes	C
PaD	Palatine silt loam, 15 to 25 percent slopes	C
PmC	Palmyra gravelly silt loam, 8 to 15 percent slopes	A
PpB	Phelps gravelly loam, 3 to 8 percent slopes	B/D
Pr	Phelps, fan gravelly loam, 0 to 8 percent slopes	C
RhA	Rhinebeck silty clay loam, 0 to 3 percent slopes	C/D
RhB	Rhinebeck silty clay loam, 3 to 8 percent slopes	C/D
Te	Teel silt loam, 0 to 3 percent slopes	B/D

The Soil Conservation Service defines the HSGs as follows:

- Type A Soils: Soils having a high infiltration rate (low runoff potential).
- Type B Soils: Soils having a moderate infiltration rate.
- Type C Soils: Soils having a slow infiltration rate.
- Type D Soils: Soils having a very slow infiltration rate (high runoff potential).

For soils assigned to a dual hydrologic group, the first letter refers to drained areas and the second refers to undrained areas. In project areas of unknown soil type or areas not within agricultural land, the more conservative soil classification is assumed. Refer to Appendix E for the USDA NRCS Soil Resource Report for the Facility Site.

Geotechnical investigations were conducted at the Facility Site in April and May 2021. Soils were visually classified by texture, color, relative density, consistency, moisture, etc. Table 2, below, details the test boring and groundwater results.

Table 2 – Soil Boring Results

Boring Location	Depth to Very Dense Soils (ft)	Depth to Auger Refusal (ft)	Groundwater Level (ft)
B-01	6.5	6.9	--
B-02	8	>15	--
B-03	8	>15	--
B-04	7	>15	--
B-05	7	>15	--
B-06	7	7.7	--
B-07	8	>15	--
B-08	>15	>15	12.5
B-09	10	13.9	10.3
B-10	7.8	>15	--
B-11	6	7.6	--
B-12	5	>15	--
B-13	>15	>15	--
B-14	13.5	>15	--
B-15	9	>15	--

Boring Location	Depth to Very Dense Soils (ft)	Depth to Auger Refusal (ft)	Groundwater Level (ft)
B-16	>15	>15	--
B-17	9	10.5	--
B-18	6	8	--
B-19	6	7.5	--
B-20	>15	>15	--
B-21	>15	>15	--
B-22	>15	>15	--
B-23	6	>15	--
B-24	8	>15	10.3
B-25	>15	>15	14.2
B-26	>15	>15	--
B-27	13.5	>15	--
B-28	8	>15	3.0*
B-29	7	14.6	--
B-30	5.5	6.5	2.5*
SS-01	7	>35	--
SS-02	9	>35	8.2

*Possible perched water.

Additional information on the soil testing can be found in the Geotechnical Engineering Report provided in Appendix E.

5.2 Wetlands and Waterbodies

Review of the NYSDEC Environmental Resource Mapper (ERM) identified three NYSDEC-mapped freshwater wetlands and five NYSDEC-mapped streams within the Survey Area. Field delineations were completed in October and November 2020; May, June, and November 2021; and April and August 2022 to identify existing waterbodies and wetland at the Facility Site. Field delineations identified 172 wetlands and 95 streams within the Facility Survey Area.

Impacts to state-regulated streams and waterbodies are not anticipated as a result of the Facility. Impacts to state-jurisdictional wetlands and state-jurisdictional regulated adjacent areas are anticipated as a result of the Facility. The Client anticipates compensatory mitigation will be required to offset the impacts to wetland areas as a result of construction. A Wetland Restoration and Mitigation Plan will be developed for the Facility outlining the proposed compensatory mitigation plan, mitigation activities and potential locations, and long-term mitigation site protection and management. The wetlands and streams are detailed further in Exhibits 13 and 14 of the Section 94-c Application.

5.3 Floodplains

The following Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM) associated with the Facility Site have been printed:

- Panel 36057C0159E, effective January 19, 2018
- Panel 36057C0166E, effective January 19, 2018
- Panel 36057C0170E, effective January 19, 2018
- Panel 36057C0187E, effective January 19, 2018

In addition, the following FEMA FIRM panel is associated with the Facility Site but was not printed for the Facility Site:

- Panel 36057C0190E, effective January 19, 2018

The Facility Site was identified to be located within Flood Zone X, defined as areas determined to be outside the 0.2% (500-year) annual chance floodplain. Copies of the printed FEMA FIRM panels are provided in Appendix E.

In addition, the NYSDEC ERM did not identify the Facility Site to be located within a base flood elevation plus 72/75” sea-level rise.

5.4 Rainfall Information

Facility Site specific rainfall information for the 90% rainfall event was obtained from Figure 4.1 of the SMDM. Rainfall data for the 1-, 10-, and 100-year rainfall events was obtained from the Northeast Regional Climate Center’s Extreme Precipitation Tables. Table 3, below, details the 24-hour rainfall amounts for the Facility Site.

Table 3 – Rainfall Event Quantities

Rainfall Event	24-Hour Rainfall Amount (inches)
90%	1.10
1-Year	2.17
10-Year	3.50
100-Year	5.72

The precipitation information obtained from the Northeast Regional Climate Center is included in Appendix E.

5.5 Environmental Resource Information

A review of the NYSDEC ERM indicated the potential for rare plants or animals in the northwestern corner of the Facility Site and that a portion of the Facility along the western boundary falls within the vicinity of a listed bat species occurrence. Significant natural communities were not identified on the ERM to be present within or immediately adjacent to the Facility Site.

A review of the United States Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) system listed the following threatened, endangered, and/or candidate species to have the potential to be present within the Facility Site:

- Northern Long-eared Bat (NLEB) (*Myotis septentrionalis*) – federally and state listed endangered species
- Monarch Butterfly (*Danaus plexippus*) – federally listed candidate species

Consultation with the USFWS via IPaC indicated the potential presence of the NLEB within the vicinity of the Facility Site and did not identify presence of the Indiana bat within the vicinity of the Facility Site.

The Client consulted with ORES regarding the potential impact on the NLEB, Indiana Bat, Bald Eagle, and grassland bird species within or in the vicinity of the Facility Site. A Determination of Occupied Habitat, Incidental Take, and Net Conservation Benefit Plan was issued by ORES for the NLEB and Indiana Bat on August 3, 2023. The Determination concluded the Facility Site is not within one and a half (1.5) miles of a maternity roost site or five (5) miles of a hibernaculum site for the NLEB or within two and a half (2.5) miles of maternity roost sites nor within 2.5 miles of a hibernaculum or bachelor colonies for the Indiana Bat. In addition, according to ORES and the NYSDEC, there are no known bald eagle nests within the Facility Site or within one-quarter (0.25) mile of the Facility Site.

Based on the Determination of Occupied Habitat, Incidental Take, and Net Conservation Benefit issued by ORES, the Facility is anticipated to have greater than a *de minimis* impact on occupied habitat for state-listed grassland bird species, therefore a Net Conservation Benefit Plan (NCBP) will be prepared for the Facility in consultation with ORES to provide proposed mitigation actions to offset potential impacts to species. The implementation of the NCBP would result in a net positive conservation benefit on each of the affected species by protecting suitable habitat.

The Facility has been sited to avoid and minimize potential impacts to the species of concern during construction and operation of the Facility to the maximum extent practicable. Refer to Exhibit 12 of the Section 94-c Application and Appendix E for additional information and agency consultation documentation for the listed species.

5.6 Cultural Resource Information

A review of the NYS Office of Parks Recreation and Historic Preservation (OPRHP) Cultural Resources Information System (CRIS) database indicates that portions of the Facility Site are located within an archaeologically sensitive area. The OPRHP records confirm there are no NRHP-listed or eligible for listing archaeological sites within the area of potential effect for archaeological resources. Three previously recorded OPRHP archaeological sites and one cemetery are present within the Facility Site. Additional archaeological surveys and consultation with OPRHP is ongoing. Refer to Exhibit 9 of the Section 94-c Application for additional information on cultural resources within or adjacent to the Facility Site.

6.0 Contract Documents

The Contractor is responsible for the implementation of this SWPPP, as well as the installation, construction, repair, replacement, inspection and maintenance of erosion and sediment control practices. Each Contractor shall sign the Contractor Certification Form provided in Appendix C prior to the commencement of construction activities. Copies of the NYSDEC 4-hour Erosion and Sediment Control Training Certificates for the Contractor(s), Subcontractor(s), and Qualified Inspector shall be provided in Appendix C prior to the commencement of construction.

This SWPPP and associated documentation, including but not limited to, a copy of the GP-0-20-001, NOI, NYSDEC NOI Acknowledgement Letter, Contractor Certification Form, Construction Drawings, inspection reports, and permit eligibility forms, must be maintained in a secure location for the duration of the Facility.

7.0 Personnel Contact List

The Construction Personnel Contact List for the Facility is provided in Appendix C. The listed personnel are responsible for ensuring compliance with the SWPPP and associated permit conditions. Personnel responsibilities include, but are not limited to, the following:

- Implement the SWPPP;
- Oversee maintenance practices identified in the SWPPP;
- Conduct or provide for inspection and monitoring activities;
- Identify potential erosion, sedimentation, and pollutant sources during construction and ensure issues are addressed appropriately and in a timely manner;
- Identify necessary amendments to the SWPPP and ensure proper implementation; and,
- Document activities associated with the implementation of this SWPPP and supporting documents.

Refer to GP-0-20-001 for information regarding specific personnel responsibilities.

8.0 SWPPP Construction Requirements and Sequencing

This section provides the Owner/Operator and the Contractor with a suggested order of construction that will minimize erosion and the transport of sediments. The individual objectives of the construction techniques described herein shall be considered an integral component of the Facility design. The construction sequence is not intended to prescribe definitive construction methods and should not be interpreted as a construction specification document.

The Contractor shall follow the general principles outlined below throughout the construction phase:

- Protect and maintain existing vegetation wherever possible;
- Minimize the area of disturbance;
- To the extent possible, route unpolluted flows around disturbed areas;
- Install approved erosion and sediment control devices as early as possible;
- Minimize the time disturbed areas are left un-stabilized; and,
- Maintain erosion and sediment control devices in proper condition.

The Contractor should use the suggested construction sequence and techniques as a general guide and modify the suggested methods and procedures as required to best suit seasonal and site-specific physical constraints for the purpose of minimizing the environmental impact due to construction.

The Facility is anticipated to involve three stages of work; site preparation, construction, and site restoration. Prior to the commencement of construction activities, temporary erosion and sediment control measures shall be installed per the Construction Drawings provided in Appendix F. The Facility stages are detailed below.

Stage 1: Facility Site Preparation

- Establish access to the Facility Site including the stabilized construction entrances and access roads;
- Stake/flag construction limits, staging/storage areas, concrete washout locations, environmentally sensitive areas, and other associated work areas;
- Mark existing utilities and infrastructure;
- Conduct tree clearing and vegetation management, if necessary, and grading of work areas, as required; and,
- Install the erosion and sediment controls as detailed on the Erosion and Sediment Control Plans.

Stage 2: Construction

- Conduct grading activities as required.
- Install posts and racking for solar arrays.
- Install of solar panels.
- Install inverter pads, substation, and associated electrical equipment.
- Install stormwater management practices and complete final site grading.
- Install perimeter fencing and gates.
- Construct the pervious access road.

Stage 3: Facility Site Restoration

- Remove and dispose of Facility related waste material at an approved disposal facility;
- Prepare soils as needed (restoration of original grade, de-compaction, soil amendments, etc.), and seed and mulch all disturbed areas. Restore disturbed soils per New York State Department of Agriculture and Markets (NYSAGM) requirements in agricultural areas, and NYSDEC standards and specifications in non-agricultural areas;
- Remove the temporary erosion and sediment controls when 80% of natural vegetative cover has been achieved and erosion issues are no longer present; and,
- Submit the Notice of Termination (NOT) Form to the NYSDEC in accordance with the General Permit.

The Facility anticipates disturbance of greater than five acres at any one time throughout construction. As such, a Five-Acre Disturbance Waiver Request will be prepared and submitted to the NYSDEC for approval in accordance with the General Permit requirements. A Phasing Plan will be prepared for the Facility as part of the Five-Acre Waiver Request to detail the maximum disturbed area and amount of cut/fill required per phase. A copy of the Request and the Phasing Plan shall be provided in Appendix D. Refer to Section 12.2 for additional information regarding the approval of the Request and the associated inspection requirements.

9.0 Stormwater Management and Pollution Controls

Prior to the commencement of construction activities, temporary erosion and sediment controls shall be installed to prevent erosion of the soils and prevent water quality degradation in wetlands and waterbodies. Erosion and sediment controls will be utilized to limit, control, and mitigate construction related impacts. The stormwater management and pollution controls shall include practices that involve runoff control, soil stabilization practices, and sediment control.

The erosion and sediment controls utilized at the Facility Site must be installed and maintained in accordance with GP-0-20-001, the SSESC and the SMDM. Improper installation of practices may result in an increase in water quality impacts to nearby waterbodies or sedimentation impacts to undisturbed lands. Deviations from the SSESC and SMDM standards should be discussed with the Qualified Inspector/Qualified Professional prior to utilizing the alternative practice. If the alternative practice is acceptable, documentation is required to detail the reasoning for the alternative practice and to provide evidence that the alternative design is equivalent to the technical standard. The SWPPP shall be amended as appropriate to incorporate the alternative practice. In the event that an alternative practice fails and a standard SSESC practice is required, the Contractor shall install the required practice upon approval from the Qualified Inspector/ Qualified Professional and Owner/Operator. The SWPPP shall be amended as appropriate to document changes to the practice.

The following sections detail potential stormwater contamination sources due to construction related activities and the temporary and permanent erosion and sediment controls to be utilized throughout the construction of the Facility to mitigate impacts. Refer to the SSESC and SMDM for additional guidance on installation, maintenance and removal.

9.1 Potential Impacts for Stormwater Contamination

Construction activities and processes that result in either increased stormwater runoff or the potential to add pollutants to runoff are subject to the requirements of this SWPPP. These activities may include areas of land disturbed by grading, excavation, construction, or material storage. Water that comes in contact with the surface of the Facility Site as a result of precipitation (snow, hail, rain, etc.) is classified as stormwater associated with the Facility and is subject to the requirements of this SWPPP.

Construction activities that may negatively impact stormwater include, but are not limited to, the following:

- <u>Tree Clearing and Vegetation Removal</u>: Removal of vegetation can expose and weaken soils and may result in erosion.
- <u>Construction Site Entrance</u>: Vehicles leaving the Facility Site can track soils onto public roadways.
- <u>Grading Operations</u>: Exposed soils have the potential for erosion and sedimentation when not stabilized.
- <u>Fugitive Dust</u>: Dust generated by vehicles or from strong winds during a drought period can be deposited in wetlands, waterways, and other environmentally sensitive areas, or may negatively impact the air quality.

- General Site Construction Activities: Maintenance and heavy use of access roads can expose soils, creating significant erosion potential. Soil stockpiling from site excavations and grading may promote erosion and sedimentation. Dewatering activities may result in concentrated flows and has the potential to increase erosion.
- Construction Vehicles and Equipment: Refueling of vehicles may result in spilling or dripping gasoline and diesel fuel onto the ground. On-site maintenance of excavating equipment may result in hydraulic oil, lubricants, or antifreeze dripping onto the ground. Sediment tracking and the spread of invasive species may occur if construction vehicles are improperly maintained. Ruts caused by equipment can create paths for concentrated water flows.
- Waste Management Practices: Typical construction projects often generate significant quantities of solid waste, such as wrappings, personnel-generated trash and waste, and construction debris.

Proper utilization of staging and storage areas, stockpiling areas, and erosion and sediment controls will mitigate potential impacts to the stormwater. Refer to Section 10.1 for additional information on spill prevention and waste management procedures for the Facility.

9.2 Protection of Existing Vegetation

Natural vegetation shall be preserved to the maximum extent practicable. Preserving natural vegetation will reduce soil erosion and maintain the inherent integrity of the Facility Site. Protection practices may include barrier fencing to prevent equipment and vehicle traffic in vegetated and environmentally sensitive areas.

9.3 Temporary Erosion and Sediment Controls

Temporary erosion and sediment controls shall be utilized to reduce erosion, sedimentation, and pollutants in stormwater discharges, and to prevent impacts to undisturbed areas, natural resources, wetlands, waterbodies, and downstream areas. Both stabilization techniques and structural methods will be utilized, as needed, to meet these objectives.

Temporary erosion and sediment control measures shall be applied during construction to:

- Minimize soil erosion and sedimentation through the stabilization of disturbed areas and removal of sediment from construction site discharges.
- Preserve existing vegetation to the maximum extent practicable and establish permanent vegetation on exposed soils following the completion of soil disturbance activities.
- Minimize the area and duration of soil disturbance through site preparation activities and construction sequencing.

Table 4, below, lists the erosion and sediment controls anticipated to be utilized at the Facility Site.

Table 4 – Proposed Erosion and Sediment Control Measures

Construction Road Stabilization	Concrete Truck Washout
Dust Control	Protecting Vegetation During Construction
Site Pollution Prevention	Stabilized Construction Access
Temporary Access Waterway Crossing	Winter Stabilization
Check Dam	Diversion Berm
Earth Dike	Flow Diffuser
Flow (Level) Spreader	Rock Outlet Protection
Anchored Stabilization Matting	Armored Slope and Channel Stabilization
Fertilizer Application	Land grading
Mulching	Permanent Construction Area Planting
Soil Restoration	Surface Roughening
Temporary Construction Area Seeding	Topsoiling
Buffer Filter Strip	Compost Filter Sock
Geotextile Filter Bag	Silt Fence
Straw Bale Dike	

The standards and specifications for the erosion and sediment control measures listed in Table 4 are provided in Appendix G. Refer to the SSESC and SMDM for the Standards and Specifications of alternate measures and practices, as needed. The temporary erosion and sediment control measures not detailed in the SSESC or SMDM are detailed below.

9.3.1 Temporary Stockpiling

Temporary stockpiling of granular material (gravel, excavated spoils, select backfill, topsoils, etc.) is expected on-site throughout the construction process. Stockpiling of materials is not permitted in areas where health or safety risks are present, or where impacts to water quality may occur. Stockpiling is not permitted in wetland or wetland buffer areas.

Stockpile areas shall be contained and protected with the proper erosion and sediment controls such as silt fencing and mulch. Soil stockpiles shall be stabilized with vegetation, geotextile fabric, or plastic covers if not utilized for seven days.

Stockpile areas should be inspected and maintained as needed or directed by the Project Engineer (or Qualified Inspector/Qualified Professional).

9.3.2 Temporary Spoil Stockpiling

Spoil material shall be segregated, conserving topsoil for revegetation and disposing of the inorganic sub-soils. Spoils shall be free of construction debris including foreign chunks of concrete, and other construction-related materials.

A procedure for spoil disposal will be developed and included in the Final SWPPP prior to excavation, including the proposed quantities of spoil and the proposed location(s) and procedures for stockpiling and disposal. Spoils shall not be disposed of within wetlands, waterbodies, agricultural areas, or other environmentally sensitive areas. Excess topsoil is encouraged to be spread within the immediate disturbed areas, including agricultural areas, if the material is free of rocks. Inorganic spoils shall be buried and capped with the previously stripped, native topsoil to ensure revegetation. Additional topsoil may be required to adequately cover the spoil area. If additional space is needed for on-site disposal, the SWPPP shall be amended as appropriate. For spoils needing to be disposed of off-site, the spoils shall be disposed of at an authorized facility off-site.

9.3.3 Timber Matting

Timber (“swamp”) matting is often utilized to distribute vehicle loads on agricultural, lawn, and wetland areas. The matting aids in reducing rutting, soil compaction, and restoration activities in protected areas. Poorly drained upland soils, such as wetland transitional areas, may be matted to reduce rutting and sediment tracking.

An additional benefit of matting in wetlands is that mats can be arranged to act as a containment surrounding excavations. This may be especially helpful in standing water situations were conventional erosion and sediment controls are not practicable. The Contractor should be cognizant of the hydrology of the area by recognizing water staining and bank full indicators. The Qualified Inspector can assist in this identification.

Headers and stringers shall be used in deeper or open water wetlands to allow wetland inundation under the matted drivable surface. The SWPPP specified wetland access does not account for poorly drained or poorly structured soils that are not wetlands. Transitional areas may experience severe rutting due to high traffic associated with the installation of the wetland access matting. Additional matting is recommended to reduce track out and restoration efforts, however it is not required for access.

Submerged wetland matting can create a “pumping” effect as vehicles pass, resulting in disturbed wetland soils, turbidity and sedimentation. This disturbance is a violation of the associated wetland permits. Although the presence of matting in this situation is still better than the alternative, pumping mats will require additional stabilization and sediment control practices not planned for in the Construction Drawings. Matting will need to be re-installed, or access will be shut down until water recedes to eliminate the erosion concern.
Refer to Appendix G for additional information regarding timber matting.

9.3.4 Horizontal Directional Drilling (HDD)

To avoid unnecessary disturbance or impact to the bed, banks, and aquatic habitat of the streams, horizontal directional drilling (HDD) may be utilized for installation of the collection lines at the stream crossings. HDD may also be used at roadway crossings as necessary to prevent impacts to the public. The HDD process involves drilling boreholes with a fluid mixture, primarily composed of water and bentonite, a naturally occurring clay. The drilling fluid aids in the removal of cuttings from the borehole, stabilizes the borehole, and acts as a coolant and lubricant throughout the drilling process. The bentonite-water mixture is not classified as a toxic or hazardous substance, however, if released into waterbodies, bentonite has the potential to temporarily reduce water quality, and therefore, adversely impact fish and other aquatic species.

To protect public health and safety and natural resources should HDD be employed at the Facility during construction, the Contractor shall establish operational procedures and responsibilities for the prevention, containment, and cleanup of inadvertent releases associated with the proposed HDD. The operational procedures should:

1. Minimize the potential for an inadvertent release of drilling fluids associated with HDD activities;
2. Provide for the timely detection of inadvertent returns;
3. Protect environmentally sensitive areas (streams, wetlands, etc.) while responding to an inadvertent release;
4. Ensure an organized, timely and “minimum-impact” response in the event of an inadvertent return and release of drilling fluids; and,
5. Ensure that all appropriate notifications are made immediately.

The Contractor shall comply with the Owner’s/Operator’s operational procedures for HDD.

9.4 Temporary Stabilization for Frozen Conditions

Winter stabilization standards apply to construction activities with ongoing soil disturbance and exposure between November 15th and April 1st. Temporary winter stabilization measures shall be employed prior to frozen conditions, as detailed in the SSESC.

Erosion and sediment control measures shall be inspected to ensure proper performance and winter stabilization function. Repairs should be made as necessary to prevent erosion and sedimentation during thawing or rain events.

10.0 Post-Construction Stormwater Management

Chapter 3 of the SMDM sets forth the required planning process that must be followed when addressing stormwater management planning for new development and redevelopment projects. The five steps included in the process are as follows:

- Site planning to preserve natural site features and reduce impervious cover.
- Calculation of the Water Quality Volume (WQv) of the Facility Site.
- Incorporations of runoff reduction techniques and standard SMPs with Runoff Reduction Volume (RRv) capacity.
- Use standard SMPs, where applicable, to treat the portion of WQv not reduced through RRv techniques and SMPs with RRv capacity.
- Design for volume and peak rate control practices where required.

The five steps have been classified as Site Planning to Preserve Natural Features, WQv, RRv, Channel Protection Volume, and Overbank Flood and Extreme Storm Attenuation. These items will be addressed in the sections below.

10.1 Design Justification

The proposed Facility will result in greater than one acre of soil disturbance and results in an increase in impervious surface, therefore post-construction stormwater management practices are required for the Facility.

The WQv and stormwater quantity requirements shall be met by projects requiring post-construction stormwater controls. The SMDM details the stormwater management practices that may be implemented at the Facility Site to aid in the reduction of stormwater effects to newly developed areas. Effects from new development may include changes in runoff volume, flow rates, timing of runoff, habitat destruction, and degradation of receiving waterbodies and downstream areas.

The following site constraints were considered when determining the appropriate stormwater management practices to be implemented on the Facility Site:

- Practices cannot impact existing structures or utilities;
- Facility Site use limitations;
- Steep site slopes greater than 25% in areas of the Facility Site; and
- The proposed new development conditions need to mimic the existing runoff patterns to the maximum extent practicable.

The peak runoff rates for the pre-development and post-development conditions have been analyzed to aid in maintaining the pre-development runoff rates. Regulating the runoff rate will minimize the impacts to adjacent and downstream properties and waterbodies and minimize impacts to the stormwater runoff quality.

10.2 Stormwater Quality Analysis

10.2.1 Water Quality Volume (WQv) Analysis

The Facility requires treatment of the WQv, which is intended to improve water quality by capturing and treating runoff from small, frequent storm events. The NYSDEC has defined WQv as the volume of runoff generated from the 90th percentile (90%) rainfall event. Practices sized to treat the WQv will capture and treat 90% of all 24-hour rainfall events. The WQv is determined using the following equation:

$$WQ_v = \frac{P * R_v * A}{12}$$

Where:

- WQv = Water Quality Volume (acre-feet)
- P = 90% Rainfall Event Number

- $Rv = 0.05 + 0.009(I)$, where I is percent impervious cover
- A = Site Area (acres)

The 90% rainfall event number has been obtained from Figure 4.1 of the SMDM. The WQv is directly correlated to the amount of impervious cover at the Facility Site. Approximately 19 acres of new impervious cover are proposed within the Facility Site, composed of gravel access roads and inverter pads. The total required WQv for the Facility was calculated to be 7,894 ft^3 (0.18 ac-ft). A summary of the calculated WQv for each subcatchment within the Facility Site is provided in Appendix J.

10.2.2 Runoff Reduction Volume (RRv) Analysis

The RRv is intended to reduce the WQv through infiltration, groundwater recharge, reuse, recycle, evaporation/evapotranspiration of the post-development runoff in order to replicate the pre-development hydrology. Replication of the pre-development hydrology includes maintaining pre-construction infiltration, peak runoff flow, discharge volume and minimizing concentrated flow through the use of runoff control techniques.

The RRv is determined using the following equation:

$$RR_v = \frac{[(P)(R_v^*)(A_i]}{12}$$

Where:

- RRv = Minimum Runoff Reduction Volume (acre/feet)
- P = 90% Rainfall Event Number
- $Rv^* = 0.05 + 0.009(I)$, where I is 100% impervious
- A_i = Impervious cover targeted for runoff reduction, calculated as $A_i = (S)(A_{ic})$
- S = Specific Runoff Reduction Factor (per HSG)
- A_{ic} = Total area of new impervious cover

The runoff reduction techniques have been selected based on the proposed Facility use type and the existing site constraints as detailed in Section 10.1, above.

New development projects that cannot achieve 100% runoff reduction for the WQv due to site limitations, must direct runoff from newly constructed impervious areas to runoff reduction or SMP practices, unless infeasible. The percentage of reduction required is determined from the specific runoff reduction factor (S), which is based on the site's HSG. Table 4, below, details the specific reduction factors per HSG.

Table 5 - RRv Reduction by Soil Type

HSG	Specific Reduction Factor (S)
A	0.55
B	0.40
C	0.30
D	0.20

Infiltration trenches are proposed to capture and treat the required WQv and RRv for the Facility. Infiltration trenches store the WQv in the void space of the gravel trench allowing the runoff to infiltrate into the ground. In total, 38 infiltration trenches are proposed throughout the Facility. Level spreaders, flow diffusers, and grass filter strips are proposed to provide pretreatment for runoff into the infiltration trenches.

Refer to Appendix J for detailed WQv and RRv calculations.

10.2.3 Green Infrastructure Techniques

Runoff reduction is the reduction of WQv achieved through application of green infrastructure techniques and standard SMPs having RRv capacity. Green infrastructure for stormwater management reduces the Facility Site’s impact on the aquatic ecosystem by replicating the pre-development hydrology while minimizing concentrated flows. The green infrastructure techniques are practices which indirectly reduce runoff and are detailed in Table 6 below, which was adapted from Table 3.1 in the SMDM. The green infrastructure practices were considered for this Facility to the maximum extent practicable.

Table 6 – Green Infrastructure Planning (Adapted from SMDM Table 3.1)

NYSDEC Stormwater Management Design Manual Table 3.1 Green Infrastructure Planning General Categories and Specific Practices			
Group	**Practice**	**Description**	**Application to Facility**
Preservation of Natural Resources	Preservation of Undisturbed Areas	Delineate and place into permanent conservation easement undisturbed forests, native vegetated areas riparian corridors, wetlands, and natural terrain.	Earth disturbance have been reduced to the maximum extent practicable.
	Preservation of Buffers	Define, delineate and place in permanent conservation easement naturally vegetated buffers along perennial streams, rivers, shorelines, and wetlands.	Natural areas and buffers have been conserved to the maximum extent practicable.
	Reduction of Clearing and Grading	Limit clearing and grading to the minimum amount needed for roads, driveways, foundations, utilities, and stormwater management facilities.	The amount of land clearing and grading will be kept to the minimum necessary and required to construct the Facility.
	Locating Development in Less Sensitive Areas	Avoid sensitive resource areas such as floodplains, steep slopes, erodible soils, wetlands, mature forests and critical habitats by locating development to fit the terrain in areas that will create the least impact.	The Facility has been designed in a relatively flat location and outside of floodplains and environmentally sensitive areas to the maximum extent practicable.
	Open Space Design	Using clustering, conservation design, or open space design to reduce impervious	Open space design has not been applied to the Facility.

NYSDEC Stormwater Management Design Manual Table 3.1 Green Infrastructure Planning General Categories and Specific Practices			
Group	**Practice**	**Description**	**Application to Facility**
		cover, preserve more open space and protect water resources.	
	Soil Restoration	Restore the original properties and porosity of the soil by deep till and amendment with compost to reduce the generation of runoff and enhance the runoff reduction performance of practices such as grass channels, filter strips, and tree clusters.	This practice will be employed throughout the Facility to restore the original properties of the soil and replicate pre-development hydrology conditions to the maximum extent practicable.
Reduction of Impervious Cover	Roadway Reduction	Minimize roadway widths and lengths to reduce site impervious area.	Access roads have been designed to the minimum necessary for the Facility.
	Sidewalk Reduction	Minimize sidewalk lengths and widths to reduce site impervious area.	Sidewalks are not proposed for the Facility.
	Driveway Reduction	Minimize driveway lengths and widths to reduce site impervious area.	Driveway width and length are limited to the minimum required for access to the Facility.
	Cul-de-sac Reduction	Minimize the number of cul-de-sacs and incorporate landscaped areas to reduce their impervious cover.	Cul-de-sacs are not proposed for the Facility.
	Building Footprint Reduction	Reduce the impervious footprint of residences and commercial buildings by using alternate or taller buildings while maintaining the same floor to area ratio.	Proposed buildings/structures will be limited to the substation areas and are designed to the minimum necessary for the Facility.
	Parking Area Reduction	Reduce imperviousness on parking lots by eliminating unneeded spaces, providing compact car spaces and efficient parking lanes, minimizing stall dimensions, using porous pavement surfaces in overflow parking areas, and using multistoried parking decks where appropriate.	Parking areas are limited to designated temporary laydown areas adjacent to access roads.

10.2.4 Runoff Reduction Techniques

The stormwater management plan must demonstrate that green infrastructure planning and design options were evaluated in order to meet the RRv requirement. Projects that cannot reduce 100% of the WQv shall direct runoff from all newly construction impervious areas to a runoff reduction (RR) technique or standard SMP with RRv capacity unless infeasible. The runoff reduction techniques are practices in which runoff reduction is quantified and are detailed in Table 7 below, which was adapted from Table 3.2 in the SMDM. The runoff reduction techniques were considered for this Facility to the maximum extent practicable.

Table 7 – Runoff Reduction Techniques (Adapted from SMDM Table 3.2)

NYSDEC Stormwater Management Design Manual Table 3.2 **Acceptable Runoff Reduction Techniques**			
Group	**Practice**	**Description**	**Application to Facility**
Runoff Reduction Techniques	Conservation of Natural Areas	Retain the pre-development hydrologic and water quality characteristics of undisturbed natural areas, stream and wetland buffers by restoring and/or permanently conserving these areas on a site.	Natural areas have been conserved to the maximum extent practicable.
	Sheetflow to Riparian Buffers or Filter Strips	Undisturbed natural areas such as forested conservation areas and stream buffers or vegetated filter strips and riparian buffers can be used to treat and control stormwater runoff from some areas of a development project.	Natural areas have been conserved to the maximum extent practicable. Filter strips are proposed throughout the Facility Site.
	Vegetated Open Swale	The natural drainage paths, or properly designed vegetated channels, can be used instead of constructing underground storm sewers or concrete open channels to increase time of concentration, reduce the peak discharge, and provide infiltration.	Vegetated open swales are not proposed for the Facility.
	Tree Planting/ Tree Box	Plant or conserve trees to reduce stormwater runoff, increase nutrient uptake, and provide bank stabilization. Trees can be used for applications such as landscaping, stormwater management practice areas, conservation areas and erosion and sediment control.	Tree clearing has been kept to the minimum necessary for construction. Landscaping will be employed to provide visual buffers for sensitive areas. Tree boxes are not proposed for the Facility.
	Stream Daylighting for Redevelopment Projects	Stream Daylight previously-culverted/piped streams to restore natural habitats, better attenuate runoff by increasing the storage size, promotion infiltration, and help reduce pollutant loads.	Stream daylighting is not proposed. The Project is not a redevelopment project.
	Rain Garden	Manage and treat small volumes of stormwater runoff using a conditioned planting soil bed and planting materials to filter runoff stored within a shallow depression.	Rain gardens are not proposed for the Facility.
	Green Roof	Capture runoff by a layer of vegetation and soil installed on top of a conventional flat or sloped roof. The rooftop vegetation allows evaporation and evapotranspiration processes to reduce volume and discharge rate of runoff entering conveyance system.	Green roof techniques are not applicable to the Facility.
	Stormwater Planter	Small, landscaped stormwater treatment devices that can be designed as infiltration or filtering practices. Stormwater planters use soil infiltration and biogeochemical processes to decrease stormwater quantity and improve water quality.	Stormwater planters are not applicable to the Facility.
	Rain Tank/Cistern	Capture and store stormwater runoff to be used for irrigation systems or filtered and reused for non-contact activities.	Rain tanks/cisterns are not proposed for the Facility.
	Porous Pavement	Pervious types of pavements that provide an alternative to conventional paved surfaces, designed to infiltrate rainfall through the surface, thereby reducing stormwater runoff from a site and providing some pollutant uptake in the underlying soils.	Porous pavement is not proposed for the Facility.

10.2.5 Standard Stormwater Management Practices (SMPs) for Treatment

Table 8 below, adapted from Table 3.3 in the SMDM, details standard SMPs that are acceptable for water quality treatment. These practices are designed to capture and treat the WQv which was not reduced from RR techniques.

Table 8 – Stormwater Management Practices for Water Quality Volume (Adapted from SMDM Table 3.3)

NYSDEC Stormwater Management Design Manual Table 3.3 Stormwater Management Practices Acceptable for Water Quality Volume			
Group	**Practice**	**Description**	**Application to Facility**
Pond	Micropool Extended Detention Pond (P-1)	Pond that treats the majority of the water quality volume through extended detention and incorporates a micropool at the outlet of the pond to prevent sediment resuspension.	This practice has not been applied to the Facility.
	Wet Pond (P-2)	Pond that provides storage for the entire water quality volume in the permanent pool	This practice has not been applied to the Facility.
	Wet Extended Detention Pond (P-3)	Pond that treats a portion of the water quality volume by detaining storm flows above a permanent pool for a specified minimum detention time.	Detention ponds are proposed for the Facility.
	Multiple Pond System (P-4)	A group of ponds that collectively treat the water quality volume.	This practice has not been applied to the Facility.
	Pocket Pond (P-5)	A stormwater wetland design adapted for the treatment of runoff from small drainage areas that has little or no baseflow available to maintain water elevations and relies on ground water to maintain a permanent pool.	This practice has not been applied to the Facility.
Wetland	Shallow Wetland (w-1)	A wetland that provides water quality treatment entirely in a wet shallow marsh.	This practice has not been applied to the Facility.
	Extended Detention Wetland (W-2)	A wetland system that provides some fraction of the water quality volume by detaining storm flows above the marsh surface.	This practice has not been applied to the Facility.
	Pond/Wetland System (W-3)	A wetland system that provides a portion of the water quality volume in the permanent pool of a wet pond that precedes the marsh for a specified minimum detention time.	This practice has not been applied to the Facility.
	Pocket Wetland (W-4)	A shallow wetland design adapted for the treatment of runoff from small drainage areas that has variable water levels and relies on groundwater for its permanent pool.	This practice has not been applied to the Facility.
Infiltration	Infiltration Trench (I-1)	An infiltration practice that stores the water quality volume in the void spaces of a gravel trench before it is infiltrated into the ground.	Infiltration trenches are proposed to treat new impervious areas.
	Infiltration Basin (I-2)	An infiltration practice that stores the water quality volume in a shallow depression, before it is infiltrated it into the ground	This practice has not been applied to the Facility.
	Dry Well (I-3)	An infiltration practice similar in design to the infiltration trench, and best suited for treatment of rooftop runoff.	This practice has not been applied to the Facility.
Filtering Practices	Surface Sand Filter (F-1)	A filtering practice that treats stormwater by settling out larger particles in a sediment chamber, and then filtering stormwater through a sand matrix.	This practice has not been applied to the Facility.
	Underground Sand Filter (F-2)	A filtering practice that treats stormwater as it flows through underground settling and filtering chambers.	This practice has not been applied to the Facility.

NYSDEC Stormwater Management Design Manual Table 3.3 Stormwater Management Practices Acceptable for Water Quality Volume			
Group	**Practice**	**Description**	**Application to Facility**
	Perimeter Sand Filter (F-3)	A filter that incorporates a sediment chamber and filer bed as parallel vaults adjacent to a parking lot.	This practice has not been applied to the Facility.
	Organic Filter (F-4)	A filtering practice that uses an organic medium such as compost in the filter, in the place of sand.	This practice has not been applied to the Facility.
	Bioretention (F-5)	A shallow depression that treats stormwater as it flows through a soil matrix and is returned to the storm drain system.	This practice has not been applied to the Facility.
Open Channels	Dry Swale (O-1)	An open drainage channel or depression explicitly designed to detain and promote the filtration of stormwater runoff into the soil media.	This practice has not been applied to the Facility.
	Wet Swale (O-2)	An open drainage channel or depression designed to retain water or intercept groundwater for water quality treatment.	This practice has not been applied to the Facility.

10.3 Stormwater Quantity Analysis

A runoff analysis for this Facility was performed in order to demonstrate compliance with the requirements for stormwater quantity control found in Chapter 4 of the SMDM. This analysis includes of a comparison of the pre- and post-development peak runoff rates from the Facility Site.

Appendices K and L include Pre-Development and Post-Development Subcatchment Maps with contours information, land cover types, hydrologic soil groups, subcatchment area boundaries, time of concentration flow lines, existing features and drainage ways. The post-development stormwater management plan also shows the locations of the proposed development.

The analyses include computations for determining the times of concentration for the subcatchments, as well as the HydroCAD output which includes composite curve number (CN) calculations, peak discharge calculations for the design storms, and routing calculations. Detailed discussions of the analyses are provided in the following sections.

10.3.1 Stormwater Management Performance Criteria

In accordance with the General Permit, stormwater management practices shall be designed in conformance with the performance criteria detailed in Chapter 6 of the SMDM for each practice type. The performance criteria were developed for the following performance goals:

- Feasibility: Identify site considerations that may restrict the use of a practice.
- Conveyance: Convey runoff to the practice in a manner that is safe, minimizes erosion and disruption to natural channels, and promotes filtering and infiltration.
- Pretreatment: Trap coarse elements before they enter the facility, thus reducing the maintenance burden and ensuring a long-lived practice.
- Treatment Geometry: Produce water quality treatment, through design elements that provide the maximum pollutant removal as water flows through the practice.
- Environmental/Landscaping: Reduce secondary environmental impacts of facilities through features that minimize disturbance of natural stream systems and

comply with environmental regulations. Provide landscaping that enhances the pollutant removal and aesthetic value of the practice.

- Maintenance: Maintain the long-term performance of the practice through regular maintenance activities, and through design elements that ease the maintenance burden.

10.3.2 Methodology

Stormwater runoff was estimated using HydroCAD, Version 10.0. HydroCAD software is based on methodologies developed by the USDA NRCS, namely "Urban Hydrology for Small Watersheds", Technical Release 55 and Technical Release 20 (TR-50 and TR-20, respectively), in conjunction with other hydrologic and hydraulic calculations. Based on site specific information, including land cover, slopes, soils, and rainfall data, the program calculates inflow and outflow hydrographs for subcatchments, reach routing, and pond routing. See Appendices K and L for copies of this information.

For the HydroCAD analysis, the Facility Site was divided by watershed and drainage systems, which contribute to the overall stormwater network. The watersheds and drainage systems were classified by the following components:

- Subcatchment: Utilized to model the runoff from a given area of land.
- Pond: Used to model a reservoir, dam, catch basin, manhole, drywell, storage chamber, vault, or other impoundment that fills with water. Ponds may empty through a weir, culvert, orifice, or other outlet device.
- Reach: Used to perform independent routing through an open channel or overland flows.
- Link: A multi-purpose node used to link a hydrograph to another system.

10.3.3 Rainfall Data

Rainfall data was obtained from the Northeast Regional Climate Center's Extreme Precipitation Tables for the 1, 10 and 100-year, 24-hour storm events. HydroCAD uses the local 24-hour precipitation data to generate local 24-hour Intensity-Duration-Frequency (IDF) curves and rainfall distributions. The software then uses the rainfall amounts and distributions to generate runoff hydrographs for each of the design storms. Storm events modeled for the runoff analyses assumed precipitation events with a 24-hour duration and return frequencies of 1, 10, and 100 years. The corresponding precipitation depths for these storm events are 2.17, 3.50 and 5.72 inches, respectively. Refer to Appendix E of the SWPPP for rainfall data obtained for the Facility.

10.3.4 Curve Number (CN) Computations

Runoff CNs are based on the land cover and HSGs for the Facility Site. Cover types for the Facility Site were determined from survey and aerial photography. Due to the presence of agricultural land at the Facility Site, existing agricultural land cover was classified as "non-grazed meadow," per the SMDM's requirement. These CNs and their respective soil types are indicated on the Pre-Development and Post-Development Subcatchment Maps.

The soil classifications and HSGs of soils on or adjacent to the Facility Site were obtained from the UDSA NRCS Soil Survey of Montgomery County, New York. The information was downloaded from the NRCS Web Soil Survey website and is located in Appendix E of the SWPPP.

HydroCAD provided CNs based on the selected land use and HSG. HydroCAD's CN table is based on Table 2-2 of the NRCS TR-55 publication.

10.3.5 Time of Concentration Calculations

Times of concentration (Tc) were calculated using NRCS TR-55 methodologies considering the hydrologic flow lengths, land slope, cover type, and surface roughness. The type and length of each hydrologic flow line are indicated in the HydroCAD modeling output (Appendices K and L). The maximum sheet flow length used for this analysis was 100 feet. Shallow concentrated flow lengths were extended until they reached a subcatchment boundary or a concentrated flow channel.

10.4 Subcatchments and Study Points

The pre-development and post-development conditions for the Facility Site were divided into subcatchments, which depict the watershed conditions, methods of collection, conveyance, points of discharge and topography. In addition, the drainage pattern, drainage structures, soil types, and ground covers are utilized to analyze the rate of runoff in the existing and proposed conditions. The subcatchments include off-site contributing areas as determined by the site topography and site features. The Facility Site was divided into 54 subcatchments for both the pre- and post-development condition. The overall bounds of the subcatchments and study points remain unchanged from the pre-development condition. The study points are were used to compare the pre-development and post-development runoff conditions across the Facility Site and determine the need for stormwater management practices.

10.4.1 Pre-Development Conditions

Pre-development runoff rates were determined by identifying the subcatchments within the Facility Site. Table 9 below provides a summary of the land cover conditions in the pre-development condition.

Table 9 – Pre-Development Land Covers

Land Cover	Curve Number	Area (acres)
>75% Grass Cover, Good, HSG A	39	0.502
>75% Grass Cover, Good, HSG B	61	50.906
>75% Grass Cover, Good, HSG C	74	38.798
>75% Grass Cover, Good, HSG D	80	7.707
Brush, Good, HSG A	30	0.940
Brush, Good, HSG B	48	27.713
Brush, Good, HSG C	65	26.712
Brush, Good, HSG D	73	13.341
Gravel, HSG D	96	16.302

Land Cover	Curve Number	Area (acres)
Impervious Surface, HSG D	98	14.956
Meadow, non-grazed, HSG A	30	21.106
Meadow, non-grazed, HSG B	58	794.057
Meadow, non-grazed, HSG C	71	759.192
Meadow, non-grazed, HSG D	78	108.864
Surface Water, HSG D	98	19.715
Unconnected Roofs, HSG D	98	4.420
Woods, Good, HSG A	30	25.720
Woods, Good, HSG B	55	268.497
Woods, Good, HSG C	70	81.945
Woods, Good, HSG D	77	32.582
Total	**64**	**2,314**

Additional information on the pre-development land covers can be found in Appendix K.

10.4.2 Post-Development Conditions

Table 10 – Post-Development Land Covers

Land Cover	Curve Number	Area (acres)
>75% Grass Cover, Good, HSG A	39	0.498
>75% Grass Cover, Good, HSG B	61	42.317
>75% Grass Cover, Good, HSG C	74	30.147
>75% Grass Cover, Good, HSG D	80	6.842
Brush, Good, HSG A	30	0.802
Brush, Good, HSG B	48	24.339
Brush, Good, HSG C	65	31.552
Brush, Good, HSG D	73	19.339
Gravel, HSG D	96	42.056
Impervious Surface, HSG D	98	3.335
Meadow, non-grazed, HSG A	30	23.090
Meadow, non-grazed, HSG B	58	828.747
Meadow, non-grazed, HSG C	71	775.381
Meadow, non-grazed, HSG D	78	107.794
Pasture/Grassland/Range, Good, HSG C	74	0.107
Pasture/Grassland/Range, Good, HSG D	80	0.090
Pavement, HSG D	98	1.142
Surface Water, HSG D	98	15.507
Unconnected Roofs, HSG D	98	12.428
Woods, Good, HSG A	30	24.824

Land Cover	Curve Number	Area (acres)
Woods, Good, HSG B	55	236.304
Woods, Good, HSG C	70	65.163
Woods, Good, HSG D	77	22.853
Total	**64**	**2,134**

The Facility proposes construction of impervious surfaces and land cover conversion that may increase runoff from the pre- to post-development conditions. Refer to Appendix L for a summary of the post-development land cover conditions.

10.5 Runoff Analysis Results

10.5.1 Stormwater Quantity Analysis

The SMDM Section 4.4-4.6 requires the Facility to meet the following separate stormwater quantity criteria:

- Channel Protection Volume (Cpv): The Cpv requirement is designed to protect stream channels from erosion by providing 24 hours of extended detention for a 1-year, 24-hour storm event.
- Overbank Flood Control (Qp): The Qp requirement is designed to prevent an increase in frequency and magnitude of out-of-bank flooding generated by urban development. The overbank control requires storage to attenuate the post-development 10-year, 24-hour peak discharge rate to pre-development rates.
- Extreme Flood Control (Qf): The Qf requirement is designed to prevent the increased risk of flood damage from large storm events, maintain boundaries of the pre-development 100-year floodplain, and protect the physical integrity of the stormwater management practices. The extreme flood control requires storage to attenuate the post-development 100-year, 24-hour peak discharge rate to pre-development rates.

10.5.2 Runoff Analysis

In order to compare the pre-development and post-development runoff conditions, study points were selected across the Facility Site. Table 11 provides a summary of the pre- and post-development peak runoff rates for the various storm events at each study point. The rate of runoff is impacted by the land cover and topography of the pre- and post-development conditions.

Table 11 – Peak Runoff Rates and Volumes

Study Point	Pre-Development Rate (cfs)			Post-Development Rate (cfs)		
	1-Year Storm	10-Year Storm	100-Year Storm	1-Year Storm	10-Year Storm	100-Year Storm
SP1	0.03	1.74	10.41	0.03	1.74	10.41
SP2	0.10	5.64	30.30	0.07	4.76	28.42

Study Point	Pre-Development Rate (cfs)			Post-Development Rate (cfs)		
	1-Year Storm	10-Year Storm	100-Year Storm	1-Year Storm	10-Year Storm	100-Year Storm
SP3	0.54	11.88	52.70	0.54	11.88	52.70
SP4	3.41	35.64	133.29	2.89	30.23	113.38
SP5	6.08	31.00	95.55	6.08	30.80	94.50
SP7	0.53	12.87	65.69	0.49	11.99	61.20
SP9	2.90	24.39	86.90	1.97	19.40	77.77
SP10	3.89	16.44	44.88	3.83	15.17	43.49
SP11	2.01	14.10	44.67	1.55	12.71	41.84
SP13	2.11	8.61	26.22	1.93	7.96	25.09
SP14	5.46	31.66	99.70	5.46	31.66	99.70
SP17	1.46	27.14	121.08	1.46	27.14	121.08
SP18	5.31	26.15	76.28	5.31	26.15	76.28
SP22	21.82	149.08	473.35	21.38	140.57	451.38
SP23	2.30	11.48	33.25	1.51	8.66	27.45
SP24	1.93	6.60	16.40	1.63	5.97	15.20
SP25	5.45	21.20	55.28	5.09	18.53	48.02
SP26	1.36	11.13	36.72	1.36	11.13	36.72
SP27	2.68	18.63	58.97	2.24	15.57	51.71
SP28	1.51	12.05	40.53	1.35	10.83	36.93
SP29	0.59	8.27	32.39	0.59	8.26	32.39
SP30	1.90	17.68	62.67	1.29	14.29	53.26
SP34	2.78	49.57	227.89	2.39	47.38	217.12
SP35	3.19	24.07	82.01	3.11	23.34	79.38
SP36	2.07	24.27	89.17	2.07	24.27	89.17
SP37	0.16	3.02	13.48	0.16	3.02	13.48
SP38	2.95	24.59	87.58	2.95	24.59	87.58
SP39	5.95	57.34	215.84	5.95	57.34	215.84
SP41	2.29	24.38	91.27	1.71	21.94	86.70
SP42	2.10	24.60	101.59	2.01	19.06	84.26
SP43	11.22	57.18	173.96	11.09	54.76	165.50
SP46	0.00	0.12	4.48	0.00	0.08	3.05
SP47	0.00	0.09	4.75	0.00	0.07	3.23
SP48	15.16	59.68	158.49	12.18	51.67	140.87
SP50	5.73	31.56	94.34	4.44	23.82	72.03
SP51	4.89	43.05	153.74	4.28	36.64	131.32
SP52	2.70	13.42	38.30	2.55	12.69	36.22
SP53	1.89	11.37	35.62	1.89	11.37	35.62

Study Point	Pre-Development Rate (cfs)			Post-Development Rate (cfs)		
	1-Year Storm	10-Year Storm	100-Year Storm	1-Year Storm	10-Year Storm	100-Year Storm
SP54	7.27	33.26	93.52	5.74	28.37	82.69
SP55	1.96	13.01	42.41	1.94	11.07	34.81
SP56	6.36	38.94	121.25	3.42	24.07	77.99
Total	**152.04**	**1,036.90**	**3,526.92**	**135.93**	**940.95**	**3,255.78**

Nineteen detention basins are proposed within the Facility Site to provide for the temporary storage of stormwater runoff and reduce downstream water quantity impacts. The detention basins provide stormwater quantity controls for the 1, 10 and 100-year storm events. Outlet control structures will be utilized to manage discharge from the detention basins. Emergency spillways will be used to allow excess stormwater to discharge from the detention basin for storm events exceeding the 100-year storm event. The detention basins sizing will be finalized prior to construction during final site design.

The runoff analysis for this Facility demonstrates that the overall post-development condition stormwater runoff for the Facility Site will be reduced below the pre-development levels. As detailed in Table 11 above, the post-development runoff rates will be reduced from the pre-development condition for all study points for each storm event.

Pre-development drainage patterns and sheet flow will be maintained throughout the Facility Site and all attempts have been made to minimize tree/vegetation removal and earth disturbance and minimize impervious areas to the maximum extent practicable. Negative impacts to downstream areas due to this Facility are not anticipated. Refer to Appendices K and L for the stormwater calculations and modeling for the pre- and post-development condition. Refer to the Construction Drawings in Appendix F and the sizing calculations in Appendix J for details regarding the sizing of the SMPs.

The SMPs proposed within this Preliminary SWPPP are anticipated practices to be installed at the Facility. These practices will be modified as necessary for the Final SWPPP prior to Facility construction.

11.0 Construction Pollution Prevention

Proper material storage, handling, and disposal practices shall be implemented during construction to reduce the risk of exposure of materials and hazardous substances to stormwater and environmental resources. The storage, handling, and disposal procedures to be enforced by the Owner/Operator, Contractor(s) and the Qualified Inspector are described below.

11.1 Management of Spills and Releases

The Owner/Operator must be notified in the event of a non-stormwater (fuel, oil, chemical, etc.) spill or release to ensure proper reporting and clean up. The Owner/Operator shall proceed as appropriate in accordance with the Owner/Operator’s, local, state, and federal environmental policies and procedures.

A spill or release shall be reported to the NYSDEC Spill Hotline (1-800-457-7362), as applicable, within two hours of the release. The Contractor is responsible for retaining documentation containing the NYS spill number and spill information to provide to the Owner/Operator and the Qualified Inspector. The Contractor is responsible for the cleanup and response actions, in accordance with the on-site spill prevention procedures manual. Contaminated soil shall be removed from the Facility Site and disposed of in accordance with the product specific Safety Data Sheets (SDS) and environmental guidance.

Potential pollutant sources are likely to be stored on the construction site. Bulk petroleum storage (1,100 gallon above ground tank and/or 110 below ground tank) and chemical storage (185 gallon above ground tank and/or any below ground tank) shall not be present onsite. Construction materials typically present on construction sites, as noted in the National Pollutant Discharge Elimination System (NPDES) Construction General Permit, include, but are not limited to, the following:

- <u>Building Products:</u> Asphalt sealants, copper flashing, roofing materials, adhesives, concrete admixtures, and gravel and/or mulch stockpiles;
- <u>Chemicals:</u> Pesticides, herbicides, insecticides, fertilizers, and landscape materials;
- <u>Petroleum Products:</u> Diesel fuel, oil, hydraulic fluids, gasoline, etc.;
- <u>Hazardous or Toxic Waste:</u> Paints, caulks, sealants, fluorescent light ballasts, solvents, petroleum-based products, wood preservatives, additives, curing compounds, and acids;
- <u>Sanitary Facilities:</u> Portable toilets; and,
- <u>Construction Debris:</u> Fill, vegetative debris, stumps, and construction waste.

Specific quantities cannot be estimated until construction methodology and contractor(s) are secured for construction.

Spill cleanup and response guidance is provided in Appendix H of this SWPPP.

11.2 Construction Housekeeping

The Owner/Operator or the Contractor shall coordinate with local fire officials regarding on-site fire safety and emergency response. The Contractor shall keep the Construction Supervisor and the Qualified Inspector/Qualified Professional aware of chemicals and waste present on site. The Contractor shall periodically conduct safety inspections at the Facility Site to identify housekeeping issues and employ spill prevention procedures.

11.2.1 Material Stockpiling

Material resulting from clearing and grubbing, grading, and other construction activities, or new material delivered to the Facility Site, shall be stockpiled upslope of disturbed areas. The stockpile areas shall have the proper erosion and sediment controls installed to prevent the migration of sediments and materials. Materials shall be properly stored and kept away from water resources and environmentally sensitive areas, including, but not limited to, wetlands, streams, storm drains, and ditches.

11.2.2 Staging, Storage, and Laydown Areas

Construction materials and equipment should be stored in designated staging areas as indicated on the Construction Drawings or as directed by the Project Engineer (or Qualified Inspector). The staging, storage, and laydown areas should be located in an area that minimizes impacts to stormwater quality.

Chemicals, solvents, fertilizers, and other toxic materials must be stored in waterproof containers and must be kept in the proper storage facilities, except during use or application. Runoff containing such materials must be collected and disposed of at an approved solid waste or chemical disposal facility.

Bulk storage of materials will be staged at the Facility laydown yard per SDS specification and Environmental Health and Safety Standards, whichever is more restrictive. Contractor marshalling yards may be associated with other projects not covered under this SWPPP and General Permit. If the laydown area is associated with this SWPPP, the yard shall be inspected by the Qualified Inspector until Facility related activities have ceased. A Qualified Inspector shall inspect the laydown yard to assess for environmental impacts prior to and throughout its use. If additional laydown yards are required, they must abide by this SWPPP and GP-0-20-001. Amendments shall be made to the SWPPP, as necessary, for the additional laydown areas.

11.2.3 Equipment Cleaning and Maintenance

All on-site construction vehicles, including employee vehicles, shall be monitored for leaks and shall receive regular preventative maintenance to reduce the risk of leakage. Any equipment leaking oil, fuel, or hydraulic fluid shall be repaired immediately or removed from the Facility Site. Construction equipment and Contractor personal vehicles shall be parked, refueled and serviced at least 100 feet from a wetland, waterbody, or other ecologically sensitive area, at an upland location away from conveyance channels, unless approved by the Qualified Inspector/Qualified Professional.

Where there is no reasonable alternative, refueling may occur within these setbacks, but only under the observation of the Qualified Inspector or Trained Contractor and after proper precautions are taken to prevent an accidental spill. The Contractor shall take precautions to ensure that drips, spills, or seeps do not enter the ground. The use of absorbent towels and/or a portable basin beneath the fuel tank is recommended. Refueling activities shall be performed under continual surveillance with extreme care. In the event of a release, the spill shall be promptly cleaned up in accordance with the spill response and clean up procedures.

Petroleum products and hydraulic fluids that are not in vehicles shall be stored in tightly sealed containers that are clearly labeled. All gasoline and fuel storage vessels with greater than a 25-gallon capacity must have secondary containment constructed of an impervious material and be capable of holding 110% of the vessel capacity.

11.2.4 Concrete Washout Areas

Designated concrete washout areas should be provided as needed to allow concrete trucks to wash out or discharge surplus concrete and wash water on site. The concrete washout areas shall be a diked impervious area, located a minimum of 100 feet from a drainage way, waterbody, or wetland area. The concrete washout areas should be designed to prevent contact between the concrete wash and stormwater. The concrete washout areas shall have the proper signage to indicate the location of the facility. The Contractor is responsible for the maintenance of the concrete washout areas. Waste collected at the concrete washout areas shall be disposed of as non-hazardous construction waste material.

The washout facility should have sufficient volume to contain the concrete waste resulting from washout and a minimum freeboard of 12 inches. The washout areas should not be filled beyond 95% capacity and shall be cleaned out once 75% capacity has been met unless a new facility has been constructed. Refer to the SSESC and SMDM for guidance on the construction and use of concrete washout areas.

11.3 Waste Management

The Contractor shall comply with all required regulations governing the on-site management and off-site disposal of solid and hazardous waste generated during construction of the Facility. Substances and materials with the potential to pollute surface and groundwaters must be handled, controlled and contained as appropriate to ensure they do not discharge from the Facility Site.

A solid waste management program will be implemented to support proper solid waste disposal and recycling practices. Solid waste and debris that cannot be recycled, reused, or salvaged shall be stored in on-site containers for off-site disposal. The containers shall be emptied periodically by a licensed waste transport service and hauled away from the site for proper disposal. No loose materials shall be allowed at the Facility Site and all waste material shall be disposed of promptly and properly. The burning of crates, waste, and other refuse is not permitted.

If a hazardous material spill occurs, it must be contained and disposed of immediately. Contaminated soil shall be removed from the Facility Site and disposed of in accordance with product specific SDS and associated guidelines. Reporting spills to the NYSDEC may be required per 17 New York Code, Rules and Regulations (NYCRR) 32.3 and 32.4, and the Environmental Conservation Law (ECL) 17-1734.

12.0 Maintenance Inspections and Reporting Requirements

12.1 Pre-Construction Inspection

A site assessment shall be conducted by the Qualified Inspector prior to commencement of construction activities to ensure erosion and sediment controls have been adequately and appropriately installed. The Contractor is responsible for contacting the Qualified Inspector for the pre-construction inspection following the installation of the erosion and sediment control measures.

12.2 Construction Phase Inspections

A Qualified Inspector shall conduct regular site inspections for the implementation of this SWPPP through final stabilization of the Facility Site. Inspections shall occur at an interval of once every seven calendar days unless greater than five acres of soil is disturbed at any one time or if the Facility Site directly discharges to a 303(d) waterbody segment or is located in one of the watersheds listed in Appendix C of GP-0-20-001, in which inspections shall occur at least twice per every seven calendar days. The two inspections shall be separated by a minimum of two full calendar days. Written authorization from the NYSDEC is required prior to disturbance of greater than five acres. If a portion of the Facility Site is permanently stabilized, inspections can cease in that area as long as the condition has been documented by amending the SWPPP.

The Qualified Inspector shall conduct site inspections to assess the performance of the erosion and sediment controls and identify areas requiring modification or repair. The Qualified Inspector shall complete an inspection report following each inspection.

The Owner/Operator and the Contractor(s) must ensure the erosion and sediment control practices implemented at the Facility Site have been maintained in accordance with GP-0-20-001, the SSESC and SMDM. The Trained Contractor shall regularly inspect the erosion and sediment control practices and pollution prevention measures to ensure they are being maintained in effective operating condition at all times. Corrective actions to the identified deficiencies shall be made within a reasonable time frame.

The Qualified Inspector/Qualified Professional shall inspect the debris removal on a continual basis during construction to ensure proper management and disposal. When construction and restoration are complete, the Contractor is responsible for ensuring the Facility Site is free of all construction debris and materials.

12.3 Temporary Construction Activity Suspension

The Contractor must temporarily stabilize all disturbed areas prior to temporary suspension of construction activities. For construction sites where soil disturbance activities have been temporarily suspended and the appropriate temporary stabilization measures have been installed and applied to all disturbed areas, the Qualified Inspector shall begin conducting site inspections in accordance with Part IV.C.2 of GP-0-20-001. The Trained Contractor may cease the regular maintenance inspections until soil disturbance activities resume.

The Owner/Operator must notify the NYSDEC DOW Program contact at the Regional Office in writing prior to reducing the frequency of inspections. Correspondence with the NYSDEC DOW shall be included in Appendix D of this SWPPP.

12.4 Partial Facility Completion

Construction sites where soil disturbance activities have been shut down with partial Facility completion, the Qualified Inspector can stop conducting inspections once all disturbed areas have achieved final stabilization in conformance with this SWPPP.

The Owner/Operator must notify the NYSDEC DOW Program contact at the Regional Office in writing prior to shut down. Correspondence with the NYSDEC DOW shall be included in Appendix D of this SWPPP.

If soil disturbance activities have ceased for two years from the date of shutdown, the Owner/Operator shall have the Qualified Inspector complete a final inspection to certify final stabilization has been achieved and all temporary erosion and sediment control measures have been removed. The Owner/Operator shall complete the NOT form and submit the form to the NYSDEC. A copy of the completed NOT shall be included in Appendix A of this SWPPP.

12.5 Reporting Requirements

Inspection and maintenance reports shall be prepared in accordance with GP-0-20-001 from the commencement of construction activities until the NOT has been submitted to the NYSDEC. The Qualified Inspector shall provide a copy of the completed inspection report to the Owner/Operator and the Contractor(s) within one business day of inspection. A copy of the inspection report shall be included in Appendix N of the on-site SWPPP. A blank SWPPP Inspection Form is provided in Appendix N.

12.6 Post-Construction Operation and Maintenance Record Archiving

Post-construction stormwater operation and maintenance (O&M) activities shall be performed in accordance with the O&M Manual provided in Appendix I of this SWPPP and the requirements outlined in the Section 3.5 of the SMDM. Post-construction operation and maintenance shall occur once stormwater management practices have been installed and are in operation, and the disturbed areas have achieved final stabilization.

12.7 Records Archiving

The Owner/Operator shall retain physical copies of the SWPPP, permit coverage forms, inspection records, and all other associated documentation that were prepared in conjunction with GP-0-20-001 for a period of at least five years from the date that the NYSDEC received the completed NOT.

Appendix A – SWPPP Permit Coverage Forms

- Notice of Intent (NOI) -

- SWPPP Preparer Certification Form -

- Owner/Operator Certification Form -

- NYSDEC NOI Acknowledgement Letter for Permit Coverage -

- Notice of Termination (NOT) Form -

Appendix A – Notice of Intent (NOI)

Note: The Notice of Intent will be completed in the Final SWPPP prior to construction.

0644089821

NOTICE OF INTENT

New York State Department of Environmental Conservation
Division of Water
625 Broadway, 4th Floor
Albany, New York 12233-3505

NYR (for DEC use only)

Stormwater Discharges Associated with Construction Activity Under State Pollutant Discharge Elimination System (SPDES) General Permit # GP-0-15-002

All sections must be completed unless otherwise noted. Failure to complete all items may result in this form being returned to you, thereby delaying your coverage under this General Permit. Applicants must read and understand the conditions of the permit and prepare a Stormwater Pollution Prevention Plan prior to submitting this NOI. Applicants are responsible for identifying and obtaining other DEC permits that may be required.

-IMPORTANT-

RETURN THIS FORM TO THE ADDRESS ABOVE

OWNER/OPERATOR MUST SIGN FORM

Owner/Operator Information

Owner/Operator (Company Name/Private Owner Name/Municipality Name)

Owner/Operator Contact Person Last Name (NOT CONSULTANT)

Owner/Operator Contact Person First Name

Owner/Operator Mailing Address

City

State

Zip -

Phone (Owner/Operator) - -

Fax (Owner/Operator) - -

Email (Owner/Operator)

FED TAX ID - (not required for individuals)

Project Site Information

Project/Site Name

Street Address (NOT P.O. BOX)

Side of Street

○ **North** ○ **South** ○ **East** ○ **West**

City/Town/Village (THAT ISSUES BUILDING PERMIT)

State: N Y

Zip: -

County

DEC Region

Name of Nearest Cross Street

Distance to Nearest Cross Street (Feet)

Project In Relation to Cross Street

○ **North** ○ **South** ○ **East** ○ **West**

Tax Map Numbers
Section-Block-Parcel

Tax Map Numbers

1. Provide the Geographic Coordinates for the project site in NYTM Units. To do this you **must** go to the NYSDEC Stormwater Interactive Map on the DEC website at:

www.dec.ny.gov/imsmaps/stormwater/viewer.htm

Zoom into your Project Location such that you can accurately click on the centroid of your site. Once you have located your project site, go to the tool boxes on the top and choose "i"(identify). Then click on the center of your site and a new window containing the X, Y coordinates in UTM will pop up. Transcribe these coordinates into the boxes below. For problems with the interactive map use the help function.

X Coordinates (Easting)	**Y Coordinates (Northing)**
	4

2. What is the nature of this construction project?

○ **New Construction**

○ **Redevelopment with increase in impervious area**

○ **Redevelopment with no increase in impervious area**

3. Select the predominant land use for both pre and post development conditions.
SELECT ONLY ONE CHOICE FOR EACH

Pre-Development
Existing Land Use

- ○ FOREST
- ○ PASTURE/OPEN LAND
- ○ CULTIVATED LAND
- ○ SINGLE FAMILY HOME
- ○ SINGLE FAMILY SUBDIVISION
- ○ TOWN HOME RESIDENTIAL
- ○ MULTIFAMILY RESIDENTIAL
- ○ INSTITUTIONAL/SCHOOL
- ○ INDUSTRIAL
- ○ COMMERCIAL
- ○ ROAD/HIGHWAY
- ○ RECREATIONAL/SPORTS FIELD
- ○ BIKE PATH/TRAIL
- ○ LINEAR UTILITY
- ○ PARKING LOT
- ○ OTHER

Post-Development
Future Land Use

- ○ SINGLE FAMILY HOME
- ○ SINGLE FAMILY SUBDIVISION
- ○ TOWN HOME RESIDENTIAL
- ○ MULTIFAMILY RESIDENTIAL
- ○ INSTITUTIONAL/SCHOOL
- ○ INDUSTRIAL
- ○ COMMERCIAL
- ○ MUNICIPAL
- ○ ROAD/HIGHWAY
- ○ RECREATIONAL/SPORTS FIELD
- ○ BIKE PATH/TRAIL
- ○ LINEAR UTILITY (water, sewer, gas, etc.)
- ○ PARKING LOT
- ○ CLEARING/GRADING ONLY
- ○ DEMOLITION, NO REDEVELOPMENT
- ○ WELL DRILLING ACTIVITY *(Oil, Gas, etc.)
- ○ OTHER

Number of Lots

***Note**: for gas well drilling, non-high volume hydraulic fractured wells only

4. In accordance with the larger common plan of development or sale, enter the total project site area; the total area to be disturbed; existing impervious area to be disturbed (for redevelopment activities); and the future impervious area constructed within the disturbed area. (Round to the nearest tenth of an acre.)

Total Site Area	**Total Area To Be Disturbed**	**Existing Impervious Area To Be Disturbed**	**Future Impervious Area Within Disturbed Area**
.	.	.	.

5. Do you plan to disturb more than 5 acres of soil at any one time? ○ **Yes** ○ **No**

6. Indicate the percentage of each Hydrologic Soil Group(HSG) at the site.

A	**B**	**C**	**D**
%	%	%	%

7. Is this a phased project? ○ **Yes** ○ **No**

8. Enter the planned start and end dates of the disturbance activities.

Start Date / / - **End Date** / /

9. Identify the nearest surface waterbody(ies) to which construction site runoff will discharge.

Name

9a. Type of waterbody identified in Question 9?

○ Wetland / State Jurisdiction On Site (Answer 9b)
○ Wetland / State Jurisdiction Off Site
○ Wetland / Federal Jurisdiction On Site (Answer 9b)
○ Wetland / Federal Jurisdiction Off Site
○ Stream / Creek On Site
○ Stream / Creek Off Site
○ River On Site
○ River Off Site
○ Lake On Site
○ Lake Off Site
○ Other Type On Site
○ Other Type Off Site

9b. How was the wetland identified?

○ Regulatory Map
○ Delineated by Consultant
○ Delineated by Army Corps of Engineers
○ Other (identify)

10. Has the surface waterbody(ies) in question 9 been identified as a 303(d) segment in Appendix E of GP-0-15-002? ○ **Yes** ○ **No**

11. Is this project located in one of the Watersheds identified in Appendix C of GP-0-15-002? ○ **Yes** ○ **No**

12. Is the project located in one of the watershed areas associated with AA and AA-S classified waters? **If no, skip question 13.** ○ **Yes** ○ **No**

13. Does this construction activity disturb land with no existing impervious cover and where the Soil Slope Phase is identified as an E or F on the USDA Soil Survey? **If Yes, what is the acreage to be disturbed?** ○ **Yes** ○ **No**

.

14. Will the project disturb soils within a State regulated wetland or the protected 100 foot adjacent area? ○ **Yes** ○ **No**

15. Does the site runoff enter a separate storm sewer system (including roadside drains, swales, ditches, culverts, etc)? ○ **Yes** ○ **No** ○ **Unknown**

16. What is the name of the municipality/entity that owns the separate storm sewer system?

17. Does any runoff from the site enter a sewer classified as a Combined Sewer? ○ **Yes** ○ **No** ○ **Unknown**

18. Will future use of this site be an agricultural property as defined by the NYS Agriculture and Markets Law? ○ **Yes** ○ **No**

19. Is this property owned by a state authority, state agency, federal government or local government? ○ **Yes** ○ **No**

20. Is this a remediation project being done under a Department approved work plan? (i.e. CERCLA, RCRA, Voluntary Cleanup Agreement, etc.) ○ **Yes** ○ **No**

21. Has the required Erosion and Sediment Control component of the SWPPP been developed in conformance with the current NYS Standards and Specifications for Erosion and Sediment Control (aka Blue Book)? ○ **Yes** ○ **No**

22. Does this construction activity require the development of a SWPPP that includes the post-construction stormwater management practice component (i.e. Runoff Reduction, Water Quality and Quantity Control practices/techniques)? ○ **Yes** ○ **No**
If No, skip questions 23 and 27-39.

23. Has the post-construction stormwater management practice component of the SWPPP been developed in conformance with the current NYS Stormwater Management Design Manual? ○ **Yes** ○ **No**

24. The Stormwater Pollution Prevention Plan (SWPPP) was prepared by:

○ **Professional Engineer (P.E.)**

○ **Soil and Water Conservation District (SWCD)**

○ **Registered Landscape Architect (R.L.A)**

○ **Certified Professional in Erosion and Sediment Control (CPESC)**

○ **Owner/Operator**

○ **Other**

SWPPP Preparer

Contact Name (Last, Space, First)

Mailing Address

City

State Zip -

Phone - -

Fax - -

Email

SWPPP Preparer Certification

I hereby certify that the Stormwater Pollution Prevention Plan (SWPPP) for this project has been prepared in accordance with the terms and conditions of the GP-0-15-002. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of this permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

First Name

MI

Last Name

Signature

Date / /

25. Has a construction sequence schedule for the planned management practices been prepared? ○ **Yes** ○ **No**

26. Select **all** of the erosion and sediment control practices that will be employed on the project site:

Temporary Structural

- ○ **Check Dams**
- ○ **Construction Road Stabilization**
- ○ **Dust Control**
- ○ **Earth Dike**
- ○ **Level Spreader**
- ○ **Perimeter Dike/Swale**
- ○ **Pipe Slope Drain**
- ○ **Portable Sediment Tank**
- ○ **Rock Dam**
- ○ **Sediment Basin**
- ○ **Sediment Traps**
- ○ **Silt Fence**
- ○ **Stabilized Construction Entrance**
- ○ **Storm Drain Inlet Protection**
- ○ **Straw/Hay Bale Dike**
- ○ **Temporary Access Waterway Crossing**
- ○ **Temporary Stormdrain Diversion**
- ○ **Temporary Swale**
- ○ **Turbidity Curtain**
- ○ **Water bars**

Biotechnical

- ○ **Brush Matting**
- ○ **Wattling**

Vegetative Measures

- ○ **Brush Matting**
- ○ **Dune Stabilization**
- ○ **Grassed Waterway**
- ○ **Mulching**
- ○ **Protecting Vegetation**
- ○ **Recreation Area Improvement**
- ○ **Seeding**
- ○ **Sodding**
- ○ **Straw/Hay Bale Dike**
- ○ **Streambank Protection**
- ○ **Temporary Swale**
- ○ **Topsoiling**
- ○ **Vegetating Waterways**

Permanent Structural

- ○ **Debris Basin**
- ○ **Diversion**
- ○ **Grade Stabilization Structure**
- ○ **Land Grading**
- ○ **Lined Waterway (Rock)**
- ○ **Paved Channel (Concrete)**
- ○ **Paved Flume**
- ○ **Retaining Wall**
- ○ **Riprap Slope Protection**
- ○ **Rock Outlet Protection**
- ○ **Streambank Protection**

Other

Post-construction Stormwater Management Practice (SMP) Requirements

Important: Completion of Questions 27-39 is not required if response to Question 22 is No.

27. Identify all site planning practices that were used to prepare the final site plan/layout for the project.

○ **Preservation of Undisturbed Areas**
○ **Preservation of Buffers**
○ **Reduction of Clearing and Grading**
○ **Locating Development in Less Sensitive Areas**
○ **Roadway Reduction**
○ **Sidewalk Reduction**
○ **Driveway Reduction**
○ **Cul-de-sac Reduction**
○ **Building Footprint Reduction**
○ **Parking Reduction**

27a. Indicate which of the following soil restoration criteria was used to address the requirements in Section 5.1.6("Soil Restoration") of the Design Manual (2010 version).

○ All disturbed areas will be restored in accordance with the Soil Restoration requirements in Table 5.3 of the Design Manual (see page 5-22).

○ Compacted areas were considered as impervious cover when calculating the **WQv Required**, and the compacted areas were assigned a post-construction Hydrologic Soil Group (HSG) designation that is one level less permeable than existing conditions for the hydrology analysis.

28. Provide the total Water Quality Volume (WQv) required for this project (based on final site plan/layout).

Total WQv Required

☐☐☐.☐☐☐ **acre-feet**

29. Identify the RR techniques (Area Reduction), RR techniques(Volume Reduction) and Standard SMPs with RRv Capacity in Table 1 (See Page 9) that were used to reduce the Total WQv Required(#28).

Also, provide in Table 1 the total impervious area that contributes runoff to each technique/practice selected. For the Area Reduction Techniques, provide the total contributing area (includes pervious area) and, if applicable, the total impervious area that contributes runoff to the technique/practice.

Note: Redevelopment projects shall use Tables 1 and 2 to identify the SMPs used to treat and/or reduce the WQv required. If runoff reduction techniques will not be used to reduce the required WQv, skip to question 33a after identifying the SMPs.

Table 1 - Runoff Reduction (RR) Techniques and Standard Stormwater Management Practices (SMPs)

	Total Contributing Area (acres)		Total Contributing Impervious Area(acres)
RR Techniques (Area Reduction)			
○ Conservation of Natural Areas (RR-1) ...	.	and/or	.
○ Sheetflow to Riparian Buffers/Filters Strips (RR-2)	.	and/or	.
○ Tree Planting/Tree Pit (RR-3)	.	and/or	.
○ Disconnection of Rooftop Runoff (RR-4)..	.	and/or	.
RR Techniques (Volume Reduction)			
○ Vegetated Swale (RR-5)			.
○ Rain Garden (RR-6)			.
○ Stormwater Planter (RR-7)			.
○ Rain Barrel/Cistern (RR-8)			.
○ Porous Pavement (RR-9)			.
○ Green Roof (RR-10)			.
Standard SMPs with RRv Capacity			
○ Infiltration Trench (I-1)			.
○ Infiltration Basin (I-2)			.
○ Dry Well (I-3)			.
○ Underground Infiltration System (I-4)			.
○ Bioretention (F-5)			.
○ Dry Swale (O-1)			.
Standard SMPs			
○ Micropool Extended Detention (P-1)			.
○ Wet Pond (P-2)			.
○ Wet Extended Detention (P-3)			.
○ Multiple Pond System (P-4)			.
○ Pocket Pond (P-5)			.
○ Surface Sand Filter (F-1)			.
○ Underground Sand Filter (F-2)			.
○ Perimeter Sand Filter (F-3)			.
○ Organic Filter (F-4)			.
○ Shallow Wetland (W-1)			.
○ Extended Detention Wetland (W-2)			.
○ Pond/Wetland System (W-3)			.
○ Pocket Wetland (W-4)			.
○ Wet Swale (O-2)			.

Table 2 - Alternative SMPs (DO NOT INCLUDE PRACTICES BEING USED FOR PRETREATMENT ONLY)

Alternative SMP	Total Contributing Impervious Area(acres)
○ **Hydrodynamic**	.
○ **Wet Vault**	.
○ **Media Filter**	.
○ **Other**	.

Provide the name and manufacturer of the Alternative SMPs (i.e. proprietary practice(s)) being used for WQv treatment.

Name

Manufacturer

Note: Redevelopment projects which do not use RR techniques, shall use questions 28, 29, 33 and 33a to provide SMPs used, total WQv required and total WQv provided for the project.

30. Indicate the Total RRv provided by the RR techniques (Area/Volume Reduction) and Standard SMPs with RRv capacity identified in question 29.

Total RRv provided

. **acre-feet**

31. Is the Total RRv provided (#30) greater than or equal to the total WQv required (#28).

○ **Yes** ○ **No**

If Yes, go to question 36.
If No, go to question 32.

32. Provide the Minimum RRv required based on HSG.
[Minimum RRv Required = (P)(0.95)(Ai)/12, Ai=(S)(Aic)]

Minimum RRv Required

. **acre-feet**

32a. Is the Total RRv provided (#30) greater than or equal to the Minimum RRv Required (#32)?

○ **Yes** ○ **No**

If Yes, go to question 33.
Note: Use the space provided in question #39 to summarize the specific site limitations and justification for not reducing 100% of WQv required (#28). A detailed evaluation of the specific site limitations and justification for not reducing 100% of the WQv required (#28) must also be included in the SWPPP.
If No, sizing criteria has not been met, so NOI can not be processed. SWPPP preparer must modify design to meet sizing criteria.

33. Identify the Standard SMPs in Table 1 and, if applicable, the Alternative SMPs in Table 2 that were used to treat the remaining total WQv(=Total WQv Required in 28 - Total RRv Provided in 30).

Also, provide in Table 1 and 2 the total impervious area that contributes runoff to each practice selected.

Note: Use Tables 1 and 2 to identify the SMPs used on Redevelopment projects.

33a. Indicate the Total WQv provided (i.e. WQv treated) by the SMPs identified in question #33 and Standard SMPs with RRv Capacity identified in question 29.

WQv Provided

☐☐☐.☐☐☐ **acre-feet**

Note: For the standard SMPs with RRv capacity, the WQv provided by each practice = the WQv calculated using the contributing drainage area to the practice - RRv provided by the practice. (See Table 3.5 in Design Manual)

34. Provide the sum of the Total RRv provided (#30) and the WQv provided (#33a). ☐☐☐.☐☐☐

35. Is the sum of the RRv provided (#30) and the WQv provided (#33a) greater than or equal to the total WQv required (#28)? ○ **Yes** ○ **No**

If Yes, go to question 36.
If No, sizing criteria has not been met, so NOI can not be processed. SWPPP preparer must modify design to meet sizing criteria.

36. Provide the total Channel Protection Storage Volume (CPv) required and provided or select waiver (36a), if applicable.

CPv Required	**CPv Provided**
☐☐☐.☐☐☐ **acre-feet**	☐☐☐.☐☐☐ **acre-feet**

36a. The need to provide channel protection has been waived because:

○ Site discharges directly to tidal waters or a fifth order or larger stream.

○ Reduction of the total CPv is achieved on site through runoff reduction techniques or infiltration systems.

37. Provide the Overbank Flood (Qp) and Extreme Flood (Qf) control criteria or select waiver (37a), if applicable.

Total Overbank Flood Control Criteria (Qp)

Pre-Development	**Post-development**
☐☐☐.☐☐☐ **CFS**	☐☐☐.☐☐☐ **CFS**

Total Extreme Flood Control Criteria (Qf)

Pre-Development	**Post-development**
☐☐☐.☐☐☐ **CFS**	☐☐☐.☐☐☐ **CFS**

37a. The need to meet the Qp and Qf criteria has been waived because:

○ Site discharges directly to tidal waters or a fifth order or larger stream.

○ Downstream analysis reveals that the Qp and Qf controls are not required

38. Has a long term Operation and Maintenance Plan for the post-construction stormwater management practice(s) been developed? ○ **Yes** ○ **No**

If Yes, Identify the entity responsible for the long term Operation and Maintenance

39. Use this space to summarize the specific site limitations and justification for not reducing 100% of WQv required(#28). (See question 32a) This space can also be used for other pertinent project information.

40. Identify other DEC permits, existing and new, that are required for this project/facility.

○ Air Pollution Control
○ Coastal Erosion
○ Hazardous Waste
○ Long Island Wells
○ Mined Land Reclamation
○ Solid Waste
○ Navigable Waters Protection / Article 15
○ Water Quality Certificate
○ Dam Safety
○ Water Supply
○ Freshwater Wetlands/Article 24
○ Tidal Wetlands
○ Wild, Scenic and Recreational Rivers
○ Stream Bed or Bank Protection / Article 15
○ Endangered or Threatened Species(Incidental Take Permit)
○ Individual SPDES
○ SPDES Multi-Sector GP NYR
○ Other
○ None

41. Does this project require a US Army Corps of Engineers Wetland Permit? ○ Yes ○ No
If Yes, Indicate Size of Impact. .

42. Is this project subject to the requirements of a regulated, traditional land use control MS4? ○ Yes ○ No
(If No, skip question 43)

43. Has the "MS4 SWPPP Acceptance" form been signed by the principal executive officer or ranking elected official and submitted along with this NOI? ○ Yes ○ No

44. If this NOI is being submitted for the purpose of continuing or transferring coverage under a general permit for stormwater runoff from construction activities, please indicate the former SPDES number assigned. NYR

Owner/Operator Certification

I have read or been advised of the permit conditions and believe that I understand them. I also understand that, under the terms of the permit, there may be reporting requirements. I hereby certify that this document and the corresponding documents were prepared under my direction or supervision. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. I further understand that coverage under the general permit will be identified in the acknowledgment that I will receive as a result of submitting this NOI and can be as long as sixty (60) business days as provided for in the general permit. I also understand that, by submitting this NOI, I am acknowledging that the SWPPP has been developed and will be implemented as the first element of construction, and agreeing to comply with all the terms and conditions of the general permit for which this NOI is being submitted.

Print First Name **MI**

Print Last Name

Owner/Operator Signature

Date

/ /

Appendix A – SWPPP Preparer Certification Form

Note: The signed SWPPP Preparer Certification Form will be completed in the Final SWPPP prior to construction.

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

SWPPP Preparer Certification Form

SPDES General Permit for Stormwater Discharges From Construction Activity (GP-0-20-001)

Project Site Information

Project/Site Name

Owner/Operator Information

Owner/Operator (Company Name/Private Owner/Municipality Name)

Certification Statement – SWPPP Preparer

I hereby certify that the Stormwater Pollution Prevention Plan (SWPPP) for this project has been prepared in accordance with the terms and conditions of the GP-0-20-001. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of this permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

First name MI Last Name

Signature Date

Revised: January 2020

Appendix A – Owner/Operator Certification Form

Note: The signed Owner/Operator Certification Form will be completed in the Final SWPPP prior to construction.

NEW YORK
STATE OF
OPPORTUNITY

Department of
Environmental
Conservation

Owner/Operator Certification Form

SPDES General Permit For Stormwater Discharges From Construction Activity (GP-0-20-001)

Project/Site Name: ____

eNOI Submission Number: ______________________________________

eNOI Submitted by: ☐ **Owner/Operator** ☐ **SWPPP Preparer** ☐ **Other**

Certification Statement - Owner/Operator

I have read or been advised of the permit conditions and believe that I understand them. I also understand that, under the terms of the permit, there may be reporting requirements. I hereby certify that this document and the corresponding documents were prepared under my direction or supervision. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. I further understand that coverage under the general permit will be identified in the acknowledgment that I will receive as a result of submitting this NOI and can be as long as sixty (60) business days as provided for in the general permit. I also understand that, by submitting this NOI, I am acknowledging that the SWPPP has been developed and will be implemented as the first element of construction, and agreeing to comply with all the terms and conditions of the general permit for which this NOI is being submitted.

Owner/Operator First Name M.I. Last Name

____
Signature

____
Date

Appendix A – NYSDEC NOI Acknowledgement Letter for Permit Coverage

Note: The NYSDEC NOI Acknowledgement Letter will be provided in the Final SWPPP prior to construction.

Appendix A – Notice of Termination (NOT) Form

New York State Department of Environmental Conservation
Division of Water
625 Broadway, 4th Floor
Albany, New York 12233-3505
(NOTE: Submit completed form to address above)

NOTICE OF TERMINATION for Storm Water Discharges Authorized under the SPDES General Permit for Construction Activity

Please indicate your permit identification number: NYR ___ ___ ___ ___ ___ ___

I. Owner or Operator Information

1. Owner/Operator Name:

2. Street Address:

3. City/State/Zip:

4. Contact Person: 4a.Telephone:

4b. Contact Person E-Mail:

II. Project Site Information

5. Project/Site Name:

6. Street Address:

7. City/Zip:

8. County:

III. Reason for Termination

9a. ☐ All disturbed areas have achieved final stabilization in accordance with the general permit and SWPPP. ***Date final stabilization completed** (month/year): ________________________________

9b. ☐ Permit coverage has been transferred to new owner/operator. Indicate new owner/operator's permit identification number: NYR ____ ____ ____ ____ ____ ____
(Note: Permit coverage can not be terminated by owner identified in I.1. above until new owner/operator obtains coverage under the general permit)

9c. ☐ Other (Explain on Page 2)

IV. Final Site Information:

10a. Did this construction activity require the development of a SWPPP that includes post-construction stormwater management practices? ☐ yes ☐ no (If no, go to question 10f.)

10b. Have all post-construction stormwater management practices included in the final SWPPP been constructed? ☐ yes ☐ no (If no, explain on Page 2)

10c. Identify the entity responsible for long-term operation and maintenance of practice(s)?

____

NOTICE OF TERMINATION for Storm Water Discharges Authorized under the SPDES General Permit for Construction Activity - continued

10d. Has the entity responsible for long-term operation and maintenance been given a copy of the operation and maintenance plan required by the general permit? ☐ yes ☐ no

10e. Indicate the method used to ensure long-term operation and maintenance of the post-construction stormwater management practice(s):

☐ Post-construction stormwater management practice(s) and any right-of-way(s) needed to maintain practice(s) have been deeded to the municipality.

☐ Executed maintenance agreement is in place with the municipality that will maintain the post-construction stormwater management practice(s).

☐ For post-construction stormwater management practices that are privately owned, a mechanism is in place that requires operation and maintenance of the practice(s) in accordance with the operation and maintenance plan, such as a deed covenant in the owner or operator's deed of record.

☐ For post-construction stormwater management practices that are owned by a public or private institution (e.g. school, university or hospital), government agency or authority, or public utility; policy and procedures are in place that ensures operation and maintenance of the practice(s) in accordance with the operation and maintenance plan.

10f. Provide the total area of impervious surface (i.e. roof, pavement, concrete, gravel, etc.) constructed within the disturbance area? ______________________________ (acres)

11. Is this project subject to the requirements of a regulated, traditional land use control MS4? ☐ yes ☐ no

(If Yes, complete section VI - "MS4 Acceptance" statement

V. Additional Information/Explanation:

(Use this section to answer questions 9c. and 10b., if applicable)

VI. MS4 Acceptance - MS4 Official (principal executive officer or ranking elected official) or Duly Authorized Representative (Note: Not required when 9b. is checked -transfer of coverage)

I have determined that it is acceptable for the owner or operator of the construction project identified in question 5 to submit the Notice of Termination at this time.

Printed Name:

Title/Position:

Signature:	Date:

NOTICE OF TERMINATION for Storm Water Discharges Authorized under the SPDES General Permit for Construction Activity - continued

VII. Qualified Inspector Certification - Final Stabilization:

I hereby certify that all disturbed areas have achieved final stabilization as defined in the current version of the general permit, and that all temporary, structural erosion and sediment control measures have been removed. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

Printed Name:

Title/Position:

Signature: Date:

VIII. Qualified Inspector Certification - Post-construction Stormwater Management Practice(s):

I hereby certify that all post-construction stormwater management practices have been constructed in conformance with the SWPPP. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

Printed Name:

Title/Position:

Signature: Date:

IX. Owner or Operator Certification

I hereby certify that this document was prepared by me or under my direction or supervision. My determination, based upon my inquiry of the person(s) who managed the construction activity, or those persons directly responsible for gathering the information, is that the information provided in this document is true, accurate and complete. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

Printed Name:

Title/Position:

Signature: Date:

(NYS DEC Notice of Termination - January 2015)

Appendix B – General Permit GP-0-20-001

NEW YORK
STATE OF
OPPORTUNITY

Department of
Environmental
Conservation

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SPDES GENERAL PERMIT
FOR STORMWATER DISCHARGES

From

CONSTRUCTION ACTIVITY

Permit No. GP- 0-20-001

Issued Pursuant to Article 17, Titles 7, 8 and Article 70

of the Environmental Conservation Law

Effective Date: January 29, 2020

Expiration Date: January 28, 2025

John J. Ferguson

Chief Permit Administrator

1-23-20

Authorized Signature

Date

Address: NYS DEC
Division of Environmental Permits
625 Broadway, 4th Floor
Albany, N.Y. 12233-1750

PREFACE

Pursuant to Section 402 of the Clean Water Act ("CWA"), stormwater *discharges* from certain *construction activities* are unlawful unless they are authorized by a *National Pollutant Discharge Elimination System ("NPDES")* permit or by a state permit program. New York administers the approved State Pollutant Discharge Elimination System (SPDES) program with permits issued in accordance with the New York State Environmental Conservation Law (ECL) Article 17, Titles 7, 8 and Article 70.

An *owner or operator* of a *construction activity* that is eligible for coverage under this permit must obtain coverage prior to the *commencement of construction activity*. Activities that fit the definition of "*construction activity*", as defined under 40 CFR 122.26(b)(14)(x), (15)(i), and (15)(ii), constitute construction of a *point source* and therefore, pursuant to ECL section 17-0505 and 17-0701, the *owner or operator* must have coverage under a SPDES permit prior to *commencing construction activity*. The *owner or operator* cannot wait until there is an actual *discharge* from the *construction site* to obtain permit coverage.

***Note: The italicized words/phrases within this permit are defined in Appendix A.**

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
SPDES GENERAL PERMIT FOR STORMWATER DISCHARGES FROM CONSTRUCTION ACTIVITIES

Table of Contents

Part 1. PERMIT COVERAGE AND LIMITATIONS

A. Permit Application

This permit authorizes stormwater *discharges* to *surface waters of the State* from the following *construction activities* identified within 40 CFR Parts 122.26(b)(14)(x), 122.26(b)(15)(i) and 122.26(b)(15)(ii), provided all of the eligibility provisions of this permit are met:

1. *Construction activities* involving soil disturbances of one (1) or more acres; including disturbances of less than one acre that are part of a *larger common plan of development or sale* that will ultimately disturb one or more acres of land; excluding *routine maintenance activity* that is performed to maintain the original line and grade, hydraulic capacity or original purpose of a facility;

2. *Construction activities* involving soil disturbances of less than one (1) acre where the Department has determined that a *SPDES* permit is required for stormwater *discharges* based on the potential for contribution to a violation of a *water quality standard* or for significant contribution of *pollutants* to *surface waters of the State.*

3. *Construction activities* located in the watershed(s) identified in Appendix D that involve soil disturbances between five thousand (5,000) square feet and one (1) acre of land.

B. Effluent Limitations Applicable to Discharges from Construction Activities

*Discharge*s authorized by this permit must achieve, at a minimum, the effluent limitations in Part I.B.1. (a) – (f) of this permit. These limitations represent the degree of effluent reduction attainable by the application of best practicable technology currently available.

1. Erosion and Sediment Control Requirements - The *owner or operator* must select, design, install, implement and maintain control measures to *minimize* the *discharge* of *pollutants* and prevent a violation of the *water quality standards*. The selection, design, installation, implementation, and maintenance of these control measures must meet the non-numeric effluent limitations in Part I.B.1.(a) – (f) of this permit and be in accordance with the New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016, using sound engineering judgment. Where control measures are not designed in conformance with the design criteria included in the technical standard, the *owner or operator* must include in the *Stormwater Pollution Prevention Plan* ("SWPPP") the reason(s) for the

deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

a. **Erosion and Sediment Controls.** Design, install and maintain effective erosion and sediment controls to *minimize* the *discharge* of *pollutants* and prevent a violation of the *water quality standards*. At a minimum, such controls must be designed, installed and maintained to:

  (i) *Minimize* soil erosion through application of runoff control and soil stabilization control measure to *minimize pollutant discharges*;

  (ii) Control stormwater *discharge*s, including both peak flowrates and total stormwater volume, to *minimize* channel and *streambank* erosion and scour in the immediate vicinity of the *discharge* points;

  (iii) *Minimize* the amount of soil exposed during *construction activity*;

  (iv) *Minimize* the disturbance of *steep slopes*;

  (v) *Minimize* sediment *discharge*s from the site;

  (vi) Provide and maintain *natural buffer*s around surface waters, direct stormwater to vegetated areas and maximize stormwater infiltration to reduce *pollutant discharge*s, unless *infeasible*;

  (vii) *Minimize* soil compaction. Minimizing soil compaction is not required where the intended function of a specific area of the site dictates that it be compacted;

  (viii) Unless *infeasible*, preserve a sufficient amount of topsoil to complete soil restoration and establish a uniform, dense vegetative cover; and

  (ix) *Minimize* dust. On areas of exposed soil, *minimize* dust through the appropriate application of water or other dust suppression techniques to control the generation of pollutants that could be discharged from the site.

b. **Soil Stabilization**. In areas where soil disturbance activity has temporarily or permanently ceased, the application of soil stabilization measures must be initiated by the end of the next business day and completed within fourteen (14) days from the date the current soil disturbance activity ceased. For construction sites that *directly discharge* to one of the 303(d) segments listed in Appendix E or is located in one of the watersheds listed in Appendix C, the application of soil stabilization measures must be initiated by the end of the next business day and completed within seven (7) days from the date the current soil disturbance activity ceased. See Appendix A for definition of *Temporarily Ceased*.

c. **Dewatering**. *Discharge*s from *dewatering* activities, including *discharge*s from *dewatering* of trenches and excavations, must be managed by appropriate control measures.

d. **Pollution Prevention Measures**. Design, install, implement, and maintain effective pollution prevention measures to *minimize* the *discharge* of *pollutants* and prevent a violation of the *water quality standards*. At a minimum, such measures must be designed, installed, implemented and maintained to:

(i) *Minimize* the *discharge* of *pollutants* from equipment and vehicle washing, wheel wash water, and other wash waters. This applies to washing operations that use clean water only. Soaps, detergents and solvents cannot be used;

(ii) *Minimize* the exposure of building materials, building products, construction wastes, trash, landscape materials, fertilizers, pesticides, herbicides, detergents, sanitary waste, hazardous and toxic waste, and other materials present on the site to precipitation and to stormwater. Minimization of exposure is not required in cases where the exposure to precipitation and to stormwater will not result in a *discharge* of *pollutants*, or where exposure of a specific material or product poses little risk of stormwater contamination (such as final products and materials intended for outdoor use) ; and

(iii) Prevent the *discharge* of *pollutants* from spills and leaks and implement chemical spill and leak prevention and response procedures.

e. **Prohibited *Discharge*s.** The following *discharge*s are prohibited:

(i) Wastewater from washout of concrete;

(ii) Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds and other construction materials;

(iii) Fuels, oils, or other *pollutants* used in vehicle and equipment operation and maintenance;

(iv) Soaps or solvents used in vehicle and equipment washing; and

(v) Toxic or hazardous substances from a spill or other release.

f. Surface Outlets. When discharging from basins and impoundments, the outlets shall be designed, constructed and maintained in such a manner that sediment does not leave the basin or impoundment and that erosion at or below the outlet does not occur.

C. Post-construction Stormwater Management Practice Requirements

1. The *owner or operator* of a *construction activity* that requires post-construction stormwater management practices pursuant to Part III.C. of this permit must select, design, install, and maintain the practices to meet the *performance criteria* in the New York State Stormwater Management Design Manual (“Design Manual”), dated January 2015, using sound engineering judgment. Where post-construction stormwater management practices (“SMPs”) are not designed in conformance with the *performance criteria* in the Design Manual, the *owner or operator* must include in the SWPPP the reason(s) for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

2. The *owner or operator* of a *construction activity* that requires post-construction stormwater management practices pursuant to Part III.C. of this permit must design the practices to meet the applicable *sizing criteria* in Part I.C.2.a., b., c. or d. of this permit.

a. Sizing Criteria for New Development

(i) Runoff Reduction Volume (“RRv”): Reduce the total Water Quality Volume (“WQv”) by application of RR techniques and standard SMPs with RRv capacity. The total WQv shall be calculated in accordance with the criteria in Section 4.2 of the Design Manual.

(ii) Minimum RRv and Treatment of Remaining Total WQv: Construction activities that cannot meet the criteria in Part I.C.2.a.(i) of this permit due to site limitations shall direct runoff from all newly constructed impervious areas to a RR technique or standard SMP with RRv capacity unless infeasible. The specific site limitations that prevent the reduction of 100% of the WQv shall be documented in the SWPPP.

For each impervious area that is not directed to a RR technique or standard SMP with RRv capacity, the SWPPP must include documentation which demonstrates that all options were considered and for each option explains why it is considered infeasible.

In no case shall the runoff reduction achieved from the newly constructed impervious areas be less than the Minimum RRv as calculated using the criteria in Section 4.3 of the Design Manual. The remaining portion of the total WQv that cannot be reduced shall be treated by application of standard SMPs.

(iii) Channel Protection Volume ("Cpv"): Provide 24 hour extended detention of the post-developed 1-year, 24-hour storm event; remaining after runoff reduction. The Cpv requirement does not apply when:
  (1) Reduction of the entire Cpv is achieved by application of runoff reduction techniques or infiltration systems, or
  (2) The site discharges directly to tidal waters, or fifth order or larger streams.

(iv) *Overbank* Flood Control Criteria ("Qp"): Requires storage to attenuate the post-development 10-year, 24-hour peak discharge rate (Qp) to predevelopment rates. The Qp requirement does not apply when:
  (1) the site discharges directly to tidal waters or fifth order or larger streams, or
  (2) A downstream analysis reveals that *overbank* control is not required.

(v) Extreme Flood Control Criteria ("Qf"): Requires storage to attenuate the post-development 100-year, 24-hour peak discharge rate (Qf) to predevelopment rates. The Qf requirement does not apply when:
  (1) the site discharges directly to tidal waters or fifth order or larger streams, or
  (2) A downstream analysis reveals that *overbank* control is not required.

b. ***Sizing Criteria* for *New Development* in Enhanced Phosphorus Removal Watershed**

(i) Runoff Reduction Volume (RRv): Reduce the total Water Quality Volume (WQv) by application of RR techniques and standard SMPs with RRv capacity. The total WQv is the runoff volume from the 1-year, 24 hour design storm over the post-developed watershed and shall be calculated in accordance with the criteria in Section 10.3 of the Design Manual.

(ii) Minimum RRv and Treatment of Remaining Total WQv: *Construction activities* that cannot meet the criteria in Part I.C.2.b.(i) of this permit due to *site limitations* shall direct runoff from all newly constructed *impervious areas* to a RR technique or standard SMP with RRv capacity unless *infeasible*. The specific *site limitations* that prevent the reduction of 100% of the WQv shall be documented in the SWPPP. For each *impervious area* that is not directed to a RR technique or standard SMP with RRv capacity, the SWPPP must include documentation which demonstrates that all options were considered and for each option explains why it is considered *infeasible.*

In no case shall the runoff reduction achieved from the newly constructed *impervious areas* be less than the Minimum RRv as calculated using the criteria in Section 10.3 of the Design Manual. The remaining portion of the total WQv that cannot be reduced shall be treated by application of standard SMPs.

(iii) Channel Protection Volume (Cpv): Provide 24 hour extended detention of the post-developed 1-year, 24-hour storm event; remaining after runoff reduction. The Cpv requirement does not apply when:
(1) Reduction of the entire Cpv is achieved by application of runoff reduction techniques or infiltration systems, or
(2) The site *discharge*s directly to tidal waters, or fifth order or larger streams.

(iv) *Overbank* Flood Control Criteria (Qp): Requires storage to attenuate the post-development 10-year, 24-hour peak *discharge* rate (Qp) to predevelopment rates. The Qp requirement does not apply when:
(1) the site *discharge*s directly to tidal waters or fifth order or larger streams, or
(2) A downstream analysis reveals that *overbank* control is not required.

(v) Extreme Flood Control Criteria (Qf): Requires storage to attenuate the post-development 100-year, 24-hour peak *discharge* rate (Qf) to predevelopment rates. The Qf requirement does not apply when:
(1) the site *discharge*s directly to tidal waters or fifth order or larger streams, or
(2) A downstream analysis reveals that *overbank* control is not required.

c. Sizing Criteria for Redevelopment Activity

(i) Water Quality Volume (WQv): The WQv treatment objective for *redevelopment activity* shall be addressed by one of the following options. *Redevelopment activities* located in an Enhanced Phosphorus Removal Watershed (see Part III.B.3. and Appendix C of this permit) shall calculate the WQv in accordance with Section 10.3 of the Design Manual. All other *redevelopment activities* shall calculate the WQv in accordance with Section 4.2 of the Design Manual.

(1) Reduce the existing *impervious cover* by a minimum of 25% of the total disturbed, *impervious area*. The Soil Restoration criteria in Section 5.1.6 of the Design Manual must be applied to all newly created pervious areas, or

(2) Capture and treat a minimum of 25% of the WQv from the disturbed, *impervious area* by the application of standard SMPs; or reduce 25% of the WQv from the disturbed, *impervious area* by the application of RR techniques or standard SMPs with RRv capacity., or

(3) Capture and treat a minimum of 75% of the WQv from the disturbed, *impervious area* as well as any additional runoff from tributary areas by application of the alternative practices discussed in Sections 9.3 and 9.4 of the Design Manual., or

(4) Application of a combination of 1, 2 and 3 above that provide a weighted average of at least two of the above methods. Application of this method shall be in accordance with the criteria in Section 9.2.1(B) (IV) of the Design Manual.

If there is an existing post-construction stormwater management practice located on the site that captures and treats runoff from the *impervious area* that is being disturbed, the WQv treatment option selected must, at a minimum, provide treatment equal to the treatment that was being provided by the existing practice(s) if that treatment is greater than the treatment required by options 1 – 4 above.

(ii) Channel Protection Volume (Cpv): Not required if there are no changes to hydrology that increase the *discharge* rate from the project site.

(iii) *Overbank* Flood Control Criteria (Qp): Not required if there are no changes to hydrology that increase the *discharge* rate from the project site.

(iv) Extreme Flood Control Criteria (Qf): Not required if there are no changes to hydrology that increase the *discharge* rate from the project site

d. Sizing Criteria for Combination of Redevelopment Activity and New Development

Construction projects that include both New Development and Redevelopment Activity shall provide post-construction stormwater management controls that meet the sizing criteria calculated as an aggregate of the Sizing Criteria in Part I.C.2.a. or b. of this permit for the New Development portion of the project and Part I.C.2.c of this permit for Redevelopment Activity portion of the project.

D. Maintaining Water Quality

The Department expects that compliance with the conditions of this permit will control *discharge*s necessary to meet applicable *water quality standards*. It shall be a violation of the *ECL* for any discharge to either cause or contribute to a violation of *water quality standards* as contained in Parts 700 through 705 of Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York, such as:

1. There shall be no increase in turbidity that will cause a substantial visible contrast to natural conditions;

2. There shall be no increase in suspended, colloidal or settleable solids that will cause deposition or impair the waters for their best usages; and

3. There shall be no residue from oil and floating substances, nor visible oil film, nor globules of grease.

If there is evidence indicating that the stormwater *discharge*s authorized by this permit are causing, have the reasonable potential to cause, or are contributing to a violation of the *water quality standards*; the *owner or operator* must take appropriate corrective action in accordance with Part IV.C.5. of this general permit and document in accordance with Part IV.C.4. of this general permit. To address the *water quality standard* violation the *owner or operator* may need to provide additional information, include and implement appropriate controls in the SWPPP to correct the problem, or obtain an individual SPDES permit.

If there is evidence indicating that despite compliance with the terms and conditions of this general permit it is demonstrated that the stormwater *discharge*s authorized by this permit are causing or contributing to a violation of *water quality standards*, or if the Department determines that a modification of the permit is necessary to prevent a violation of *water quality standards*, the authorized *discharge*s will no longer be eligible for coverage under this permit. The Department may require the *owner or operator* to obtain an individual SPDES permit to continue discharging.

E. Eligibility Under This General Permit

1. This permit may authorize all *discharges* of stormwater from *construction activity* to *surface waters of the State* and *groundwaters* except for ineligible *discharges* identified under subparagraph F. of this Part.

2. Except for non-stormwater *discharges* explicitly listed in the next paragraph, this permit only authorizes stormwater *discharge*s; including stormwater runoff, snowmelt runoff, and surface runoff and drainage, from *construction activities*.

3. Notwithstanding paragraphs E.1 and E.2 above, the following non-stormwater discharges are authorized by this permit: those listed in 6 NYCRR 750-1.2(a)(29)(vi), with the following exception: "Discharges from firefighting activities are authorized only when the firefighting activities are emergencies/unplanned"; waters to which other components have not been added that are used to control dust in accordance with the SWPPP; and uncontaminated *discharge*s from *construction site* de-watering operations. All non-stormwater discharges must be identified in the SWPPP. Under all circumstances, the *owner or operator* must still comply with *water quality standards* in Part I.D of this permit.

4. The *owner or operator* must maintain permit eligibility to *discharge* under this permit. Any *discharges* that are not compliant with the eligibility conditions of this permit are not authorized by the permit and the *owner or operator* must either apply for a separate permit to cover those ineligible *discharges* or take steps necessary to make the *discharge* eligible for coverage.

F. Activities Which Are Ineligible for Coverage Under This General Permit

All of the following are **not** authorized by this permit:

1. *Discharge*s after *construction activities* have been completed and the site has undergone *final stabilization*;

2. *Discharge*s that are mixed with sources of non-stormwater other than those expressly authorized under subsection E.3. of this Part and identified in the SWPPP required by this permit;

3. *Discharges* that are required to obtain an individual SPDES permit or another SPDES general permit pursuant to Part VII.K. of this permit;

4. *Construction activities* or *discharges* from *construction activities* that may adversely affect an *endangered or threatened species* unless the *owner or*

operator has obtained a permit issued pursuant to 6 NYCRR Part 182 for the project or the Department has issued a letter of non-jurisdiction for the project. All documentation necessary to demonstrate eligibility shall be maintained on site in accordance with Part II.D.2 of this permit;

5. *Discharges* which either cause or contribute to a violation of *water quality standards* adopted pursuant to the *ECL* and its accompanying regulations;

6. *Construction activities* for residential, commercial and institutional projects:

    a. Where the *discharge*s from the *construction activities* are tributary to waters of the state classified as AA or AA-s; and

    b. Which are undertaken on land with no existing *impervious cover*; and

    c. Which disturb one (1) or more acres of land designated on the current United States Department of Agriculture ("USDA") Soil Survey as Soil Slope Phase "D", (provided the map unit name is inclusive of slopes greater than 25%), or Soil Slope Phase "E" or "F" (regardless of the map unit name), or a combination of the three designations.

7. *Construction activities* for linear transportation projects and linear utility projects:

    a. Where the *discharge*s from the *construction activities* are tributary to waters of the state classified as AA or AA-s; and

    b. Which are undertaken on land with no existing *impervious cover*; and

    c. Which disturb two (2) or more acres of land designated on the current USDA Soil Survey as Soil Slope Phase "D" (provided the map unit name is inclusive of slopes greater than 25%), or Soil Slope Phase "E" or "F" (regardless of the map unit name), or a combination of the three designations.

8. *Construction activities* that have the potential to affect an *historic property*, unless there is documentation that such impacts have been resolved. The following documentation necessary to demonstrate eligibility with this requirement shall be maintained on site in accordance with Part II.D.2 of this permit and made available to the Department in accordance with Part VII.F of this permit:

   a. Documentation that the *construction activity* is not within an archeologically sensitive area indicated on the sensitivity map, and that the *construction activity* is not located on or immediately adjacent to a property listed or determined to be eligible for listing on the National or State Registers of Historic Places, and that there is no new permanent building on the *construction site* within the following distances from a building, structure, or object that is more than 50 years old, or if there is such a new permanent building on the *construction site* within those parameters that NYS Office of Parks, Recreation and Historic Preservation (OPRHP), a Historic Preservation Commission of a Certified Local Government, or a qualified preservation professional has determined that the building, structure, or object more than 50 years old is not historically/archeologically significant.

      - 1-5 acres of disturbance - 20 feet
      - 5-20 acres of disturbance - 50 feet
      - 20+ acres of disturbance - 100 feet, or

   b. DEC consultation form sent to OPRHP, and copied to the NYS DEC Agency Historic Preservation Officer (APO), and
      (i) the State Environmental Quality Review (SEQR) Environmental Assessment Form (EAF) with a negative declaration or the Findings Statement, with documentation of OPRHP’s agreement with the resolution; or
      (ii) documentation from OPRHP that the *construction activity* will result in No Impact; or
      (iii) documentation from OPRHP providing a determination of No Adverse Impact; or
      (iv) a Letter of Resolution signed by the owner/operator, OPRHP and the DEC APO which allows for this *construction activity* to be eligible for coverage under the general permit in terms of the State Historic Preservation Act (SHPA); or

   c. Documentation of satisfactory compliance with Section 106 of the National Historic Preservation Act for a coterminous project area:

   (i) No Affect
   (ii) No Adverse Affect
   (iii) Executed Memorandum of Agreement, or

d. Documentation that:

(i) SHPA Section 14.09 has been completed by NYS DEC or another state agency.

9. *Discharge*s from *construction activities* that are subject to an existing SPDES individual or general permit where a SPDES permit for *construction activity* has been terminated or denied; or where the *owner or operator* has failed to renew an expired individual permit.

Part II. PERMIT COVERAGE

A. How to Obtain Coverage

1. An *owner or operator* of a *construction activity* that is not subject to the requirements of a regulated, traditional land use control MS4 must first prepare a SWPPP in accordance with all applicable requirements of this permit and then submit a completed Notice of Intent (NOI) to the Department to be authorized to discharge under this permit.

2. An *owner or operator* of a *construction activity* that is subject to the requirements of a *regulated, traditional land use control MS4* must first prepare a SWPPP in accordance with all applicable requirements of this permit and then have the SWPPP reviewed and accepted by the *regulated, traditional land use control MS4* prior to submitting the NOI to the Department. The *owner or operator* shall have the “MS4 SWPPP Acceptance” form signed in accordance with Part VII.H., and then submit that form along with a completed NOI to the Department.

3. The requirement for an *owner or operator* to have its SWPPP reviewed and accepted by the *regulated, traditional land use control MS4* prior to submitting the NOI to the Department does not apply to an *owner or operator* that is obtaining permit coverage in accordance with the requirements in Part II.F. (Change of *Owner or Operator*) or where the *owner or operator* of the *construction activity* is the *regulated, traditional land use control MS4* . This exemption does not apply to *construction activities* subject to the New York City Administrative Code.

B. Notice of Intent (NOI) Submittal

1. Prior to December 21, 2020, an owner or operator shall use either the electronic (eNOI) or paper version of the NOI that the Department prepared. Both versions of the NOI are located on the Department's website (http://www.dec.ny.gov/). The paper version of the NOI shall be signed in accordance with Part VII.H. of this permit and submitted to the following address:

   NOTICE OF INTENT
   NYS DEC, Bureau of Water Permits
   625 Broadway, 4th Floor
   Albany, New York 12233-3505

2. Beginning December 21, 2020 and in accordance with EPA's 2015 NPDES Electronic Reporting Rule (40 CFR Part 127), the *owner or operator* must submit the NOI electronically using the *Department's* online NOI.

3. The *owner or operator* shall have the SWPPP preparer sign the "SWPPP Preparer Certification" statement on the NOI prior to submitting the form to the Department.

4. As of the date the NOI is submitted to the Department, the *owner or operator* shall make the NOI and SWPPP available for review and copying in accordance with the requirements in Part VII.F. of this permit.

C. Permit Authorization

1. An *owner or operator* shall not *commence construction activity* until their authorization to *discharge* under this permit goes into effect.

2. Authorization to *discharge* under this permit will be effective when the *owner or operator* has satisfied all of the following criteria:

   a. project review pursuant to the State Environmental Quality Review Act ("SEQRA") have been satisfied, when SEQRA is applicable. See the Department's website (http://www.dec.ny.gov/) for more information,

   b. where required, all necessary Department permits subject to the *Uniform Procedures Act ("UPA")* (see 6 NYCRR Part 621), or the equivalent from another New York State agency, have been obtained, unless otherwise notified by the Department pursuant to 6 NYCRR 621.3(a)(4). *Owners or operators* of *construction activities* that are required to obtain *UPA* permits must submit a preliminary SWPPP to the appropriate DEC Permit Administrator at the Regional Office listed in Appendix F at the time all other necessary *UPA* permit applications are submitted. The preliminary SWPPP must include sufficient information to demonstrate that the *construction activity* qualifies for authorization under this permit,

c. the final SWPPP has been prepared, and

d. a complete NOI has been submitted to the Department in accordance with the requirements of this permit.

3. An *owner or operator* that has satisfied the requirements of Part II.C.2 above will be authorized to *discharge* stormwater from their *construction activity* in accordance with the following schedule:

   a. For *construction activities* that are not subject to the requirements of a *regulated, traditional land use control MS4*:

      (i) Five (5) business days from the date the Department receives a complete electronic version of the NOI (eNOI) for *construction activities* with a SWPPP that has been prepared in conformance with the design criteria in the technical standard referenced in Part III.B.1 and the *performance criteria* in the technical standard referenced in Parts III.B., 2 or 3, for *construction activities* that require post-construction stormwater management practices pursuant to Part III.C.; or

      (ii) Sixty (60) business days from the date the Department receives a complete NOI (electronic or paper version) for *construction activities* with a SWPPP that has not been prepared in conformance with the design criteria in technical standard referenced in Part III.B.1. or, for *construction activities* that require post-construction stormwater management practices pursuant to Part III.C., the *performance criteria* in the technical standard referenced in Parts III.B., 2 or 3, or;

      (iii) Ten (10) business days from the date the Department receives a complete paper version of the NOI for *construction activities* with a SWPPP that has been prepared in conformance with the design criteria in the technical standard referenced in Part III.B.1 and the *performance criteria* in the technical standard referenced in Parts III.B., 2 or 3, for *construction activities* that require post-construction stormwater management practices pursuant to Part III.C.

b. For *construction activities* that are subject to the requirements of a *regulated, traditional land use control MS4*:

   (i) Five (5) business days from the date the Department receives both a complete electronic version of the NOI (eNOI) and signed "*MS4* SWPPP Acceptance" form, or

   (ii) Ten (10) business days from the date the Department receives both a complete paper version of the NOI and signed "MS4 SWPPP Acceptance" form.

4. Coverage under this permit authorizes stormwater *discharges* from only those areas of disturbance that are identified in the NOI. If an *owner or operator* wishes to have stormwater *discharges* from future or additional areas of disturbance authorized, they must submit a new NOI that addresses that phase of the development, unless otherwise notified by the Department. The *owner or operator* shall not *commence construction activity* on the future or additional areas until their authorization to *discharge* under this permit goes into effect in accordance with Part II.C. of this permit.

D. General Requirements For Owners or Operators With Permit Coverage

1. The *owner or operator* shall ensure that the provisions of the SWPPP are implemented from the *commencement of construction activity* until all areas of disturbance have achieved *final stabilization* and the Notice of Termination ("NOT") has been submitted to the Department in accordance with Part V. of this permit. This includes any changes made to the SWPPP pursuant to Part III.A.4. of this permit.

2. The *owner or operator* shall maintain a copy of the General Permit (GP-0-20-001), NOI, *NOI Acknowledgment Letter*, SWPPP, MS4 SWPPP Acceptance form, inspection reports, responsible contractor's or subcontractor's certification statement (see Part III.A.6.), and all documentation necessary to demonstrate eligibility with this permit at the *construction site* until all disturbed areas have achieved *final stabilization* and the NOT has been submitted to the Department. The documents must be maintained in a secure location, such as a job trailer, on-site construction office, or mailbox with lock. The secure location must be accessible during normal business hours to an individual performing a compliance inspection.

3. The *owner or operator* of a *construction activity* shall not disturb greater than five (5) acres of soil at any one time without prior written authorization from the Department or, in areas under the jurisdiction of a *regulated, traditional land* *use control MS4,* the *regulated, traditional land use control MS4* (provided the *regulated, traditional land use control MS4* is not the *owner or operator* of the *construction activity*). At a minimum, the *owner or operator* must comply with the following requirements in order to be authorized to disturb greater than five (5) acres of soil at any one time:

a. The *owner or operator* shall have a *qualified inspector* conduct **at least** two (2) site inspections in accordance with Part IV.C. of this permit every seven (7) calendar days, for as long as greater than five (5) acres of soil remain disturbed. The two (2) inspections shall be separated by a minimum of two (2) full calendar days.

b. In areas where soil disturbance activity has temporarily or permanently ceased, the application of soil stabilization measures must be initiated by the end of the next business day and completed within seven (7) days from the date the current soil disturbance activity ceased. The soil stabilization measures selected shall be in conformance with the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016.

c. The *owner or operator* shall prepare a phasing plan that defines maximum disturbed area per phase and shows required cuts and fills.

d. The *owner or operator* shall install any additional site-specific practices needed to protect water quality.

e. The *owner or operator* shall include the requirements above in their SWPPP.

4. In accordance with statute, regulations, and the terms and conditions of this permit, the Department may suspend or revoke an *owner's or operator's* coverage under this permit at any time if the Department determines that the SWPPP does not meet the permit requirements or consistent with Part VII.K..

5. Upon a finding of significant non-compliance with the practices described in the SWPPP or violation of this permit, the Department may order an immediate stop to all activity at the site until the non-compliance is remedied. The stop work order shall be in writing, describe the non-compliance in detail, and be sent to the *owner or operator*.

6. For *construction activities* that are subject to the requirements of a *regulated, traditional land use control MS4*, the *owner or operator* shall notify the

regulated, traditional land use control MS4 in writing of any planned amendments or modifications to the post-construction stormwater management practice component of the SWPPP required by Part III.A. 4. and 5. of this permit. Unless otherwise notified by the *regulated, traditional land use control MS4*, the *owner or operator* shall have the SWPPP amendments or modifications reviewed and accepted by the *regulated, traditional land use control MS4* prior to commencing construction of the post-construction stormwater management practice.

E. Permit Coverage for Discharges Authorized Under GP-0-15-002

1. Upon renewal of SPDES General Permit for Stormwater Discharges from *Construction Activity* (Permit No. GP-0-15-002), an *owner or operator* of *a construction activity* with coverage under GP-0-15-002, as of the effective date of GP- 0-20-001, shall be authorized to *discharge* in accordance with GP- 0-20-001, unless otherwise notified by the Department.

   An *owner or operator* may continue to implement the technical/design components of the post-construction stormwater management controls provided that such design was done in conformance with the technical standards in place at the time of initial project authorization. However, they must comply with the other, non-design provisions of GP-0-20-001.

F. Change of Owner or Operator

1. When property ownership changes or when there is a change in operational control over the construction plans and specifications, the original *owner or operator* must notify the new *owner or operator*, in writing, of the requirement to obtain permit coverage by submitting a NOI with the Department. For *construction activities* subject to the requirements of a *regulated, traditional land use control MS4,* the original *owner or operator* must also notify the MS4, in writing, of the change in ownership at least 30 calendar days prior to the change in ownership.

2. Once the new *owner or operator* obtains permit coverage, the original *owner or operator* shall then submit a completed NOT with the name and permit identification number of the new *owner or operator* to the Department at the address in Part II.B.1. of this permit. If the original *owner or operator* maintains ownership of a portion of the *construction activity* and will disturb soil, they must maintain their coverage under the permit.

3. Permit coverage for the new *owner or operator* will be effective as of the date the Department receives a complete NOI, provided the original *owner or*

operator was not subject to a sixty (60) business day authorization period that has not expired as of the date the Department receives the NOI from the new *owner or operator*.

Part III. STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

A. General SWPPP Requirements

1. A SWPPP shall be prepared and implemented by the *owner or operator* of each *construction activity* covered by this permit. The SWPPP must document the selection, design, installation, implementation and maintenance of the control measures and practices that will be used to meet the effluent limitations in Part I.B. of this permit and where applicable, the post-construction stormwater management practice requirements in Part I.C. of this permit. The SWPPP shall be prepared prior to the submittal of the NOI. The NOI shall be submitted to the Department prior to the *commencement of construction activity*. A copy of the completed, final NOI shall be included in the SWPPP.

2. The SWPPP shall describe the erosion and sediment control practices and where required, post-construction stormwater management practices that will be used and/or constructed to reduce the *pollutants* in stormwater *discharges* and to assure compliance with the terms and conditions of this permit. In addition, the SWPPP shall identify potential sources of pollution which may reasonably be expected to affect the quality of stormwater *discharges*.

3. All SWPPPs that require the post-construction stormwater management practice component shall be prepared by a *qualified professional* that is knowledgeable in the principles and practices of stormwater management and treatment.

4. The *owner or operator* must keep the SWPPP current so that it at all times accurately documents the erosion and sediment controls practices that are being used or will be used during construction, and all post-construction stormwater management practices that will be constructed on the site. At a minimum, the *owner or operator* shall amend the SWPPP, including construction drawings:

    a. whenever the current provisions prove to be ineffective in minimizing *pollutants* in stormwater *discharges* from the site;

  b. whenever there is a change in design, construction, or operation at the *construction site* that has or could have an effect on the *discharge* of *pollutants*;

  c. to address issues or deficiencies identified during an inspection by the *qualified inspector,* the Department or other regulatory authority; and

  d. to document the final construction conditions.

5. The Department may notify the *owner or operator* at any time that the SWPPP does not meet one or more of the minimum requirements of this permit. The notification shall be in writing and identify the provisions of the SWPPP that require modification. Within fourteen (14) calendar days of such notification, or as otherwise indicated by the Department, the *owner or operator* shall make the required changes to the SWPPP and submit written notification to the Department that the changes have been made. If the *owner or operator* does not respond to the Department's comments in the specified time frame, the Department may suspend the *owner's or operator's* coverage under this permit or require the *owner or operator* to obtain coverage under an individual SPDES permit in accordance with Part II.D.4. of this permit.

6. Prior to the *commencement of construction activity*, the *owner or operator* must identify the contractor(s) and subcontractor(s) that will be responsible for installing, constructing, repairing, replacing, inspecting and maintaining the erosion and sediment control practices included in the SWPPP; and the contractor(s) and subcontractor(s) that will be responsible for constructing the post-construction stormwater management practices included in the SWPPP. The *owner or operator* shall have each of the contractors and subcontractors identify at least one person from their company that will be responsible for implementation of the SWPPP. This person shall be known as the *trained contractor.* The *owner or operator* shall ensure that at least one *trained contractor* is on site on a daily basis when soil disturbance activities are being performed.

   The *owner or operator* shall have each of the contractors and subcontractors identified above sign a copy of the following certification statement below before they commence any *construction activity*:

   > "I hereby certify under penalty of law that I understand and agree to comply with the terms and conditions of the SWPPP and agree to implement any corrective actions identified by the *qualified inspector* during a site inspection. I also understand that the *owner or operator* must comply with

the terms and conditions of the most current version of the New York State Pollutant Discharge Elimination System ("SPDES") general permit for stormwater *discharge*s from *construction activities* and that it is unlawful for any person to cause or contribute to a violation of *water quality standards*. Furthermore, I am aware that there are significant penalties for submitting false information, that I do not believe to be true, including the possibility of fine and imprisonment for knowing violations"

In addition to providing the certification statement above, the certification page must also identify the specific elements of the SWPPP that each contractor and subcontractor will be responsible for and include the name and title of the person providing the signature; the name and title of the *trained contractor* responsible for SWPPP implementation; the name, address and telephone number of the contracting firm; the address (or other identifying description) of the site; and the date the certification statement is signed. The *owner or operator* shall attach the certification statement(s) to the copy of the SWPPP that is maintained at the *construction site*. If new or additional contractors are hired to implement measures identified in the SWPPP after construction has commenced, they must also sign the certification statement and provide the information listed above.

7. For projects where the Department requests a copy of the SWPPP or inspection reports, the *owner or operator* shall submit the documents in both electronic (PDF only) and paper format within five (5) business days, unless otherwise notified by the Department.

B. Required SWPPP Contents

1. Erosion and sediment control component - All SWPPPs prepared pursuant to this permit shall include erosion and sediment control practices designed in conformance with the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016. Where erosion and sediment control practices are not designed in conformance with the design criteria included in the technical standard, the *owner or operator* must demonstrate *equivalence* to the technical standard. At a minimum, the erosion and sediment control component of the SWPPP shall include the following:

   a. Background information about the scope of the project, including the location, type and size of project

b. A site map/construction drawing(s) for the project, including a general location map. At a minimum, the site map shall show the total site area; all improvements; areas of disturbance; areas that will not be disturbed; existing vegetation; on-site and adjacent off-site surface water(s); floodplain/floodway boundaries; wetlands and drainage patterns that could be affected by the *construction activity*; existing and final contours ; locations of different soil types with boundaries; material, waste, borrow or equipment storage areas located on adjacent properties; and location(s) of the stormwater *discharge*(s);

c. A description of the soil(s) present at the site, including an identification of the Hydrologic Soil Group (HSG);

d. A construction phasing plan and sequence of operations describing the intended order of *construction activities*, including clearing and grubbing, excavation and grading, utility and infrastructure installation and any other activity at the site that results in soil disturbance;

e. A description of the minimum erosion and sediment control practices to be installed or implemented for each *construction activity* that will result in soil disturbance. Include a schedule that identifies the timing of initial placement or implementation of each erosion and sediment control practice and the minimum time frames that each practice should remain in place or be implemented;

f. A temporary and permanent soil stabilization plan that meets the requirements of this general permit and the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016, for each stage of the project, including initial land clearing and grubbing to project completion and achievement of *final stabilization*;

g. A site map/construction drawing(s) showing the specific location(s), size(s), and length(s) of each erosion and sediment control practice;

h. The dimensions, material specifications, installation details, and operation and maintenance requirements for all erosion and sediment control practices. Include the location and sizing of any temporary sediment basins and structural practices that will be used to divert flows from exposed soils;

i. A maintenance inspection schedule for the contractor(s) identified in Part III.A.6. of this permit, to ensure continuous and effective operation of the erosion and sediment control practices. The maintenance inspection schedule shall be in accordance with the requirements in the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016;

j. A description of the pollution prevention measures that will be used to control litter, construction chemicals and construction debris from becoming a *pollutant* source in the stormwater *discharges*;

k. A description and location of any stormwater *discharges* associated with industrial activity other than construction at the site, including, but not limited to, stormwater *discharges* from asphalt plants and concrete plants located on the *construction site*; and

l. Identification of any elements of the design that are not in conformance with the design criteria in the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016. Include the reason for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

2. Post-construction stormwater management practice component – The *owner or operator* of any construction project identified in Table 2 of Appendix B as needing post-construction stormwater management practices shall prepare a SWPPP that includes practices designed in conformance with the applicable *sizing criteria* in Part I.C.2.a., c. or d. of this permit and the *performance criteria* in the technical standard, New York State Stormwater Management Design Manual dated January 2015

   Where post-construction stormwater management practices are not designed in conformance with the *performance criteria* in the technical standard, the *owner or operator* must include in the SWPPP the reason(s) for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

   The post-construction stormwater management practice component of the SWPPP shall include the following:

   a. Identification of all post-construction stormwater management practices to be constructed as part of the project. Include the dimensions, material specifications and installation details for each post-construction stormwater management practice;

b. A site map/construction drawing(s) showing the specific location and size of each post-construction stormwater management practice;

c. A Stormwater Modeling and Analysis Report that includes:

    (i) Map(s) showing pre-development conditions, including watershed/subcatchments boundaries, flow paths/routing, and design points;

    (ii) Map(s) showing post-development conditions, including watershed/subcatchments boundaries, flow paths/routing, design points and post-construction stormwater management practices;

    (iii) Results of stormwater modeling (i.e. hydrology and hydraulic analysis) for the required storm events. Include supporting calculations (model runs), methodology, and a summary table that compares pre and post-development runoff rates and volumes for the different storm events;

    (iv) Summary table, with supporting calculations, which demonstrates that each post-construction stormwater management practice has been designed in conformance with the *sizing criteria* included in the Design Manual;

    (v) Identification of any *sizing criteria* that is not required based on the requirements included in Part I.C. of this permit; and

    (vi) Identification of any elements of the design that are not in conformance with the *performance criteria* in the Design Manual. Include the reason(s) for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the Design Manual;

d. Soil testing results and locations (test pits, borings);

e. Infiltration test results, when required; and

f. An operations and maintenance plan that includes inspection and maintenance schedules and actions to ensure continuous and effective operation of each post-construction stormwater management practice. The plan shall identify the entity that will be responsible for the long term operation and maintenance of each practice.

3. Enhanced Phosphorus Removal Standards - All construction projects identified in Table 2 of Appendix B that are located in the watersheds identified in Appendix C shall prepare a SWPPP that includes post-construction stormwater management practices designed in conformance with the applicable *sizing criteria* in Part I.C.2. b., c. or d. of this permit and the *performance criteria,* Enhanced Phosphorus Removal Standards included in the Design Manual. At a minimum, the post-construction stormwater management practice component of the SWPPP shall include items 2.a - 2.f. above.

C. Required SWPPP Components by Project Type

Unless otherwise notified by the Department, *owners or operators* of *construction activities* identified in Table 1 of Appendix B are required to prepare a SWPPP that only includes erosion and sediment control practices designed in conformance with Part III.B.1 of this permit. *Owners or operators* of the *construction activities* identified in Table 2 of Appendix B shall prepare a SWPPP that also includes post-construction stormwater management practices designed in conformance with Part III.B.2 or 3 of this permit.

Part IV. INSPECTION AND MAINTENANCE REQUIREMENTS

A. General Construction Site Inspection and Maintenance Requirements

1. The *owner or operator* must ensure that all erosion and sediment control practices (including pollution prevention measures) and all post-construction stormwater management practices identified in the SWPPP are inspected and maintained in accordance with Part IV.B. and C. of this permit.

2. The terms of this permit shall not be construed to prohibit the State of New York from exercising any authority pursuant to the ECL, common law or federal law, or prohibit New York State from taking any measures, whether civil or criminal, to prevent violations of the laws of the State of New York or protect the public health and safety and/or the environment.

B. Contractor Maintenance Inspection Requirements

1. The *owner or operator* of each *construction activity* identified in Tables 1 and 2 of Appendix B shall have a *trained contractor* inspect the erosion and sediment control practices and pollution prevention measures being implemented within the active work area daily to ensure that they are being maintained in effective operating condition at all times. If deficiencies are identified, the contractor shall

begin implementing corrective actions within one business day and shall complete the corrective actions in a reasonable time frame.

2. For construction sites where soil disturbance activities have been temporarily suspended (e.g. winter shutdown) and *temporary stabilization* measures have been applied to all disturbed areas, the *trained contractor* can stop conducting the maintenance inspections. The *trained contractor* shall begin conducting the maintenance inspections in accordance with Part IV.B.1. of this permit as soon as soil disturbance activities resume.

3. For construction sites where soil disturbance activities have been shut down with partial project completion, the *trained contractor* can stop conducting the maintenance inspections if all areas disturbed as of the project shutdown date have achieved *final stabilization* and all post-construction stormwater management practices required for the completed portion of the project have been constructed in conformance with the SWPPP and are operational.

C. Qualified Inspector Inspection Requirements

The *owner or operator* shall have a *qualified inspector* conduct site inspections in conformance with the following requirements:

[Note: The *trained contractor* identified in Part III.A.6. and IV.B. of this permit **cannot** conduct the *qualified inspector* site inspections unless they meet the *qualified inspector* qualifications included in Appendix A. In order to perform these inspections, the *trained contractor* would have to be a:

- licensed Professional Engineer,
- Certified Professional in Erosion and Sediment Control (CPESC),
- New York State Erosion and Sediment Control Certificate Program holder
- Registered Landscape Architect, or
- someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided they have received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity].

1. A *qualified inspector* shall conduct site inspections for all *construction activities* identified in Tables 1 and 2 of Appendix B, with the exception of:

   a. the construction of a single family residential subdivision with 25% or less *impervious cover* at total site build-out that involves a soil disturbance of one (1) or more acres of land but less than five (5) acres and is not located in one of the watersheds listed in Appendix C and <u>not</u> directly discharging to one of the 303(d) segments listed in Appendix E;

b. the construction of a single family home that involves a soil disturbance of one (1) or more acres of land but less than five (5) acres and is <u>not</u> located in one of the watersheds listed in Appendix C and <u>not</u> directly discharging to one of the 303(d) segments listed in Appendix E;

c. construction on agricultural property that involves a soil disturbance of one (1) or more acres of land but less than five (5) acres; and

d. *construction activities* located in the watersheds identified in Appendix D that involve soil disturbances between five thousand (5,000) square feet and one (1) acre of land.

2. Unless otherwise notified by the Department, the *qualified inspector* shall conduct site inspections in accordance with the following timetable:

   a. For construction sites where soil disturbance activities are on-going, the *qualified inspector* shall conduct a site inspection at least once every seven (7) calendar days.

   b. For construction sites where soil disturbance activities are on-going and the *owner or operator* has received authorization in accordance with Part II.D.3 to disturb greater than five (5) acres of soil at any one time, the *qualified inspector* shall conduct at least two (2) site inspections every seven (7) calendar days. The two (2) inspections shall be separated by a minimum of two (2) full calendar days.

   c. For construction sites where soil disturbance activities have been temporarily suspended (e.g. winter shutdown) and *temporary stabilization* measures have been applied to all disturbed areas, the *qualified inspector* shall conduct a site inspection at least once every thirty (30) calendar days. The *owner or operator* shall notify the DOW Water (SPDES) Program contact at the Regional Office (see contact information in Appendix F) or, in areas under the jurisdiction of a *regulated, traditional land use control MS4,* the *regulated, traditional land use control MS4* (provided the *regulated, traditional land use control MS4* is not the *owner or operator* of the *construction activity*) in writing prior to reducing the frequency of inspections.

d. For construction sites where soil disturbance activities have been shut down with partial project completion, the *qualified inspector* can stop conducting inspections if all areas disturbed as of the project shutdown date have achieved *final stabilization* and all post-construction stormwater management practices required for the completed portion of the project have been constructed in conformance with the SWPPP and are operational. The *owner or operator* shall notify the DOW Water (SPDES) Program contact at the Regional Office (see contact information in Appendix F) or, in areas under the jurisdiction of a *regulated, traditional land use control MS4,* the *regulated, traditional land use control MS4* (provided the *regulated, traditional land use control MS4* is not the *owner or operator* of the *construction activity*) in writing prior to the shutdown. If soil disturbance activities are not resumed within 2 years from the date of shutdown, the *owner or operator* shall have the *qualified inspector* perform a final inspection and certify that all disturbed areas have achieved *final stabilization,* and all temporary, structural erosion and sediment control measures have been removed*;* and that all post-construction stormwater management practices have been constructed in conformance with the SWPPP by signing the "*Final Stabilization*" and "Post-Construction Stormwater Management Practice" certification statements on the NOT. The *owner or operator* shall then submit the completed NOT form to the address in Part II.B.1 of this permit.

e. For construction sites that directly *discharge* to one of the 303(d) segments listed in Appendix E or is located in one of the watersheds listed in Appendix C, the *qualified inspector* shall conduct at least two (2) site inspections every seven (7) calendar days. The two (2) inspections shall be separated by a minimum of two (2) full calendar days.

3. At a minimum, the *qualified inspector* shall inspect all erosion and sediment control practices and pollution prevention measures to ensure integrity and effectiveness, all post-construction stormwater management practices under construction to ensure that they are constructed in conformance with the SWPPP, all areas of disturbance that have not achieved *final stabilization,* all points of *discharge* to natural surface waterbodies located within, or immediately adjacent to, the property boundaries of the *construction site*, and all points of *discharge* from the *construction site*.

4. The *qualified inspector* shall prepare an inspection report subsequent to each and every inspection. At a minimum, the inspection report shall include and/or address the following:

a. Date and time of inspection;

b. Name and title of person(s) performing inspection;

c. A description of the weather and soil conditions (e.g. dry, wet, saturated) at the time of the inspection;

d. A description of the condition of the runoff at all points of *discharge* from the *construction site*. This shall include identification of any *discharges* of sediment from the *construction site*. Include *discharges* from conveyance systems (i.e. pipes, culverts, ditches, etc.) and overland flow;

e. A description of the condition of all natural surface waterbodies located within, or immediately adjacent to, the property boundaries of the *construction site* which receive runoff from disturbed areas. This shall include identification of any *discharges* of sediment to the surface waterbody;

f. Identification of all erosion and sediment control practices and pollution prevention measures that need repair or maintenance;

g. Identification of all erosion and sediment control practices and pollution prevention measures that were not installed properly or are not functioning as designed and need to be reinstalled or replaced;

h. Description and sketch of areas with active soil disturbance activity, areas that have been disturbed but are inactive at the time of the inspection, and areas that have been stabilized (temporary and/or final) since the last inspection;

i. Current phase of construction of all post-construction stormwater management practices and identification of all construction that is not in conformance with the SWPPP and technical standards;

j. Corrective action(s) that must be taken to install, repair, replace or maintain erosion and sediment control practices and pollution prevention measures; and to correct deficiencies identified with the construction of the post-construction stormwater management practice(s);

k. Identification and status of all corrective actions that were required by previous inspection; and

l. Digital photographs, with date stamp, that clearly show the condition of all practices that have been identified as needing corrective actions. The *qualified inspector* shall attach paper color copies of the digital photographs to the inspection report being maintained onsite within seven (7) calendar days of the date of the inspection. The *qualified inspector* shall also take digital photographs, with date stamp, that clearly show the condition of the practice(s) after the corrective action has been completed. The *qualified inspector* shall attach paper color copies of the digital photographs to the inspection report that documents the completion of the corrective action work within seven (7) calendar days of that inspection.

5. Within one business day of the completion of an inspection, the *qualified inspector* shall notify the *owner or operator* and appropriate contractor or subcontractor identified in Part III.A.6. of this permit of any corrective actions that need to be taken. The contractor or subcontractor shall begin implementing the corrective actions within one business day of this notification and shall complete the corrective actions in a reasonable time frame.

6. All inspection reports shall be signed by the *qualified inspector.* Pursuant to Part II.D.2. of this permit, the inspection reports shall be maintained on site with the SWPPP.

Part V. TERMINATION OF PERMIT COVERAGE

A. Termination of Permit Coverage

1. An *owner or operator* that is eligible to terminate coverage under this permit must submit a completed NOT form to the address in Part II.B.1 of this permit. The NOT form shall be one which is associated with this permit, signed in accordance with Part VII.H of this permit.

2. An *owner or operator* may terminate coverage when one or more the following conditions have been met:

   a. Total project completion - All *construction activity* identified in the SWPPP has been completed; <u>and</u> all areas of disturbance have achieved *final stabilization*; <u>and</u> all temporary, structural erosion and sediment control measures have been removed; <u>and</u> all post-construction stormwater management practices have been constructed in conformance with the SWPPP and are operational;

b. Planned shutdown with partial project completion - All soil disturbance activities have ceased; and all areas disturbed as of the project shutdown date have achieved *final stabilization*; and all temporary, structural erosion and sediment control measures have been removed; and all post-construction stormwater management practices required for the completed portion of the project have been constructed in conformance with the SWPPP and are operational;

c. A new *owner or operator* has obtained coverage under this permit in accordance with Part II.F. of this permit.

d. The *owner or operator* obtains coverage under an alternative SPDES general permit or an individual SPDES permit.

3. For *construction activities* meeting subdivision 2a. or 2b. of this Part, the *owner or operator* shall have the *qualified inspector* perform a final site inspection prior to submitting the NOT. The *qualified inspector* shall, by signing the "*Final Stabilization*" and "Post-Construction Stormwater Management Practice certification statements on the NOT, certify that all the requirements in Part V.A.2.a. or b. of this permit have been achieved.

4. For *construction activities* that are subject to the requirements of a *regulated, traditional land use control MS4* and meet subdivision 2a. or 2b. of this Part, the *owner or operator* shall have the *regulated, traditional land use control MS4* sign the "MS4 Acceptance" statement on the NOT in accordance with the requirements in Part VII.H. of this permit. The *regulated, traditional land use control MS4* official, by signing this statement, has determined that it is acceptable for the *owner or operator* to submit the NOT in accordance with the requirements of this Part. The *regulated, traditional land use control MS4* can make this determination by performing a final site inspection themselves or by accepting the *qualified inspector*'s final site inspection certification(s) required in Part V.A.3. of this permit.

5. For *construction activities* that require post-construction stormwater management practices and meet subdivision 2a. of this Part, the *owner or operator* must, prior to submitting the NOT, ensure one of the following:

a. the post-construction stormwater management practice(s) and any right-of-way(s) needed to maintain such practice(s) have been deeded to the municipality in which the practice(s) is located,

b. an executed maintenance agreement is in place with the municipality that will maintain the post-construction stormwater management practice(s),

c. for post-construction stormwater management practices that are privately owned, the *owner or operator* has a mechanism in place that requires operation and maintenance of the practice(s) in accordance with the operation and maintenance plan, such as a deed covenant in the *owner or operator's* deed of record,

d. for post-construction stormwater management practices that are owned by a public or private institution (e.g. school, university, hospital), government agency or authority, or public utility; the *owner or operator* has policy and procedures in place that ensures operation and maintenance of the practices in accordance with the operation and maintenance plan.

Part VI. REPORTING AND RETENTION RECORDS

A. Record Retention

The *owner or operator* shall retain a copy of the NOI, NOI Acknowledgment Letter, SWPPP, MS4 SWPPP Acceptance form and any inspection reports that were prepared in conjunction with this permit for a period of at least five (5) years from the date that the Department receives a complete NOT submitted in accordance with Part V. of this general permit.

B. Addresses

With the exception of the NOI, NOT, and MS4 SWPPP Acceptance form (which must be submitted to the address referenced in Part II.B.1 of this permit), all written correspondence requested by the Department, including individual permit applications, shall be sent to the address of the appropriate DOW Water (SPDES) Program contact at the Regional Office listed in Appendix F.

Part VII. STANDARD PERMIT CONDITIONS

A. Duty to Comply

The *owner or operator* must comply with all conditions of this permit. All contractors and subcontractors associated with the project must comply with the terms of the SWPPP. Any non-compliance with this permit constitutes a violation of the Clean Water

Act (CWA) and the ECL and is grounds for an enforcement action against the *owner or operator* and/or the contractor/subcontractor; permit revocation, suspension or modification; or denial of a permit renewal application. Upon a finding of significant non-compliance with this permit or the applicable SWPPP, the Department may order an immediate stop to all *construction activity* at the site until the non-compliance is remedied. The stop work order shall be in writing, shall describe the non-compliance in detail, and shall be sent to the *owner or operator*.

If any human remains or archaeological remains are encountered during excavation, the *owner or operator* must immediately cease, or cause to cease, all *construction activity* in the area of the remains and notify the appropriate Regional Water Engineer (RWE). *Construction activity* shall not resume until written permission to do so has been received from the RWE.

B. Continuation of the Expired General Permit

This permit expires five (5) years from the effective date. If a new general permit is not issued prior to the expiration of this general permit, an *owner or operator* with coverage under this permit may continue to operate and *discharge* in accordance with the terms and conditions of this general permit, if it is extended pursuant to the State Administrative Procedure Act and 6 NYCRR Part 621, until a new general permit is issued.

C. Enforcement

Failure of the *owner or operator,* its contractors, subcontractors, agents and/or assigns to strictly adhere to any of the permit requirements contained herein shall constitute a violation of this permit. There are substantial criminal, civil, and administrative penalties associated with violating the provisions of this permit. Fines of up to $37,500 per day for each violation and imprisonment for up to fifteen (15) years may be assessed depending upon the nature and degree of the offense.

D. Need to Halt or Reduce Activity Not a Defense

It shall not be a defense for an *owner or operator* in an enforcement action that it would have been necessary to halt or reduce the *construction activity* in order to maintain compliance with the conditions of this permit.

E. Duty to Mitigate

The *owner or operator* and its contractors and subcontractors shall take all reasonable steps to *minimize* or prevent any *discharge* in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

F. Duty to Provide Information

The *owner or operator* shall furnish to the Department, within a reasonable specified time period of a written request, all documentation necessary to demonstrate eligibility and any information to determine compliance with this permit or to determine whether cause exists for modifying or revoking this permit, or suspending or denying coverage under this permit, in accordance with the terms and conditions of this permit. The NOI, SWPPP and inspection reports required by this permit are public documents that the *owner or operator* must make available for review and copying by any person within five (5) business days of the *owner or operator* receiving a written request by any such person to review these documents. Copying of documents will be done at the requester's expense.

G. Other Information

When the *owner or operator* becomes aware that they failed to submit any relevant facts, or submitted incorrect information in the NOI or in any of the documents required by this permit , or have made substantive revisions to the SWPPP (e.g. the scope of the project changes significantly, the type of post-construction stormwater management practice(s) changes, there is a reduction in the sizing of the post-construction stormwater management practice, or there is an increase in the disturbance area or *impervious area*), which were not reflected in the original NOI submitted to the Department, they shall promptly submit such facts or information to the Department using the contact information in Part II.A. of this permit. Failure of the *owner or operator* to correct or supplement any relevant facts within five (5) business days of becoming aware of the deficiency shall constitute a violation of this permit.

H. Signatory Requirements

1. All NOIs and NOTs shall be signed as follows:

    a. For a corporation these forms shall be signed by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means:

(i) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation; or

(ii) the manager of one or more manufacturing, production or operating facilities, provided the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

b. For a partnership or sole proprietorship these forms shall be signed by a general partner or the proprietor, respectively; or

c. For a municipality, State, Federal, or other public agency these forms shall be signed by either a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer of a Federal agency includes:

(i) the chief executive officer of the agency, or

(ii) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrators of EPA).

2. The SWPPP and other information requested by the Department shall be signed by a person described in Part VII.H.1. of this permit or by a duly authorized representative of that person. A person is a duly authorized representative only if:

a. The authorization is made in writing by a person described in Part VII.H.1. of this permit;

b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field, superintendent, position of *equivalent* responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position) and,

c. The written authorization shall include the name, title and signature of the authorized representative and be attached to the SWPPP.

3. All inspection reports shall be signed by the *qualified inspector* that performs the inspection.

4. The MS4 SWPPP Acceptance form shall be signed by the principal executive officer or ranking elected official from the *regulated, traditional land use control MS4,* or by a duly authorized representative of that person.

   It shall constitute a permit violation if an incorrect and/or improper signatory authorizes any required forms, SWPPP and/or inspection reports.

I. Property Rights

The issuance of this permit does not convey any property rights of any sort, nor any exclusive privileges, nor does it authorize any injury to private property nor any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations. *Owners or operators* must obtain any applicable conveyances, easements, licenses and/or access to real property prior to *commencing construction activity*.

J. Severability

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit shall not be affected thereby.

K. Requirement to Obtain Coverage Under an Alternative Permit

1. The Department may require any owner or operator authorized by this permit to apply for and/or obtain either an individual SPDES permit or another SPDES general permit. When the Department requires any discharger authorized by a general permit to apply for an individual SPDES permit, it shall notify the discharger in writing that a permit application is required. This notice shall

include a brief statement of the reasons for this decision, an application form, a statement setting a time frame for the owner or operator to file the application for an individual SPDES permit, and a deadline, not sooner than 180 days from owner or operator receipt of the notification letter, whereby the authorization to discharge under this general permit shall be terminated. Applications must be submitted to the appropriate Permit Administrator at the Regional Office. The Department may grant additional time upon demonstration, to the satisfaction of the Department, that additional time to apply for an alternative authorization is necessary or where the Department has not provided a permit determination in accordance with Part 621 of this Title.

2. When an individual SPDES permit is issued to a discharger authorized to *discharge* under a general SPDES permit for the same *discharge*(s), the general permit authorization for outfalls authorized under the individual SPDES permit is automatically terminated on the effective date of the individual permit unless termination is earlier in accordance with 6 NYCRR Part 750.

L. Proper Operation and Maintenance

The *owner or operator* shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the *owner or operator* to achieve compliance with the conditions of this permit and with the requirements of the SWPPP.

M. Inspection and Entry

The *owner or operator* shall allow an authorized representative of the Department, EPA, applicable county health department, or, in the case of a *construction site* which *discharges* through an *MS4*, an authorized representative of the *MS4* receiving the discharge, upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the owner’s or operator's premises where a regulated facility or activity is located or conducted or where records must be kept under the conditions of this permit;

2. Have access to and copy at reasonable times, any records that must be kept under the conditions of this permit; and

3. Inspect at reasonable times any facilities or equipment (including monitoring and control equipment), practices or operations regulated or required by this permit.

4. Sample or monitor at reasonable times, for purposes of assuring permit compliance or as otherwise authorized by the Act or ECL, any substances or parameters at any location.

N. Permit Actions

This permit may, at any time, be modified, suspended, revoked, or renewed by the Department in accordance with 6 NYCRR Part 621. The filing of a request by the *owner or operator* for a permit modification, revocation and reissuance, termination, a notification of planned changes or anticipated noncompliance does not limit, diminish and/or stay compliance with any terms of this permit.

O. Definitions

Definitions of key terms are included in Appendix A of this permit.

P. Re-Opener Clause

1. If there is evidence indicating potential or realized impacts on water quality due to any stormwater discharge associated with construction activity covered by this permit, the owner or operator of such discharge may be required to obtain an individual permit or alternative general permit in accordance with Part VII.K. of this permit or the permit may be modified to include different limitations and/or requirements.

2. Any Department initiated permit modification, suspension or revocation will be conducted in accordance with 6 NYCRR Part 621, 6 NYCRR 750-1.18, and 6 NYCRR 750-1.20.

Q. Penalties for Falsification of Forms and Reports

In accordance with 6NYCRR Part 750-2.4 and 750-2.5, any person who knowingly makes any false material statement, representation, or certification in any application, record, report or other document filed or required to be maintained under this permit, including reports of compliance or noncompliance shall, upon conviction, be punished in accordance with ECL §71-1933 and or Articles 175 and 210 of the New York State Penal Law.

R. Other Permits

Nothing in this permit relieves the *owner or operator* from a requirement to obtain any other permits required by law.

APPENDIX A – Acronyms and Definitions

Acronyms

APO – Agency Preservation Officer
BMP – Best Management Practice
CPESC – Certified Professional in Erosion and Sediment Control
Cpv – Channel Protection Volume
CWA – Clean Water Act (or the Federal Water Pollution Control Act, 33 U.S.C. §1251 et seq)
DOW – Division of Water
EAF – Environmental Assessment Form
ECL - Environmental Conservation Law
EPA – U. S. Environmental Protection Agency
HSG – Hydrologic Soil Group
MS4 – Municipal Separate Storm Sewer System
NOI – Notice of Intent
NOT – Notice of Termination
NPDES – National Pollutant Discharge Elimination System
OPRHP – Office of Parks, Recreation and Historic Places
Qf – Extreme Flood
Qp – Overbank Flood
RRv – Runoff Reduction Volume
RWE – Regional Water Engineer
SEQR – State Environmental Quality Review
SEQRA - State Environmental Quality Review Act
SHPA – State Historic Preservation Act
SPDES – State Pollutant Discharge Elimination System
SWPPP – Stormwater Pollution Prevention Plan
TMDL – Total Maximum Daily Load
UPA – Uniform Procedures Act
USDA – United States Department of Agriculture
WQv – Water Quality Volume

Definitions

All definitions in this section are solely for the purposes of this permit.

Agricultural Building – a structure designed and constructed to house farm implements, hay, grain, poultry, livestock or other horticultural products; excluding any structure designed, constructed or used, in whole or in part, for human habitation, as a place of employment where agricultural products are processed, treated or packaged, or as a place used by the public.

Agricultural Property –means the land for construction of a barn, *agricultural building*, silo, stockyard, pen or other structural practices identified in Table II in the "Agricultural Management Practices Catalog for Nonpoint Source Pollution in New York State" prepared by the Department in cooperation with agencies of New York Nonpoint Source Coordinating Committee (dated June 2007).

Alter Hydrology from Pre to Post-Development Conditions - means the post-development peak flow rate(s) has increased by more than 5% of the pre-developed condition for the design storm of interest (e.g. 10 yr and 100 yr).

Combined Sewer - means a sewer that is designed to collect and convey both "sewage" and "stormwater".

Commence (Commencement of) Construction Activities - means the initial disturbance of soils associated with clearing, grading or excavation activities; or other construction related activities that disturb or expose soils such as demolition, stockpiling of fill material, and the initial installation of erosion and sediment control practices required in the SWPPP. See definition for "*Construction Activity(ies)*" also.

Construction Activity(ies) - means any clearing, grading, excavation, filling, demolition or stockpiling activities that result in soil disturbance. Clearing activities can include, but are not limited to, logging equipment operation, the cutting and skidding of trees, stump removal and/or brush root removal. Construction activity does not include routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of a facility.

Construction Site – means the land area where *construction activity(ies)* will occur. See definition for "*Commence (Commencement of) Construction Activities"* and "*Larger Common Plan of Development or Sale" also.*

Dewatering – means the act of draining rainwater and/or groundwater from building foundations, vaults or excavations/trenches.

Direct Discharge (to a specific surface waterbody) - means that runoff flows from a *construction site* by overland flow and the first point of discharge is the specific surface waterbody, or runoff flows from a *construction site* to a separate storm sewer system and the first point of discharge from the separate storm sewer system is the specific surface waterbody.

Discharge(s) - means any addition of any pollutant to waters of the State through an outlet or *point source*.

Embankment –means an earthen or rock slope that supports a road/highway.

Endangered or Threatened Species – see 6 NYCRR Part 182 of the Department’s rules and regulations for definition of terms and requirements.

Environmental Conservation Law (ECL) - means chapter 43-B of the Consolidated Laws of the State of New York, entitled the Environmental Conservation Law.

Equivalent (Equivalence) – means that the practice or measure meets all the performance, longevity, maintenance, and safety objectives of the technical standard and will provide an equal or greater degree of water quality protection.

Final Stabilization - means that all soil disturbance activities have ceased and a uniform, perennial vegetative cover with a density of eighty (80) percent over the entire pervious surface has been established; or other equivalent stabilization measures, such as permanent landscape mulches, rock rip-rap or washed/crushed stone have been applied on all disturbed areas that are not covered by permanent structures, concrete or pavement.

General SPDES permit - means a SPDES permit issued pursuant to 6 NYCRR Part 750-1.21 and Section 70-0117 of the ECL authorizing a category of discharges.

Groundwater(s) - means waters in the saturated zone. The saturated zone is a subsurface zone in which all the interstices are filled with water under pressure greater than that of the atmosphere. Although the zone may contain gas-filled interstices or interstices filled with fluids other than water, it is still considered saturated.

Historic Property – means any building, structure, site, object or district that is listed on the State or National Registers of Historic Places or is determined to be eligible for listing on the State or National Registers of Historic Places.

Impervious Area (Cover) - means all impermeable surfaces that cannot effectively infiltrate rainfall. This includes paved, concrete and gravel surfaces (i.e. parking lots, driveways, roads, runways and sidewalks); building rooftops and miscellaneous impermeable structures such as patios, pools, and sheds.

Infeasible – means not technologically possible, or not economically practicable and achievable in light of best industry practices.

Larger Common Plan of Development or Sale - means a contiguous area where multiple separate and distinct *construction activities* are occurring, or will occur, under one plan. The term “plan” in “larger common plan of development or sale” is broadly defined as any announcement or piece of documentation (including a sign, public notice or hearing, marketing plan, advertisement, drawing, permit application, State Environmental Quality Review Act (SEQRA) environmental assessment form or other documents, zoning request, computer design, etc.) or physical demarcation (including boundary signs, lot stakes, surveyor markings, etc.) indicating that *construction activities* may occur on a specific plot.

For discrete construction projects that are located within a larger common plan of development or sale that are at least 1/4 mile apart, each project can be treated as a separate plan of development or sale provided any interconnecting road, pipeline or utility project that is part of the same “common plan” is not concurrently being disturbed.

Minimize – means reduce and/or eliminate to the extent achievable using control measures (including best management practices) that are technologically available and economically practicable and achievable in light of best industry practices.

Municipal Separate Storm Sewer (MS4) - a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains):

(i) Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, stormwater, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the CWA that discharges to surface waters of the State*;*
(ii) Designed or used for collecting or conveying stormwater;
(iii) Which is not a *combined sewer*; and
(iv) Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2.

National Pollutant Discharge Elimination System (NPDES) - means the national system for the issuance of wastewater and stormwater permits under the Federal Water Pollution Control Act (Clean Water Act).

Natural Buffer –means an undisturbed area with natural cover running along a surface water (e.g. wetland, stream, river, lake, etc.).

New Development – means any land disturbance that does not meet the definition of Redevelopment Activity included in this appendix.

New York State Erosion and Sediment Control Certificate Program – a certificate program that establishes and maintains a process to identify and recognize individuals who are capable of developing, designing, inspecting and maintaining erosion and sediment control plans on projects that disturb soils in New York State. The certificate program is administered by the New York State Conservation District Employees Association.

NOI Acknowledgment Letter - means the letter that the Department sends to an owner or operator to acknowledge the Department's receipt and acceptance of a complete Notice of Intent. This letter documents the owner's or operator's authorization to discharge in accordance with the general permit for stormwater discharges from *construction activity*.

Nonpoint Source - means any source of water pollution or pollutants which is not a discrete conveyance or *point source* permitted pursuant to Title 7 or 8 of Article 17 of the Environmental Conservation Law (see ECL Section 17-1403).

Overbank –means flow events that exceed the capacity of the stream channel and spill out into the adjacent floodplain.

Owner or Operator - means the person, persons or legal entity which owns or leases the property on which the *construction activity* is occurring; an entity that has operational control over the construction plans and specifications, including the ability to make modifications to the plans and specifications; and/or an entity that has day-to-day operational control of those activities at a project that are necessary to ensure compliance with the permit conditions.

Performance Criteria – means the design criteria listed under the "Required Elements" sections in Chapters 5, 6 and 10 of the technical standard, New York State Stormwater Management Design Manual, dated January 2015. It does not include the Sizing Criteria (i.e. WQv, RRv, Cpv, Qp and Qf) in Part I.C.2. of the permit.

Point Source - means any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, vessel or other floating craft, or landfill leachate collection system from which *pollutants* are or may be discharged.

Pollutant - means dredged spoil, filter backwash, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand and industrial, municipal, agricultural waste and ballast discharged into water; which may cause or might reasonably be expected to cause pollution of the waters of the state in contravention of the standards or guidance values adopted as provided in 6 NYCRR Parts 700 et seq .

Qualified Inspector - means a person that is knowledgeable in the principles and practices of erosion and sediment control, such as a licensed Professional Engineer, Certified Professional in Erosion and Sediment Control (CPESC), Registered Landscape Architect, New York State Erosion and Sediment Control Certificate Program holder or other Department endorsed individual(s).

It can also mean someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided that person has training in the principles and practices of erosion and sediment control. Training in the principles and practices of erosion and sediment control means that the individual working under the direct supervision of the licensed Professional Engineer or Registered Landscape Architect has received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity. After receiving the initial training, the individual working under the direct supervision of the licensed Professional Engineer or Registered Landscape Architect shall receive four (4) hours of training every three (3) years.

It can also mean a person that meets the *Qualified Professional* qualifications in addition to the *Qualified Inspector* qualifications.

Note: Inspections of any post-construction stormwater management practices that include structural components, such as a dam for an impoundment, shall be performed by a licensed Professional Engineer.

Qualified Professional - means a person that is knowledgeable in the principles and practices of stormwater management and treatment, such as a licensed Professional Engineer, Registered Landscape Architect or other Department endorsed individual(s). Individuals preparing SWPPPs that require the post-construction stormwater management practice component must have an understanding of the principles of hydrology, water quality management practice design, water quantity control design, and, in many cases, the principles of hydraulics. All components of the SWPPP that involve the practice of engineering, as defined by the NYS Education Law (see Article 145), shall be prepared by, or under the direct supervision of, a professional engineer licensed to practice in the State of New York.

Redevelopment Activity(ies) – means the disturbance and reconstruction of existing impervious area, including impervious areas that were removed from a project site within five (5) years of preliminary project plan submission to the local government (i.e. site plan, subdivision, etc.).

Regulated, Traditional Land Use Control MS4 - means a city, town or village with land use control authority that is authorized to discharge under New York State DEC's

SPDES General Permit For Stormwater Discharges from Municipal Separate Stormwater Sewer Systems (MS4s) or the City of New York’s Individual SPDES Permit for their Municipal Separate Storm Sewer Systems (NY-0287890).

Routine Maintenance Activity - means *construction activity* that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of a facility, including, but not limited to:

- Re-grading of gravel roads or parking lots,
- Cleaning and shaping of existing roadside ditches and culverts that maintains the approximate original line and grade, and hydraulic capacity of the ditch,
- Cleaning and shaping of existing roadside ditches that does not maintain the approximate original grade, hydraulic capacity and purpose of the ditch if the changes to the line and grade, hydraulic capacity or purpose of the ditch are installed to improve water quality and quantity controls (e.g. installing grass lined ditch),
- Placement of aggregate shoulder backing that stabilizes the transition between the road shoulder and the ditch or *embankment*,
- Full depth milling and filling of existing asphalt pavements, replacement of concrete pavement slabs, and similar work that does not expose soil or disturb the bottom six (6) inches of subbase material,
- Long-term use of equipment storage areas at or near highway maintenance facilities,
- Removal of sediment from the edge of the highway to restore a previously existing sheet-flow drainage connection from the highway surface to the highway ditch or *embankment*,
- Existing use of Canal Corp owned upland disposal sites for the canal, and
- Replacement of curbs, gutters, sidewalks and guide rail posts.

Site limitations – means site conditions that prevent the use of an infiltration technique and or infiltration of the total WQv. Typical site limitations include: seasonal high groundwater, shallow depth to bedrock, and soils with an infiltration rate less than 0.5 inches/hour. The existence of site limitations shall be confirmed and documented using actual field testing (i.e. test pits, soil borings, and infiltration test) or using information from the most current United States Department of Agriculture (USDA) Soil Survey for the County where the project is located.

Sizing Criteria – means the criteria included in Part I.C.2 of the permit that are used to size post-construction stormwater management control practices. The criteria include; Water Quality Volume (WQv), Runoff Reduction Volume (RRv), Channel Protection Volume (Cpv), *Overbank* Flood (Qp), and Extreme Flood (Qf).

State Pollutant Discharge Elimination System (SPDES) - means the system established pursuant to Article 17 of the ECL and 6 NYCRR Part 750 for issuance of permits authorizing discharges to the waters of the state.

Steep Slope – means land area designated on the current United States Department of Agriculture (“USDA”) Soil Survey as Soil Slope Phase “D”, (provided the map unit name is inclusive of slopes greater than 25%) , or Soil Slope Phase E or F, (regardless of the map unit name), or a combination of the three designations.

Streambank – as used in this permit, means the terrain alongside the bed of a creek or stream. The bank consists of the sides of the channel, between which the flow is confined.

Stormwater Pollution Prevention Plan (SWPPP) – means a project specific report, including construction drawings, that among other things: describes the construction activity(ies), identifies the potential sources of pollution at the *construction site*; describes and shows the stormwater controls that will be used to control the pollutants (i.e. erosion and sediment controls; for many projects, includes post-construction stormwater management controls); and identifies procedures the *owner or operator* will implement to comply with the terms and conditions of the permit. See Part III of the permit for a complete description of the information that must be included in the SWPPP.

Surface Waters of the State - shall be construed to include lakes, bays, sounds, ponds, impounding reservoirs, springs, rivers, streams, creeks, estuaries, marshes, inlets, canals, the Atlantic ocean within the territorial seas of the state of New York and all other bodies of surface water, natural or artificial, inland or coastal, fresh or salt, public or private (except those private waters that do not combine or effect a junction with natural surface waters), which are wholly or partially within or bordering the state or within its jurisdiction. Waters of the state are further defined in 6 NYCRR Parts 800 to 941.

Temporarily Ceased – means that an existing disturbed area will not be disturbed again within 14 calendar days of the previous soil disturbance.

Temporary Stabilization - means that exposed soil has been covered with material(s) as set forth in the technical standard, New York Standards and Specifications for Erosion and Sediment Control, to prevent the exposed soil from eroding. The materials can include, but are not limited to, mulch, seed and mulch, and erosion control mats (e.g. jute twisted yarn, excelsior wood fiber mats).

Total Maximum Daily Loads (TMDLs) - A TMDL is the sum of the allowable loads of a single pollutant from all contributing point and *nonpoint source*s. It is a calculation of the maximum amount of a pollutant that a waterbody can receive on a daily basis and still meet *water quality standards*, and an allocation of that amount to the pollutant's sources. A TMDL stipulates wasteload allocations (WLAs) for *point source* discharges, load allocations (LAs) for *nonpoint source*s, and a margin of safety (MOS).

Trained Contractor - means an employee from the contracting (construction) company, identified in Part III.A.6., that has received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity. After receiving the initial training, the *trained contractor* shall receive four (4) hours of training every three (3) years.

It can also mean an employee from the contracting (construction) company, identified in Part III.A.6., that meets the *qualified inspector* qualifications (e.g. licensed Professional Engineer, Certified Professional in Erosion and Sediment Control (CPESC), Registered Landscape Architect, New York State Erosion and Sediment Control Certificate Program holder, or someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided they have received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity).

The *trained contractor* is responsible for the day to day implementation of the SWPPP.

Uniform Procedures Act (UPA) Permit - means a permit required under 6 NYCRR Part 621 of the Environmental Conservation Law (ECL), Article 70.

Water Quality Standard - means such measures of purity or quality for any waters in relation to their reasonable and necessary use as promulgated in 6 NYCRR Part 700 et seq.

APPENDIX B – Required SWPPP Components by Project Type

Table 1
Construction Activities that Require the Preparation of a SWPPP That Only Includes Erosion and Sediment Controls

The following construction activities that involve soil disturbances of one (1) or more acres of land, but less than five (5) acres:

- Single family home not located in one of the watersheds listed in Appendix C or not *directly discharging* to one of the 303(d) segments listed in Appendix E
- Single family residential subdivisions with 25% or less impervious cover at total site build-out and not located in one of the watersheds listed in Appendix C and not directly discharging to one of the 303(d) segments listed in Appendix E
- Construction of a barn or other *agricultural building*, silo, stock yard or pen.

The following construction activities that involve soil disturbances between five thousand (5000) square feet and one (1) acre of land:

All construction activities located in the watersheds identified in Appendix D that involve soil disturbances between five thousand (5,000) square feet and one (1) acre of land.

The following construction activities that involve soil disturbances of one (1) or more acres of land:

- Installation of underground, linear utilities; such as gas lines, fiber-optic cable, cable TV, electric, telephone, sewer mains, and water mains
- Environmental enhancement projects, such as wetland mitigation projects, stormwater retrofits and stream restoration projects
- Pond construction
- Linear bike paths running through areas with vegetative cover, including bike paths surfaced with an impervious cover
- Cross-country ski trails and walking/hiking trails
- Sidewalk, bike path or walking path projects, surfaced with an impervious cover, that are not part of residential, commercial or institutional development;
- Sidewalk, bike path or walking path projects, surfaced with an impervious cover, that include incidental shoulder or curb work along an existing highway to support construction of the sidewalk, bike path or walking path.
- Slope stabilization projects
- Slope flattening that changes the grade of the site, but does not significantly change the runoff characteristics

Table 1 (Continued) CONSTRUCTION ACTIVITIES THAT REQUIRE THE PREPARATION OF A SWPPP

THAT ONLY INCLUDES EROSION AND SEDIMENT CONTROLS

The following construction activities that involve soil disturbances of one (1) or more acres of land:

- Spoil areas that will be covered with vegetation
- Vegetated open space projects (i.e. recreational parks, lawns, meadows, fields, downhill ski trails) excluding projects that *alter hydrology from pre to post development* conditions,
- Athletic fields (natural grass) that do not include the construction or reconstruction of *impervious area* <u>and</u> do not *alter hydrology from pre to post development* conditions
- Demolition project where vegetation will be established, and no redevelopment is planned
- Overhead electric transmission line project that does not include the construction of permanent access roads or parking areas surfaced with *impervious cover*
- Structural practices as identified in Table II in the “Agricultural Management Practices Catalog for Nonpoint Source Pollution in New York State”, excluding projects that involve soil disturbances of greater than five acres and construction activities that include the construction or reconstruction of impervious area
- Temporary access roads, median crossovers, detour roads, lanes, or other temporary impervious areas that will be restored to pre-construction conditions once the construction activity is complete

Table 2

CONSTRUCTION ACTIVITIES THAT REQUIRE THE PREPARATION OF A SWPPP THAT INCLUDES POST-CONSTRUCTION STORMWATER MANAGEMENT PRACTICES

The following construction activities that involve soil disturbances of one (1) or more acres of land:

- Single family home located in one of the watersheds listed in Appendix C or *directly discharging* to one of the 303(d) segments listed in Appendix E
- Single family home that disturbs five (5) or more acres of land
- Single family residential subdivisions located in one of the watersheds listed in Appendix C or *directly discharging* to one of the 303(d) segments listed in Appendix E
- Single family residential subdivisions that involve soil disturbances of between one (1) and five (5) acres of land with greater than 25% impervious cover at total site build-out
- Single family residential subdivisions that involve soil disturbances of five (5) or more acres of land, and single family residential subdivisions that involve soil disturbances of less than five (5) acres that are part of a larger common plan of development or sale that will ultimately disturb five or more acres of land
- Multi-family residential developments; includes duplexes, townhomes, condominiums, senior housing complexes, apartment complexes, and mobile home parks
- Airports
- Amusement parks
- Breweries, cideries, and wineries, including establishments constructed on agricultural land
- Campgrounds
- Cemeteries that include the construction or reconstruction of impervious area (>5% of disturbed area) or *alter the hydrology from pre to post development* conditions
- Commercial developments
- Churches and other places of worship
- Construction of a barn or other *agricultural building* (e.g. silo) and structural practices as identified in Table II in the “Agricultural Management Practices Catalog for Nonpoint Source Pollution in New York State” that include the construction or reconstruction of *impervious area*, excluding projects that involve soil disturbances of less than five acres.
- Golf courses
- Institutional development; includes hospitals, prisons, schools and colleges
- Industrial facilities; includes industrial parks
- Landfills
- Municipal facilities; includes highway garages, transfer stations, office buildings, POTW’s, water treatment plants, and water storage tanks
- Office complexes
- Playgrounds that include the construction or reconstruction of impervious area
- Sports complexes
- Racetracks; includes racetracks with earthen (dirt) surface
- Road construction or reconstruction, including roads constructed as part of the construction activities listed in Table 1

Table 2 (Continued)

CONSTRUCTION ACTIVITIES THAT REQUIRE THE PREPARATION OF A SWPPP THAT INCLUDES POST-CONSTRUCTION STORMWATER MANAGEMENT PRACTICES

The following construction activities that involve soil disturbances of one (1) or more acres of land:

- Parking lot construction or reconstruction, including parking lots constructed as part of the construction activities listed in Table 1
- Athletic fields (natural grass) that include the construction or reconstruction of impervious area (>5% of disturbed area) or *alter the hydrology from pre to post development* conditions
- Athletic fields with artificial turf
- Permanent access roads, parking areas, substations, compressor stations and well drilling pads, surfaced with *impervious cover,* and constructed as part of an over-head electric transmission line project, wind-power project, cell tower project, oil or gas well drilling project, sewer or water main project or other linear utility project
- Sidewalk, bike path or walking path projects, surfaced with an impervious cover, that are part of a residential, commercial or institutional development
- Sidewalk, bike path or walking path projects, surfaced with an impervious cover, that are part of a highway construction or reconstruction project
- All other construction activities that include the construction or reconstruction of *impervious area* or *alter the hydrology from pre to post development* conditions, and are not listed in Table 1

APPENDIX C – Watersheds Requiring Enhanced Phosphorus Removal

Watersheds where *owners or operators* of construction activities identified in Table 2 of Appendix B must prepare a SWPPP that includes post-construction stormwater management practices designed in conformance with the Enhanced Phosphorus Removal Standards included in the technical standard, New York State Stormwater Management Design Manual ("Design Manual").

- Entire New York City Watershed located east of the Hudson River **-** Figure 1
- Onondaga Lake Watershed **-** Figure 2
- Greenwood Lake Watershed **-**Figure 3
- Oscawana Lake Watershed – Figure 4
- Kinderhook Lake Watershed – Figure 5

Figure 1 - New York City Watershed East of the Hudson

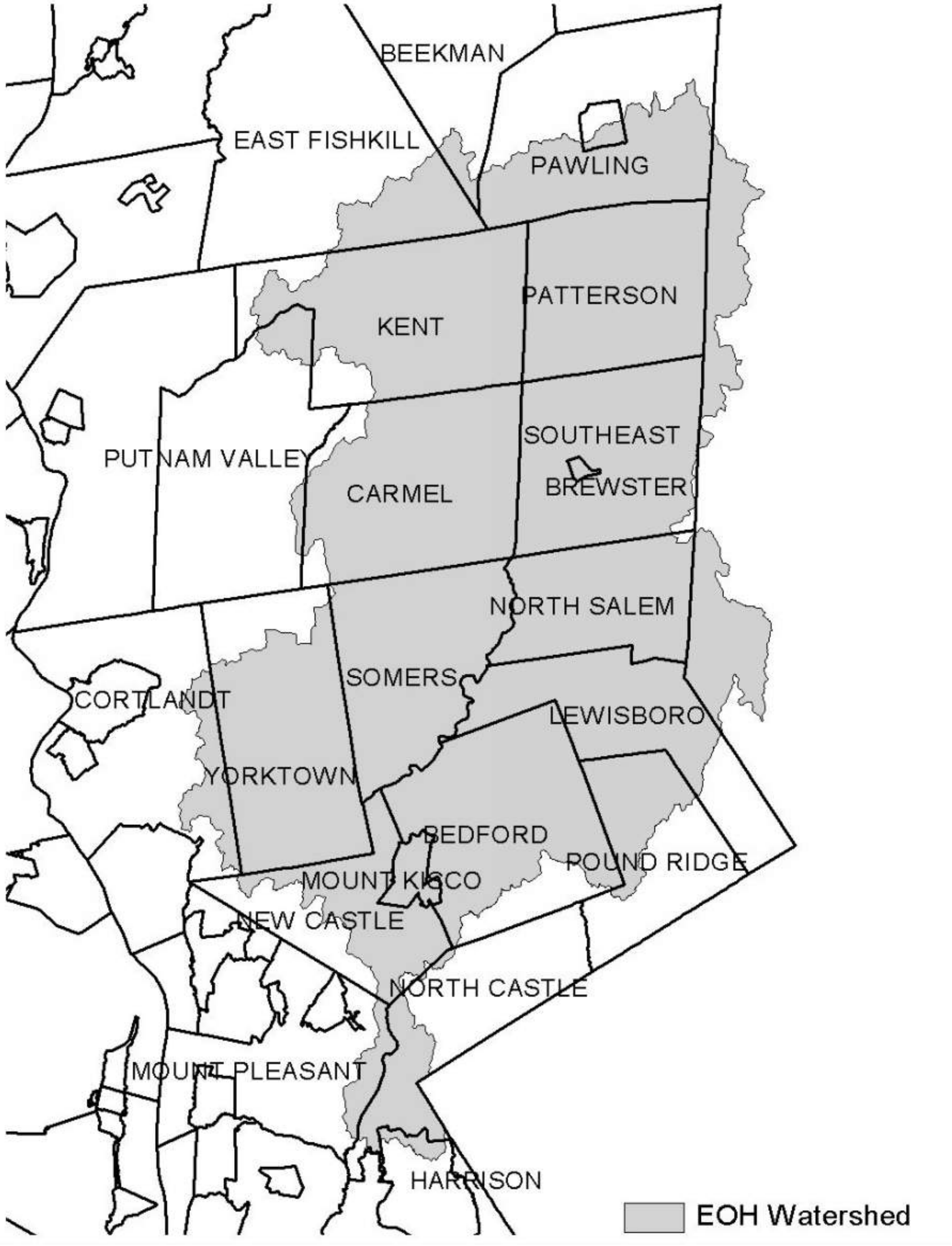


Figure 2 - Onondaga Lake Watershed

Figure 3 - Greenwood Lake Watershed

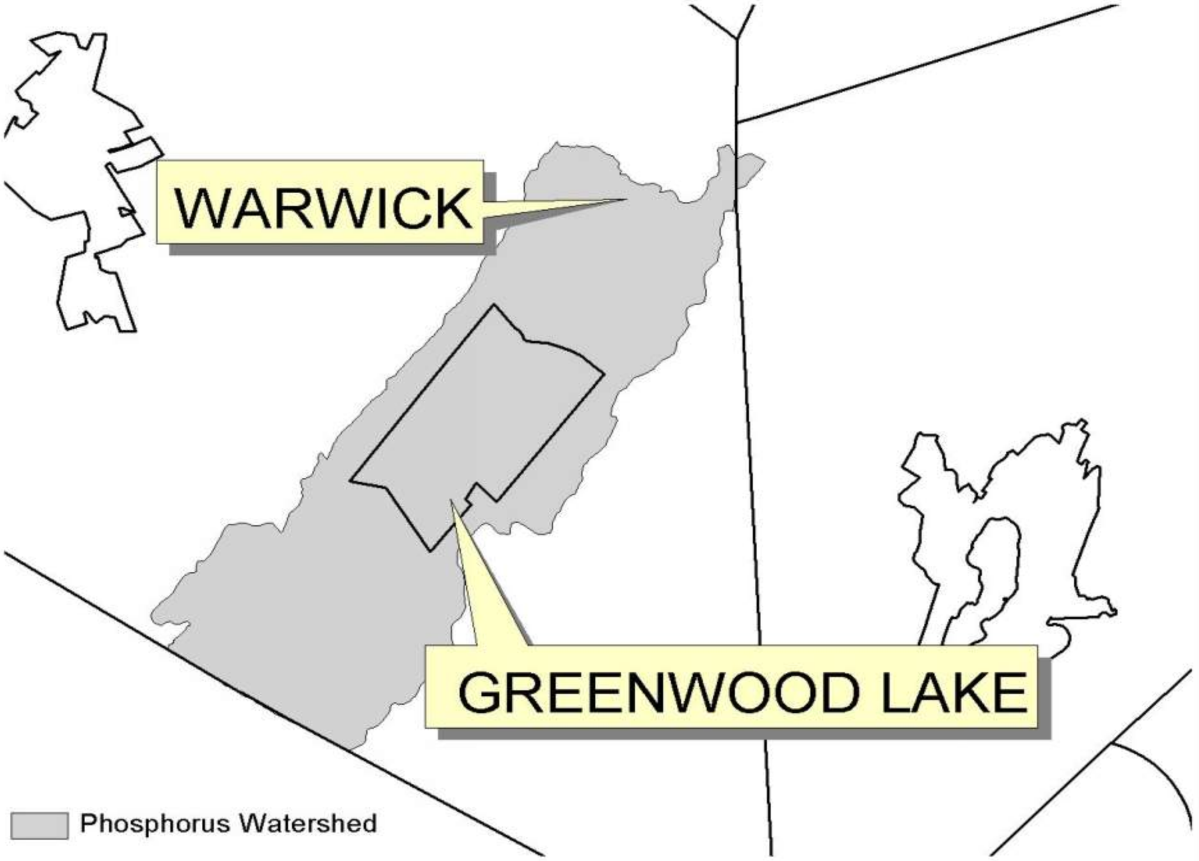


Figure 4 - Oscawana Lake Watershed

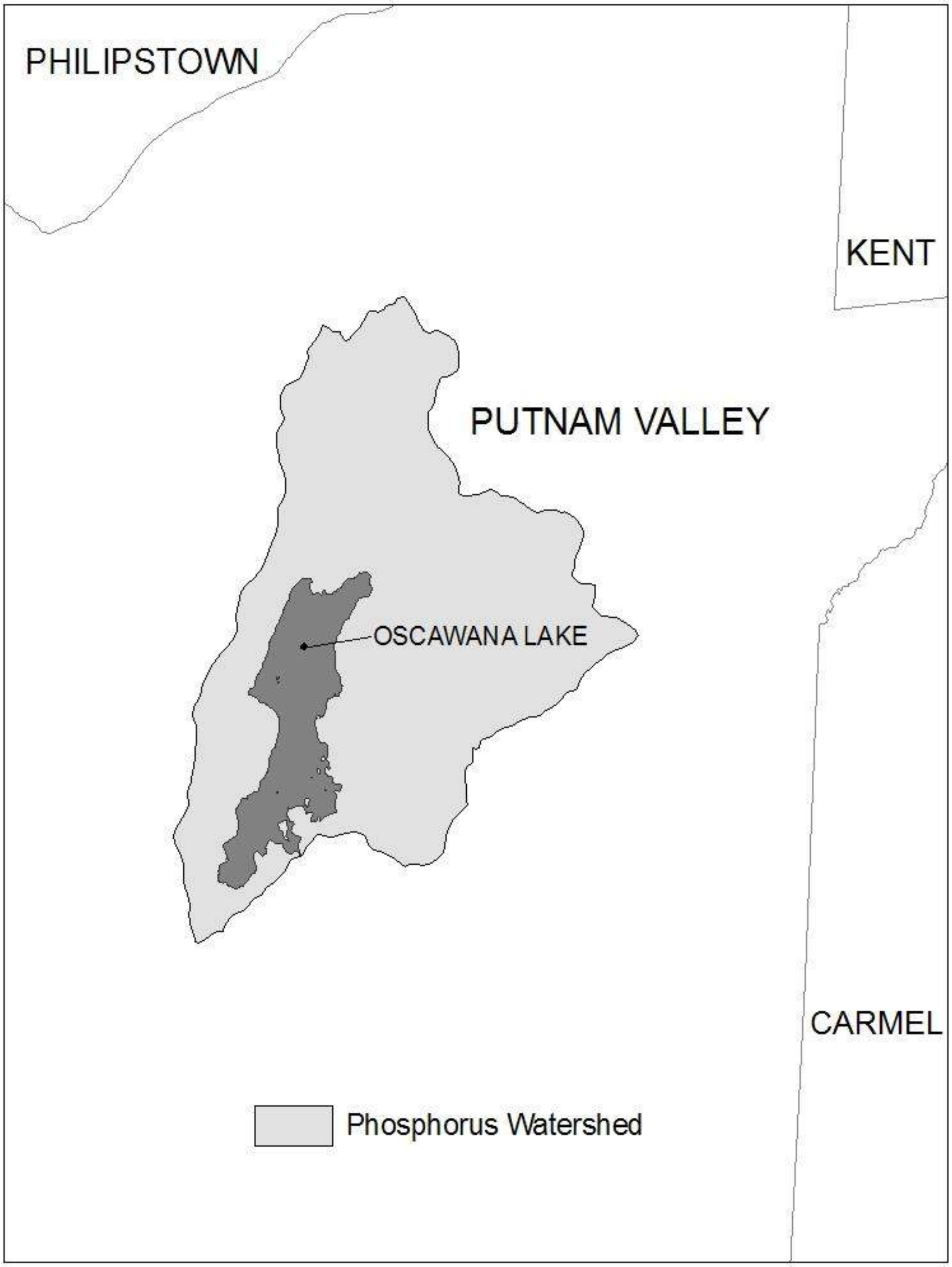
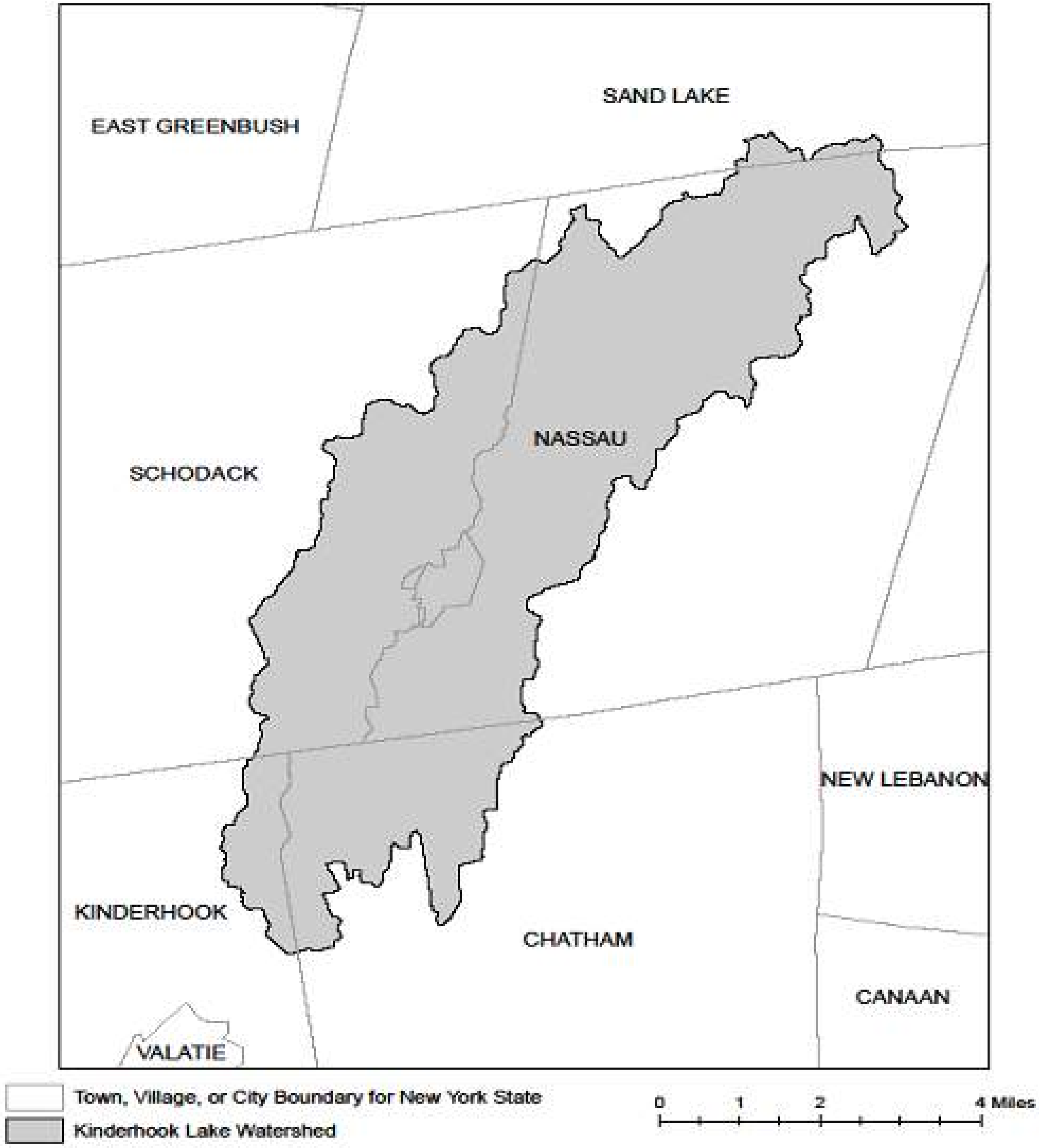


Figure 5 - Kinderhook Lake Watershed



APPENDIX D – Watersheds with Lower Disturbance Threshold

Watersheds where *owners or operators* of construction activities that involve soil disturbances between five thousand (5000) square feet and one (1) acre of land must obtain coverage under this permit.

Entire New York City Watershed that is located east of the Hudson River **-** See Figure 1 in Appendix C

APPENDIX E – 303(d) Segments Impaired by Construction Related Pollutant(s)

List of 303(d) segments impaired by pollutants related to *construction activity* (e.g. silt, sediment or nutrients). The list was developed using ”The Final New York State 2016 Section 303(d) List of Impaired Waters Requiring a TMDL/Other Strategy” dated November 2016. *Owners or operators* of single family home and single family residential subdivisions with 25% or less total impervious cover at total site build-out that involve soil disturbances of one or more acres of land, but less than 5 acres, and *directly discharge* to one of the listed segments below shall prepare a SWPPP that includes post-construction stormwater management practices designed in conformance with the New York State Stormwater Management Design Manual (“Design Manual”), dated January 2015.

COUNTY	WATERBODY	POLLUTANT
Albany	Ann Lee (Shakers) Pond, Stump Pond	Nutrients
Albany	Basic Creek Reservoir	Nutrients
Allegany	Amity Lake, Saunders Pond	Nutrients
Bronx	Long Island Sound, Bronx	Nutrients
Bronx	Van Cortlandt Lake	Nutrients
Broome	Fly Pond, Deer Lake, Sky Lake	Nutrients
Broome	Minor Tribs to Lower Susquehanna (north)	Nutrients
Broome	Whitney Point Lake/Reservoir	Nutrients
Cattaraugus	Allegheny River/Reservoir	Nutrients
Cattaraugus	Beaver (Alma) Lake	Nutrients
Cattaraugus	Case Lake	Nutrients
Cattaraugus	Linlyco/Club Pond	Nutrients
Cayuga	Duck Lake	Nutrients
Cayuga	Little Sodus Bay	Nutrients
Chautauqua	Bear Lake	Nutrients
Chautauqua	Chadakoin River and tribs	Nutrients
Chautauqua	Chautauqua Lake, North	Nutrients
Chautauqua	Chautauqua Lake, South	Nutrients
Chautauqua	Findley Lake	Nutrients
Chautauqua	Hulburt/Clymer Pond	Nutrients
Clinton	Great Chazy River, Lower, Main Stem	Silt/Sediment
Clinton	Lake Champlain, Main Lake, Middle	Nutrients
Clinton	Lake Champlain, Main Lake, North	Nutrients
Columbia	Kinderhook Lake	Nutrients
Columbia	Robinson Pond	Nutrients
Cortland	Dean Pond	Nutrients

303(d) Segments Impaired by Construction Related Pollutant(s)

Dutchess	Fall Kill and tribs	Nutrients
Dutchess	Hillside Lake	Nutrients
Dutchess	Wappingers Lake	Nutrients
Dutchess	Wappingers Lake	Silt/Sediment
Erie	Beeman Creek and tribs	Nutrients
Erie	Ellicott Creek, Lower, and tribs	Silt/Sediment
Erie	Ellicott Creek, Lower, and tribs	Nutrients
Erie	Green Lake	Nutrients
Erie	Little Sister Creek, Lower, and tribs	Nutrients
Erie	Murder Creek, Lower, and tribs	Nutrients
Erie	Rush Creek and tribs	Nutrients
Erie	Scajaquada Creek, Lower, and tribs	Nutrients
Erie	Scajaquada Creek, Middle, and tribs	Nutrients
Erie	Scajaquada Creek, Upper, and tribs	Nutrients
Erie	South Branch Smoke Cr, Lower, and tribs	Silt/Sediment
Erie	South Branch Smoke Cr, Lower, and tribs	Nutrients
Essex	Lake Champlain, Main Lake, South	Nutrients
Essex	Lake Champlain, South Lake	Nutrients
Essex	Willsboro Bay	Nutrients
Genesee	Bigelow Creek and tribs	Nutrients
Genesee	Black Creek, Middle, and minor tribs	Nutrients
Genesee	Black Creek, Upper, and minor tribs	Nutrients
Genesee	Bowen Brook and tribs	Nutrients
Genesee	LeRoy Reservoir	Nutrients
Genesee	Oak Orchard Cr, Upper, and tribs	Nutrients
Genesee	Tonawanda Creek, Middle, Main Stem	Nutrients
Greene	Schoharie Reservoir	Silt/Sediment
Greene	Sleepy Hollow Lake	Silt/Sediment
Herkimer	Steele Creek tribs	Silt/Sediment
Herkimer	Steele Creek tribs	Nutrients
Jefferson	Moon Lake	Nutrients
Kings	Hendrix Creek	Nutrients
Kings	Prospect Park Lake	Nutrients
Lewis	Mill Creek/South Branch, and tribs	Nutrients
Livingston	Christie Creek and tribs	Nutrients
Livingston	Conesus Lake	Nutrients
Livingston	Mill Creek and minor tribs	Silt/Sediment
Monroe	Black Creek, Lower, and minor tribs	Nutrients
Monroe	Buck Pond	Nutrients
Monroe	Cranberry Pond	Nutrients

303(d) Segments Impaired by Construction Related Pollutant(s)

Monroe	Lake Ontario Shoreline, Western	Nutrients
Monroe	Long Pond	Nutrients
Monroe	Mill Creek and tribs	Nutrients
Monroe	Mill Creek/Blue Pond Outlet and tribs	Nutrients
Monroe	Minor Tribs to Irondequoit Bay	Nutrients
Monroe	Rochester Embayment - East	Nutrients
Monroe	Rochester Embayment - West	Nutrients
Monroe	Shipbuilders Creek and tribs	Nutrients
Monroe	Thomas Creek/White Brook and tribs	Nutrients
Nassau	Beaver Lake	Nutrients
Nassau	Camaans Pond	Nutrients
Nassau	East Meadow Brook, Upper, and tribs	Silt/Sediment
Nassau	East Rockaway Channel	Nutrients
Nassau	Grant Park Pond	Nutrients
Nassau	Hempstead Bay	Nutrients
Nassau	Hempstead Lake	Nutrients
Nassau	Hewlett Bay	Nutrients
Nassau	Hog Island Channel	Nutrients
Nassau	Long Island Sound, Nassau County Waters	Nutrients
Nassau	Massapequa Creek and tribs	Nutrients
Nassau	Milburn/Parsonage Creeks, Upp, and tribs	Nutrients
Nassau	Reynolds Channel, west	Nutrients
Nassau	Tidal Tribs to Hempstead Bay	Nutrients
Nassau	Tribs (fresh) to East Bay	Nutrients
Nassau	Tribs (fresh) to East Bay	Silt/Sediment
Nassau	Tribs to Smith/Halls Ponds	Nutrients
Nassau	Woodmere Channel	Nutrients
New York	Harlem Meer	Nutrients
New York	The Lake in Central Park	Nutrients
Niagara	Bergholtz Creek and tribs	Nutrients
Niagara	Hyde Park Lake	Nutrients
Niagara	Lake Ontario Shoreline, Western	Nutrients
Niagara	Lake Ontario Shoreline, Western	Nutrients
Oneida	Ballou, Nail Creeks and tribs	Nutrients
Onondaga	Harbor Brook, Lower, and tribs	Nutrients
Onondaga	Ley Creek and tribs	Nutrients
Onondaga	Minor Tribs to Onondaga Lake	Nutrients
Onondaga	Ninemile Creek, Lower, and tribs	Nutrients
Onondaga	Onondaga Creek, Lower, and tribs	Nutrients
Onondaga	Onondaga Creek, Middle, and tribs	Nutrients

303(d) Segments Impaired by Construction Related Pollutant(s)

Onondaga	Onondaga Lake, northern end	Nutrients
Onondaga	Onondaga Lake, southern end	Nutrients
Ontario	Great Brook and minor tribs	Silt/Sediment
Ontario	Great Brook and minor tribs	Nutrients
Ontario	Hemlock Lake Outlet and minor tribs	Nutrients
Ontario	Honeoye Lake	Nutrients
Orange	Greenwood Lake	Nutrients
Orange	Monhagen Brook and tribs	Nutrients
Orange	Orange Lake	Nutrients
Orleans	Lake Ontario Shoreline, Western	Nutrients
Orleans	Lake Ontario Shoreline, Western	Nutrients
Oswego	Lake Neatahwanta	Nutrients
Oswego	Pleasant Lake	Nutrients
Putnam	Bog Brook Reservoir	Nutrients
Putnam	Boyd Corners Reservoir	Nutrients
Putnam	Croton Falls Reservoir	Nutrients
Putnam	Diverting Reservoir	Nutrients
Putnam	East Branch Reservoir	Nutrients
Putnam	Lake Carmel	Nutrients
Putnam	Middle Branch Reservoir	Nutrients
Putnam	Oscawana Lake	Nutrients
Putnam	Palmer Lake	Nutrients
Putnam	West Branch Reservoir	Nutrients
Queens	Bergen Basin	Nutrients
Queens	Flushing Creek/Bay	Nutrients
Queens	Jamaica Bay, Eastern, and tribs (Queens)	Nutrients
Queens	Kissena Lake	Nutrients
Queens	Meadow Lake	Nutrients
Queens	Willow Lake	Nutrients
Rensselaer	Nassau Lake	Nutrients
Rensselaer	Snyders Lake	Nutrients
Richmond	Grasmere Lake/Bradys Pond	Nutrients
Rockland	Congers Lake, Swartout Lake	Nutrients
Rockland	Rockland Lake	Nutrients
Saratoga	Ballston Lake	Nutrients
Saratoga	Dwaas Kill and tribs	Silt/Sediment
Saratoga	Dwaas Kill and tribs	Nutrients
Saratoga	Lake Lonely	Nutrients
Saratoga	Round Lake	Nutrients
Saratoga	Tribs to Lake Lonely	Nutrients

303(d) Segments Impaired by Construction Related Pollutant(s)

Schenectady	Collins Lake	Nutrients
Schenectady	Duane Lake	Nutrients
Schenectady	Mariaville Lake	Nutrients
Schoharie	Engleville Pond	Nutrients
Schoharie	Summit Lake	Nutrients
Seneca	Reeder Creek and tribs	Nutrients
St.Lawrence	Black Lake Outlet/Black Lake	Nutrients
St.Lawrence	Fish Creek and minor tribs	Nutrients
Steuben	Smith Pond	Nutrients
Suffolk	Agawam Lake	Nutrients
Suffolk	Big/Little Fresh Ponds	Nutrients
Suffolk	Canaan Lake	Silt/Sediment
Suffolk	Canaan Lake	Nutrients
Suffolk	Flanders Bay, West/Lower Sawmill Creek	Nutrients
Suffolk	Fresh Pond	Nutrients
Suffolk	Great South Bay, East	Nutrients
Suffolk	Great South Bay, Middle	Nutrients
Suffolk	Great South Bay, West	Nutrients
Suffolk	Lake Ronkonkoma	Nutrients
Suffolk	Long Island Sound, Suffolk County, West	Nutrients
Suffolk	Mattituck (Marratooka) Pond	Nutrients
Suffolk	Meetinghouse/Terrys Creeks and tribs	Nutrients
Suffolk	Mill and Seven Ponds	Nutrients
Suffolk	Millers Pond	Nutrients
Suffolk	Moriches Bay, East	Nutrients
Suffolk	Moriches Bay, West	Nutrients
Suffolk	Peconic River, Lower, and tidal tribs	Nutrients
Suffolk	Quantuck Bay	Nutrients
Suffolk	Shinnecock Bay and Inlet	Nutrients
Suffolk	Tidal tribs to West Moriches Bay	Nutrients
Sullivan	Bodine, Montgomery Lakes	Nutrients
Sullivan	Davies Lake	Nutrients
Sullivan	Evens Lake	Nutrients
Sullivan	Pleasure Lake	Nutrients
Tompkins	Cayuga Lake, Southern End	Nutrients
Tompkins	Cayuga Lake, Southern End	Silt/Sediment
Tompkins	Owasco Inlet, Upper, and tribs	Nutrients
Ulster	Ashokan Reservoir	Silt/Sediment
Ulster	Esopus Creek, Upper, and minor tribs	Silt/Sediment
Warren	Hague Brook and tribs	Silt/Sediment

303(d) Segments Impaired by Construction Related Pollutant(s)

Warren	Huddle/Finkle Brooks and tribs	Silt/Sediment
Warren	Indian Brook and tribs	Silt/Sediment
Warren	Lake George	Silt/Sediment
Warren	Tribs to L.George, Village of L George	Silt/Sediment
Washington	Cossayuna Lake	Nutrients
Washington	Lake Champlain, South Bay	Nutrients
Washington	Tribs to L.George, East Shore	Silt/Sediment
Washington	Wood Cr/Champlain Canal and minor tribs	Nutrients
Wayne	Port Bay	Nutrients
Westchester	Amawalk Reservoir	Nutrients
Westchester	Blind Brook, Upper, and tribs	Silt/Sediment
Westchester	Cross River Reservoir	Nutrients
Westchester	Lake Katonah	Nutrients
Westchester	Lake Lincolndale	Nutrients
Westchester	Lake Meahagh	Nutrients
Westchester	Lake Mohegan	Nutrients
Westchester	Lake Shenorock	Nutrients
Westchester	Long Island Sound, Westchester (East)	Nutrients
Westchester	Mamaroneck River, Lower	Silt/Sediment
Westchester	Mamaroneck River, Upper, and minor tribs	Silt/Sediment
Westchester	Muscoot/Upper New Croton Reservoir	Nutrients
Westchester	New Croton Reservoir	Nutrients
Westchester	Peach Lake	Nutrients
Westchester	Reservoir No.1 (Lake Isle)	Nutrients
Westchester	Saw Mill River, Lower, and tribs	Nutrients
Westchester	Saw Mill River, Middle, and tribs	Nutrients
Westchester	Sheldrake River and tribs	Silt/Sediment
Westchester	Sheldrake River and tribs	Nutrients
Westchester	Silver Lake	Nutrients
Westchester	Teatown Lake	Nutrients
Westchester	Titicus Reservoir	Nutrients
Westchester	Truesdale Lake	Nutrients
Westchester	Wallace Pond	Nutrients
Wyoming	Java Lake	Nutrients
Wyoming	Silver Lake	Nutrients

APPENDIX F – List of NYS DEC Regional Offices

Region	Covering the following counties:	DIVISION OF ENVIRONMENTAL PERMITS (DEP) Permit Administrators	DIVISION OF WATER (DOW) Water (SPDES) Program
1	Nassau and Suffolk	50 Circle Road Stony Brook, Ny 11790 Tel. (631) 444-0365	50 Circle Road Stony Brook, Ny 11790-3409 Tel. (631) 444-0405
2	Bronx, Kings, New York, Queens and Richmond	1 Hunters Point Plaza, 47-40 21st St. Long Island City, Ny 11101-5407 Tel. (718) 482-4997	1 Hunters Point Plaza, 47-40 21st St. Long Island City, Ny 11101-5407 Tel. (718) 482-4933
3	Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster and Westchester	21 South Putt Corners Road New Paltz, Ny 12561-1696 Tel. (845) 256-3059	100 Hillside Avenue, Suite 1w White Plains, Ny 10603 Tel. (914) 428 - 2505
4	Albany, Columbia, Delaware, Greene, Montgomery, Otsego, Rensselaer, Schenectady and Schoharie	1150 North Westcott Road Schenectady, Ny 12306-2014 Tel. (518) 357-2069	1130 North Westcott Road Schenectady, Ny 12306-2014 Tel. (518) 357-2045
5	Clinton, Essex, Franklin, Fulton, Hamilton, Saratoga, Warren and Washington	1115 State Route 86, Po Box 296 Ray Brook, Ny 12977-0296 Tel. (518) 897-1234	232 Golf Course Road Warrensburg, Ny 12885-1172 Tel. (518) 623-1200
6	HERKIMER, JEFFERSON, LEWIS, ONEIDA AND ST. LAWRENCE	STATE OFFICE BUILDING 317 WASHINGTON STREET WATERTOWN, NY 13601-3787 TEL. (315) 785-2245	STATE OFFICE BUILDING 207 GENESEE STREET UTICA, NY 13501-2885 TEL. (315) 793-2554
7	BROOME, CAYUGA, CHENANGO, CORTLAND, MADISON, ONONDAGA, OSWEGO, TIOGA AND TOMPKINS	615 ERIE BLVD. WEST SYRACUSE, NY 13204-2400 TEL. (315) 426-7438	615 ERIE BLVD. WEST SYRACUSE, NY 13204-2400 TEL. (315) 426-7500
8	CHEMUNG, GENESEE, LIVINGSTON, MONROE, ONTARIO, ORLEANS, SCHUYLER, SENECA, STEUBEN, WAYNE AND YATES	6274 EAST AVON-LIMA ROADAVON, NY 14414-9519 TEL. (585) 226-2466	6274 EAST AVON-LIMA RD. AVON, NY 14414-9519 TEL. (585) 226-2466
9	ALLEGANY, CATTARAUGUS, CHAUTAUQUA, ERIE, NIAGARA AND WYOMING	270 MICHIGAN AVENUE BUFFALO, NY 14203-2999 TEL. (716) 851-7165	270 MICHIGAN AVENUE BUFFALO, NY 14203-2999 TEL. (716) 851-7070

Appendix C – Construction Personnel Contact List

- Construction Contact List -

- Contractor Certification Form –

- NYSDEC 4-Hour Erosion and Sediment Control Training Certificates -

Appendix C – Construction Contact List

Note: The Construction Contact List will be provided in the Final SWPPP prior to construction.

SWPPP Construction Contact List

Name	Title/Role	Company	Phone Number
	Project Engineer		
	Project Field Construction Coordinator		
	Project Environmental Engineer		
	Division Environmental Engineer (Spill Reporting)		
	SWPPP Preparer		
	Qualified Inspector		

Appendix C – Contractor Certification Form

Note: The signed Contractor Certification Form will be completed in the Final SWPPP prior to construction.

Contractor Certification Form

Stormwater Pollution Prevention Plan (SWPPP)
State Pollutant Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Construction Activity
GP-0-20-001

Mill Point Solar I Project
Town of Glen, Montgomery County, New York

All Contractors and Subcontractors performing construction activities shall sign the following certification before they commence construction activities. A copy of the certification shall be included in Appendix A of the on-site SWPPP. All Contractors and Subcontractors must identify at least one trained person from their company, who has met the requirements of a *Trained Contractor* as defined in GP-0-20-001, that will be responsible for the implementation of the SWPPP.

> "I hereby certify under penalty of the law that I understand and agree to comply with the terms and conditions of the SWPPP and agree to implement any corrective actions identified by the Qualified Inspector during a site inspection. I also understand that the Owner or Operator must comply with the terms and conditions of the most current version of the New York State SPDES General Permit for Stormwater Discharges from Construction Activities (GP-0-20-001) and that is unlawful for any person to cause or contribute to a violation of water quality standards. Furthermore, I am aware that there are significant penalties for submitting false information that I do not believe to be true, including the possibility of fine and imprisonment for knowing violations."

Name of Construction Company

Address of Construction Company — Telephone Number

Printed Name of Authorized Representative — Title

Signature of Authorized Representative — Date

Printed Name of Trained Contractor(s) — Title(s)

Type of construction services to be provided:

Appendix C – NYSDEC 4-Hour Erosion and Sediment Control Training Certificates

Provide copies of the NYSDEC 4-hour erosion and Sediment Control Training certificates for the Contractor(s), Subcontractor(s), and Qualified Inspector.

Note: Copies if the Contractor's NYSDEC 4-hour ESC Training Certificate will be provided in the Final SWPPP prior to construction.

Appendix D – Agency Correspondence and Notifications

Provide copies of correspondence and notifications with agencies during construction and prior to temporary shutdown or Facility termination. At a minimum, the following documentation shall be provided if necessary:

- Five-Acre Waiver request letter, Phasing Plan, and approval.
- Construction inspection reduction notices to NYSDEC or MS4 representative.
- Notification of partial Facility shutdown to NYSDEC.

Appendix D – Five-Acre Waiver Request Letter and Phasing Plan

Note: A Five-Acre Waiver request will be submitted to the NYSDEC for approval with the Final SWPPP prior to construction.

Appendix E – Environmental Background Information

- Figure 1: Site Location Map -

-Environmental and Cultural Resource Information -

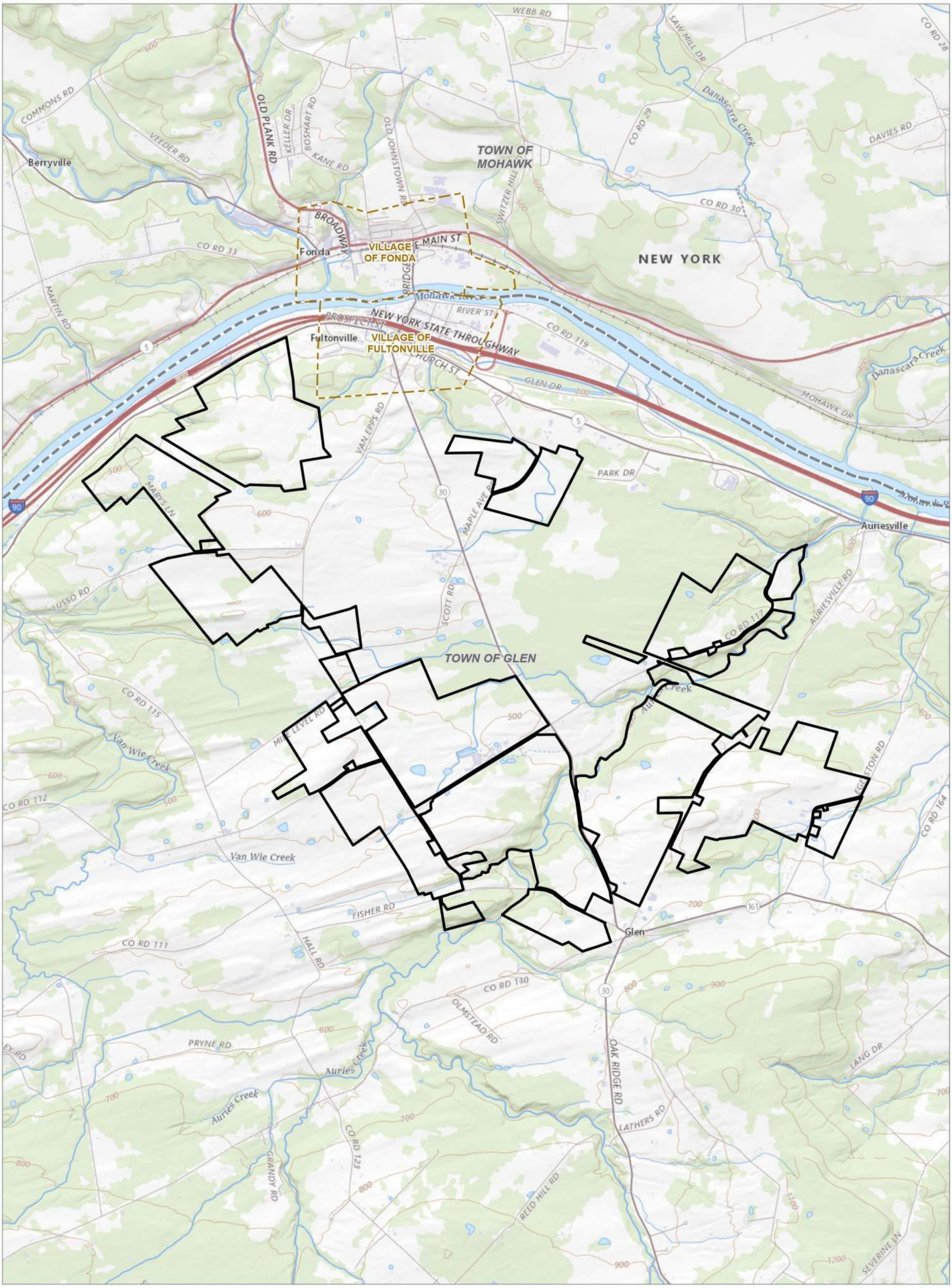
- USDA NRCS Soil Resource Report -

- Geotechnical Engineering Report -

- Northeast Regional Climate Center’s Extreme Precipitation Tables -

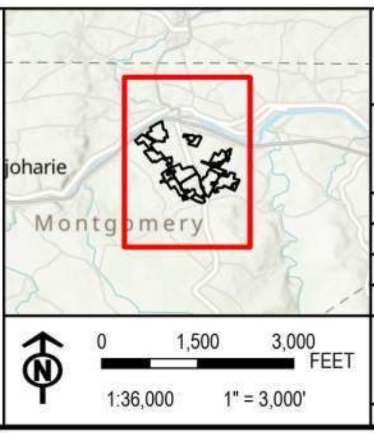
Appendix E – Figure 1: Site Location Map

COORDINATE SYSTEM: NAD 1983 STATEPLANE NEW YORK EAST FIPS 3101 FEET; MAP ROTATION: 0
– SAVED BY: ACORDAS ON 7/25/2023, 17:30:08 PM; FILE PATH: Z:\1-PROJECTS\CONNECTGEN\411360-MILL_POINT_SOLAR\2-APRX\MILL_POINT_94C_EX2_3_5.APRX; LAYOUT NAME: FIG_2_1_FACILITY_SITE_LOC_11X17P



▭ FACILITY SITE
▭ VILLAGE BOUNDARY
▭ TOWN BOUNDARY

BASE MAP: USGS TOPOGRAPHIC MAP SERVICE
DATA SOURCES: ESRI, NYSDEC, USGS, TRC



PROJECT:
CONNECTGEN MONTGOMERY COUNTY LLC
MILL POINT SOLAR I
TOWN OF GLEN, MONTGOMERY COUNTY, NY

TITLE:
FACILITY SITE LOCATION

DRAWN BY:	A. CORDAS	PROJ. NO.:	411360.1000.0000
CHECKED BY:	C.PEARCE	**FIGURE 1**	
APPROVED BY:	T.KONDAK		
DATE:	JULY 2023		

TRC
3 Corporate Drive
Suite 202
Clifton Park, NY 12065
Phone: 518.348.1190

FILE: MILL_POINT_94C_EX2_3_5.APRX

Appendix E – Environmental and Cultural Resource Information

IPaC **U.S. Fish & Wildlife Service**

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Montgomery County, New York

Local office

New York Ecological Services Field Office

- ☎ (607) 753-9334
- 📠 (607) 753-9699
- ✉ fw5es_nyfo@fws.gov

3817 Luker Road
Cortland, NY 13045-9385

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

---

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information. IPaC only shows species that are regulated by USFWS (see FAQ).

2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
Northern Long-eared Bat Myotis septentrionalis Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9045	Endangered

Insects

NAME	STATUS
Monarch Butterfly Danaus plexippus Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9743	Candidate

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

There are no critical habitats at this location.

You are still required to determine if your project(s) may have effects on all above listed species.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern https://www.fws.gov/program/migratory-birds/species
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle Haliaeetus leucocephalus This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Dec 1 to Aug 31
Belted Kingfisher Megaceryle alcyon This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds Mar 15 to Jul 25

Black-billed Cuckoo Coccyzus erythropthalmus — Breeds May 15 to Oct 10

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9399

Blue-winged Warbler Vermivora pinus — Breeds May 1 to Jun 30

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Bobolink Dolichonyx oryzivorus — Breeds May 20 to Jul 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Canada Warbler Cardellina canadensis — Breeds May 20 to Aug 10

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Cerulean Warbler Dendroica cerulea — Breeds Apr 20 to Jul 20

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/2974

Chimney Swift Chaetura pelagica — Breeds Mar 15 to Aug 25

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Eastern Meadowlark Sturnella magna — Breeds Apr 25 to Aug 31

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Evening Grosbeak Coccothraustes vespertinus — Breeds May 15 to Aug 10

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Golden Eagle Aquila chrysaetos — Breeds Jan 1 to Aug 31

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.
https://ecos.fws.gov/ecp/species/1680

Lesser Yellowlegs Tringa flavipes Breeds elsewhere

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9679

Prairie Warbler Dendroica discolor Breeds May 1 to Jul 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Short-billed Dowitcher Limnodromus griseus Breeds elsewhere

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9480

Upland Sandpiper Bartramia longicauda Breeds May 1 to Aug 31

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/9294

Wood Thrush Hylocichla mustelina Breeds May 10 to Aug 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (🟩)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted

Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.

2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

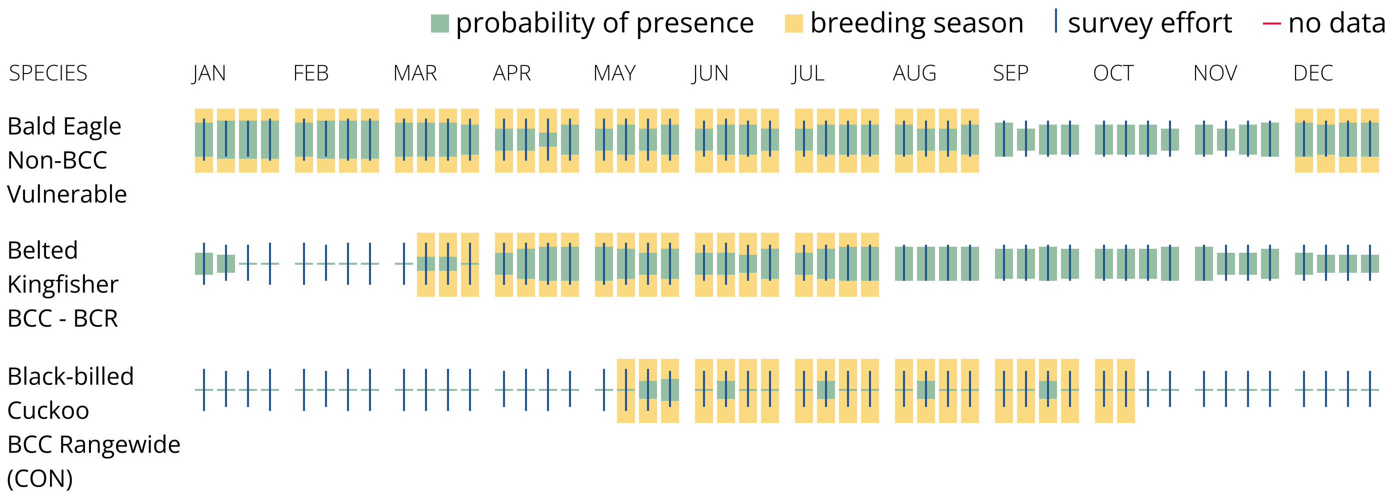
Breeding Season (🟨)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

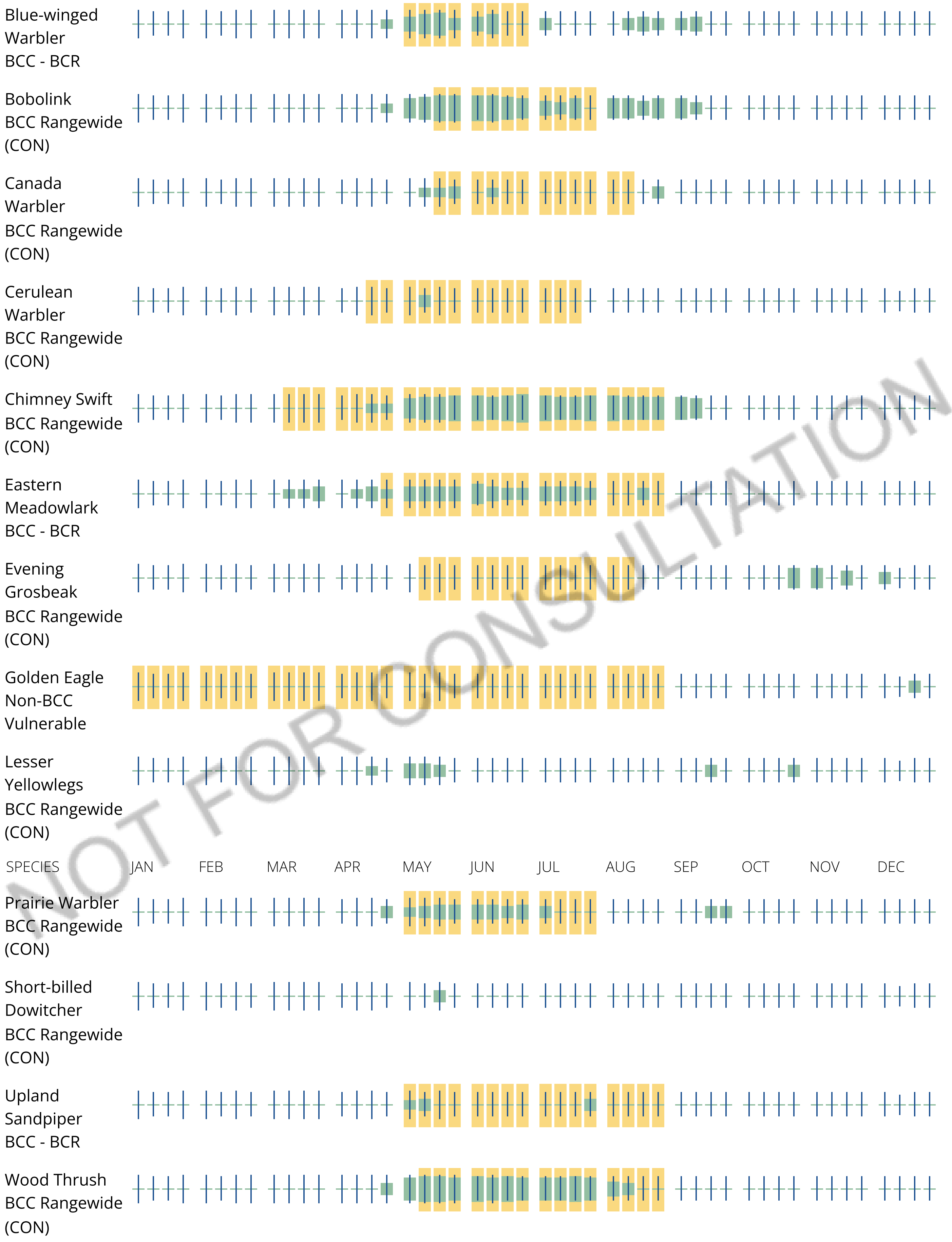
Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.




Blue-winged Warbler
BCC - BCR
Bobolink
BCC Rangewide (CON)
Canada Warbler
BCC Rangewide (CON)
Cerulean Warbler
BCC Rangewide (CON)
Chimney Swift
BCC Rangewide (CON)
Eastern Meadowlark
BCC - BCR
Evening Grosbeak
BCC Rangewide (CON)
Golden Eagle
Non-BCC Vulnerable
Lesser Yellowlegs
BCC Rangewide (CON)
SPECIES
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
Prairie Warbler
BCC Rangewide (CON)
Short-billed Dowitcher
BCC Rangewide (CON)
Upland Sandpiper
BCC - BCR
Wood Thrush
BCC Rangewide (CON)

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the list of migratory birds that potentially occur in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets.

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering or migrating in my area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may query your location using the RAIL Tool and look at the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

There are no refuge lands at this location.

Fish hatcheries

There are no fish hatcheries at this location.

Wetlands in the National Wetlands Inventory (NWI)

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

FRESHWATER EMERGENT WETLAND

- PEM1E
- PEM1A

PEM1Ad

FRESHWATER FORESTED/SHRUB WETLAND

PSS1E

FRESHWATER POND

PUBHx
PUBH
PUBFx

RIVERINE

R2UBH
R4SBC
R4SBA

A full description for each wetland code can be found at the National Wetlands Inventory website

NOTE: This initial screening does **not** replace an on-site delineation to determine whether wetlands occur. Additional information on the NWI data is provided below.

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate Federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

TRC

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Lanham, MD 20706

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January 6, 2021

Daniel Mackay, Deputy Commissioner/Deputy SHPO
New York State Office of Parks, Recreation and Historic Preservation
Historic Preservation Field Services Bureau
Peebles Island Resource Center, PO Box 189
Waterford, NY 12188-0189

RE: Request for Consultation: Proposed Mill Point Solar Project, Town of Glen, Montgomery County, New York

Dear Mr. Mackay,

ConnectGen LLC (Applicant) proposes to construct the Mill Point Solar Project (Project) under Section 94-c of the New York State Law. The Project will obtain a siting permit from the Office of Renewable Energy Siting (ORES). The Project will obtain and adhere to all other applicable federal, state, and local permits not supplanted by 94-c, including a Section 404 permit from the USACE if Project activities will result in fill or dredge within jurisdictional wetlands and waters of the U.S. as well as an NYSDEC Article 24 permit if disturbance activities occur in NYSDEC state-protected wetlands or regulated adjacent areas. The Project will also be conducted in accordance with Section 106 of the National Historic Preservation Act (NHPA). The Project will have a generating capability of 250+ megawatts (MW) of power located on land leased from owners of private property in the Town of Glen, Montgomery County (Project Area) **(Figure 1**).

Project components will include photovoltaic panels and associated racking systems, co-located inverters and medium voltage transformers, a Battery Energy Storage System (BESS), a new 345 kV substation and switching station, underground and/or overhead AC collection, access roads, temporary laydown areas, and a potential operations and maintenance facility located within an approximate 3,500-acre site (Project Area). The final solar array specification, as well as locations of arrays, will be finalized as part of ongoing engineering efforts.

TRC Companies, Inc. (TRC) has been retained by the Applicant to provide environmental review and licensing services in support of the Project. The purpose of this letter is to initiate formal consultation with the New York State Office of Parks, Recreation, and Historic Preservation (OPRHP) in determining potential impacts to cultural resources that could result from the Project. TRC will also be undertaking cultural resource studies/surveys (Archaeology and Historic Architecture), as required, in support of Project review. To that end, TRC plans to conduct Phase IA and IB archaeological studies (as determined in consultation with your office) and a historic architectural survey in advance of proposed construction to identify potential impacts to cultural resources.

Archaeology

TRC plans to conduct a Phase IA archaeological study, the objective of which will be to identify the archaeological sensitivity of the Project Area through review of known archaeological data, archival data, site file information, and previous cultural surveys. The goal of this review will be to identify where archaeological field testing (Phase IB survey) may be needed to identify archaeological resources within the Impact Area or Area of Potential Effect (APE). For archaeological resources, the APE is defined as a location where significant ground disturbance may occur.

Based on review of the Project Area on the OPRHP Cultural Resources Information System (CRIS), portions of the Project Area are identified as archaeologically sensitive. There are two previously recorded OPRHP archaeological sites within the Project Area and 35 additional OPRHP archaeological sites within a one-mile radius (**Table 1**). These 37 sites include 22 prehistoric, 14 historic, and one unknown site. Identified prehistoric site types include seven isolated finds, four villages, two sites with a burial component, and one lithic scatter. The type of the remaining eight prehistoric sites is unknown. Identified historic site types include two domestic sites, two bridge sites, and one village site; with the type of the remaining nine historic sites unknown.

Of these 37 previously recorded archaeological sites, two are listed in the National Register of Historic Places (NRHP), one has been determined not eligible (Site 05705.000050), and the remaining 34 have not been evaluated for inclusion in the NRHP. The NRHP-listed sites are Site 05707.000002, a prehistoric site with a burial component, and Site 05744.000002, an historic courthouse.

Twenty-three CRIS-mapped New York State Museum (NYSM) archaeological areas are located within a one-mile radius of the Project Area, eight of which are within the Project Area. Twenty-two NYSM archaeological sites are noted within a one-mile radius, three of which are within the Project Area. Five NYSM sites also have OPRHP site numbers.

Table 1: Previously Recorded Archaeological Sites within One Mile of Project Area

OPRHP Site Number	NYSM Number	Site Type	NRHP-Eligibility Status	Distance from Project Area
Within Project Area				
05705.000030	NYSM Site 1089	Prehistoric	Undetermined	Within Project Area
05705.000031	NYSM Site 1090	Prehistoric	Undetermined	Within Project Area
N/A	NYSM Site 9197	N/A	N/A	Within Project Area
Within One Mile				
05705.000010	N/A	Prehistoric, village	Undetermined	0.98 mi west
05705.000027	NYSM Site 1085	Prehistoric	Undetermined	0.76 mi east
05705.000032	NYSM Site 1091	Prehistoric	Undetermined	0.16 mi east
05705.000033	N/A	Prehistoric, burial	Undetermined	0.15 mi north
05705.000034	N/A	Prehistoric	Undetermined	0.5 mi north
05705.000050	N/A	Prehistoric, lithic scatter	Not Eligible	0.67 mi north
05705.000051	N/A	Historic	Undetermined	0.49 mi east
05705.000053	N/A	Unknown	Undetermined	0.05 mi east
05705.000057	N/A	Prehistoric, isolated find	Undetermined	0.5 mi north
05705.000058	N/A	Prehistoric, isolated find	Undetermined	0.39 mi north
05705.000059	N/A	Prehistoric, isolated find	Undetermined	0.4 mi north
05705.000060	N/A	Prehistoric, isolated find	Undetermined	0.46 mi north
05705.000061	N/A	Prehistoric, isolated find	Undetermined	0.56 mi north
05705.000062	N/A	Prehistoric, isolated find	Undetermined	0.61 mi north

OPRHP Site Number	NYSM Number	Site Type	NRHP-Eligibility Status	Distance from Project Area
05705.000063	N/A	Prehistoric, isolated find	Undetermined	0.53 mi north
05705.000064	N/A	Historic	Undetermined	0.4 mi north
05707.000002	N/A	Prehistoric, burial	Listed	0.72 mi north
05707.000008	N/A	Prehistoric, village	Undetermined	0.66 mi northwest
05707.000015	N/A	Prehistoric	Undetermined	0.28 mi north
05707.000016	N/A	Prehistoric, village	Undetermined	0.63 mi north
05707.000017	N/A	Prehistoric	Undetermined	0.39 mi north
05707.000029	N/A	Prehistoric, village	Undetermined	0.55 mi northwest
05707.000063	N/A	Prehistoric	Undetermined	0.52 mi northwest
05707.000064	N/A	Historic	Undetermined	0.67 mi northeast
05707.000065	N/A	Historic	Undetermined	0.91 mi northeast
05707.000070	N/A	Historic	Undetermined	0.95 mi west
05707.000099	N/A	Historic, village (1666-1693)	Undetermined	0.75 mi north
05744.000002	N/A	Historic	Listed	0.77 mi northeast
05744.000007	N/A	Historic, bridge	Undetermined	0.65 mi north
05744.000008	N/A	Historic, domestic	Undetermined	0.82 mi northeast
05744.000216	N/A	Historic	Undetermined	0.61 mi north
05744.000222	NYSM 12344	Historic, bridge	Undetermined	0.99 mi northeast
05744.000223	N/A	Historic, domestic	Undetermined	0.86 mi northeast
05746.000118	N/A	Historic	Undetermined	0.72 mi northeast
05746.000119	N/A	Historic	Undetermined	0.73 mi northeast
N/A	NYSM Site 1092	N/A	N/A	0.08 mi north
N/A	NYSM Site 1093	N/A	N/A	0.47 mi northeast
N/A	NYSM Site 1098	N/A	N/A	0.99 mi north
N/A	NYSM Site 1116	N/A	N/A	0.73 mi north
N/A	NYSM Site 1117	N/A	N/A	0.6 mi northwest
N/A	NYSM Site 1124	N/A	N/A	0.8 mi west
N/A	NYSM Site 1142	N/A	N/A	0.26 mi north
N/A	NYSM Site 1143	N/A	N/A	0.26 mi north
N/A	NYSM Site 1144	N/A	N/A	0.38 mi north
N/A	NYSM Site 1150	N/A	N/A	0.5 mi northwest
N/A	NYSM Site 3999	N/A	N/A	0.26 mi east
N/A	NYSM Site 4013	N/A	N/A	0.2 mi north
N/A	NYSM Site 7652	N/A	N/A	0.05 mi north
N/A	NYSM Site 7656	N/A	N/A	0.83 mi east
N/A	NYSM Site 8596	N/A	N/A	0.9 mi north
N/A	NYSM Site 8999	N/A	N/A	0.56 mi north
N/A	NYSM Site 9007	N/A	N/A	0.91 mi northeast

Fourteen archaeological surveys have been conducted within a one-mile radius of the Project Area, one of which is within the current Project Area. Thirty consultation projects have been conducted within one mile of the Project Area, including one project within the Project Area boundary **(Figure 2)**.

One cemetery is located within the boundaries of, and four additional cemeteries are identified within a one-mile radius of, the Project Area. The cemetery located within the Project Area is identified on CRIS as an unnamed cemetery near the intersection of Logtown and Hall Road. The remaining five cemeteries include Wycoff Cemetery, Van-Epps-Starin Cemetery, Village Cemetery, and an unnamed cemetery.

Historic Architecture

Consistent with the OPRHP Guidelines (*OPRHP 2020 Solar Guidelines*) for projects with solar arrays covering 100 acres or more, TRC completed a desktop historic architectural survey and GIS analysis identifying all areas within the Zone of Visual Impact (ZVI). The ZVI is defined as areas within a two-mile radius of the solar field that the bare earth topography visibility modeling shows will have positive visibility of the Project. Vegetation and buildings were not factored into the visibility modeling. TRC identified and mapped all previously identified NRHP listed and eligible architectural resources and architectural resources with an undetermined eligibility status as noted in OPRHP CRIS, within the ZVI.

A search of the on-line OPRHP CRIS database identified 471 previously identified historic architectural properties and architectural resources in the ZVI. Of the 471 previously surveyed architectural resources, 245 are listed in the NRHP, 45 have been determined NRHP eligible, 72 have been determined not eligible for the NRHP, and 109 have an undetermined eligibility status. Three NRHP-listed historic districts are located within the ZVI: the Glen Historic District, the New York State Barge Canal Historic District, and the Fultonville Historic District. The New York State Barge Canal Historic District is also a National Historic Landmark. One NRHP-eligible historic district, the Fonda Speedway, is located within the ZVI.

The Project Area is within the Mohawk Valley physiographic province. It features a rural character, with a few densely populated hamlets. The Project Area contains wooded areas, open fields, and agricultural land with sloping hillsides, wetlands and streams, and limited-use roads and private driveways. The terrain resulted from glaciofluvial processes and the relief ranges from gently to moderately-steeply sloping. As currently planned, the Project is expected to have no physical impacts to above-ground resources in the Project Area.

Recommendations

Archaeology

The majority of the Project Area is characterized as open agricultural fields and wooded areas. Should your office determine that a Phase IB survey is warranted, TRC assumes the survey would be limited to areas of significant ground disturbance within areas of high archaeological sensitivity as defined by your office for solar energy projects of this type. TRC will conduct the study in accordance with the New York Archaeological Council's *Standards for Cultural Resource Investigations and the Curation of Archaeological Collections in New York State* (1994), and the State Historic Preservation Office's *Phase I Archaeological Report Format Requirements* (2005).

Historic Architecture

There are approximately 471 previously identified historic architectural properties and architectural resources within the ZVI. For this Near-Term Analysis of the anticipated Historic Architectural Resources Survey, TRC assumes the survey would be limited to those portions of the ZVI within which visibility modelling suggests the Project may be visible. Based on OPRHP guidelines for Solar Facility Development Cultural Resources Work, architectural resources that were previously determined not eligible for NRHP listing do not require further consideration. In order to complete the following phase, TRC will conduct the Historic Architectural Resources Survey in the ZVI in accordance with a methodology that is developed in consultation with, and approved by, OPRHP.

TRC respectfully requests your review of this information to determine the need for further study of potential Project effects as warranted. We look forward to receiving your comments in support of the permitting process. Should you have any questions or require additional information, please do not hesitate to contact me at (301) 276-8040, or tsara@trccompanies.com.

Sincerely yours,

Timothy R. Sara, RPA
Program Manager, Cultural Resources

cc: Tegan Kondak, TRC

file 411360.0000.0000

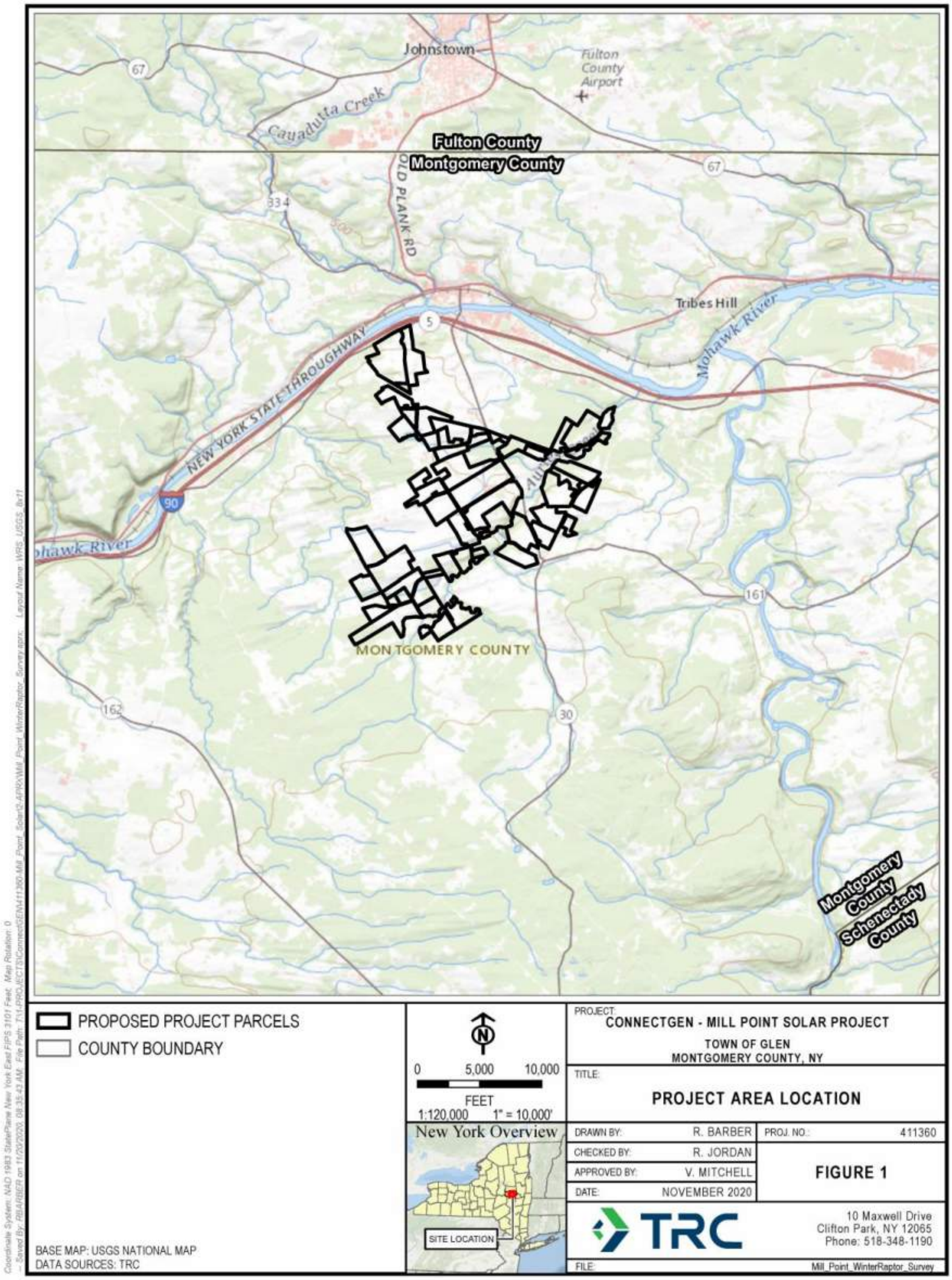

Figure 1: General Project location in Montgomery County, New York.

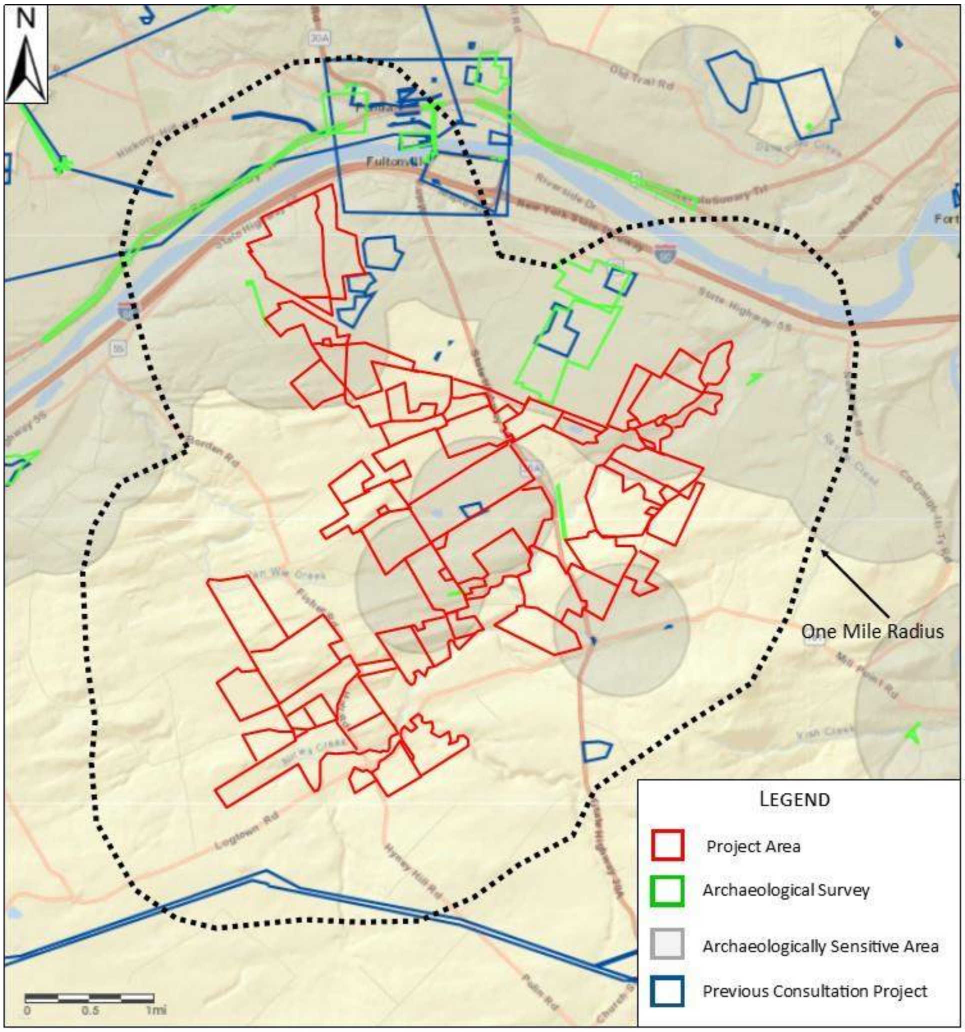

Figure 2: Project Area superimposed OPRHP CRIS Webviewer results for archaeologically sensitive areas within a one-mile radius ***(accessed November 2020).***

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ANDREW M. CUOMO
Governor

ERIK KULLESEID
Commissioner

SOLAR FACILITY
Phase IA Archaeological Survey Recommendations/Sensitivity Model

Project: Mill Point Solar Project/250 MW/3500 Acres
PR#: 21PR00133
Date: 1/12/2021

The State Historic Preservation Office/Office of Parks, Recreation and Historic Preservation (SHPO/OPRHP) recommends a Phase IA archaeological survey, including Phase IB testing recommendations. A Phase IA: Literature Search and Sensitivity Study is the initial assessment of the overall sensitivity of a project area (*Area of Potential Effects or APE*) for the presence of archaeological sites and Native American sites of religious and cultural significance and functions to guide subsequent field investigations.

The State Historic Preservation Office/Office of Parks, Recreation and Historic Preservation (SHPO/OPRHP) recommends that Phase IB archaeological testing is warranted for areas of substantial proposed ground disturbance that fall within areas of high archaeological sensitivity. Substantial proposed ground disturbance includes: (1) grading and excavation more than six inches deep; (2) grubbing, tree and stump removal; and (3) trenches more than three feet wide. Phase IB archaeological testing is not recommended for panel arrays; perimeter fencing and utility poles, if their associated posts are driven or drilled into the ground and no grubbing or grading is involved, and for excavations and grading less than six inches in depth.

The SHPO defines areas of high sensitivity, where archaeological sites are most likely to be identified, as those: (1) within 100-meters (328 feet) of permanent water (rivers, streams, wetlands, ponds and lakes and hydric soils) and on slopes equal to or less than 12%; (2) within or near known archaeological sites; and (3) locations of standing or demolished historic structures. Hydric soils are included to account for areas that may not be currently near water but were in the past. The 100-meter cut off from water is based on data presented by Robert E. Funk in his 1993 *Archaeological Investigations in the Upper Susquehanna Valley, New York State.* Testing should conform to the 1994 New York Archaeological Council Standards.

All other portions of the project area are considered to have low sensitivity for the presence of archaeological sites, including areas of previous ground disturbance. The SHPO has no archaeological concerns with low sensitivity areas and does not recommend Phase IB testing in these locations.

If project design flexibility or shovel ready status is desired, the SHPO recommends 100% sampling of all highly sensitive areas irrespective of the nature and type of construction impacts. With this approach, changes in project design will not require further archaeological consultation except for changes that may impact archaeological sites or that increase the size of the project area.

Our office does not conduct archaeological surveys. A 36 CFR 61 qualified archaeologist should be retained to conduct this work.

Please provide the interested Indian Nations with a copy of the Phase IA report, including the Phase IB archaeological testing scope-of-work and request that the Indian Nations provide cultural resource comments to the Secretary of the Public Service Commission *(address enclosed)* and copy the SHPO/OPRHP. Indian Nation contact information is enclosed.

If you have any questions concerning archaeology, please contact Jessica Schreyer at Jessica.Schreyer@parks.ny.gov.

Hon. Michelle L. Phillips
Secretary to the Commission
New York State Public Service Commission
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St. Regis Mohawk Tribe (Federally Recognized)
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Tribal Historic Preservation Office
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March 22, 2021

Erin Czernecki
Historic Preservation Program Analyst
Division for Historic Preservation
New York State Office of Parks, Recreation and Historic Preservation
Peebles Island State Park
P.O. Box 189, Waterford, New York, 12188-0189

RE: Submittal of Historic Architecture Survey Methodology: Proposed Mill Point Solar Project, Town of Glen, Montgomery County, New York (21PR00133)

Dear Ms. Czernecki,

ConnectGen Montgomery County LLC, proposes to construct the Mill Point Solar Project (Project) through the Office of Renewable Energy Siting (ORES) under Section 94-c of the New York Executive Law (New York Codes, Rules and Regulations (NYCRR) Chapter XVIII, Title 19 Part 900, subparts 900-1 through 900-14). The Project will have a generating capability of 250+ megawatts (MW) of power located on land leased from owners of private property in the Town of Glen, Montgomery County. Your office, in its review comments received on January 13, 2021, through the Cultural Resources Information System (CRIS), requested that a Historic Architecture Survey be conducted for the Project via the Trekker mobile application.

- **Project Setting**

The Project Area is within the Mohawk Valley physiographic province. In general, it features a rural setting and contains wooded areas, open fields and agricultural land, wetlands and streams, and limited-use roads and private driveways. The Project is located in the vicinity of population centers at Fonda, Glen, and Fultonville. The terrain in the Project Area is characterized by gently rolling hills and areas of agricultural land.

- **Project Description**

Based on current design, Project components will include photovoltaic panels and associated racking systems, co-located inverters and medium voltage transformers, a Battery Energy Storage System (BESS), a new 345 kilovolt (kV) substation and switching station, underground and/or overhead alternating current (AC) collection, access roads, temporary laydown areas, and a potential operations and maintenance facility. Final solar array specifications, as well as locations of arrays, will be determined by ongoing engineering efforts.

- **Survey Methodology and Definition of Area of Potential Effect**

As per the January 13, 2021, New York State Office of Parks, Recreation and Historic Preservation (OPRHP) Project review request, TRC proposes the following survey methodology to complete the requested historic architectural survey and visual effects assessment. Based on the survey request, TRC will complete a survey of all properties 50 years old or older within the Zone of Visual Impacts (ZVI), or Area of Potential Effect (APE), which is defined as areas within the two-mile radius of the solar field that the bare earth topography visibility modelling shows will have positive visibility of the Project. Vegetation and buildings will not be factored into the visibility modelling.

TRC will identify and map all previously identified National Register of Historic Places (NRHP) listed and eligible architectural resources and architectural resources with an undetermined eligibility status in CRIS, within the ZVI, as defined above. TRC will complete a reconnaissance-level, historic architectural survey to identify, document, and evaluate for NRHP eligibility, architectural resources 50 years old or older within the ZVI. The survey will include updates to all previously identified resources from the following categories: resources with undetermined NRHP status in CRIS, NRHP-eligible resources, and NRHP-listed resources. TRC will pay close attention to newly identified resources and resources with an undetermined NRHP status that are found in concentrations or clusters that may form a historic district. TRC will photograph and update the NRHP status of previously surveyed resources.

Additionally, TRC's Architectural Historians, who exceed the professional qualification standards set forth by the *Secretary of the Interior* for both Architectural Historians and Historians (36 Code of Federal Regulations [CFR] Section [§] 61), will survey new resources that, in their opinion, may meet NRHP eligibility criteria. All resources will be assessed from public rights of way. TRC will not inventory resources meeting the NRHP age criterion but lacking sufficient historic architectural integrity or historical merit to be recommended NRHP-eligible under any criterion. TRC will utilize the Trekker mobile application for completion of the survey.

- **Reporting**

TRC will submit an Historic Resources Survey Report that will include survey results and an assessment of adverse effects on historic properties (NRHP-listed, NRHP-eligible, and resources recommended NRHP-eligible). Trekker survey forms for each surveyed resource in the ZVI will be submitted to OPRHP via CRIS Trekker Manager. TRC will provide a spreadsheet and map that identify, per OPRHP's request, all New York State and/or National Register listed properties and districts, and National Historic Landmarks with positive visibility of the Project within a 5-mile radius.

Should you have any questions or wish to discuss this work plan, please do not hesitate to contact me at 878.670.1957 or mhyland@trccompanies.com.

Respectfully submitted,

Matthew G. Hyland

Matthew G. Hyland, Ph.D.
Senior Architectural Historian

Cc: Rande Patterson, ConnectGen LLC
Eddie Barry, ConnectGen LLC
Nancy Vlahos, TRC
Tim Sara, TRC
Tegan Kondak, TRC

File: 411360.0000.0000

NEW YORK
STATE OF
OPPORTUNITY.

Parks, Recreation,
and Historic Preservation

ANDREW M. CUOMO
Governor

ERIK KULLESEID
Commissioner

April 05, 2021

Tim Sara
Program Manager, Cultural Resources
TRC
4425-B Forbes Blvd
Lanham, MD 20706

Re: ORES
Mill Point Solar Project/250 MW/3500 Acres
Town of Glen, Montgomery County, NY
21PR00133

Dear Tim Sara:

Thank you for requesting the comments of the Division for Historic Preservation of the Office of Parks, Recreation and Historic Preservation (OPRHP). We have reviewed the submitted materials in accordance with the New York State Historic Preservation Act of 1980 (section 14.09 of the New York Parks, Recreation and Historic Preservation Law). These comments are those of the Division for Historic Preservation and relate only to Historic/Cultural resources. They do not include potential environmental impacts to New York State Parkland that may be involved in or near your project. Such impacts must be considered as part of the environmental review of the project pursuant to the State Environmental Quality Review Act (New York Environmental Conservation Law Article 8) and its implementing regulations (6NYCRR Part 617).

OPRHP has reviewed the Phase IA Archaeological Survey Report entitled “Phase IA Archaeological Survey, Mill Point Solar Project, Montgomery County, New York” prepared by TRC (March 2021; 21SR00196). OPRHP concurs with the report recommendations that a Phase IB Archaeological Survey is warranted, and we support the Phase IB testing strategy outlined in the report.

If you have any questions, I can be reached at Jessica.Schreyer@parks.ny.gov.

Sincerely,

Jessica E. Schreyer

Jessica Schreyer
Scientist Archaeology

TRC
4425-B Forbes Blvd.
Lanham, MD 20706
T 301.306.6981
TRCcompanies.com

SENT via EMAIL

August 5, 2021
St. Regis Mohawk Tribe
Darren Bonaparte, Director Tribal Historic Preservation Office
St. Regis Mohawk Tribe
71 Margaret Terrance Memorial Way Akwesasne, NY 13655
Phone: (518) 358-2272, ext. 2163
Email: darren.bonaparte@srmt-nsn.gov

RE: Project Outreach: Proposed Mill Point Solar Project, Town of Glen, Montgomery County, New York

Dear Mr. Bonaparte,

ConnectGen Montgomery County LLC proposes to construct the Mill Point Solar Project under Section 94-c of the New York Executive Law in the Town of Glen, Montgomery County, New York (Figure 1 - Project Area). The Project will have a generating capacity of approximately 250 megawatts (MW). Approximately 4,000 acres are being evaluated as shown on Figure 1, and Project infrastructure will ultimately be sited on an approximately 1,500-acre subset. TRC Companies (TRC) has been retained by ConnectGen Montgomery County LLC to provide environmental review and licensing services in support of the Project. The purpose of this letter is to provide information on behalf of ConnectGen Montgomery County LLC with the St. Regis Mohawk Tribe to assist in determining potential impacts to cultural resources that could result from the Project.

As requested by the OPRHP, TRC has conducted a Phase IA archaeological study in support of the application and is pleased to submit the Phase IA report to the Tribe as Attachment A. The OPRHP has also requested that a Phase IB field survey be conducted for the Project, which will be conducted in accordance with Section 94-c. ConnectGen Montgomery County LLC would welcome any information you may have on significant archaeological, religious, or cultural sites that may be of special importance to the Tribe within the Project area. Please do not hesitate to contact Erin Steinwachs at esteinwachs@trccompanies.com or myself at tsara@trccompanies.com should you require any additional information. As requested by the ORHP, TRC will provide any comments offered by the Tribe to the Office of Renewable Energy Siting (ORES), attention Houtan Moaveni, Executive Deputy Director, ORES, 99 Washington, Avenue, Albany, NY 12231.

Sincerely yours,

Timothy R. Sara, RPA
Program Manager, Cultural Resources

cc: T. Kondak, TRC
R. Patterson, ConnectGen
K. Laughlin, ConnectGen

Attachments
Attachment A Phase 1A for Mill Point Solar Project

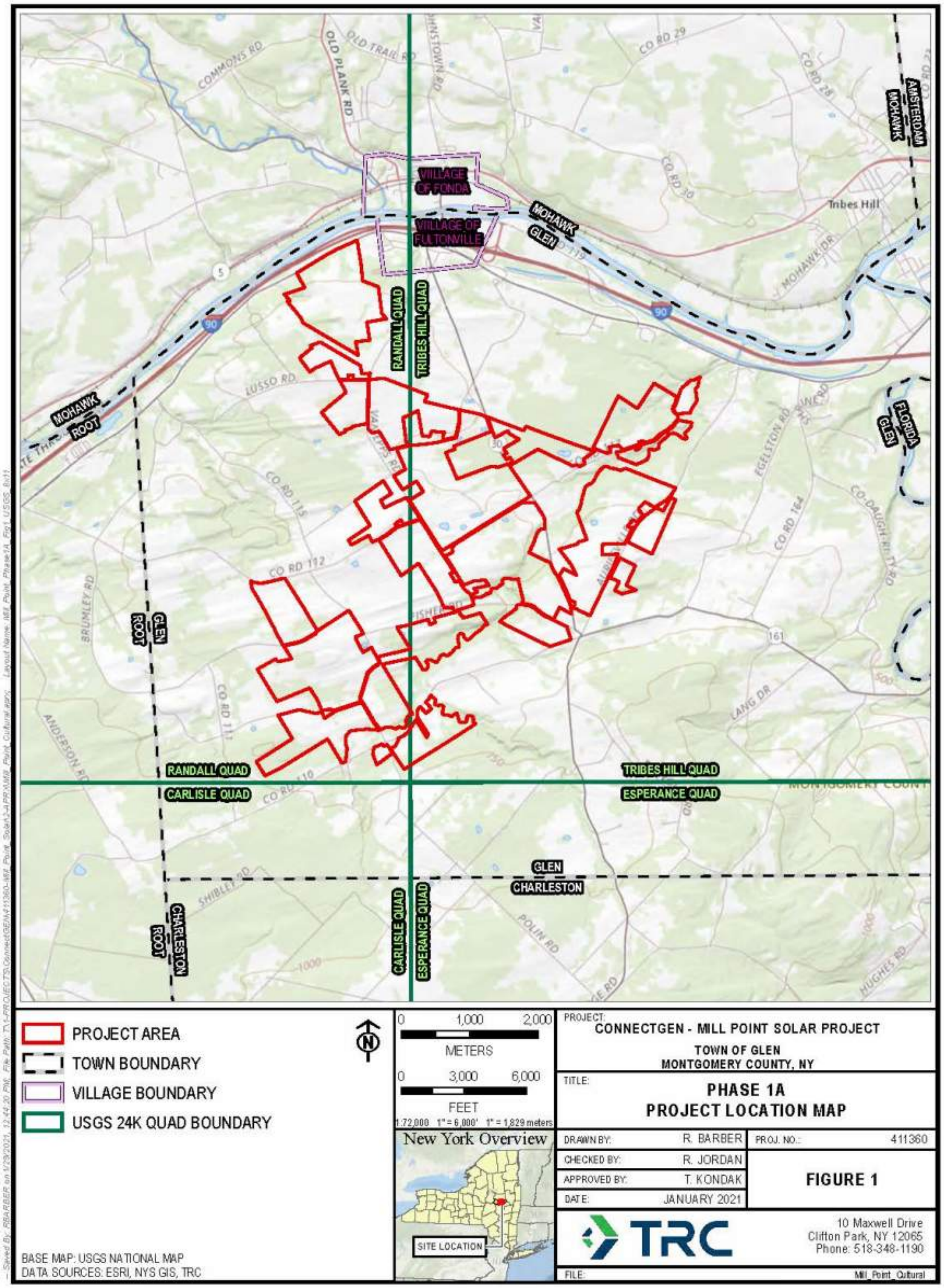


Figure 1: General Project location in Montgomery County, New York

Attachment A

Phase IA Archaeological Survey
Mill Point Solar Project
Montgomery County, New York

New York State
Parks, Recreation and
Historic Preservation

KATHY HOCHUL
Governor

ERIK KULLESEID
Commissioner

November 23, 2022

Tim Sara
Program Manager, Cultural Resources
TRC
4425-B Forbes Blvd
Lanham, MD 20706

Re: ORES
Mill Point Solar Project/250 MW/3500 Acres
Town of Glen, Montgomery County, NY
21PR00133

Dear Tim Sara:

Thank you for requesting the comments of the Division for Historic Preservation of the Office of Parks, Recreation and Historic Preservation (OPRHP). We have reviewed the submitted materials in accordance with the New York State Historic Preservation Act of 1980 (section 14.09 of the New York Parks, Recreation and Historic Preservation Law). These comments are those of the Division for Historic Preservation and relate only to Historic/Cultural resources. They do not include potential environmental impacts to New York State Parkland that may be involved in or near your project. Such impacts must be considered as part of the environmental review of the project pursuant to the State Environmental Quality Review Act (New York Environmental Conservation Law Article 8) and its implementing regulations (6NYCRR Part 617).

We note that there are numerous historic resources listed and eligible for listing in the State and National Register of Historic Places within or near the project APE. We have reviewed the architectural survey and effects report dated October 2022. In order to continue our review of the project we respectfully offer the following comments and request additional information:

- We are particularly concerned with the project’s impact on the Glen Historic District, which is noted for its rural, agricultural character. As such, please submit project plans of the APE nearest the historic district so the visual impact can be better understood.

Documentation requested in this letter should be provided via our Cultural Resource Information System (CRIS) at https://cris.parks.ny.gov/. Once on the CRIS site, you can log in as a guest and choose "submit" at the very top menu. Next choose "submit new information for an existing project". You will need this project number and your email address.

If you have any questions, please feel free to reach out via email.

Sincerely,

Wm Floyd

William Floyd
Historic Preservation Technical Specialist
william.floyd@parks.ny.gov
(518) 268-2142

New York State
Parks, Recreation and
Historic Preservation

KATHY HOCHUL
Governor

ERIK KULLESEID
Commissioner

July 14, 2023

Kristy Primeau
Agency Preservation Officer
Office of Renewable Energy Siting
1200 Washington Avenue, Building 9
Albany, NY 12226

Re: ORES
Mill Point Solar Project/250 MW/3500 Acres
Town of Glen, Montgomery County, NY
21PR00133

Dear Kristy Primeau:

Thank you for continuing to consult with the Division for Historic Preservation of the Office of Parks, Recreation and Historic Preservation (OPRHP). We have reviewed the submitted materials in accordance with the New York State Historic Preservation Act of 1980 (section 14.09 of the New York Parks, Recreation and Historic Preservation Law). These comments are those of the Division for Historic Preservation and relate only to Historic/Cultural resources.

We have reviewed the response letter dated June 16, 2023, and the associated visibility maps dated March 2023. Based on that review, OPRHP has *no above ground concerns*, as the solar array visibility from the Glen Historic District will be limited.

Please note that there are outstanding archaeology concerns. All archaeology questions should go to Jessica Schreyer (Jessica.schreyer@parks.ny.gov).

If you have any questions, please feel free to reach out via email.

Sincerely,

Wm Floyd

William Floyd
Historic Preservation Technical Specialist
william.floyd@parks.ny.gov
(518) 268-2142

New York State
Parks, Recreation and
Historic Preservation

KATHY HOCHUL
Governor

ERIK KULLESEID
Commissioner

July 24, 2023

Kristy Primeau
Agency Preservation Officer
Office of Renewable Energy Siting
1200 Washington Avenue, Building 9
Albany, NY 12226

Re: ORES
Mill Point Solar Project/250 MW/3500 Acres
Town of Glen, Montgomery County, NY
21PR00133

Dear Kristy Primeau:

Thank you for requesting the comments of the Division for Historic Preservation of the Office of Parks, Recreation and Historic Preservation (OPRHP). We have reviewed the submitted materials in accordance with the New York State Historic Preservation Act of 1980 (section 14.09 of the New York Parks, Recreation and Historic Preservation Law). These comments are those of the Division for Historic Preservation and relate only to Historic/Cultural resources.

OPRHP has reviewed the Phase IB Archaeological Survey report prepared for this project (June 2023; 23SR00357). The survey identified 14 archaeological sites and 33 isolated finds. A summary of the archaeological sites identified and OPRHP's recommendations is provided in the table below.

Summary of Archaeological Sites and OPRHP Recommendations

Site	USN	Period	S/NRHP Status	OPRHP Recommendation
TRC-MP-1	05705.000167	Precontact	Not Eligible	No Further Work
TRC-MP-2	05705.000168	Precontact	Not Eligible	No Further Work
TRC-MP-3	05705.000169	Historic	Undetermined	Avoidance or Phase II
TRC-MP-4	05705.000170	Historic	Undetermined	Avoidance or Phase II
TRC-MP-5	05705.000171	Historic	Not Eligible	No Further Work
TRC-MP-6	05705.000172	Historic	Not Eligible	No Further Work
TRC-MP-7	05705.000173	Historic	Undetermined	Avoidance or Phase II
TRC-MP-8	05705.000174	Historic	Not Eligible	No Further Work
TRC-MP-9	05705.000175	Precontact	Not Eligible	No Further Work
TRC-MP-10	05705.000176	Precontact	Undetermined	Avoidance or Phase II
TRC-MP-11	05705.000177	Historic	Undetermined	Avoidance or Phase II
TRC-MP-12	05705.000178	Precontact	Not Eligible	No Further Work
TRC-MP-13	05705.000179	Precontact	Not Eligible	No Further Work
TRC-MP-14	05705.000180	Historic	Not Eligible	No Further Work

No further work is recommended for the 33 isolated finds identified during the Phase IB survey.

For Sites TRC-MP-3, TRC-MP-4, TRC-MP-7, TRC-MP-10, and TRC-MP-11, we recommend that either documentation of avoidance or Phase II site evaluations are submitted to our office for review.

If you have any questions, I can be reached at Jessica.Schreyer@parks.ny.gov.

Sincerely,

Jessica E. Schreyer

Jessica Schreyer
Historic Preservation Program Analyst - Archaeologist

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 18N. The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was provided in digital format by the New York State Office of Cyber Security & Critical Infrastructure Coordination. This information was provided as 60-centimeter resolution panchromatic orthoimagery from photography dated April 2006.

The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

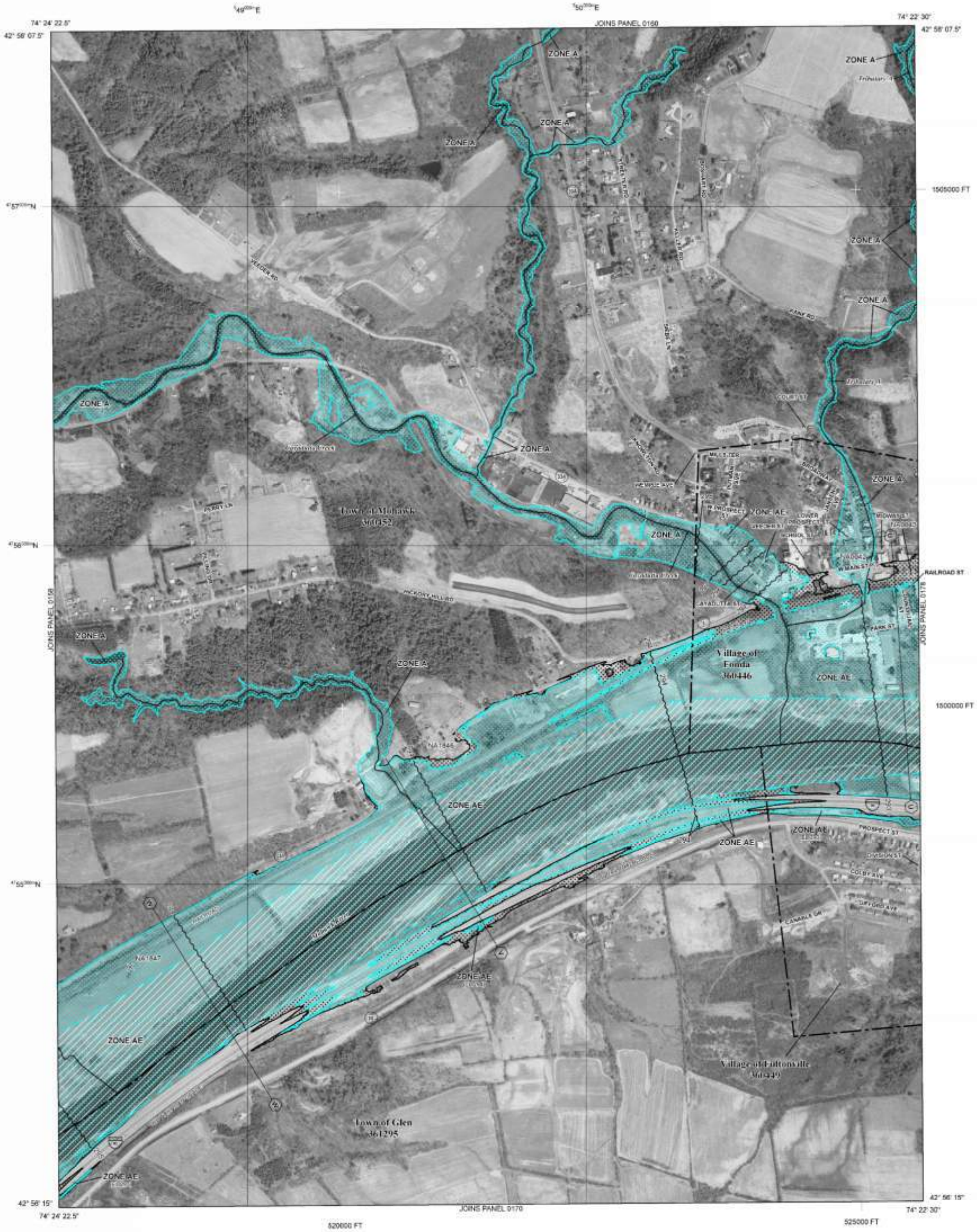
Based on updated topographic information, this map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. As a result, the Flood Profiles and Floodway Data tables for multiple streams in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on the map. Also, the road to floodplain relationships for unrevised streams may differ from what is shown on previous maps.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map**, how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.



LEGEND

▨ SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

▨ FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

▩ OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

☐ OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

▧ COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

▧ OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

———	1% Annual Chance Floodplain Boundary
———	0.2% Annual Chance Floodplain Boundary
— —	Floodway boundary
— — —	Zone D boundary
• • • • • • • • • • • • •	CBRS and OPA boundary
◀	Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.
~~ 513 ~~~	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

Ⓐ——Ⓐ	Cross section line
㉓- - - - - -㉓	Transect line
45° 02' 08", 93° 02' 12"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
3100000 FT	5000-foot ticks: New York State Plane East Zone (FIPS Zone 3101), Transverse Mercator projection
^42^80^000m N	1000-meter Universal Transverse Mercator grid values, zone 18N
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
January 19, 2018

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 500 1000 FEET
METERS 150 0 150 300

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0159H

FIRM

FLOOD INSURANCE RATE MAP

for MONTGOMERY COUNTY, NEW YORK
ALL JURISDICTIONS

CONTAINS:

COMMUNITY	NUMBER
FONDA, VILLAGE OF	360446
FULTONVILLE, VILLAGE OF	360449
GLEN, TOWN OF	361295
MOHAWK, TOWN OF	360452

PANEL 159 OF 385
MAP SUFFIX: E
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
36057C0159H

EFFECTIVE DATE
JANUARY 19, 2018

Federal Emergency Management Agency

NOTES TO USERS

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Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations tables in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations tables should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

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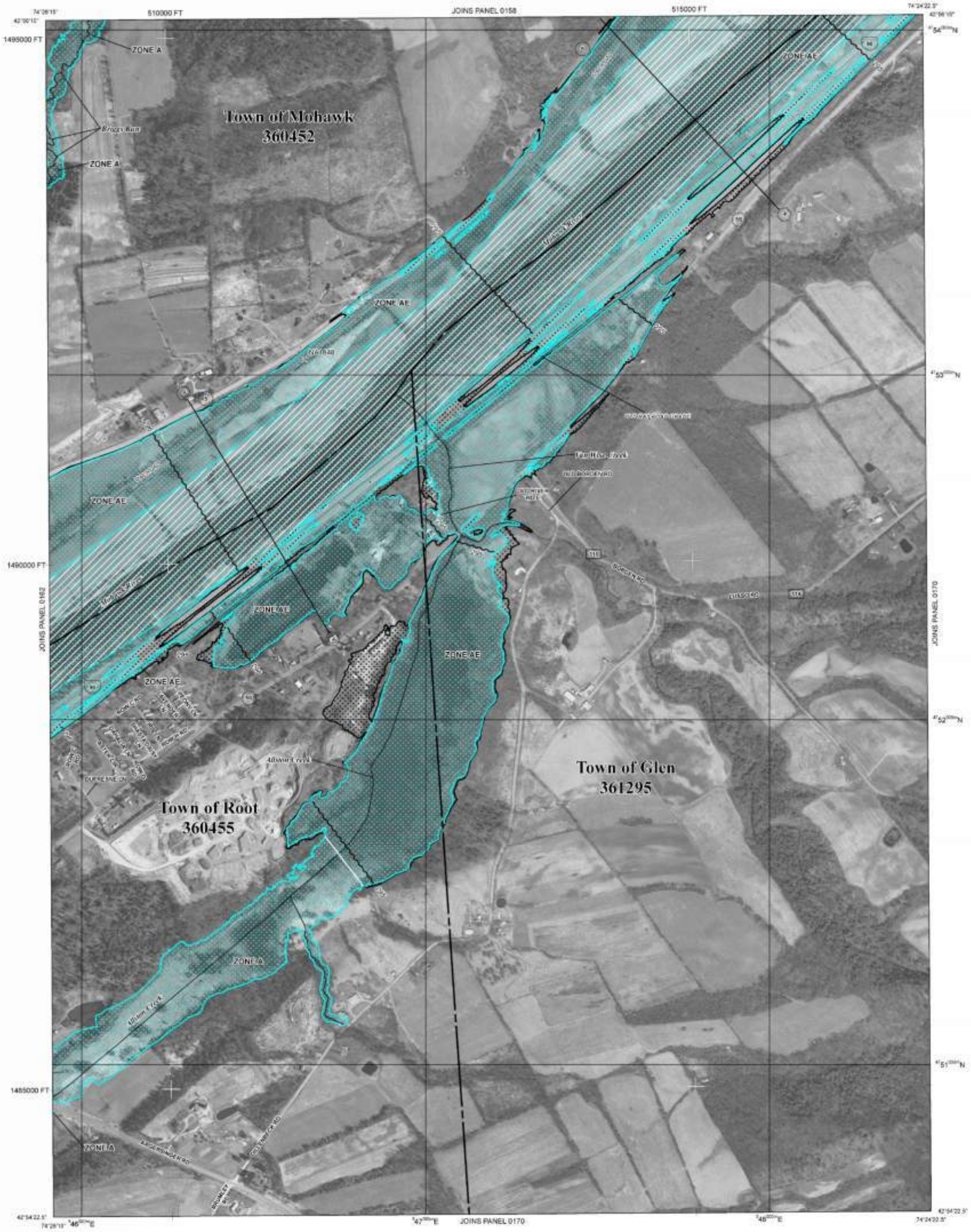

LEGEND

▨ SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

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▒ OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

☐ OTHER AREAS

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▧ COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

▧ OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

───	1% annual chance floodplain boundary
───	0.2% annual chance floodplain boundary
─ ─ ─	Floodway boundary
— — — —	Zone D boundary
• • • • • • • • • • • • • • • •	CBRS and OPA boundary
───	Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- • - • - • -	Limit of Moderate Wave Action
~~ 513 ~~~	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

Ⓐ───Ⓐ	Cross section line
㉓- - - -㉓	Transect line
87°07'45", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
4276000mN	1000-meter Universal Transverse Mercator grid values, zone NAD 1983 UTM Zone 18N
600000 FT	5000-foot grid ticks: New York State Plane coordinate system, East zone (FIPSZONE 3101), Transverse Mercator projection
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
● M1.5	River Mile

MAP REPOSITORIES
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
JANUARY 19, 2018

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

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MAP SCALE 1" = 500'

250	0	500	1000	FEET
150	0	150	300	METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0166E

FIRM

FLOOD INSURANCE RATE MAP

for MONTGOMERY COUNTY, NEW YORK
ALL JURISDICTIONS

CONTAINS:

COMMUNITY	NUMBER
GLEN, TOWN OF	361295
MOHAWK, TOWN OF	360452
ROOT, TOWN OF	360455

PANEL 166 OF 385
MAP SUFFIX: E
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
36057C0166E

EFFECTIVE DATE
JANUARY 19, 2018

Federal Emergency Management Agency

NOTES TO USERS

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To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations tables in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations tables should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

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The projection used in the preparation of this map was Universal Transverse Mercator (UTM) zone 18N. The **horizontal datum** was NAD 83, GRS1980. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was provided in digital format by the New York State Office of Cyber Security & Critical Infrastructure Coordination. This information was provided as 60-centimeter resolution panchromatic orthoimagery from photography dated April 2005.

This map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map. Also, the road to floodplain relationships for unrevised streams may differ from what is shown on previous maps.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Information eXchange or FMIX** at **1-877-FEMA MAP** (1-877-336-2627) for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The **FEMA Map Information eXchange or FMIX** may also be reached by Fax at 1-800-358-9620 and its website at http://www.msc.fema.gov/.

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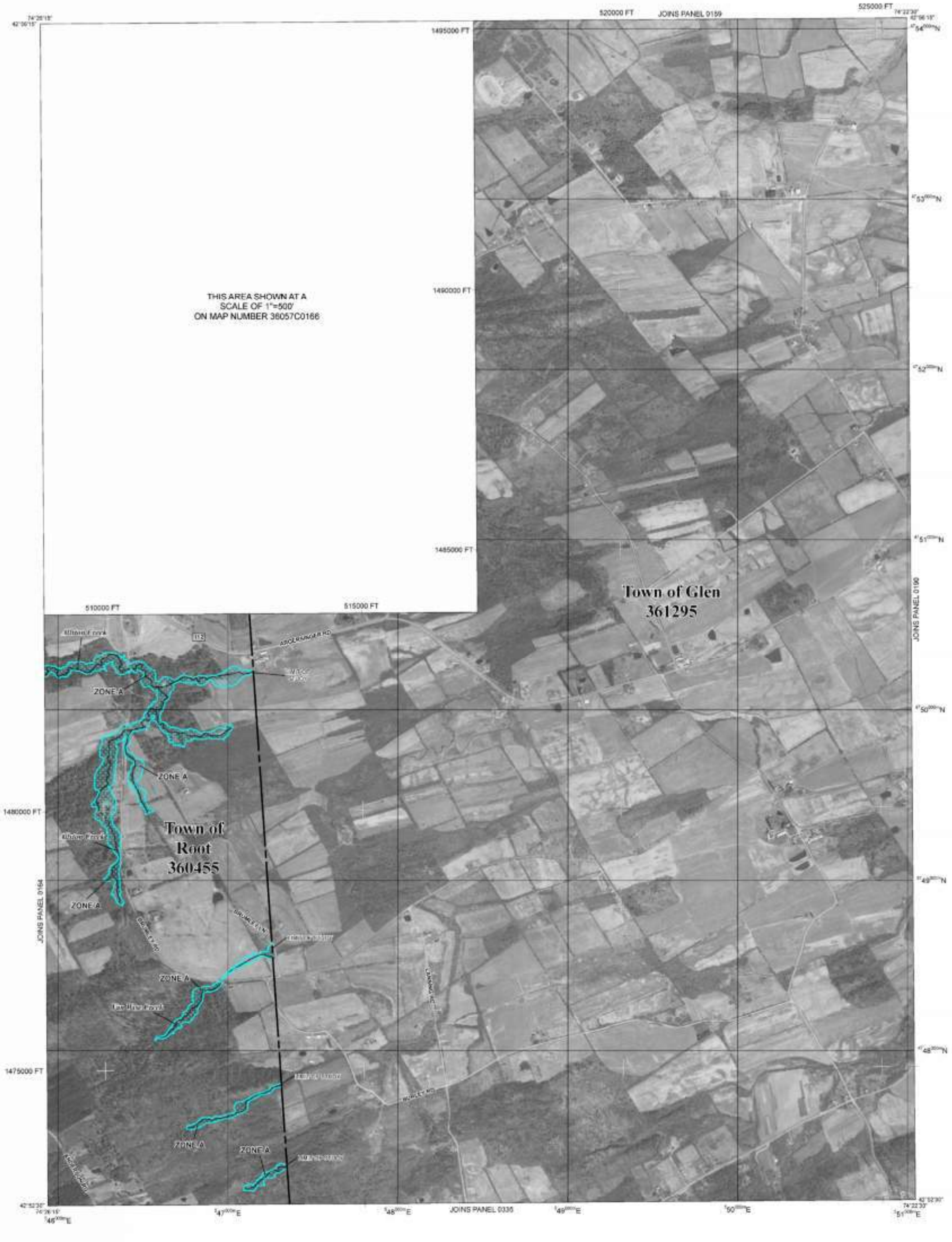

LEGEND

🟦 SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

▨ FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

▒ OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

☐ OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

▧ COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

▨ OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

———	1% annual chance floodplain boundary
———	0.2% annual chance floodplain boundary
———	Floodway boundary
— — — —	Zone D boundary
••••••••••••••••	CBRS and OPA boundary
═══	Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- • - • - •	Limit of Moderate Wave Action
~~ 513 ~~~~	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

Ⓐ——Ⓐ	Cross section line
㉓- - - - -㉓	Transect line
87°07'45", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
4276000mN	1000-meter Universal Transverse Mercator grid values, zone NAD 1983 UTM Zone 18N
600000 FT	5000-foot grid ticks: New York State Plane coordinate system, East zone (FIPSZONE 3101), Transverse Mercator projection
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5	River Mile

MAP REPOSITORIES
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
JANUARY 19, 2018

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

N

MAP SCALE 1" = 1000'

500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0170E

FIRM
FLOOD INSURANCE RATE MAP

for MONTGOMERY COUNTY, NEW YORK
ALL JURISDICTIONS

CONTAINS:

COMMUNITY	NUMBER
GLEN, TOWN OF	361295
ROOT, TOWN OF	360455

PANEL 170 OF 385
MAP SUFFIX: E
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
36057C0170E

EFFECTIVE DATE
JANUARY 19, 2018

Federal Emergency Management Agency

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— — — —	Zone D boundary
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~~ 513 ~~~~	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

(A)───(A)	Cross section line
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DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
● M1.5	River Mile

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FLOOD INSURANCE RATE MAP
JANUARY 19, 2018

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MAP SCALE 1" = 500'

250	0	500	1000	FEET
150	0	150	300	METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0187E

FIRM
FLOOD INSURANCE RATE MAP

for MONTGOMERY COUNTY, NEW YORK
ALL JURISDICTIONS

CONTAINS:

COMMUNITY	NUMBER
GLEN, TOWN OF	361295
MOHAWK, TOWN OF	360452

PANEL 187 OF 385
MAP SUFFIX: E
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

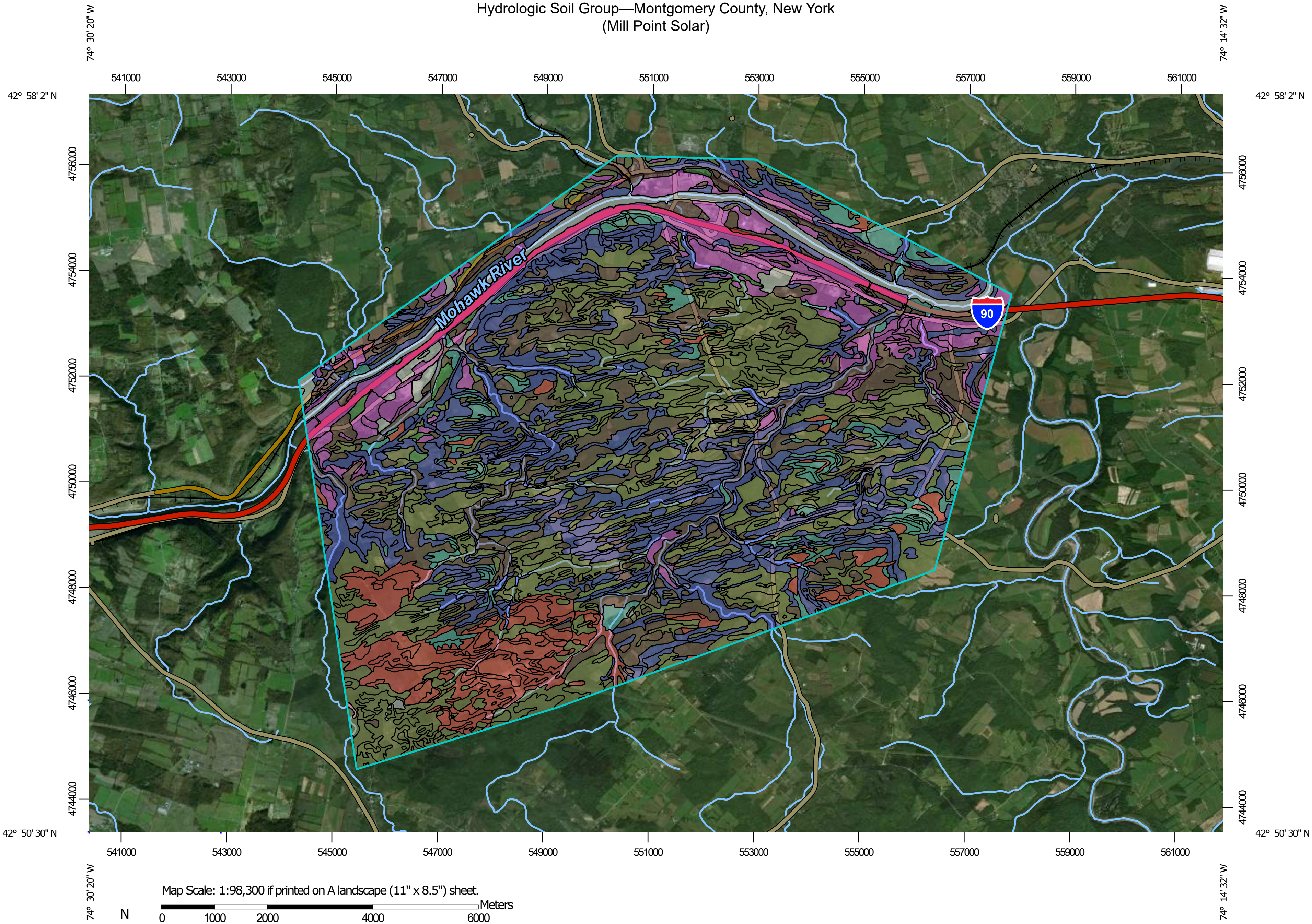
MAP NUMBER
36057C0187E

EFFECTIVE DATE
JANUARY 19, 2018

Federal Emergency Management Agency

Appendix E – USDA NRCS Soil Resource Report

Hydrologic Soil Group—Montgomery County, New York
(Mill Point Solar)



Map Scale: 1:98,300 if printed on A landscape (11" x 8.5") sheet.

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

□ Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

- ～ Streams and Canals

Transportation

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

Background

- ▨ Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

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

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

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

Soil Survey Area: Montgomery County, New York
Survey Area Data: Version 19, Aug 29, 2021

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

Date(s) aerial images were photographed: Oct 7, 2013—Nov 9, 2016

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AnB	Angola silt loam, 3 to 8 percent slopes	D	152.4	0.6%
ApA	Appleton silt loam, 0 to 3 percent slopes	B/D	65.1	0.3%
ApB	Appleton silt loam, 3 to 8 percent slopes	B/D	2,397.3	9.3%
ArB	Arnot channery silt loam, 0 to 8 percent slopes	D	6.1	0.0%
AtC	Arnot channery silt loam, 8 to 15 percent slopes, rocky	D	236.7	0.9%
AtD	Arnot channery silt loam, 15 to 25 percent slopes, rocky	D	133.1	0.5%
AvB	Arnot-Angola channery silt loams, 3 to 8 percent slopes	D	159.3	0.6%
AZF	Arnot-Rock outcrop association, very steep	D	105.3	0.4%
Br	Brockport silt loam	D	499.9	1.9%
BuA	Burdett channery silt loam, 0 to 3 percent slopes	C/D	11.7	0.0%
BuB	Burdett channery silt loam, 3 to 8 percent slopes	C/D	648.8	2.5%
BuC	Burdett channery silt loam, 8 to 15 percent slopes	C/D	36.7	0.1%
Ca	Carlisle muck	A/D	26.3	0.1%
CFL	Cut and fill land	A	1,131.5	4.4%
ChA	Churchville silty clay loam, 0 to 3 percent slopes	C/D	399.3	1.5%
ChB	Churchville silty clay loam, 3 to 8 percent slopes	C/D	1,161.4	4.5%
ClB	Claverack loamy fine sand, 3 to 8 percent slopes	C/D	0.0	0.0%
CPE	Colonie and Plainfield soils, steep	A	2.3	0.0%
Cr	Copake silt loam	A	25.6	0.1%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
DaA	Darien silt loam, 0 to 3 percent slopes	C/D	75.8	0.3%
DaB	Darien silt loam, 3 to 8 percent slopes	C/D	1,899.2	7.4%
DaC	Darien silt loam, 8 to 15 percent slopes	C/D	5.0	0.0%
FBD	Farmington-Rock outcrop association, moderately steep		14.1	0.1%
FL	Fluvaquents, loamy	B/D	554.0	2.1%
Fo	Fonda mucky silty clay loam	C/D	289.1	1.1%
Fr	Fredon silt loam	B/D	367.1	1.4%
GP	Gravel pits		162.4	0.6%
Gr	Granby loamy fine sand	A/D	45.0	0.2%
Ha	Hamlin silt loam	B	441.8	1.7%
He	Herkimer channery silt loam, calcareous subsoil variant	C	12.5	0.0%
HoB	Hornell silt loam, 3 to 8 percent slopes	D	755.2	2.9%
HrA	Howard gravelly silt loam, 0 to 3 percent slopes	A	128.9	0.5%
HrB	Howard gravelly silt loam, 3 to 8 percent slopes	A	387.5	1.5%
HrC	Howard gravelly silt loam, 8 to 15 percent slopes	A	132.7	0.5%
HrD	Howard gravelly silt loam, 15 to 25 percent slopes	A	96.4	0.4%
HTF	Howard soils, very steep	A	186.1	0.7%
HuB	Hudson silty clay loam, 3 to 8 percent slopes	C/D	21.7	0.1%
HuC	Hudson silty clay loam, 8 to 15 percent slopes	C/D	52.9	0.2%
HuD	Hudson silty clay loam, 15 to 25 percent slopes,eroded	C/D	2.3	0.0%
HVF	Hudson soils, very steep	C/D	87.5	0.3%
IlA	Ilion silt loam, 0 to 3 percent slopes	C/D	473.1	1.8%
IlB	Ilion silt loam, 3 to 8 percent slopes	C/D	420.5	1.6%
LaB	Lansing silt loam, 3 to 8 percent slopes	B	1,011.6	3.9%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
LaC	Lansing silt loam, 8 to 15 percent slopes	B	1,903.9	7.4%
LaD	Lansing silt loam, 15 to 25 percent slopes	B	538.1	2.1%
LMF	Lansing and Mohawk soils, 25 to 60 percent slopes	B	1,413.0	5.5%
Ma	Madalin silty clay loam, 0 to 3 percent slopes	C/D	1,175.5	4.5%
Md	Madalin silty clay loam, moderately shallow variant	D	51.5	0.2%
Mg	Made land	C	68.8	0.3%
MmA	Manheim silt loam, 0 to 3 percent slopes	C/D	24.7	0.1%
MmB	Manheim silt loam, 3 to 8 percent slopes	C/D	242.9	0.9%
MnB	Manlius silt loam, 3 to 8 percent slopes	C	14.7	0.1%
MoC	Manlius shaly silt loam, 8 to 15 percent slopes	C	68.3	0.3%
MoD	Manlius shaly silt loam, 15 to 25 percent slopes	C	45.3	0.2%
MsB	Mohawk silt loam, 3 to 8 percent slopes	B	384.1	1.5%
MsC	Mohawk silt loam, 8 to 15 percent slopes	B	824.0	3.2%
MsD	Mohawk silt loam, 15 to 25 percent slopes	B	205.0	0.8%
NuB	Nunda channery silt loam, 3 to 8 percent slopes	C/D	3.3	0.0%
PaB	Palatine silt loam, 3 to 8 percent slopes	C	432.3	1.7%
PaC	Palatine silt loam, 8 to 15 percent slopes	C	227.7	0.9%
PaD	Palatine silt loam, 15 to 25 percent slopes	C	216.4	0.8%
Pb	Palms muck	B/D	5.6	0.0%
PmA	Palmyra gravelly silt loam, 0 to 3 percent slopes	A	7.0	0.0%
PmB	Palmyra gravelly silt loam, 3 to 8 percent slopes	A	74.2	0.3%
PmC	Palmyra gravelly silt loam, 8 to 15 percent slopes	A	53.5	0.2%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
PpA	Phelps gravelly loam, 0 to 3 percent slopes	B/D	36.7	0.1%
PpB	Phelps gravelly loam, 3 to 8 percent slopes	B/D	328.4	1.3%
Pr	Phelps gravelly loam, fan	C	142.9	0.6%
PsB	Plainfield loamy sand, 3 to 10 percent slopes	A	352.0	1.4%
RhA	Rhinebeck silty clay loam, 0 to 3 percent slopes	C/D	208.2	0.8%
RhB	Rhinebeck silty clay loam, 3 to 8 percent slopes	C/D	381.5	1.5%
RLF	Rock outcrop-Farmington association, very steep		30.6	0.1%
SA	Saprists and Aquents	A/D	50.4	0.2%
ScB	Scio silt loam, 3 to 8 percent slopes	B/D	5.5	0.0%
Te	Teel silt loam	B/D	307.8	1.2%
Tu	Tuller channery silt loam	D	23.7	0.1%
UnB	Unadilla silt loam, 0 to 8 percent slopes	B	1.2	0.0%
UnC	Unadilla silt loam, 8 to 15 percent slopes	B	10.5	0.0%
UnD	Unadilla silt loam, 15 to 25 percent slopes	B	104.2	0.4%
W	Water		623.0	2.4%
Wy	Wayland soils complex, 0 to 3 percent slopes, frequently flooded	B/D	428.7	1.7%
Totals for Area of Interest			**25,838.3**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Appendix E – Geotechnical Engineering Report

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T 856.273.1224
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June 14, 2021

Mr. Eddie Barry
ConnectGen LLC
1001 McKinney Street, Suite 700
Houston, TX 77002

Re: Geotechnical Engineering Report
Mill Point Solar Project
Town of Glen
Montgomery County, New York
TRC Project No.: 411360.GEO1

Dear Mr. Barry:

TRC Engineers, Inc. (TRC) is pleased to present our Geotechnical Engineering Report for this project. Our work was initiated in accordance with your authorization to proceed (Task Order # 03) dated March 4, 2021 and completed in general accordance with our agreed scope of work presented in our revised proposal, submitted February 10, 2021. A summary of our geotechnical investigation activities, findings and recommendations is summarized below.

1.0 INTRODUCTION

This report presents the results of our geotechnical investigation for the proposed 250 MW photovoltaic (PV) solar array to be constructed at the Mill Point project site. The Mill Point project consists of multiple parcels on the order of 3,000 acres , located South of Interstate 90 in the Town of Glen, New York. The purpose of our investigation was to evaluate the geologic and subsurface conditions to reduce uncertainty with respect to anticipated foundation and site construction, and to provide preliminary geotechnical recommendations for design of the proposed project.

1.1 Project Description

The site is located South of Interstate 90 in the Town of Glen, in Montgomery County, NY. The project includes PV solar arrays, ancillary equipment, and proposed substation facilities on the north side of Ingersoll Road. Based on our experience with similar projects, we assume that the proposed photovoltaic arrays would preferably be mounted on posts driven into the ground. The anticipated post loads have not been provided but are assumed to be typical for such construction. It is assumed that existing grades will remain relatively unchanged.

1.2 Scope of Services

Our scope of services was presented in our Proposal for Geotechnical Engineering Services dated February 10, 2021. To accomplish this work, we have provided the following services:

- Exploration of subsurface conditions by drilling thirty (30) borings spread across the proposed solar array areas, drilling two (2) additional test borings within the proposed substation areas, and retrieving soil samples for classification & laboratory testing.

- Evaluation of the physical and engineering properties of the subsurface soils based on visually classifying the samples by a member of our geotechnical staff.

- Engineering analysis to evaluate the proposed foundation systems for the support of the ground-mounted PV solar arrays and associated equipment.

- Preparation of this report to summarize our findings and to present our conclusions and recommendations regarding the following:

    - Foundation support for the proposed solar array structures assuming post foundations, or alternative system as applicable based on subsurface conditions.
    - Preliminary bearing capacity and other parameters for use in preliminary foundation design.
    - Anticipated excavation conditions and presence of potential rock or other refusal conditions, if applicable.
    - Suitability of on-site soils for reuse in backfills and requirements for imported fills.
    - Recommendations for placement, compaction, and testing of fills, if applicable.
    - Preliminary soil parameters pressures (both above and below ground water table) for active, at rest, and passive conditions and L-Pile soil parameters for use in foundation design
    - Anticipated ground water conditions and impacts on the design and construction.
    - Frost penetration depth.
    - Corrosivity concerns on buried steel and concrete.
    - Thermal resistivity results.
    - Preliminary Seismic Site Class parameters.
    - Other construction-related concerns, as warranted based on site subsurface conditions, details of the proposed construction, and any available preliminary design information.

2.0 SITE CONDITIONS

2.1 Site Reconnaissance, Boring Stakeout and Investigation

TRC's field staff performed a site reconnaissance in conjunction with test boring stakeout. Test boring locations were staked in the field using a hand-held GPS unit at the approximate locations recommended by TRC's geotechnical staff and approved by the Client as shown on the Test Boring Location Plan. The site is mostly open agricultural fields covered by seasonal crops along the array field. Some wooded areas are present in many of the proposed parcel areas. Prior to drilling, the Dig Safely NY notification system was contacted to check the presence of public utilities in the area of the proposed testing borings.

The test boring work was performed during the period from April 27, 2021 to May 4, 2021 by TRC's drilling subcontractor, CME Associates. Drilling and sampling were performed using an ATV-mounted drill rig in general accordance with ASTM D 1586. Split spoon sampling was performed continuously through the upper 10 ft and at 5 ft intervals thereafter to the completion depths of each boring, unless refusal to drilling tools was encountered prior to these depths. Borings were terminated at depths ranging from 6.5 to 15 ft below existing ground surface (bgs) within the proposed solar array areas. Test borings for the proposed substation locations were extended to depths of 35 ft bgs each. Upon completion, all test borings were backfilled to the approximate existing ground surface with the auger cuttings. Copies of the test boring logs and a Test Boring Location plan identifying approximate borings locations are attached.

2.2 Geology

According to available geological data, the surficial geology at the project site consists of residual soils. Locally the site is underlain predominantly by mudstone and shale of the Canajoharie Shale Formation from the Middle Ordovician Age. The northern parcels sit near a contact with carbonate limestone of the Trenton and Black River Groups, as well as Quarternary Age glacial and alluvial deposits.

2.3 Subsurface Conditions

The test borings revealed that the project site is generally covered with a surficial layer of topsoil approximately 3 inches thick. Below the surficial topsoil, the subsurface conditions consisted of brown to dark brown clays and silts with varying quantities of sand and gravel or gravel-sized rock fragments. Standard Penetration (SPT) N-values indicate that the consistency of this layer ranges from "medium" and "stiff" in the upper 2 to 4 ft bgs and generally increasing to "very stiff" to "hard with depth. Laboratory test results performed on representative samples indicate plastic limits ranging from approximately 13% to 28%, liquid limits ranging from 18% to 52% and plasticity indices ranging from 4% to 25%.

Natural moisture contents range from approximately 10% to 40% and dry unit weights ranged from approximately 93.9 to 124.8 pounds per cubic foot (pcf). Maximum laboratory compacted dry density of five composite bulk samples as determined by ASTM D 698 ranged from 96.2 to 119 pcf at optimum moisture contents ranging from 11.8% to 18.4%.

Occasional strata of cobbles and boulders were encountered in various borings ranging from the depth of 3 ft to 15 ft. The SPT N-values for these strata indicate the consistency of very dense to refusal. The presence of this strata may pose difficult driving conditions for driven post type foundation during installation.

Auger refusal, which typically represents the presence of weathered rock was encountered in ten (10) of the borings, sporadically located throughout the exploration area. Refusal depths varied between 6.5 ft and 9.5 ft, dipping away from Mohawk River. Difficult drilling conditions which are typically indicative of very dense till type of soil and/or decomposed rock were also encountered in 21 of the 32 test boring locations. The depths and locations where difficult drilling and auger refusal were encountered are summarized in Table 1, below.

Table 1. Summary of Difficult Drilling and Auger Refusal Depths

Test Boring Location	Depth to Very Dense Soils/Difficult Drilling (ft)	Depth to Auger Refusal (ft)
B-01	6.5	6.9
B-02	8	>15
B-03	8	>15
B-04	7	>15
B-05	7	>15
B-06	7	7.7
B-07	8	>15
B-08	>15	>15
B-09	10	13.9
B-10	7.8	>15
B-11	6	7.6
B-12	5	>15
B-13	>15	>15
B-14	13.5	>15
B-15	9	>15
B-16	>15	>15
B-17	9	10.5
B-18	6	8
B-19	6	7.5

Test Boring Location	Depth to Very Dense Soils/Difficult Drilling (ft)	Depth to Auger Refusal (ft)
B-20	>15	>15
B-21	>15	>15
B-22	>15	>15
B-23	6	>15
B-24	8	>15
B-25	>15	>15
B-26	>15	>15
B-27	13.5	>15
B-28	8	>15
B-29	7	14.6
B-30	5.5	6.5
SS-01	7	>35
SS-02	9	>35

2.4 Ground Water

Groundwater was encountered during drilling at the time of the field investigation in seven (7) of the test boring locations as summarized in Table 2 below:

Table 2. Summary of Groundwater Conditions

Test Boring Location	Groundwater Depth (ft)
B-08	12.5
B-09	10.3
B-24	10.3
B-25	14.2
B-28*	3
B-30*	2.5
SS-02	8.2

* *Possible perched water*

Groundwater and/or the development of perched water conditions may be encountered within standard excavation depths for foundations or utilities during wet periods. The groundwater conditions are representative of the conditions at the date and time of this study and are not representative of daily, seasonal, long term fluctuations, development of perched conditions, or ponding of water in low lying areas during wet periods.

3.0 CORROSION EVALUATION AND THERMAL RESTIVITY

3.1 Corrosion Evaluation

To evaluate the corrosion potential of the subsurface soils at the site, we submitted five (5) composite bulk soil samples collected from test boring locations (approximately 0-5 ft bgs) during our subsurface investigation to an analytical laboratory for pH, resistivity, soluble sulfate and chloride content testing. The results are summarized in Table 3, below.

Table 3. Results of Corrosivity Testing

Sample	Boring No.	Chloride (mg/kg)*	Sulfate (mg/kg)*	pH	Resistivity (ohm-cm)**	Estimated Corrosivity Based on Resistivity	Estimated Corrosivity Based on Sulfates
Bulk 1	B-1 to B-5	50	58	7.7	2,548	Moderately Corrosive	Negligible
Bulk 2	B-6 to B-8	40	55	8.1	2,940	Moderately Corrosive	Negligible
Bulk 3	B-9 to B-14	40	220	8.4	1,260	Severely Corrosive	Negligible
Bulk 4	B-22 to B-29	38	235	8.2	1,176	Severely Corrosive	Negligible
Bulk 5	SS-1 & SS-2	75	185	8.3	1,568	Severely Corrosive	Negligible

* *mg/kg = milligrams per kilogram*
** *ohm-cm = ohm-centimeter*

TRC also conducted ten (10) field resistivity testing using the Wenner Four-Pin method in general accordance with ASTM G57. Tests were centered at boring locations B-1, B-4, B-9, B-12, B-13, B-16, B-20, B-22, B-27, and SS-2 with the test lines oriented perpendicular to one another at each test location. Measurements were taken along each test line corresponding to electrode spacings of 2.5 ft, 5 ft, 10 ft, 20 ft, and 40 ft. Field resistivity test results are attached, and the results are discussed further in this section.

Many factors can affect the corrosion potential of soil including soil moisture content, resistivity, permeability and pH, as well as chloride and sulfate concentration. In general, soil resistivity, which is a measure of how easily electrical current flows through soils, is the most influential factor. Based on classification developed by William J. Ellis (1978), the approximate relationship between soil corrosiveness was developed as shown in Table 4 below.

Table 4. Relationship Between Soil Resistivity and Soil Corrosivity

Soil Resistivity (ohm-cm)*	Classification of Soil Corrosiveness
0 to 900	Very Severely Corrosive
900 to 2,300	Severely Corrosive
2,300 to 5,000	Moderately Corrosive
5,000 to 10,000	Mildly Corrosive
10,000 to >100,000	Very Mildly Corrosive

** ohm-cm = ohm-centimeter*

Chloride and sulfate ion concentrations and pH appear to play secondary roles in affecting corrosion potential. High chloride levels tend to reduce soil resistivity and break down otherwise protective surface deposits, which can result in corrosion of buried metallic improvements or reinforced concrete structures. Sulfate ions in the soil can lower the soil resistivity and can be highly aggressive to Portland cement concrete (PCC) by combining chemically with certain constituents of the concrete, principally tricalcium aluminate. This reaction is accompanied by expansion and eventual disruption of the concrete matrix. Soils containing high sulfate content could also cause corrosion of the reinforcing steel in concrete. Table 4.2.1 of the American Concrete Institute (ACI, 2008) provides requirements for concrete exposed to sulfate-containing solutions as summarized in Table 5.

Table 5. Relationship Between Sulfate Concentration and Sulfate Exposure (Table 4.2.1 of ACI)

Water-Soluble Sulfate (SO4) in soil (ppm)*	Sulfate Exposure
0 to 1,000	Negligible
1,000 to 2,000	Moderate
2,000 to 20,000	Severe
over 20,000	Very Severe

* *ppm = parts per million*

Acidity is an important factor of soil corrosivity. The lower the pH (the more acidic the environment), the higher will the soil corrosivity be with respect to buried metallic structures. As soil pH increases above 7 (the neutral value), the soil is increasingly more alkaline and less corrosive to buried steel structures due to protective surface films which form on steel in high pH environments. A pH between 5 and 8.5 is generally considered relatively passive from a corrosion standpoint.

The laboratory electrical resistivity tests completed on the composite samples of surficial soils indicate values ranging from 1,176 to 2,940 ohm-centimeters, which would be indicative of moderately to severely corrosive potential to buried metallic improvements. Based on the field resistivity testing results, the electrical resistivity values for the existing subsoils range from approximately 3,275 to 69,132 ohm-centimeters. Based on these results and the resistivity correlations presented in Table 4, the corrosion potential to buried metallic improvements may be characterized a ranging from moderately corrosive to severely corrosive.

Based on our previous experience and Table 4.2.1 of the ACI, it is our opinion that sulfate exposure to PCC may be considered negligible for the native subsurface materials sampled.

3.2 Thermal Resistivity

The thermal resistivity test results with the thermal dryout curves, are attached to this report. Thermal Resistivity testing was performed in general accordance with ASTM 5334 on five composite samples compacted to density equivalent to approximately 90% of the maximum dry density per ASTM D 698 and at the optimum moisture contents for each composite test sample. The samples were then oven dried and multiple thermal resistivity readings were obtained at various moisture contents. The thermal resistivities decrease with increasing moisture content and varies from 100 to 565 ^{o}C-cm/W when fully dry and from 46.8 to 111.5 ^{o}C-cm/W at optimum moisture.

4.0 FOUNDATIONS AND EARTHWORK

4.1 Site Seismic Coefficients

According to the 2018 International Building Code, the site class is within “Site Class C” based on the soil profiles. The maximum considered earthquake ground motions in this area for 0.2 sec. and 1.0 sec. spectral responses are approximately 21.4 % g and 6.2 % g, respectively. For Site Class C, the corresponding 0.2 and 1.0 sec. design spectral response acceleration parameters S_{DS} and S_{D1} are 18.5 % g and 6.2 % g, respectively.

4.2 Foundations

Based on the results of this investigation and our experience with similar structures, a foundation system consisting of driven posts is generally preferred for support of the proposed ground-mounted photovoltaic arrays. Boring locations were divided in five (5) different zone for engineering characterization purposes. Based on the results of the test borings, the use of driven posts could be problematic in zones 2 and 3 (Table 5) due to very dense soil and shallow refusal conditions

As noted in Table 1, nine (9) test borings encountered refusal to earth drilling equipment at depths ranging from 6.5 to nearly 15 feet bgs. Additionally, difficult drilling conditions and/or very dense soil conditions including cobble layers were encountered in twenty (20) of the thirty two (32) test borings at depths ranging from 5 ft to 10 ft ft bgs. Therefore, shallow refusal conditions may be encountered within these areas and other portions of the proposed solar array areas when attempting to drive posts.

Since the use of a driven post system may be limited for use on this project where refusal to drilling and sampling tools is encountered, the designer and contractor should be prepared to implement alternative installation methods (or alternative foundation support systems) for achieving sufficient foundation embedment to provide sufficient resistance for uplift and lateral loading condition, as necessary. The following alternatives will need to be considered at the project site since subsurface obstructions due to likely highly decomposed rock or possible cobbles are anticipated at depths less than 10 ft at six (6) out of thirty (32) test boring locations in addition to possible difficult driving conditions due to very dense residual soils:

- The use of predrilling or spudding with a heavy steel beam to break up the dense highly decomposed rock or other obstructions to increase post embedment for vertical and lateral support.
- The use of larger sized, heavier grade posts that will allow harder driving and could provide increased embedment and sufficient lateral capacity and uplift.
- The use of helical screw piles to achieve uplift and lateral capacities at shallower depths.
- The use of shallow spread footings or ballast foundations where adequate embedment with other foundation or installation methods cannot be achieved.

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4.2.1 Driven Post Support System

As mentioned above, driving post beyond depths where very dense soils, cobble layers, and highly decomposed rock were encountered will be difficult and pre-drilling will likely become necessary to achieve sufficient post depth to resist the required lateral and uplift loads wherever similar conditions are encountered. All posts should be driven to bear at sufficient depths required to provide adequate axial, uplift, and lateral resistances.

4.2.2 Helical Screw Support System

A helical pile system, such as that manufactured by IDEAL Manufacturing, AB Chance, Magnum Piering, or similar, having a minimum 3-inch diameter or low-displacement ground screws, such as those manufactured by TerraSmart, or similar, could be considered as an alternative to driven posts in areas where overburden depths are less than 8 ft for support of the proposed arrays. Lateral and uplift capacities of helical piles, as well as the ability of the shaft to withstand anticipated installation torque based on subsurface conditions, should be verified by the pile manufacturer or installer. Generally speaking, additional capacities can be developed using larger diameters and helix combinations. Installation of helical piles below the auger refusal depths, where encountered, will not be feasible. Embedment into the very dense/difficult augering material may be possible, but as stated previously, will be dependent on the ability of the central shaft to withstand installation torque required to advance helices. Depths of very dense soils and auger refusal are as presented in Table 1 above and piles will not be able to penetrate below these depths Alternative to a conventional small shaft diameter helical pile, the use of a continuous flight helical pile, could be considered that generally can be drilled deeper into very dense soil conditions as compared to a conventional helical pile with larger diameter helices.

The final design should be verified by the helical or drilled pile manufacturer prior to implementation at the site. Also, the type and diameter of helix plates to be used, as well as the central bar or round pipe characteristics or that of a continuous flight helical pile should be verified by the product manufacturer based on this design capacity and anticipated torque value required for installation of the helical piles. If subsurface obstructions are encountered during installation, pre-drilling or pre-excavation will be required. If predrilling or pre-excavating, then all piles should be grouted to ensure intimate contact with surrounding soils and so not to negatively impact lateral stability.

Recommended geotechnical parameters for use in design analysis, included in Tables 6a through 6e below, can be utilized for evaluation of posts or piles for support of the PV solar array, or other design analysis, as required. We recommend that lateral and uplift resistance of soils be reduced by 50% above a depth of 4 ft below the ground surface to account for disturbance resulting from construction as well as to account for the negative impacts and loss of support due to frost and thaw action. A minimum factor of safety of 2 is recommended for compression loads; a factor of safety equal to 3 should be used for determining allowable uplift capacity of piles; a factor of safety equal to 1.5 should be used for transient (wind/seismic) loading conditions.

Table 6a. Summary of Unfactored Soil Parameters for Design
Zone 1: Borings B-1 through B-5
(reduce by 50% for upper 4 ft)

Soil Description	**LPILE Soil Type**	**Relative Density / Consistency**	**Total Unit Weight (pcf*)**	**Friction Angle (degrees)**	**E_{50}**	**Cohesion (psf**)**	**Allowable Bearing Capacity (ksf***)**
SILT & CLAY (0-4 ft)	Clay	“Medium” to “Stiff”	120	-	0.01	1,500	2
SILT & CLAY (4 ft+)	Clay	“Very Stiff” to “Hard”	125	-	0.005	3,000	4

* *pcf – pounds per cubic foot*
** *psf – pounds per square foot*
*** *ksf – kips per square foot*

Table 6b. Summary of Unfactored Soil Parameters for Design Zone 2: Borings B-6 through B-8 (reduce by 50% for upper 4 ft)

Soil Description	LPILE Soil Type	Relative Density / Consistency	Total Unit Weight (pcf*)	Friction Angle (degrees)	E_{50}	Cohesion (psf**)	Soil Modulus, k (pci***)	Allowable Bearing Capacity (ksf****)
Silty CLAY (0-6 ft)	Clay	"Medium" to "Stiff"	115	-	0.01	1,500		1.5
Silty SAND & Silty Gravel (6 ft+)	Sand	"Medium Dense/Very Stiff" to "Dense/Hard"	125	34	-	-	225	4

*	*pcf – pounds per cubic foot*
**	*psf – pounds per square foot*
***	*pci – pounds per cubic inch*
****	*ksf – kips per square foot*

Table 6c. Summary of Unfactored Soil Parameters for Design Zone 3: Borings B-9 through B-16 (reduce by 50% for upper 4 ft)

Soil Description	LPILE Soil Type	Relative Density / Consistency	Total Unit Weight (pcf*)	Friction Angle (degrees)	E_{50}	Cohesion (psf**)	Soil Modulus, k (pci***)	Allowable Bearing Capacity (ksf****)
Sandy and Clayey SILT (0-6 ft)	Clay	"Medium" to "Stiff"	115	-	0.01	1,500		2
SILT and Sandy SILT (6 ft+)	Sand	"Medium Dense/Very Stiff" to "Dense/Hard"	130	32	-	-	225	3

*	*pcf – pounds per cubic foot*
**	*psf – pounds per square foot*
***	*pci – pounds per cubic inch*
****	*ksf – kips per square foot*

Table 6d. Summary of Unfactored Soil Parameters for Design Zone 4: Borings B-17 through B-21, B-30, SS-1 & SS-2 (reduce by 50% for upper 4 ft)

Soil Description	LPILE Soil Type	Relative Density / Consistency	Total Unit Weight (pcf*)	E_{50}	Cohesion (psf**)	Allowable Bearing Capacity (ksf***)
Silt & Clay (0-2 ft)	Clay	"Soft" to "Medium"	115	0.01	1,000	1.5

Soil Description	LPILE Soil Type	Relative Density / Consistency	Total Unit Weight (pcf*)	E_{50}	Cohesion (psf**)	Allowable Bearing Capacity (ksf***)
Silt & Clay (2-6 ft)	Clay	"Medium" to "Stiff"	115	0.01	1,500	1.5
Silty CLAY & Silty Gravel (6 ft+)	Clay	"Medium Dense/Very Stiff" to "Dense/Hard"	125	0.005	4,000	4

* *pcf – pounds per cubic foot*
** *psf – pounds per square foot*
*** *ksf – kips per square foot*

Table 6e. Summary of Unfactored Soil Parameters for Design
Zone 5: Borings B-22 through B-29
(reduce by 50% for upper 4 ft)

Soil Description	LPILE Soil Type	Relative Density / Consistency	Total Unit Weight (pcf*)	Friction Angle (degrees)	E_{50}	Cohesion (psf**)	Soil Modulus, k (pci***)	Allowable Bearing Capacity (ksf****)
SILT (0-6 ft)	Clay	"Medium" to "Stiff"	115	-	0.01	1,500	-	2
SILT & SILTY SAND (6 ft+)	Sand	"Medium Dense/Very Stiff" to "Dense/Hard"	125	32	-	-	225	3

* *pcf – pounds per cubic foot*
** *psf – pounds per square foot*
*** *pci – pounds per cubic inch*
**** *ksf – kips per square foot*

We recommend that the installation of each pile size or system utilized should be monitored and documented by qualified geotechnical personnel under the direct supervision of a professional engineer registered in the State of New York. Prior to or during construction, we recommend that tension and lateral load tests be conducted on a minimum of two piles for each pile size or system planned to be utilized for this project to verify the adequacy of the design. Testing should be performed in general accordance with ASTM 3689 and ASTM 3966 or in accordance with standard practice in the industry. The test locations should coincide with the test boring locations based on the variability of the subsurface conditions. Each planned pile type should be installed with the same means and methods used to install production piles. In the event that the means and methods of pile installation are revised following initial pile testing, additional pile tests should be performed to verify that sufficient resistance can be achieved with the revised means and methods. The results should be reviewed and approved by a qualified geotechnical engineer.

4.2.3 Shallow Foundations

Shallow foundation systems such as rigid mats can be considered for support of electrical equipment. Mats supporting electrical equipment can be designed for an allowable bearing capacity of 2,000 psf when constructed in accordance with the general recommendations presented in the *Earthwork* section of this report. A vertical subgrade modulus of 100 pci may be used in foundation mat design. Foundation subgrades for supporting electrical equipment or other ancillary structures subjected to freezing temperatures during construction and/or the life of the structure should be established at least 4 ft below adjacent grades or otherwise protected against frost action. Alternatively, to resist frost heave, light loaded mat slabs constructed at grade should be provided a coarse aggregate similar to AASHTO #57 aggregate below the slab that extends to frost depth. To guard against a punching type shear failure, minimum widths of continuous footings should be 24 in.

Shallow excavations for foundation slabs and construction of utilities are not expected to encounter static groundwater. However, perched groundwater should be anticipated in excavations in low lying areas or during wet periods. If perched groundwater or surface runoff are encountered, sumps and pumps should be sufficient to control groundwater and provide stable working conditions.

4.3 Earthwork

Based on our understanding of the proposed construction, significant grading and earthwork operations are not anticipated unless material removal and replacement would be considered for support of equipment foundations. The following recommendations are provided based on the site soils encountered.

Any existing subsurface utilities which conflict with the proposed development should be removed or relocated, where applicable. In areas of backfill placement and/or construction of shallow foundations, all topsoil and organic or otherwise deleterious material should be removed before foundation construction or new fill placement. Any obstructions that would interfere with new foundation construction must be removed in their entirety from a foundation location. After stripping residual topsoil and excavation to the proposed bearing elevations for shallow mat foundations, the exposed subgrade areas should be vigorously densified with as large a compactor as is practical. Loose or unstable areas identified during the course of excavation should be densified in-place or excavated and replaced with compacted load bearing fill.

The natural soils surficial soils contain predominantly fine-grained (clay and silt) content and will be sensitive to moisture and disturbance, especially during wet periods. Therefore, they will lose considerable strength when wet or disturbed by construction equipment and could be difficult to work with during cold or wet weather. Laboratory testing of representative samples indicates that the in-situ surficial soils are generally above their optimum moisture contents. Therefore, drying of these soils should be anticipated before reuse in compacted backfills, particularly during wet seasons. Once a subgrade has been prepared, construction traffic should be controlled in such a fashion as to minimize subgrade disturbance.

Imported load-bearing fill, if required, should consist of well-graded granular material similar to SW-GW as identified by the Unified Soil Classification System (USCS) which is not excessively moist and is free from ice and snow, roots, surface coatings, sod, loam, clay, rubbish, other deleterious or organic matter, and any particles larger than 4 inches in diameter. Alternatively, an AASHTO No. 57 coarse aggregate layer (minimum 24 inches thick) could be utilized below mat foundations supporting electrical equipment to reduce frost impacts.

All backfills fills should be placed in layers not exceeding 8 in. loose thickness. This criterion may be modified in the field depending on the conditions present at the time of construction and on the compaction equipment used. Load-bearing fills for the support of foundations should be compacted to not less than 98% of maximum dry density (ASTM D 698). All fills and backfills if utilized for areas of the solar array posts or piles, should be compacted to not less the 95% of maximum dry density. Fills in paved areas or access roads, if planned, should be compacted to not less than 95% of maximum dry density. Fills in landscaped areas should be compacted to at least 90% of maximum dry density.

The sidewalls of any confined excavations deeper than 4 ft must be sloped, benched or adequately shored per OSHA 29 CFR 1926 regulations. Trench boxes and/or sheeting could be used in conjunction with open cut slopes to permit access to confined excavations. The onsite near surface soils are classified as Type B soils according to OSHA 29 CFR 1926. Open excavations in the natural soils should not be steeper than 1H:1V if dry and 1.5H:1V if submerged.

If site grading will include cuts, especially near or beyond the depths listed in Table 1, then heavy duty excavators or dozers with ripper attachments will be required to remove the decomposed rock materials.

4.4 Trench Backfill

Bedding and pipe embedment materials to be used around underground utility or electrical conduit pipes should be well graded sand or gravel conforming to the pipe manufacturer’s recommendations and should be placed and compacted in accordance with project specifications, local requirements or governing jurisdiction. General fill to be used above pipe embedment materials should be placed and compacted in accordance with the recommendations contained in this section.

Utility trenches located adjacent to footings or foundations should not extend below an imaginary 1:1 (horizontal:vertical) plane projected downward from the foundation bearing surface to the bottom edge of the trench. Where utility trenches will cross beneath footing bearing planes, the footing concrete should be deepened to encase the pipe, or the utility trench should be backfilled with sand/cement slurry or lean concrete within the foundation-bearing plane.

Depended on site grading and depth of trenches, it is noted that cobbles and or refusal to excavation equipment may be encountered during excavation of trenches. Heavy duty excavators and/or hydraulic ram attachments may need to be considered if such conditions are encountered.

4.5 Surface Drainage

Positive surface water drainage gradients at least 2 percent should be provided to direct surface water away from foundations and mat slabs towards suitable discharge facilities. Ponding of surface water should not be allowed on or adjacent to structures, slabs-on-grade, or pavements. Any rain runoff should be directed away from foundation and slabs-on-grade such as equipment pads, as applicable.

In addition, a sufficiently thick velocity dissipater, such as layer of coarse drainage aggregate of at least 3 to 4 inches in size, should be placed along water flow paths to dissipate concentrated flow of runoff water in order to minimize surface erosion.

4.6 Plans, Specifications, and Construction Review

We recommend that TRC perform a plan review of the geotechnical aspects of the project design for general conformance with our recommendations. In addition, subsurface materials encountered in the relatively small diameter, widely spaced borings may vary significantly from other subsurface materials on the site. Therefore, we also recommend that a representative of our firm observe and confirm the geotechnical specifications of the project construction. This will allow us to form an opinion about the general conformance of the project plans and construction with our recommendations. In addition, our observations during construction will enable us to note subsurface conditions that may vary from the conditions encountered during our investigation and, if needed, provide supplemental recommendations. For the above reasons, our geotechnical recommendations are contingent upon geotechnical observation and testing services by qualified geotechnical professionals during construction to confirm that site conditions do not vary considerably from the conditions previously observed. These services are not included as part of TRC’s current scope of work.

4.7 Construction Observation

A qualified geotechnical professional should observe the geotechnical aspects of the earthwork for general conformance with our recommendations including site preparation, selection of fill materials, pile installation, and the placement and compaction of fill. To facilitate your construction schedule and if you wish TRC to perform these services, we request sufficient notification (72 hours) for site visits. The project plans and specifications should incorporate all recommendations contained in the text of this report. These services are not included as part of TRC's current scope of work.

5.0 LIMITATIONS

This report has been prepared ConnectGen LLC., specifically for design of the proposed solar array and associated development to be constructed at the project site located in Glen, NY, as identified herein.
Transfer of this report or included information is at the sole discretion of ConnectGen LLC. TRC's contractual relationship remains with ConnectGen LLC and limitations stated herein remain applicable regardless of end user. The opinions, conclusions, and recommendations presented in this report have been formulated in accordance with accepted geotechnical engineering practices that exist in the area at the time this report was written. No other warranty, expressed or implied, is made or should be inferred.

The opinions, conclusions and recommendations contained in this report are based upon the information obtained from our investigation, which includes data from a limited number of widely separated discrete locations, visual observations from our site reconnaissance, and review of other geotechnical data provided to us, along with local experience and engineering judgment. An attempt has been made to provide for normal contingencies; however, the possibility remains that differing or unexpected conditions may be encountered during construction. If this should occur, or if additional or contradictory data are revealed in the future, TRC should be notified so that modifications to this report can be made, if necessary. TRC is not responsible for any conclusions or opinions drawn from the data included herein, other than those specifically stated, nor are the recommendations presented in this report intended for direct use as construction specifications.

TRC should be retained to review the geotechnical aspects of the final plans and specifications for conformance with our recommendations. The recommendations provided in this report are based on the assumption that TRC will be retained to provide observation and testing services during construction to confirm that conditions are similar to that assumed for design and to form an opinion as to whether the work has been performed in accordance with the project plans and specifications. If we are not retained for these services, TRC cannot assume any responsibility for any potential claims that may arise during or after construction as a result of misuse or misinterpretation of TRC's report by others. Furthermore, TRC will cease to be the Geotechnical Engineer-of-Record at the time another consultant is retained for follow up service to this report, if applicable.

The opinions presented in this report are valid as of the present date for the property evaluated. Changes in the condition of the property will likely occur with the passage of time due to natural processes and/or the works of man. In addition, changes in applicable standards of practice can occur as a result of legislation and/or the broadening of knowledge. Furthermore, geotechnical issues may arise that were not apparent at the time of our investigation. Accordingly, the opinions presented in this report may be invalidated, wholly or partially, by changes outside of our control. Therefore, this report is subject to review and should not be relied upon after a period of three years. Similarly, this report should not be used, nor are its recommendation applicable, for any other properties or alternate developments.

We trust this report contains the information you require and thank you for the opportunity to work on this project. Please consider our firm for future geotechnical services as needed.

Sincerely,

TRC Engineers, Inc.

James P. Benjamin

James P. Benjamin, PE*
Geotechnical Project Manager
*NJ, PA

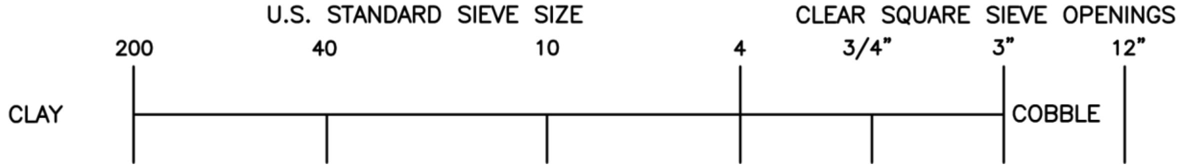
Petro W. Kazaniwsky, PE
Chief Geotechnical Engineer
NY License No.: 081310

Nhi K. Lam, EIT
Geotechnical Engineer

SILTS AND CLAY	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		

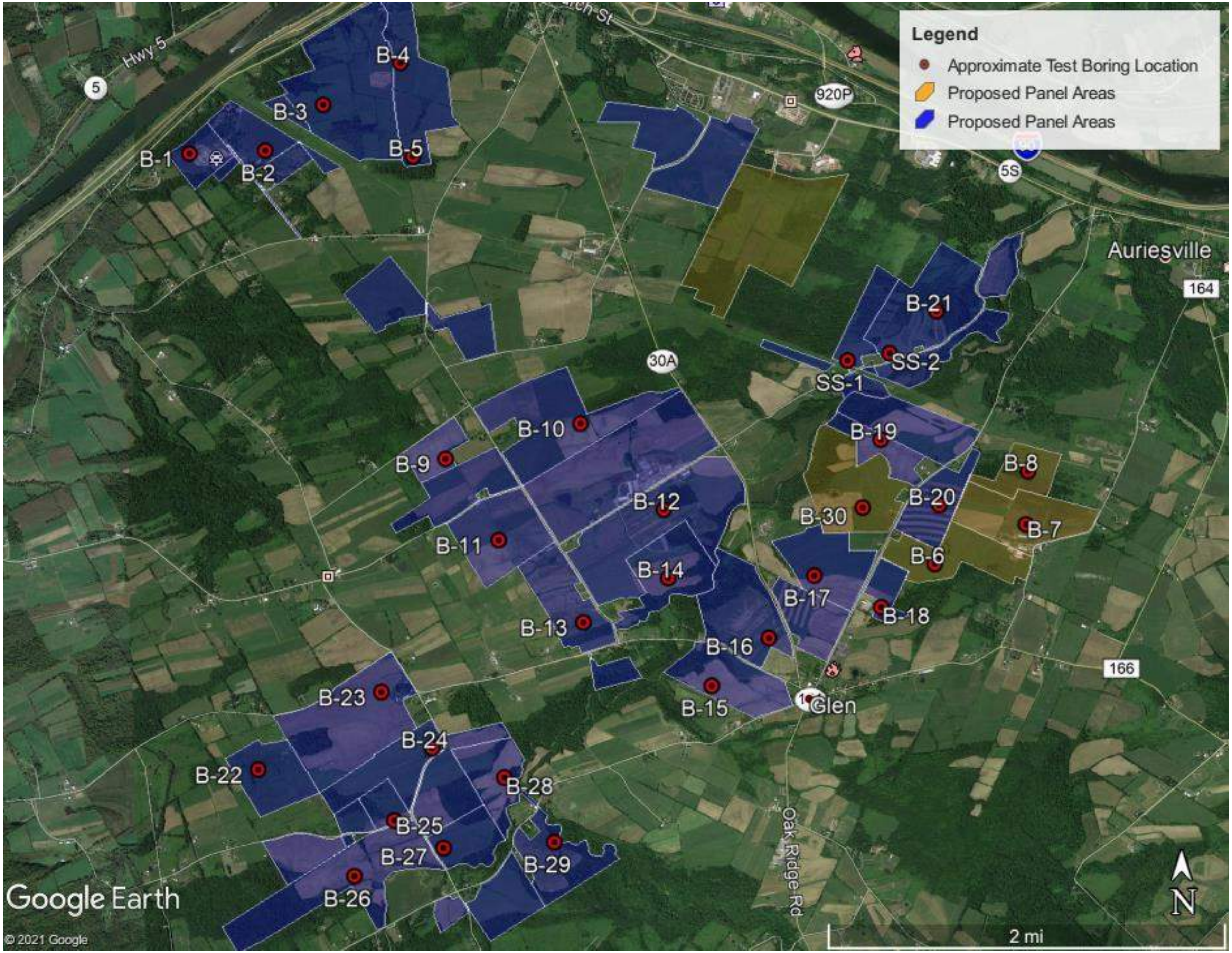
PRIMARY DIVISIONS			SOIL TYPE		SECONDARY DIVISIONS
COARSE GRAINED SOILS MORE THAN HALF OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVELS MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS (Less than 5% Fines)	GW		Well graded gravels, gravel–sand mixtures, little or no fines
			GP		Poorly graded gravels or gravel–sand mixtures, little or no fines
		GRAVEL WITH FINES	GM		Silty gravels, gravel–sand–silt mixtures, plastic fines
			GC		Clayey gravels, gravel–sand–clay mixtures, plastic fines
	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS (Less than 5% Fines)	SW		Well graded sands, gravelly sands, little or no fines
			SP		Poorly graded sands or gravelly sands, little or no fines
		SANDS WITH FINES	SM		Silty sands, sand–silt–mixtures, non–plastic fines
			SC		Clayey sands, sand–clay mixtures, plastic fines
FINE GRAINED SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT IS LESS THAN 50 %		ML		Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
			CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL		Organic silts and organic silty clays of low plasticity
	SILTS AND CLAYS LIQUID LIMIT IS GREATER THAN 50 %		MH		Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
			CH		Inorganic clays of high plasticity, fat clays
			OH		Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS			PT		Peat and other highly organic soils

DEFINITION OF TERMS



FIELD DATA

FIGURES



Project No. 411360.GEO1

Date: June 9, 2021

For:
ConnectGen LLC
Houston, TX

TRC
16000 Commerce Parkway, Mt. Laurel, New Jersey 08054
PH. (856) 273-1224 FAX. (856) 273-9244

APPROXIMATE TEST BORING LOCATIONS

Mill Point Solar

Town of Glen, Montgomery County, New York

FIGURE
1

TEST BORING LOGS

TEST BORING LOG

PROJECT: MILL POINT SOLAR AND BATTERY STORAGE PROJECT
LOCATION: GLEN, NY

BORING	**B-01**
G.S. ELEV.	
FILE	411360.GEO1
SHEET	1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED N/A			
DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	6.6 '
d	FROM	6.6 '	TO	6.9 '

DRILLER B. FLETCHER
HELPER R. CASATELLI
INSPECTOR A. FISHMAN
DATE STARTED 04/27/2021
DATE COMPLETED 04/27/2021

DEPTH	A	B	C	DESCRIPTION	PP	REMARKS
				0.2 ***TOPSOIL***		
	S-1	2 4 3 3				
	S-2	3 4 7 7		***BROWN SILTY CLAY, TR TO SM F/M SAND, SM ORANGE STAINING***		
5						
	S-3	5 9 16 24				
	S-4	19 100/0.1'		6.9		
				END OF BORING AT 6.9'		AUGER REFUSAL AT 6.9 FT
10						
15						
20						
25						
30						
35						

DRN. SAP
CKD. JPB

TEST BORING LOG

PROJECT: MILL POINT SOLAR AND BATTERY STORAGE PROJECT
LOCATION: GLEN, NY

BORING	**B-02**
G.S. ELEV.	
FILE	411360.GEO1
SHEET	1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED N/A			
DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	15.0 '

DRILLER B. FLETCHER
HELPER R. CASATELLI
INSPECTOR A. FISHMAN
DATE STARTED 04/27/2021
DATE COMPLETED 04/27/2021

DEPTH	A	B	C	DESCRIPTION	PP	REMARKS
				0.2 ***TOPSOIL***		
	S-1	1 4 4 5				
	S-2	3 4 6 8				
5				***DARK BROWN SILTY CLAY, TR GRAVEL, SM ORANGE STAINING ON GRAVEL, MOIST***		
	S-3	12 12 16 12				
	S-4	19 30 23 30				
10	S-5	10 16 22 26		10.0		
				DARK BROWN TO BLACK SILTY CLAY, SM GRAVEL		
15	S-6	7 7 11		15.0		
				END OF BORING AT 15'		
20						
25						
30						
35						

DRN. SAP
CKD. JPB

TEST BORING LOG

PROJECT: MILL POINT SOLAR AND BATTERY STORAGE PROJECT
LOCATION: GLEN, NY

BORING	**B-03**
G.S. ELEV.	
FILE	411360.GEO1
SHEET	1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED N/A			
DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE					
a	FROM	0.0 '	TO	10.0 '	
d	FROM	10.0 '	TO	15.0 '	

DRILLER B. FLETCHER
HELPER R. CASATELLI
INSPECTOR A. FISHMAN
DATE STARTED 04/27/2021
DATE COMPLETED 04/27/2021

DEPTH		A	B	C	DESCRIPTION	PP	REMARKS
					0.3 ***TOPSOIL***		
		S-1	2 3 5 5				
		S-2	4 5 6 6		***BROWN CLAYEY SILT, TR TO SM F/M SAND, MOIST***		
5							
		S-3	3 3 6 5		6.3		
		S-4	3 5 18 76		***BROWN CLAY, TR TO SM GRAVEL***		PROBABLE COBBLES 7.8 FT TO 8.5 FT
		S-5	100/0.4'		8.5		
10							
					BROWN TO DARK GRAY SILT, TR TO SM GRAVEL, MOIST		
15		S-6	8 10 13		15.0		
					END OF BORING AT 15'		
20							
25							
30							
35							

DRN. SAP
CKD. JPB

TEST BORING LOG

BORING	**B-04**
G.S. ELEV.	
FILE	411360.GEO1
SHEET	1 OF 1

PROJECT: MILL POINT SOLAR AND BATTERY STORAGE PROJECT
LOCATION: GLEN, NY

GROUNDWATER DATA			
FIRST ENCOUNTERED N/A			
DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	15.0 '

DRILLER B. FLETCHER
HELPER R. CASATELLI
INSPECTOR A. FISHMAN
DATE STARTED 04/27/2021
DATE COMPLETED 04/27/2021

DEPTH	A	B	C	DESCRIPTION	PP	REMARKS
				0.2 ***TOPSOIL***		
	S-1	1 2 3 5				
	S-2	4 4 4 4		***DARK BROWN SAND AND CLAYEY SILT, TR TO SM F/C GRAVEL***		
5						
	S-3	2 8 4 15		7.0		
	S-4	17 14 20 25		8.0 ***COBBLES***		
10	S-5	10 10 13 15				
				DARK GRAY SILT, SM F/M SAND, TR TO SM GRAVEL		
15	S-6	5 7 7		15.0		
				END OF BORING AT 15'		
20						
25						
30						
35						

DRN. SAP
CKD. JPB

TEST BORING LOG

PROJECT: MILL POINT SOLAR AND BATTERY STORAGE PROJECT
LOCATION: GLEN, NY

BORING **B-05**
G.S. ELEV.
FILE 411360.GEO1
SHEET 1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED N/A			
DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	15.0 '

DRILLER B. FLETCHER
HELPER R. CASATELLI
INSPECTOR A. FISHMAN
DATE STARTED 04/27/2021
DATE COMPLETED 04/27/2021

DEPTH	A	B	C	DESCRIPTION	PP	REMARKS
			0.2	***TOPSOIL***		
	S-1	1 1 3 6				
	S-2	8 12 12 20		***DARK BROWN TO BROWN CLAYEY SILT, TR TO SM F/M/C SAND, TR GRAVEL***		SOME CLAY FROM 4 FT TO 5 FT
5						
	S-3	7 11 14 27				
			7.0			PROBABLE COBBLES FROM 7 FT TO 10 FT
	S-4	20 21 25 25				
10	S-5	9 16 87 37				
				BROWN AND DARK GRAY SILTY CLAY, SM F/M/C SAND, TR TO SM GRAVEL		
15	S-6	34 10 14	15.0			
				END OF BORING AT 15'		
20						
25						
30						
35						

DRN. SAP
CKD. JPB

TEST BORING LOG

BORING	**B-06**
G.S. ELEV.	
FILE	411360.GEO1
SHEET	1 OF 1

PROJECT: MILL POINT SOLAR AND BATTERY STORAGE PROJECT

LOCATION: GLEN, NY

GROUNDWATER DATA			
FIRST ENCOUNTERED N/A			
DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	3.5 '
d	FROM	3.5 '	TO	7.7 '

DRILLER B. FLETCHER
HELPER R. CASATELLI
INSPECTOR N. LAM
DATE STARTED 05/05/2021
DATE COMPLETED 05/05/2021

DEPTH	A	B				C	DESCRIPTION	PP	REMARKS
	S-1	1	3	3	4	2.0	***DARK BROWN SILTY CLAY, TR TO SM F/M SAND, MOIST***		
	S-2	3	7	12	26				PROBABLE BOULDER AT 3.5 FT
5	S-3	26	21	18	25		***GRAVEL-SIZED ROCK FRAGMENTS, SM SILT,SM F/M/C SAND***		
	S-4	20	24	32	100/0.2'	7.7			
							END OF BORING AT 7.7'		
10									
15									
20									
25									
30									
35									

DRN. SAP
CKD. JPB

TEST BORING LOG

BORING	**B-07**
G.S. ELEV.	
FILE	411360.GEO1
SHEET	1 OF 1

PROJECT: MILL POINT SOLAR AND BATTERY STORAGE PROJECT
LOCATION: GLEN, NY

GROUNDWATER DATA			
FIRST ENCOUNTERED N/A			
DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE					
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	15.0 '

DRILLER B. FLETCHER
HELPER R. CASATELLI
INSPECTOR N. LAM
DATE STARTED 05/05/2021
DATE COMPLETED 05/05/2021

DEPTH		A	B	C	DESCRIPTION	PP	REMARKS
		S-1	WH 1 1 4	2.0	*BROWN SILTY CLAY, TR F/ SAND, WITH ROOTS (ORGANICS)*		
		S-2	4 6 7 9		*BROWN SILTY CLAY, TR TO SM F/ SAND, GLACIAL TILL, MOIST*		
5		S-3	7 10 14 22	6.0			
		S-4	22 26 34 35				
10		S-5	20 26 40 50		*DARK GRAY F/M/C SAND AND SILT, TR TO SM GRAVEL, MOIST*		
15		S-6	12 22 25 33	15.0			
					END OF BORING AT 15'		
20							
25							
30							
35							

DRN. SAP
CKD. JPB

TEST BORING LOG

PROJECT: MILL POINT SOLAR AND BATTERY STORAGE PROJECT
LOCATION: GLEN, NY

BORING	**B-08**
G.S. ELEV.	
FILE	411360.GEO1
SHEET	1 OF 1

GROUNDWATER DATA				
FIRST ENCOUNTERED N/A				▽
DEPTH	HOUR	DATE	ELAPSED TIME	
12.5'	14:00	5/5	0 HR	▼
				▽

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	15.0 '

DRILLER B. FLETCHER
HELPER R. CASATELLI
INSPECTOR N. LAM
DATE STARTED 05/05/2021
DATE COMPLETED 05/05/2021

DEPTH		A	B	C	DESCRIPTION	PP	REMARKS
		S-1	1 2 4 4		***DARK BROWN CLAYEY SILT, TR TO SM F/ SAND, TR F/ GRAVEL***		
		S-2	2 2 2 4				
5		S-3	4 5 9 6		6.0		
▽		S-4	6 6 5 5		***BROWN F/M/C SAND, SM F/ GRAVEL, SM SILT, WET*** 8.0		
10		S-5	3 4 4 4		***BROWN F/M/C SAND AND CLAYEY SILT, TR TO SM GRAVEL, WET*** 10.0		
▼					***DARK GRAY SILTY CLAY, SM F/ SAND, WET***		
15		S-6	WH 2 3 3		15.0		
					END OF BORING AT 15'		
20							
25							
30							
35							

DRN. SAP
CKD. JPB

TEST BORING LOG

PROJECT: MILL POINT SOLAR AND BATTERY STORAGE PROJECT
LOCATION: GLEN, NY

BORING	**B-09**
G.S. ELEV.	
FILE	411360.GEO1
SHEET	1 OF 1

GROUNDWATER DATA				
FIRST ENCOUNTERED N/A				▽
DEPTH	HOUR	DATE	ELAPSED TIME	
10.3'	NR	4/28	0 HR	▼

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	13.9 '

DRILLER B. FLETCHER
HELPER R. CASATELLI
INSPECTOR A. FISHMAN
DATE STARTED 04/28/2021
DATE COMPLETED 04/28/2021

DEPTH	A	B	C	DESCRIPTION	PP	REMARKS
			0.2	***TOPSOIL***		
	S-1	3 4 4 6				
	S-2	4 4 4 7				
5						
	S-3	5 8 12 16		***DARK BROWN F/M/C SAND AND SILT, TR TO SM GRAVEL, SOME ORANGE STAINING***		
	S-4	11 13 13 18				
▼ 10	S-5	13 13 59 96				
			12.0			
				GRAVEL-SIZED ROCK FRAGMENTS		
	S-6	100/0.4'	13.9			
15				***END OF BORING AT 13.9'***		
20						
25						
30						
35						

DRN. SAP
CKD. JPB

NEW PROJECTS TEST BORING LOG 411360.GEO1.GPJ SITE BLAUVELT.GDT 6/9/21

TEST BORING LOG

PROJECT: MILL POINT SOLAR AND BATTERY STORAGE PROJECT
LOCATION: GLEN, NY

BORING	**B-10**
G.S. ELEV.	
FILE	411360.GEO1
SHEET	1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED N/A			
DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	15.0 '

DRILLER B. FLETCHER
HELPER R. CASATELLI
INSPECTOR A. FISHMAN
DATE STARTED 04/28/2021
DATE COMPLETED 04/28/2021

DEPTH	A	B	C	DESCRIPTION	PP	REMARKS
				0.2 ***TOPSOIL***		
	S-1	1 2 4 7				
	S-2	6 7 9 10		***BROWN SILT, SM GRAVEL, SOME ORANGE STAINING***		
5						
	S-3	9 12 15 15				
	S-4	12 16 19 44		7.5		PROBABLE COBBLES FROM 7.5 FT
10	S-5	37 67 61 32				
				DARK GRAY TO BLACK SILT, SM GRAVEL		
15	S-6	44 45 100		15.0		
				END OF BORING AT 15'		
20						
25						
30						
35						

DRN. SAP
CKD. JPB

NEW PROJECTS TEST BORING LOG 411360.GEO1.GPJ SITE BLAUVELT.GDT 6/9/21

TEST BORING LOG

PROJECT: MILL POINT SOLAR AND BATTERY STORAGE PROJECT
LOCATION: GLEN, NY

BORING	**B-11**
G.S. ELEV.	
FILE	411360.GEO1
SHEET	1 OF 1

GROUNDWATER DATA

FIRST ENCOUNTERED N/A

DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE

a	FROM	0.0 '	TO	6.3 '
d	FROM	6.3 '	TO	7.6 '

DRILLER B. FLETCHER
HELPER R. CASATELLI
INSPECTOR A. FISHMAN
DATE STARTED 04/28/2021
DATE COMPLETED 04/28/2021

DEPTH	A	B	C	DESCRIPTION	PP	REMARKS
			0.2	***TOPSOIL***		
	S-1	2 3 6 8				
	S-2	5 7 11 14		***BROWN CLAYEY SILT, TR TO SM GRAVEL, TR TO SM F/M/C SAND***		
5						
	S-3	6 14 26 35	6.5			
	S-4	100/0.3'	7.6	***DECOMPOSED SHALE***		AUGER REFUSAL AT 7.6 FT
				END OF BORING AT 7.6'		
10						
15						
20						
25						
30						
35						

DRN. SAP
CKD. JPB

TEST BORING LOG

BORING	**B-12**
G.S. ELEV.	
FILE	411360.GEO1
SHEET	1 OF 1

PROJECT: MILL POINT SOLAR AND BATTERY STORAGE PROJECT

LOCATION: GLEN, NY

GROUNDWATER DATA			
FIRST ENCOUNTERED N/A			
DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	15.0 '

DRILLER B. FLETCHER
HELPER R. CASATELLI
INSPECTOR A. FISHMAN
DATE STARTED 04/28/2021
DATE COMPLETED 04/28/2021

DEPTH	A	B	C	DESCRIPTION	PP	REMARKS
				0.2 ***TOPSOIL***		
	S-1	2 5 7 6				
	S-2	5 7 11 13				
5						
	S-3	16 23 19 20				POSSBILE COBBLES FROM 5 FT
	S-4	16 20 22 24		***BROWN F/M/C SANDY SILT, TR TO SM GRAVEL***		
10	S-5	13 28 36 25				
15	S-6	7 15 22		15.0		
				END OF BORING AT 15'		
20						
25						
30						
35						

DRN. SAP
CKD. JPB

TEST BORING LOG

PROJECT: MILL POINT SOLAR AND BATTERY STORAGE PROJECT
LOCATION: GLEN, NY

BORING	**B-13**
G.S. ELEV.	
FILE	411360.GEO1
SHEET	1 OF 1

GROUNDWATER DATA

FIRST ENCOUNTERED N/A

DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE

a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	15.0 '

DRILLER B. FLETCHER
HELPER R. CASATELLI
INSPECTOR A. FISHMAN
DATE STARTED 04/28/2021
DATE COMPLETED 04/28/2021

DEPTH	A	B	C	DESCRIPTION	PP	REMARKS
				0.2 ***TOPSOIL***		
	S-1	WH/1.5' 24				
	S-2	5 7 9 12				
5						
	S-3	7 11 13 16				
	S-4	15 16 17 22		***BROWN, DARK BROWN AND DARK GRAY CLAYEY SILT, TR TO SM F/M SAND, TR GRAVEL, SOME ORANGE STAINING***		ENCOUNTERED POSSIBLE COBBLES FROM 8.7 FEET TO 10 FEET
10	S-5	6 8 10 15				
15	S-6	17 10 12		15.0		
				END OF BORING AT 15'		
20						
25						
30						
35						

DRN. SAP
CKD. JPB

NEW PROJECTS TEST BORING LOG 411360.GEO1.GPJ SITE BLAUVELT.GDT 6/9/21

TEST BORING LOG

PROJECT: MILL POINT SOLAR AND BATTERY STORAGE PROJECT
LOCATION: GLEN, NY

BORING	**B-14**
G.S. ELEV.	
FILE	411360.GEO1
SHEET	1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED N/A			
DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE				
a	FROM 0.0 '	TO 10.0 '		
d	FROM 10.0 '	TO 15.0 '		

DRILLER B. FLETCHER
HELPER R. CASATELLI
INSPECTOR A. FISHMAN
DATE STARTED 04/28/2021
DATE COMPLETED 04/28/2021

DEPTH	A	B	C	DESCRIPTION	PP	REMARKS
				0.2 ***TOPSOIL***		POSSBILE COBBLES THROUGHOUT
	S-1	2 3 5 5				
	S-2	4 4 5 4				
5	S-3	3 6 6 14				
	S-4	12 18 14 16		***BROWN, DARK BROWN, DARK GRAY SILTY CLAY, TR TO SM F/M SAND, TR TO SM GRAVEL***		
10	S-5	20 11 19 27				
15	S-6	48 25 24		15.0		
				END OF BORING AT 15'		
20						
25						
30						
35						

DRN. SAP
CKD. JPB

TEST BORING LOG

BORING	**B-15**
G.S. ELEV.	
FILE	411360.GEO1
SHEET	1 OF 1

PROJECT: MILL POINT SOLAR AND BATTERY STORAGE PROJECT

LOCATION: GLEN, NY

GROUNDWATER DATA			
FIRST ENCOUNTERED N/A			
DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE					
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	15.0 '

DRILLER B. FLETCHER
HELPER R. CASATELLI
INSPECTOR A. FISHMAN
DATE STARTED 04/30/2021
DATE COMPLETED 04/30/2021

DEPTH	A	B	C	DESCRIPTION	PP	REMARKS
				0.2 ***TOPSOIL***		
	S-1	1 4 5 7				
	S-2	6 8 9 10		***BROWN, DARK BROWN AND BLACK SILT, TR TO SM F/M SAND, TR GRAVEL***		
5						
	S-3	4 4 4 4				
	S-4	6 9 13 19		8.0		
	S-5	16 25 100/0.3'				
10						
				BROWN AND BLACK SILTY F/M/C SAND, SM GRAVEL		
15	S-6	45 52 61		15.0		
				END OF BORING AT 15'		
20						
25						
30						
35						

DRN. SAP
CKD. JPB

TEST BORING LOG

PROJECT: MILL POINT SOLAR AND BATTERY STORAGE PROJECT
LOCATION: GLEN, NY

BORING B-16
G.S. ELEV.
FILE 411360.GEO1
SHEET 1 OF 1

GROUNDWATER DATA
FIRST ENCOUNTERED N/A

DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE

a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	15.0 '

DRILLER B. FLETCHER
HELPER R. CASATELLI
INSPECTOR N. LAM
DATE STARTED 05/03/2021
DATE COMPLETED 05/03/2021

DEPTH	A	B	C	DESCRIPTION	PP	REMARKS
	S-1	WH 2 3 4	▨	*DARK GRAY CLAYEY SILT, TR GRAVEL, MOIST*		
	S-2	3 9 9 11		4.0		
5						
	S-3	10 10 14 14	▨	*DARK GRAY CLAYEY SILT, TR TO SM GRAVEL, TR TO SM F/M/C SAND, MOIST*		
	S-4	12 18 30 35		8.0		
10	S-5	15 17 14 17	▨	*DARK GRAY F/M/C SAND AND SILT, SM F/C GRAVEL, MOIST*		
				13.0		
			▨	*DARK GRAY CLAYEY SILT, TR TO SM F/C GRAVEL*		
15	S-6	7 9 14		15.0		
				END OF BORING AT 15'		
20						
25						
30						
35						

DRN. SAP
CKD. JPB

TEST BORING LOG

BORING	**B-17**
G.S. ELEV.	
FILE	411360.GEO1
SHEET	1 OF 1

PROJECT: MILL POINT SOLAR AND BATTERY STORAGE PROJECT

LOCATION: GLEN, NY

GROUNDWATER DATA			
FIRST ENCOUNTERED 6.0 ' ▽			
DEPTH	HOUR	DATE	ELAPSED TIME
▼			

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	9.0 '
d	FROM	9.0 '	TO	15.0 '

DRILLER B. FLETCHER
HELPER R. CASATELLI
INSPECTOR N. LAM
DATE STARTED 05/03/2021
DATE COMPLETED 05/03/2021

DEPTH	A	B	C	DESCRIPTION	PP	REMARKS
	S-1	WH 3 3 5		***BROWN SILT, TR TO SM F/M/C SAND, TR GRAVEL, WITH ORGANICS (ROOTS), MOIST***		
	S-2	4 5 7 7		4.0		
5						
▽	S-3	7 7 7 12		***DARK GRAY CLAY, SM F/M/CSAND, TR TO SM GRAVEL-SIZED ROCK FRAGMENTS, MOIST TO WET***		
	S-4	3 8 21 10				
	S-5	36 27 50/0		9.0		
10				***SHALE COBBLES***		AUGER REFUSAL AT 10.5 FT; BORING OFFSET AND COMPLETED TO 15 FT.
				13.5		
15	S-7	21 16 16		***DARK GRAY SILTY CLAY, TR F/M/C SAND, TR GRAVEL, WET*** 15.0		
				END OF BORING AT 15'		
20						
25						
30						
35						

DRN. SAP
CKD. JPB

TEST BORING LOG

PROJECT: MILL POINT SOLAR AND BATTERY STORAGE PROJECT
LOCATION: GLEN, NY

BORING	**B-18**
G.S. ELEV.	
FILE	411360.GEO1
SHEET	1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED N/A			
DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	6.0 '
d	FROM	6.0 '	TO	8.0 '

DRILLER B. FLETCHER
HELPER R. CASATELLI
INSPECTOR N. LAM
DATE STARTED 05/03/2021
DATE COMPLETED 05/03/2021

DEPTH		A	B				C		DESCRIPTION	PP	REMARKS
		S-1	1	1	4	6	▨		***BROWN CLAY, TR TO SM F/M SAND, TR F/C GRAVEL, MOIST***		
		S-2	4	7	9	10	▨				
5		S-3	4	5	6	80	▨	6.0			
							▨	8.0	***GRAVEL-SIZED SHALE FRAGMENTS***		S-4: 50/0' AT 6 FT REFUSAL AT 8 FT
									END OF BORING AT 8'		
10											
15											
20											
25											
30											
35											

DRN. SAP
CKD. JPB

TEST BORING LOG

PROJECT: MILL POINT SOLAR AND BATTERY STORAGE PROJECT
LOCATION: GLEN, NY

BORING **B-19**
G.S. ELEV.
FILE 411360.GEO1
SHEET 1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED N/A			
DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	7.2 '
d	FROM	7.2 '	TO	7.5 '

DRILLER B. FLETCHER
HELPER R. CASATELLI
INSPECTOR N. LAM
DATE STARTED 05/04/2021
DATE COMPLETED 05/04/2021

DEPTH	A	B	C	DESCRIPTION	PP	REMARKS
	S-1	WH 1 2 4	2.0	***BROWN SILTY CLAY, TR F/M/C SAND WITH ROOTS (ORGANICS), MOIST***		
	S-2	5 7 9 16		***BROWN SILT, TR F/M/C SAND, MOIST***		
5	S-3	6 9 12 18	6.0			
	S-4	48 80 100/0.2'	7.5	***DECOMPOSED SHALE***		AUGER REFUSAL AT 7.5 FT
				END OF BORING AT 7.5'		
10						
15						
20						
25						
30						
35						

Boring moved 20 feet north

DRN. SAP
CKD. JPB

NEW PROJECTS TEST BORING LOG 411360.GEO1.GPJ SITE BLAUVELT.GDT 6/9/21

TRC

TEST BORING LOG

PROJECT: MILL POINT SOLAR AND BATTERY STORAGE PROJECT
LOCATION: GLEN, NY

BORING	**B-20**
G.S. ELEV.	
FILE	411360.GEO1
SHEET	1 OF 1

GROUNDWATER DATA

FIRST ENCOUNTERED N/A

DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE

a	FROM 0.0 '		TO 10.0 '	
d	FROM 10.0 '		TO 15.0 '	

DRILLER B. FLETCHER
HELPER R. CASATELLI
INSPECTOR N. LAM
DATE STARTED 05/05/2021
DATE COMPLETED 05/05/2021

DEPTH		A	B	C	DESCRIPTION	PP	REMARKS
		S-1	1 2 2 3	▨	***BROWN TO DARK GRAY SILTY CLAY, TR TO SM F/M/C SAND, TR GRAVEL***		
		S-2	3 4 4 4				
5							POSSIBLE COBBLE AT 5 FT
		S-3	4 29 6 6				
		S-4	6 5 5 8				
10		S-5	49 16 17 17				
15		S-6	12 14 12 9		15.0		
					END OF BORING AT 15'		
20							
25							
30							
35							

DRN. SAP
CKD. JPB

TEST BORING LOG

BORING	**B-21**
G.S. ELEV.	
FILE	411360.GEO1
SHEET	1 OF 1

PROJECT: MILL POINT SOLAR AND BATTERY STORAGE PROJECT

LOCATION: GLEN, NY

GROUNDWATER DATA

FIRST ENCOUNTERED N/A

DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE

a	FROM 0.0 '		TO	10.0 '
d	FROM 10.0 '		TO	15.0 '

DRILLER B. FLETCHER
HELPER R. CASATELLI
INSPECTOR N. LAM
DATE STARTED 05/04/2021
DATE COMPLETED 05/04/2021

DEPTH	A	B	C	DESCRIPTION	PP	REMARKS
	S-1	WH 2 3 3	2.0	***BROWN SILT, SM F/ SAND, SM ROOTS/ORGANICS, MOIST***		
	S-2	3 4 6 8				
5	S-3	2 3 3 3	6.0	***GRAYISH BROWN AND BROWN F/M/C SAND AND SILT, TR TO SM GRAVEL, MOIST***		
	S-4	2 3 4 6				
10	S-5	6 7 9 13				
15	S-6	4 3 4 6	15.0	***GRAY SILTY CLAY, TR F/M/C SAND, TR GRAVEL, MOIST***		
				END OF BORING AT 15'		
20						
25						
30						
35						

DRN. SAP
CKD. JPB

TEST BORING LOG

BORING	**B-22**
G.S. ELEV.	
FILE	411360.GEO1
SHEET	1 OF 1

PROJECT: MILL POINT SOLAR AND BATTERY STORAGE PROJECT

LOCATION: GLEN, NY

GROUNDWATER DATA			
FIRST ENCOUNTERED N/A			
DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	15.0 '

DRILLER B. FLETCHER
HELPER R. CASATELLI
INSPECTOR A. FISHMAN
DATE STARTED 04/29/2021
DATE COMPLETED 04/29/2021

DEPTH		A	B	C	DESCRIPTION	PP	REMARKS
					0.3 ***TOPSOIL***		
		S-1	WH/1.0' 2 8				
		S-2	4 6 6 7				
5					***BROWN, DARK BROWN AND BLACK SILT, SM F/M/C SAND, TR TO SM F/C GRAVEL, MOIST***		
		S-3	4 5 10 16				
		S-4	15 16 17 17				
					8.8		
10		S-5	7 13 16 18				
					DARK GRAY TO BLACK SILTY F/ SAND, MOIST		
15		S-6	10 11 14		15.0		
					END OF BORING AT 15'		
20							
25							
30							
35							

DRN. SAP
CKD. JPB

TRC

TEST BORING LOG

PROJECT: MILL POINT SOLAR AND BATTERY STORAGE PROJECT
LOCATION: GLEN, NY

BORING	**B-23**
G.S. ELEV.	
FILE	411360.GEO1
SHEET	1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED N/A			
DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	15.0 '

DRILLER B. FLETCHER
HELPER R. CASATELLI
INSPECTOR A. FISHMAN
DATE STARTED 04/29/2021
DATE COMPLETED 04/29/2021

DEPTH	A	B	C	DESCRIPTION	PP	REMARKS
				0.2 ***TOPSOIL***		
	S-1	1 2 6 8		***BROWN AND DARK BROWN CLAYEY SILT, TR TO SM F/M SAND, TR GRAVEL***		
	S-2	4 4 3 4		4.0		
5				***DARK BROWN SILT, TR TO SM F/M/C SAND, TR TO SM GRAVEL-SIZED ROCK FRAGMENTS***		
	S-3	2 5 20 46		6.0		
	S-4	100/0.1'		***POSSIBLE COBBLES***		
				8.0		
10	S-5	24 21 26 32				
				BLACK SILT, SM F/M SAND, SM F/C GRAVEL-SIZED ROCK FRAGMENTS		
15	S-6	30 4 100/0.3'		14.8		
				END OF BORING AT 14.8'		
20						
25						
30						
35						

DRN. SAP
CKD. JPB

TEST BORING LOG

BORING	**B-24**
G.S. ELEV.	
FILE	411360.GEO1
SHEET	1 OF 1

PROJECT: MILL POINT SOLAR AND BATTERY STORAGE PROJECT

LOCATION: GLEN, NY

GROUNDWATER DATA			
FIRST ENCOUNTERED 10.3 ' ▽			
DEPTH	HOUR	DATE	ELAPSED TIME
▼			

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	15.0 '

DRILLER	B. FLETCHER
HELPER	R. CASATELLI
INSPECTOR	A. FISHMAN
DATE STARTED	04/29/2021
DATE COMPLETED	04/29/2021

DEPTH		A	B	C	DESCRIPTION	PP	REMARKS
					0.2 ***TOPSOIL***		
		S-1	1 1 41 4				
		S-2	6 11 12 20				
5							
		S-3	8 15 17 23				
		S-4	18 26 28 24		***BROWN SILT, SM F/M/C SAND, TR TO SM F/ GRAVEL***		
▽ 10		S-5	8 14 15 19				SAND SEAM FROM 9 FT TO 9.3 FT
					14.3		
15		S-6	7 9 12		15.0 ***GRAY SILTY F/M SAND***		
					END OF BORING AT 15'		
20							
25							
30							
35							

DRN.	SAP
CKD.	JPB

NEW PROJECTS TEST BORING LOG 411360.GEO1.GPJ SITE BLAUVELT.GDT 6/9/21

TEST BORING LOG

PROJECT: MILL POINT SOLAR AND BATTERY STORAGE PROJECT
LOCATION: GLEN, NY

BORING	**B-25**
G.S. ELEV.	
FILE	411360.GEO1
SHEET	1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED 14.2 ' ▽			
DEPTH	HOUR	DATE	ELAPSED TIME
▼			

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	15.0 '

DRILLER	B. FLETCHER
HELPER	R. CASATELLI
INSPECTOR	A. FISHMAN
DATE STARTED	04/29/2021
DATE COMPLETED	04/29/2021

DEPTH	A	B				C	DESCRIPTION	PP	REMARKS
							0.2 ***TOPSOIL***		
	S-1	1	3	4	3				
	S-2	3	3	3	4				
5									
	S-3	4	3	3	4				SAND SEAM FROM 5.8 FT TO 6 FT
	S-4	6	8	13	16		***BROWN, DARK GRAY AND BLACK F/M SANDY SILT, TR GGRAVEL-SIZED ROCK FRAGMENTS***		
10	S-5	8	10	12	13				
▽									
15	S-6	13	20	27			15.0		
							END OF BORING AT 15'		
20									
25									
30									
35									

DRN.	SAP
CKD.	JPB

NEW PROJECTS TEST BORING LOG 411360.GEO1.GPJ SITE BLAUVELT.GDT 6/9/21

TEST BORING LOG

BORING **B-26**
G.S. ELEV.
FILE 411360.GEO1
SHEET 1 OF 1

PROJECT: MILL POINT SOLAR AND BATTERY STORAGE PROJECT
LOCATION: GLEN, NY

GROUNDWATER DATA			
FIRST ENCOUNTERED N/A			
DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	15.0 '

DRILLER B. FLETCHER
HELPER R. CASATELLI
INSPECTOR A. FISHMAN
DATE STARTED 04/30/2021
DATE COMPLETED 04/30/2021

DEPTH	A	B	C	DESCRIPTION	PP	REMARKS
				0.2 ***TOPSOIL***		
	S-1	1 5 5 6				
	S-2	5 9 7 51				
5						
	S-3	4 6 7 10				
	S-4	8 12 17 22		***BROWN, DARK GRAY AND BLACK SILT, SM F/M SAND, SM GRAVEL-SIZED ROCK FRAGMENTS***		
10	S-5	15 23 23 37				
15	S-6	13 18 22		15.0		
				END OF BORING AT 15'		
20						
25						
30						
35						

DRN. SAP
CKD. JPB

TEST BORING LOG

PROJECT: MILL POINT SOLAR AND BATTERY STORAGE PROJECT
LOCATION: GLEN, NY

BORING **B-27**
G.S. ELEV.
FILE 411360.GEO1
SHEET 1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED N/A			
DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	15.0 '

DRILLER B. FLETCHER
HELPER R. CASATELLI
INSPECTOR A. FISHMAN
DATE STARTED 04/30/2021
DATE COMPLETED 04/30/2021

DEPTH	A	B				C	DESCRIPTION	PP	REMARKS
							0.2 ***TOPSOIL***		
	S-1	1	2	3	4				
	S-2	4	4	4	4				
5									
	S-3	3	3	4	10				
	S-4	16	32	14	15		***BROWN SILT, SM F/M/C SAND, TR TO SM GRAVEL-SIZED SHALE FRAGMENTS***		
10	S-5	12	16	19	29				
									COBBLES PRESENT FROM 13.5-15 FEET
15	S-6	15	11	14			15.0		
							END OF BORING AT 15'		
20									
25									
30									
35									

DRN. SAP
CKD. JPB

TEST BORING LOG

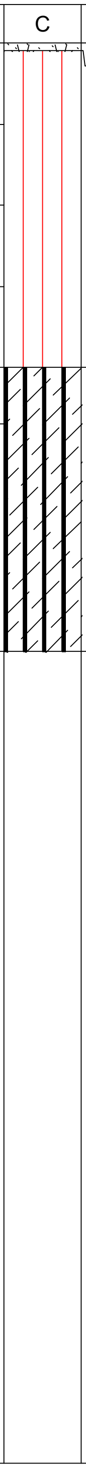
PROJECT: MILL POINT SOLAR AND BATTERY STORAGE PROJECT
LOCATION: GLEN, NY

BORING	**B-28**
G.S. ELEV.	
FILE	411360.GEO1
SHEET	1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED 3.0 ' ▽			
DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	9.4 '
d	FROM	9.4 '	TO	15.0 '

DRILLER B. FLETCHER
HELPER R. CASATELLI
INSPECTOR A. FISHMAN
DATE STARTED 04/30/2021
DATE COMPLETED 04/30/2021



DEPTH	A	B	C	DESCRIPTION	PP	REMARKS
				0.2 ***TOPSOIL***		
	S-1	2 4 6 4				
▽						
	S-2	8 3 4 7		***BROWN SILT, SM F/M/C SAND, TR TO SM GRAVEL-SIZED SHALE FRAGMENTS***		
5						
	S-3	5 4 2 8				
	S-4	12 16 19 22		8.0		
	S-5	57 84 100/0.4'				
10						
				BLACK CLAYEY SILT, TR TO SM GRAVEL-SIZED ROCK FRAGMENTS		
15	S-6	67 89 41		15.0		
				END OF BORING AT 15'		
20						
25						
30						
35						

DRN. SAP
CKD. JPB

TEST BORING LOG

PROJECT: MILL POINT SOLAR AND BATTERY STORAGE PROJECT
LOCATION: GLEN, NY

BORING **B-29**
G.S. ELEV.
FILE 411360.GEO1
SHEET 1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED N/A			
DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	9.4 '
d	FROM	9.4 '	TO	14.1 '

DRILLER B. FLETCHER
HELPER R. CASATELLI
INSPECTOR A. FISHMAN
DATE STARTED 04/30/2021
DATE COMPLETED 04/30/2021

DEPTH		A	B	C	DESCRIPTION	PP	REMARKS
					0.2 ***TOPSOIL***		
		S-1	WH/1.0' 2/1.0'				
		S-2	2 2 4 5		***BROWN SILT, TR TO SM GRAVEL-SIZED ROCK FRAGMENTS***		
5							
		S-3	5 2 3 3		6.6		
		S-4	11 32 25 50/0.4'				
		S-5	32 66 100/0.4'				
10					***BLACK SILTY F/M/C SAND, SM GRAVEL-SIZED SHALE FRAGMENTS***		
		S-6	50 77 100/0.1'		14.6		
15					***END OF BORING AT 14.6'***		
20							
25							
30							
35							

DRN. SAP
CKD. JPB

TEST BORING LOG

PROJECT: MILL POINT SOLAR AND BATTERY STORAGE PROJECT
LOCATION: GLEN, NY

BORING **B-30**
G.S. ELEV.
FILE 411360.GEO1
SHEET 1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED N/A			
DEPTH	HOUR	DATE	ELAPSED TIME
2.5'	16:15	5/4	0 HR

METHOD OF ADVANCING BOREHOLE	
a	FROM 0.0 ' TO 6.5 '

DRILLER B. FLETCHER
HELPER R. CASATELLI
INSPECTOR N. LAM
DATE STARTED 05/04/2021
DATE COMPLETED 05/04/2021

DEPTH	A	B	C	DESCRIPTION	PP	REMARKS
▽ ▼	S-1	3 5 7 8		***BROWN SILT, TR TO SM F/M/C SAND, TR GRAVEL***		
	S-2	17 9 7 7		4.0		
5				***DARK BROWN SILTY GRAVEL, TR TO SM F/M/C SAND, WET***		
	S-3	3 3 36 48		6.0		
	S-4	20 50/0		6.5 ***DECOMPOSED SHALE***		AUGER REFUSAL AT 6.5 FT
				END OF BORING AT 6.5'		
10						
15						
20						
25						
30						
35						

DRN. SAP
CKD. JPB

TEST BORING LOG

PROJECT: MILL POINT SOLAR AND BATTERY STORAGE PROJECT
LOCATION: GLEN, NY

BORING **SS-01**
G.S. ELEV.
FILE 411360.GEO1
SHEET 1 OF 1

GROUNDWATER DATA			
FIRST ENCOUNTERED 18.0 ' ▽			
DEPTH	HOUR	DATE	ELAPSED TIME
▼			

METHOD OF ADVANCING BOREHOLE				
a	FROM	0.0 '	TO	10.0 '
d	FROM	10.0 '	TO	35.0 '

DRILLER B. FLETCHER
HELPER R. CASATELLI
INSPECTOR N. LAM
DATE STARTED 05/03/2021
DATE COMPLETED 05/04/2021

DEPTH	A	B	C	DESCRIPTION	PP	REMARKS
	S-1	1 2 5 5				
	S-2	6 12 14 15				
5						
	S-3	7 10 18 27				
	S-4	21 32 44 35		***BROWN CLAY, SM F//M/C SAND, TR TO SM GRAVEL, MOIST***		
10	S-5	13 21 23 24				
				13.0		
15	S-6	12 17 20				
▽				***DARK GRAY F/M/C SANDY SILT, TR F/ GRAVEL, MOIST TO WET***		WET FROM 18 FT TO 35 FT
20	S-7	33 21 27 36				
				23.0		
25	S-8	54 15 27 46				
30	S-9	29 27 28 25		***DARK GRAY SILTY CLAY, TR TO SM F/M/C SAND, TR F/ GRAVEL, WET***		
35	S-10			35.0		

END OF BORING AT 35'

DRN. SAP
CKD. JPB

TEST BORING LOG

PROJECT: MILL POINT SOLAR AND BATTERY STORAGE PROJECT
LOCATION: GLEN, NY

BORING SS-02
G.S. ELEV.
FILE 411360.GEO1
SHEET 1 OF 1

GROUNDWATER DATA				
FIRST ENCOUNTERED N/A				∇
DEPTH	HOUR	DATE	ELAPSED TIME	
8.2'	NR	5/4	0 HR	▼
				∇

METHOD OF ADVANCING BOREHOLE					
a	FROM	0.0 '	TO	10.0 '	
d	FROM	10.0 '	TO	35.0 '	

DRILLER B. FLETCHER
HELPER R. CASATELLI
INSPECTOR N. LAM
DATE STARTED 05/04/2021
DATE COMPLETED 05/04/2021

DEPTH	A	B	C	DESCRIPTION	PP	REMARKS
	S-1	WH 3 4 6		***BROWN SILTY CLAY AND F/M/C SAND, TR TO SM F/C GRAVEL, MOIST*** 2.0		
	S-2	5 6 10 11		***BROWN SILT, SM F/M/C SAND, TR GRAVEL, MOIST***		
5	S-3	5 26 18 16		6.0		
▼	S-4	8 15 24 25				PROBABLE COBBLES FROM 8-11 FT
10	S-5	76 54 48 39		***BROWN F/M/C SANDY SILT, TR GRAVEL, MOIST*** 13.0		
15	S-6	26 28 21 26				
∇				***DARK GRAY CLAY, TR TO SM F/M/C SAND, TR TO SM F/C GRAVEL, MOIST TO WET***		
20	S-7	28 17 20 33		23.0		
25	S-8	9 11 17 22				
30	S-9	10 12 16 21		***DARK GRAY SILTY CLAY, TR TO SM F/M SAND***		
35	S-10	10 12 20 23		35.0		

END OF BORING AT 35'

DRN. SAP
CKD. JPB

KEY TO SYMBOLS

Symbol	Description
Strata symbols	
▨	Boulders / Cobbles
▨	Clay with High Plasticity
▨	Clay with Low Plasticity
▨	Clayey Silt
▨	Silty Clay
▨	Highly Weathered or Decomposed Rock
▨	Silty Gravel
▨	Poorly-graded Gravel with Silt
▨	Silt with Low Plasticity
▨	USCS Gravelly Silt
▨	USCS Sandy Silt
▨	Silty Sand
▨	Poorly graded silty fine sand
▨	Poorly-graded Sand with Clay

Symbol	Description
Misc. Symbols	
▽	Water table first encountered
▼	Water table first reading after drilling
▼	Water table second reading after drilling
▼	Water table third reading after drilling
NR	Not Recorded
MH	Moh's Hardness
Sample Type	
▯	Split Barrel

Lab Symbols

FINES = Fines %

LL = Liquid Limit %

PI = Plasticity Index %

U_c = Unconfined Compressive Strength

W/V = Unit Weight

Notes:

COLUMN A) Soil sample number.

COLUMN B) FOR SOIL SAMPLE (ASTM D 1586): indicates number of blows obtained for each 6 ins. penetration of the standard split-barrel sampler. FOR ROCK CORING (ASTM D2113): indicates percent recovery (REC) per run and rock quality designation (RQD). RQD is the % of rock pieces that are 4 ins. or greater in length in a core run.

COLUMN C) Strata symbol as assigned by the geotechnical engineer.

DESCRIPTION) Description including color, texture and classification of subsurface material as applicable (see Descriptive Terms). Estimated depths to bottom of strata as interpolated from the borings are also shown.

DESCRIPTIVE TERMS: F = fine M = medium C = coarse

RELATIVE PROPORTIONS:

-Descriptive Term-	-Symbol-	-Est. Percentages-
Trace	TR	1-10
Trace to Some	TR to SM	10-15
Some	SM	15-30
Silty, Sandy, Clayey, Gravelly	-	30-40
And	and	40-50

REMARKS) Special conditions or test data as noted during investigation. Note that W.O.P. indicates water observation pipes.

* Free water level as noted may not be indicative of daily, seasonal, tidal, flood, and/or long term fluctuations.

FIELD RESISTIVITY DATA

TRC Engineers, Inc.
Field Resistivity Testing
Wenner Method

Project:	Mill Point Solar	Project No.:	411360.GEO1
Location:	Glen, NY	Client:	ConnectGen
Site Conditions:	___ Dry _x__Wet ___ Ideal	Date Completed:	4/30/2021
Ambient Temperature:	70° F	Operator:	N.Lam
Rain storms previous day- yes		Helper:	NA

Test	Electrode Spacing (ft)	Resistance ⌖ (Ohms)	Apparent Resistivity (Ohm-cm)	Remarks
Line 1	2.5	12.3	5,889	
	5.0	9.3	8,943	
	10.0	9.2	17,695	
	20.0	8.5	32,708	
	50.0	7.0	67,025	

Line 1 Direction:
_______ N-S
_______ NE_SW
___x___ E-W
_______ NW-SE

Test Location B1

TRC Engineers, Inc.
Field Resistivity Testing
Wenner Method

Project:	Mill Point Solar	Project No.:	411360.GEO1
Location:	Glen, NY	Client:	ConnectGen
Site Conditions:	___Dry x Wet ___Ideal	Date Completed:	4/30/2021
Ambient Temperature:	70° F	Operator:	N.Lam
Rain storms previous day- yes		Helper:	NA

Test	Electrode Spacing (ft)	Resistance ⌖ (Ohms)	Apparent Resistivity (Ohm-cm)	Remarks
Line 2	2.5	12.6	6,032	
	5.0	9.7	9,326	
	10.0	8.8	16,775	
	20.0	8.7	33,168	
	50.0	7.2	69,132	

Line 2 Direction:
___x___ N-S
_______ NE_SW
_______ E-W
_______ NW-SE

Test Location B1

TRC Engineers, Inc.
Field Resistivity Testing
Wenner Method

Project:	Mill Point Solar	Project No.:	411360.GEO1
Location:	Glen, NY	Client:	ConnectGen
Site Conditions:	___ Dry _x__Wet ___ Ideal	Date Completed:	4/30/2021
Ambient Temperature:	70° F	Operator:	N.Lam
Rain storms previous day- yes		Helper:	NA

Test	Electrode Spacing (ft)	Resistance ⌖ (Ohms)	Apparent Resistivity (Ohm-cm)	Remarks
Line 1	2.5	10.3	4,931	Move from B4 due to access issue
	5.0	6.5	6,262	
	10.0	4.2	8,062	
	20.0	2.7	10,226	
	50.0	1.8	16,852	

Line 1 Direction:
- ______ N-S
- ______ NE_SW
- x E-W
- ______ NW-SE

Test Location B5

TRC Engineers, Inc.
Field Resistivity Testing
Wenner Method

Project:	Mill Point Solar	Project No.:	411360.GEO1
Location:	Glen, NY	Client:	ConnectGen
Site Conditions:	___Dry x Wet Ideal	Date Completed:	4/30/2021
Ambient Temperature:	70o F	Operator:	N.Lam
Rain storms previous day- yes		Helper:	NA

Test	Electrode Spacing (ft)	Resistance ⌖ (Ohms)	Apparent Resistivity (Ohm-cm)	Remarks
Line 2	2.5	17.0	8,139	
	5.0	9.0	8,646	
	10.0	5.1	9,747	
	20.0	3.1	11,720	
	50.0	1.9	18,480	

Line 2 Direction:
- x N-S
- ______ NE_SW
- ______ E-W
- ______ NW-SE

Test Location B5

TRC Engineers, Inc.

Field Resistivity Testing

Wenner Method

Project:	Mill Point Solar	Project No.:	411360.GEO1
Location:	Glen, NY	Client:	ConnectGen
Site Conditions:	___ Dry ___Wet _x_ Ideal	Date Completed:	4/28/2021
Ambient Temperature:	70° F	Operator:	N.Lam
Rain storms previous day- No		Helper:	NA

Test	Electrode Spacing (ft)	Resistance ⌖ (Ohms)	Apparent Resistivity (Ohm-cm)	Remarks
Line 1	2.5	14.7	7,038	
	5.0	7.8	7,469	
	10.0	4.8	9,211	
	20.0	3.0	11,567	
	50.0	1.8	16,852	

Line 1 Direction:
______ N-S
______ NE_SW
___x___ E-W
______ NW-SE

Test Location B9

TRC Engineers, Inc.

Field Resistivity Testing

Wenner Method

Project:	Mill Point Solar	Project No.:	411360.GEO1
Location:	Glen, NY	Client:	ConnectGen
Site Conditions:	___Dry___Wet__x__Ideal	Date Completed:	4/28/2021
Ambient Temperature:	70° F	Operator:	N.Lam
Rain storms previous day- No		Helper:	NA

Test	Electrode Spacing (ft)	Resistance ⌖ (Ohms)	Apparent Resistivity (Ohm-cm)	Remarks
Line 2	2.5	14.6	6,990	
	5.0	8.0	7,622	
	10.0	4.7	9,020	
	20.0	3.2	12,179	
	50.0	1.7	16,086	

Line 2 Direction:
______ N-S
______ NE_SW
___x___ E-W
______ NW-SE

Test Location B9

TRC Engineers, Inc.

Field Resistivity Testing

Wenner Method

Project:	Mill Point Solar	Project No.:	411360.GEO1
Location:	Glen, NY	Client:	ConnectGen
Site Conditions:	___ Dry ___Wet _x__ Ideal	Date Completed:	4/28/2021
Ambient Temperature:	70° F	Operator:	N.Lam
Rain storms previous day- No		Helper:	NA

Test	Electrode Spacing (ft)	Resistance ⌖ (Ohms)	Apparent Resistivity (Ohm-cm)	Remarks
Line 1	2.5	14.2	6,798	
	5.0	7.6	7,287	
	10.0	4.2	7,986	
	20.0	2.1	8,043	
	50.0	1.2	11,682	

Line 1 Direction:
______ N-S
______ NE_SW
x E-W
______ NW-SE

Test Location B12

TRC Engineers, Inc.

Field Resistivity Testing

Wenner Method

Project:	Mill Point Solar	Project No.:	411360.GEO1
Location:	Glen, NY	Client:	ConnectGen
Site Conditions:	___Dry ___Wet _x_ Ideal	Date Completed:	4/28/2021
Ambient Temperature:	70° F	Operator:	N.Lam
Rain storms previous day- No		Helper:	NA

Test	Electrode Spacing (ft)	Resistance ⌖ (Ohms)	Apparent Resistivity (Ohm-cm)	Remarks
Line 2	2.5	18.6	8,905	
	5.0	7.8	7,488	
	10.0	4.1	7,928	
	20.0	2.3	8,732	
	50.0	1.2	11,490	

Line 2 Direction:
x N-S
______ NE_SW
______ E-W
______ NW-SE

Test Location B12

TRC Engineers, Inc.
Field Resistivity Testing
Wenner Method

Project:	Mill Point Solar	Project No.:	411360.GEO1
Location:	Glen, NY	Client:	ConnectGen
Site Conditions:	___ Dry ___Wet _x_ Ideal	Date Completed:	4/28/2021
Ambient Temperature:	70° F	Operator:	N.Lam
Rain storms previous day- No		Helper:	NA

Test	Electrode Spacing (ft)	Resistance ⌖ (Ohms)	Apparent Resistivity (Ohm-cm)	Remarks
Line 1	2.5	7.7	3,677	
	5.0	3.0	2,834	
	10.0	2.0	3,811	
	20.0	1.5	5,822	
	50.0	1.1	10,054	

Line 1 Direction:
______ N-S
______ NE_SW
___x___ E-W
______ NW-SE

Test Location B13

TRC Engineers, Inc.
Field Resistivity Testing
Wenner Method

Project:	Mill Point Solar	Project No.:	411360.GEO1
Location:	Glen, NY	Client:	ConnectGen
Site Conditions:	Dry Wet x Ideal	Date Completed:	4/28/2021
Ambient Temperature:	70° F	Operator:	N.Lam
Rain storms previous day- No		Helper:	NA

Test	Electrode Spacing (ft)	Resistance ⌖ (Ohms)	Apparent Resistivity (Ohm-cm)	Remarks
Line 2	2.5	6.8	3,275	
	5.0	3.1	2,968	
	10.0	1.9	3,658	
	20.0	1.5	5,554	
	50.0	1.2	11,011	

Line 2 Direction:
___x___ N-S
______ NE_SW
______ E-W
______ NW-SE

Test Location B13

TRC Engineers, Inc.
Field Resistivity Testing
Wenner Method

Project:	Mill Point Solar	Project No.:	411360.GEO1
Location:	Glen, NY	Client:	ConnectGen
Site Conditions:	___ Dry ___Wet _x_ Ideal	Date Completed:	4/28/2021
Ambient Temperature:	70° F	Operator:	N.Lam
Rain storms previous day- No		Helper:	NA

Test	Electrode Spacing (ft)	Resistance ⌖ (Ohms)	Apparent Resistivity (Ohm-cm)	Remarks
Line 1	2.5	10.5	5,027	
	5.0	6.1	5,812	
	10.0	3.8	7,334	
	20.0	2.3	8,847	
	50.0	1.4	13,788	

Line 1 Direction: x N-S

NE_SW

E-W

NW-SE

Test Location B16

TRC Engineers, Inc.
Field Resistivity Testing
Wenner Method

Project:	Mill Point Solar	Project No.:	411360.GEO1
Location:	Glen, NY	Client:	ConnectGen
Site Conditions:	___Dry ___Wet _x_ Ideal	Date Completed:	4/28/2021
Ambient Temperature:	70° F	Operator:	N.Lam
Rain storms previous day- No		Helper:	NA

Test	Electrode Spacing (ft)	Resistance ⌖ (Ohms)	Apparent Resistivity (Ohm-cm)	Remarks
Line 2	2.5	11.0	5,266	
	5.0	6.1	5,860	
	10.0	3.7	7,124	
	20.0	2.4	9,115	
	50.0	1.5	13,884	

Line 2 Direction: N-S

NE_SW

x E-W

NW-SE

Test Location B16

TRC Engineers, Inc.

Field Resistivity Testing

Wenner Method

Project:	Mill Point Solar	Project No.:	411360.GEO1
Location:	Glen, NY	Client:	ConnectGen
Site Conditions:	___ Dry _x__Wet ___ Ideal	Date Completed:	4/29/2021
Ambient Temperature:	70^{o} F	Operator:	N.Lam
Rain storms previous day- yes		Helper:	NA

Test	Electrode Spacing (ft)	Resistance ⌖ (Ohms)	Apparent Resistivity (Ohm-cm)	Remarks
Line 1	2.5	16.6	7,947	
	5.0	8.4	8,053	
	10.0	4.5	8,694	
	20.0	2.9	10,992	
	50.0	2.3	22,406	

Line 1 Direction:
_______ N-S
_______ NE_SW
___x___ E-W
_______ NW-SE

Test Location B20

TRC Engineers, Inc.

Field Resistivity Testing

Wenner Method

Project:	Mill Point Solar	Project No.:	411360.GEO1
Location:	Glen, NY	Client:	ConnectGen
Site Conditions:	___Dry_x__Wet____Ideal	Date Completed:	4/29/2021
Ambient Temperature:	70^{o} F	Operator:	N.Lam
Rain storms previous day- yes		Helper:	NA

Test	Electrode Spacing (ft)	Resistance ⌖ (Ohms)	Apparent Resistivity (Ohm-cm)	Remarks
Line 2	2.5	16.4	7,852	
	5.0	8.2	7,890	
	10.0	4.4	8,407	
	20.0	2.7	10,494	
	50.0	2.2	21,448	

Line 2 Direction:
___x___ N-S
_______ NE_SW
_______ E-W
_______ NW-SE

Test Location B20

TRC Engineers, Inc.
Field Resistivity Testing
Wenner Method

Project:	Mill Point Solar	Project No.:	411360.GEO1
Location:	Glen, NY	Client:	ConnectGen
Site Conditions:	___ Dry _x__Wet ___ Ideal	Date Completed:	4/30/2021
Ambient Temperature:	70° F	Operator:	N.Lam
Rain storms previous day- yes		Helper:	NA

Test	Electrode Spacing (ft)	Resistance ⌖ (Ohms)	Apparent Resistivity (Ohm-cm)	Remarks
Line 1	2.5	8.6	4,098	
	5.0	5.0	4,749	
	10.0	3.3	6,320	
	20.0	1.4	5,285	
	50.0	0.6	6,128	

Line 1 Direction: x N-S
NE_SW
E-W
NW-SE

Test Location B22

TRC Engineers, Inc.
Field Resistivity Testing
Wenner Method

Project:	Mill Point Solar	Project No.:	411360.GEO1
Location:	Glen, NY	Client:	ConnectGen
Site Conditions:	___Dry x Wet ___Ideal	Date Completed:	4/30/2021
Ambient Temperature:	70o F	Operator:	N.Lam
Rain storms previous day- yes		Helper:	NA

Test	Electrode Spacing (ft)	Resistance ⌖ (Ohms)	Apparent Resistivity (Ohm-cm)	Remarks
Line 2	2.5	7.8	3,753	
	5.0	5.8	5,563	
	10.0	3.0	5,783	
	20.0	1.5	5,630	
	50.0	0.7	6,320	

Line 2 Direction: N-S
NE_SW
x E-W
NW-SE

Test Location B22

TRC Engineers, Inc.

Field Resistivity Testing

Wenner Method

Project:	Mill Point Solar	Project No.:	411360.GEO1
Location:	Glen, NY	Client:	ConnectGen
Site Conditions:	___ Dry _x__Wet ___ Ideal	Date Completed:	4/29/2021
Ambient Temperature:	70° F	Operator:	N.Lam
Rain storms previous day- yes		Helper:	NA

Test	Electrode Spacing (ft)	Resistance Φ (Ohms)	Apparent Resistivity (Ohm-cm)	Remarks
Line 1	2.5	8.2	3,916	
	5.0	4.3	4,127	
	10.0	3.1	5,898	
	20.0	2.2	8,464	
	50.0	1.5	14,267	

Line 1 Direction:

x N-S

___ NE_SW

___ E-W

___ NW-SE

Test Location B27

TRC Engineers, Inc.

Field Resistivity Testing

Wenner Method

Project:	Mill Point Solar	Project No.:	411360.GEO1
Location:	Glen, NY	Client:	ConnectGen
Site Conditions:	___ Dry _x__Wet ___ Ideal	Date Completed:	4/29/2021
Ambient Temperature:	70° F	Operator:	N.Lam
Rain storms previous day- yes		Helper:	NA

Test	Electrode Spacing (ft)	Resistance Φ (Ohms)	Apparent Resistivity (Ohm-cm)	Remarks
Line 2	2.5	8.3	3,950	
	5.0	5.2	4,960	
	10.0	3.5	6,607	
	20.0	2.7	10,226	
	50.0	1.9	17,810	

Line 2 Direction:

x N-S

___ NE_SW

___ E-W

___ NW-SE

Test Location B27

TRC Engineers, Inc.
Field Resistivity Testing
Wenner Method

Project:	Mill Point Solar	Project No.:	411360.GEO1
Location:	Glen, NY	Client:	ConnectGen
Site Conditions:	___ Dry _x__Wet ___ Ideal	Date Completed:	4/29/2021
Ambient Temperature:	65^{o} F	Operator:	N.Lam
Rain storms previous day- yes		Helper:	NA

Test	Electrode Spacing (ft)	Resistance ⌖ (Ohms)	Apparent Resistivity (Ohm-cm)	Remarks
Line 1	2.5	7.1	3,390	
	5.0	4.6	4,366	
	10.0	3.1	5,994	
	20.0	2.1	8,043	
	50.0	1.1	10,533	

Line 1 Direction:
_______ N-S
_______ NE_SW
___x___ E-W
_______ NW-SE

Test Location SS-2

TRC Engineers, Inc.
Field Resistivity Testing
Wenner Method

Project:	Mill Point Solar	Project No.:	411360.GEO1
Location:	Glen, NY	Client:	ConnectGen
Site Conditions:	___Dry _x__Wet ___Ideal	Date Completed:	4/29/2021
Ambient Temperature:	65^{o} F	Operator:	N.Lam
Rain storms previous day- yes		Helper:	NA

Test	Electrode Spacing (ft)	Resistance ⌖ (Ohms)	Apparent Resistivity (Ohm-cm)	Remarks
Line 2	2.5	7.5	3,567	
	5.0	4.3	4,089	
	10.0	3.2	6,166	
	20.0	2.1	7,966	
	50.0	0.9	9,001	

Line 2 Direction:
_______ N-S
_______ NE_SW
___x___ E-W
_______ NW-SE

Test Location SS-2

LABORATORY DATA

SUMMARY OF LABORATORY TEST DATA

Project Name: Mill Point Solar Project
Client Name: ConnectGen, LLC
TRC Project #: 411360.GEO1

SAMPLE IDENTIFICATION			Soil Group (USCS System)	Moisture Content (%)	Dry Unit Weight (pcf)	GRAIN SIZE DISTRIBUTION				PLASTICITY			
Boring #	Sample #	Depth (ft)				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)
B-1 to B-5	BULK 1	0.0-5.0	CL-ML	16.2	-	6.8	40.7	52.5		22	16	6	0.0
B-1	S-2	2.0-4.0	CL*	16.6	-	-	-	-		24	16	8	0.1
B-2	S-5	8.0-10.0	CL-ML*	9.5	125.0	-	-	-		21	14	7	-0.6
B-3	S-4	6.0-8.0	CL*	18.5	-	-	-	-		25	16	9	0.3
B-4	S-3	4.0-6.0	SM	11.6	-	18.9	36.7	44.4		-	-	-	-
B-5	S-5	8.0-10.0	CL-ML*	10.7	-	-	-	-		20	13	7	-0.3
B-6 to B-8	BULK 2	0.0-5.0	CL	25.7	-	14.4	27.3	58.3		34	23	11	0.2
B-7	S-3	4.0-6.0	CL-ML*	12.7	-	-	-	-		21	15	6	-0.4

DRAWN BY: TBT 06/14/21

CHECKED BY: JPB 06/14/21

SUMMARY OF LABORATORY TEST DATA

Project Name: Mill Point Solar Project
Client Name: ConnectGen, LLC
TRC Project #: 411360.GEO1

SAMPLE IDENTIFICATION			Soil Group (USCS System)	Moisture Content (%)	Dry Unit Weight (pcf)	GRAIN SIZE DISTRIBUTION				PLASTICITY			
Boring #	Sample #	Depth (ft)				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)
B-7	S-4	6.0-8.0	SM	8.5	-	12.6	39.4	48.0		-	-	-	-
B-8	S-4	6.0-8.0	SM	12.9	-	24.9	47.5	27.6		-	-	-	-
B-9 to B-14	BULK 3	0.0-5.0	CL-ML	12.0	-	9.1	37.5	53.4		20	14	6	-0.3
B-9	S-4	6.0-8.0	SM	12.3	-	15.0	38.8	46.2		-	-	-	-
B-12	S-4	6.0-8.0	ML	10.6	124.8	11.1	34.6	54.3		-	-	-	-
B-12	S-6	13.0-15.0	ML	10.6	123.6	7.6	27.8	64.6		-	-	-	-
B-14	S-3	4.0-6.0	CL-ML*	15.0	-	-	-	-		23	18	5	-0.6
B-15	S-6	13.0-15.0	SM	6.6	-	27.5	33.0	39.5		-	-	-	-

DRAWN BY: TBT 06/14/21

CHECKED BY: JPB 06/14/21

SUMMARY OF LABORATORY TEST DATA

Project Name: Mill Point Solar Project
Client Name: ConnectGen, LLC
TRC Project #: 411360.GEO1

SAMPLE IDENTIFICATION			Soil Group (USCS System)	Moisture Content (%)	Dry Unit Weight (pcf)	GRAIN SIZE DISTRIBUTION				PLASTICITY			
Boring #	Sample #	Depth (ft)				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)
B-16	S-5	8.0-10.0	SM	8.9	-	22.1	30.5	47.5		-	-	-	-
B-17	S-3	6.0-8.0	CL*	24.7	-	-	-	-		40	24	16	0.0
B-18	S-2	2.0-4.0	CL*	25.4	-	-	-	-		42	26	16	0.0
B-19	S-2	4.0-6.0	ML*	27.9	93.9	-	-	-		48	28	20	0.0
B-20	S-5	8.0-10.0	CL-ML*	9.8	-	-	-	-		19	13	6	-0.5
B-21	S-3	4.0-6.0	ML	22.7	-	15.5	29.9	54.6		-	-	-	-
B-21	S-5	8.0-10.0	CH*	29.2	95.1	-	-	-		52	27	25	0.1
B-22 to B-29	BULK 4	0.0-5.0	CL-ML	19.7	-	2.0	21.5	76.5		18	14	4	1.4

DRAWN BY: TBT 06/14/21

CHECKED BY: JPB 06/14/21

SUMMARY OF LABORATORY TEST DATA

Project Name: Mill Point Solar Project
Client Name: ConnectGen, LLC
TRC Project #: 411360.GEO1

SAMPLE IDENTIFICATION			Soil Group (USCS System)	Moisture Content (%)	Dry Unit Weight (pcf)	GRAIN SIZE DISTRIBUTION				PLASTICITY			
Boring #	Sample #	Depth (ft)				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)
B-25	S-3	4.0-6.0	ML	31.4	-	1.9	31.1	67.0		-	-	-	-
B-27	S-4	6.0-8.0	ML	17.9	-	16.8	27.2	56.0		-	-	-	-
B-29	S-5	8.0-9.4	SM	5.4	-	18.7	44.6	36.7		-	-	-	-
B-30	S-3	4.0-6.0	GM	31.9	-	44.4	10.7	44.9		-	-	-	-
SS-1 & SS-2	BULK 5	0.0-5.0	CL	40.1	-	1.2	25.1	73.7		43	25	18	0.8
SS-1	S-3	4.0-6.0	CL*	19.5	-	-	-	-		32	20	12	0.0
SS-1	S-6	13.0-15.0	ML	9.6	-	9.1	31.8	59.1		-	-	-	-
SS-1	S-8	23.0-25.0	CL-ML	14.5	-	6.9	18.9	74.2		-	-	-	-

DRAWN BY: TBT 06/14/21

CHECKED BY: JPB 06/14/21

SUMMARY OF LABORATORY TEST DATA

Project Name: Mill Point Solar Project
Client Name: ConnectGen, LLC
TRC Project #: 411360.GEO1

SAMPLE IDENTIFICATION			Soil Group (USCS System)	Moisture Content (%)	Dry Unit Weight (pcf)	GRAIN SIZE DISTRIBUTION				PLASTICITY			
Boring #	Sample #	Depth (ft)				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)
SS-2	S-4	6.0-8.0	ML	12.4	-	4.0	33.1	62.9		-	-	-	-
SS-2	S-6	13.0-15.0	CL*	10.3	-	-	-	-		21	13	8	-0.3

DRAWN BY: TBT 06/14/21

CHECKED BY: JPB 06/14/21

SUMMARY OF LABORATORY TEST DATA

Project Name: Mill Point Solar Project
Client Name: ConnectGen, LLC
TRC Project #: 411360.GEO1

CORROSIVITY ANALYSIS OF SOILS

Specimen Identification			pH Analysis ASTM D4972 (IN H20)	pH Analysis ASTM D4972 (IN CaCl2)	Water Soluble Sulfates, mg/kg ASTM D516	Chlorides, mg/kg ASTM D512	Resistivity, ohm-cm ASTM G57
Source #	Sample #	Depth (ft)					
B-1 to B-5	BULK 1	0.0-5.0	7.7	7.4	58	50	2,548
B-6 to B-8	BULK 2	0.0-5.0	8.1	7.5	55	40	2,940
B-9 to B-14	BULK 3	0.0-5.0	8.4	7.5	220	40	1,260
B-22 to B-29	BULK 4	0.0-5.0	8.2	8.0	235	38	1,176
SS-1 & SS-2	BULK 5	0.0-5.0	8.3	8.0	185	75	1,568

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CHECKED BY: JPB 06/14/21

SUMMARY OF LABORATORY TEST DATA

Project Name: Mill Point Solar Project
Client Name: ConnectGen, LLC
TRC Project #: 411360.GEO1

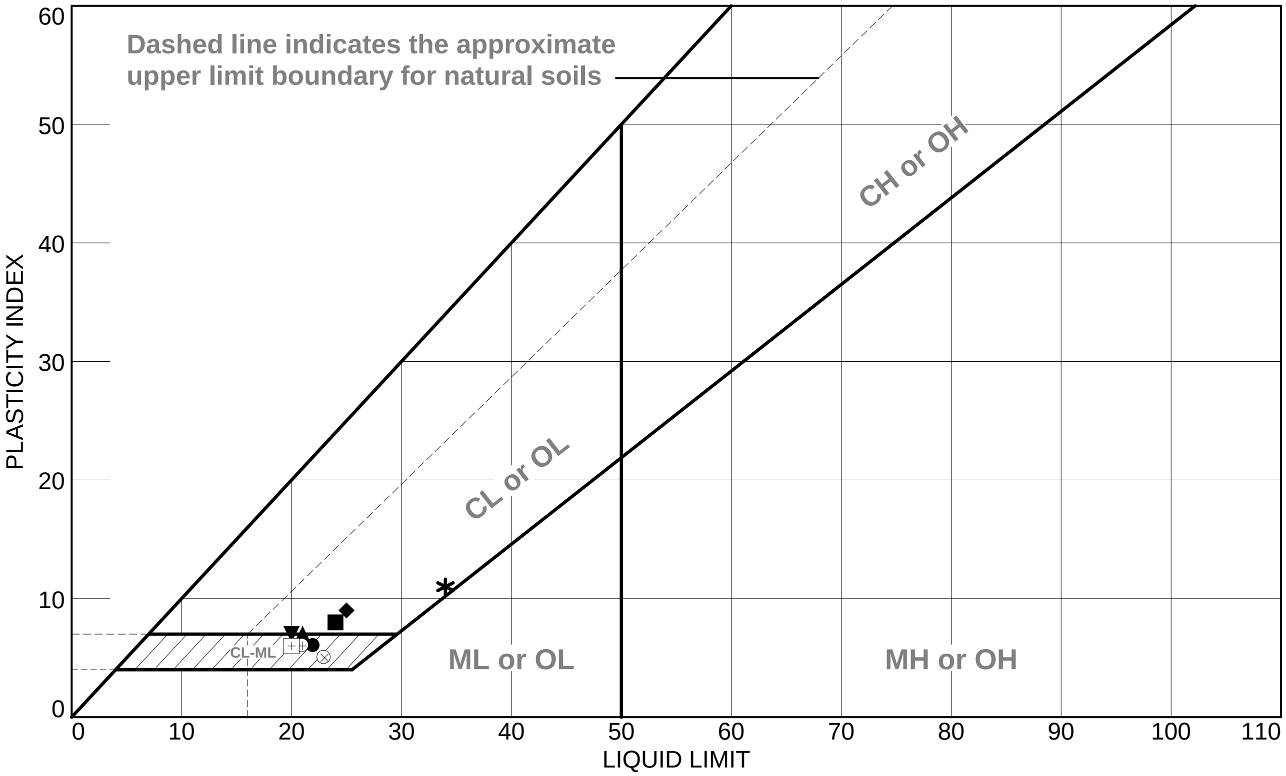
COMPACTION & THERMAL RESISTIVITY RESULTS

Specimen Identification			Compaction Characteristics			Thermal Resistivity (°C-cm/W)		Moisture Content (%)	Dry Density (pcf)
Source #	Sample #	Depth (ft)	Type of Test	Maximum Density (PCF)	Optimum Moisture Content (%)	Wet	Dry		
B-1 to B-5	BULK 1	0.0-5.0	D698	118.6	11.8	111.5	565.0	9.0	106.3
B-6 to B-8	BULK 2	0.0-5.0	D698	109.0	14.8	61.6	120.0	14.8	98.1
B-9 to B-14	BULK 3	0.0-5.0	D698	119.0	11.9	46.8	100.0	11.9	107.1
B-22 to B-29	BULK 4	0.0-5.0	D698	114.5	12.1	69.9	174.6	12.1	103.1
SS-1 & SS-2	BULK 5	0.0-5.0	D698	96.2	18.4	68.9	182.6	18.4	86.6

DRAWN BY: TBT 06/14/21

CHECKED BY: JPB 06/14/21

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	LIQUIDITY INDEX	USCS
●	B-1 TO B-5	BULK		16.2	16	22	6	0.0	CL-ML
■	B-1	S-2	2.0-4.0 FT	16.6	16	24	8	0.1	CL*
▲	B-2	S-5	8.0-10.0 FT	9.5	14	21	7	-0.6	CL-ML*
◆	B-3	S-4	6.0-8.0 FT	18.5	16	25	9	0.3	CL*
▼	B-5	S-5	8.0-10.0 FT	10.7	13	20	7	-0.3	CL-ML*
✱	B-6 TO B-8	BULK		25.7	23	34	11	0.2	CL
⊕	B-7	S-3	4.0-6.0 FT	12.7	15	21	6	-0.4	CL-ML*
⊞	B-9 TO B-14	BULK		12.0	14	20	6	-0.3	CL-ML
⊗	B-14	S-3	4.0-6.0 FT	15.0	18	23	5	-0.6	CL-ML*

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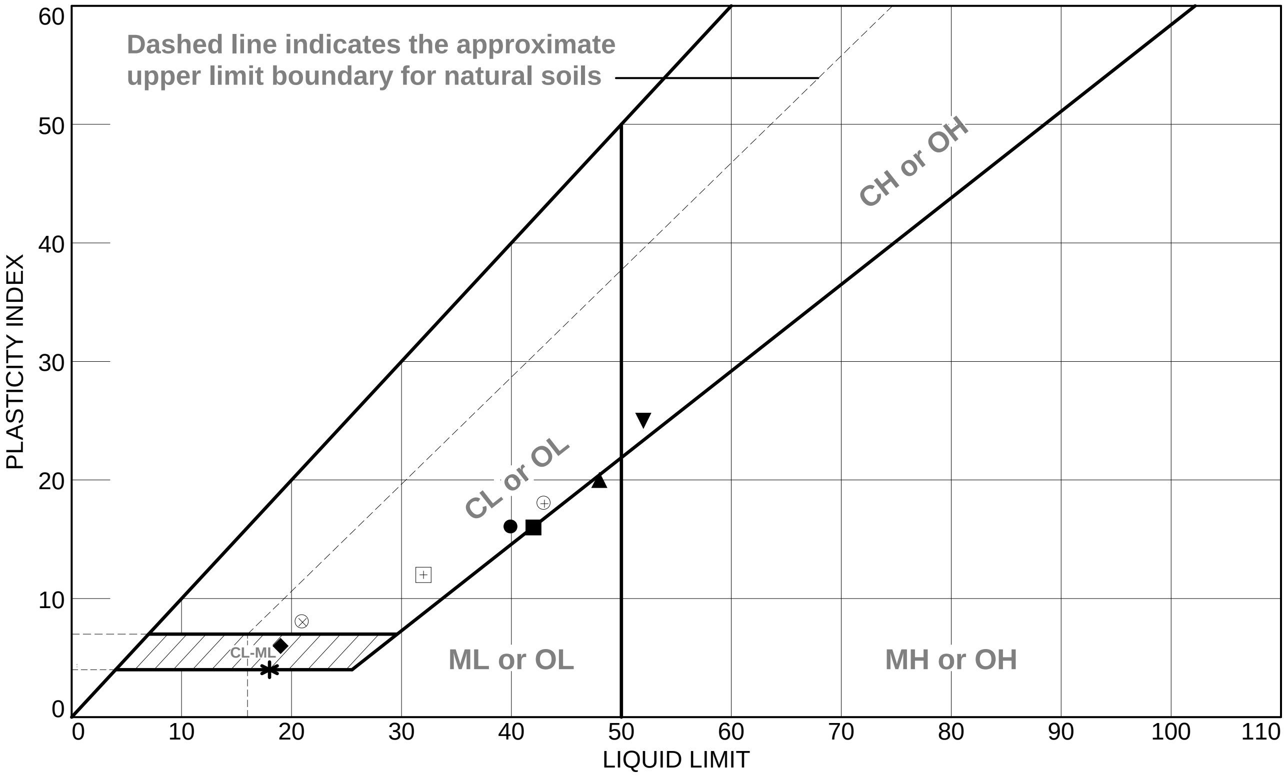
Mt. Laurel, NJ

Client: CONNECTGEN, LLC
Project: MILL POINT SOLAR PROJECT

Project No.: 411360.GEO1 **Figure** 1

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	LIQUIDITY INDEX	USCS
●	B-17	S-3	6.0-8.0 FT	24.7	24	40	16	0.0	CL*
■	B-18	S-2	2.0-4.0 FT	25.4	26	42	16	0.0	CL*
▲	B-19	S-2	2.0-4.0 FT	27.9	28	48	20	0.0	ML*
◆	B-20	S-5	8.0-10.0 FT	9.8	13	19	6	-0.5	CL-ML*
▼	B-21	S-5	8.0-10.0 FT	29.2	27	52	25	0.1	CH*
✱	B-22 TO B-29	BULK 4	0.0-5.0 FT	19.7	14	18	4	1.4	CL-ML
⊕	SS-1 & SS-2	BULK 5	0.0-5.0 FT	40.1	25	43	18	0.8	CL
⊞	SS-1	S-3	4.0-6.0 FT	19.5	20	32	12	0.0	CL*
⊗	SS-2	S-6	13.0-15.0 FT	10.3	13	21	8	-0.3	CL*

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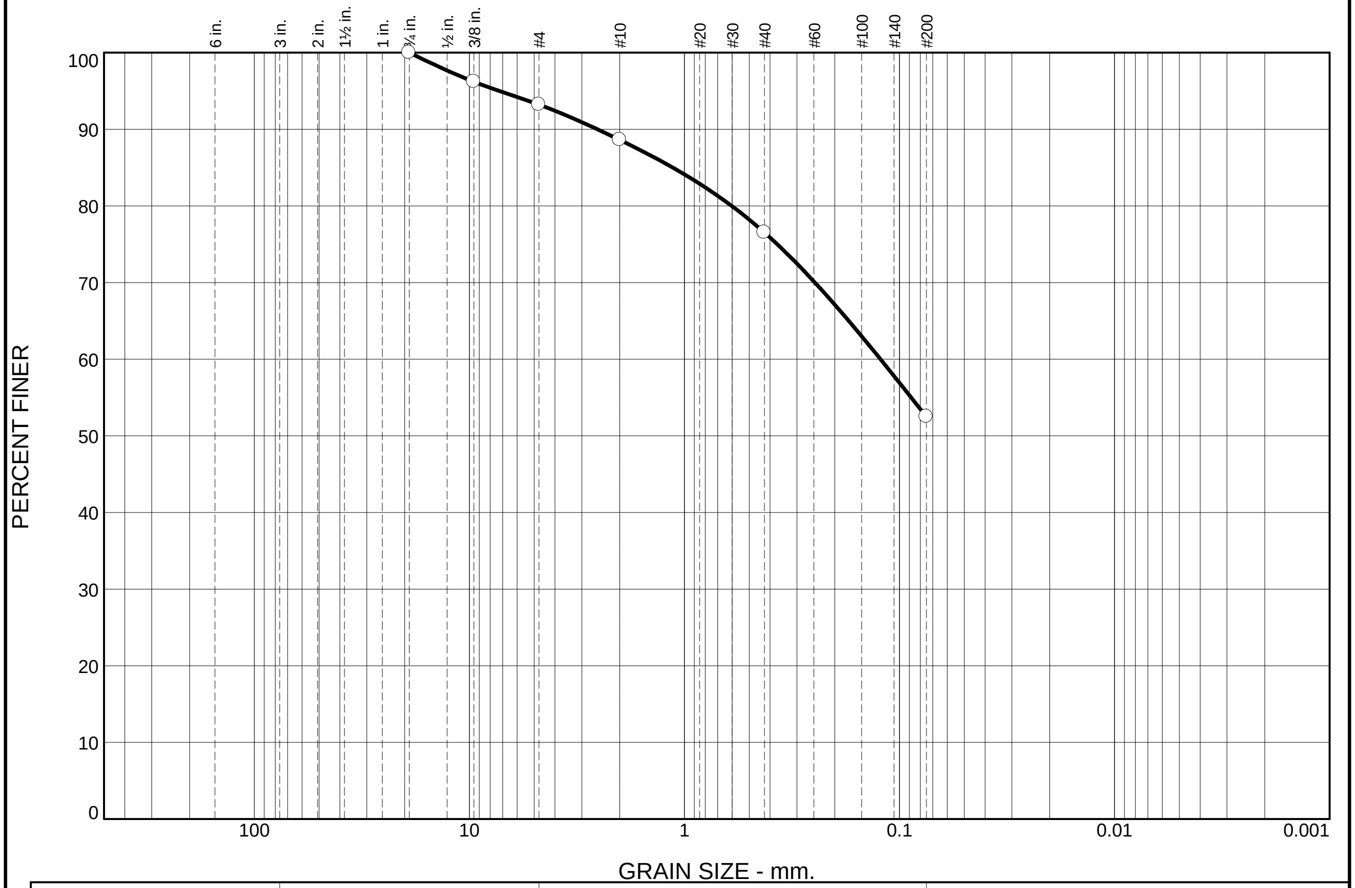
Engineers, Inc.
Mt. Laurel, NJ

Client: CONNECTGEN, LLC
Project: MILL POINT SOLAR PROJECT

Project No.: 411360.GEO1 **Figure** 2

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	6.8	4.6	12.1	24.0	52.5	

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	22	16	1.1328	0.1226						

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ BROWN SANDY SILTY CLAY	05/24/21	CL-ML	16.2

Project No. 411360.GEO1 **Client:** CONNECTGEN, LLC
Project: MILL POINT SOLAR PROJECT

○ **Source of Sample:** B-1 TO B-5 **Sample Number:** BULK

Remarks:
○SAMPLE DESCRIPTION
BASED ON USCS

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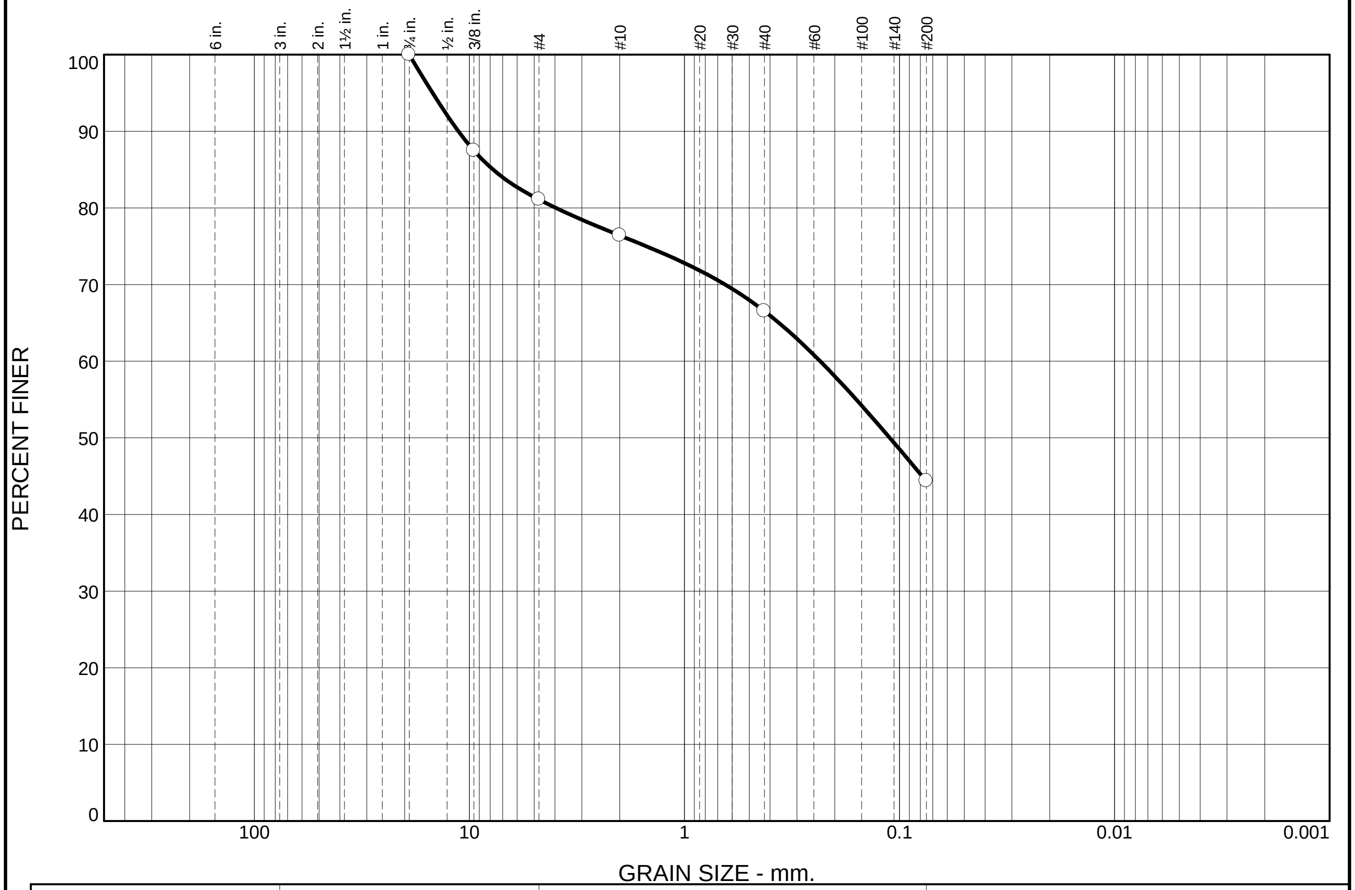
Figure 3

Tested By: CWZ 05/24/21 **Checked By:** JPB 05/28/21

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	18.9	4.7	9.9	22.1	44.4	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			7.7606	0.2338	0.1110					

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ BROWN SILTY SAND WITH GRAVEL	05/24/21	SM	11.6

Project No. 411360.GEO1 **Client:** CONNECTGEN, LLC
Project: MILL POINT SOLAR PROJECT

○ **Source of Sample:** B-4 **Depth:** 4.0-6.0 FT **Sample Number:** S-3

Remarks:
○SAMPLE DESCRIPTION
BASED ON USCS

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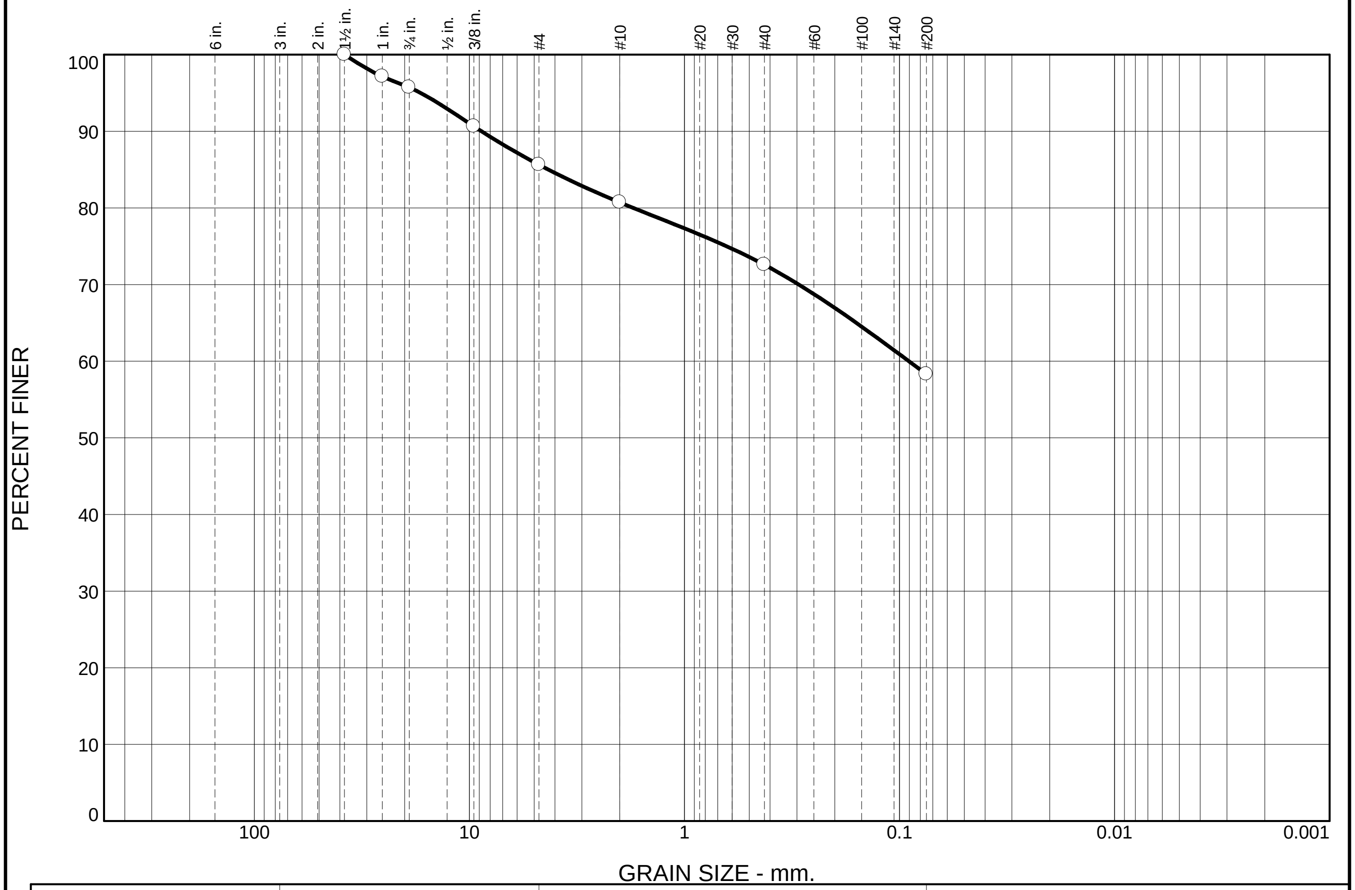
Figure 4

Tested By: CWZ 05/24/21 **Checked By:** JPB 05/28/21

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	4.3	10.1	4.9	8.1	14.3	58.3	

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	34	23	4.2931	0.0904						

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ BROWN SANDY LEAN CLAY	05/24/21	CL	25.7

Project No. 411360.GEO1 **Client:** CONNECTGEN, LLC

Project: MILL POINT SOLAR PROJECT

○ **Source of Sample:** B-6 TO B-8 **Sample Number:** BULK

Remarks:

○SAMPLE DESCRIPTION
BASED ON USCS

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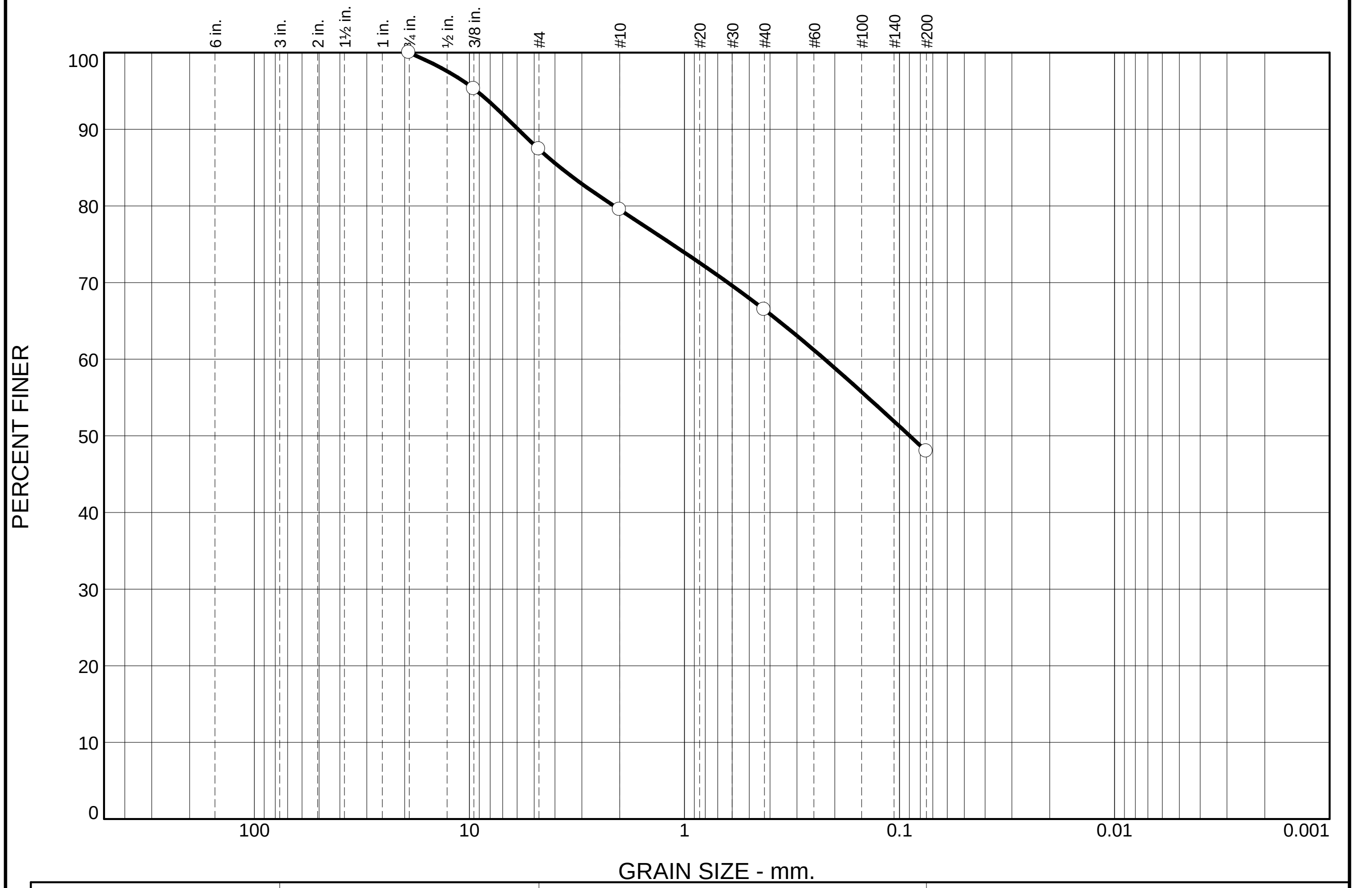
Figure 5

Tested By: CWZ 05/24/21 **Checked By:** JPB 05/28/21

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	12.6	7.9	13.0	18.5	48.0	

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			3.7714	0.2230	0.0896					

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ BROWN SILTY SAND	05/24/21	SM	8.5

Project No. 411360.GEO1 **Client:** CONNECTGEN, LLC
Project: MILL POINT SOLAR PROJECT

○ **Source of Sample:** B-7 **Depth:** 6.0-8.0 FT **Sample Number:** S-4

Remarks:
○SAMPLE DESCRIPTION
BASED ON USCS

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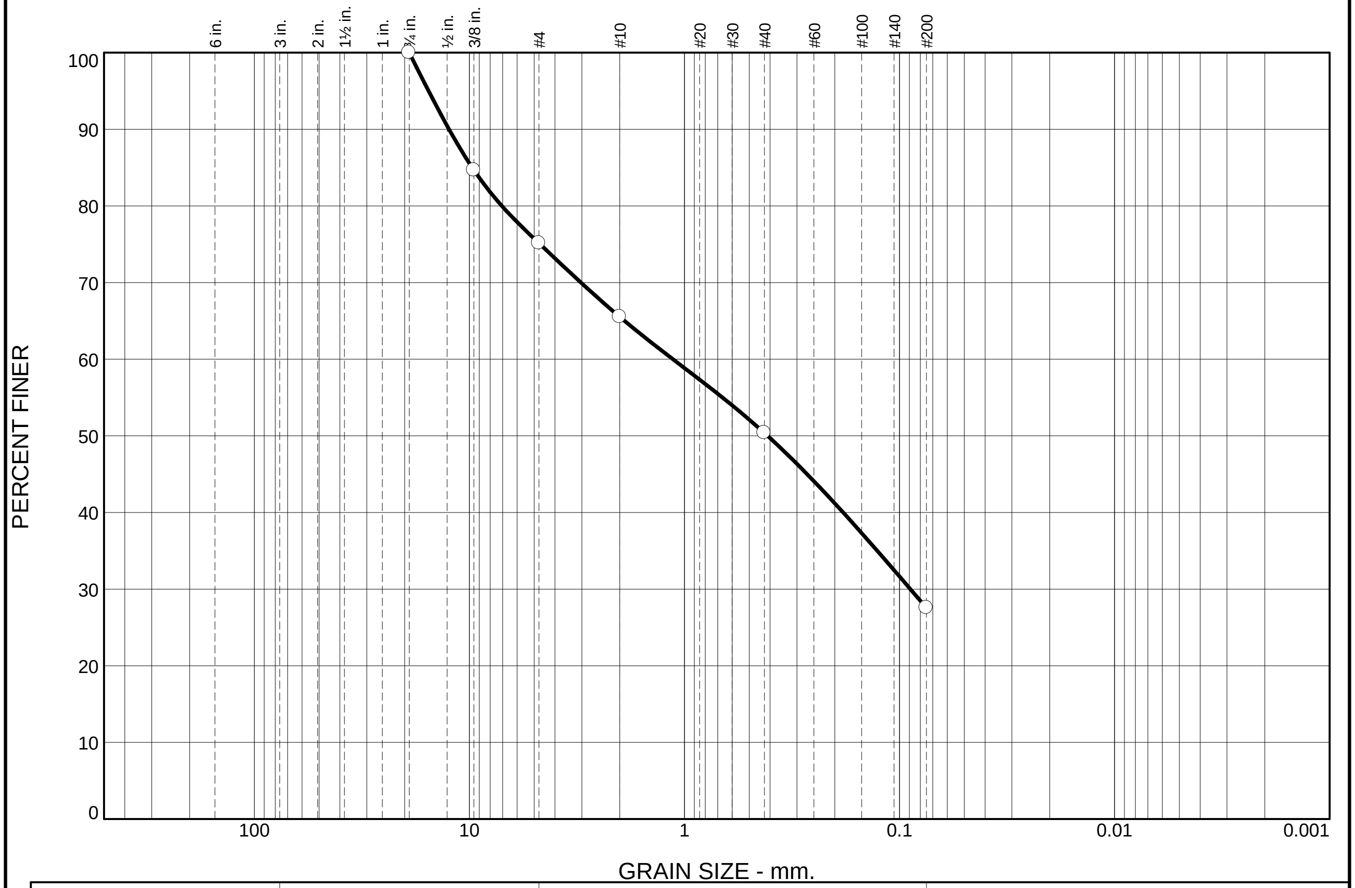
Figure 6

Tested By: CWZ 05/24/21 **Checked By:** JPB 05/28/21

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	24.9	9.6	15.1	22.8	27.6	

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			9.7063	1.1310	0.4104	0.0890				

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ BROWN SILTY SAND WITH GRAVEL	05/24/21	SM	12.9

Project No. 411360.GEO1 **Client:** CONNECTGEN, LLC

Project: MILL POINT SOLAR PROJECT

○ **Source of Sample:** B-8 **Depth:** 6.0-8.0 FT **Sample Number:** S-4

Remarks:

○SAMPLE DESCRIPTION BASED ON USCS

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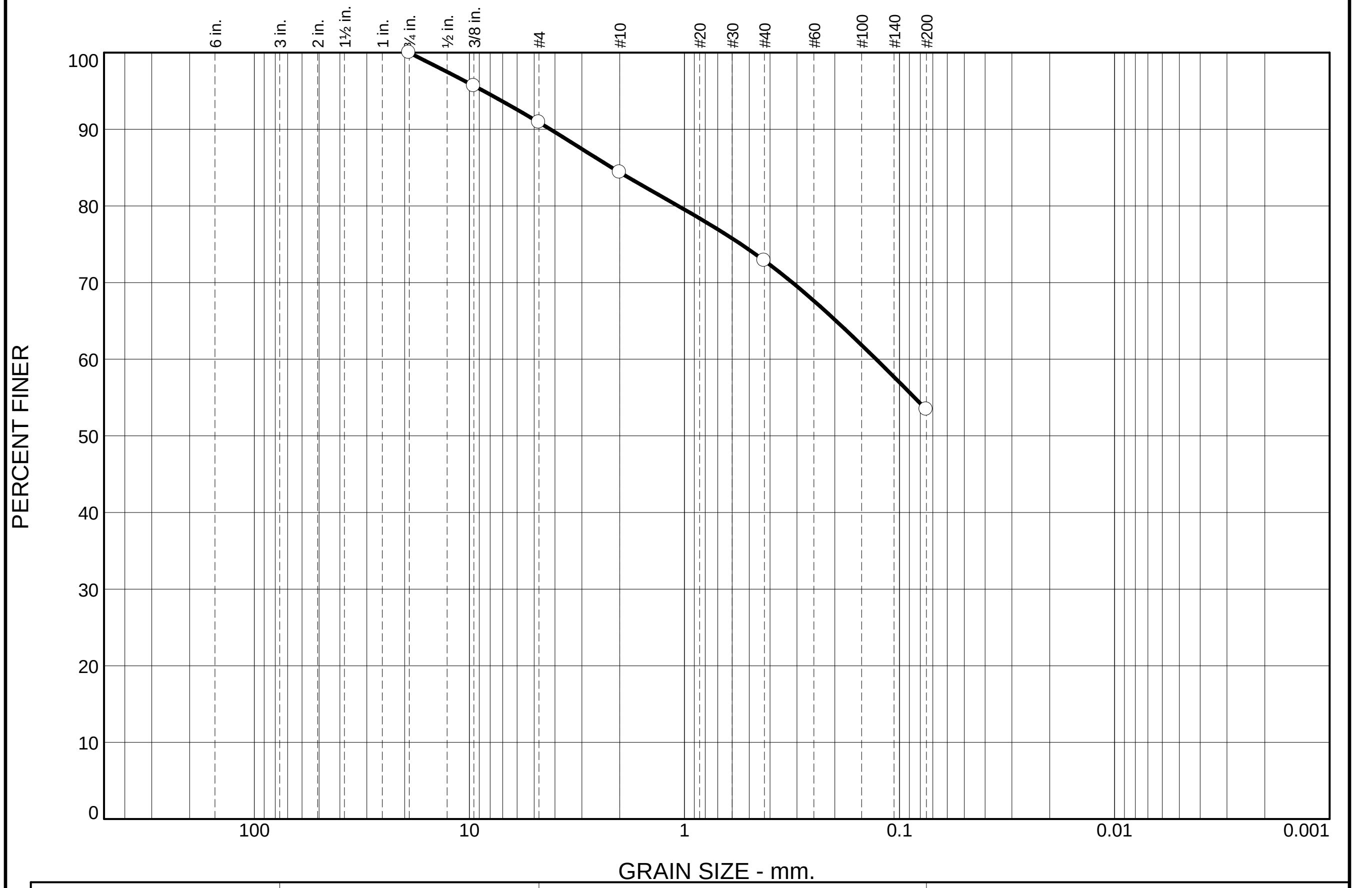
Figure 7

Tested By: CWZ 05/24/21 **Checked By:** JPB 05/28/21

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	9.1	6.5	11.5	19.5	53.4	

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	20	14	2.1735	0.1285						

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ BROWN SANDY SILTY CLAY	05/28/21	CL-ML	12.0

Project No. 411360.GEO1 **Client:** CONNECTGEN, LLC
Project: MILL POINT SOLAR PROJECT

○ **Source of Sample:** B-9 TO B-14 **Sample Number:** BULK

Remarks:
○SAMPLE DESCRIPTION
BASED ON USCS

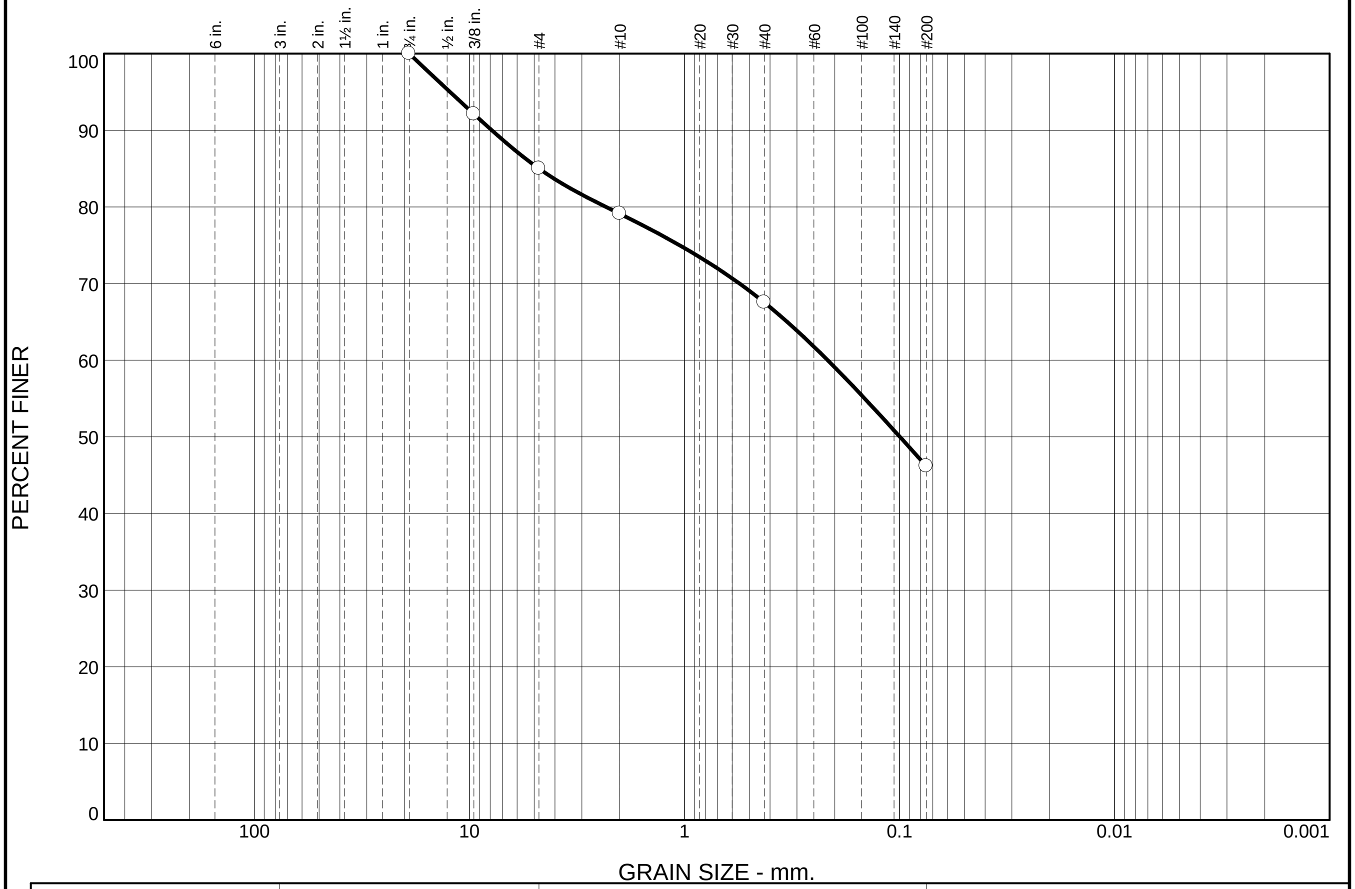
TRC Engineers, Inc.

Mt. Laurel, NJ

Figure 8

Tested By: CWZ 05/28/21 **Checked By:** JPB 06/04/21

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	15.0	5.9	11.6	21.3	46.2	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			4.7464	0.2157	0.0996					

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ BROWN SILTY SAND WITH GRAVEL	05/24/21	SM	12.3

Project No. 411360.GEO1 **Client:** CONNECTGEN, LLC
Project: MILL POINT SOLAR PROJECT

○ **Source of Sample:** B-9 **Depth:** 6.0-8.0 FT **Sample Number:** S-4

Remarks:
○SAMPLE DESCRIPTION
BASED ON USCS

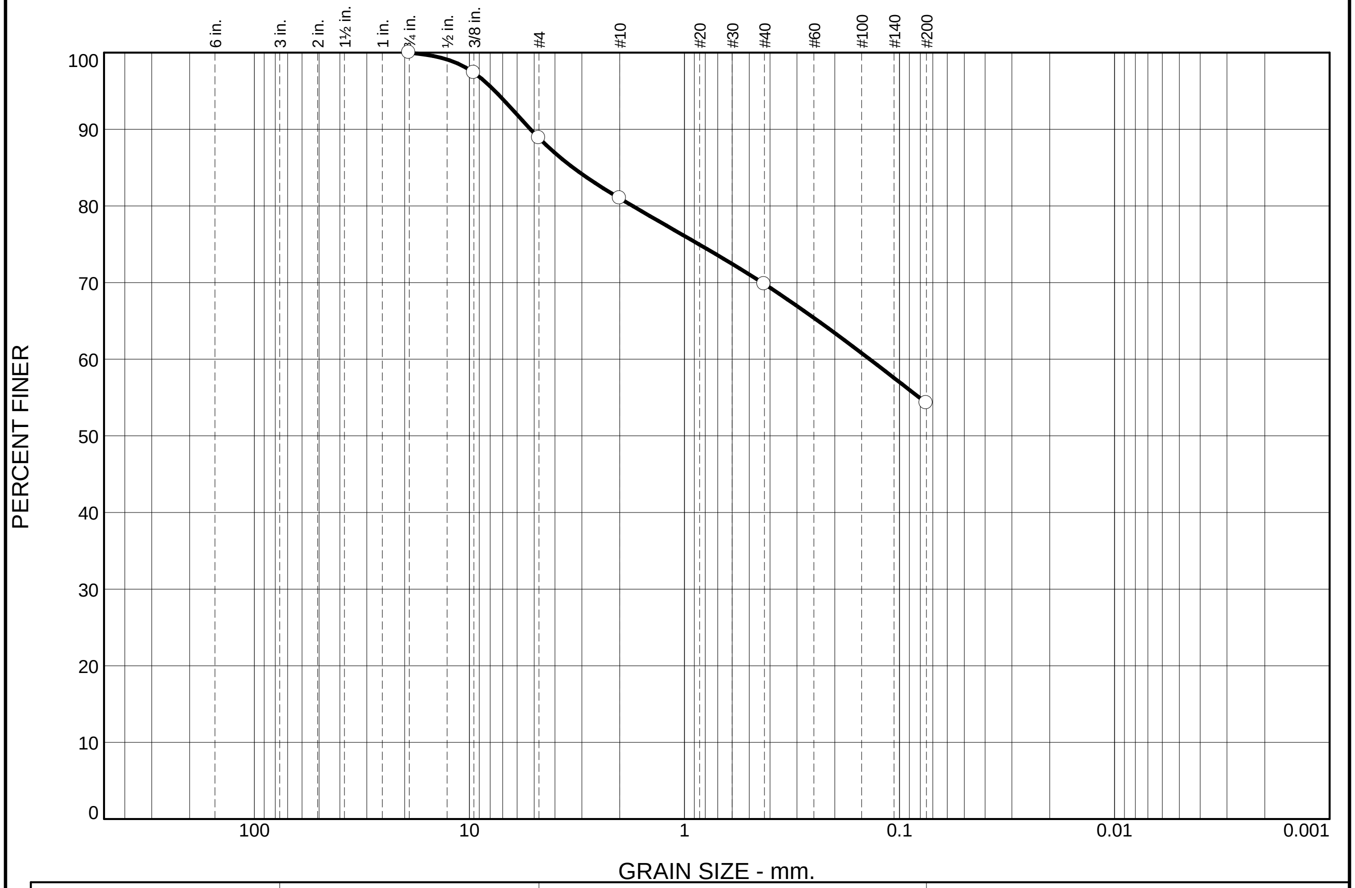
TRC Engineers, Inc.

Mt. Laurel, NJ

Figure 9

Tested By: CWZ 05/24/21 **Checked By:** JPB 05/28/21

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	11.1	7.9	11.2	15.5	54.3	

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			3.2965	0.1376						

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ BROWN SANDY SILT	05/24/21	ML	10.6

Project No. 411360.GEO1 **Client:** CONNECTGEN, LLC

Project: MILL POINT SOLAR PROJECT

○ **Source of Sample:** B-12 **Depth:** 6.0-8.0 FT **Sample Number:** S-4

Remarks:

○SAMPLE DESCRIPTION
BASED ON USCS

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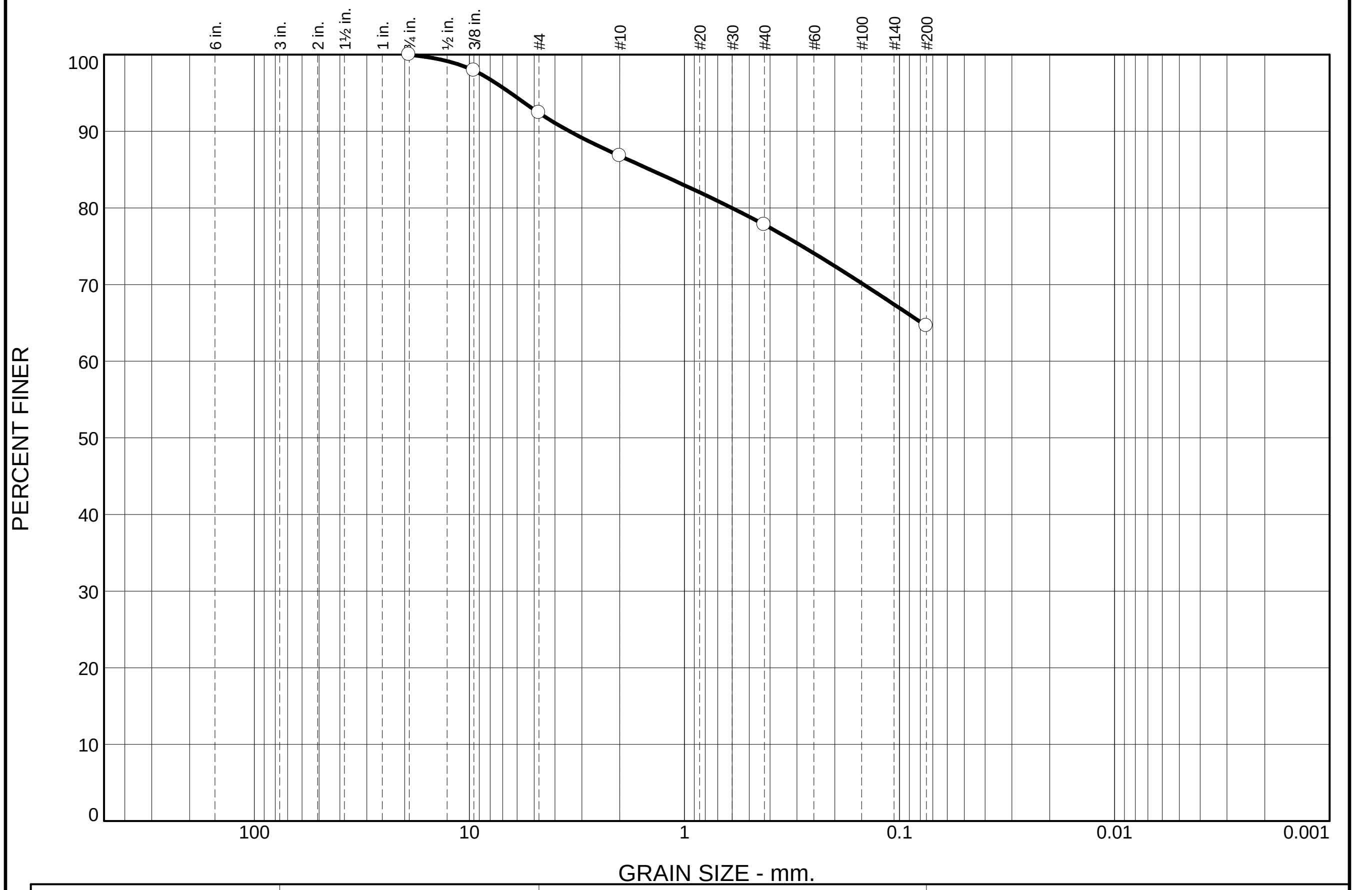
Figure 10

Tested By: CWZ 05/24/21 **Checked By:** JPB 05/28/21

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	7.6	5.6	9.0	13.2	64.6	

╳	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			1.4451							

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ BROWN SANDY SILT	05/24/21	ML	10.6

Project No. 411360.GEO1 **Client:** CONNECTGEN, LLC

Project: MILL POINT SOLAR PROJECT

○ **Source of Sample:** B-12 **Depth:** 13.0-15.0 FT **Sample Number:** S-6

Remarks:

○SAMPLE DESCRIPTION
BASED ON USCS

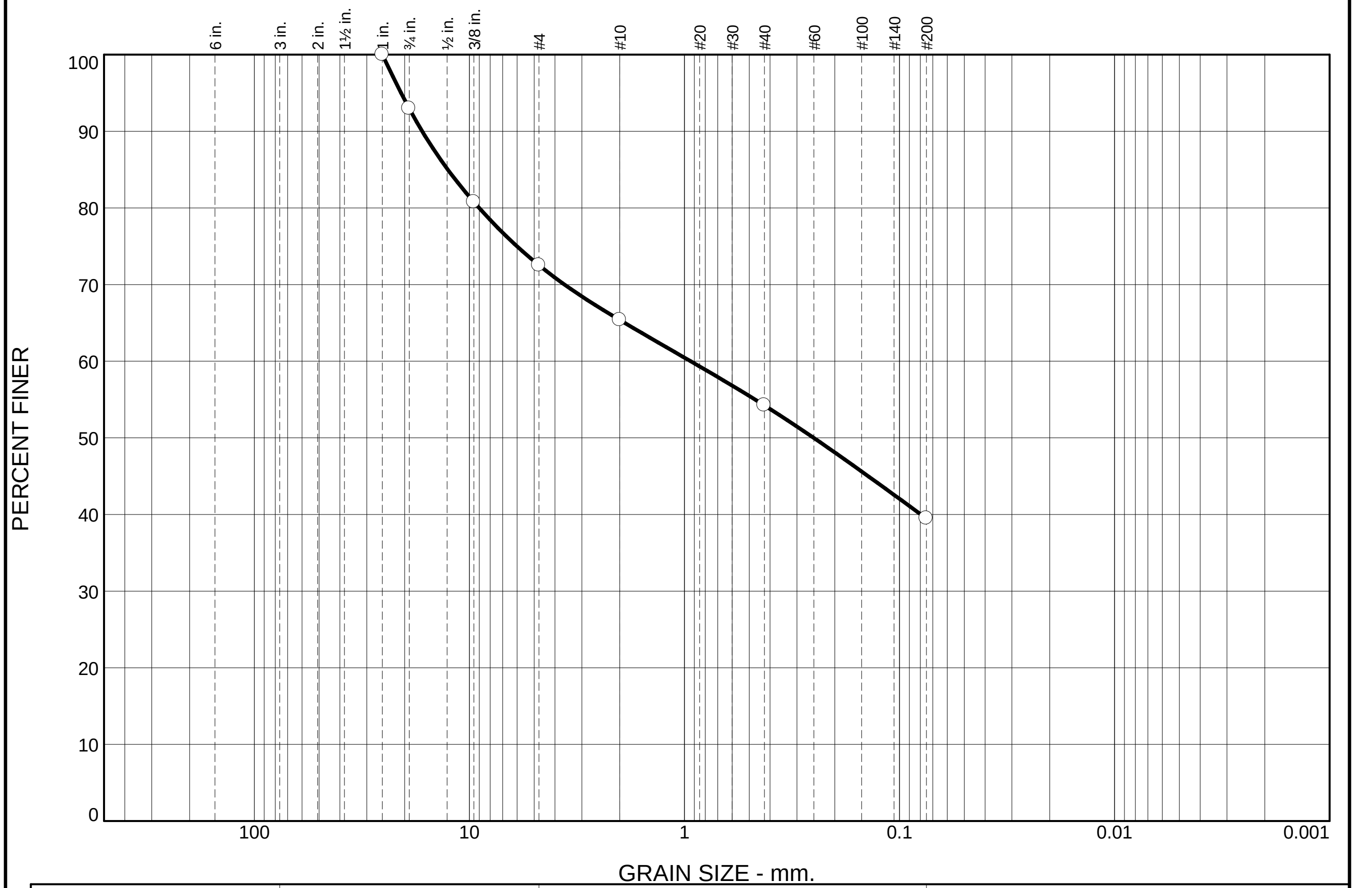
TRC Engineers, Inc.

Mt. Laurel, NJ

Figure 11

Tested By: CWZ 05/24/21 **Checked By:** JPB 05/28/21

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	7.0	20.5	7.1	11.2	14.7	39.5	

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			12.6024	0.9361	0.2507					

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ DARK BROWN TO BLACK SILTY SAND WITH GRAVEL	05/24/21	SM	6.6

Project No. 411360.GEO1 **Client:** CONNECTGEN, LLC

Project: MILL POINT SOLAR PROJECT

○ **Source of Sample:** B-15 **Depth:** 13.0-15.0 FT **Sample Number:** S-6

Remarks:

○SAMPLE DESCRIPTION BASED ON USCS

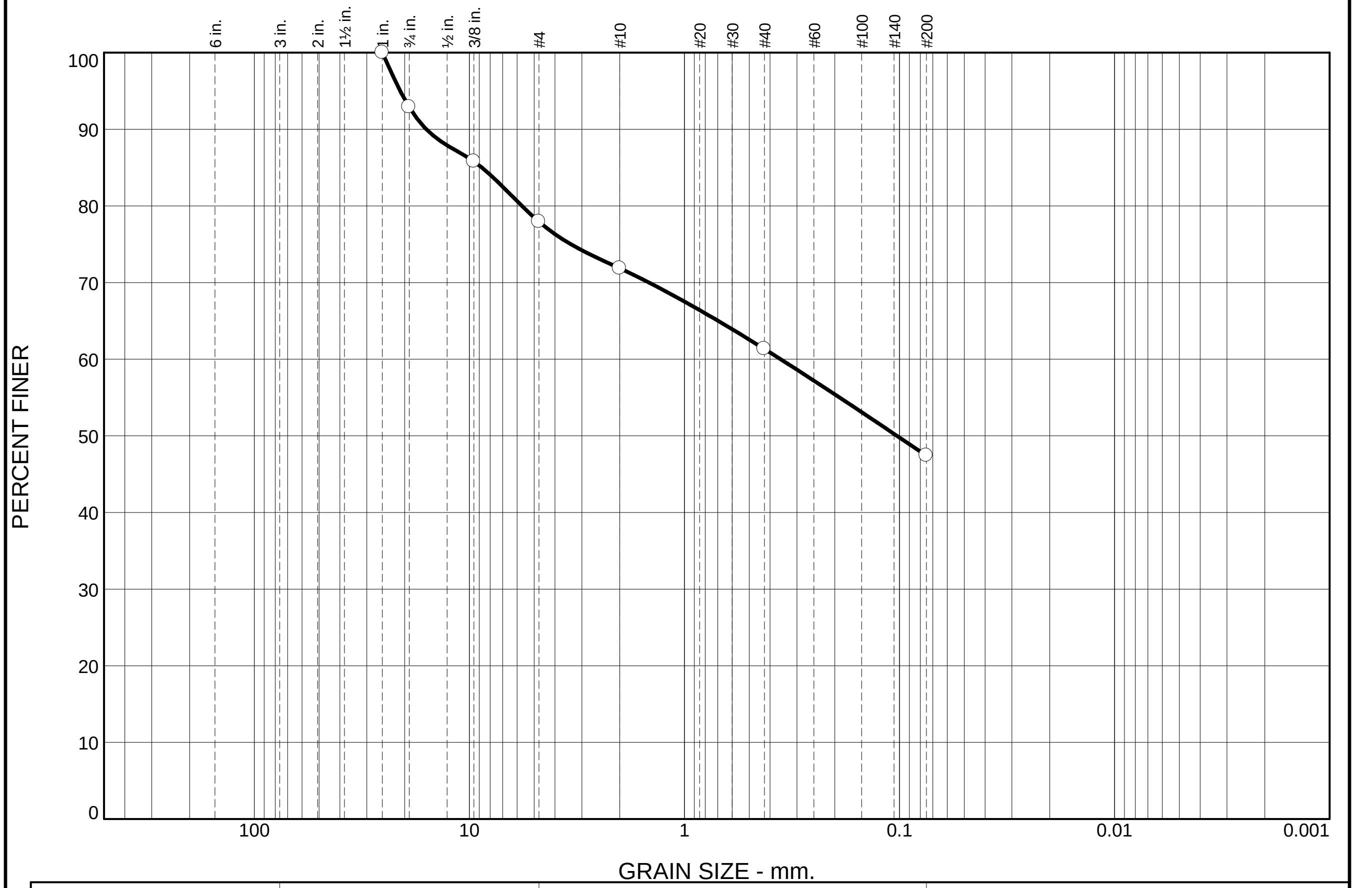
TRC Engineers, Inc.

Mt. Laurel, NJ

Figure 12

Tested By: CWZ 05/24/21 **Checked By:** JPB 05/28/21

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	7.1	15.0	6.0	10.6	13.9	47.4	

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			8.7438	0.3574	0.1027					

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ BROWN SILTY SAND WITH GRAVEL	05/24/21	SM	8.9

Project No. 411360.GEO1 **Client:** CONNECTGEN, LLC
Project: MILL POINT SOLAR PROJECT

○ **Source of Sample:** B-16 **Depth:** 8.0-10.0 FT **Sample Number:** S-5

Remarks:
○SAMPLE DESCRIPTION
BASED ON USCS

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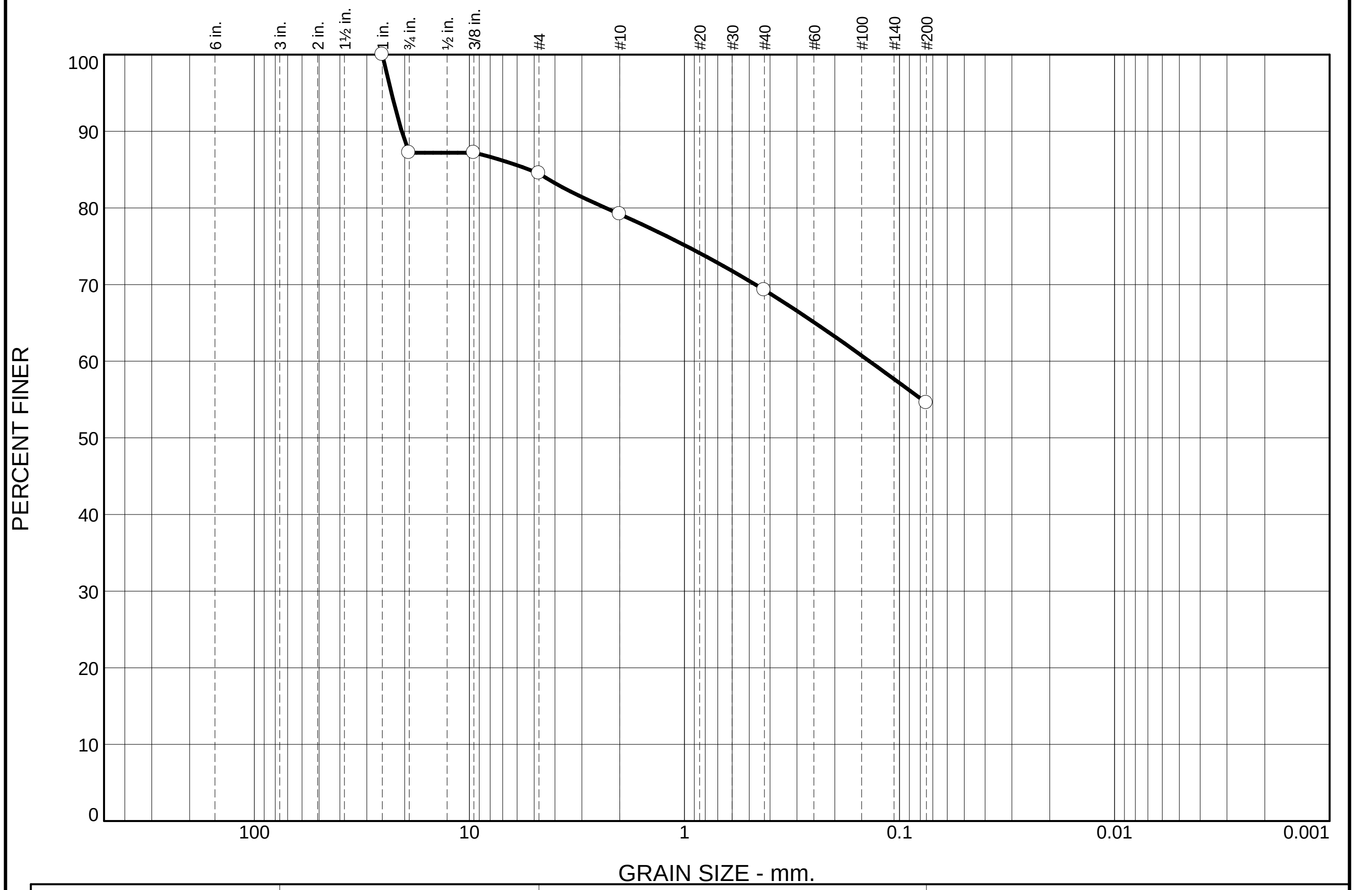
Figure 13

Tested By: CWZ 05/24/21 **Checked By:** JPB 05/28/21

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	12.8	2.7	5.3	9.9	14.7	54.6	

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			5.2677	0.1379						

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ BROWN SANDY SILT WITH GRAVEL	05/24/21	ML	22.7

Project No. 411360.GEO1 **Client:** CONNECTGEN, LLC

Project: MILL POINT SOLAR PROJECT

○ **Source of Sample:** B-21 **Depth:** 4.0-6.0 FT **Sample Number:** S-3

Remarks:
○SAMPLE DESCRIPTION
BASED ON USCS

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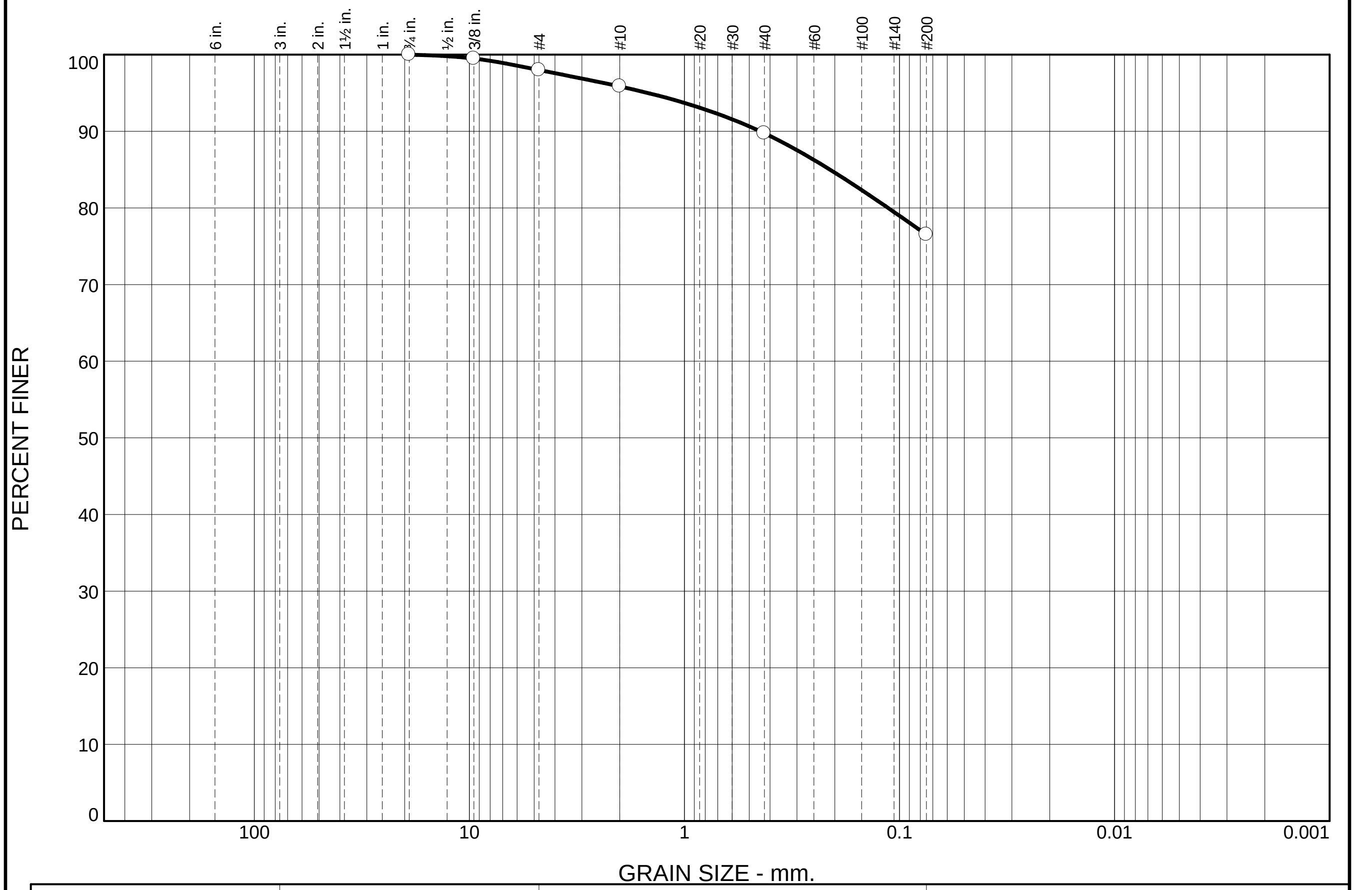
Figure 14

Tested By: CWZ 05/24/21 **Checked By:** JPB 05/28/21

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	2.0	2.1	6.2	13.2	76.5	

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	18	14	0.2107							

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ BROWN SILTY CLAY WITH SAND	05/28/21	CL-ML	19.7

Project No. 411360.GEO1 **Client:** CONNECTGEN, LLC
Project: MILL POINT SOLAR PROJECT

○ **Source:** B-22 TO B-29 **Depth:** 0.0-5.0 FT **Sample No.:** BULK 4

Remarks:
○SAMPLE DESCRIPTION
BASED ON USCS

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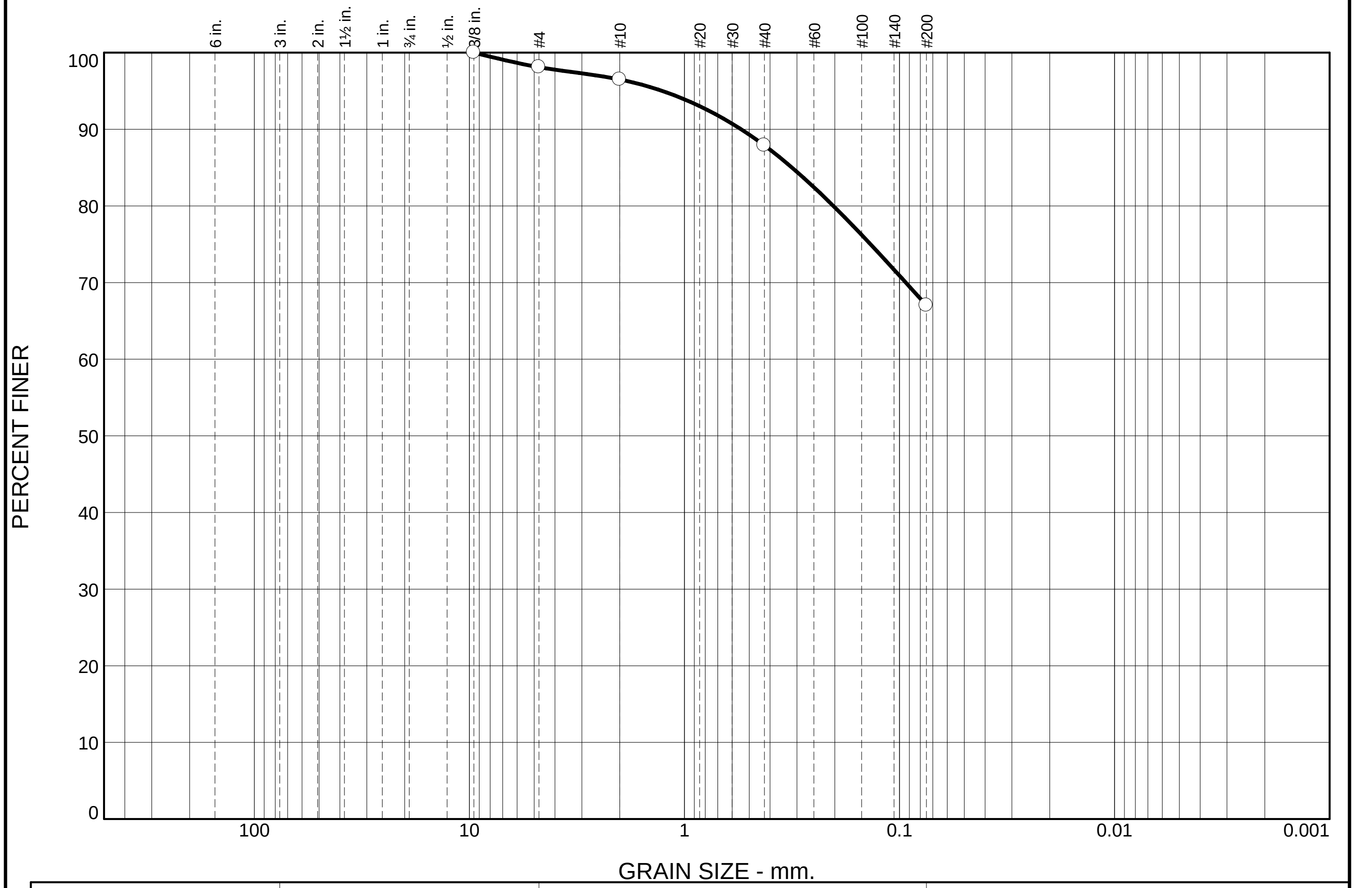
Figure 15

Tested By: CWZ 05/28/21 **Checked By:** JPB 06/04/21

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	1.9	1.6	8.6	20.9	67.0	

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.3161							

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ BROWN SANDY SILT	05/24/21	ML	31.4

Project No. 411360.GEO1 **Client:** CONNECTGEN, LLC
Project: MILL POINT SOLAR PROJECT

○ **Source of Sample:** B-25 **Depth:** 4.0-6.0 FT **Sample Number:** S-3

Remarks:
○SAMPLE DESCRIPTION
BASED ON USCS

TRC Engineers, Inc.

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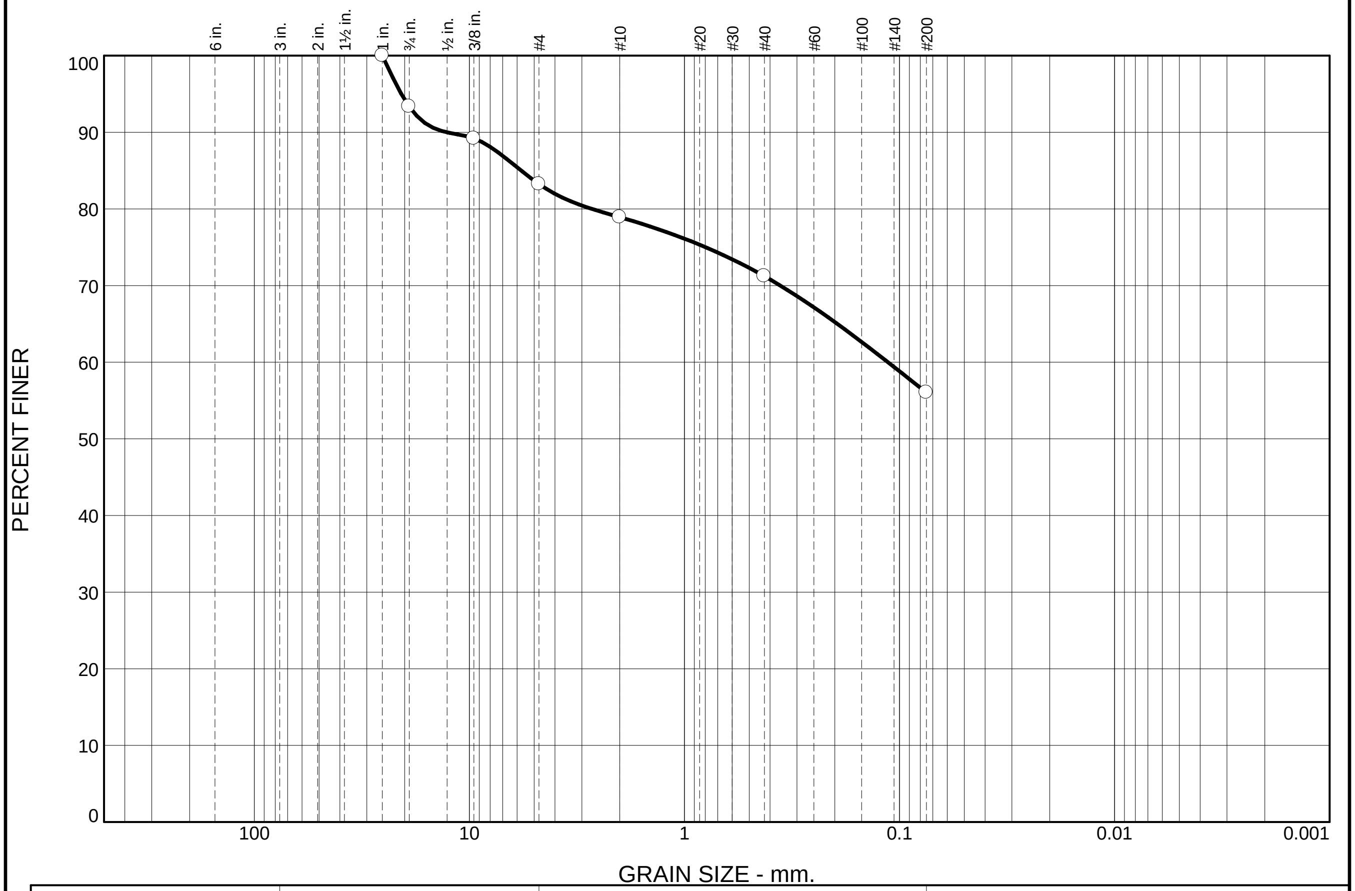
Figure 16

Tested By: CWZ 05/24/21 **Checked By:** JPB 05/28/21

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	6.6	10.2	4.3	7.7	15.2	56.0	

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			5.7390	0.1132						

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ BROWN SANDY SILT WITH GRAVEL	05/24/21	ML	17.9

Project No. 411360.GEO1 **Client:** CONNECTGEN, LLC

Project: MILL POINT SOLAR PROJECT

○ **Source of Sample:** B-27 **Depth:** 6.0-8.0 FT **Sample Number:** S-4

Remarks:

○SAMPLE DESCRIPTION
BASED ON USCS

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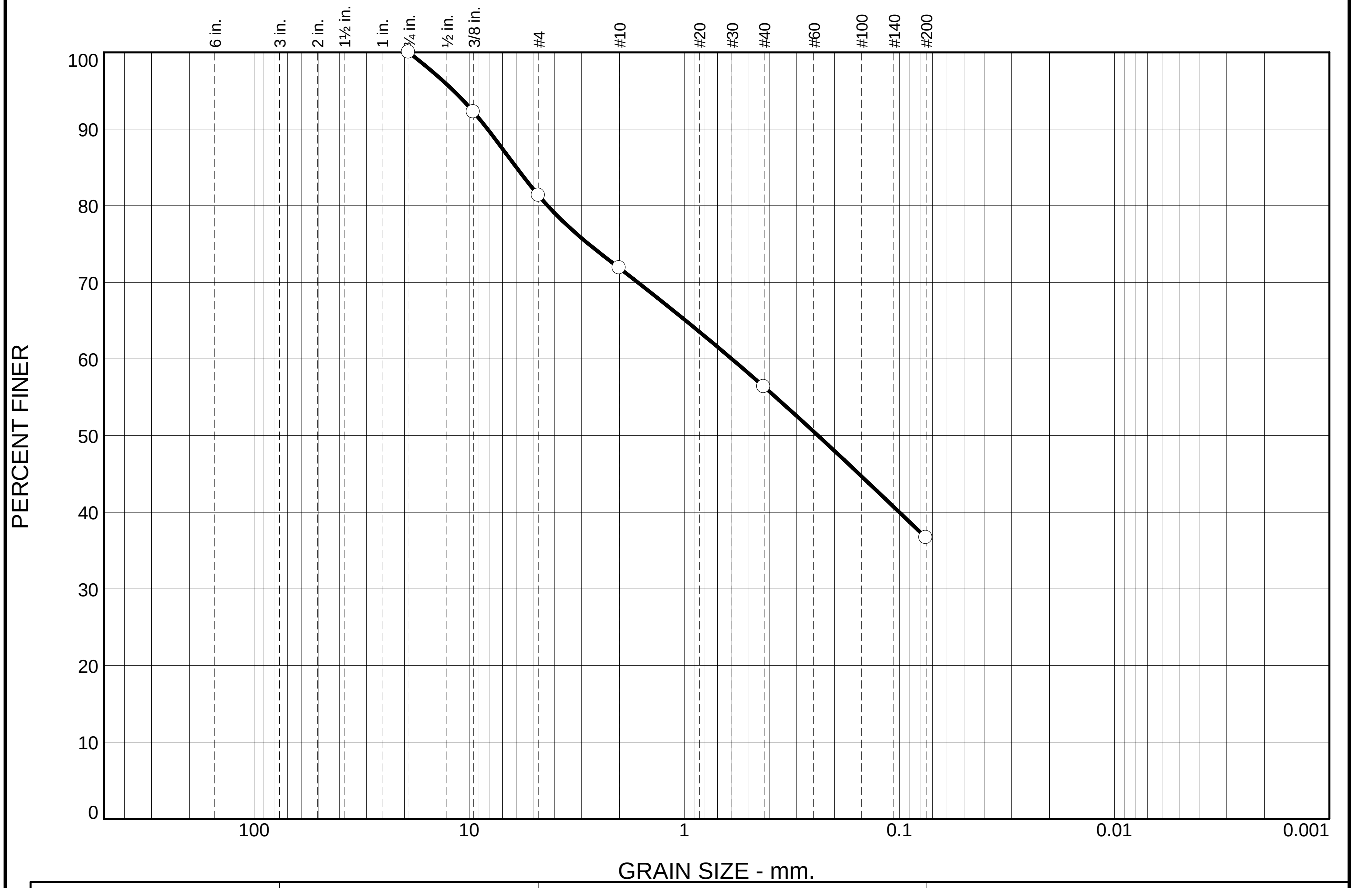
Mt. Laurel, NJ

Figure 17

Tested By: CWZ 05/24/21 **Checked By:** JPB 05/28/21

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	18.7	9.5	15.4	19.7	36.7	

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			6.0299	0.6005	0.2386					

	MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○	DARK BROWN TO BLACK SILTY SAND WITH GRAVEL	05/24/21	SM	5.4

Project No. 411360.GEO1 **Client:** CONNECTGEN, LLC
Project: MILL POINT SOLAR PROJECT

○ **Source of Sample:** B-29 **Depth:** 8.0-9.4 FT **Sample Number:** S-5

Remarks:
○SAMPLE DESCRIPTION BASED ON USCS

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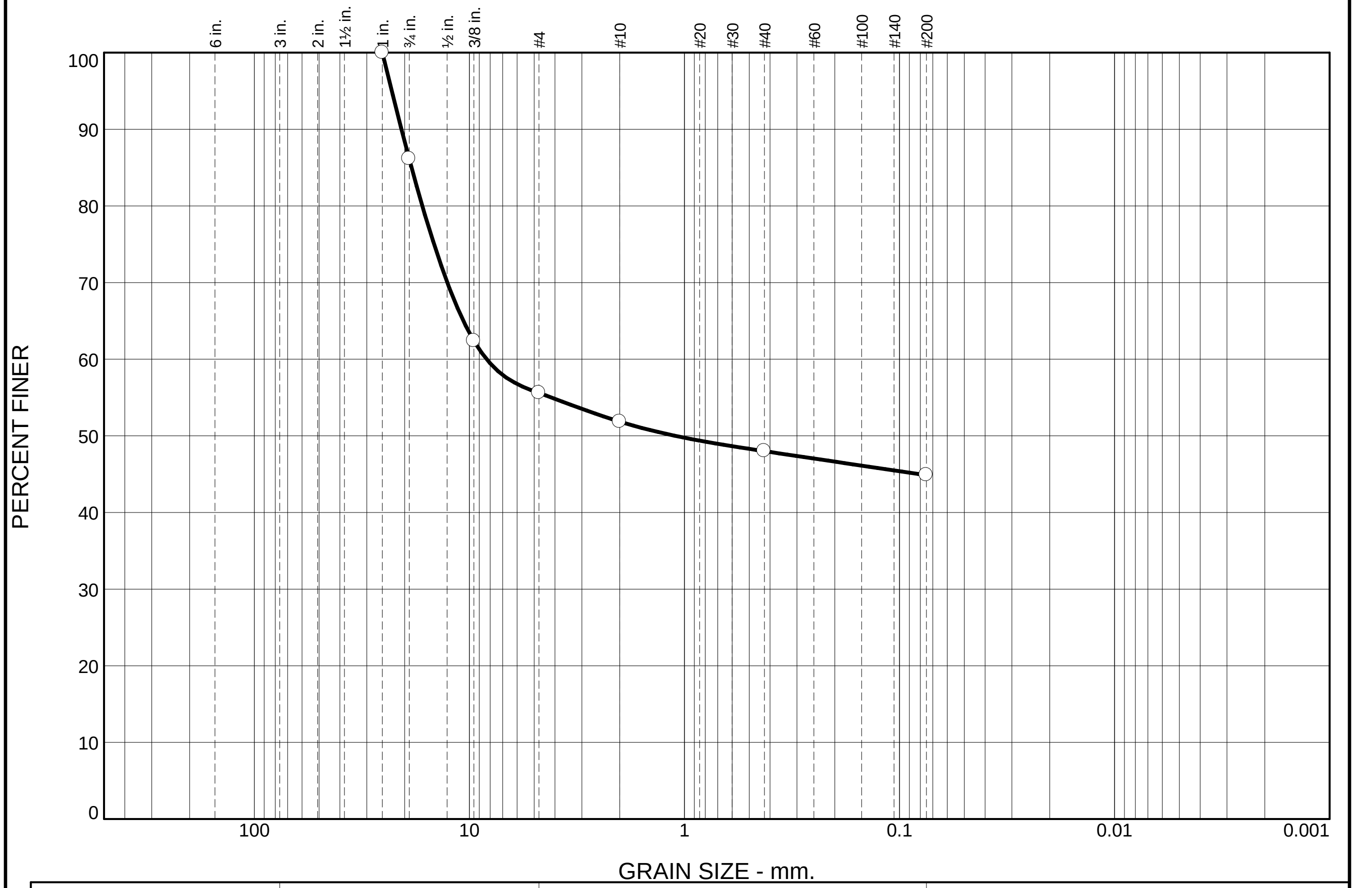
Figure 18

Tested By: CWZ 05/24/21 **Checked By:** JPB 05/28/21

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	13.8	30.6	3.7	3.9	3.1	44.9	

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			18.5696	8.3194	1.1026					

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ BROWN SILTY GRAVEL	05/24/21	GM	31.9

Project No. 411360.GEO1 **Client:** CONNECTGEN, LLC
Project: MILL POINT SOLAR PROJECT

○ **Source of Sample:** B-30 **Depth:** 4.0-6.0 FT **Sample Number:** S-3

Remarks:
○SAMPLE DESCRIPTION
BASED ON USCS

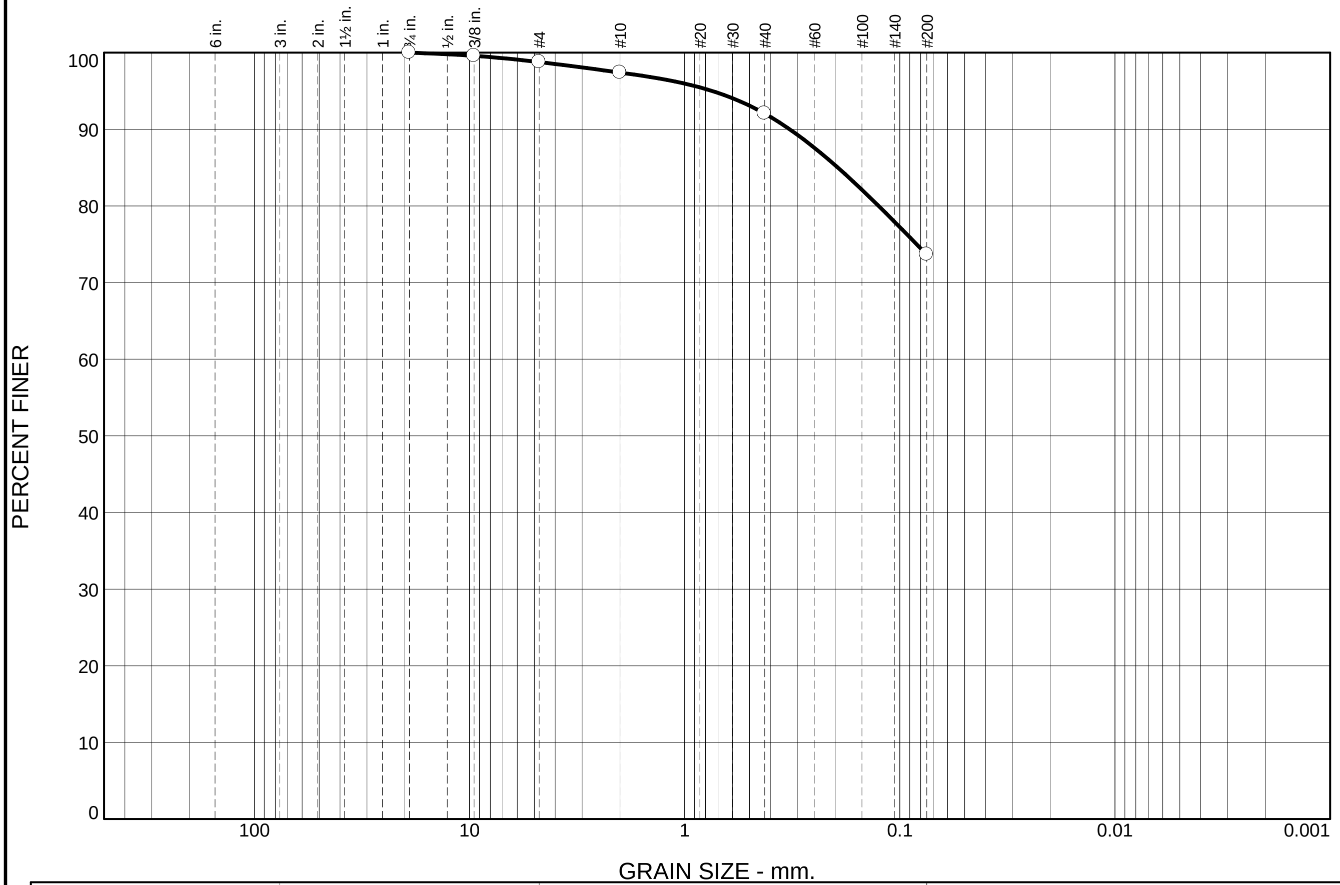
TRC Engineers, Inc.

Mt. Laurel, NJ

Figure 19

Tested By: CWZ 05/24/21 **Checked By:** JPB 05/28/21

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	1.2	1.4	5.3	18.4	73.7	

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	43	25	0.1942							

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ BROWN CLAY WITH SAND	05/27/21	CL	40.1

Project No. 411360.GEO1 **Client:** CONNECTGEN, LLC

Project: MILL POINT SOLAR PROJECT

○ **Source:** SS-1 & SS-2 **Depth:** 0.0-5.0 FT **Sample No.:** BULK 5

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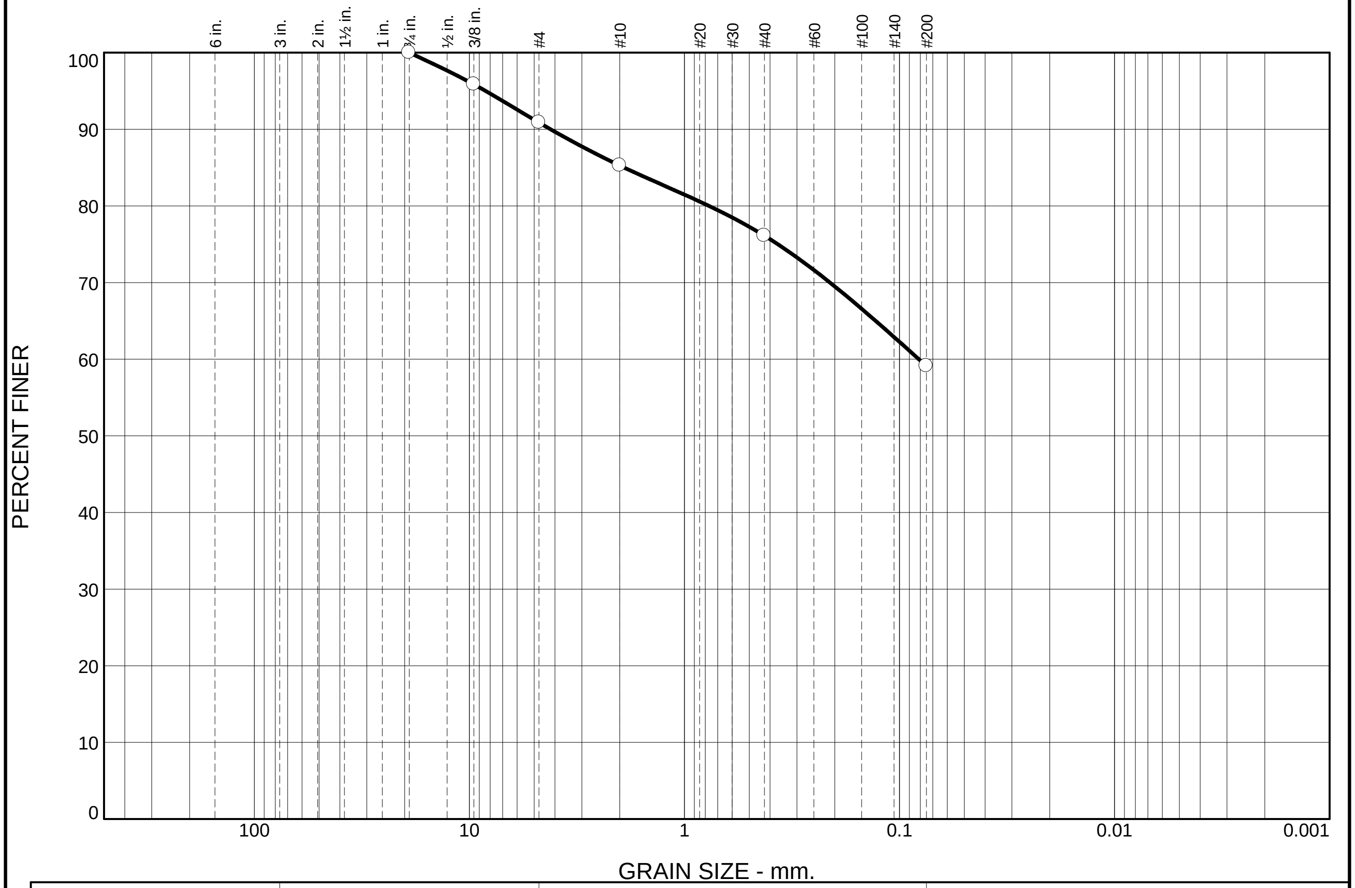
Remarks:

○SAMPLE DESCRIPTION
BASED ON USCS

Figure 20

Tested By: CWZ 05/27/21 **Checked By:** JPB 06/04/21

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	9.1	5.6	9.2	17.0	59.1	

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			1.9078	0.0813						

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ DARK BROWN SANDY SILT	05/24/21	ML	9.6

Project No. 411360.GEO1 **Client:** CONNECTGEN, LLC
Project: MILL POINT SOLAR PROJECT

○ **Source of Sample:** SS-1 **Depth:** 13.5-15.0 FT **Sample Number:** S-6

Remarks:
○SAMPLE DESCRIPTION
BASED ON USCS

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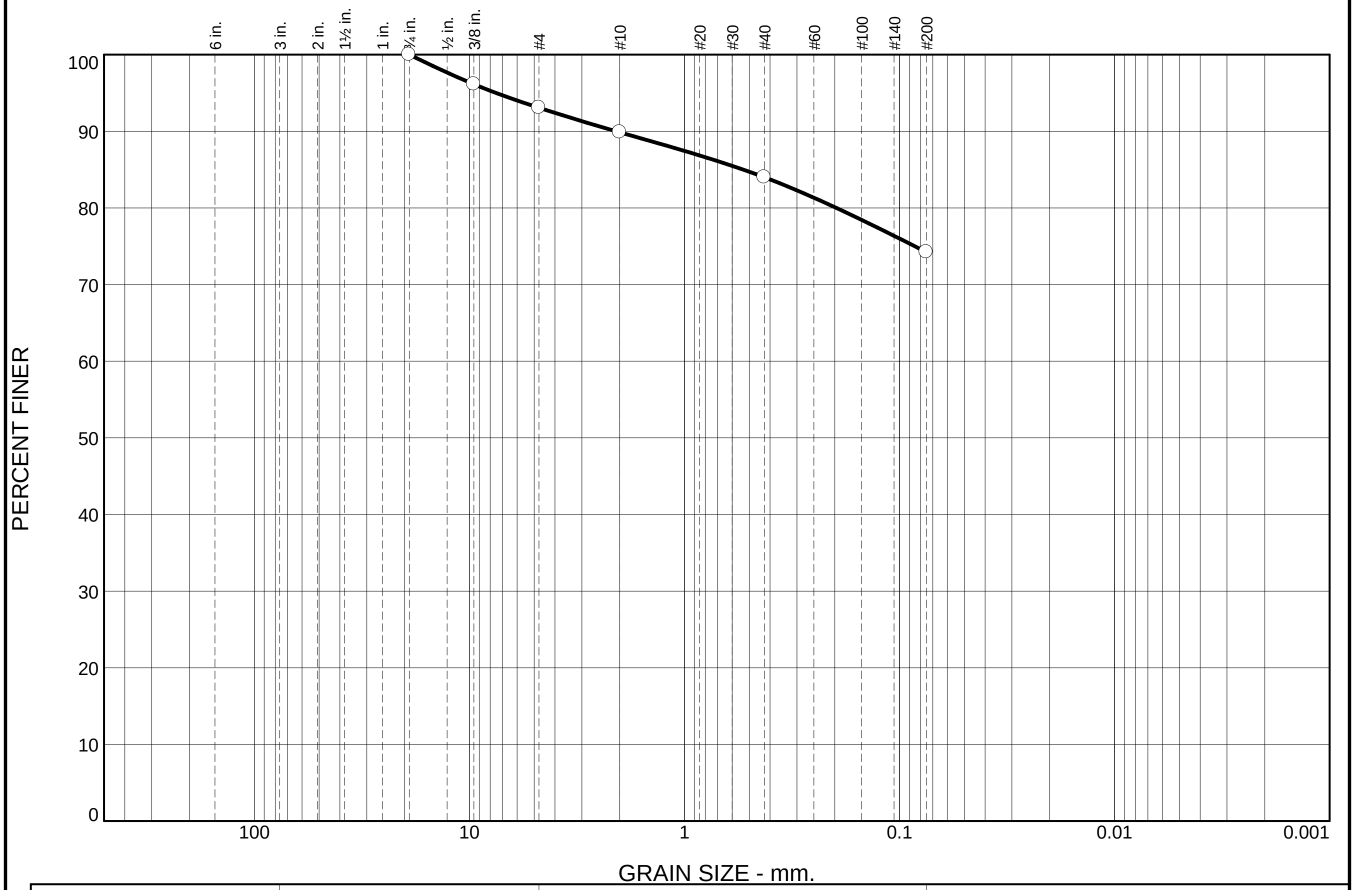
Figure 21

Tested By: CWZ 05/24/21 **Checked By:** JPB 05/28/21

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	6.9	3.2	5.9	9.8	74.2	

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.5328							

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ DARK BROWN SILTY CLAY WITH SAND	05/24/21	CL-ML	14.5

Project No. 411360.GEO1 **Client:** CONNECTGEN, LLC
Project: MILL POINT SOLAR PROJECT

○ **Source of Sample:** SS-1 **Depth:** 23.0-25.0 FT **Sample Number:** S-8

Remarks:
○SAMPLE DESCRIPTION
BASED ON USCS

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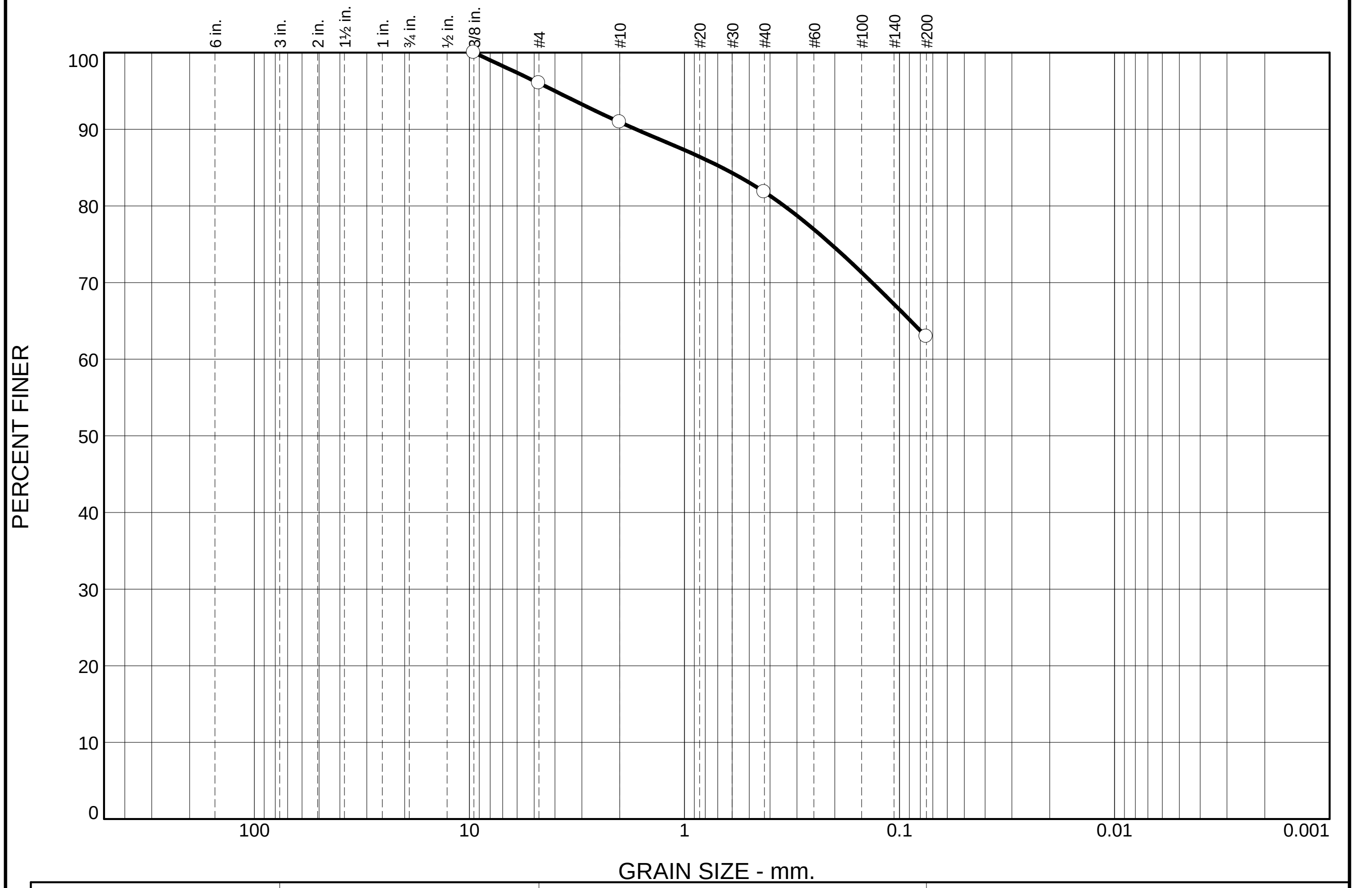
Figure 22

Tested By: CWZ 05/27/21 **Checked By:** JPB 05/28/21

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	4.0	5.1	9.1	18.9	62.9	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.6686							

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ BROWN SANDY SILT	05/24/21	ML	12.4

Project No. 411360.GEO1 **Client:** CONNECTGEN, LLC

Project: MILL POINT SOLAR PROJECT

○ **Source of Sample:** SS-2 **Depth:** 6.0-8.0 FT **Sample Number:** S-4

Remarks:

○SAMPLE DESCRIPTION BASED ON USCS

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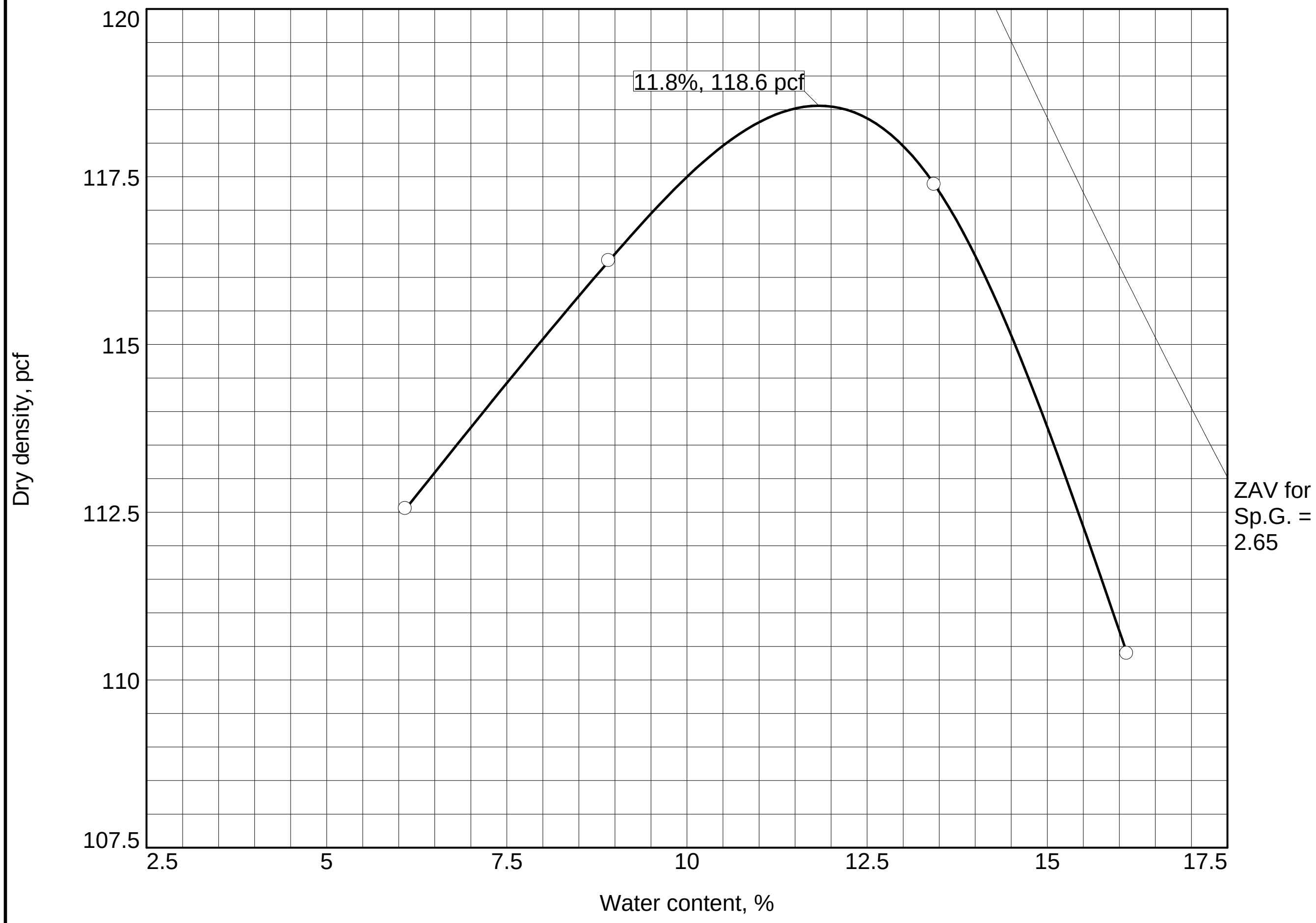
Figure 23

Tested By: CWZ 05/24/21 **Checked By:** JPB 05/28/21

COMPACTION TEST REPORT



Test specification: ASTM D 698-12 Method B Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	**AASHTO**						
	CL-ML	A-4(0)	16.2		22	6	3.8	52.5

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 118.6 pcf Optimum moisture = 11.8 %	BROWN SANDY SILTY CLAY

Project No. 411360.GEO1 **Client:** CONNECTGEN, LLC
Project: MILL POINT SOLAR PROJECT

○**Source of Sample:** B-1 TO B-5 **Sample Number:** BULK

Remarks:
SAMPLE DESCRIPTION BASED ON USCS

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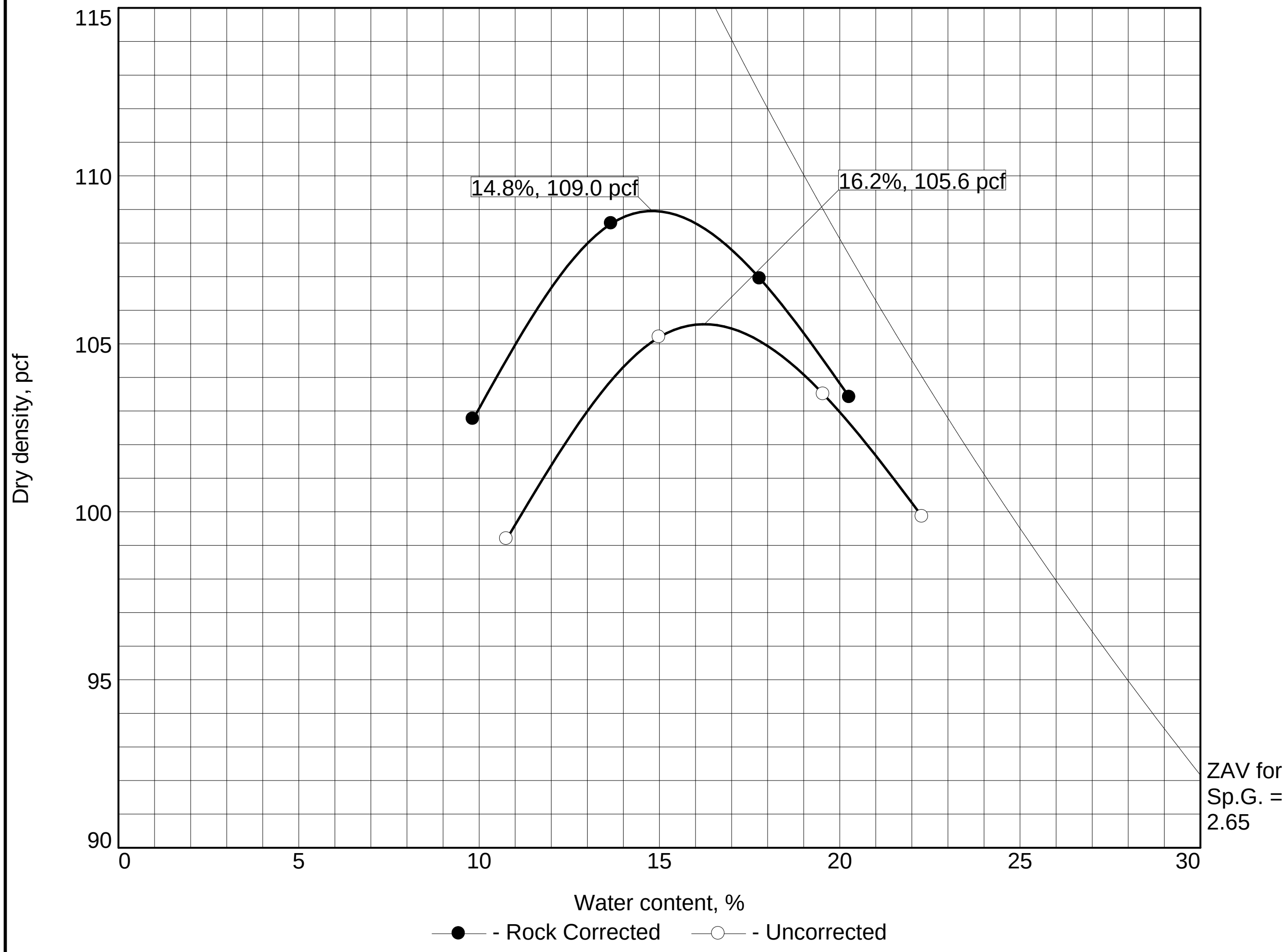
Figure 24

Tested By: CWZ 05/17/21

COMPACTION TEST REPORT



Test specification: ASTM D 698-12 Method B Standard
ASTM D4718-15 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
	CL	A-6(4)	25.7		34	11	9.4	58.3

ROCK CORRECTED TEST RESULTS	UNCORRECTED
Maximum dry density = 109.0 pcf	105.6 pcf
Optimum moisture = 14.8 %	16.2 %

MATERIAL DESCRIPTION

BROWN SANDY LEAN CLAY

Project No. 411360.GEO1 **Client:** CONNECTGEN, LLC
Project: MILL POINT SOLAR PROJECT

○**Source of Sample:** B-6 TO B-8 **Sample Number:** BULK

Remarks:
SAMPLE DESCRIPTION BASED ON USCS

TRC Engineers, Inc.

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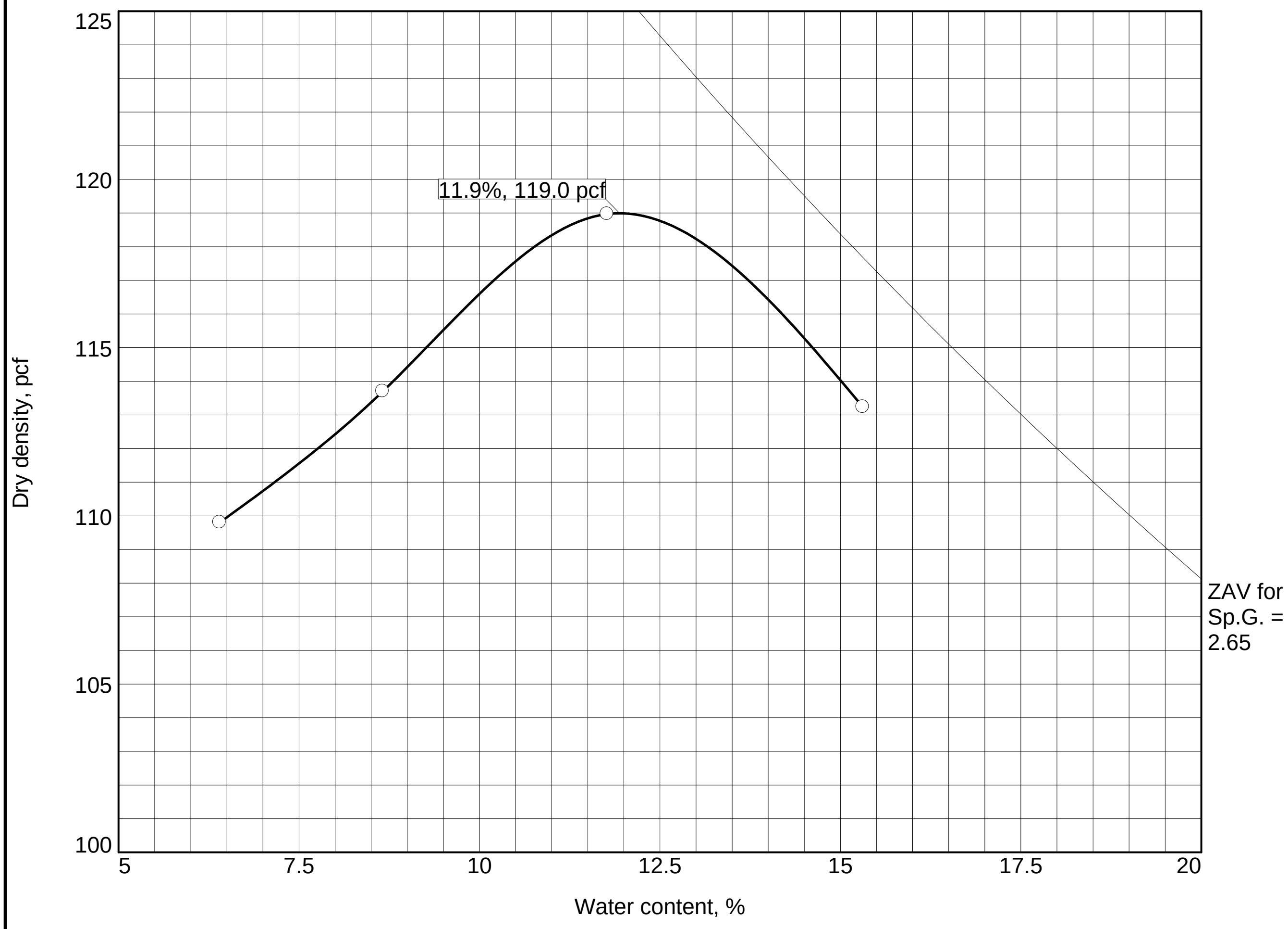
Figure 25

Tested By: CWZ 05/17/21

COMPACTION TEST REPORT



Test specification: ASTM D 698-12 Method B Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
	CL-ML	A-4(0)	12.0		20	6	4.3	53.4

TEST RESULTS

Maximum dry density = 119.0 pcf

Optimum moisture = 11.9 %

MATERIAL DESCRIPTION

BROWN SANDY SILTY CLAY

Project No. 411360.GEO1 **Client:** CONNECTGEN, LLC

Project: MILL POINT SOLAR PROJECT

○**Source of Sample:** B-9 TO B-14 **Sample Number:** BULK

Remarks:

SAMPLE DESCRIPTION BASED ON USCS

TRC Engineers, Inc.

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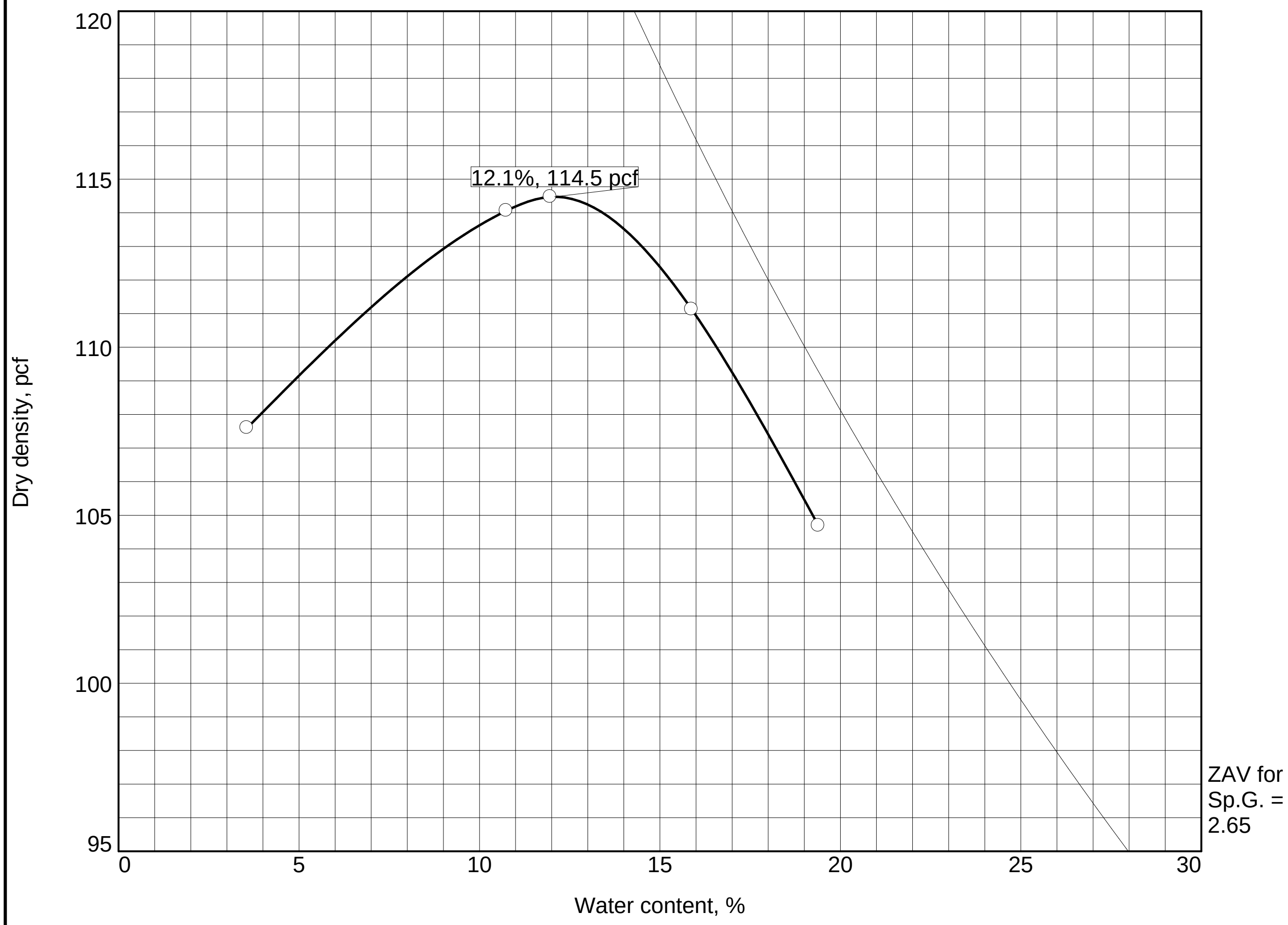
Figure 26

Tested By: CWZ 05/17/21

COMPACTION TEST REPORT



Test specification: ASTM D 698-12 Method B Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
0.0-5.0 FT	CL-ML	A-4(0)	19.7		18	4	0.5	76.5

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 114.5 pcf Optimum moisture = 12.1 %	BROWN SILTY CLAY WITH SAND

Project No. 411360.GEO1 **Client:** CONNECTGEN, LLC

Project: MILL POINT SOLAR PROJECT

○**Source of Sample:** B-22 TO B-29 **Sample Number:** BULK 4

TRC Engineers, Inc.

Mt. Laurel, NJ

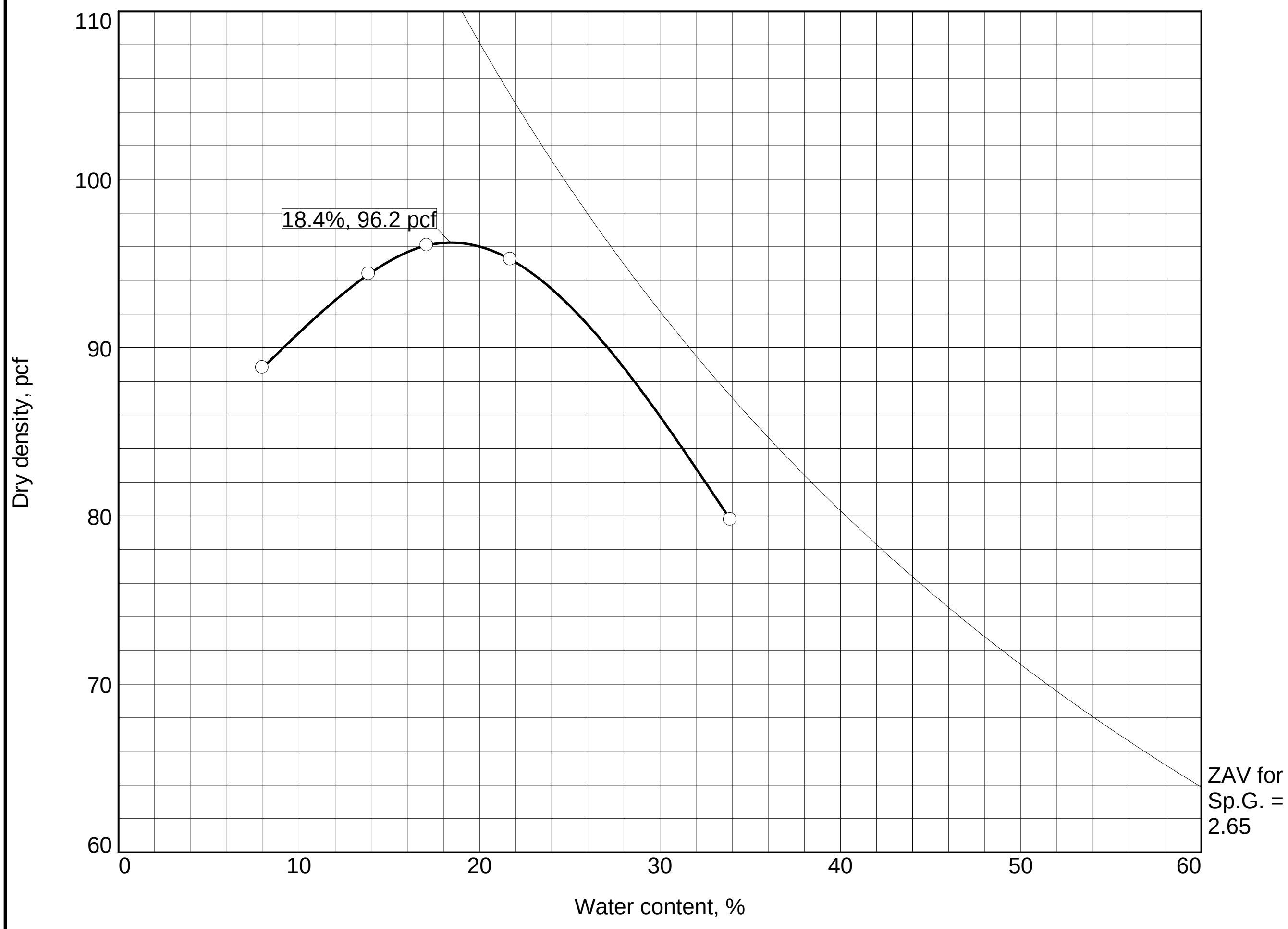
Remarks:

SAMPLE DESCRIPTION BASED ON USCS

Figure 27

Tested By: WM 05/25/21 **Checked By:** JPB 05/28/21

COMPACTION TEST REPORT



Test specification: ASTM D 698-12 Method B Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
0.0-5.0 FT	CL	A-7-6(13)	40.1		43	18	0.4	73.7

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 96.2 pcf Optimum moisture = 18.4 %	BROWN CLAY WITH SAND

Project No. 411360.GEO1 **Client:** CONNECTGEN, LLC
Project: MILL POINT SOLAR PROJECT

○**Source of Sample:** SS-1 & SS-2 **Sample Number:** BULK 5

Remarks:
SAMPLE DESCRIPTION BASED ON USCS

TRC Engineers, Inc.

Mt. Laurel, NJ

Figure 28

Tested By: WM 05/25/21 **Checked By:** JPB 05/28/21

TRC ENGINEERS, INC.
UNIT WEIGHT

Job # **411360.GEO1**
Boring No. **B-2**
Sample No. **S-5**
Lift #: **8.0-10.0**

Job Name: **Mill Point Solar Project**
Client Name: **ConnectGen, LLC**

Height 1.9496
Diameter 1.3584

	g
Moist Sample Weight + Tare (g)	227.03
Dry Sample Weight + Tare (g)	218.21
Tare weight (g)	125.5

	g	lbs
Moist Sample Weight - Tare	101.53	0.223634
Dry Sample Weight - Tare	92.71	0.204207
Weight of Water	8.82	-
Moisture %	9.5	-
Moisture Content	0.095	-

Sample Total Area 1.45 in2

Total Volume (cu in) 2.82

Total Volume (cu ft) 0.0016342

Dry Unit Weight (pcf) **125.0**

Wet Unit Weight (pcf) **136.8**

TRC ENGINEERS, INC.
UNIT WEIGHT

Job # **411360.GEO1**
Boring No. **B-12**
Sample No. **S-4**
Lift #: **6.0-8.0**

Job Name: **Mill Point Solar Project**
Client Name: **ConnectGen, LLC**

Height 1.2361
Diameter 1.3703

	g
Moist Sample Weight + Tare (g)	228.37
Dry Sample Weight + Tare (g)	222.06
Tare weight (g)	162.34

	g	lbs
Moist Sample Weight - Tare	66.03	0.145441
Dry Sample Weight - Tare	59.72	0.131542
Weight of Water	6.31	-
Moisture %	10.6	-
Moisture Content	0.106	-

Sample Total Area 1.47 in2

Total Volume (cu in) 1.82

Total Volume (cu ft) 0.0010544

Dry Unit Weight (pcf) **124.8**

Wet Unit Weight (pcf) **137.9**

TRC ENGINEERS, INC.
UNIT WEIGHT

Job # **411360.GEO1**
Boring No. **B-12**
Sample No. **S-6**
Lift #: **13.0-15.0**

Job Name: **Mill Point Solar Project**
Client Name: **ConnectGen, LLC**

Height 1.8373
Diameter 1.3748

	g
Moist Sample Weight + Tare (g)	255.53
Dry Sample Weight + Tare (g)	246.16
Tare weight (g)	157.65

	g	lbs
Moist Sample Weight - Tare	97.88	0.215595
Dry Sample Weight - Tare	88.51	0.194956
Weight of Water	9.37	-
Moisture %	10.6	-
Moisture Content	0.106	-

Sample Total Area 1.48 in2

Total Volume (cu in) 2.73

Total Volume (cu ft) 0.0015774

Dry Unit Weight (pcf) **123.6**

Wet Unit Weight (pcf) **136.7**

TRC ENGINEERS, INC.
UNIT WEIGHT

Job # **411360.GEO1**
Boring No. **B-19**
Sample No. **S-2**
Lift #: **2.0-4.0**

Job Name: **Mill Point Solar Project**
Client Name: **ConnectGen, LLC**

Height 2.7996
Diameter 1.3778

	g
Moist Sample Weight + Tare (g)	267.71
Dry Sample Weight + Tare (g)	239.02
Tare weight (g)	136.1

	g	lbs
Moist Sample Weight - Tare	131.61	0.289890
Dry Sample Weight - Tare	102.92	0.226696
Weight of Water	28.69	-
Moisture %	27.9	-
Moisture Content	0.279	-

Sample Total Area 1.49 in2

Total Volume (cu in) 4.17

Total Volume (cu ft) 0.0024142

Dry Unit Weight (pcf) **93.9**

Wet Unit Weight (pcf) **120.1**

TRC ENGINEERS, INC.
UNIT WEIGHT

Job # **411360.GEO1**
Boring No. **B-21**
Sample No. **S-5**
Lift #: **8.0-10.0**

Job Name: **Mill Point Solar Project**
Client Name: **ConnectGen, LLC**

Height 2.8235
Diameter 1.4788

	g
Moist Sample Weight + Tare (g)	284.85
Dry Sample Weight + Tare (g)	249.52
Tare weight (g)	128.36

	g	lbs
Moist Sample Weight - Tare	156.49	0.344692
Dry Sample Weight - Tare	121.16	0.266872
Weight of Water	35.33	-
Moisture %	29.2	-
Moisture Content	0.292	-

Sample Total Area 1.72 in2

Total Volume (cu in) 4.85

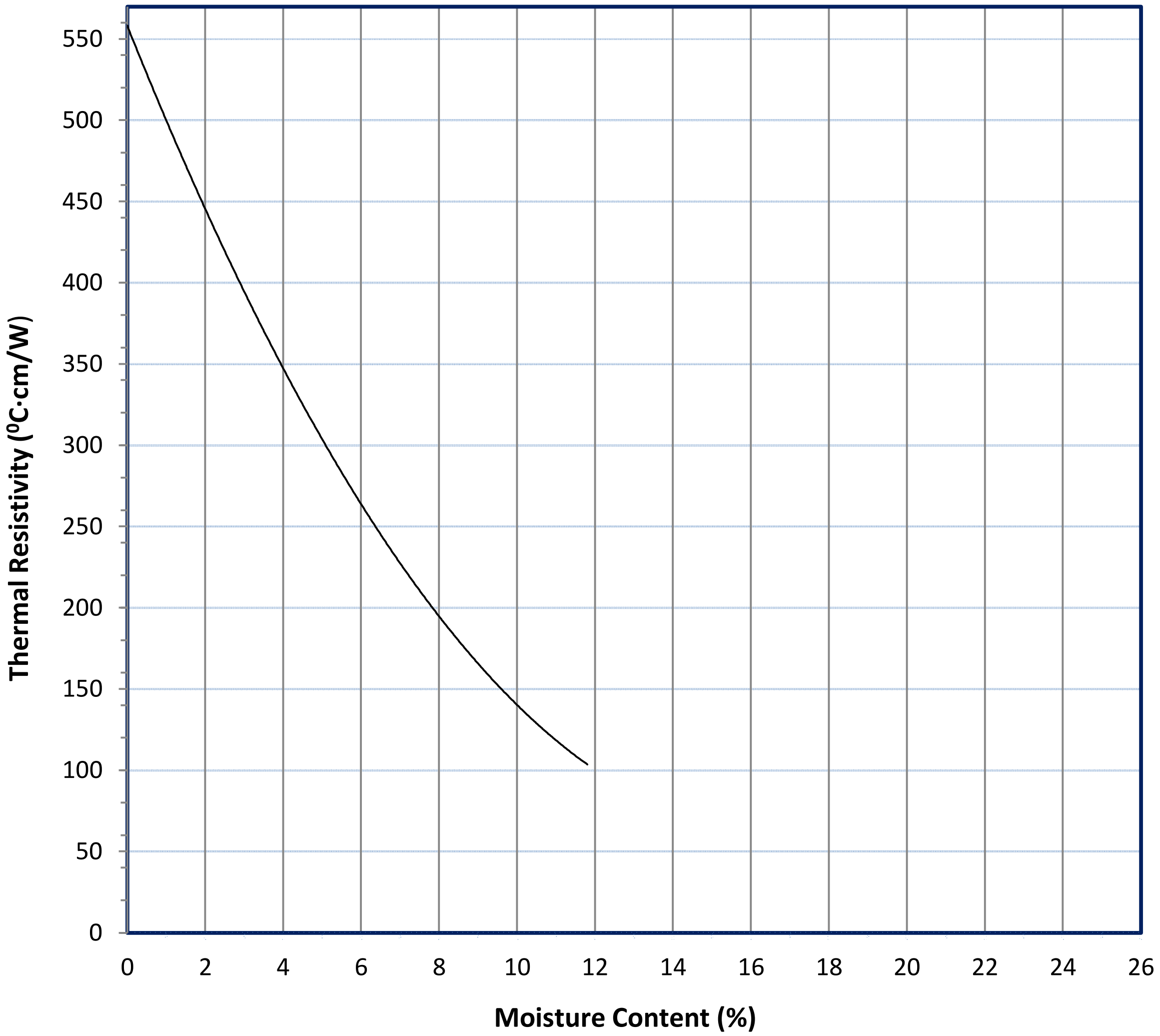
Total Volume (cu ft) 0.0028048

Dry Unit Weight (pcf) **95.1**

Wet Unit Weight (pcf) **122.9**

B-1 to B-5, Bulk 1, 0.0-5.0 ft

THERMAL RESISTIVITY DRY-OUT CURVES
411360.GEO1: Mill Point Solar Project

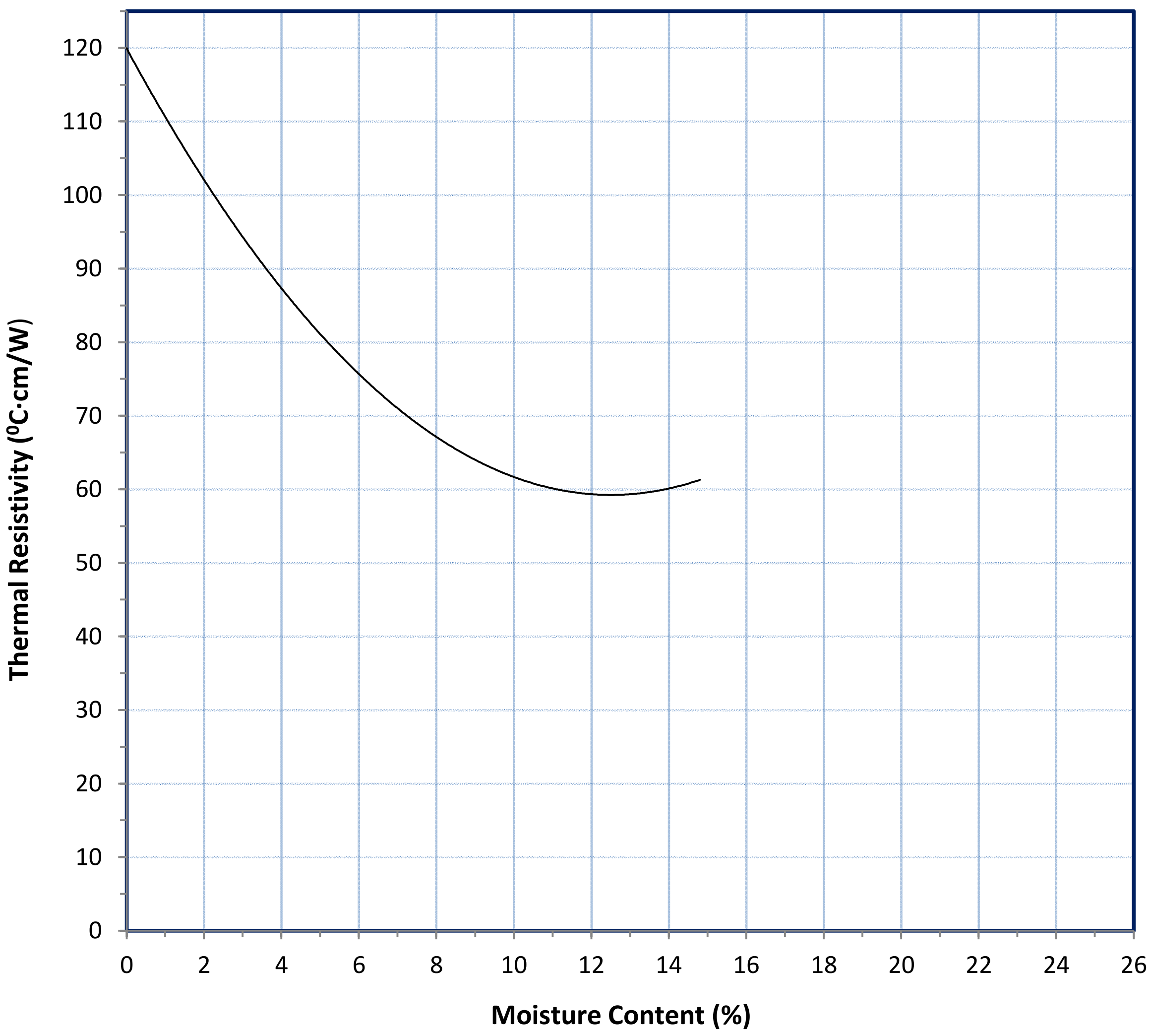


Specimen ID:	B-1 to B-5, Bulk 1, 0.0-5.0 ft
USCS:	CL-ML
Received Moisture:	16.2%
LL:	22
PI:	6
P200:	52.5%
Max. Dry Dens.:	118.6 pcf
Optimum Moisture:	11.8%

Specimen was prepared at the optimum moisture content and at approximately 90% of the maximum dry density as determined by the Standard Proctor test.

B-6 to B-8, Bulk 2, 0.0-5.0 ft

THERMAL RESISTIVITY DRY-OUT CURVES
411360.GEO1: Mill Point Solar Project

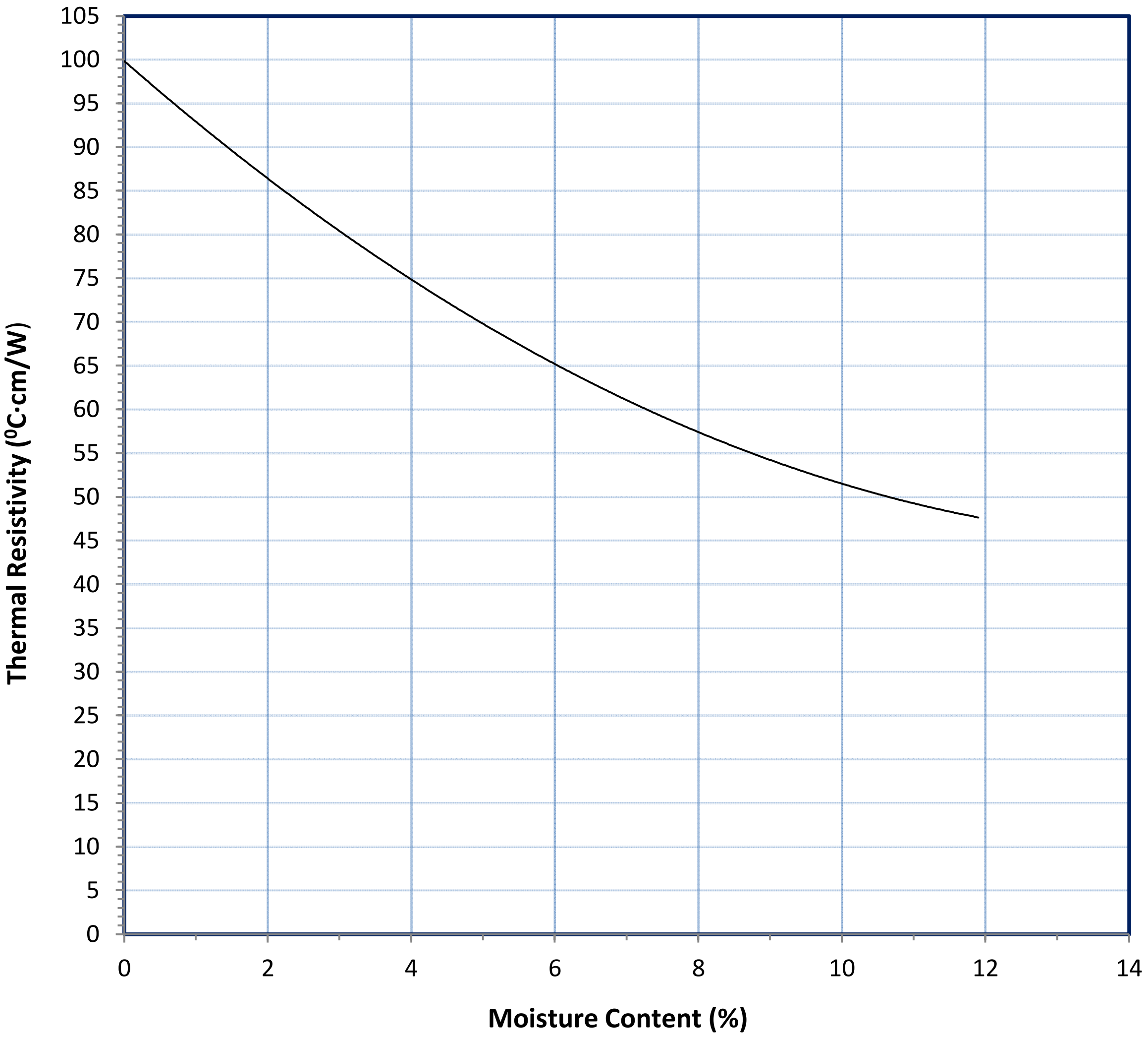


Specimen ID:	B-6 to B-8, Bulk 2, 0.0-5.0 ft
USCS:	CL
Received Moisture:	25.7%
LL:	34
PI:	11
P200:	58.3%
Max. Dry Dens.:	109.0 pcf
Optimum Moisture:	14.8%

Specimen was prepared at the optimum moisture content and at approximately 90% of the maximum dry density as determined by the Standard Proctor test.

B-9 to B-14, Bulk 3, 0.0-5.0 ft

THERMAL RESISTIVITY DRY-OUT CURVES
411360.GEO1: Mill Point Solar Project

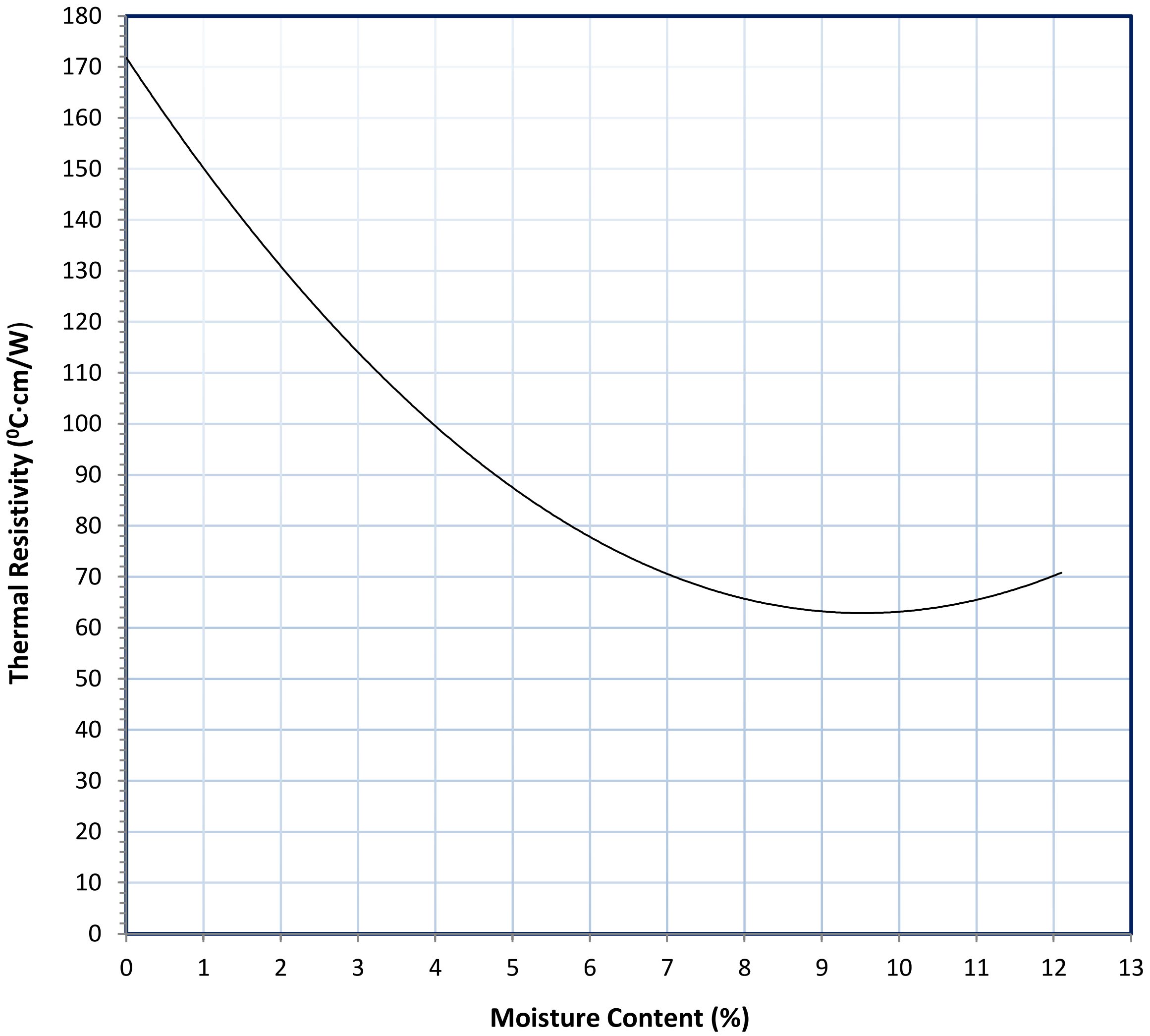


Specimen ID:	B-9 to B-14, Bulk 3, 0.0-5.0 ft
USCS:	CL-ML
Received Moisture:	12.0%
LL:	20
PI:	6
P200:	53.4%
Max. Dry Dens.:	119.0 pcf
Optimum Moisture:	11.9%

Specimen was prepared at the optimum moisture content and at approximately 90% of the maximum dry density as determined by the Standard Proctor test.

B-22 to B-29, Bulk 4, 0.0-5.0 ft

THERMAL RESISTIVITY DRY-OUT CURVES
411360.GEO1: Mill Point Solar Project

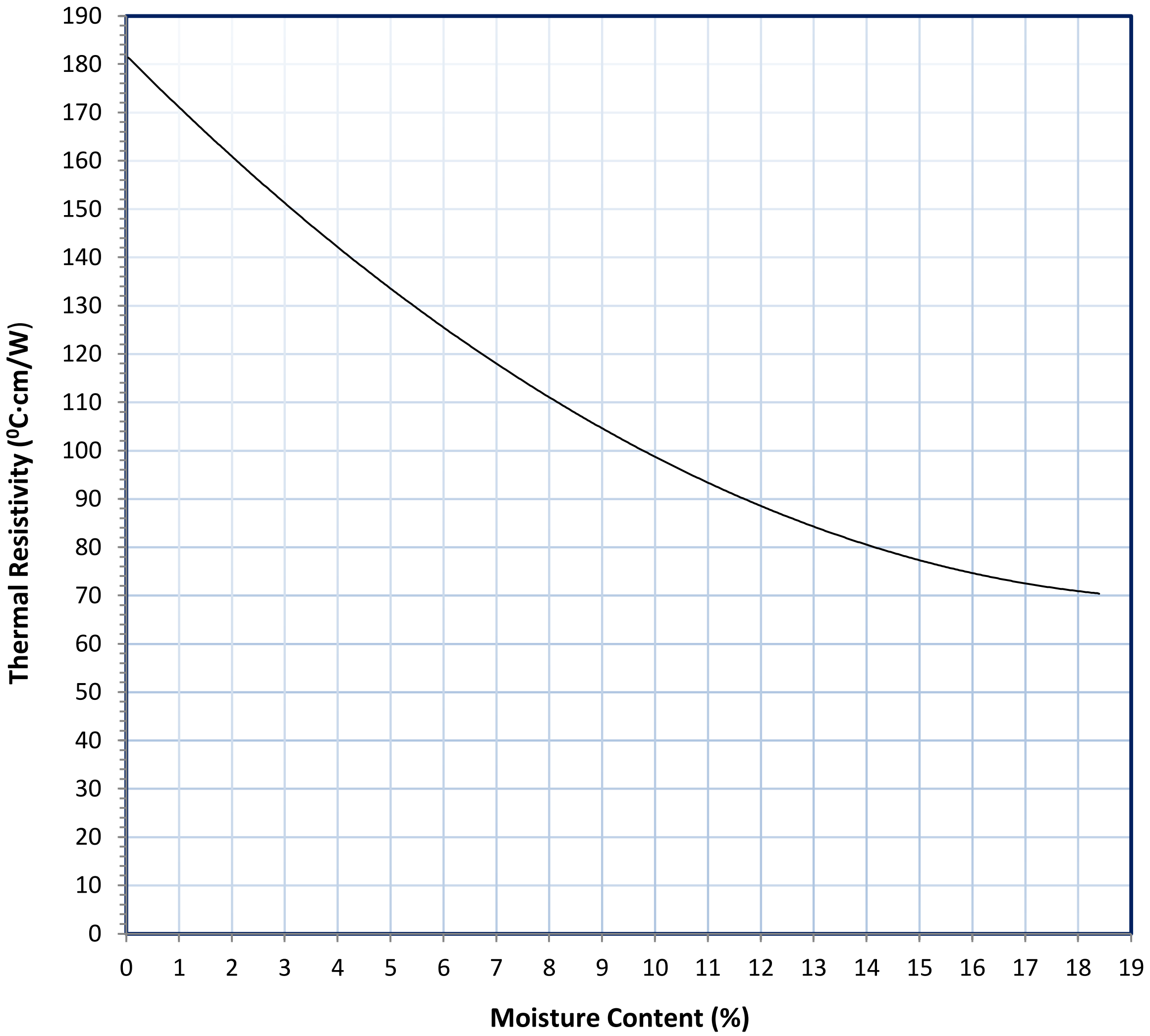


Specimen ID:	B-22 to B-29, Bulk 4, 0.0-5.0 ft
USCS:	CL-ML
Received Moisture:	19.7%
LL:	18
PI:	4
P200:	76.5%
Max. Dry Dens.:	114.5 pcf
Optimum Moisture:	12.1%

Specimen was prepared at the optimum moisture content and at approximately 90% of the maximum dry density as determined by the Standard Proctor test.

SS-1 & SS-2, Bulk 5, 0.0-5.0 ft

THERMAL RESISTIVITY DRY-OUT CURVES
411360.GEO1: Mill Point Solar Project



Specimen ID:	SS-1 & SS-2, Bulk 5, 0.0-5.0 ft
USCS:	CL
Received Moisture:	14.5%
LL:	43
PI:	18
P200:	73.7%
Max. Dry Dens.:	96.2 pcf
Optimum Moisture:	18.4%

Specimen was prepared at the optimum moisture content and at approximately 90% of the maximum dry density as determined by the Standard Proctor test.

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CLIENT
TRC Solutions, Inc.
1600 Commerce Parkway, Suite B
Mount Laurel, NJ 08054

PROJECT NO: 411360

PROJECT
Mill Point

DATE: June 1, 2021

LAB ID: 21-0068

Sample By: Client

Analyzed By: Kurt D. Ergun

RESULTS FOR CORROSIVITY ANALYSIS OF SOILS

Sample No:	Bulk
Sample Location:	SS-1 to SS-2
Sample Depth:	0.0-5.0
Laboratory Testing Methods	
pH Analysis, ASTM D4972(in H20)	8.34
pH Analysis, ASTM D4972(in CaCl2)	8.00
Water Solube Sulfates, ASTM D516(mg/kg)	185
Clorides, ASTM D512(mg/kg)	75
Resistivity, ASTM G57(ohm-cm)	1568

Kurt D. Ergun
Chemist

Note: The tests were performed in accordance with applicable ASTM, AASHTO, or AWWA methods. Test results submitted are only applicable to samples tested at referenced locations and are not indicative of the results of similar materials.

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PROJECT
Mill Point

DATE: June 1, 2021

LAB ID: 21-0068

Sample By: Client

Analyzed By: Kurt D. Ergun

RESULTS FOR CORROSIVITY ANALYSIS OF SOILS

Sample No:	Bulk	Bulk	Bulk	Bulk
Sample Location:	B-1 to B-5	B-7 to B-8	B-9 to B-14	B-22 to B-29
Sample Depth:	0.0-5.0	0.0-5.0	0.0-5.0	0.0-5.0
Laboratory Testing Methods				
pH Analysis, ASTM D4972(in H20)	7.71	8.08	8.40	8.21
pH Analysis, ASTM D4972(in CaCl2)	7.36	7.45	7.45	8.03
Water Solube Sulfates, ASTM D516(mg/kg)	58	55	220	235
Clorides, ASTM D512(mg/kg)	50	40	40	38
Resistivity, ASTM G57(ohm-cm)	2548	2940	1260	1176

Kurt D. Ergun

Kurt D. Ergun
Chemist

Note: The tests were performed in accordance with applicable ASTM, AASHTO, or AWWA methods. Test results submitted are only applicable to samples tested at referenced locations and are not indicative of the results of similar materials.

Appendix E – Northeast Regional Climate Center's Extreme Precipitation Tables

Extreme Precipitation Tables

Northeast Regional Climate Center

Data represents point estimates calculated from partial duration series. All precipitation amounts are displayed in inches.

Smoothing	No
State	New York
Location	
Longitude	74.368 degrees West
Latitude	42.907 degrees North
Elevation	0 feet
Date/Time	Wed, 13 Oct 2021 10:57:09 -0400

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.25	0.38	0.47	0.63	0.77	0.96	**1yr**	0.67	0.93	1.09	1.40	1.73	2.17	2.45	**1yr**	1.92	2.36	2.78	3.39	3.90	**1yr**
2yr	0.31	0.48	0.59	0.80	0.99	1.13	**2yr**	0.85	1.10	1.27	1.63	2.03	2.50	2.81	**2yr**	2.21	2.71	3.17	3.82	4.36	**2yr**
5yr	0.37	0.57	0.71	0.97	1.23	1.39	**5yr**	1.06	1.36	1.57	1.98	2.48	3.03	3.44	**5yr**	2.68	3.31	3.84	4.53	5.16	**5yr**
10yr	0.42	0.65	0.80	1.12	1.45	1.63	**10yr**	1.25	1.60	1.83	2.30	2.87	3.50	4.01	**10yr**	3.10	3.86	4.44	5.16	5.85	**10yr**
25yr	0.51	0.77	0.96	1.37	1.81	2.02	**25yr**	1.56	1.98	2.26	2.79	3.49	4.25	4.91	**25yr**	3.76	4.72	5.39	6.13	6.93	**25yr**
50yr	0.58	0.89	1.10	1.59	2.13	2.38	**50yr**	1.84	2.33	2.65	3.23	4.05	4.93	5.73	**50yr**	4.36	5.51	6.24	6.99	7.87	**50yr**
100yr	0.67	1.02	1.27	1.84	2.52	2.80	**100yr**	2.17	2.73	3.11	3.75	4.70	5.72	6.69	**100yr**	5.06	6.43	7.24	7.98	8.95	**100yr**
200yr	0.78	1.17	1.48	2.14	2.98	3.29	**200yr**	2.57	3.22	3.64	4.35	5.46	6.64	7.81	**200yr**	5.87	7.51	8.40	9.10	10.17	**200yr**
500yr	0.94	1.40	1.80	2.62	3.73	4.08	**500yr**	3.21	3.99	4.50	5.30	6.66	8.09	9.60	**500yr**	7.16	9.23	10.23	10.84	12.06	**500yr**

Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.20	0.31	0.38	0.51	0.63	0.86	1yr	0.54	0.85	0.95	1.22	1.59	2.03	2.30	1yr	1.80	2.21	2.57	3.20	3.63	1yr
2yr	0.30	0.47	0.57	0.78	0.96	1.09	2yr	0.83	1.07	1.22	1.60	1.99	2.44	2.75	2yr	2.16	2.64	3.10	3.74	4.28	2yr
5yr	0.34	0.53	0.66	0.90	1.15	1.30	5yr	0.99	1.27	1.48	1.88	2.31	2.85	3.24	5yr	2.52	3.11	3.62	4.30	4.90	5yr
10yr	0.38	0.59	0.73	1.02	1.31	1.48	10yr	1.13	1.44	1.68	2.11	2.60	3.18	3.67	10yr	2.81	3.53	4.07	4.77	5.43	10yr
25yr	0.44	0.67	0.83	1.19	1.57	1.75	25yr	1.35	1.71	1.99	2.48	3.03	3.68	4.33	25yr	3.26	4.16	4.73	5.46	6.19	25yr
50yr	0.49	0.74	0.92	1.32	1.78	1.99	50yr	1.54	1.95	2.25	2.80	3.39	4.12	4.91	50yr	3.65	4.72	5.31	6.05	6.85	50yr
100yr	0.55	0.82	1.03	1.49	2.05	2.27	100yr	1.77	2.22	2.55	3.17	3.81	4.59	5.55	100yr	4.06	5.34	5.96	6.70	7.56	100yr
200yr	0.61	0.91	1.16	1.68	2.34	2.60	200yr	2.02	2.54	2.88	3.59	4.28	5.10	6.29	200yr	4.51	6.05	6.69	7.41	8.36	200yr
500yr	0.71	1.06	1.36	1.98	2.81	3.09	500yr	2.43	3.02	3.39	4.24	5.00	5.83	7.41	500yr	5.16	7.13	7.78	8.48	9.54	500yr

Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.27	0.42	0.51	0.69	0.84	1.03	1yr	0.73	1.01	1.17	1.50	1.87	2.29	2.65	1yr	2.03	2.55	2.98	3.58	4.12	1yr
2yr	0.32	0.50	0.61	0.83	1.02	1.16	2yr	0.88	1.13	1.32	1.68	2.09	2.57	2.90	2yr	2.28	2.79	3.26	3.91	4.47	2yr
5yr	0.39	0.61	0.75	1.03	1.31	1.48	5yr	1.13	1.45	1.67	2.09	2.62	3.24	3.64	5yr	2.86	3.50	4.04	4.76	5.42	5yr
10yr	0.47	0.72	0.89	1.24	1.61	1.80	10yr	1.39	1.76	2.02	2.49	3.12	3.85	4.35	10yr	3.41	4.19	4.79	5.53	6.31	10yr
25yr	0.59	0.89	1.11	1.58	2.09	2.30	25yr	1.80	2.25	2.62	3.10	3.93	4.87	5.51	25yr	4.31	5.30	5.98	6.76	7.70	25yr
50yr	0.69	1.06	1.32	1.89	2.55	2.78	50yr	2.20	2.72	3.19	3.68	4.66	5.85	6.61	50yr	5.18	6.35	7.09	7.87	8.96	50yr
100yr	0.83	1.26	1.58	2.28	3.12	3.35	100yr	2.70	3.28	3.89	4.36	5.55	7.03	7.92	100yr	6.22	7.61	8.42	9.18	10.44	100yr
200yr	0.99	1.49	1.88	2.73	3.80	4.07	200yr	3.28	3.97	4.74	5.18	6.61	8.45	9.48	200yr	7.48	9.12	10.00	10.70	12.20	200yr
500yr	1.25	1.87	2.40	3.49	4.96	5.22	500yr	4.28	5.10	6.16	6.49	8.34	10.85	12.08	500yr	9.60	11.61	12.58	13.12	14.96	500yr

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Appendix F – Construction Drawings

Refer to Exhibit 5 of the Section 94-c Application for the Construction Drawings.

Appendix G – Standards and Specifications for Erosion and Sediment Controls

STANDARD AND SPECIFICATIONS FOR CONSTRUCTION ROAD STABILIZATION

Definition & Scope

The stabilization of temporary construction access routes, on-site vehicle transportation routes, and construction parking areas to control erosion on temporary construction routes and parking areas.

Conditions Where Practice Applies

All traffic routes and parking areas for temporary use by construction traffic.

Design Criteria

Construction roads should be located to reduce erosion potential, minimize impact on existing site resources, and maintain operations in a safe manner. Highly erosive soils, wet or rocky areas, and steep slopes should be avoided. Roads should be routed where seasonal water tables are deeper than 18 inches. Surface runoff and control should be in accordance with other standards.

Road Grade – A maximum grade of 12% is recommended, although grades up to 15% are possible for short distances.

Road Width – 12 foot minimum for one-way traffic or 24 foot minimum for two-way traffic.

Side Slope of Road Embankment – 2:1 or flatter.

Ditch Capacity – On-site roadside ditch and culvert capacities shall be the 10 yr. peak runoff.

Composition – Use a 6-inch layer of NYS DOT sub-base Types 1,2,3, 4 or equivalent as specified in NYSDOT Standard Specifications.

Construction Specifications

1. Clear and strip roadbed and parking areas of all vegetation, roots, and other objectionable material.

2. Locate parking areas on naturally flat areas as available. Keep grades sufficient for drainage, but not more than 2 to 3 percent.

3. Provide surface drainage and divert excess runoff to stabilized areas.

4. Maintain cut and fill slopes to 2:1 or flatter and stabilized with vegetation as soon as grading is accomplished.

5. Spread 6-inch layer of sub-base material evenly over the full width of the road and smooth to avoid depressions.

6. Provide appropriate sediment control measures to prevent offsite sedimentation.

Maintenance

Inspect construction roads and parking areas periodically for condition of surface. Top dress with new gravel as needed. Check ditches for erosion and sedimentation after rainfall events. Maintain vegetation in a healthy, vigorous condition. Areas producing sediment should be treated immediately.

STANDARD AND SPECIFICATIONS FOR CONCRETE TRUCK WASHOUT

Definition & Scope

A temporary excavated or above ground lined constructed pit where concrete truck mixers and equipment can be washed after their loads have been discharged, to prevent highly alkaline runoff from entering storm drainage systems or leaching into soil.

Conditions Where Practice Applies

Washout facilities shall be provided for every project where concrete will be poured or otherwise formed on the site. This facility will receive highly alkaline wash water from the cleaning of chutes, mixers, hoppers, vibrators, placing equipment, trowels, and screeds. Under no circumstances will wash water from these operations be allowed to infiltrate into the soil or enter surface waters.

Design Criteria

Capacity: The washout facility should be sized to contain solids, wash water, and rainfall and sized to allow for the evaporation of the wash water and rainfall. Wash water shall be estimated at 7 gallons per chute and 50 gallons per hopper of the concrete pump truck and/or discharging drum. The minimum size shall be 8 feet by 8 feet at the bottom and 2 feet deep. If excavated, the side slopes shall be 2 horizontal to 1 vertical.

Location: Locate the facility a minimum of 100 feet from drainage swales, storm drain inlets, wetlands, streams and other surface waters. Prevent surface water from entering the structure except for the access road. Provide appropriate access with a gravel access road sloped down to the structure. Signs shall be placed to direct drivers to the facility after their load is discharged.

Liner: All washout facilities will be lined to prevent leaching of liquids into the ground. The liner shall be plastic sheeting with a minimum thickness of 10 mils with no holes or tears, and anchored beyond the top of the pit with an earthen berm, sand bags, stone, or other structural appurtenance except at the access point.

If pre-fabricated washouts are used they must ensure the capture and containment of the concrete wash and be sized based on the expected frequency of concrete pours. They shall be sited as noted in the location criteria.

Maintenance

- All concrete washout facilities shall be inspected daily. Damaged or leaking facilities shall be deactivated and repaired or replaced immediately. Excess rainwater that has accumulated over hardened concrete should be pumped to a stabilized area, such as a grass filter strip.
- Accumulated hardened material shall be removed when 75% of the storage capacity of the structure is filled. Any excess wash water shall be pumped into a containment vessel and properly disposed of off site.
- Dispose of the hardened material off-site in a construction/demolition landfill. On-site disposal may be allowed if this has been approved and accepted as part of the projects SWPPP. In that case, the material should be recycled as specified, or buried and covered with a minimum of 2 feet of clean compacted earthfill that is permanently stabilized to prevent erosion.
- The plastic liner shall be replaced with each cleaning of the washout facility.
- Inspect the project site frequently to ensure that no concrete discharges are taking place in non-designated areas.

STANDARD AND SPECIFICATIONS FOR DUST CONTROL

Definition & Scope

The control of dust resulting from land-disturbing activities, to prevent surface and air movement of dust from disturbed soil surfaces that may cause off-site damage, health hazards, and traffic safety problems.

Conditions Where Practice Applies

On construction roads, access points, and other disturbed areas subject to surface dust movement and dust blowing where off-site damage may occur if dust is not controlled.

Design Criteria

Construction operations should be scheduled to minimize the amount of area disturbed at one time. Buffer areas of vegetation should be left where practical. Temporary or permanent stabilization measures shall be installed. No specific design criteria is given; see construction specifications below for common methods of dust control.

Water quality must be considered when materials are selected for dust control. Where there is a potential for the material to wash off to a stream, ingredient information must be provided to the NYSDEC.

No polymer application shall take place without written approval from the NYSDEC.

Construction Specifications

A. **Non-driving Areas** – These areas use products and materials applied or placed on soil surfaces to prevent airborne migration of soil particles.

Vegetative Cover – For disturbed areas not subject to traffic, vegetation provides the most practical method of dust control (see Section 3).

Mulch (including gravel mulch) – Mulch offers a fast effective means of controlling dust. This can also include rolled erosion control blankets.

Spray adhesives – These are products generally composed of polymers in a liquid or solid form that are mixed with water to form an emulsion that is sprayed on the soil surface with typical hydroseeding equipment. The mixing ratios and application rates will be in accordance with the manufacturer's recommendations for the specific soils on the site. In no case should the application of these adhesives be made on wet soils or if there is a probability of precipitation within 48 hours of its proposed use. Material Safety Data Sheets will be provided to all applicators and others working with the material.

B. **Driving Areas** – These areas utilize water, polymer emulsions, and barriers to prevent dust movement from the traffic surface into the air.

Sprinkling – The site may be sprayed with water until the surface is wet. This is especially effective on haul roads and access route to provide short term limited dust control.

Polymer Additives – These polymers are mixed with water and applied to the driving surface by a water truck with a gravity feed drip bar, spray bar or automated distributor truck. The mixing ratios and application rates will be in accordance with the manufacturer's recommendations. Incorporation of the emulsion into the soil will be done to the appropriate depth based on expected traffic. Compaction after incorporation will be by vibratory roller to a minimum of 95%. The prepared surface shall be moist and no application of the polymer will be made if there is a probability of precipitation within 48 hours of its proposed use. Material Safety Data Sheets will be provided to all applicators working with the material.

Barriers – Woven geo-textiles can be placed on the driving surface to effectively reduce dust throw and particle migration on haul roads. Stone can also be used for construction roads for effective dust control.

Windbreak – A silt fence or similar barrier can control air currents at intervals equal to ten times the barrier height. Preserve existing wind barrier vegetation as much as practical.

Maintenance

Maintain dust control measures through dry weather periods until all disturbed areas are stabilized.

STANDARD AND SPECIFICATIONS FOR PROTECTING VEGETATION DURING CONSTRUCTION

Definition & Scope

The protection of trees, shrubs, ground cover and other vegetation from damage by construction equipment. In order to preserve existing vegetation determined to be important for soil erosion control, water quality protection, shade, screening, buffers, wildlife habitat, wetland protection, and other values.

Conditions Where Practices Applies

On planned construction sites where valued vegetation exists and needs to be preserved.

Design Criteria

1. Planning Considerations

    A. Inventory:

    1) Property boundaries, topography, vegetation and soils information should be gathered. Identify potentially high erosion areas, areas with tree windthrow potential, etc. A vegetative cover type map should be made on a copy of a topographic map which shows other natural and manmade features. Vegetation that is desirable to preserve because of its value for screening, shade, critical erosion control, endangered species, aesthetics, etc., should be identified and marked on the map.

    2) Based upon this data, general statements should be prepared about the present condition, potential problem areas, and unique features of the property.

    B. Planning:

    1) After engineering plans (plot maps) are prepared, another field review should take place and recommendations made for the vegetation to be saved. Minor adjustments in location of roads, dwellings, and utilities may be needed. Construction on steep slopes, erodible soils, wetlands, and streams should be avoided. Clearing limits should be delineated (See "Determine Limits of Clearing and Grading" on page 2.2).

    2) Areas to be seeded and planted should be identified. Remaining vegetation should blend with their surroundings and/or provide special function such as a filter strip, buffer zone, or screen.

    3) Trees and shrubs of special seasonal interest, such as flowering dogwood, red maple, striped maple, serviceberry, or shadbush, and valuable potential shade trees should be identified and marked for special protective treatment as appropriate.

    4) Trees to be cut should be marked on the plans. If timber can be removed for salable products, a forester should be consulted for marketing advice.

    5) Trees that may become a hazard to people, personal property, or utilities should be removed. These include trees that are weak-wooded, disease-prone, subject to windthrow, or those that have severely damaged root systems.

    6) The vigor of remaining trees may be improved by a selective thinning. A forester should be consulted for implementing this practice.

2. Measures to Protect Vegetation

    A. Limit soil placement over existing tree and shrub roots to a maximum of 3 inches. Soils with loamy texture and good structure should be used.

    B. Use retaining walls and terraces to protect roots of trees and shrubs when grades are lowered. Lowered grades should start no closer than the dripline of the tree. For narrow-canopied trees and shrubs, the stem diameter in inches is converted to feet and doubled, such that a 10 inch tree should be protected to 20 feet.

    C. Trenching across tree root systems should be the same minimum distance from the trunk, as in "B". Tunnels under root systems for underground utilities should start 18 inches or deeper below the normal ground surface. Tree roots which must be severed should be cut clean. Backfill material that will be in contact with the roots should be topsoil or a prepared planting soil mixture.

    D. Construct sturdy fences, or barriers, of wood, steel, or other protective material around valuable vegetation for protection from construction equipment. Place barriers far enough away from trees, but not less than the specifications in "B", so that tall equipment such as backhoes and dump trucks do not contact tree branches.

E. Construction limits should be identified and clearly marked to exclude equipment.

F. Avoid spills of oil/gas and other contaminants.

G. Obstructive and broken branches should be pruned properly. The branch collar on all branches whether living or dead should not be damaged. The 3 or 4 cut method should be used on all branches larger than two inches at the cut. First cut about one-third the way through the underside of the limb (about 6-12 inches from the tree trunk). Then (approximately an inch further out) make a second cut through the limb from the upper side. When the branch is removed, there is no splintering of the main tree trunk. Remove the stub. If the branch is larger than 5-6 inches in diameter, use the four cut system. Cuts 1 and 2 remain the same and cut 3 should be from the underside of the limb, on the outside of the branch collar. Cut 4 should be from the top and in alignment with the 3rd cut. Cut 3 should be 1/4 to 1/3 the way through the limb. This will prevent the bark from peeling down the trunk. Do not paint the cut surface.

H. Penalties for damage to valuable trees, shrubs, and herbaceous plants should be clearly spelled out in the contract.

PROTECTING TREES IN HEAVY USE AREAS

The compaction of soil over the roots of trees and shrubs by the trampling of recreationists, vehicular traffic, etc., reduces oxygen, water, and nutrient uptake by feeder roots. This weakens and may eventually kill the plants. Table 2.6 rates the “Susceptibility of Tree Species to Compaction.”

Where heavy compaction is anticipated, apply and maintain a 3 to 4 inch layer of undecayed wood chips or 2 inches of No. 2 washed, crushed gravel. In addition, use of a wooden or plastic mat may be used to lessen compaction, if applicable.

Table 2.6
Susceptibility of Tree Species to Compaction[1]

Resistant:

Box elder	*Acer negundo*	Willows	*Salix spp.*
Green ash	*Fraxinus pennsylvanica*	Honey locust	*Gleditsia triacanthos*
Red elm	*Ulmus rubra*	Eastern cottonwood	*Populus deltoides*
Hawthornes	*Crataegus spp.*	Swamp white oak	*Quercus bicolor*
Bur oak	*Quercus macrocarpa*	Hophornbeam	*Ostrya virginiana*
Northern white cedar	*Thuja occidentalis*		

Intermediate:

Red maple	*Acer rubrum*	Sweetgum	*Liquidambar styraciflua*
Silver maple	*Acer saccharinum*	Norway maple	*Acer platanoides*
Hackberry	*Celtis occidentalis*	Shagbark hickory	*Carya ovata*
Black gum	*Nyssa sylvatica*	London plane	*Platanus x hybrida*
Red oak	*Quercus rubra*	Pin oak	*Quercus palustris*
Basswood	*Tilia americana*		

Susceptible:

Sugar maple	*Acer saccharum*	Austrian Pine	*Pinus nigra*
White pine	*Pinus strobus*	White ash	*Fraxinus americana*
Blue spruce	*Picea pungens*	Paper birch	*Betula papyrifera*
White oak	*Quercus alba*	Moutain ash	*Sorbus aucuparia*
Red pine	*Pinus resinosa*	Japanese maple	*Acer palmatum*

[1] If a tree species does not appear on the list, insufficient information is available to rate it for this purpose.

STANDARD AND SPECIFICATIONS FOR SITE POLLUTION PREVENTION

Definition & Scope

A collection of management practices intended to control non-sediment pollutants associated with construction activities to prevent the generation of pollutants due to improper handling, storage, and spills and prevent the movement of toxic substances from the site into surface waters.

Conditions Where Practice Applies

On all construction sites where the earth disturbance exceeds 5,000 square feet, and involves the use of fertilizers, pesticides, petroleum based chemicals, fuels and lubricants, as well as sealers, paints, cleared woody vegetation, garbage, and sanitary wastes.

Design Criteria

The variety of pollutants on a particular site and the severity of their impacts depend on factors such as the nature of the construction activity, the physical characteristics of the construction site, and the proximity of water bodies and conveyances to the pollutant source.

1. All state and federal regulations shall be followed for the storage, handling, application, usage, and disposal of pesticides, fertilizers, and petroleum products.

2. Vehicle and construction equipment staging and maintenance areas will be located away from all drainage ways with their parking areas graded so the runoff from these areas is collected, contained and treated prior to discharge from the site.

3. Provide sanitary facilities for on-site personnel.

4. Store, cover, and isolate construction materials including topsoil, and chemicals, to prevent runoff of pollutants and contamination of groundwater and surface waters.

5. Develop and implement a spill prevention and control plan. The plan should include NYSDEC's spill reporting and initial notification requirements.

6. Provide adequate disposal for solid waste including woody debris, stumps, and other construction waste and include these methods and directions in the construction details on the site construction drawings. Fill, woody debris, stumps and construction waste shall not be placed in regulated wetlands, streams or other surface waters.

7. Distribute or post informational material regarding proper handling, spill response, spill kit location, and emergency actions to be taken, to all construction personnel.

8. Refueling equipment shall be located at least 100 feet from all wetlands, streams and other surface waters.

STANDARD AND SPECIFICATIONS FOR STABILIZED CONSTRUCTION ACCESS

Definition & Scope

A stabilized pad of aggregate underlain with geotextile located at any point where traffic will be entering or leaving a construction site to or from a public right-of-way, street, alley, sidewalk, or parking area. The purpose of stabilized construction access is to reduce or eliminate the tracking of sediment onto public rights-of-way or streets.

Conditions Where Practice Applies

A stabilized construction access shall be used at all points of construction ingress and egress.

Design Criteria

See Figure 2.1 on page 2.31 for details.

Aggregate Size: Use a matrix of 1-4 inch stone, or reclaimed or recycled concrete equivalent.

Thickness: Not less than six (6) inches.

Width: 12-foot minimum but not less than the full width of points where ingress or egress occurs. 24-foot minimum if there is only one access to the site.

Length: As required, but not less than 50 feet (except on a single residence lot where a 30 foot minimum would apply).

Geotextile: To be placed over the entire area to be covered with aggregate. Filter cloth will not be required on a single-family residence lot. Piping of surface water under entrance shall be provided as required. If piping is impossible, a mountable berm with 5:1 slopes will be permitted.

Criteria for Geotextile: The geotextile shall be woven or nonwoven fabric consisting only of continuous chain polymeric filaments or yarns of polyester. The fabric shall be inert to commonly encountered chemicals, hydro-carbons, mildew, rot resistant, and conform to the fabric properties as shown:

Fabric Properties[3]	Light Duty[1] Roads Grade Subgrade	Heavy Duty[2] Haul Roads Rough Graded	Test Method
Grab Tensile Strength (lbs)	200	220	ASTM D1682
Elongation at Failure (%)	50	60	ASTM D1682
Mullen Burst Strength (lbs)	190	430	ASTM D3786
Puncture Strength (lbs)	40	125	ASTM D751 Modified
Equivalent	40-80	40-80	US Std Sieve
Opening Size			CW-02215
Aggregate Depth	6	10	-

[1] Light Duty Road: Area sites that have been graded to subgrade and where most travel would be single axle vehicles and an occasional multi-axle truck. Acceptable materials are Trevira Spunbond 1115, Mirafi 100X, Typar 3401, or equivalent.

[2] Heavy Duty Road: Area sites with only rough grading, and where most travel would be multi-axle vehicles. Acceptable materials are Trevira Spunbond 1135, Mirafi 600X, or equivalent.

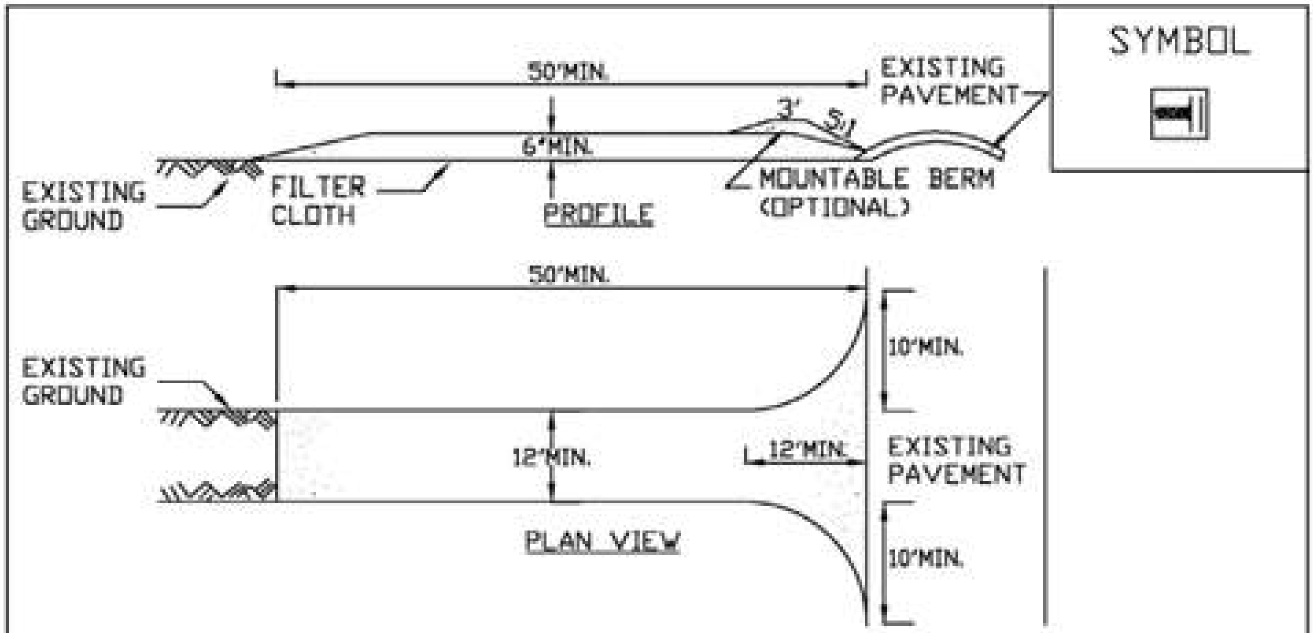
[3] Fabrics not meeting these specifications may be used only when design procedure and supporting documentation are supplied to determine aggregate depth and fabric strength.

Maintenance

The access shall be maintained in a condition which will prevent tracking of sediment onto public rights-of-way or streets. This may require periodic top dressing with additional aggregate. All sediment spilled, dropped, or washed onto public rights-of-way must be removed immediately.

When necessary, wheels must be cleaned to remove sediment prior to entrance onto public rights-of-way. When washing is required, it shall be done on an area stabilized with aggregate, which drains into an approved sediment-trapping device. All sediment shall be prevented from entering storm drains, ditches, or watercourses.

Figure 2.1
Stabilized Construction Access



CONSTRUCTION SPECIFICATIONS

1. STONE SIZE - USE 1-4 INCH STONE, OR RECLAIMED OR RECYCLED CONCRETE EQUIVALENT.
2. LENGTH - NOT LESS THAN 50 FEET (EXCEPT ON A SINGLE RESIDENCE LOT WHERE A 30 FOOT MINIMUM LENGTH WOULD APPLY).
3. THICKNESS - NOT LESS THAN SIX (6) INCHES.
4. WIDTH - TWELVE (12) FOOT MINIMUM, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS. TWENTY-FOUR (24) FOOT IF SINGLE ENTRANCE TO SITE.
5. GEOTEXTILE - WILL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING OF STONE.
6. SURFACE WATER - ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ACCESS SHALL BE PIPED BENEATH THE ENTRANCE. IF PIPING IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SLOPES WILL BE PERMITTED.
7. MAINTENANCE - THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY, ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHTS-OF-WAY MUST BE REMOVED IMMEDIATELY.
8. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON A AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.
9. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS,
NEW YORK STATE DEPARTMENT OF TRANSPORTATION,
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION,
NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

STABILIZED
CONSTRUCTION
ACCESS

STANDARD AND SPECIFICATIONS FOR TEMPORARY ACCESS WATERWAY CROSSING

Definition & Scope

A temporary access waterway crossing is a structure placed across a waterway to provide access for construction purposes for a period of less than one year. Consideration should be given to stream flow capacity and velocity anticipated during the period of time that the temporary structures will be in place. Temporary access crossings shall not be utilized to maintain traffic for the general public. The purpose of the temporary access waterway crossing is to provide safe, environmentally sound access across a waterway for construction equipment by establishing minimum standards and specifications for the design, construction, maintenance, and removal of the structure. This standard and specification may represent a channel constriction, thus, the temporary nature of waterway access crossing must be stressed. They should be planned to be in service for the shortest practical period of time and removed as soon as their function is completed.

Conditions Where Practice Applies

This standard and specification for temporary access waterway crossings is applicable in non-tidal waterways. It provides designs based on waterway geometry rather than the drainage area contributing to the point of crossing.

The principal consideration for development of the standard and specifications is concern for erosion and sediment control, tracking soil into waterways, blocking fish passage and destruction of aquatic habitat. Structural utility and safety must also be considered when designing temporary access waterway crossings to withstand expected loads.

The three types of standard temporary access waterway crossings are bridges, culverts, and fords.

General Requirements

1. In-Stream Excavation: In-Stream excavation shall be limited to only that necessary to allow installation of the standard methods as presented in Subsection “Temporary Access Waterway Crossing Methods.”

2. Elimination of Fish Migration Barriers: Of the two basic methods presented in Subsection “Temporary Access Waterway Crossing Methods,” bridges pose the least potential for creating barriers to aquatic migration. The construction of any specific crossing method as presented in Subsection “Temporary Access Waterway Crossing Methods,” shall not cause a significant water level difference between the upstream and downstream water surface elevations. Fish spawning or migration within waterways generally occurs between October 1 to May 31 for water classified for trout and from March 15 to July 15 for other streams. Fish spawning or migration dates can vary across New York and restrictions imposed by the NYS Department of Environmental Conservation may vary and must be checked.

3. Crossing Alignment: The temporary waterway crossing shall be at right angles to the stream. Where approach conditions dictate, the crossing may vary 15 degrees from a line drawn perpendicular to the centerline of the stream at the intended crossing location.

4. Road Approaches: The centerline of both roadway approaches shall coincide with the crossing alignment centerline for a minimum distance of 50 feet from each bank of the waterway being crossed. If physical or right-of-way restraints preclude the 50 feet minimum, a shorter distance may be provided. All fill materials associated with the roadway approach shall be limited to a maximum height of 2 feet above the existing flood plain elevation.

5. Surface Water Diverting Structure: A water diverting structure such as a swale shall be constructed (across the roadway on both roadway approaches) 50 feet (maximum) on either side of the waterway crossing. This will prevent roadway surface runoff from directly entering the waterway. The 50 feet is measured from the top of the waterway bank. Design criteria for this diverting structure shall be in accordance with the “Standard and Specification” for

the individual design standard of choice. If the roadway approach is constructed with a reverse grade away from the waterway, a separate diverting structure is not required.

6. Road Width: All crossings shall have one traffic lane. The minimum width shall be 12 feet with a maximum width of 20 feet.

7. Time of Operation: All temporary crossing shall be removed within 14 calendar days after the structure is no longer needed. Unless prior written approval is obtained, all structures shall be removed within one year from the date of the installation.

8. Materials

A. Aggregate: There shall be no earth or soil materials used for construction within the waterway channel. NYS DOT specifications for coarse aggregate designation No. 4 (2" to 4"), also referenced as AASHTO designation No. 1, shall be the minimum acceptable aggregate size for temporary crossings. Larger aggregates will be allowed.

B. Filter Cloth: Filter cloth is a fabric consisting of either woven or nonwoven plastic, polypropylene, or nylon used to distribute the load, retain fines, allow increased drainage of the aggregate and reduce mixing of the aggregate with the subgrade soil. The designer shall specify the appropriate filter fabric/cloth for a specific use.

Temporary Access Waterway Crossing Methods

The following criteria for erosion and sediment control shall be considered when selecting a specific temporary access waterway crossing standard method:

1. Site aesthetics: Select a standard design method that will least disrupt the existing terrain of the stream reach. Consider the effort that will be required to restore the area after the temporary crossing is removed.

2. Site location: Locate the temporary crossing where there will be the least disturbance to the soils of the existing waterway banks. When possible, locate the crossing at a point receiving minimal surface runoff.

3. Physical site constraints: The physical constraints of a site may preclude the selection of one or more of the standard methods.

4. Time of year: The time of year may preclude the selection of one or more of the standard methods due to fish spawning or migration restrictions.

5. Vehicular loads and traffic patterns: Vehicular loads, traffic patterns, and frequency of crossing should be considered in choosing a specific method.

6. Maintenance of crossing: The standard methods will require various amounts of maintenance. The bridge method should require the least maintenance, whereas the ford method will probably require more intensive maintenance.

7. Removal of the Structure: Ease of removal and subsequent damage to the waterway should be primary factors in considering the choice of a standard method.

Temporary Access Bridge (Figure 2.2 on page 2.36)

A temporary access bridge is a structure made of wood, metal, or other materials, which provides access across a stream or waterway.

Considerations:

1. This is the preferred method for temporary access waterway crossings. Normally, bridge construction causes the least disturbance to the waterway bed and banks when compared to the other access waterway crossings.

2. Most bridges can be quickly removed and reused.

3. Temporary access bridges pose the least chance for interference with fish migration when compared to the other temporary access waterway crossings.

4. Span width will be limited by the length of the bridging material and weight of equipment that will drive over the temporary bridge. Spans of over 10 feet are difficult to construct.

5. Restrictions and Permits: A permit from the New York State Department of Environmental Conservation, Division of Environmental Permits, Regional Permit Administrator, will be needed to install and remove temporary access culverts in streams with a classification of C(T) and higher. Installation and removal may not be permitted during the period of time from the start of trout spawning until the eggs have hatched. In some instances, restrictions may also be applied to bass spawning waters.

Construction Specifications:

1. Restriction: Construction, use, or removal of a temporary access bridge will not normally have any time of year restrictions if construction, use, or

removal does not disturb the stream or its banks.

2. Bridge Placement: A temporary bridge structure shall be constructed at or above bank elevation to prevent the entrapment of floating materials and debris.

3. Abutments: Abutments shall be placed parallel to and on stable banks.

4. Bridge Span: Bridges shall be constructed to span the entire channel. If a footing, pier, or bridge support is constructed within the waterway, a stream- disturbance permit may be required.

5. Stringers: Stringers shall either be logs, saw timber, pre-stressed concrete beams, metal beams, or other approved materials.

6. Deck Material: Decking shall be of sufficient strength to support the anticipated load. All decking members shall be placed perpendicular to the stringers, butted tightly, and securely fastened to the stringers. Decking materials must be butted tightly to prevent any soil material tracked onto the bridge from falling into the waterway below.

7. Run Planks (optional): Run planking shall be securely fastened to the length of the span. One run plank shall be provided for each track of the equipment wheels. Although run planks are optional, they may be necessary to properly distribute loads.

8. Curbs or Fenders: Curbs or fenders may be installed along the outer sides of the deck. Curbs or fenders are an option, which will provide additional safety.

9. Bridge Anchors: Bridges shall be securely anchored at only one end using steel cable or chain. Anchoring at only one end will prevent channel obstruction in the event that floodwaters float the bridge. Acceptable anchors are large trees, large boulders, or driven steel anchors. Anchoring shall be sufficient to prevent the bridge from floating downstream and possibly causing an obstruction to the flow.

10. Stabilization: All areas disturbed during installation shall be stabilized within 14 calendar days of that disturbance in accordance with the Standard and Specification for Temporary Construction Area Seeding on page 4.58.

Bridge Maintenance Requirements

1. Inspection: Periodic inspection shall be performed by the user to ensure that the bridge, streambed, and streambanks are maintained and not damaged.

2. Maintenance: Maintenance shall be performed, as needed to ensure that the structure complies with the standard and specifications. This shall include removal and disposal of any trapped sediment or debris. Sediment shall be disposed of outside of the floodplain and stabilized.

Bridge Removal and Clean-Up Requirements

1. Removal: When the temporary bridge is no longer needed, all structures including abutments and other bridging materials shall be removed within 14 calendar days. In all cases, the bridge materials shall be removed within one year of installation.

2. Final Clean-Up: Final clean-up shall consist of removal of the temporary bridge from the waterway, protection of banks from erosion, and removal of all construction materials. All removed materials shall be stored outside the waterway floodplain.

3. Method: Removal of the bridge and clean-up of the area shall be accomplished without construction equipment working in the waterway channel.

4. Final Stabilization: All areas disturbed during removal shall be stabilized within 14 calendar days of that disturbance in accordance with the Standard and Specifications for Permanent Construction Area Planting on page 4.42.

Temporary Access Culvert (Figure 2.3 on page 2.37)

A temporary access culvert is a structure consisting of a section(s) of circular pipe, pipe arches, or oval pipes of reinforcing concrete, corrugated metal, or structural plate, which is used to convey flowing water through the crossing.

Considerations

1. Temporary culverts are used where a) the channel is too wide for normal bridge construction, b) anticipated loading may prove unsafe for single span bridges, or c) access is not needed from bank to bank.

2. This temporary waterway crossing method is normally preferred over a ford type of crossing, since disturbance to the waterway is only during construction and removal of the culvert.

3. Temporary culverts can be salvaged and reused.

Construction Specifications

1. Restrictions and Permits: A permit from the New York State Department of Environmental

Conservation, Division of Environmental Permits, Regional Permit Administrator, will be needed to install and remove temporary access culverts in streams with a classification of C(T) and higher. Installation and removal may not be permitted during the period of time from the start of trout spawning until the eggs have hatched. In some instances, restrictions may also be applied to bass spawning waters.

2. Culvert Strength: All culverts shall be strong enough to support their cross sectional area under maximum expected loads.

3. Culvert Size: The size of the culvert pipe shall be the largest pipe diameter that will fit into the existing channel without major excavation of the waterway channel or without major approach fills. If a channel width exceeds 3 feet, additional pipes may be used until the cross sectional area of the pipes is greater than 60 percent of the cross sectional area of the existing channel. The minimum size culvert that may be used is 12-inch diameter pipe.

4. Culvert Length: The culvert(s) shall extend a minimum of one foot beyond the upstream and downstream toe of the aggregate placed around the culvert. In no case shall the culvert exceed 40 feet in length.

5. Filter Cloth: Filter cloth shall be placed on the streambed and streambanks prior to placement of the pipe culvert(s) and aggregate. The filter cloth shall cover the streambed and extend a minimum six inches and a maximum one foot beyond the end of the culvert and bedding material. Filter cloth reduces settlement and improves crossing stability.

6. Culvert Placement: The invert elevation of the culvert shall be installed on the natural streambed grade to minimize interference with fish migration (free passage of fish).

7. Culvert Protection: The culvert(s) shall be covered with a minimum of one foot of aggregate. If multiple culverts are used, they shall be separated by at least 12 in. of compacted aggregate fill. At the minimum, the bedding and fill material used in the construction of the temporary access culvert crossings shall conform with the aggregate requirements cited in the General Requirements subsection.

8. Stabilization: All areas disturbed during culvert installation shall be stabilized within 14 calendar days of the disturbance in accordance with the Standard for Permanent Construction Area Plantings.

Culvert Maintenance Requirements

1. Inspection: Periodic inspection shall be performed to ensure that the culverts, streambed, and streambanks are not damaged, and that sediment is not entering the stream or blocking fish passage or migration.

2. Maintenance: Maintenance shall be performed, as needed in a timely manner to ensure that structures are in compliance with this standard and specification. This shall include removal and disposal of any trapped sediment or debris. Sediment shall be disposed of and stabilized outside the waterway flood plain.

Culvert Removal and Clean-Up Requirements

1. Removal: When the crossing has served its purpose, all structures, including culverts, bedding, and filter cloth materials shall be removed within 14 calendar days. In all cases, the culvert materials shall be removed within one year of installation. No structure shall be removed during the spawning season (generally October 1 through May 31 for trout waters and March 15 through July 15 for other waters).

2. Final Clean-Up: Final clean-up shall consist of removal of the temporary structure from the waterway, removal of all construction materials, restoration of original stream channel cross section, and protection of the streambanks from erosion. Removed material shall be stored outside of the waterway floodplain.

3. Method: Removal of the structure and clean-up of the area shall be accomplished without construction equipment working in the waterway channel.

4. Final Stabilization: All areas disturbed during culvert removal shall be stabilized within 14 calendar days of the disturbance in accordance with the Standard for Permanent Construction Area Plantings.

NOTE: Any temporary access crossing shall conform to the technical requirements of this Standard and Specifications as well as any specific requirement imposed by the New York State Department of Environmental Conservation and the US Army Corps of Engineers. Permits may be required for streambank disturbance.

Figure 2.2
Temporary Access Bridge

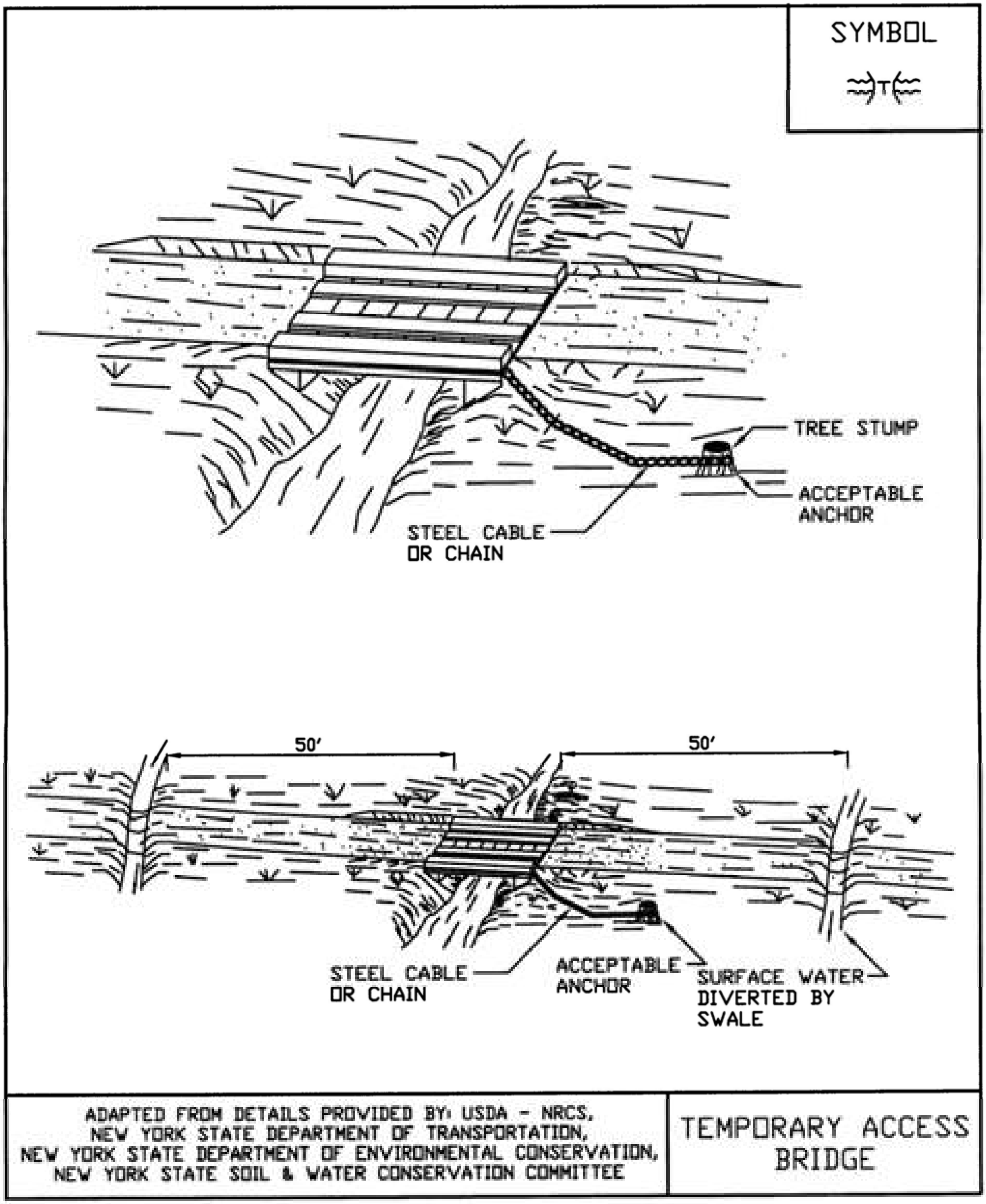


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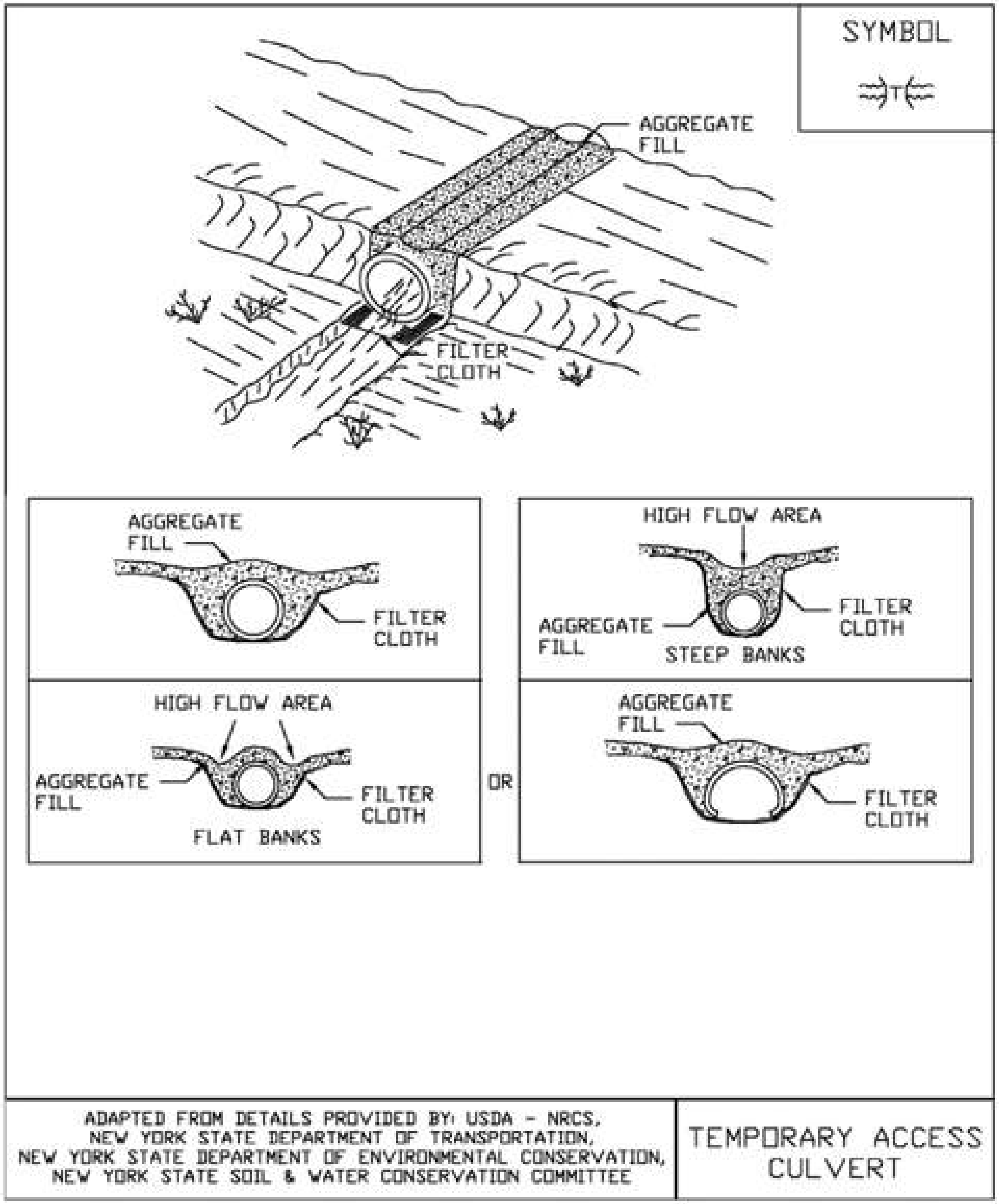
Figure 2.3
Temporary Access Culvert



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STANDARD AND SPECIFICATIONS FOR WINTER STABILIZATION

Definition & Scope

A temporary site specific, enhanced erosion and sediment control plan to manage runoff and sediment at the site during construction activities in the winter months to protect off-site water resources.

Conditions Where Practice Applies

This standard applies to all construction activities involved with ongoing land disturbance and exposure between November 15th to the following April 1st.

Design Criteria

1. Prepare a snow management plan with adequate storage for snow and control of melt water, requiring cleared snow to be stored in a manner not affecting ongoing construction activities.

2. Enlarge and stabilize access points to provide for snow management and stockpiling. Snow management activities must not destroy or degrade installed erosion and sediment control practices.

3. A minimum 25 foot buffer shall be maintained from all perimeter controls such as silt fence. Mark silt fence with tall stakes that are visible above the snow pack.

4. Edges of disturbed areas that drain to a waterbody within 100 feet will have 2 rows of silt fence, 5 feet apart, installed on the contour.

5. Drainage structures must be kept open and free of snow and ice dams. All debris, ice dams, or debris from plowing operations, that restrict the flow of runoff and meltwater, shall be removed.

6. Sediment barriers must be installed at all appropriate perimeter and sensitive locations. Silt fence and other practices requiring earth disturbance must be installed before the ground freezes.

7. Soil stockpiles must be protected by the use of established vegetation, anchored straw mulch, rolled stabilization matting, or other durable covering. A barrier must be installed at least 15 feet from the toe of the stockpile to prevent soil migration and to capture loose soil.

8. In areas where soil disturbance activity has temporarily or permanently ceased, the application of soil stabilization measures should be initiated by the end of the next business day and completed within three (3) days. Rolled erosion control blankets must be used on all slopes 3 horizontal to 1 vertical or steeper.

9. If straw mulch alone is used for temporary stabilization, it shall be applied at double the standard rate of 2 tons per acre, making the application rate 4 tons per acre. Other manufactured mulches should be applied at double the manufacturer's recommended rate.

10. To ensure adequate stabilization of disturbed soil in advance of a melt event, areas of disturbed soil should be stabilized at the end of each work day unless:

    a. work will resume within 24 hours in the same area and no precipitation is forecast or;

    b. the work is in disturbed areas that collect and retain runoff, such as open utility trenches, foundation excavations, or water management areas.

11. Use stone paths to stabilize access perimeters of buildings under construction and areas where construction vehicle traffic is anticipated. Stone paths should be a minimum 10 feet in width but wider as necessary to accommodate equipment.

Maintenance

The site shall be inspected frequently to ensure that the erosion and sediment control plan is performing its winter stabilization function. If the site will not have earth disturbing activities ongoing during the "winter season", **all** bare exposed soil must be stabilized by established vegetation, straw or other acceptable mulch, matting, rock, or other approved material such as rolled erosion control products. Seeding of areas with mulch cover is preferred but seeding alone is not acceptable for proper stabilization.

Compliance inspections must be performed and reports filed properly in accordance with the SWPPP for all sites under a winter shutdown.

STANDARD AND SPECIFICATIONS FOR CHECK DAM

Definition & Scope

Small barriers or dams constructed of stone, bagged sand or gravel, or other durable materials across a drainageway to reduce erosion in a drainage channel by reducing the velocity of flow in the channel.

Conditions Where Practice Applies

This practice is used as a **temporary** and, in some cases, a **permanent** measure to limit erosion by reducing velocities in open channels that are degrading or subject to erosion or where permanent stabilization is impractical due to short period of usefulness and time constraints of construction.

Design Criteria

Drainage Area: Maximum drainage area above the check dam shall not exceed two (2) acres.

Height: Not greater than 2 feet. Center shall be maintained 9 inches lower than abutments at natural ground elevation.

Side Slopes: Shall be 2:1 or flatter.

Spacing: The check dams shall be spaced as necessary in the channel so that the crest of the downstream dam is at the elevation of the toe of the upstream dam. This spacing is equal to the height of the check dam divided by the channel slope.

Therefore:

$$S = \frac{h}{s}$$

Where:
S = spacing interval (ft.)
h = height of check dam (ft.)
s = channel slope (ft./ft.)

Example:

For a channel with a 4% slope and 2 ft. high stone check dams, they are spaced as follows:

$$S = \frac{2\ \text{ft}}{0.04\ \frac{\text{ft}}{\text{ft}}} = 50\ \text{ft}$$

For stone check dams: Use a well graded stone matrix 2 to 9 inches in size (NYS – DOT Light Stone Fill meets these requirements).

The overflow of the check dams will be stabilized to resist erosion that might be caused by the check dam. See Figure 3.1 on page 3.3 for details.

Check dams should be anchored in the channel by a cutoff trench 1.5 ft. wide and 0.5 ft. deep and lined with filter fabric to prevent soil migration.

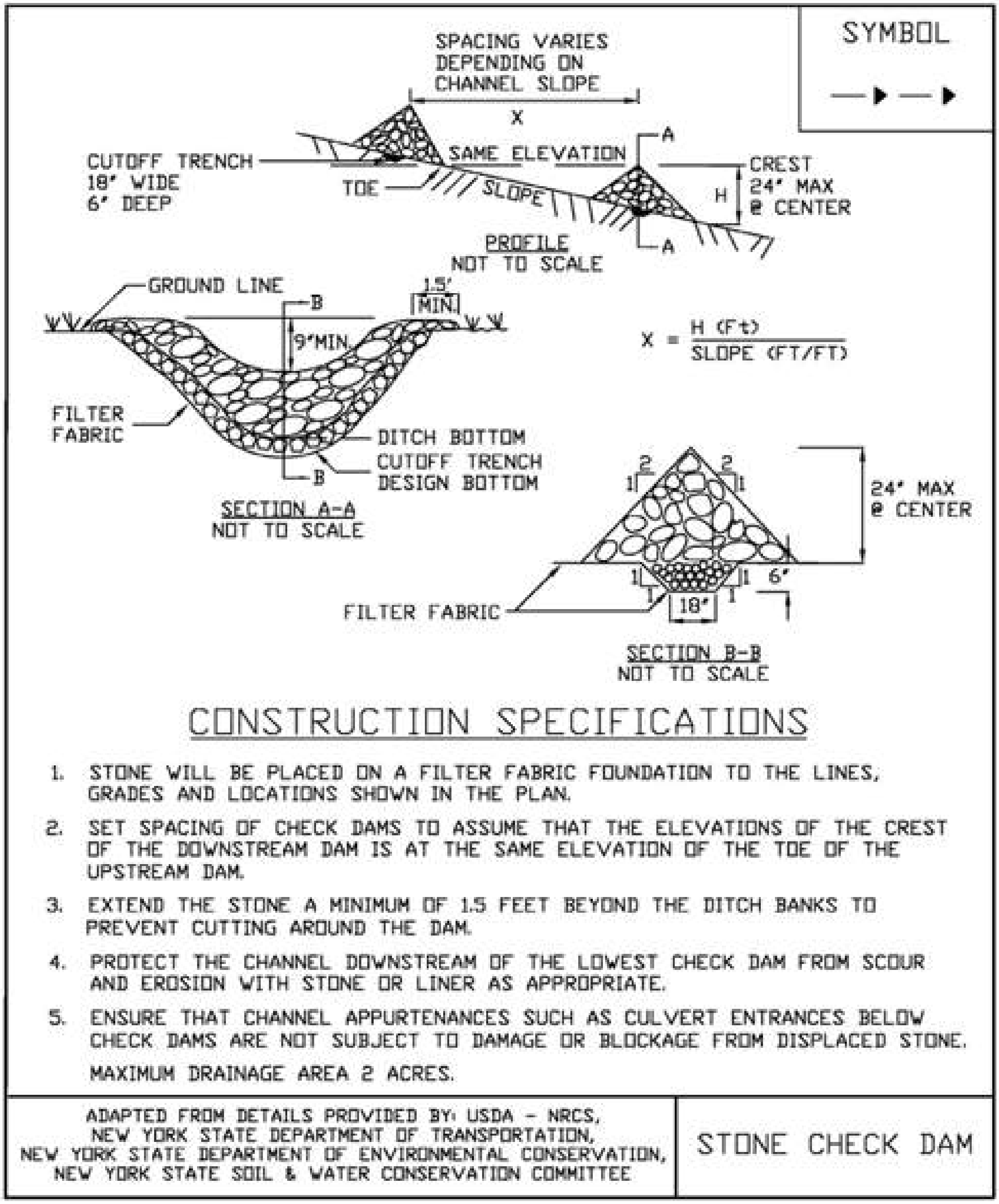
For filter sock or fiber roll check dams: The check dams will be anchored by staking the dam to the earth contact surface. The dam will extend to the top of the bank. The check dam will have a splash apron of NYS DOT #2 crushed stone extending a minimum 3 feet downstream from the dam and 1 foot up the sides of the channel. The compost and materials for a filter sock check dam shall meet the requirements shown in the standard for Compost Filter Sock on page 5.7.

Maintenance

The check dams should be inspected after each runoff event. Correct all damage immediately. If significant erosion has occurred between structures, a liner of stone or other suitable material should be installed in that portion of the channel or additional check dams added.

Remove sediment accumulated behind the dam as needed to allow channel to drain through the stone check dam and prevent large flows from carrying sediment over the dam.

Figure 3.1
Stone Check Dam Detail



CONSTRUCTION SPECIFICATIONS

1. STONE WILL BE PLACED ON A FILTER FABRIC FOUNDATION TO THE LINES, GRADES AND LOCATIONS SHOWN IN THE PLAN.
2. SET SPACING OF CHECK DAMS TO ASSUME THAT THE ELEVATIONS OF THE CREST OF THE DOWNSTREAM DAM IS AT THE SAME ELEVATION OF THE TOE OF THE UPSTREAM DAM.
3. EXTEND THE STONE A MINIMUM OF 1.5 FEET BEYOND THE DITCH BANKS TO PREVENT CUTTING AROUND THE DAM.
4. PROTECT THE CHANNEL DOWNSTREAM OF THE LOWEST CHECK DAM FROM SCOUR AND EROSION WITH STONE OR LINER AS APPROPRIATE.
5. ENSURE THAT CHANNEL APPURTENANCES SUCH AS CULVERT ENTRANCES BELOW CHECK DAMS ARE NOT SUBJECT TO DAMAGE OR BLOCKAGE FROM DISPLACED STONE.

MAXIMUM DRAINAGE AREA 2 ACRES.

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STONE CHECK DAM

STANDARD AND SPECIFICATIONS FOR DIVERSION

Definition & Scope

A drainage way of parabolic or trapezoidal cross-section with a supporting ridge on the lower side that is constructed across the slope to intercept and convey runoff to stable outlets at non-erosive velocities.

Conditions Where Practice Applies

Diversions are used where:

1. Runoff from higher areas has potential for damaging properties, causing erosion, or interfering with, or preventing the establishment of, vegetation on lower areas.
2. Surface and/or shallow subsurface flow is damaging sloping upland.
3. The length of slopes needs to be reduced so that soil loss will be kept to a minimum.

Diversions are only applicable below stabilized or protected areas. Avoid establishment on slopes greater than fifteen percent. Diversions should be used with caution on soils subject to slippage. Construction of diversions shall be in compliance with state and local drainage and water laws.

Design Criteria

Location

Diversion location shall be determined by considering outlet conditions, topography, land use, soil type, length of slope, seep planes (when seepage is a problem), and the development layout.

Capacity

Peak rates of runoff values used in determining the capacity requirements shall be calculated using the most current hydrologic data from the Northeast Regional Climate Center in an appropriate model.

The constructed diversion shall have capacity to carry, as a minimum, the peak discharge from a 10 year frequency rainfall event with freeboard of not less than 0.3 feet.

Diversions designed to protect homes, schools, industrial buildings, roads, parking lots, and comparable high-risk areas, and those designed to function in connection with other structures, shall have sufficient capacity to carry peak runoff expected from a storm frequency consistent with the hazard involved.

Cross Section

The diversion channel shall be parabolic or trapezoidal in shape. Parabolic Diversion design charts are provided in Tables 3.2, 3.3 and 3.4 on pages 3.10, 3.12 and 3.13**.** The diversion shall be designed to have stable side slopes. The side slopes shall not be steeper than 2:1 and shall be flat enough to ensure ease of maintenance of the diversion and its protective vegetative cover.

The ridge shall have a minimum width of four feet at the design water elevation; a minimum of 0.3 feet freeboard and a reasonable settlement factor shall be provided.

Velocity and Grade

The permissible velocity for the specified method of stabilization will determine the maximum grade. Maximum permissible velocities of flow for the stated conditions of stabilization shall be as shown in Table 3.1 on page 3.10 of this standard.

Diversions are not usually applicable below high sediment producing areas unless land treatment practices or structural measures, designed to prevent damaging accumulations of sediment in the channels, are installed with, or before, the diversions.

Outlets

Each diversion must have an adequate outlet. The outlet may be a grassed waterway, vegetated or paved area, grade stabilization structure, flow spreader, flow diffuser, stable watercourse, or subsurface drain outlet. In all cases, the outlet must convey runoff to a point where outflow will not cause damage. Vegetated outlets shall be installed before diversion construction, if needed, to ensure establishment of vegetative cover in the outlet channel.

The design elevation of the water surface in the diversion shall not be lower than the design elevation of the water surface in the outlet at their junction when both are operating at design flow.

Stabilization

Vegetated diversions shall be stabilized in accordance with the following tables.

Table 3.1
Diversion Maximum Permissible Design Velocities Table

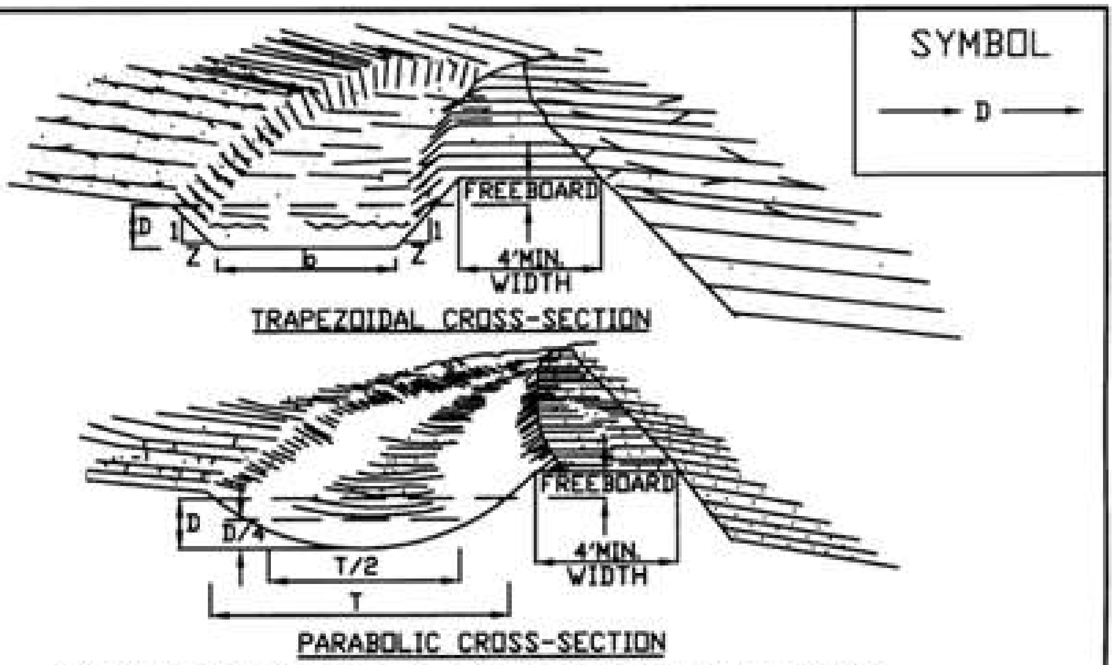
Soil Texture	Retardance and Cover	Permissible Velocity (ft / second) for Selected Channel Vegetation
Sand, Silt, Sandy loam, silty loam, loamy sand (ML, SM, SP, SW)	C-Kentucky 31 tall fescue and Kentucky bluegrass	3.0
	D-Annuals[1] Small grain (rye, oats, barley, millet) Ryegrass	2.5
Silty clay loam, Sandy clay loam (ML-CL, SC)	C-Kentucky 31 tall fescue and Kentucky bluegrass	4.0
	D-Annuals[1] Small grain (rye, oats, barley, millet) Ryegrass	3.5
Clay (CL)	C-Kentucky 31 tall fescue and Kentucky bluegrass	5.0
	D-Annuals[1] Small grain (rye, oats, barley, millet) Ryegrass	4.0

[1] Annuals—Use only as temporary protection until permanent vegetation is established.

Table 3.2 - Retardance Factors for Various Grasses and Legumes Table

Retardance	Cover	Condition
A	Reed canarygrass	Excellent stand, tall (average 36 inches)
B	Smooth bromegrass	Good stand, mowed (average 12 to 15 inches)
	Tall fescue	Good stand, unmowed (average 18 inches)
	Grass-legume mixture—Timothy, smooth bromegrass, or Orchard grass with birdsfoot trefoil	Good stand, uncut (average 20 inches)
	Reed canarygrass	Good stand, mowed (average 12 to 15 inches)
	Tall fescue, with birdsfoot trefoil or ladino clover	Good stand, uncut (average 18 inches)
C	Redtop	Good stand, headed (15 to 20 inches)
	Grass-legume mixture—summer (Orchard grass, redtop, Annual ryegrass, and ladino or white clover)	Good stand, uncut (6 to 8 inches)
	Kentucky bluegrass	Good stand, headed (6 to 12 inches)
D	Red fescue	Good stand, headed (12 to 18 inches)
	Grass-legume mixture—fall, spring (Orchard grass, redtop, Annual ryegrass, and white or ladino clover)	Good stand, uncut (4 to 5 inches)

Figure 3.4
Diversion Detail



CONSTRUCTION SPECIFICATIONS

1. ALL TREES, BRUSH, STUMPS, OBSTRUCTIONS, AND OTHER OBJECTIONABLE MATERIAL SHALL BE REMOVED AND DISPOSED OF SO AS NOT TO INTERFERE WITH THE PROPER FUNCTIONING OF THE DIVERSION.
2. THE DIVERSION SHALL BE EXCAVATED OR SHAPED TO LINE, GRADE, AND CROSS SECTION AS REQUIRED TO MEET THE CRITERIA SPECIFIED HEREIN, AND BE FREE OF BANK PROJECTIONS OR OTHER IRREGULARITIES WHICH WILL IMPEDE NORMAL FLOW.
3. FILLS SHALL BE COMPACTED AS NEEDED TO PREVENT UNEQUAL SETTLEMENT THAT WOULD CAUSE DAMAGE IN THE COMPLETE DIVERSION.
4. ALL EARTH REMOVED AND NOT NEEDED IN CONSTRUCTION SHALL BE SPREAD OR DISPOSED OF SO THAT IT WILL NOT INTERFERE WITH THE FUNCTIONING OF THE DIVERSION.
5. STABILIZATION SHALL BE DONE ACCORDING TO THE APPROPRIATE STANDARD AND SPECIFICATIONS FOR VEGETATIVE PRACTICES.
   A. FOR DESIGN VELOCITIES OF LESS THAN 3.5 FT. PER. SEC., SEEDING AND MULCHING MAY BE USED FOR THE ESTABLISHMENT OF THE VEGETATION. IT IS RECOMMENDED THAT, WHEN CONDITIONS PERMIT, TEMPORARY DIVERSIONS OR OTHER MEANS SHOULD BE USED TO PREVENT WATER FROM ENTERING THE DIVERSION DURING THE ESTABLISHMENT OF THE VEGETATION.
   B. FOR DESIGN VELOCITIES OF MORE THAN 3.5 FT. PER. SEC., THE DIVERSION SHALL BE STABILIZED WITH SOD, WITH SEEDING PROTECTED BY JUTE OR EXCELSIOR MATTING OR WITH SEEDING AND MULCHING INCLUDING TEMPORARY DIVERSION OF THE WATER UNTIL THE VEGETATION IS ESTABLISHED.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS,
NEW YORK STATE DEPARTMENT OF TRANSPORTATION,
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION,
NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

DIVERSION

Table 3.3
Parabolic Diversion Design, Without Freeboard Tables - 1 (USDA– NRCS)

PARABOLIC DIVERSION DESIGN, WITHOUT FREEBOARD

RETARDANCE - D & C
GRADE, % - 0.50

V_1 Based on Permissible Velocity of the Soil With Retardance "D"
Top Width, Depth & V_2 Based on Retardance "C"

Q	$V_1 = 2.0$			$V_1 = 2.5$			$V_1 = 3.0$			$V_1 = 3.5$			$V_1 = 4.0$			$V_1 = 4.5$			$V_1 = 5.0$			$V_1 = 5.5$			$V_1 = 6.0$		
cfs	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2
15	9	1.6	1.6																								
20	11	1.6	1.7																								
25	14	1.6	1.7	9	1.9	2.1																					
30	17	1.6	1.7	11	1.9	2.2	8	2.2	2.5																		
35	20	1.6	1.7	12	1.9	2.3	9	2.1	2.6																		
40	22	1.6	1.7	14	1.9	2.3	11	2.1	2.7																		
45	25	1.5	1.7	16	1.8	2.3	12	2.0	2.8																		
50	28	1.5	1.7	18	1.8	2.4	13	2.0	2.8	10	2.4	3.2															
55	31	1.5	1.7	19	1.8	2.4	15	2.0	2.8	11	2.4	3.3															
60	33	1.5	1.7	21	1.8	2.4	16	2.0	2.8	11	2.4	3.3															
65	36	1.5	1.8	23	1.8	2.4	17	2.0	2.9	12	2.4	3.3															
70	39	1.5	1.7	24	1.8	2.4	18	2.0	2.9	13	2.3	3.4															
75	42	1.5	1.8	26	1.8	2.4	19	2.0	2.9	14	2.3	3.4	11	2.7	3.7												
80	44	1.5	1.8	28	1.8	2.4	21	2.0	2.9	15	2.3	3.4	12	2.7	3.8												
90	50	1.5	1.8	31	1.8	2.4	24	2.0	2.9	17	2.3	3.4	13	2.7	3.8												
100	55	1.5	1.8	35	1.8	2.4	26	2.0	2.9	19	2.3	3.5	15	2.6	3.9	12	3.0	4.1									

PARABOLIC DIVERSION DESIGN, WITHOUT FREEBOARD

RETARDANCE - D & C
GRADE, % - 1.0

V_1 based on Permissible Velocity of the Soil With Retardance "D"
Top Width, Depth & V_2 Based on Retardance "C"

Q	$V_1 = 2.0$			$V_1 = 2.5$			$V_1 = 3.0$			$V_1 = 3.5$			$V_1 = 4.0$			$V_1 = 4.5$			$V_1 = 5.0$			$V_1 = 5.5$			$V_1 = 6.0$		
cfs	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2
15	13	1.1	1.5	8	1.3	2.0																					
20	18	1.1	1.5	11	1.3	2.1	8	1.5	2.6																		
25	22	1.1	1.5	14	1.3	2.1	9	1.5	2.6	8	1.6	3.0															
30	27	1.1	1.5	17	1.3	2.1	11	1.5	2.7	9	1.6	3.0															
35	31	1.1	1.5	19	1.3	2.2	13	1.5	2.8	11	1.6	3.1	8	1.8	3.6												
40	35	1.1	1.5	22	1.3	2.1	15	1.4	2.8	12	1.5	3.1	9	1.8	3.7												
45	40	1.1	1.5	25	1.3	2.2	17	1.5	2.8	13	1.6	3.2	10	1.8	3.7												
50	44	1.1	1.5	28	1.3	2.2	19	1.4	2.8	15	1.6	3.2	11	1.8	3.7	9	2.0	4.2									
55	46	1.1	1.5	30	1.3	2.2	20	1.4	2.8	16	1.5	3.3	12	1.8	3.8	10	2.0	4.3									
60	53	1.1	1.5	33	1.3	2.2	22	1.4	2.8	18	1.5	3.3	14	1.7	3.8	10	2.0	4.3									
65	57	1.1	1.5	36	1.3	2.2	24	1.4	2.8	19	1.5	3.3	15	1.7	3.8	11	2.0	4.3	9	2.2	4.7						
70	61	1.1	1.5	38	1.3	2.2	26	1.4	2.8	21	1.5	3.3	16	1.7	3.9	12	2.0	4.4	10	2.2	4.7						
75	66	1.1	1.5	41	1.3	2.2	28	1.4	2.9	22	1.5	3.3	17	1.7	3.9	13	2.0	4.5	11	2.2	4.7						
80	70	1.1	1.5	44	1.3	2.2	29	1.4	2.9	24	1.5	3.3	18	1.7	3.9	14	2.0	4.4	11	2.2	4.9						
90	79	1.1	1.5	49	1.3	2.2	33	1.4	2.9	27	1.5	3.3	20	1.7	3.9	15	1.9	4.5	13	2.2	4.9	11	2.4	5.2			
100	87	1.1	1.5	55	1.3	2.2	37	1.4	2.9	29	1.5	3.3	22	1.7	3.9	17	1.9	4.5	14	2.2	4.9	12	2.4	5.3			

Table 3.4
Parabolic Diversion Design, Without Freeboard Tables - 2 (USDA– NRCS)

PARABOLIC DIVERSION DESIGN, WITHOUT FREEBOARD

RETARDANCE - D & C
GRADE, % - 1.5

V_1 Based on Permissible Velocity of the Soil With Retardance "D"
Top Width, Depth & V_2 Based on Retardance "C"

Q	V_1 = 2.0			V_1 = 2.5			V_1 = 3.0			V_1 = 3.5			V_1 = 4.0			V_1 = 4.5			V_1 = 5.0			V_1 = 5.5			V_1 = 6.0		
cfs	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2
15	17	0.9	1.4	11	1.1	1.9	8	1.2	2.4																		
20	23	0.9	1.4	15	1.0	1.9	10	1.2	2.5	7	1.4	3.0	5	1.5	3.4												
25	28	0.9	1.4	19	1.0	1.9	12	1.2	2.6	8	1.4	3.2	7	1.5	3.6												
30	34	0.9	1.4	22	1.0	1.9	15	1.2	2.6	10	1.3	3.2	8	1.5	3.6	7	1.6	4.0									
35	40	0.9	1.4	26	1.0	2.0	17	1.1	2.6	12	1.3	3.3	10	1.4	3.7	8	1.6	4.1									
40	45	0.9	1.4	30	1.0	1.9	20	1.2	2.6	14	1.3	3.3	11	1.4	3.7	9	1.6	4.2	7	1.8	4.6						
45	51	0.9	1.4	33	1.0	2.0	22	1.1	2.5	15	1.3	3.4	12	1.4	3.8	10	1.5	4.3	8	1.8	4.6						
50	56	0.9	1.4	37	1.0	2.0	25	1.1	2.7	17	1.3	3.4	14	1.4	3.9	11	1.5	4.3	9	1.8	4.8						
55	62	0.9	1.5	41	1.0	2.0	27	1.1	2.6	19	1.3	3.4	15	1.4	3.9	12	1.5	4.3	10	1.7	4.9	8	1.9	5.1			
60	67	0.9	1.5	44	1.0	2.0	30	1.1	2.7	20	1.3	3.4	16	1.4	3.9	14	1.5	4.4	11	1.7	4.9	9	1.9	5.2			
65	73	0.9	1.5	48	1.0	2.0	32	1.1	2.7	22	1.3	3.4	18	1.4	3.9	15	1.5	4.4	11	1.7	5.0	10	1.9	5.3			
70	78	0.9	1.5	51	1.0	2.0	34	1.1	2.7	24	1.3	3.4	19	1.4	3.9	16	1.5	4.4	12	1.7	4.9	10	1.9	5.4	9	2.1	5.6
75	83	0.9	1.5	55	1.0	2.0	37	1.1	2.7	25	1.3	3.4	21	1.4	3.9	17	1.5	4.4	13	1.7	5.0	11	1.9	5.4	9	2.1	5.6
80	89	0.9	1.5	59	1.0	2.0	39	1.1	2.7	27	1.3	3.4	22	1.4	3.9	18	1.5	4.4	14	1.7	5.0	12	1.9	5.5	10	2.1	5.8
90	100	0.9	1.5	66	1.0	2.0	44	1.1	2.7	30	1.3	3.5	25	1.4	3.9	20	1.5	4.4	15	1.7	5.0	13	1.9	5.4	11	2.0	5.9
100				73	1.0	2.0	49	1.1	2.7	33	1.3	3.5	27	1.4	3.9	22	1.5	4.5	17	1.7	5.1	15	1.9	5.5	12	2.0	6.0

PARABOLIC DIVERSION DESIGN, WITHOUT FREEBOARD

RETARDANCE - D & C
GRADE, % - 2.0

V_1 Based on Permissible Velocity of the Soil With Retardance "D"
Top Width, Depth & V_2 Based on Retardance "C"

Q	V_1 = 2.0			V_1 = 2.5			V_1 = 3.0			V_1 = 3.5			V_1 = 4.0			V_1 = 4.5			V_1 = 5.0			V_1 = 5.5			V_1 = 6.0		
cfs	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2
15	21	0.8	1.3	13	0.9	1.9	9	1.0	2.4	7	1.2	2.9															
20	28	0.8	1.3	17	0.9	1.9	12	1.0	2.4	9	1.1	3.0	7	1.3	3.5	5	1.4	3.8									
25	35	0.8	1.3	21	0.9	1.9	15	1.0	2.4	11	1.1	3.0	8	1.3	3.7	7	1.4	4.0									
30	41	0.8	1.3	26	0.9	1.9	18	1.0	2.5	13	1.1	3.0	10	1.2	3.7	8	1.3	4.2	7	1.5	4.5						
35	48	0.5	1.4	30	0.9	1.9	22	1.0	2.4	15	1.1	3.1	11	1.2	3.8	9	1.3	4.2	8	1.5	4.7						
40	55	0.8	1.3	34	0.9	1.9	25	1.0	2.5	18	1.1	3.1	13	1.2	3.8	11	1.3	4.3	9	1.5	4.7	7	1.7	5.0			
45	62	0.8	1.4	38	0.9	1.9	28	1.0	2.5	20	1.1	3.1	14	1.2	3.8	12	1.3	4.3	10	1.4	4.8	8	1.6	5.2			
50	68	0.8	1.4	42	0.9	1.9	31	1.0	2.5	22	1.1	3.1	16	1.2	3.9	13	1.3	4.3	11	1.4	4.8	9	1.6	5.3	8	1.7	5.6
55	75	0.8	1.4	46	0.9	1.9	34	1.0	2.5	24	1.1	3.1	17	1.2	3.8	14	1.3	4.3	12	1.4	4.9	10	1.6	5.3	8	1.7	5.8
60	82	0.8	1.4	51	0.9	1.9	37	1.0	2.5	26	1.1	3.1	19	1.2	3.9	16	1.3	4.4	13	1.4	4.8	11	1.6	5.3	9	1.7	5.7
65	88	0.8	1.4	55	0.9	1.9	40	1.0	2.5	28	1.1	3.1	21	1.2	3.9	17	1.3	4.4	14	1.4	4.9	11	1.6	5.4	10	1.7	5.7
70	95	0.8	1.4	59	0.9	1.9	43	1.0	2.5	30	1.1	3.1	22	1.2	3.9	18	1.3	4.4	15	1.4	4.9	12	1.6	5.4	10	1.7	5.8
75				63	0.9	1.9	46	1.0	2.5	32	1.1	3.2	24	1.2	3.9	20	1.3	4.4	16	1.4	5.0	13	1.6	5.5	11	1.7	5.9
80				67	0.9	2.0	48	1.0	2.5	35	1.1	3.1	25	1.2	3.9	21	1.3	4.4	17	1.4	4.9	14	1.6	5.4	12	1.7	6.0
90				75	0.9	2.0	54	1.0	2.5	39	1.1	3.2	28	1.2	3.9	23	1.3	4.4	19	1.4	4.9	16	1.6	5.5	13	1.7	5.9
100				83	0.9	2.0	60	1.0	2.5	43	1.1	3.2	31	1.2	3.9	26	1.3	4.4	21	1.4	5.0	17	1.6	5.5	15	1.7	6.0

STANDARD AND SPECIFICATIONS FOR EARTH DIKE

Definition & Scope

A **temporary** berm or ridge of compacted soil, located in such a manner as to channel water to a desired location. Its purpose is to direct runoff to a sediment trapping device, thereby reducing the potential for erosion and off site sedimentation. Earth dikes can also be used for diverting clean water away from disturbed areas.

Conditions Where Practice Applies

Earth dikes are often constructed across disturbed areas and around construction sites such as graded parking lots and subdivisions. The dikes shall remain in place until the disturbed areas are permanently stabilized.

Design Criteria

See Figure 3.5 on page 3.15 for details.

General

	Dike A	Dike B
Drainage Area	<5 Ac	5-10 Ac
Dike Height	18 in.	36 in.
Dike Width	24 in.	36 in.
Flow Width	4 ft.	6 ft.
Flow Depth in Channel	8 in.	15 in.
Side Slopes	2:1 or flatter	2:1 or flatter
Grade	0.5% Min. 10% Max.	0.5% Min. 10% Max.

For drainage areas larger than 10 acres, refer to the Standard and Specifications for Diversion on page 3.9.

Stabilization

Stabilization of the dike shall be completed within 2 days of installation in accordance with the standard and specifications for seed and straw mulch or straw mulch only if not in seeding season. The flow channel shall be stabilized as per the following criteria:

Type of Treatment	Channel Grade[1]	Flow Channel	
		A (<5 Ac.)	B (5-10 Ac.)
1	0.5-3.0%	Seed & Straw Mulch	Seed & Straw Mulch
2	3.1-5.0%	Seed & Straw Mulch	Seed and cover with RECP, sod, or lined with plastic or 2” stone
3	5.1-8.0%	Seed and cover with RECP, Sod, or line with plastic or 2 in. stone	Line with 4-8 in. rip-rap or, geotextile
4	8.1-10%	Line with 4-8 in. rip-rap or geotextile	Site Specific Design

[1] In highly erodible soils, as defined by the local approving agency, refer to the next higher slope grade for type of stabilization.

Outlet

Earth dikes shall have an outlet that functions with a minimum of erosion.

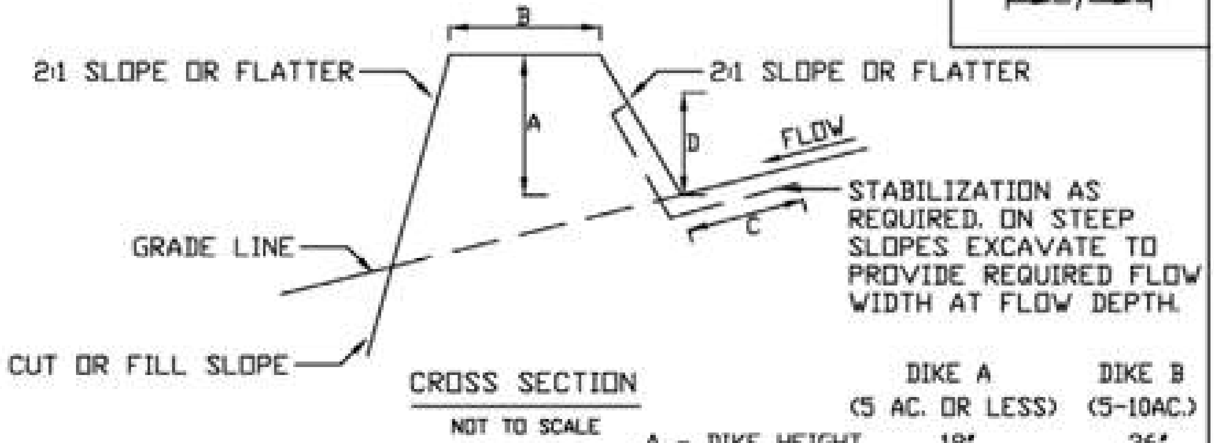
Runoff shall be conveyed to a sediment trapping device until the drainage area above the dike is adequately stabilized.

The on-site location may need to be adjusted to meet field conditions in order to utilize the most suitable outlet.

Figure 3.5
Earth Dike Detail

SYMBOL

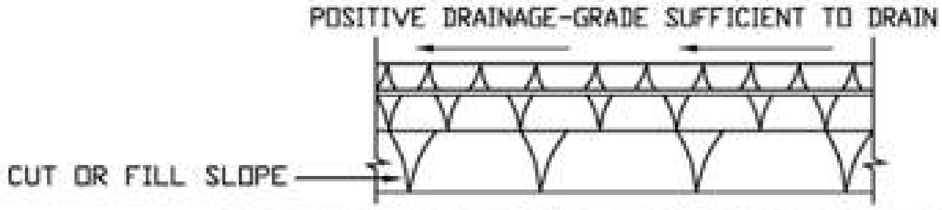
A-2/B-3



CROSS SECTION

NOT TO SCALE

	DIKE A (5 AC. OR LESS)	DIKE B (5-10AC.)
A - DIKE HEIGHT	18"	36"
B - DIKE WIDTH	24"	36"
C - FLOW WIDTH	48"	72"
D - FLOW DEPTH	8"	15"



CONSTRUCTION SPECIFICATIONS

1. ALL DIKES SHALL BE COMPACTED BY EARTH-MOVING EQUIPMENT.
2. ALL DIKES SHALL HAVE POSITIVE DRAINAGE TO AN OUTLET.
3. TOP WIDTH MAY BE WIDER AND SIDE SLOPES BE FLATTER IF DESIRED TO FACILITATE CROSSING BY CONSTRUCTION TRAFFIC.
4. FIELD LOCATION SHOULD BE ADJUSTED AS NEEDED TO UTILIZE A STABILIZED SAFE OUTLET.
5. EARTH DIKES SHALL HAVE AN OUTLET THAT FUNCTIONS WITH A MINIMUM OF EROSION. RUNOFF SHALL BE CONVEYED TO A SEDIMENT TRAPPING DEVICE SUCH AS A SEDIMENT TRAP OR SEDIMENT BASIN WHERE EITHER THE DIKE CHANNEL OR THE DRAINAGE AREA ABOVE THE DIKE ARE NOT ADEQUATELY STABILIZED.
6. FILL STABILIZATION SHALL BE: (A) IN ACCORDANCE WITH STANDARD SPECIFICATIONS FOR SEED AND STRAW MULCH IF NOT IN SEEDING SEASON, (B) FLOW CHANNEL STABILIZATION PER THE STANDARD CHART BASED ON CHANNEL GRADE.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS,
NEW YORK STATE DEPARTMENT OF TRANSPORTATION,
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION,
NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

EARTH DIKE

STANDARD AND SPECIFICATIONS FOR FLOW DIFFUSER

Definition & Scope

A permanent non-erosive outlet for concentrated runoff constructed to diffuse flow uniformly through a stone matrix onto a stablilized area in the form of shallow, low velocity, sheet flow.

Conditions Where Practice Applies

Where sediment-free stormwater runoff can be released in low velocity sheet flow down stabilized areas without causing erosion; where the ground slope at the outlet of the diffuser is less than 30% and the runoff will not re-concentrate after release; and where construction of a flow spreader is not practicable.

Design Criteria

1. **Drainage area:** The maximum drainage area to the diffuser may not exceed 0.10 acre per foot length of the flow diffuser. The drainage area served by the diffuser discharging directly cannot be 10-20% more than half the size of the receiving buffer area.

2. **Discharge from diffuser onto receiving area:** The peak stormwater flow rate from a flow diffuser onto a receiving area from a 10-year 24-hour storm must be less than 0.25 cubic feet per second (0.25 cfs) per linear foot of weir crest length.

3. **Receiving area of buffer:** Each flow diffuser shall have a vegetated receiving area with a minimum continuous length of 150 feet and the capacity to pass the flow without erosion. The receiving area shall be stable prior to the construction of the flow diffuser. The receiving area shall have topography regular enough to prevent undue flow concentration before entering a stable watercourse but it shall have a slope that is less than 30%. If the receiving area is not presently stable, then the receiving area shall be stabilized prior to construction of the flow diffuser. The receiving area below the flow diffuser shall be protected from harm during construction. Sodding and/or turf reinforcement mat (TRM) in combination with vegetative measures shall stabilize disturbed areas. The receiving area shall not be used by the flow diffuser until stabilization has been accomplished. A temporary diversion may be necessary in this case.

4. **Cross-section:** The minimum stone diffuser cross-section shall be trapezoidal with a height of 1 foot above natural ground; top width equal to 2 foot and side slope equal to 1 horizontal to 1 vertical. The storage area behind the diffuser shall be excavated to a depth of 1 foot and overall width of storage area equal to 6 feet minimum.

5. **Sizing the diffuser:** The length of the stone diffuser is governed by the size of the stone in the structure, the height of the diffuser, and the flow length through it. The following equation is used to establish the design of the diffuser:

$$Q_d = \frac{h^{3/2} W}{[(\frac{L}{D}) + 2.5 + L^2]^{0.5}}$$

Where:

Q_d = Outflow through the stone diffuser (cfs)
h = Ponding depth behind the diffuser (ft.)
W = Linear length of the diffuser along centerline (ft.)
L = Average horizontal flow length through the diffuser perpendicular to the centerline (ft.)
D = Average stone diameter (d_{50}) in the structure (ft.)

The maximum d_{50} size shall be 9" or 0.75'.

The designer shall calculate the length of diffuser needed depending on the geometry of the cross-section and rock size to be used recognizing that the maximum allowable discharge through the diffuser shall be 0.25 cfs per foot of length.

Once the discharge is calculated for the 10 year storm for the drainage area to the diffuser (Q_{10}) it can be divided by the design discharge of the diffuser to determine the diffuser length as follows:

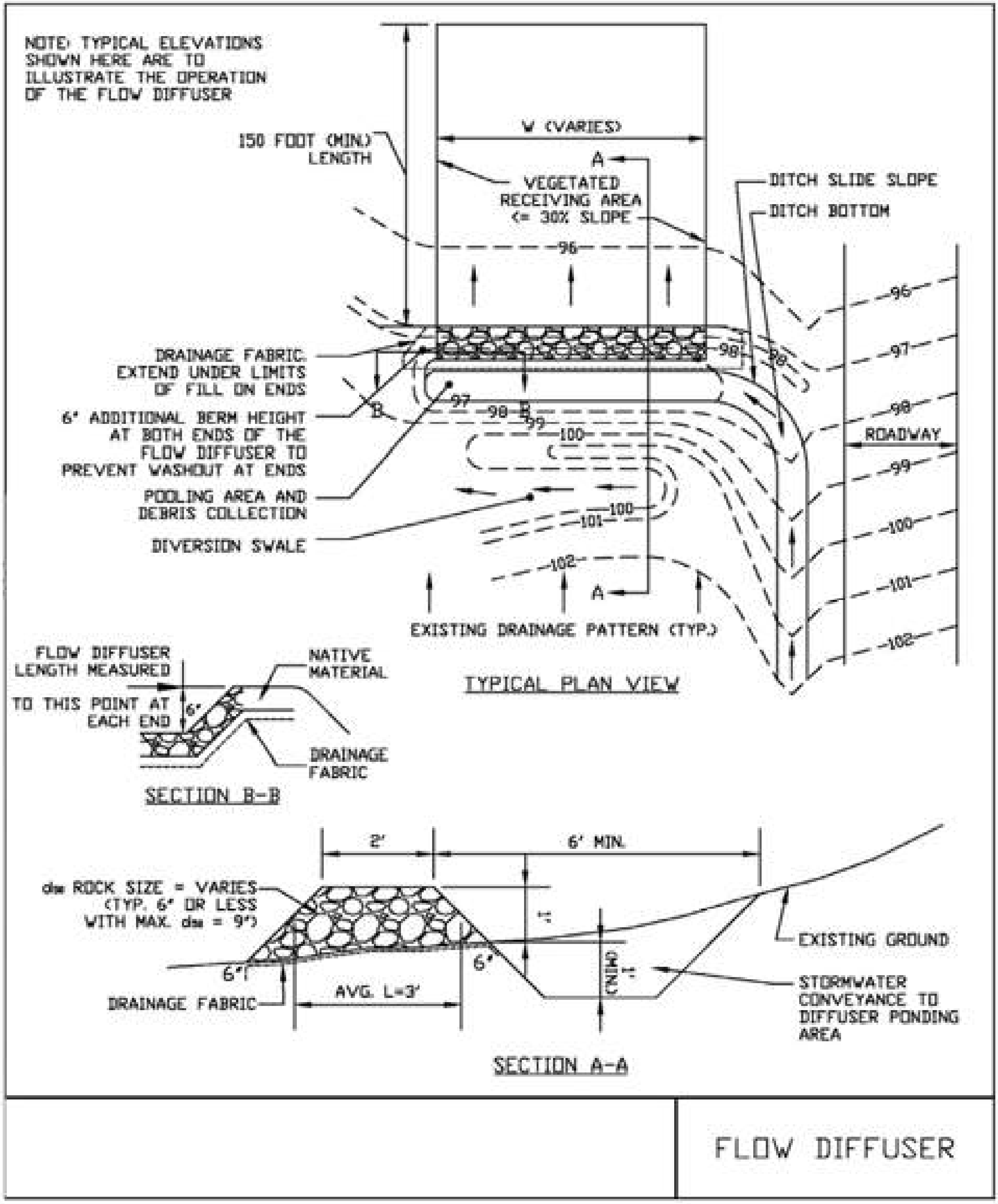
$$W = \frac{Q_{10}}{Q_d}$$

Where:

Q_d = Outflow through the stone diffuser (cfs/ft)
Q_{10} = Discharge rate for the 10 year storm (cfs)
W = Linear length of the diffuser along centerline (ft.)

Design examples are shown in Appendix B.

Figure 3.6
Flow Diffuser Detail



STANDARD AND SPECIFICATIONS FOR FLOW SPREADER

Definition & Scope

A **permanent or temporary,** non-erosive outlet for concentrated runoff, constructed to disperse concentrated flow uniformly over a hardened weir into a stabilized area as shallow, low velocity, sheet flow.

Conditions Where Practice Applies

Where sediment-free storm runoff can be released in sheet flow down a stabilized slope without causing erosion; where a hardened level weir can be constructed without filling; where the area below the weir is uniform with a slope of 10% or less and the runoff will not re-concentrate after release; and where no traffic will disturb the flow spreader.

Design Criteria

1. **Drainage area:** The maximum drainage area to the spreader may not exceed 5 acres.

2. **Discharge to a flow spreader:** The peak stormwater flow rate to a flow spreader due to runoff from a 10-year 24-hour storm must be less than 0.5 cubic feet per second (0.5 cfs) per foot length of flow spreader lip.

3. **Length of flow spreader:** The flow spreader length may not be more than 30 feet if flow is entering from one end of the spreader. Longer lengths require flow to split evenly from the center of the spreader.

4. **Receiving area of buffer:** Each flow spreader shall have a vegetated receiving area with the capacity to pass the flow without erosion. The receiving area shall be stable prior to the construction of the flow spreader. The receiving area shall have topography regular enough to prevent undue flow concentration before entering a stable watercourse but it shall have a slope that is less than 10%. If the receiving area is not presently stable, then the receiving area shall be stabilized prior to construction of the flow spreader. The receiving area below the flow spreader shall be protected from harm during construction. Sodding and/or turf reinforced mat in combination with vegetative measures shall stabilize disturbed areas. The receiving area shall not be used by the flow spreader until stabilization has been accomplished. A temporary diversion may be necessary in this case.

5. **Weir:** The weir of the flow spreader should consist of a pressure treated 2”x12” timber plank laid on edge and set at level elevation perpendicular to flow. Alternate hardened weir structures may be used as long as a hard, durable, continuous weir is maintained.

6. **Channel:** The flow spreader entrance channel shall be a minimum of 1 foot deep with a minimum 2 foot bottom width to trap sediment and reduce lateral flow velocities. Side slopes shall be 2:1 or flatter. The channel shall be constructed with a 0% grade to ensure uniform flow distribution. Velocity entering the channel shall be reduced to ensure non-erosive low approach velocity in the weir.

7. **Maintenance:** Long term maintenance of the flow spreader is essential to ensure its continued effectiveness. The following provisions should be followed. In the first year the flow spreader should be inspected semi annually and following major storm events for any signs of channelization and should be immediately repaired. After the first year, annual inspection should be sufficient. Spreaders constructed of wood, asphalt, stone or concrete curbing require periodic inspection to check for damage and to be repaired as needed.

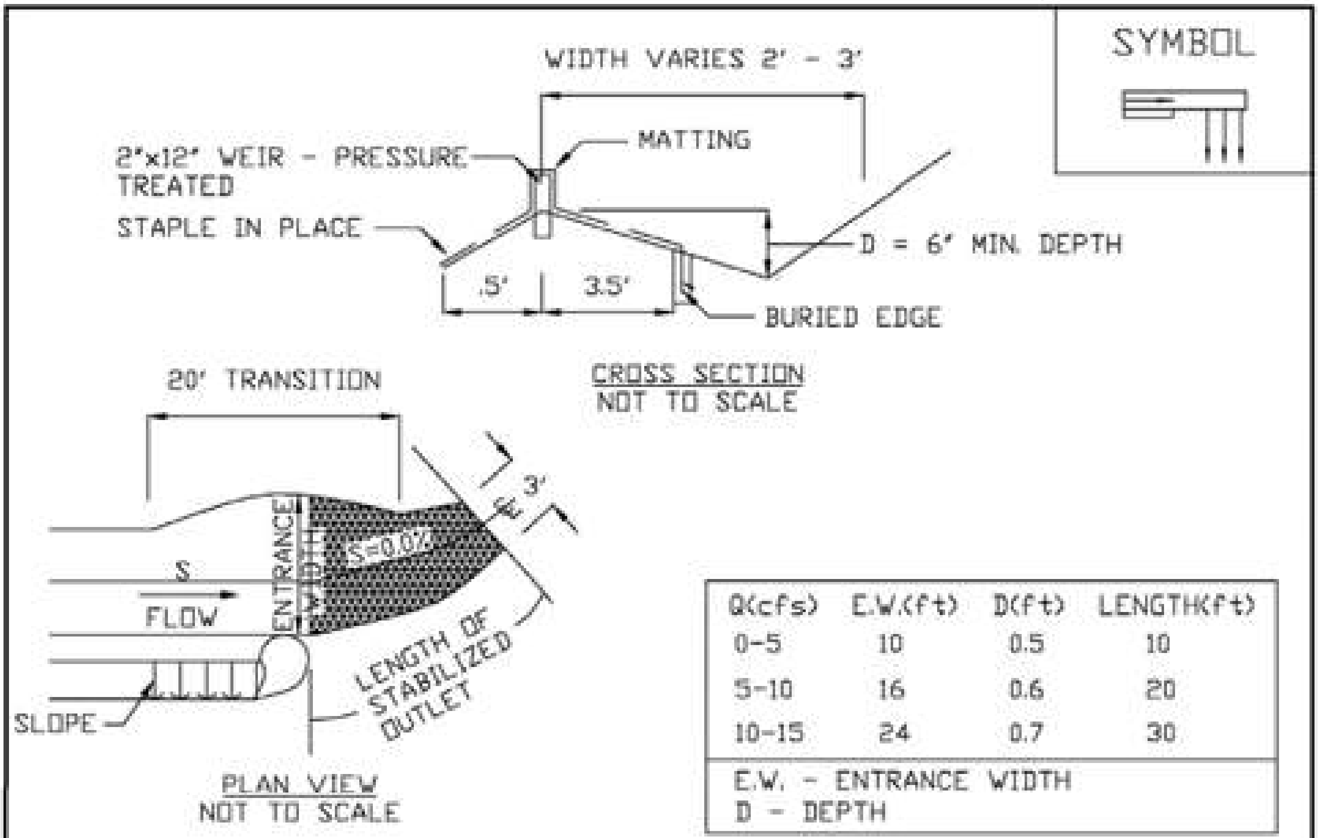
   A. **Inspections:** At least once a year, the spreader pool should be inspected for sand accumulation and debris that may reduce capacity.

   B. **Maintenance Access:** Flow spreaders should be sited to provide easy access for removal of accumulated sediment and rehabilitation of the berm.

   C. **Debris Removal:** Debris buildup within the channel should be removed when it has accumulated to approximately 10 to 20% of design volume or channel capacity. Remove debris such as leaf litter, branches, tree growth and any sediment build-up from the spreader and dispose of appropriately.

   D. **Mowing:** Vegetated spreaders may require mowing.

Figure 3.7
Flow Spreader Detail



Q(cfs)	E.W.(ft)	D(ft)	LENGTH(ft)
0-5	10	0.5	10
5-10	16	0.6	20
10-15	24	0.7	30

E.W. - ENTRANCE WIDTH
D - DEPTH

CONSTRUCTION SPECIFICATIONS

1. THE MATTING SHOULD BE A MINIMUM OF 4FT. WIDE EXTENDING 6 INCHES OVER THE WEIR AND BURIED 6 INCHES DEEP IN A VERTICAL TRENCH ON THE LOWER EDGE. THE UPPER EDGE SHOULD BUTT AGAINST SMOOTHLY CUT SOD AND BE SECURELY HELD IN PLACE WITH CLOSELY SPACED HEAVY DUTY WIRE STAPLES AT LEAST 12 INCHES IN LENGTH.
2. ENSURE THAT THE WEIR IS LEVEL TO UNIFORMLY SPREAD DISCHARGE.
3. THE WEIR SHALL BE PLACED IN UNDISTURBED SOIL NOT FILL.
4. A 20 FOOT TRANSITION SECTION WILL BE CONSTRUCTED FROM THE DIVERSION CHANNEL TO THE SPREADER TO SMOOTHLY BLEND THE DIFFERENT DIMENSION AND GRADES.
5. THE RUNOFF DISCHARGE WILL BE OUTLETED ONTO A STABILIZED VEGETATED SLOPE NOT EXCEEDING 10%.
6. SEED AND MULCH THE DISTURBED AREA IMMEDIATELY AFTER CONSTRUCTION.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS,
NEW YORK STATE DEPARTMENT OF TRANSPORTATION,
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

FLOW SPREADER

STANDARD AND SPECIFICATIONS FOR ROCK OUTLET PROTECTION

Definition & Scope

A **permanent** section of rock protection placed at the outlet end of the culverts, conduits, or channels to reduce the depth, velocity, and energy of water, such that the flow will not erode the receiving downstream reach.

Conditions Where Practice Applies

This practice applies where discharge velocities and energies at the outlets of culverts, conduits, or channels are sufficient to erode the next downstream reach. This applies to:

1. Culvert outlets of all types.
2. Pipe conduits from all sediment basins, dry storm water ponds, and permanent type ponds.
3. New channels constructed as outlets for culverts and conduits.

Design Criteria

The design of rock outlet protection depends entirely on the location. Pipe outlet at the top of cuts or on slopes steeper than 10 percent, cannot be protected by rock aprons or riprap sections due to re-concentration of flows and high velocities encountered after the flow leaves the apron.

Many counties and state agencies have regulations and design procedures already established for dimensions, type and size of materials, and locations where outlet protection is required. Where these requirements exist, they shall be followed.

Tailwater Depth

The depth of tailwater immediately below the pipe outlet must be determined for the design capacity of the pipe. If the tailwater depth is less than half the diameter of the outlet pipe, and the receiving stream is wide enough to accept divergence of the flow, it shall be classified as a Minimum Tailwater Condition; see Figure 3.16 on page 3.42 as an example. If the tailwater depth is greater than half the pipe diameter and the receiving stream will continue to confine the flow, it shall be classified as a Maximum Tailwater Condition; see Figure 3.17 on page 3.43 as an example. Pipes which outlet onto flat areas with no defined channel may be assumed to have a Minimum Tailwater Condition; see Figure 3.16 on page 3.42 as an example.

Apron Size

The apron length and width shall be determined from the curves according to the tailwater conditions:

Minimum Tailwater – Use Figure 3.16 on page 3.42
Maximum Tailwater – Use Figure 3.17 on page 3.43

If the pipe discharges directly into a well defined channel, the apron shall extend across the channel bottom and up the channel banks to an elevation one foot above the maximum tailwater depth or to the top of the bank, whichever is less.

The upstream end of the apron, adjacent to the pipe, shall have a width two (2) times the diameter of the outlet pipe, or conform to pipe end section if used.

Bottom Grade

The outlet protection apron shall be constructed with no slope along its length. There shall be no overfall at the end of the apron. The elevation of the downstream end of the apron shall be equal to the elevation of the receiving channel or adjacent ground.

Alignment

The outlet protection apron shall be located so that there are no bends in the horizontal alignment.

Materials

The outlet protection may be done using rock riprap, grouted riprap, or gabions. Outlets constructed on the bank of a stream or wetland shall not use grouted rip-rap, gabions or concrete.

Riprap shall be composed of a well-graded mixture of rock size so that 50 percent of the pieces, by weight, shall be larger than the d_{50} size determined by using the charts. A well-graded mixture, as used herein, is defined as a mixture composed primarily of larger rock sizes, but with a sufficient mixture of other sizes to fill the smaller voids between the rocks. The diameter of the largest rock size in such a mixture shall be 1.5 times the d_{50} size.

Thickness

The minimum thickness of the riprap layer shall be 1.5 times the maximum rock diameter for d_{50} of 15 inches or less; and 1.2 times the maximum rock size for d_{50} greater than 15 inches. The following chart lists some examples:

D_{50} (inches)	d_{max} (inches)	Minimum Blanket Thickness (inches)
4	6	9
6	9	14
9	14	20
12	18	27
15	22	32
18	27	32
21	32	38
24	36	43

Rock Quality

Rock for riprap shall consist of field rock or rough unhewn quarry rock. The rock shall be hard and angular and of a quality that will not disintegrate on exposure to water or weathering. The specific gravity of the individual rocks shall be at least 2.5.

Filter

A filter is a layer of material placed between the riprap and the underlying soil surface to prevent soil movement into and through the riprap. Riprap shall have a filter placed under it in all cases.

A filter can be of two general forms: a gravel layer or a plastic filter cloth. The plastic filter cloth can be woven or non-woven monofilament yarns, and shall meet these base requirements: thickness 20-60 mils, grab strength 90-120 lbs; and shall conform to ASTM D-1777 and ASTM D-1682.

Gravel filter blanket, when used, shall be designed by comparing particle sizes of the overlying material and the base material. Design criteria are available in Standard and Specification for Anchored Slope and Channel Stabilization on page 4.7.

Gabions

Gabions shall be made of hexagonal triple twist mesh with heavily galvanized steel wire. The maximum linear dimension of the mesh opening shall not exceed 4 ½ inches and the area of the mesh opening shall not exceed 10 square inches.

Gabions shall be fabricated in such a manner that the sides, ends, and lid can be assembled at the construction site into a rectangular basket of the specified sizes. Gabions shall be of single unit construction and shall be installed according to manufacturer's recommendations.

The area on which the gabion is to be installed shall be graded as shown on the drawings. Foundation conditions shall be the same as for placing rock riprap, and filter cloth shall be placed under all gabions. Where necessary, key, or tie, the structure into the bank to prevent undermining of the main gabion structure.

Maintenance

Once a riprap outlet has been installed, the maintenance needs are very low. It should be inspected after high flows for evidence of scour beneath the riprap or for dislodged rocks. Repairs should be made immediately.

Design Procedure

1. Investigate the downstream channel to assure that nonerosive velocities can be maintained.

2. Determine the tailwater condition at the outlet to establish which curve to use.

3. Use the appropriate chart with the design discharge to determine the riprap size and apron length required. It is noted that references to pipe diameters in the charts are based on full flow. For other than full pipe flow, the parameters of depth of flow and velocity must be used to adjust the design discharges.

4. Calculate apron width at the downstream end if a flare section is to be employed.

Design Examples are demonstrated in Appendix B.

Construction Specifications

1. The subgrade for the filter, riprap, or gabion shall be prepared to the required lines and grades. Any fill required in the subgrade shall be compacted to a density of approximately that of the surrounding undisturbed material.

2. The rock or gravel shall conform to the specified grad-

ing limits when installed respectively in the riprap or filter.

3. Filter cloth shall be protected from punching, cutting, or tearing. Any damage other than an occasional small hole shall be repaired by placing another piece of cloth over the damaged part or by completely replacing the cloth. All overlaps, whether for repairs or for joining two pieces of cloth shall be a minimum of one foot.

4. Rock for the riprap or gabion outlets may be placed by equipment. Both shall each be constructed to the full course thickness in one operation and in such a manner as to avoid displacement of underlying materials. The rock for riprap or gabion outlets shall be delivered and placed in a manner that will ensure that it is reasonably homogenous with the smaller rocks and spalls filling the voids between the larger rocks. Riprap shall be placed in a manner to prevent damage to the filter blanket or filter cloth. Hand placement will be required to the extent necessary to prevent damage to the permanent works.

Figure 3.16
Outlet Protection Design—Minimum Tailwater Condition Chart (Design of Outlet Protection from a Round Pipe Flowing Full, Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)

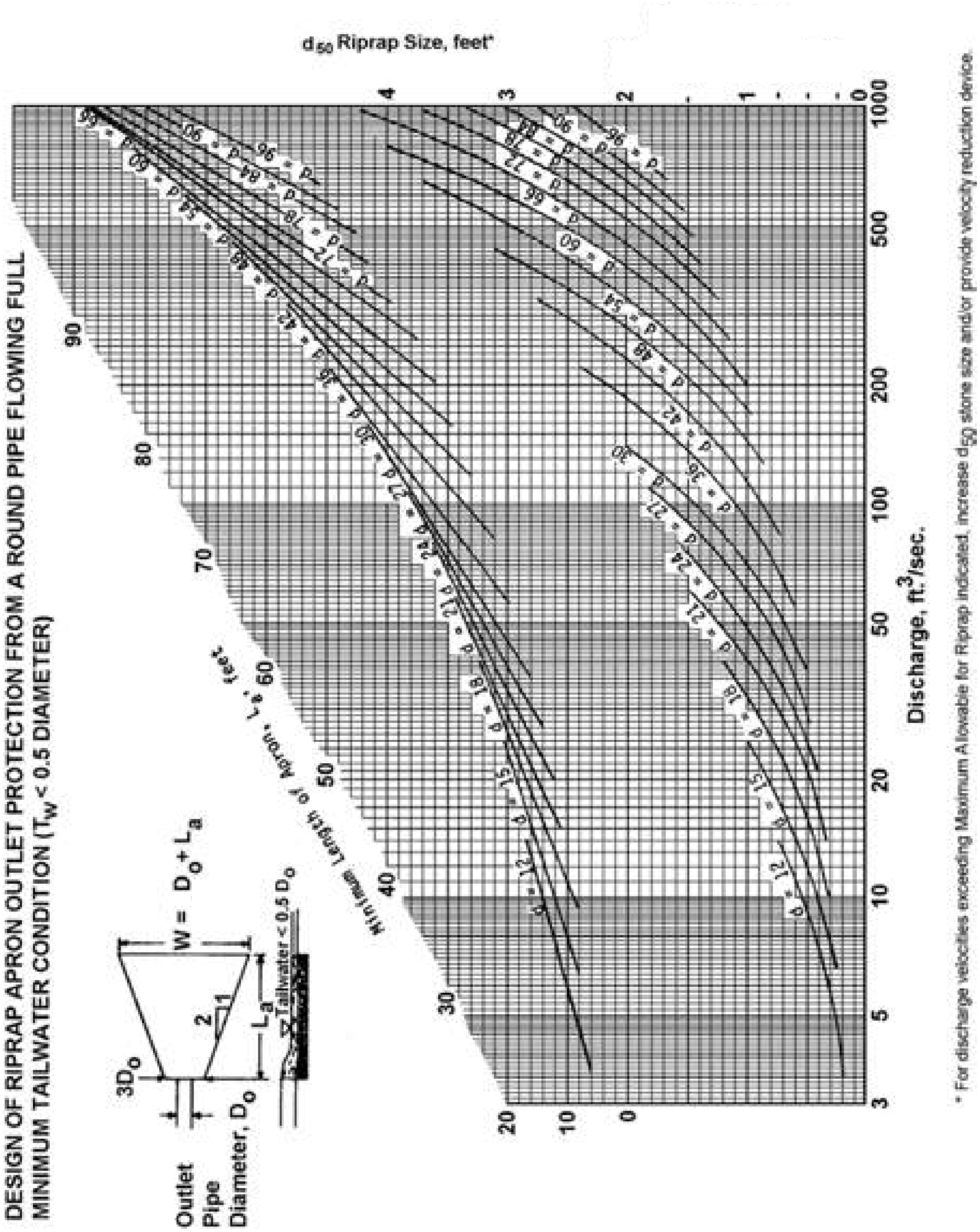


Figure 3.17
Outlet Protection Design—Maximum Tailwater Condition Chart
(Design of Outlet Protection from a Round Pipe Flowing Full, Maximum Tailwater Condition: $T_w \geq 0.5D_o$) (USDA - NRCS)

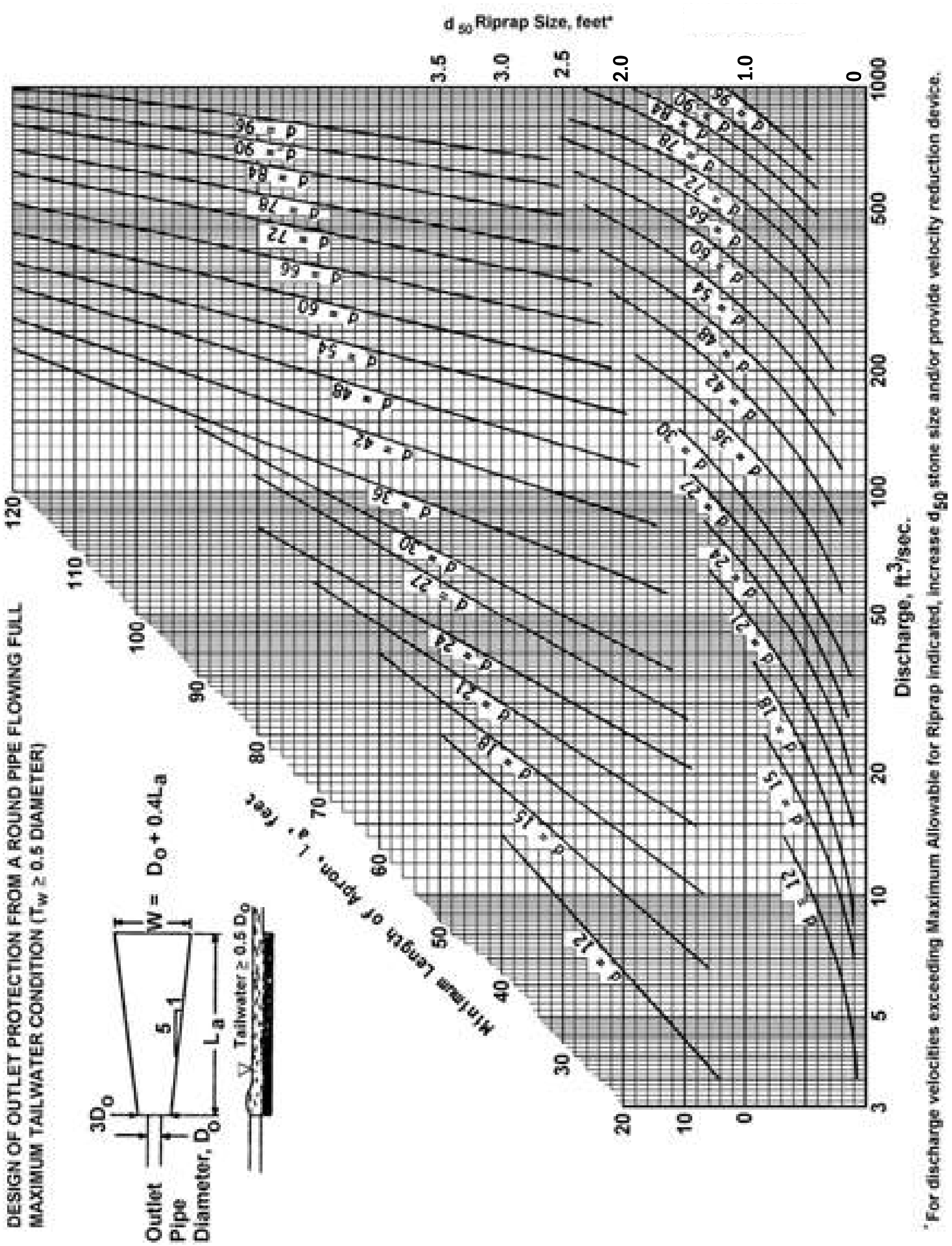


Figure 3.18
Riprap Outlet Protection Detail (1)

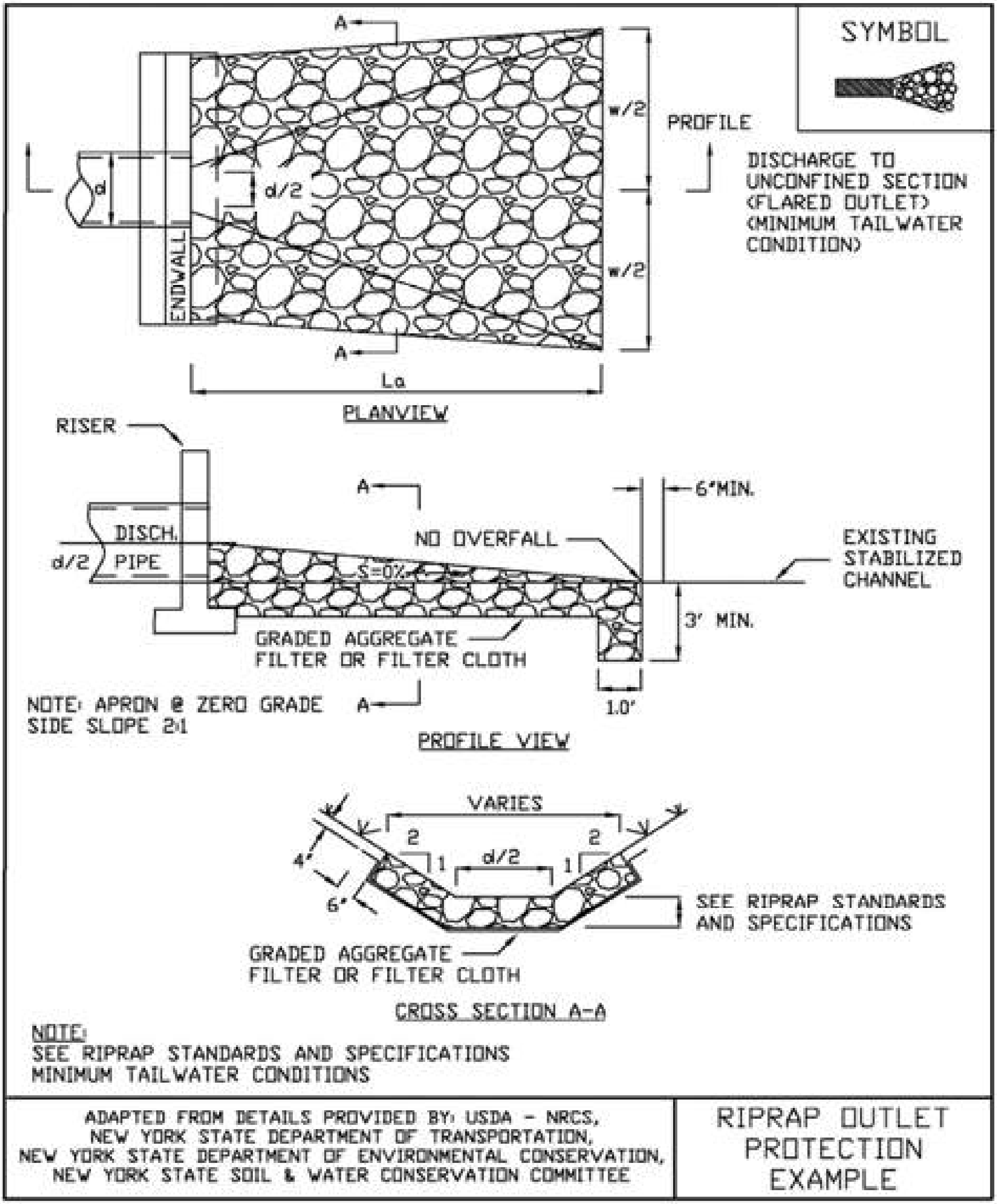


Figure 3.19
Riprap Outlet Protection Detail (2)

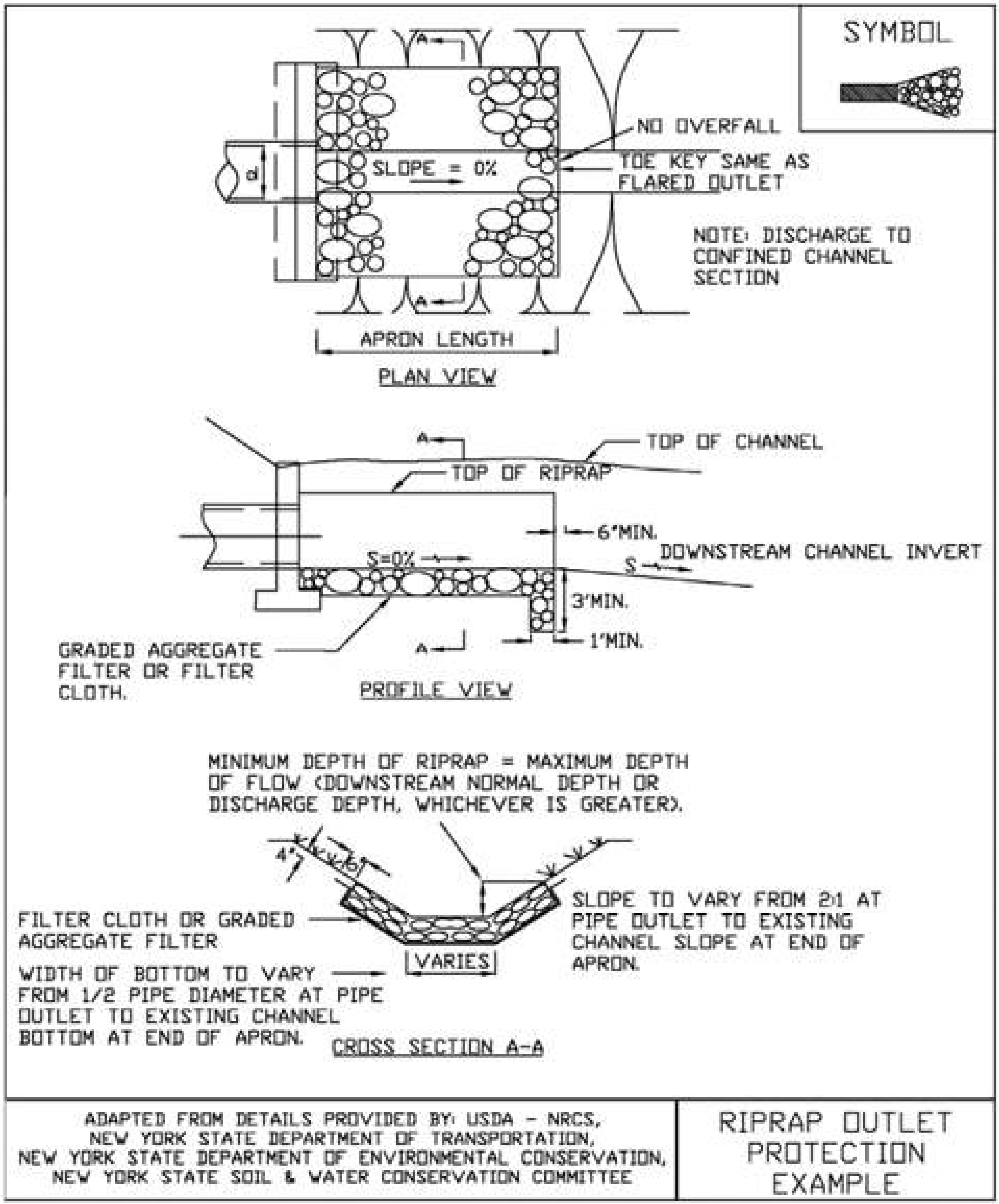
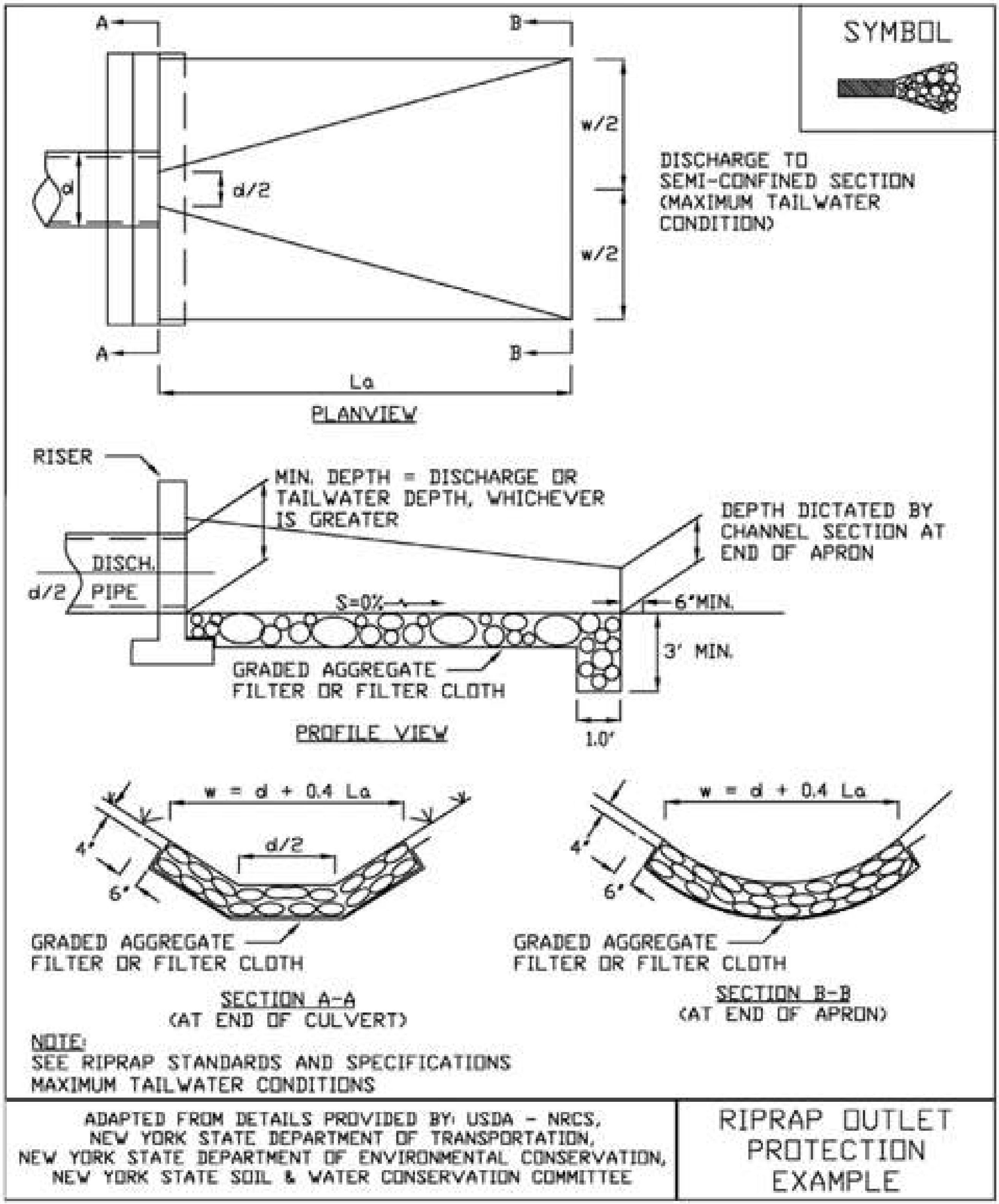


Figure 3.20
Riprap Outlet Protection Detail (3)



STANDARD AND SPECIFICATIONS FOR ANCHORED STABILIZATION MATTING

Definition and Scope

A **temporary** or **permanent** protective covering placed on a prepared, seeded planting area that is anchored in place by staples or other means to aid in controlling erosion by absorbing rain splash energy and withstand overland flow as well as provide a microclimate to protect and promote seed establishment.

Conditions Where Practice Applies

Anchored stabilization mats are required for seeded earthen slopes steeper than 3 horizontal to 1 vertical; in vegetated channels where the velocity of the design flow exceeds the allowable velocity for vegetation alone (usually greater than 5 feet per second); on streambanks and shorelines where moving water is likely to erode newly seeded or planted areas; and in areas where wind prevents standard mulching with straw. This standard does not apply to slopes stabilized with sod, rock riprap or hard armor material.

Design Criteria

Slope Applications - Anchored stabilization mats for use on slopes are primarily used as mulch blankets where the mesh material is within the blanket or as a netting over previously placed mulch. These stabilization mats are NOT effective in preventing slope failures.

1. Required on all slopes steeper than 3:1
2. Matting will be designed for proper longevity need and strength based on intended use.
3. All installation details and directions will be included on the site erosion and sediment control plan and will follow manufactures specifications.

Channel Applications - Anchored stabilization mats, for use in supporting vegetation in flow channels, are generally a non-degradable, three dimensional plastic structure which can be filled with soil prior to planting. This structure provides a medium for root growth where the matting and roots become intertwined forming a continuous anchor for the vegetated lining.

1. Channel stabilization shall be based on the tractive force method.
2. For maximum design shear stresses less than 2 pounds per square foot, a temporary or bio-degradable mat may be used.
3. The design of the final matting shall be based on the mats ability to resist the tractive shear stress at bank full flow.
4. The installation details and procedures shall be included on the site erosion and sediment control plan and will follow manufacturers specifications.

Construction Specifications

1. Prepare soil before installing matting by smoothing the surface, removing debris and large stone, and applying lime, fertilizer and seed. Refer to manufacturers installation details.
2. Begin at the top of the slope by anchoring the mat in a 6” deep x 6” wide trench. Backfill and compact the trench after stapling.
3. In channels or swales, begin at the downslope end, anchoring the mat at the bottom and top ends of the blanket. When another roll is needed, the upslope roll

should overlay the lower layer, shingle style, so that channel flows do not peel back the material.

4. Roll the mats down a slope with a minimum 4” overlap. Roll center mat in a channel in direction of water flow on bottom of the channel. Do not stretch blankets. Blankets shall have good continuous contact with the underlying soil throughout its entire length.

5. Place mats end over end (shingle style) with a 6” overlap, use a double row of staggered staples 4” apart to secure mats.

6. Full length edge of mats at top of side slopes must be anchored in 6” deep x 6” wide trench; backfill and compact the trench after stapling.

7. Mats on side slopes of a channel must be overlapped 4” over the center mat and stapled.

8. In high flow channel applications, a staple check slot is recommended at 30 to 40 foot intervals. Use a row of staples 4” apart over entire width of the channel. Place a second row 4” below the first row in a staggered pattern.

9. The terminal end of the mats must be anchored in a 6”x6” wide trench. Backfill and compact the trench after stapling.

10. Stapling and anchoring of blanket shall be done in accordance with the manufactures recommendations.

Maintenance

Blanketed areas shall be inspected weekly and after each runoff event until perennial vegetation is established to a minimum uniform 80% coverage throughout the blanketed area. Damaged or displaced blankets shall be restored or replaced within 2 calendar days.

STANDARD AND SPECIFICATIONS FOR ARMORED SLOPE AND CHANNEL STABILIZATION

Definition & Scope

A **permanent** layer of stone designed to protect and stabilize areas subject to erosion by protecting the soil surface from rain splash, sheet flow, rill and gully erosion and channel erosion. It can also be used to improve the stability of soil slopes that are subject to seepage or have poor soil structure.

Conditions Where Practice Applies

Riprap is used for cut and fill slopes subject to seepage, erosion, or weathering, particularly where conditions prohibit the establishment of vegetation. Riprap is also used for channel side slopes and bottoms, temporary dewatering diversion channels where the flow velocities exceed 6 feet/second, grade sills, on shorelines subject to erosion, and at inlets and outlets to culverts, bridges, slope drains, grade stabilization structures, and storm drains.

Slope Stabilization Design Criteria

Gradation – Riprap shall be a well-graded mixture with 50% by weight larger than the specified design size. The diameter of the largest stone size in such a mixture should be 1.5 times the d_{50} size with smaller sizes grading down to 1 inch. The designer should select the size or sizes that equal or exceed that minimum size based on riprap gradations commercially available in the area.

Thickness – The minimum layer thickness shall be 1.5 times the maximum stone diameter, but in no case less than 6 inches.

Quality – Stone for riprap shall be hard, durable field or quarry materials. They shall be angular and not subject to breaking down when exposed to water or weathering. The specific gravity shall be at least 2.5.

Size – The sizes of stones used for riprap protection are determined by purpose and specific site conditions:

1. Slope Stabilization – Riprap stone for slope stabilization not subject to flowing water or wave action shall be sized for the proposed grade. The gradient of the slope to be stabilized shall be less than the natural angle of repose of the stone selected. Angles of repose of riprap stones may be estimated from Figure 4.1.

   Riprap used for surface stabilization of slopes does not add significant resistance to sliding or slope failure and should not be considered a retaining wall. Slopes approaching 1.5:1 may require special stability analysis. The inherent stability of the soil must be satisfactory before riprap is used for surface stabilization.

2. Channel Stabilization - Design criteria for sizing stone for stability of channel side slopes are presented under Channel Stabilization Design Criteria on page 4.10.

2. Outlet Protection – Design criteria for sizing stone and determining dimensions of riprap aprons are presented in Standards and Specifications for Rock Outlet Protection on page 3.39.

Filter Blanket – A filter blanket is a layer of material placed between the riprap and the underlying soil to prevent soil movement into or through the riprap. A suitable filter may consist of a well-graded gravel or sand-gravel layer or a synthetic filter fabric manufactured for this purpose. The design of a gravel filter blanket is based on the ratio of particle size in the overlying filter material to that of the base material in accordance with the criteria below. Multiple layers may be designed to affect a proper filter if necessary.

A gravel filter blanket should have the following relationship for a stable design:

$$\frac{d_{15}\ \text{filter}}{d_{85}\ \text{base}} \leq 5$$

$$5 < \frac{d_{15}\ \text{filter}}{d_{50}\ \text{base}} \leq 40$$

and

$$\frac{d_{50}\ \text{filter}}{d_{50}\ \text{base}} \leq 40$$

Filter refers to the overlying material while base refers to the underlying material. These relationships must hold between the base and filter and the filter and riprap to prevent migration of material. In some cases, more than one filter may be needed. Each filter layer should be a minimum of 6 inches thick, unless an acceptable filter fabric is used.

A synthetic filter fabric may be used with or in place of gravel filters. The following particle size relationships should exist:

1. Filter fabric covering a base containing 50% or less by weight of fine particles (#200 sieve size):

   A. $\frac{d_{85} \text{ base (mm)}}{\text{EOS} \times \text{filter fabric (mm)}} > 1$

   B. total open area of filter fabric should not exceed 36%

2. Filter fabric covering other soils:

   A. EOS is no larger than 0.21 mm (#70 sieve size)

   B. total open area of filter fabric should not exceed 10%

*EOS – Equivalent opening size compared to a U.S. standard sieve size.

No filter fabric should have less than 4% open area or an EOS less than U.S. Standard Sieve #100 (0.15 mm). The permeability of the fabric must be greater than that of the soil. The fabric may be made of woven or nonwoven monofilament yarns and should meet the following minimum requirements:

Thickness 20-60 mils

grab strength 90-120 lbs.

conform to ASTM D-1682 or ASTM D-177

Filter blankets should always be provided where seepage is significant or where flow velocity and duration of flow or turbulence may cause underlying soil particles to move though the riprap.

Construction Specifications

Subgrade Preparation – Prepare the subgrade for riprap and filter to the required lines and grades shown on the plans. Compact any fill required in the subgrade to a density approximating that of the undisturbed material or overfill depressions with riprap. Remove brush, trees, stumps, and other objectionable material. Cut the subgrade sufficiently deep so that the finished grade of the riprap will be at the elevation of the surrounding area. Channels shall be excavated sufficiently to allow placement of the riprap in a manner such that the finished inside dimensions and grade of the riprap meet design specifications.

Sand and gravel filter blanket – Place the filter blanket immediately after the ground foundation is prepared. For gravel, spread filter stone in a uniform layer to the specified depth. Where more than one layer of filter material is used, spread the layers with minimal mixing.

Synthetic filter fabric – Place the cloth directly on the prepared foundation. Overlap the edges by at least 2 feet, and space the anchor pins every 3 feet along the overlap. Bury the upper and lower ends of the cloth a minimum of 12 inches below ground. Take precautions not to damage the cloth by dropping the riprap. If damage occurs, remove the riprap and repair the sheet by adding another layer of filter fabric with a minimum overlap of 12 inches around the damaged area. Where large stones are to be placed, a 4-inch layer of fine sand or gravel is recommended to protect the filter cloth. Filter fabric is not recommended as a filter on slopes steeper than 2 horizontal to 1 vertical.

Stone placement – Placement of the riprap shall follow immediately after placement of the filter. Place riprap so that it forms dense, well-graded mass of stone with a minimum of voids. The desired distribution of stones throughout the mass may be obtained by selective loading at the quarry and controlled dumping during final placement. Place riprap to its full thickness in one operation. Do not place riprap by dumping through chutes or other methods that cause segregation of stone sizes. Be careful not to dislodge the underlying base or filter when placing the stones.

The toe of the riprap shall be keyed into a stable foundation at its base as shown in Figure 4.2 - Typical Riprap Slope Protection Detail. The toe should be excavated to a depth of 2.0 feet. The design thickness of the riprap shall extend a minimum of 3 feet horizontally from the slope. The finished slope should be free of pockets of small stone or clusters of large stones. Hand placing may be necessary to achieve proper distribution of stone sizes to produce a relatively smooth, uniform surface. The finished grade of the riprap should blend with the surrounding area.

Maintenance

Riprap shall be inspected periodically for scour or dislodged stones. Control weed and brush growth as needed.

Figure 4.1
Angles of Repose of Riprap Stones (FHWA)

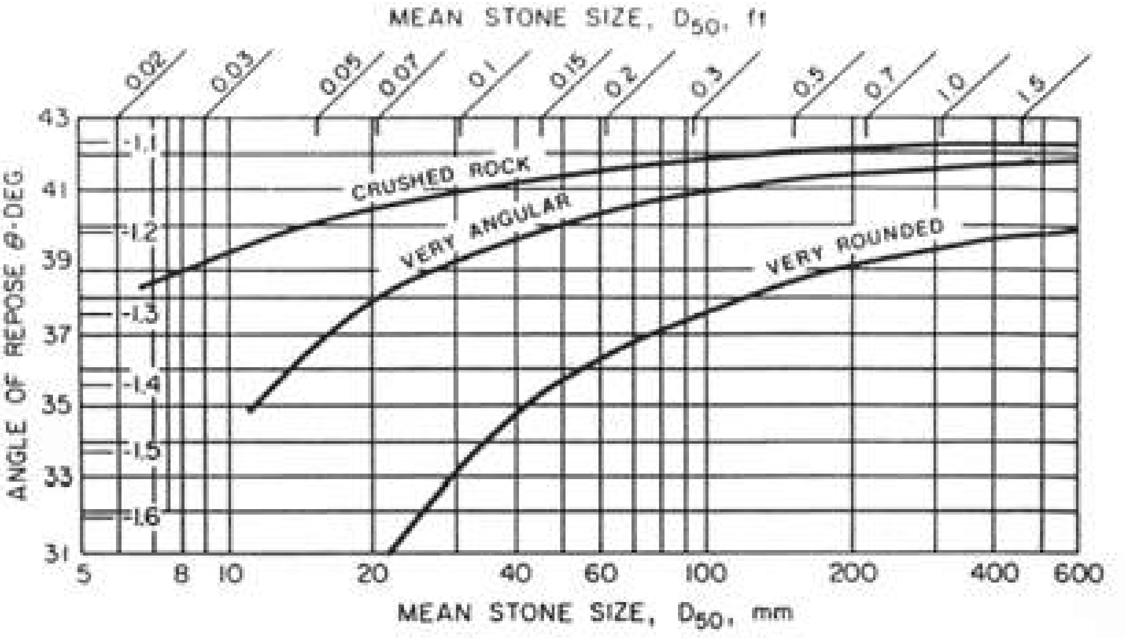
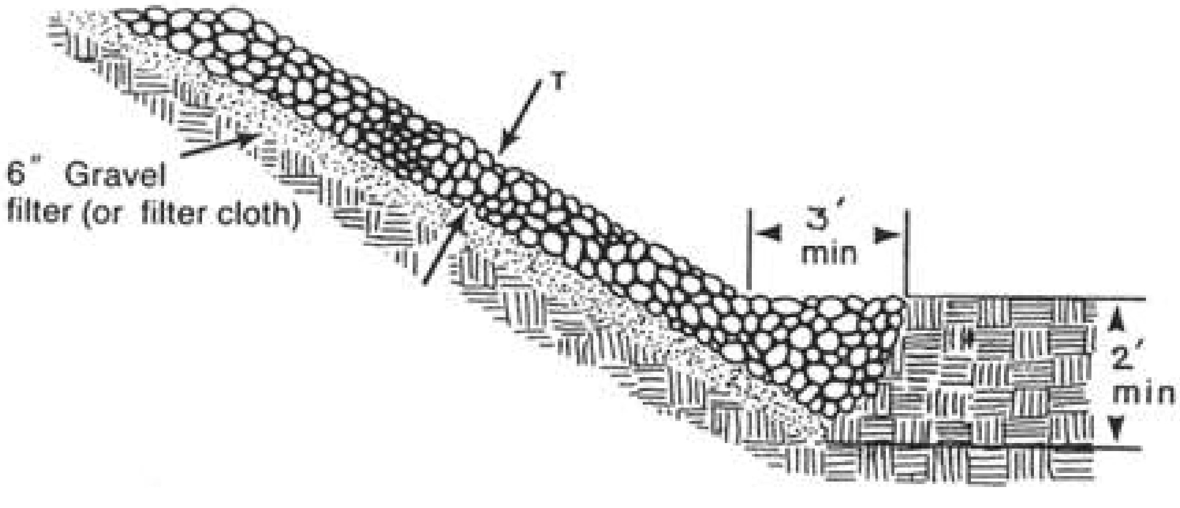


Figure 4.2
Typical Riprap Slope Protection Detail



Channel Stabilization Design Criteria

1. Since each channel is unique, measures for structural channel stabilization should be installed according to a design based on specific site conditions.

2. The plan and profile of the design reach should approximate a naturally stable channel from the project area, based on a stable "reference reach" for the subject channel type.

3. Develop designs according to the following principles:

   - Make protective measures compatible with other channel modifications planned or being carried out in the channel reaches.
   - Whenever excavation and re-shaping work is proposed within channels, the design should provide functional channel dimensions and geometry at each section. Work proposed within a stream channel may require permits from the NYS DEC and US Army Corps of Engineers.
   - Use the design velocity of the peak discharge of the 10-year storm or bankfull discharge, whichever is less. Structural measures should be capable of withstanding greater flows without serious damage.
   - Ensure that the channel bottom is stable or stabilized by structural means before installing any permanent slope protection.
   - Channel stabilization should begin at a stable location and end at a stable point along the bank.
   - Changes in alignment should not be done without a complete analysis of the environmental and stability effects on the entire system.
   - Provisions should be made to maintain and improve fish and wildlife habitat. For example, restoring lost vegetation will provide valuable shade, food, and/or cover.
   - Ensure that all requirements of state law and all permit requirements of local, state, and federal agencies are met.

Construction Specifications

Riprap – Riprap is the most commonly used material to structurally stabilize a channel. While riprap will provide the structural stabilization necessary, the side slope can be enhanced with vegetative material to slow the velocity of water, filter debris, and enhance habitat. See Principles of Biotechnical Practices on page 4.1, for more information.

1. Side slope – slopes shall be graded to 2:1 or flatter prior to placing bedding, filter fabric, or riprap.

2. Filter – filters should be placed between the base material and the riprap and meet the requirements of criteria listed pages 4.7 and 4.8.

3. Gradation – The gradation of the riprap is dependent on the velocity expected against the bank for the design conditions. See Table 4.1 on page 4.12. Once the velocity is known, gradation can be selected from the table for the appropriate class of rock. Note, this table was developed for a 2:1 slope; if the slope steepens to 1.5:1 the gradations should be increased 20%. The riprap should extend 2 feet below the channel bottom and be keyed into the side slope both at the upstream end and downstream end of the proposed work or reach.

See Figure 4.3 on page 4.13 for details.

Reinforced Concrete - Is often used to armor eroding sections of flow channel by constructing walls, bulk heads, or stabilize bank linings in urban areas for redevelopment work. Provide positive drainage behind these structures to relieve uplift pressures.

Grid Pavers – Modular concrete units with or without void areas can be used to stabilize flow channel. Units with void areas can allow the establishment of vegetation. These structures may be obtained in a variety of shapes (Figure 4.4) or they may be formed and poured in place. Maintain design and installation in accordance with manufacturer's instructions.

Revetment – Structural support or armoring to protect an embankment from erosion. Riprap and gabions are commonly used. Also used is a hollow fabric mattress with cells that receive a concrete mixture. Any revetment should be installed to a depth below the anticipated channel degradation and into the channel bed as necessary to provide stability.

Modular Pre-Cast Units – Interlocking modular precast units of different sizes, shapes, heights, and depths, have been developed for a wide variety of applications. They provide vertical support in tight areas as well as durability. Many types are available with textured surfaces. They also act as gravity retaining walls. They should be designed and installed in accordance with the manufacturer's recommendations (Figure 4.4). All areas disturbed by construction should be stabilized as soon as the structural measures are complete.

Maintenance

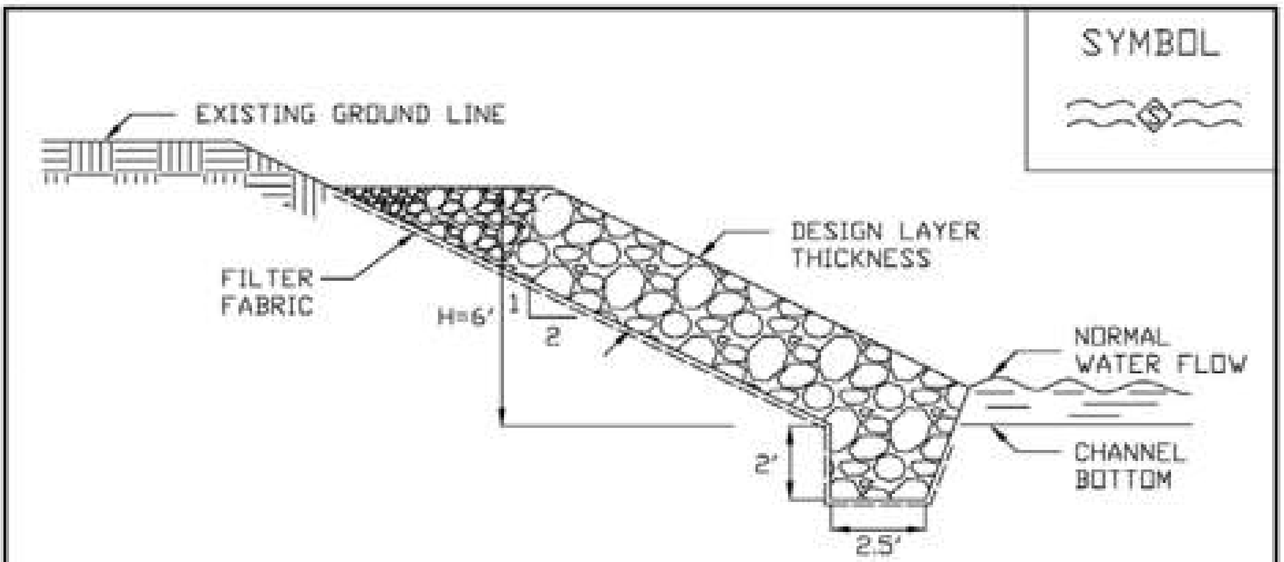
Check stabilized flow channel sections after every high-water event, and make any needed repairs immediately to prevent any further damage or unraveling of the existing work.

Table 4.1 - Riprap Gradations for Channel Stabilization

Class	Layer Thickness (in.)	Max. Velocity (ft/s)	Wave Height (ft.)		PERCENT FINER BY WEIGHT											
					D 10			D 50			D 85			D 100		
					Wt. (lbs.)	d_o (in.)	d□ (in.)	Wt. (lbs.)	d_o (in.)	d□ (in.)	Wt. (lbs.)	d_o (in.)	d□ (in.)	Wt. (lbs.)	d_o (in.)	d□ (in.)
I	18	8.5	-		5	5	4	50	10	8	100	13	10	150	15	12
II	18	10	-		17	7	6	170	15	12	340	19	15	500	22	18
III	24	12	2		46	10	8	460	21	17	920	26	21	1400	30	24
IV	36	14	3		150	15	12	1500	30	25	3000	39	32	4500	47	36
V	48	17	4.8		370	20	16	3700	42	34	7400	53	43	11,000	60	49

d_o = gravel material   d□ = angular rock riprap
Wt = weight in pounds

Figure 4.3
Riprap Channel Stabilization



RIPRAP DESIGN TABLE

REACH	CLASS	THICKNESS	LAYER	HEIGHT	D10	D50	D85	D100	FILTER

CONSTRUCTION SPECIFICATIONS

1. SLOPE SHALL BE GRADED TO 2:1 OR FLATTER PRIOR TO PLACING FILTER, FILTER FABRIC, OR RIPRAP.
2. RIPRAP SHALL BE PLACED TO MAINTAIN A UNIFORM GRADATION. LARGER STONE SHALL BE PLACED AT THE TOE.
3. ENDS OF THE RIPRAP SHALL BE KEYED INTO A STABLE BANK. WHEN TYING INTO OTHER STRUCTURES, LARGER RIPRAP CAN BE LAID IN STEPS OR STACKED AS NEEDED TO FIT. STONES LARGER THAN THOSE DESIGNED FOR FLOW SHALL BE USED FOR THIS PURPOSE.
4. REMAINING DISTURBED AREAS SHALL BE GRADED AND PERMANENTLY SEEDED AND MULCHED.

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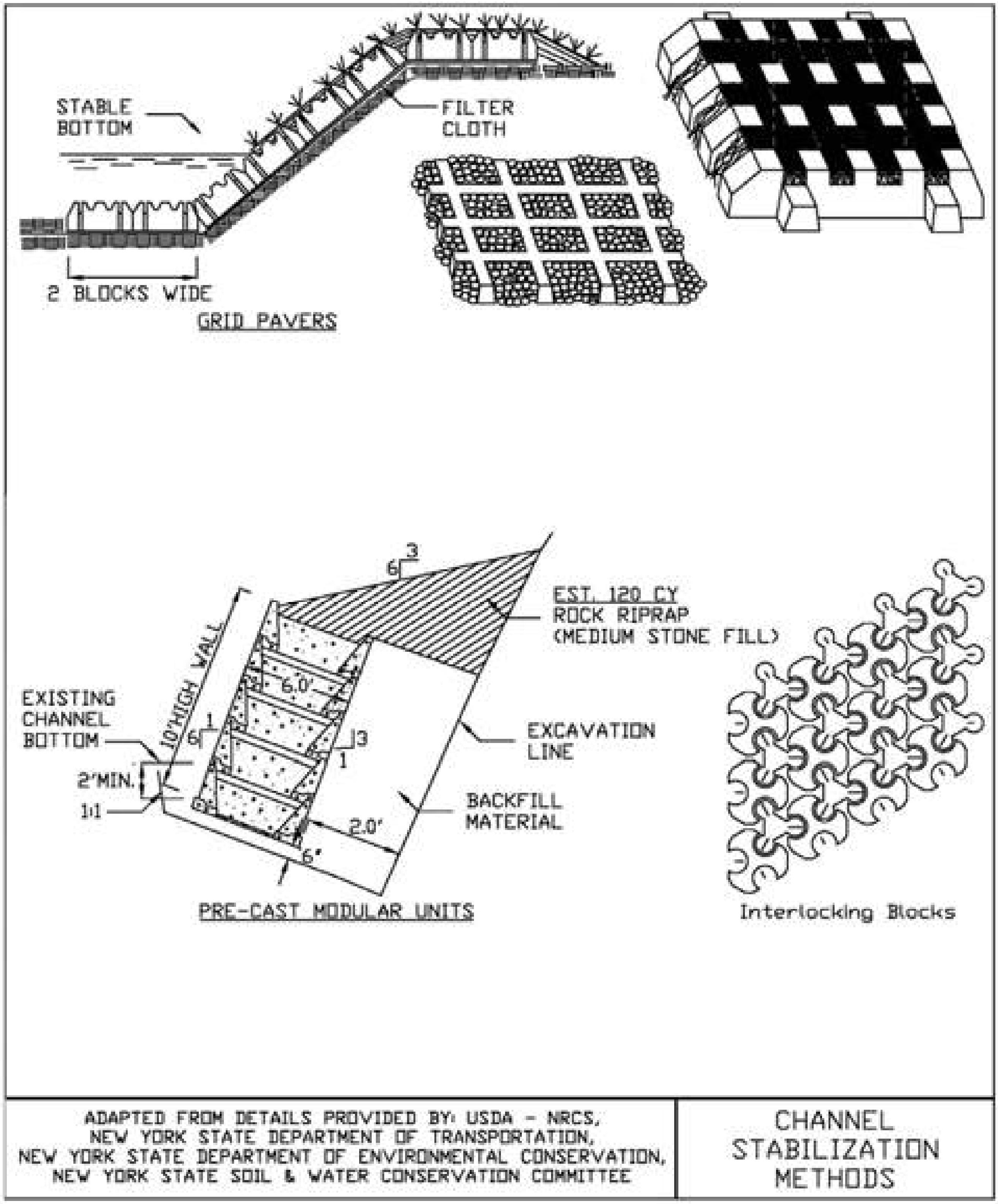
RIPRAP
CHANNEL
STABILIZATION

Figure 4.4
Channel Stabilization Methods



STANDARD AND SPECIFICATIONS FOR FERTILIZER APPLICATION

Definition & Scope

The **permanent** incorporation of fertilizer into the planting zone of the soil profile to provide nutrient amendments to the soil for vigorous support to plant and vegetation growth.

Conditions Where Practice Applies

This standard applies to all areas where permanent seeding, sodding, and plant establishment is required. All application of fertilizer shall be in accordance with Nutrient Runoff Law - ECL Article 17, Title 21. Phosphorus runoff poses a threat to water quality. Therefore, under New York Law, fertilizer containing phosphorus may only be applied to lawn or non-agricultural turf when:

1. A soil test indicates that additional phosphorus is needed for growth of that lawn or non-agricultural turf, or

2. The fertilizer is used for newly established lawn or non-agricultural turf during the first growing season.

For projects located within watersheds where enhanced phosphorus removal standards are required as part of its post-construction stormwater management plan, use of any fertilizer containing more than 0.67 percent phosphate (P_20_5) content will be done only with a valid soil test demonstrating the need for that formulation.

Design Criteria

Fertilizer is sold with an analysis printed on the tag or bag shown as three numbers separated by a dash, such as 5-10-5. The first number is the percent of the total weight of the bag that is nitrogen (N), the second is the percent of phosphate (phosphorus, P), and the third is the percent of potash (potassium, K). Other elements are sometimes included and are listed with these three basic components.

For example a 40 lb bag of 5-10-5 fertilizer contains 5% of 40 lbs of Nitrogen which equals 2 lbs. There is 10% of 40 lbs of phosphate (phosphorus) which equals 4 lbs, and there is 5% of potash (potassium), another 2 lbs., for a total of 8 lbs of active fertilizer in the 40 lb bag. The rest is filler to aid in spreading the material over the area to be treated.

Specify the design fertilizer mix and application rates based on the results of the soil tests.

Specifications

1. In no case shall fertilizer be applied between December 1 and April 1 annually.

2. Fertilizer shall not be spread within 20 feet of a surface water.

3. Any fertilizer falling or spilled into impervious surface areas such as parking lots, roadways, and sidewalks should be immediately contained and legally applied or placed in an appropriate container.

4. Incorporate the fertilizer, and lime if specified, into the top 2-4 inches of the topsoil or soil profile.

5. When applying fertilizer by hydro seeding care should be taken to apply mix only to seed bed areas at an appropriate flow rate to prevent erosion and spraying onto impervious areas.

STANDARD AND SPECIFICATIONS FOR LANDGRADING

Definition & Scope

Permanent reshaping of the existing land surface by grading in accordance with an engineering topographic plan and specification to provide for erosion control and vegetative establishment on disturbed, reshaped areas.

Design Criteria

The grading plan should be based upon the incorporation of building designs and street layouts that fit and utilize existing topography and desirable natural surrounding to avoid extreme grade modifications. Information submitted must provide sufficient topographic surveys and soil investigations to determine limitations that must be imposed on the grading operation related to slope stability, effect on adjacent properties and drainage patterns, measures for drainage and water removal, and vegetative treatment, etc.

Many municipalities and counties have regulations and design procedures already established for land grading and cut and fill slopes. Where these requirements exist, they shall be followed.

The plan must show existing and proposed contours of the area(s) to be graded. The plan shall also include practices for erosion control, slope stabilization, safe disposal of runoff water and drainage, such as waterways, lined ditches, reverse slope benches (include grade and cross section), grade stabilization structures, retaining walls, and surface and subsurface drains. The plan shall also include phasing of these practices. The following shall be incorporated into the plan:

1. Provisions shall be made to safely convey surface runoff to storm drains, protected outlets, or to stable water courses to ensure that surface runoff will not damage slopes or other graded areas; see standards and specifications for Grassed Waterway, Diversion, or Grade Stabilization Structure.
2. Cut and fill slopes that are to be stabilized with grasses shall not be steeper than 2:1. When slopes exceed 2:1, special design and stabilization consideration are required and shall be adequately shown on the plans. (Note: Where the slope is to be mowed, the slope should be no steeper than 3:1, although 4:1 is preferred because of safety factors related to mowing steep slopes.)
3. Reverse slope benches or diversion shall be provided whenever the vertical interval (height) of any 2:1 slope exceeds 20 feet; for 3:1 slope it shall be increased to 30 feet and for 4:1 to 40 feet. Benches shall be located to divide the slope face as equally as possible and shall convey the water to a stable outlet. Soils, seeps, rock outcrops, etc., shall also be taken into consideration when designing benches.
   A. Benches shall be a minimum of six feet wide to provide for ease of maintenance.
   B. Benches shall be designed with a reverse slope of 6:1 or flatter to the toe of the upper slope and with a minimum of one foot in depth. Bench gradient to the outlet shall be between 2 percent and 3 percent, unless accompanied by appropriate design and computations.
   C. The flow length within a bench shall not exceed 800 feet unless accompanied by appropriate design and computations; see Standard and Specifications for Diversion on page 3.9
4. Surface water shall be diverted from the face of all cut and/or fill slopes by the use of diversions, ditches and swales or conveyed downslope by the use of a designed structure, except where:
   A. The face of the slope is or shall be stabilized and the face of all graded slopes shall be protected from surface runoff until they are stabilized.
   B. The face of the slope shall not be subject to any concentrated flows of surface water such as from natural drainage ways, graded ditches, downspouts, etc.
   C. The face of the slope will be protected by anchored stabilization matting, sod, gravel, riprap, or other stabilization method.

5. Cut slopes occurring in ripable rock shall be serrated as shown in Figure 4.9 on page 4.26. The serrations shall be made with conventional equipment as the excavation is made. Each step or serration shall be constructed on the contour and will have steps cut at nominal two-foot intervals with nominal three-foot horizontal shelves. These steps will vary depending on the slope ratio or the cut slope. The nominal slope line is 1 ½: 1. These steps will weather and act to hold moisture, lime, fertilizer, and seed thus producing a much quicker and longer-lived vegetative cover and better slope stabilization. Overland flow shall be diverted from the top of all serrated cut slopes and carried to a suitable outlet.

6. Subsurface drainage shall be provided where necessary to intercept seepage that would otherwise adversely affect slope stability or create excessively wet site conditions.

7. Slopes shall not be created so close to property lines as to endanger adjoining properties without adequately protecting such properties against sedimentation, erosion, slippage, settlement, subsidence, or other related damages.

8. Fill material shall be free of brush, rubbish, rocks, logs, stumps, building debris, and other objectionable material. It should be free of stones over two (2) inches in diameter where compacted by hand or mechanical tampers or over eight (8) inches in diameter where compacted by rollers or other equipment. Frozen material shall not be placed in the fill nor shall the fill material be placed on a frozen foundation.

9. Stockpiles, borrow areas, and spoil shall be shown on the plans and shall be subject to the provisions of this Standard and Specifications.

10. All disturbed areas shall be stabilized structurally or vegetatively in compliance with the Permanent Construction Area Planting Standard on page 4.42.

Construction Specifications

See Figures 4.9 and 4.10 for details.

1. All graded or disturbed areas, including slopes, shall be protected during clearing and construction in accordance with the erosion and sediment control plan until they are adequately stabilized.

2. All erosion and sediment control practices and measures shall be constructed, applied and maintained in accordance with the erosion and sediment control plan and these standards.

3. Topsoil required for the establishment of vegetation shall be stockpiled in amount necessary to complete finished grading of all exposed areas.

4. Areas to be filled shall be cleared, grubbed, and stripped of topsoil to remove trees, vegetation, roots, or other objectionable material.

5. Areas that are to be topsoiled shall be scarified to a minimum depth of four inches prior to placement of topsoil.

6. All fills shall be compacted as required to reduce erosion, slippage, settlement, subsidence, or other related problems. Fill intended to support buildings, structures, and conduits, etc., shall be compacted in accordance with local requirements or codes.

7. All fill shall be placed and compacted in layers not to exceed 9 inches in thickness.

8. Except for approved landfills or nonstructural fills, fill material shall be free of frozen particles, brush, roots, sod, or other foreign objectionable materials that would interfere with, or prevent, construction of satisfactory fills.

9. Frozen material or soft, mucky or highly compressible materials shall not be incorporated into fill slopes or structural fills.

10. Fill shall not be placed on saturated or frozen surfaces.

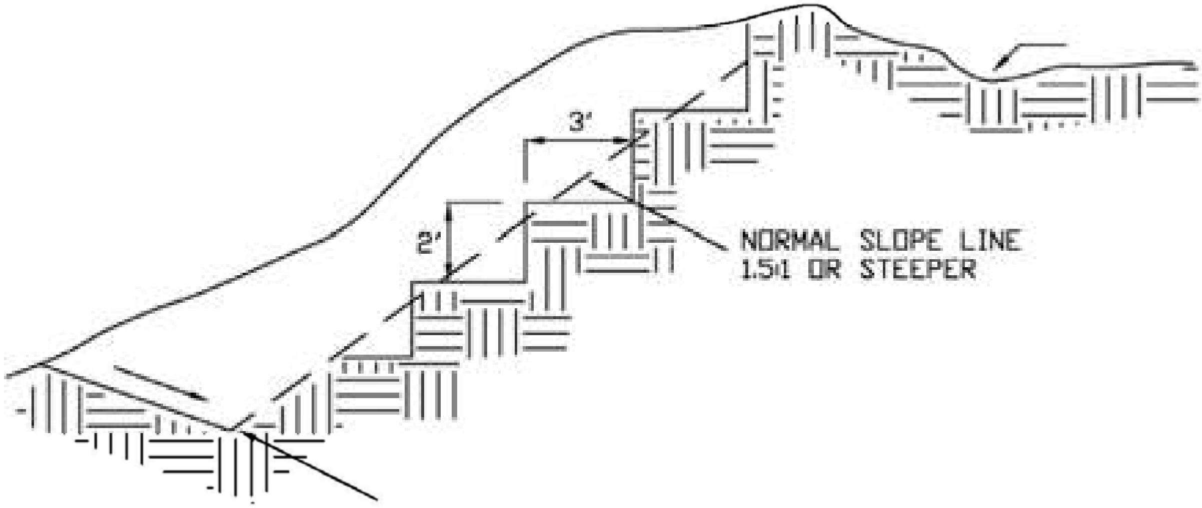
11. All benches shall be kept free of sediment during all phases of development.

12. Seeps or springs encountered during construction shall be handled in accordance with the Standard and Specification for Subsurface Drain on page 3.48 or other approved methods.

13. All graded areas shall be permanently stabilized immediately following finished grading.

14. Stockpiles, borrow areas, and spoil areas shall be shown on the plans and shall be subject to the provisions of this Standard and Specifications.

Figure 4.9
Typical Section of Serrated Cut Slope



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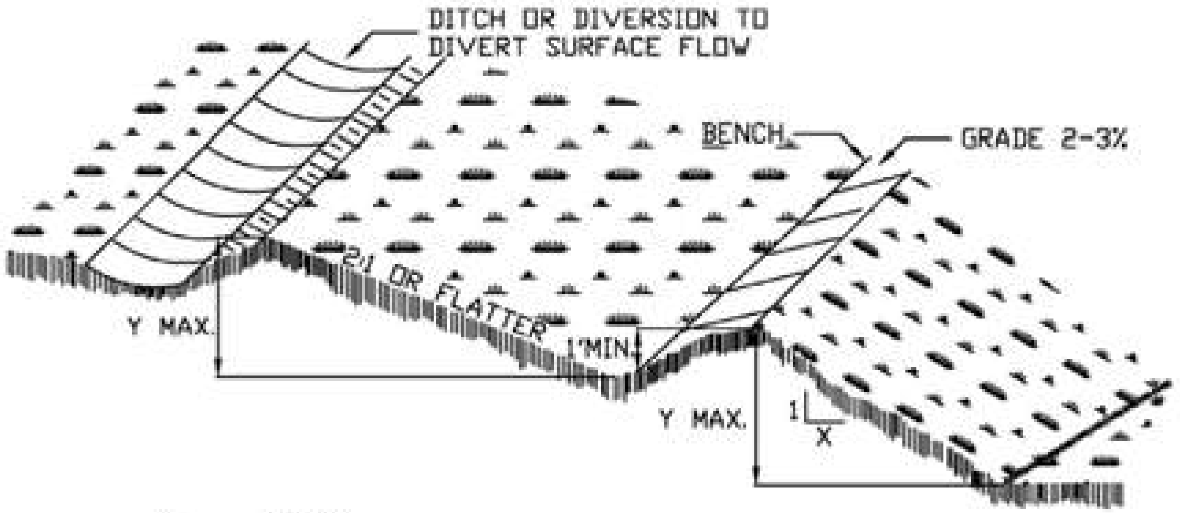
TYPICAL SECTION OF SERRATED CUT SLOPE

Figure 4.10
Landgrading

SYMBOL



X	Y(MAX)
2	20'
3	30'
4	40'

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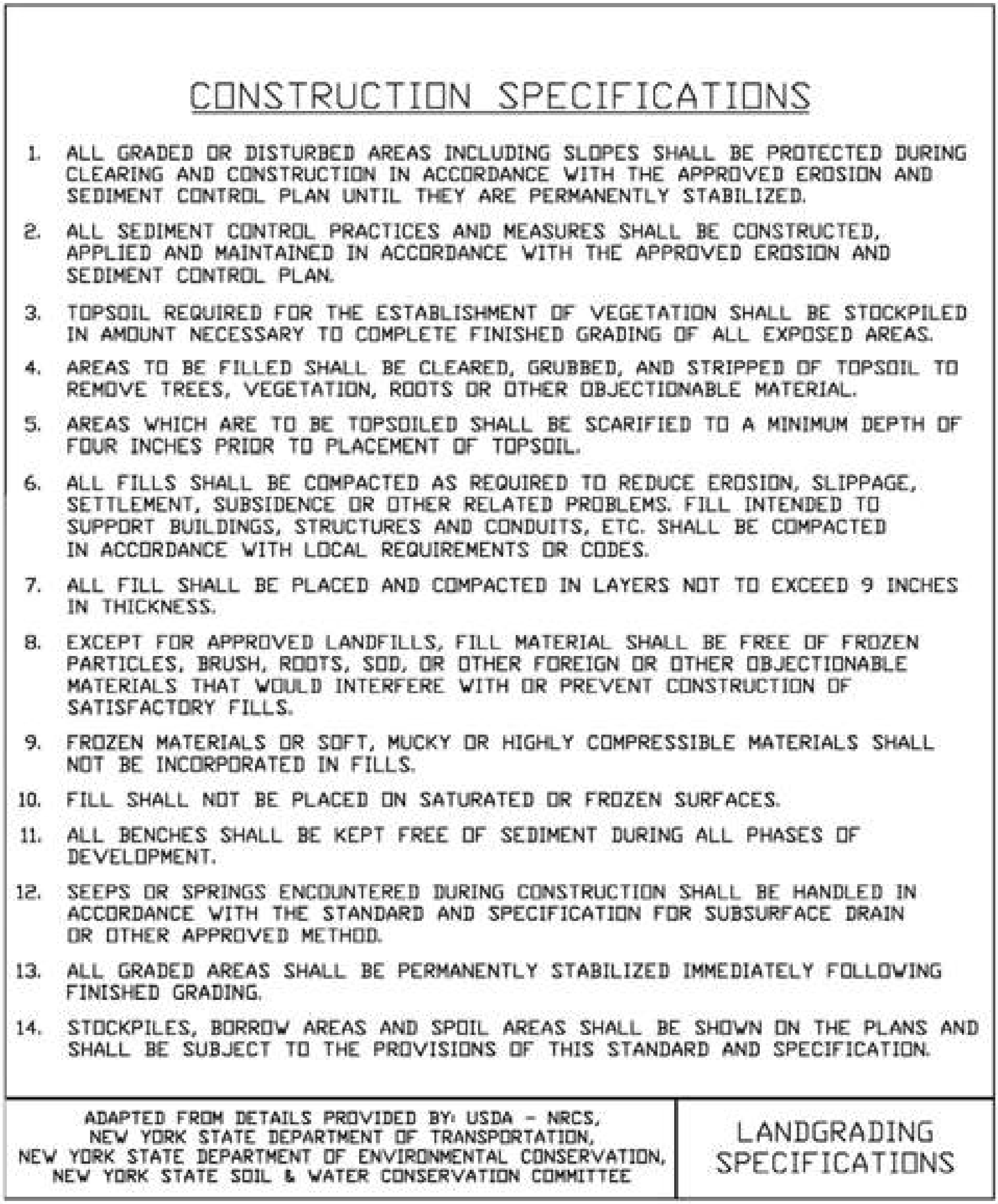
LANDGRADING DETAIL

Figure 4.11
Landgrading - Construction Specifications



CONSTRUCTION SPECIFICATIONS

1. ALL GRADED OR DISTURBED AREAS INCLUDING SLOPES SHALL BE PROTECTED DURING CLEARING AND CONSTRUCTION IN ACCORDANCE WITH THE APPROVED EROSION AND SEDIMENT CONTROL PLAN UNTIL THEY ARE PERMANENTLY STABILIZED.
2. ALL SEDIMENT CONTROL PRACTICES AND MEASURES SHALL BE CONSTRUCTED, APPLIED AND MAINTAINED IN ACCORDANCE WITH THE APPROVED EROSION AND SEDIMENT CONTROL PLAN.
3. TOPSOIL REQUIRED FOR THE ESTABLISHMENT OF VEGETATION SHALL BE STOCKPILED IN AMOUNT NECESSARY TO COMPLETE FINISHED GRADING OF ALL EXPOSED AREAS.
4. AREAS TO BE FILLED SHALL BE CLEARED, GRUBBED, AND STRIPPED OF TOPSOIL TO REMOVE TREES, VEGETATION, ROOTS OR OTHER OBJECTIONABLE MATERIAL.
5. AREAS WHICH ARE TO BE TOPSOILED SHALL BE SCARIFIED TO A MINIMUM DEPTH OF FOUR INCHES PRIOR TO PLACEMENT OF TOPSOIL.
6. ALL FILLS SHALL BE COMPACTED AS REQUIRED TO REDUCE EROSION, SLIPPAGE, SETTLEMENT, SUBSIDENCE OR OTHER RELATED PROBLEMS. FILL INTENDED TO SUPPORT BUILDINGS, STRUCTURES AND CONDUITS, ETC. SHALL BE COMPACTED IN ACCORDANCE WITH LOCAL REQUIREMENTS OR CODES.
7. ALL FILL SHALL BE PLACED AND COMPACTED IN LAYERS NOT TO EXCEED 9 INCHES IN THICKNESS.
8. EXCEPT FOR APPROVED LANDFILLS, FILL MATERIAL SHALL BE FREE OF FROZEN PARTICLES, BRUSH, ROOTS, SOD, OR OTHER FOREIGN OR OTHER OBJECTIONABLE MATERIALS THAT WOULD INTERFERE WITH OR PREVENT CONSTRUCTION OF SATISFACTORY FILLS.
9. FROZEN MATERIALS OR SOFT, MUCKY OR HIGHLY COMPRESSIBLE MATERIALS SHALL NOT BE INCORPORATED IN FILLS.
10. FILL SHALL NOT BE PLACED ON SATURATED OR FROZEN SURFACES.
11. ALL BENCHES SHALL BE KEPT FREE OF SEDIMENT DURING ALL PHASES OF DEVELOPMENT.
12. SEEPS OR SPRINGS ENCOUNTERED DURING CONSTRUCTION SHALL BE HANDLED IN ACCORDANCE WITH THE STANDARD AND SPECIFICATION FOR SUBSURFACE DRAIN OR OTHER APPROVED METHOD.
13. ALL GRADED AREAS SHALL BE PERMANENTLY STABILIZED IMMEDIATELY FOLLOWING FINISHED GRADING.
14. STOCKPILES, BORROW AREAS AND SPOIL AREAS SHALL BE SHOWN ON THE PLANS AND SHALL BE SUBJECT TO THE PROVISIONS OF THIS STANDARD AND SPECIFICATION.

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LANDGRADING
SPECIFICATIONS

STANDARD AND SPECIFICATIONS FOR MULCHING

Definition and Scope

Applying coarse plant residue or chips, or other suitable materials, to cover the soil surface to provide initial erosion control while a seeding or shrub planting is establishing. Mulch will conserve moisture and modify the surface soil temperature and reduce fluctuation of both. Mulch will prevent soil surface crusting and aid in weed control. Mulch can also be used alone for temporary stabilization in non-growing months. Use of stone as a mulch could be more permanent and should not be limited to non-growing months.

Conditions Where Practice Applies

On soils subject to erosion and on new seedings and shrub plantings. Mulch is useful on soils with low infiltration rates by retarding runoff.

Criteria

Site preparation prior to mulching requires the installation of necessary erosion control or water management practices and drainage systems.

Slope, grade and smooth the site to fit needs of selected mulch products.

Remove all undesirable stones and other debris to meet the needs of the anticipated land use and maintenance required.

Apply mulch after soil amendments and planting is accomplished or simultaneously if hydroseeding is used.

Select appropriate mulch material and application rate or material needs. Hay mulch shall not be used in wetlands or in areas of permanent seeding. Clean straw mulch is preferred alternative in wetland application. Determine local availability.

Select appropriate mulch anchoring material.

NOTE: The best combination for grass/legume establishment is straw (cereal grain) mulch applied at 2 ton/acre (90 lbs./1000sq.ft.) and anchored with wood fiber mulch (hydromulch) at 500 – 750 lbs./acre (11 – 17 lbs./1000 sq. ft.). The wood fiber mulch must be applied through a hydroseeder immediately after mulching.

Table 4.2
Guide to Mulch Materials, Rates, and Uses

Mulch Material	Quality Standards	per 1000 Sq. Ft.	per Acre	Depth of Application	Remarks
Wood chips or shavings	Air-dried. Free of objectionable coarse material	500-900 lbs.	10-20 tons	2-7”	Used primarily around shrub and tree plantings and recreation trails to inhibit weed competition. Resistant to wind blowing. Decomposes slowly.
Wood fiber cellulose (partly digested wood fibers)	Made from natural wood usually with green dye and dispersing agent	50 lbs.	2,000 lbs.	—	Apply with hydromulcher. No tie down required. Less erosion control provided than 2 tons of hay or straw.
Gravel, Crushed Stone or Slag	Washed; Size 2B or 3A—1 1/2”	9 cu. yds.	405 cu. yds.	3”	Excellent mulch for short slopes and around plants and ornamentals. Use 2B where subject to traffic. (Approximately 2,000 lbs./cu. yd.). Frequently used over filter fabric for better weed control.
Hay or Straw	Air-dried; free of undesirable seeds & coarse materials	90-100 lbs. 2-3 bales	2 tons (100-120 bales)	cover about 90% surface	Use small grain straw where mulch is maintained for more than three months. Subject to wind blowing unless anchored. Most commonly used mulching material. Provides the best micro-environment for germinating seeds.
Jute twisted yarn	Undyed, unbleached plain weave. Warp 78 ends/yd., Weft 41 ends/yd. 60-90 lbs./roll	48” x 50 yds. or 48” x 75 yds.	—	—	Use without additional mulch. Tie down as per manufacturers specifications. Good for center line of concentrated water flow.
Excelsior wood fiber mats	Interlocking web of excelsior fibers with photodegradable plastic netting	4’ x 112.5’ or 8’ x 112.5’.	—	—	Use without additional mulch. Excellent for seeding establishment. Anchor as per manufacturers specifications. Approximately 72 lbs./roll for excelsior with plastic on both sides. Use two sided plastic for centerline of waterways.
Straw or coconut fiber, or combination	Photodegradable plastic net on one or two sides	Most are 6.5 ft. x 3.5 ft.	81 rolls	—	Designed to tolerate higher velocity water flow, centerlines of waterways, 60 sq. yds. per roll.

Table 4.3
Mulch Anchoring Guide

Anchoring Method or Material	Kind of Mulch to be Anchored	How to Apply
1. Peg and Twine	Hay or straw	After mulching, divide areas into blocks approximately 1 sq. yd. in size. Drive 4-6 pegs per block to within 2" to 3" of soil surface. Secure mulch to surface by stretching twine between pegs in criss-cross pattern on each block. Secure twine around each peg with 2 or more tight turns. Drive pegs flush with soil. Driving stakes into ground tightens the twine.
2. Mulch netting	Hay or straw	Staple the light-weight paper, jute, wood fiber, or plastic nettings to soil surface according to manufacturer's recommendations. Should be biodegradable. Most products are not suitable for foot traffic.
3. Wood cellulose fiber	Hay or straw	Apply with hydroseeder immediately after mulching. Use 500 lbs. wood fiber per acre. Some products contain an adhesive material ("tackifier"), possibly advantageous.
4. Mulch anchoring tool	Hay or straw	Apply mulch and pull a mulch anchoring tool (blunt, straight discs) over mulch as near to the contour as possible. Mulch material should be "tucked" into soil surface about 3".
5. Tackifier	Hay or straw	Mix and apply polymeric and gum tackifiers according to manufacturer's instructions. Avoid application during rain. A 24-hour curing period and a soil temperature higher than 45^0 Fahrenheit are required.

STANDARD AND SPECIFICATIONS FOR PERMANENT CONSTRUCTION AREA PLANTING

Definition & Scope

Establishing **permanent** grasses with other forbs and/or shrubs to provide a minimum 80% perennial vegetative cover on areas disturbed by construction and critical areas to reduce erosion and sediment transport. Critical areas may include but are not limited to steep excavated cut or fill slopes as well as eroding or denuded natural slopes and areas subject to erosion.

Conditions Where Practice Applies

This practice applies to all disturbed areas void of, or having insufficient, cover to prevent erosion and sediment transport. See additional standards for special situations such as sand dunes and sand and gravel pits.

Criteria

All water control measures will be installed as needed prior to final grading and seedbed preparation. Any severely compacted sections will require chiseling or disking to provide an adequate rooting zone, to a minimum depth of 12”, see Soil Restoration Standard. The seedbed must be prepared to allow good soil to seed contact, with the soil not too soft and not too compact. Adequate soil moisture must be present to accomplish this. If surface is powder dry or sticky wet, postpone operations until moisture changes to a favorable condition. If seeding is accomplished within 24 hours of final grading, additional scarification is generally not needed, especially on ditch or stream banks. Remove all stones and other debris from the surface that are greater than 4 inches, or that will interfere with future mowing or maintenance.

Soil amendments should be incorporated into the upper 2 inches of soil when feasible. **The soil should be tested to determine the amounts of amendments needed.** Apply ground agricultural limestone to attain a pH of 6.0 in the upper 2 inches of soil. If soil must be fertilized before results of a soil test can be obtained to determine fertilizer needs, apply commercial fertilizer at 600 lbs. per acre of 5-5-10 or equivalent. If manure is used, apply a quantity to meet the nutrients of the above fertilizer. This requires an appropriate manure analysis prior to applying to the site. Do not use manure on sites to be planted with birdsfoot trefoil or in the path of concentrated water flow.

Seed mixtures may vary depending on location within the state and time of seeding. Generally, warm season grasses should only be seeded during early spring, April to May. These grasses are primarily used for vegetating excessively drained sands and gravels. See Standard and Specification for Sand and Gravel Mine Reclamation. Other grasses may be seeded any time of the year when the soil is not frozen and is workable. When legumes such as birdsfoot trefoil are included, spring seeding is preferred. See Table 4.4, “Permanent Construction Area Planting Mixture Recommendations” for additional seed mixtures.

General Seed Mix:	**Variety**	**lbs./ acre**	**lbs/1000 sq. ft.**
Red Clover[1] OR	Acclaim, Rally, Red Head II, Renegade	8[2]	0.20
Common white clover[1]	Common	8	0.20
PLUS			
Creeping Red Fescue	Common	20	0.45
PLUS			
Smooth Bromegrass OR	Common	2	0.05
Ryegrass (perennial)	Pennfine/Linn	5	0.10

[1] add inoculant immediately prior to seeding

[2] Mix 4 lbs each of Empire and Pardee OR 4 lbs of Birdsfoot and 4 lbs white clover per acre. All seeding rates are given for Pure Live Seed (PLS)

Pure Live Seed, or (PLS) refers to the amount of live seed in a lot of bulk seed. Information on the seed bag label includes the type of seed, supplier, test date, source of seed, purity, and germination. Purity is the percentage of pure seed. Germination is the percentage of pure seed that will produce normal plants when planted under favorable conditions.

To compute Pure Live Seed multiply the “germination percent” times the “purity” and divide that by 100 to get Pure Live Seed.

$$\text{Pure Live Seed (PLS)} = \frac{\%\text{ Germination} \times \%\text{ Purity}}{100}$$

For example, the PLS for a lot of Kentucky Blue grass with 75% purity and 96% germination would be calculated as follows:

$$\frac{(96) \times (75)}{100} = 72\% \text{ Pure Live Seed}$$

For 10lbs of PLS from this lot =

$$\frac{10}{0.72} = 13.9 \text{ lbs}$$

Therefore, 13.9 lbs of seed is the actual weight needed to meet 10lbs PSL from this specific seed lot.

Time of Seeding: The optimum timing for the general seed mixture is early spring. Permanent seedings may be made any time of year if properly mulched and adequate moisture is provided. Late June through early August is not a good time to seed, but may facilitate covering the land without additional disturbance if construction is completed. Portions of the seeding may fail due to drought and heat. These areas may need reseeding in late summer/fall or the following spring.

Method of seeding: Broadcasting, drilling, cultipack type seeding, or hydroseeding are acceptable methods. Proper soil to seed contact is key to successful seedings.

Mulching: Mulching is essential to obtain a uniform stand of seeded plants. Optimum benefits of mulching new seedings are obtained with the use of small grain straw applied at a rate of 2 tons per acre, and anchored with a netting or tackifier. See the Standard and Specifications for Mulching for choices and requirements.

Irrigation: Watering may be essential to establish a new seeding when a drought condition occurs shortly after a new seeding emerges. Irrigation is a specialized practice and care must be taken not to exceed the application rate for the soil or subsoil. When disconnecting irrigation pipe, be sure pipes are drained in a safe manor, not creating an erosion concern.

80% Perennial Vegetative Cover

50% Perennial Vegetative Cover

Table 4.4
Permanent Construction Area Planting Mixture Recommendations

Seed Mixture	Variety	Rate in lbs./acre (PLS)	Rate in lbs./ 1, 000 ft^2
Mix #1			
Creeping red fescue	Ensylva, Pennlawn, Boreal	10	.25
Perennial ryegrass	Pennfine, Linn	10	.25
*This mix is used extensively for shaded areas.			
Mix #2			
Switchgrass	Shelter, Pathfinder, Trailblazer, or Blackwell	20	.50
*This rate is in pure live seed, this would be an excellent choice along the upland edge of a wetland to filter runoff and provide wildlife benefits. In areas where erosion may be a problem, a companion seeding of sand lovegrass should be added to provide quick cover at a rate of 2 lbs. per acre (0.05 lbs. per 1000 sq. ft.).			
Mix #3			
Switchgrass	Shelter, Pathfinder, Trailblazer, or Blackwell	4	.10
Big bluestem	Niagara	4	.10
Little bluestem	Aldous or Camper	2	.05
Indiangrass	Rumsey	4	.10
Coastal panicgrass	Atlantic	2	.05
Sideoats grama	El Reno or Trailway	2	.05
Wildflower mix		.50	.01
*This mix has been successful on sand and gravel plantings. It is very difficult to seed without a warm season grass seeder such as a Truax seed drill. Broadcasting this seed is very difficult due to the fluffy nature of some of the seed, such as bluestems and indiangrass.			
Mix #4			
Switchgrass	Shelter, Pathfinder, Trailblazer, or Blackwell	10	.25
Coastal panicgrass	Atlantic	10	.25
*This mix is salt tolerant, a good choice along the upland edge of tidal areas and roadsides.			
Mix #5			
Saltmeadow cordgrass (Spartina patens)—This grass is used for tidal shoreline protection and tidal marsh restoration. It is planted by vegetative stem divisions. 'Cape' American beachgrass can be planted for sand dune stabilization above the saltmeadow cordgrass zone.			
Mix #6			
Creeping red fescue	Ensylva, Pennlawn, Boreal	20	.45
Chewings Fescue	Common	20	.45
Perennial ryegrass	Pennfine, Linn	5	.10
Red Clover	Common	10	.45
*General purpose erosion control mix. Not to be used for a turf planting or play grounds.			

STANDARD AND SPECIFICATIONS FOR SOIL RESTORATION

Definition & Scope

The decompaction of areas of a development site or construction project where soils have been disturbed to recover the original properties and porosity of the soil; thus providing a sustainable growth medium for vegetation, reduction of runoff and filtering of pollutants from stormwater runoff.

Conditions Where Practice Applies

Soil restoration is to be applied to areas whose heavy construction traffic is done and final stabilization is to begin. This is generally applied in the cleanup, site restoration, and landscaping phase of construction followed by the permanent establishment of an appropriate ground cover to maintain the soil structure. Soil restoration measures should be applied over and adjacent to any runoff reduction practices to achieve design performance.

Design Criteria

1. Soil restoration areas will be designated on the plan views of areas to be disturbed.
2. Soil restoration will be completed in accordance with Table 4.6 on page 4.53.

Specification for Full Soil Restoration

During periods of relatively low to moderate subsoil moisture, the disturbed subsoils are returned to rough grade and the following Soil Restoration steps applied:

1. Apply 3 inches of compost over subsoil. The compost shall be well decomposed (matured at least 3 months), weed-free, organic matter. It shall be aerobically composted, possess no objectionable odors, and contain less than 1%, by dry weight, of man-made foreign matter. The physical parameters of the compost shall meet the standards listed in Table 5.2 - Compost Standards Table, except for “Particle Size” 100% will pass the 1/2” sieve. **Note: All biosolids compost produced in New York State (or approved for importation) must meet NYS DEC’s 6 NYCRR Part 360 (Solid Waste Management Facilities) requirements. The Part 360 requirements are equal to or more stringent than 40 CFR Part 503 which ensure safe standards for pathogen reduction and heavy metals content.**

2. Till compost into subsoil to a depth of at least 12 inches using a cat-mounted ripper, tractor mounted disc, or tiller, to mix and circulate air and compost into the subsoil.
3. Rock-pick until uplifted stone/rock materials of four inches and larger size are cleaned off the site.
4. Apply topsoil to a depth of 6 inches.
5. Vegetate as required by the seeding plan. Use appropriate ground cover with deep roots to maintain the soil structure.
6. Topsoil may be manufactured as a mixture or a mineral component and organic material such as compost.

At the end of the project an inspector should be able to push a 3/8" metal bar 12 inches into the soil just with body weight. This should not be performed within the drip line of any existing trees or over utility installations that are within 24 inches of the surface.

Maintenance

Keep the site free of vehicular and foot traffic or other weight loads. Consider pedestrian footpaths.

Table 4.6
Soil Restoration Requirements

Type of Soil Disturbance	Soil Restoration Requirement		Comments/Examples
No soil disturbance	Restoration not permitted		Preservation of Natural Features
Minimal soil disturbance	Restoration not required		Clearing and grubbing
Areas where topsoil is stripped only - no change in grade	HSG A&B	HSG C&D	Protect area from any ongoing construction activities.
	Apply 6 inches of topsoil	Aerate* and apply 6 inches of topsoil	
Areas of cut or fill	HSG A&B	HSG C&D	
	Aerate* and apply 6 inches of topsoil	Apply full Soil Restoration**	
Heavy traffic areas on site (especially in a zone 5-25 feet around buildings but not within a 5 foot perimeter around foundation walls)	Apply full Soil Restoration (decompaction and compost enhancement)		
Areas where Runoff Reduction and/or Infiltration practices are applied	Restoration not required, but may be applied to enhance the reduction specified for appropriate practices.		Keep construction equipment from crossing these areas. To protect newly installed practice from any ongoing construction activities construct a single phase operation fence area
Redevelopment projects	Soil Restoration is required on redevelopment projects in areas where existing impervious area will be converted to pervious area.		

* Aeration includes the use of machines such as tractor-drawn implements with coulters making a narrow slit in the soil, a roller with many spikes making indentations in the soil, or prongs which function like a mini-subsoiler.
** Per "Deep Ripping and De-compaction, DEC 2008".

STANDARD AND SPECIFICATIONS FOR SURFACE ROUGHENING

Definition & Scope

Roughening a bare soil surface whether through creating horizontal grooves across a slope, stair-stepping, or tracking with construction equipment to aid the establishment of vegetative cover from seed, to reduce runoff velocity and increase infiltration, and to reduce erosion and provide for trapping of sediment.

Conditions Where Practice Applies

All construction slopes require surface roughening to facilitate stabilization with vegetation, particularly slopes steeper than 3:1.

Design Criteria

There are many different methods to achieve a roughened soil surface on a slope. No specific design criteria is required. However, the selection of the appropriate method depends on the type of slope. Methods include tracking, grooving, and stair-stepping. Steepness, mowing requirements, and/or a cut or fill slope operation are all factors considered in choosing a roughening method.

Construction Specifications

1. Cut Slope, No mowing.

    A. Stair-step grade or groove cut slopes with a gradient steeper than 3:1 (Figure 4.18).

    B. Use stair-step grading on any erodible material soft enough to be ripped with a bulldozer. Slopes of soft rock with some soil are particularly suited to stair-step grading.

    C. Make the vertical cut distance less than the horizontal distance, and slightly slope the horizontal position of the "step" to the vertical wall.

    D. Do not make vertical cuts more than 2 feet in soft materials or 3 feet in rocky materials.

Grooving uses machinery to create a series of ridges and depressions that run perpendicular to the slope following the contour. Groove using any appropriate implement that can be safely operated on the slope, such as disks, tillers, spring harrows, or the teeth of a front-end loader bucket. Do not make the grooves less than 3 inches deep or more than 15 inches apart.

2. Fill Slope, No mowing

    A. Place fill to create slopes with a gradient no steeper than 2:1 in lifts 9 inches or less and properly compacted. Ensure the face of the slope consists of loose, uncompacted fill 4 to 6 inches deep. Use grooving as described above to roughen the slope, if necessary.

    B. Do not back blade or scrape the final slope face.

3. Cuts/Fills, Mowed Maintenance

    A. Make mowed slopes no steeper than 3:1.

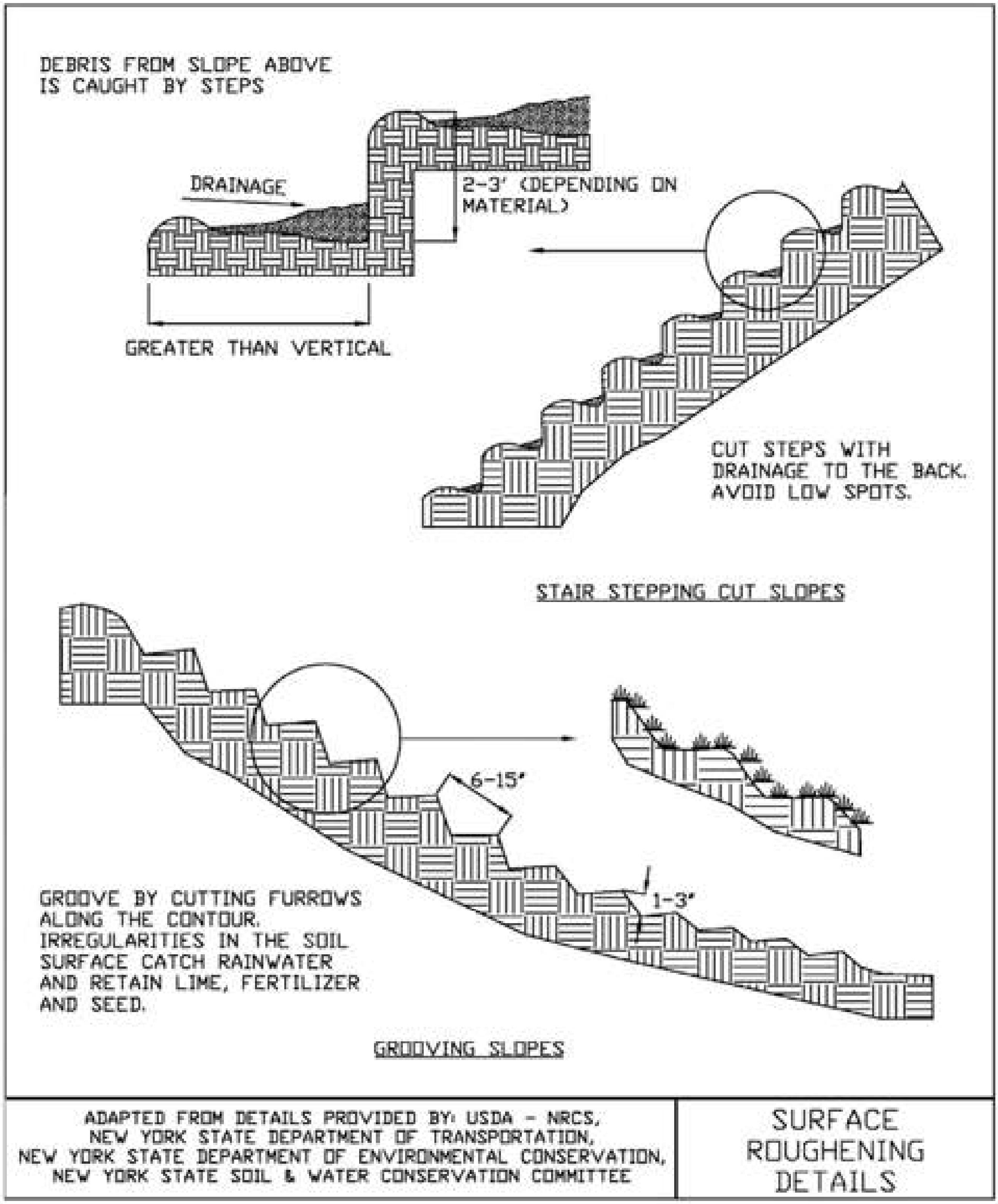
    B. Roughen these areas to shallow grooves by normal tilling, disking, harrowing, or use of cultipacker-seeder. Make the final pass of such tillage equipment on the contour.

    C. Make grooves at least 1 inch deep and a maximum of 10 inches apart.

    D. Excessive roughness is undesirable where mowing is planned.

Tracking should be used primarily in sandy soils to avoid undue compaction of the soil surface. Tracking is generally not as effective as the other roughening methods described. (It has been used as a method to track down mulch.) Operate tracked machinery up and down the slope to leave horizontal depressions in the soil. Do not back-blade during the final grading operation.

Figure 4.18
Surface Roughening



ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS,
NEW YORK STATE DEPARTMENT OF TRANSPORTATION,
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION,
NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

SURFACE ROUGHENING DETAILS

STANDARD AND SPECIFICATIONS FOR TEMPORARY CONSTRUCTION AREA SEEDING

Definition & Scope

Providing temporary erosion control protection to disturbed areas and/or localized critical areas for an interim period by covering all bare ground that exists as a result of construction activities or a natural event. Critical areas may include but are not limited to steep excavated cut or fill slopes and any disturbed, denuded natural slopes subject to erosion.

Conditions Where Practice Applies

Temporary seedings may be necessary on construction sites to protect an area, or section, where final grading is complete, when preparing for winter work shutdown, or to provide cover when permanent seedings are likely to fail due to mid-summer heat and drought. The intent is to provide temporary protective cover during temporary shutdown of construction and/or while waiting for optimal planting time.

Criteria

Water management practices must be installed as appropriate for site conditions. The area must be rough graded and slopes physically stable. Large debris and rocks are usually removed. Seedbed must be seeded within 24 hours of disturbance or scarification of the soil surface will be necessary prior to seeding.

Fertilizer or lime are not typically used for temporary seedings.

IF: Spring or summer or early fall, then seed the area with ryegrass (annual or perennial) at 30 lbs. per acre (Approximately 0.7 lb./1000 sq. ft. or use 1 lb./1000 sq. ft.).

IF: Late fall or early winter, then seed Certified ‘Aroostook’ winter rye (cereal rye) at 100 lbs. per acre (2.5 lbs./1000 sq. ft.).

Any seeding method may be used that will provide uniform application of seed to the area and result in relatively good soil to seed contact.

Mulch the area with hay or straw at 2 tons/acre (approx. 90 lbs./1000 sq. ft. or 2 bales). Quality of hay or straw mulch allowable will be determined based on long term use and visual concerns. Mulch anchoring will be required where wind or areas of concentrated water are of concern. Wood fiber hydromulch or other sprayable products approved for erosion control (nylon web or mesh) may be used if applied according to manufacturers’ specification. Caution is advised when using nylon or other synthetic products. They may be difficult to remove prior to final seeding and can be a hazard to young wildlife species.

STANDARD AND SPECIFICATIONS FOR TOPSOILING

Definition & Scope

Spreading a specified quality and quantity of topsoil materials on graded or constructed subsoil areas to provide acceptable plant cover growing conditions, thereby reducing erosion; to reduce irrigation water needs; and to reduce the need for nitrogen fertilizer application.

Conditions Where Practice Applies

Topsoil is applied to subsoils that are droughty (low available moisture for plants), stony, slowly permeable, salty or extremely acid. It is also used to backfill around shrub and tree transplants. This standard does not apply to wetland soils.

Design Criteria

1. Preserve existing topsoil in place where possible, thereby reducing the need for added topsoil.
2. Conserve by stockpiling topsoil and friable fine textured subsoils that must be stripped from the excavated site and applied after final grading where vegetation will be established. Topsoil stockpiles must be stabilized. Stockpile surfaces can be stabilized by vegetation, geotextile or plastic covers. This can be aided by orientating the stockpile lengthwise into prevailing winds.
3. Refer to USDA Natural Resource Conservation Service soil surveys or soil interpretation record sheets for further soil texture information for selecting appropriate design topsoil depths.

Site Preparation

1. As needed, install erosion and sediment control practices such as diversions, channels, sediment traps, and stabilizing measures, or maintain if already installed.
2. Complete rough grading and final grade, allowing for depth of topsoil to be added.
3. Scarify all compact, slowly permeable, medium and fine textured subsoil areas. Scarify at approximately right angles to the slope direction in soil areas that are steeper than 5 percent. Areas that have been overly compacted shall be decompacted in accordance with the Soil Restoration Standard.
4. Remove refuse, woody plant parts, stones over 3 inches in diameter, and other litter.

Topsoil Materials

1. Topsoil shall have at least 6 percent by weight of fine textured stable organic material, and no greater than 20 percent. Muck soil shall not be considered topsoil.
2. Topsoil shall have not less than 20 percent fine textured material (passing the NO. 200 sieve) and not more than 15 percent clay.
3. Topsoil treated with soil sterilants or herbicides shall be so identified to the purchaser.
4. Topsoil shall be relatively free of stones over 1 1/2 inches in diameter, trash, noxious weeds such as nut sedge and quackgrass, and will have less than 10 percent gravel.
5. Topsoil containing soluble salts greater than 500 parts per million shall not be used.
6. Topsoil may be manufactured as a mixture of a mineral component and organic material such as compost.

Application and Grading

1. Topsoil shall be distributed to a uniform depth over the area. It shall not be placed when it is partly frozen, muddy, or on frozen slopes or over ice, snow, or standing water puddles.
2. Topsoil placed and graded on slopes steeper than 5 percent shall be promptly fertilized, seeded, mulched, and stabilized by “tracking” with suitable equipment.
3. Apply topsoil in the amounts shown in Table 4.7 below:

Table 4.7 - Topsoil Application Depth		
Site Conditions	**Intended Use**	**Minimum Topsoil Depth**
1. Deep sand or loamy sand	Mowed lawn	6 in.
	Tall legumes, unmowed	2 in.
	Tall grass, unmowed	1 in.
2. Deep sandy loam	Mowed lawn	5 in.
	Tall legumes, unmowed	2 in.
	Tall grass, unmowed	none
3. Six inches or more: silt loam, clay loam, loam, or silt	Mowed lawn	4 in.
	Tall legumes, unmowed	1 in.
	Tall grass, unmowed	1 in.

STANDARD AND SPECIFICATIONS FOR BUFFER FILTER STRIP

Land Slope (%)	Minimum Filter Strip Width (ft.)
≤10	50
20	60
30	85
40	105
50	125
60	145
70	165

Definition & Scope

A **temporary/permanent** well vegetated grassed area below a disturbed area that can be used to remove sediment from runoff prior to it reaching surface waters or other designated areas of concern, such as parking lots and road pavement.

Condition Where Practice Applies

This practice is effective when the flow is in the form of sheet flow and the vegetative cover is established prior to disturbance. Surface water must be protected from sediment-laden runoff until buffer filter strip vegetation is established, and then the proposed disturbance can be undertaken. This practice is effective when the flow is in the form of sheet flow (maximum of 150 feet).

Design Criteria

1. The vegetation should be a well established perennial grass. Wooded and brushy areas are not acceptable for purposes of sediment removal.

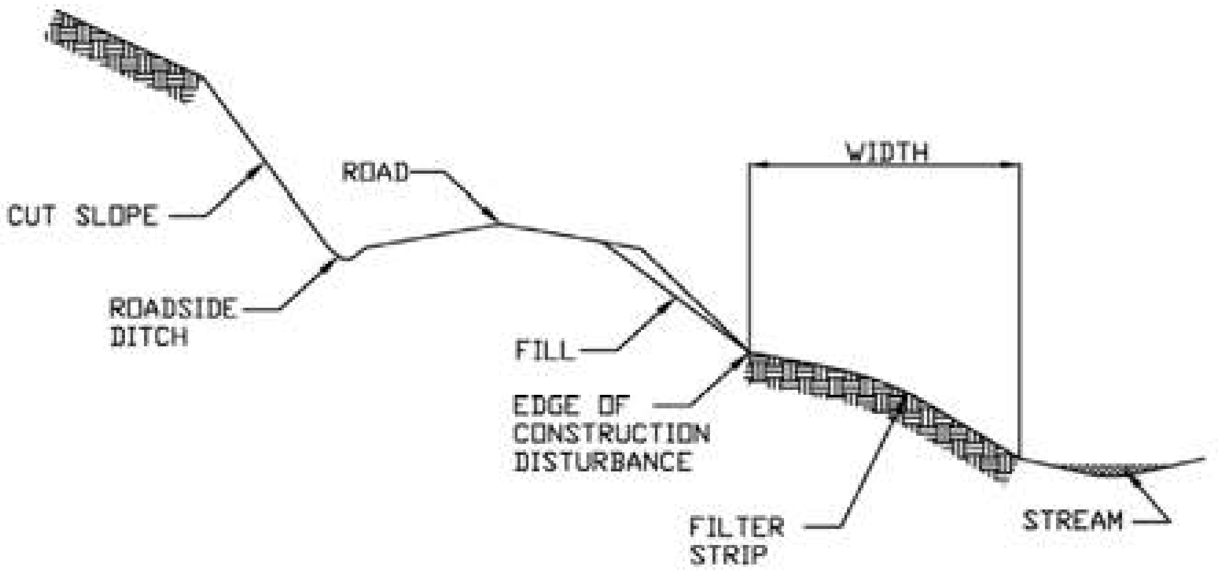
2. The minimum buffer filter strip width for stream protection shall be in accordance with the following table:

3. The minimum buffer filter strip width to protect paved areas during construction is 20 feet.

Maintenance

If at any time the width of the buffer filter strip has been reduced by sediment deposition to half its original width or concentrated flow has developed, suitable additional practices should be installed. The erosion and sediment control plan shall include these details.

Figure 5.1
Buffer Filter Strip



ADAPTED FROM DETAILS PROVIDED BY: PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION.

BUFFER FILTER STRIP

STANDARD AND SPECIFICATIONS FOR COMPOST FILTER SOCK

Definition & Scope

A **temporary** sediment control practice composed of a degradable geotextile mesh tube filled with compost filter media to filter sediment and other pollutants associated with construction activity to prevent their migration offsite.

Condition Where Practice Applies

Compost filter socks can be used in many construction site applications where erosion will occur in the form of sheet erosion and there is no concentration of water flowing to the sock. In areas with steep slopes and/or rocky terrain, soil conditions must be such that good continuous contact between the sock and the soil is maintained throughout its length. For use on impervious surfaces such as road pavement or parking areas, proper anchorage must be provided to prevent shifting of the sock or separation of the contact between the sock and the pavement. Compost filter socks are utilized both at the site perimeter as well as within the construction areas. These socks may be filled after placement by blowing compost into the tube pneumatically, or filled at a staging location and moved into its designed location.

Design Criteria

1. Compost filter socks will be placed on the contour with both terminal ends of the sock extended 8 feet upslope at a 45 degree angle to prevent bypass flow.

2. Diameters designed for use shall be 12" – 32" except that 8" diameter socks may be used for residential lots to control areas less than 0.25 acres.

3. The flat dimension of the sock shall be at least 1.5 times the nominal diameter.

4. The **Maximum Slope Length** (in feet) above a compost filter sock shall not exceed the following limits:

Dia. (in.)	Slope %						
	2	5	10	20	25	33	50
8	225*	200	100	50	20	—	—
12	250	225	125	65	50	40	25
18	275	250	150	70	55	45	30
24	350	275	200	130	100	60	35
32	450	325	275	150	120	75	50

* Length in feet

5. The compost infill shall be well decomposed (matured at least 3 months), weed-free, organic matter. It shall be aerobically composted, possess no objectionable odors, and contain less than 1%, by dry weight, of man-made foreign matter. The physical parameters of the compost shall meet the standards listed in Table 5.2 - Compost Standards Table. **Note: All biosolids compost produced in New York State (or approved for importation) must meet NYS DEC's 6 NYCRR Part 360 (Solid Waste Management Facilities) requirements. The Part 360 requirements are equal to or more stringent than 40 CFR Part 503 which ensure safe standards for pathogen reduction and heavy metals content. When using compost filter socks adjacent to surface water, the compost should have a low nutrient value.**

6. The compost filter sock fabric material shall meet the

7. Compost filter socks shall be anchored in earth with 2” x 2” wooden stakes driven 12” into the soil on 10 foot centers on the centerline of the sock. On uneven terrain, effective ground contact can be enhanced by the placement of a fillet of filter media on the disturbed area side of the compost sock.
8. All specific construction details and material specifications shall appear on the erosion and sediment control constructions drawings when compost filter socks are included in the plan.

Maintenance

1. Traffic shall not be permitted to cross filter socks.
2. Accumulated sediment shall be removed when it reaches half the above ground height of the sock and disposed of in accordance with the plan.
3. Socks shall be inspected weekly and after each runoff event. Damaged socks shall be repaired in the manner required by the manufacturer or replaced within 24 hours of inspection notification.
4. Biodegradable filter socks shall be replaced after 6 months; photodegradable filter socks after 1 year. Polypropylene socks shall be replaced according to the manufacturer’s recommendations.
5. Upon stabilization of the area contributory to the sock, stakes shall be removed. The sock may be left in place and vegetated or removed in accordance with the stabilization plan. For removal the mesh can be cut and the compost spread as an additional mulch to act as a soil supplement.

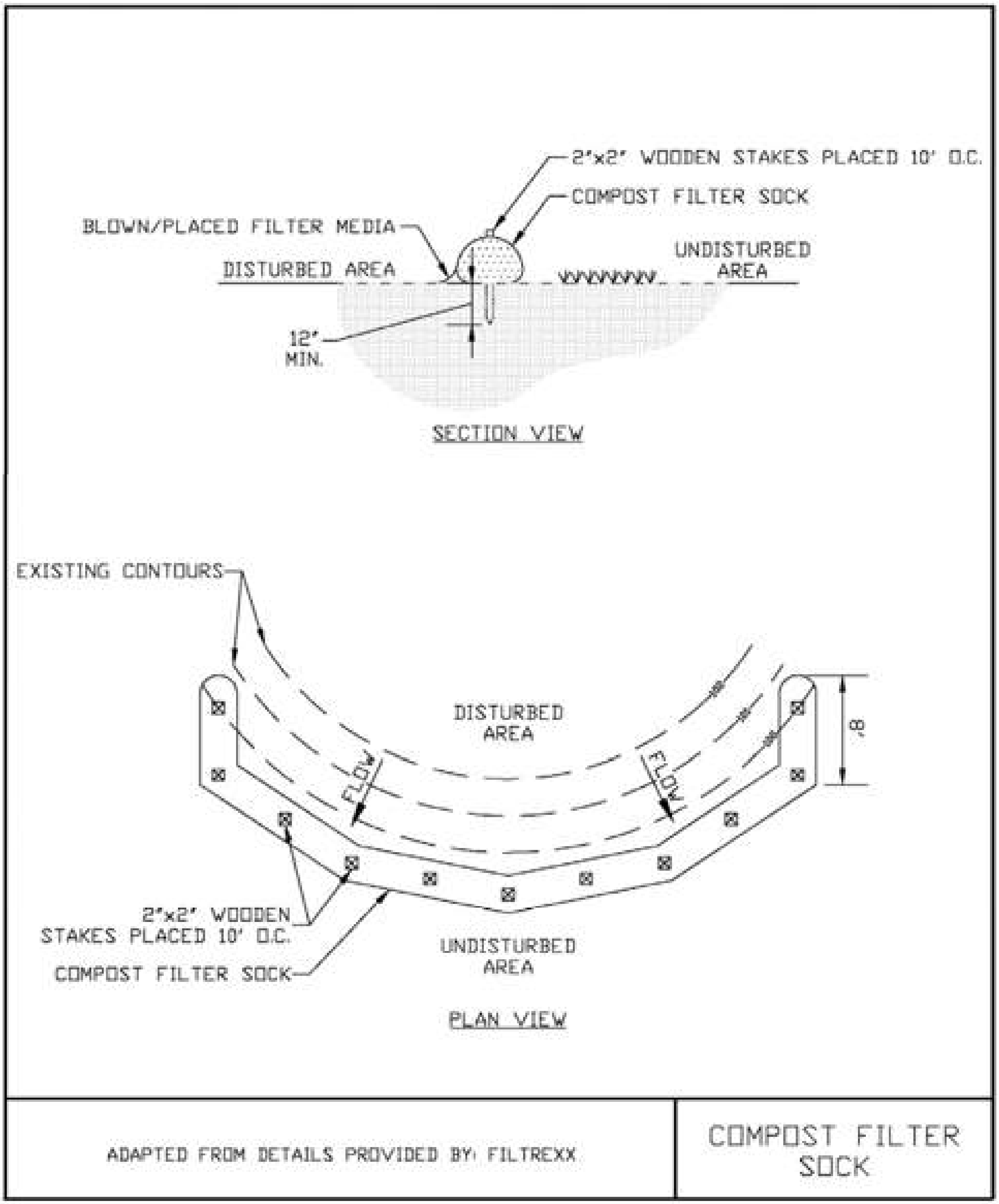
Table 5.1 - Compost Sock Fabric Minimum Specifications Table

Material Type	**3 mil HDPE**	**5 mil HDPE**	**5 mil HDPE**	**Multi-Filament Polypropylene (MFPP)**	**Heavy Duty Multi-Filament Polypropylene (HDMFPP)**
Material Characteristics	Photodegradable	Photodegradable	Biodegradable	Photodegradable	Photodegradable
Sock Diameters	12” 18”	12” 18” 24” 32”	12” 18” 24” 32”	12” 18” 24” 32”	12” 18” 24” 32”
Mesh Opening	3/8”	3/8”	3/8”	3/8”	1/8”
Tensile Strength		26 psi	26 psi	44 psi	202 psi
Ultraviolet Stability % Original Strength (ASTM G-155)	23% at 1000 hr.	23% at 1000 hr.		100% at 1000 hr.	100% at 1000 hr.
Minimum Functional Longevity	6 months	9 months	6 months	1 year	2 years

Table 5.2 - Compost Standards Table

Organic matter content	25% - 100% (dry weight)
Organic portion	Fibrous and elongated
pH	6.0 – 8.0
Moisture content	30% - 60%
Particle size	100% passing a 1” screen and 10 - 50% passing a 3/8” screen
Soluble salt concentration	5.0 dS/m (mmhos/cm) maximum

Figure 5.2
Compost Filter Sock



STANDARD AND SPECIFICATIONS FOR GEOTEXTILE FILTER BAG

Definition & Scope

A **temporary** portable device through which sediment laden water is pumped to trap and retain sediment prior to its discharge to drainageways or off-site.

Condition Where Practice Applies

On sites where space is limited such as urban construction or linear projects (e.g. roads and utility work) where rights-of-way are limited and larger de-silting practices are impractical.

Design Criteria

1. Location - The portable filter bag should be located to minimize interference with construction activities and pedestrian traffic. It should also be placed in a location that is vegetated, relatively level, and provides for ease of access by heavy equipment, cleanout, disposal of trapped sediment, and proper release of filtered water.

   The filter bag shall also be placed at least 50 feet from all wetlands, streams or other surface waters.

2. Size - Geotextile filter bag shall be sized in accordance with the manufacturers recommendations based on the pump discharge rate.

Materials and Installation

1. The geotextile material will have the following attributes:

Minimum Grab Tensile Strength	200 lbs.
Minimum Grab Tensile Elongation	50 %
Minimum Trapezoid Tear Strength	80 lbs.
Mullen Burst Strength	380 psi
Minimum Puncture Strength	130 lbs
Apparent Opening Size	40 - 80 US sieve
Minimum UV Resistance	70%
Minimum Flow Thru Rate	70 gpm/sq ft

2. The bag shall be sewn with a double needle machine using high strength thread, double stitched “Joe” type capable of minimum roll strength of 100 lbs/inch (ASTM D4884).

3. The geotextile filter bag shall have an opening large enough to accommodate a 4 inch diameter discharge hose with an attached strap to tie off the bag to the hose to prevent back flow.

4. The geotextile shall be placed on a gravel bed 2 inches thick, a straw mat 4 inches thick, or a vegetated filter strip to allow water to flow out of the bag in all directions.

Maintenance

1. The geotextile filter bag is considered full when remaining bag flow area has been reduced by 75%. At this point, it should be replaced with a new bag.

2. Disposal may be accomplished by removing the bag to an appropriate designated upland area, cut open, remove the geotextile for disposal, and spread sediment contents and seeded and mulched according to the vegetative plan.

STANDARD AND SPECIFICATIONS FOR SILT FENCE

Definition & Scope

A **temporary** barrier of geotextile fabric installed on the contours across a slope used to intercept sediment laden runoff from small drainage areas of disturbed soil by temporarily ponding the sediment laden runoff allowing settling to occur. The maximum period of use is limited by the ultraviolet stability of the fabric (approximately one year).

Conditions Where Practice Applies

A silt fence may be used subject to the following conditions:

1. Maximum allowable slope length and fence length will not exceed the limits shown in the Design Criteria for the specific type of silt fence used ; and
2. Maximum ponding depth of 1.5 feet behind the fence; and
3. Erosion would occur in the form of sheet erosion; and
4. There is no concentration of water flowing to the barrier; and
5. Soil conditions allow for proper keying of fabric, or other anchorage, to prevent blowouts.

Design Criteria

1. Design computations are not required for installations of 1 month or less. Longer installation periods should be designed for expected runoff.
2. All silt fences shall be placed as close to the disturbed area as possible, but at least 10 feet from the toe of a slope steeper than 3H:1V, to allow for maintenance and roll down. The area beyond the fence must be undisturbed or stabilized.
3. The type of silt fence specified for each location on the plan shall not exceed the maximum slope length and maximum fence length requirements shown in the following table:

		Slope Length/Fence Length (ft.)		
Slope	Steepness	Standard	Reinforced	Super
<2%	< 50:1	300/1500	N/A	N/A
2-10%	50:1 to 10:1	125/1000	250/2000	300/2500
10-20%	10:1 to 5:1	100/750	150/1000	200/1000
20-33%	5:1 to 3:1	60/500	80/750	100/1000
33-50%	3:1 to 2:1	40/250	70/350	100/500
>50%	> 2:1	20/125	30/175	50/250

Standard Silt Fence (SF) is fabric rolls stapled to wooden stakes driven 16 inches in the ground.
Reinforced Silt Fence (RSF) is fabric placed against welded wire fabric with anchored steel posts driven 16 inches in the ground.
Super Silt Fence (SSF) is fabric placed against chain link fence as support backing with posts driven 3 feet in the ground.

4. Silt fence shall be removed as soon as the disturbed area has achieved final stabilization.

The silt fence shall be installed in accordance with the appropriate details. Where ends of filter cloth come together, they shall be overlapped, folded and stapled to prevent sediment bypass. Butt joints are not acceptable. A detail of the silt fence shall be shown on the plan. See Figure 5.30 on page 5.56 for Reinforced Silt Fence as an example of details to be provided.

Criteria for Silt Fence Materials

1. Silt Fence Fabric: The fabric shall meet the following specifications unless otherwise approved by the appropriate erosion and sediment control plan approval authority. Such approval shall not constitute statewide acceptance.

Fabric Properties	Minimum Acceptable Value	Test Method
Grab Tensile Strength (lbs)	110	ASTM D 4632
Elongation at Failure (%)	20	ASTM D 4632
Mullen Burst Strength (PSI)	300	ASTM D 3786
Puncture Strength (lbs)	60	ASTM D 4833
Minimum Trapezoidal Tear Strength (lbs)	50	ASTM D 4533
Flow Through Rate (gal/min/sf)	25	ASTM D 4491
Equivalent Opening Size	40-80	US Std Sieve ASTM D 4751
Minimum UV Residual (%)	70	ASTM D 4355

2. Fence Posts (for fabricated units): The length shall be a minimum of 36 inches long. Wood posts will be of sound quality hardwood with a minimum cross sectional area of 3.5 square inches. Steel posts will be standard T and U section weighing not less than 1.00 pound per linear foot. Posts for super silt fence shall be standard chain link fence posts.

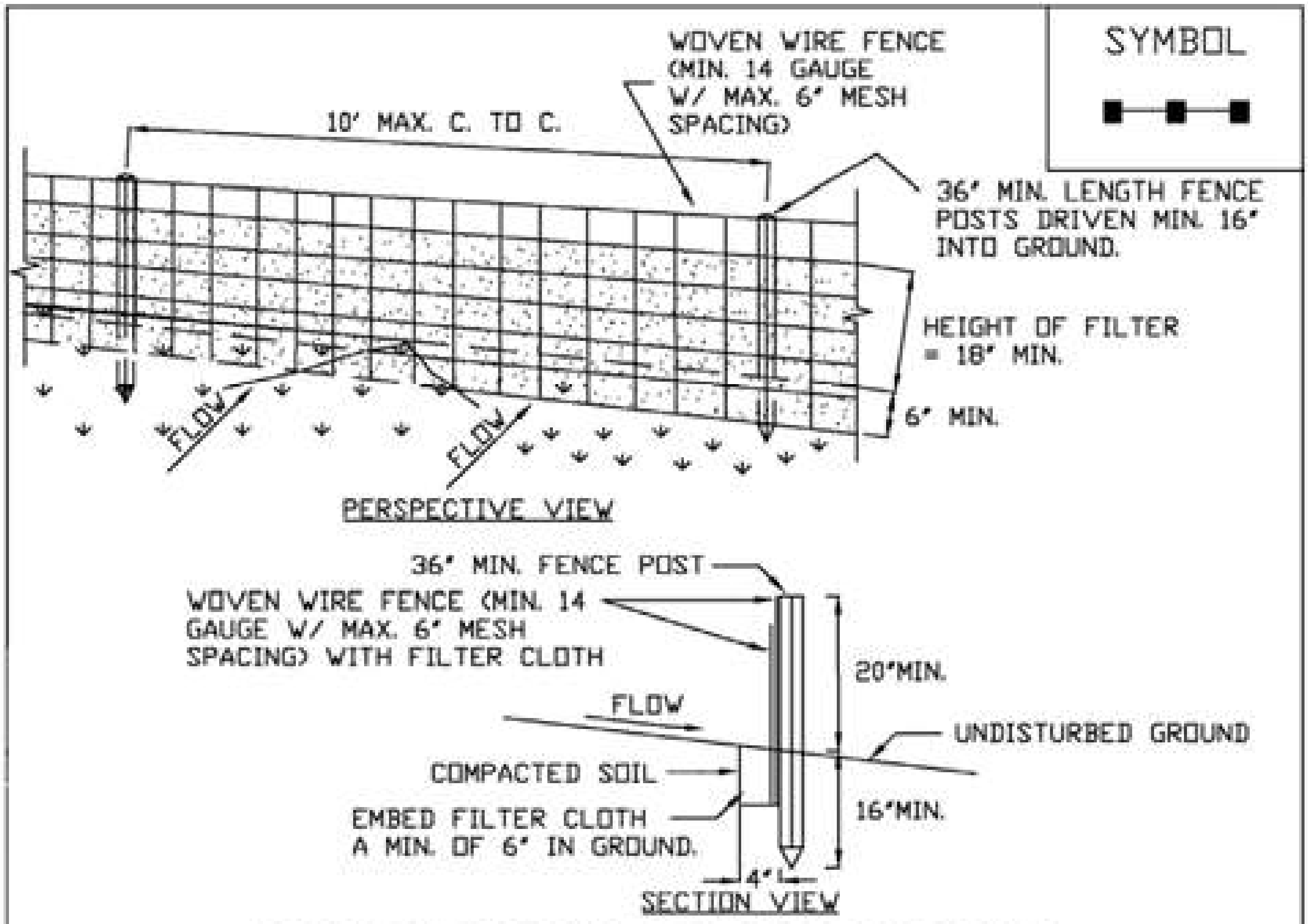
3. Wire Fence for reinforced silt fence: Wire fencing shall be a minimum 14 gage with a maximum 6 in. mesh opening, or as approved.

4. Prefabricated silt fence is acceptable as long as all material specifications are met.

Reinforced Silt Fence

Super Silt Fence

Figure 5.30
Reinforced Silt Fence



CONSTRUCTION SPECIFICATIONS

1. WOVEN WIRE FENCE TO BE FASTENED SECURELY TO FENCE POSTS WITH WIRE TIES OR STAPLES. POSTS SHALL BE STEEL EITHER "T" OR "U" TYPE OR HARDWOOD.
2. FILTER CLOTH TO BE FASTENED SECURELY TO WOVEN WIRE FENCE WITH TIES SPACED EVERY 24" AT TOP AND MID SECTION. FENCE SHALL BE WOVEN WIRE, 6" MAXIMUM MESH OPENING.
3. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER THEY SHALL BE OVERLAPPED BY SIX INCHES AND FOLDED. FILTER CLOTH SHALL BE EITHER FILTER X, MIRAFI 100X, STABILINKA T140N, OR APPROVED EQUIVALENT.
4. PREFABRICATED UNITS SHALL MEET THE MINIMUM REQUIREMENTS SHOWN.
5. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN "BULGES" DEVELOP IN THE SILT FENCE.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	REINFORCED SILT FENCE

STANDARD AND SPECIFICATIONS FOR STRAW BALE DIKE

Definition & Scope

A **temporary** barrier of straw, or similar material, used to intercept sediment laden runoff from small drainage areas of disturbed soil to reduce runoff velocity and effect deposition of the transported sediment load. Straw bale dikes have an estimated design life of three (3) months.

Condition Where Practice Applies

The straw bale dike is used where:

1. No other practice is feasible.
2. There is no concentration of water in a channel or other drainageway above the barrier.
3. Erosion would occur in the form of sheet erosion.
4. Length of slope above the straw bale dike does not exceed the following limits with the bale placed 10 feet from the toe of the slope:

Constructed Slope	Percent Slope	Slope Length (ft.)
2:1	50	25
3:1	33	50
4:1	25	75

Where slope gradient changes through the drainage area, steepness refers to the steepest slope section contributing to the straw bale dike.

The practice may also be used for a single family lot if the slope is less than 15 percent. The contributing drainage areas in this instance shall be less than one quarter of an acre per 100 feet of dike and the length of slope above the dike shall be less than 100 feet.

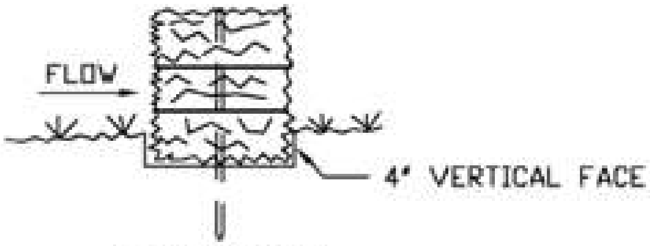
Design Criteria

The above table is adequate, in general, for a one-inch rainfall event. Larger storms could cause failure of this practice. Use of this practice in sensitive areas for longer than one month should be specifically designed to store expected runoff. All bales shall be placed on the contour with cut edge of bale adhering to the ground. See Figure 5.34 on page 5.64 for details.

Figure 5.34
Straw Bale Dike

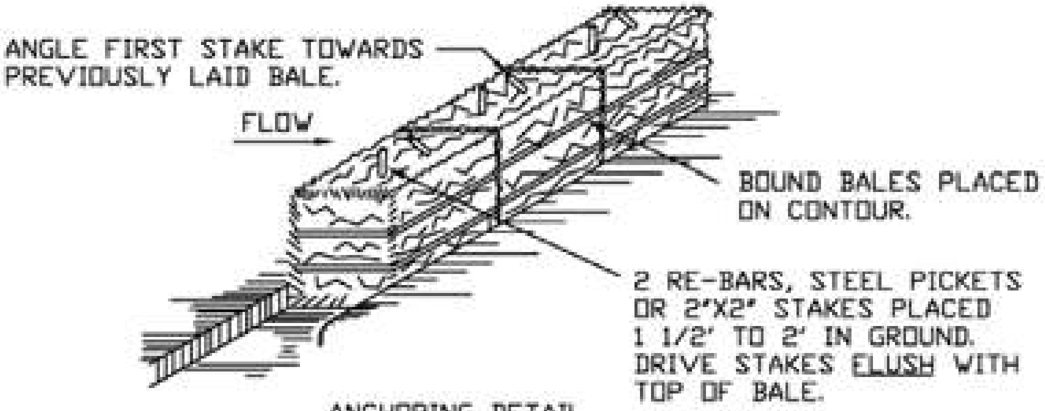
SYMBOL

●—●—●



BEDDING DETAIL
NOT TO SCALE

DRAINAGE AREA NO MORE THAN 1/4 ACRE PER 100 FEET OF STRAW BALE DIKE FOR SLOPES LESS THAN 25%.



ANCHORING DETAIL
NOT TO SCALE

CONSTRUCTION SPECIFICATIONS

1. BALES SHALL BE PLACED AT THE TOE OF A SLOPE OR ON THE CONTOUR AND IN A ROW WITH ENDS TIGHTLY ABUTTING THE ADJACENT BALES.
2. EACH BALE SHALL BE EMBEDDED IN THE SOIL A MINIMUM OF (4) INCHES, AND PLACED SO THE BINDINGS ARE HORIZONTAL.
3. BALES SHALL BE SECURELY ANCHORED IN PLACE BY EITHER TWO STAKES OR RE-BARS DRIVEN THROUGH THE BALE. THE FIRST STAKE IN EACH BALE SHALL BE DRIVEN TOWARD THE PREVIOUSLY LAID BALE AT AN ANGLE TO FORCE THE BALES TOGETHER. STAKES SHALL BE DRIVEN FLUSH WITH THE BALE.
4. INSPECTION SHALL BE FREQUENT AND REPAIR REPLACEMENT SHALL BE MADE PROMPTLY AS NEEDED.
5. BALES SHALL BE REMOVED WHEN THEY HAVE SERVED THEIR USEFULLNESS SO AS NOT TO BLOCK OR IMPEDE STORM FLOW OR DRAINAGE.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	STRAW BALE DIKE

Appendix H – Spill Cleanup and Reporting Guidance

- NYSDEC Technical Field Guidance: Spill Reporting and Initial Notification Requirements -

Appendix H – NYSDEC Technical Field Guidance: Spill Reporting and Initial Notification Requirements

TECHNICAL

FIELD GUIDANCE

SPILL REPORTING AND INITIAL NOTIFICATION REQUIREMENTS

Spill Reporting and Initial Notification Requirements

GUIDANCE SUMMARY AT-A-GLANCE

- Reporting spills is a crucial first step in the response process.
- You should understand the spill reporting requirements to be able to inform the spillers of their responsibilities.
- Several different state, local, and federal laws and regulations require spillers to report petroleum and hazardous materials spills.
- The state and federal reporting requirements are summarized in Exhibit 1.1-1.
- Petroleum spills must be reported to DEC unless they meet all of the following criteria:

  - The spill is known to be less than 5 gallons; and
  - The spill is contained and under the control of the spiller; and
  - The spill has not and will not reach the State's water or any land; and
  - The spill is cleaned up within 2 hours of discovery.

  All reportable petroleum spills and most hazardous materials spills must be reported to DEC hotline (1-800-457-7362) within New York State; and (1-518 457-7362) from outside New York State. For spills not deemed reportable, it is strongly recommended that the facts concerning the incident be documented by the spiller and a record maintained for one year.

- Inform the spiller to report the spill to other federal or local authorities, if required.
- Report yourself those spills for which you are unable to locate the responsible spiller.
- Make note of other agencies' emergency response telephone numbers in case you require their on-scene assistance, or if the response is their responsibility and not BSPR's.

NOTES

1.1.1 Notification Requirements for Oil Spills and Hazardous Material Spills

Spillers are required under state law and under certain local and federal laws to report spills. These various requirements, summarized in Exhibit 1.1-1, often overlap; that is, a particular spill might be required to be reported under several laws or regulations and to several authorities. Under state law, all petroleum and most hazardous material spills must be reported to DEC Hotline (1-800-457-7362), within New York State, and to 1-518-457-7362 from outside New York State. Prompt reporting by spillers allows for a quick response, which may reduce the likelihood of any adverse impact to human health and the environment. Yo will often have to inform spillers of there responsibilities.

Although the spiller is responsible for reporting spills, other persons with knowledge of a spill, leak, or discharge is required to report the incident (see Appendices A and B). You will often have to inform spillers of their responsibilities. You may also have to report spills yourself in situations where the spiller is not known or cannot be located. However, it is the legal responsibility of the spiller to report spills to both state and other authorities.

BSPR personnel also are responsible for notifying other response agencies when the expertise or assistance of other agencies is needed. For example, the local fire department should be notified of spills that pose a potential explosion and/or fire hazard. If such a hazard is detected and the fire department has not been notified, call for their assistance immediately. Fire departments are trained and equipped to respond to these situations; you should not proceed with your response until the fire/safety hazard is eliminated. For more information on interagency coordination in emergency situations see Part 1, Section 3, Emergency Response.

Another important responsibility is notifying health department officials when a drinking water supply is found to be contaminated as a result of a spill. It will be the health department's responsibility to advise you on the health risk associated with any contamination.

Exhibits 1.1-1 and 1.1-2 list the state and federal requirements to report petroleum and hazardous substance spills, respectively. The charts describe the type of material covered, the applicable act or regulation, the agency that must be notified, what must be reported, and the person responsible for reporting. New York state also has a emergency notification network for spill situations (e.g., major chemical releases) that escalate beyond the capabilities of local and regional response agencies/authorities to provide adequate response. The New York State Emergency Management Office (SEMO) coordinates emergency response activities among local, state, and federal government organizations in these cases.

Exhibit 1.1-1

State and Federal Reporting Requirements for Petroleum Spills, Leaks, and Discharges

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Petroleum from any source	Navigation Law Article 12; 17 NYCRR 32.3 and 32.4	DEC Hotline 1-800-457-7362	The notification of a discharge must be immediate, but in no case later than two hours after discharge. 1. Name of person making report and his relationship to any person which might be responsible for causing the discharge. 2. Time and date of discharge. 3. Probable source of discharge. 4. The location of the discharge, both geographic and with respect to bodies of water. 5. Type of petroleum discharges. 6. Possible health or fire hazards resulting from the discharge. 7. Amount of petroleum discharged. 8. All actions that are being taken to clean up and remove the discharge. 9. The personnel presently on the scene. 10. Other government agencies that have been or will be notified.	Any person causing discharge of petroleum. Owner or person in actual or constructive control must notify DEC unless that person has adequate assurance that such notice has already been given.
All aboveground petroleum and underground storage facilities with a combined storage capacity of over 1100 gallons.	ECL §17-1007; 6 NYCRR §613.8	DEC Hotline 1-800-457-7362	1. Report spill incident within two hours of discovery. 2. Also when results of any inventory, record, test, or inspection shows a facility is leaking, that fact must be reported within two hours of discovery.	Any person with knowledge of a spill, leak, or discharge.
Petroleum contaminated with PCB.	Chemical Bulk Storage Act 6 NYCRR Parts 595, 596, 597	DEC Hotline 1-800-457-7362	Releases of a reportable quantity of PCB oil.	Owner or person in actual or constructive possession or control of the substance, or a person in contractual relationship, who inspects, tests, or repairs for owner.

Exhibit 1.1-1

State and Federal Reporting Requirements for Petroleum Spills, Leaks, and Discharges (continued)

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Any liquid (petroleum included) that if released would be likely to pollute lands or waters of the state.	ECL §17-1743	DEC Hotline 1-800-457-7362	Immediate notification that a spill, release, or discharge of any amount has occurred. Owner or person in actual or constructive possession or control of more than 1,100 gallons of the liquid.	
Petroleum Discharge in violation of §311(b)(3) of the Clean Water Act	40 CFR §110.10 (Clean Water Act)	1. National Response Center (NRC) 1-800-424-8802. 2. If not possible to notify NRC, notify Coast Guard or predesignated on-scene coordinator. 3. If not possible to notify either 1 or 2, reports may be made immediately to nearest Coast Guard units, provided NRC notified as soon as possible.	Immediate notification as soon as there is knowledge of an oil discharge that violates water quality standards or causes sheen on navigable waters. Procedures for notice are set forth in 33 CFR Part 153, Subpart B, and in the National Oil and Hazardous Substances Pollution Contingency Plan, 40 CFR Part 300, Subpart E.	Person in charge of vessel or on-shore or off-shore facility.
Petroleum, petroleum by-products or other dangerous liquid commodities that may create a hazardous or toxic condition spilled into navigable waters.	33 CFR 126.29 (Ports and Waters Safety Act)	Captain of the Port or District Commander	As soon as discharge occurs, owner or master of vessel must immediately report that a discharge has occurred.	Owner or master of vessel or owner or operator of the facility at which the discharge occurred.

Exhibit 1.1-1

State and Federal Reporting Requirements for Petroleum Spills, Leaks, and Discharges (continued)

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Petroleum or hazardous substance from a vessel, on-shore or off-shore facility in violation of §311(b)(3) of the Clean Water Act.	33 CFR 153.203 (Clean Water Act)	1. NRC U.S. Coast Guard, 2100 Second Street, SW, Washington, DC 20593; 1-800-424-8802. 2. Where direct reporting not practicable, reports may be made to the Coast Guard (District Offices), the 3rd and 9th district of the EPA regional office at 26 Federal Plaza, NY, NY 10278; 1-201-548-8730. 3. Where none of the above is possible, may contact nearest Coast Guard unit, provided NRC notified as soon as possible.	Any discharger shall immediately notify the NRC of such discharge.	Person in charge of vessel or facility.

Exhibit 1.1-2

State and Federal Reporting Requirements for Hazardous Substance Spills, Leaks, and Discharges

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Any hazardous substance pursuant to Article 37. Does not include petroleum.	Chemical Bulk Storage Act 6 NYCRR Parts 595, 596, 597; ECL 40-0113(d)	DEC Hotline 1-800-457-7362	Releases of a reportable quantity of a hazardous substance.	Owner or person in actual or constructive possession or control of the substance, or a person in contractual relationship, who inspects, tests, or repairs for owner.
Hazardous materials or substances as defined in 49 CFR §171.8 that are transported. (See federal reporting requirements.)	Transportation Law 14(f); 17 NYCRR 507.4(b)	Local fire department or police department or local municipality	Immediate notification must be given of incident in which any of the following occurs as a direct result of a spill of hazardous materials: 1. Person is killed. 2. Person receives injuries requiring hospitalization. 3. Estimated damage to carrier or other property exceeds $50,000. 4. Fire, breakage, spillage, or suspected contamination due to radioactive materials. 5. Fire, breakage, spillage, or suspected contamination involving etiologic agents. 6. Situation is such that, in the judgment of the carrier, a continuing danger to life or property exists at the scene of the incident.	All persons and carriers engaged in the transportation of hazardous materials.

Exhibit 1.1-2
State and Federal Reporting Requirements for Hazardous Substance Spills, Leaks, and Discharges (continued)

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Hazardous materials (wastes included) that are transported, whose carrier is involved in an accident.	Department of Transportation Regulations 49 CFR 171.15; 17 NYCRR Part 924; 17 NYCRR Part 507	1. U.S. Department of Transportation 1-800-424-8802 2. DEC Hotline 1-800-457-7362 3. Rail Carrier <u>On-Duty</u> 518-457-1046 <u>Off-Duty</u> 518-457-6164 4. Notify local police or fire department.	Notice should be given by telephone at the earliest practicable moment and should include: 1. Name of reporter. 2. Name and address of carrier represented by reporter. 3. Phone number where reporter can be contacted. 4. Date, time, and location of incident. 5. The extent of injuries, if any. 6. Classification, name and quantity of hazardous materials involved, if available. 7. Type of incident and nature of hazardous material involved and whether a continuing danger to life exists at scene. 8. Each carrier making this report must also make the report required by §171.16.	Each carrier that transports hazardous materials involves in an accident that causes any of the following as a direct result: 1. A person is killed 2. A person receives injuries requiring hospitalization 3. Estimated damage to carrier or other property exceeds $50,000 4. Fire, breakage, spillage, suspected or otherwise involving radioactive material. 5. Fire, breakage, spillage, suspected contamination involving etiologic agents. 6. Situation is such that carrier thinks it should be reported in accordance with paragraph b.

Exhibit 1.1-2
State and Federal Reporting Requirements for Hazardous Substance Spills, Leaks, and Discharges
(continued)

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Reportable quantity of a hazardous substance into navigable waters or adjoining shorelines. Substances are listed in 40 CFR 302.4.	Department of Transportation Regulations 49 CFR §171.16 as authorized by the Hazardous Materials Transportation Act	U.S. Coast Guard National Response Center (NRC), 1-800-424-8802 or 1-202-267-2675	As soon as person in charge becomes aware of a spill incident, he must notify NRC and provide the following information: 1. The information required by 49 CFR §171.15 (see above). 2. Name of shipper of hazardous substance. 3. Quantity of hazardous substance discharged, if known. 4. If person in charge is incapacitated, carrier shall make the notification. 5. Estimate of quantity of hazardous substance removed from the scene and the manner of disposition of any unremoved hazardous substance shall be entered in Part (H) of the report required by 49 CFR 171.16 (see above).	Person in charge of aircraft, vessel, transport vehicle, or facility. Must inform NRC directly, or indirectly through carrier.
Reportable quantity of a hazardous substance from vessel, on-shore or off-shore facility. Substances and requirements specified in 40 CFR §117.3.	40 CFR §117.21 as authorized under the FWPCA	NRC 1-800-424-8802. If not practicable report may be made to the Coast Guard (3rd or 9th Districts) District Offices or to EPA, designated On-Scene Coordinator, Region II, 26 Federal Plaza, NY, NY 10278; 1-201-548-8730	Immediate notification is required.	Person in charge of vessel, or on-shore or off-shore facility

Exhibit 1.1-2
State and Federal Reporting Requirements for Hazardous Substance Spills, Leaks, and Discharges (continued)

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Facilities where a hazardous chemical is produced, used, or stored, and there is a reportable quantity of any extremely hazardous substance as set out in Appendix A to 40 CFR 355 or a CERCLA hazardous substance as specified in 40 CFR 302.4. (This section does not apply to a release that does not go beyond the facility, that emanates from a facility that is federally permitted, is continuous as defined under §103(f) of CERCLA or to any release exempt from CERCLA §103(a) reporting under §101(22) of CERCLA.)	40 CFR 355.40 (SARA) Releases of CERCLA Hazardous Substances are subject to release reporting requirements of CERCLA §103, codified at 40 CFR Part 302, in addition to being subject to the requirements of this Part.	Community emergency coordinator for the local emergency planning committee of any area likely to be affected and the State Emergency Response Commission of any state likely to be affected by the release. If there is no local emergency planning commission notification shall be made to relevant local emergency response personnel.	Immediately notify agencies at left and provide the following information when available: 1. Chemical name or identity of any substance involved in the release. 2. Indication of whether the substance is an extremely hazardous substance. 3. An estimate of the quantity released. 4. Time and duration of release. 5. Medium or media into which the release occurred. 6. Known health risks associated with emergency and where appropriate advice regarding medical attention for those exposed. 7. Proper precautions/actions that should be taken, including evacuation. 8. Names and telephone numbers of person to be contacted for further information. As soon as practicable after release, followup notification by providing the following information: 1. Actions taken to respond to and contain the release. 2. Health risks. 3. Advice on medical attention for exposed individuals.	Owner or operator of facility

Exhibit 1.1-2
State and Federal Reporting Requirements for Hazardous Substance Spills, Leaks, and Discharges (continued)

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Hazardous liquids transported in pipelines, a release of which results in any circumstances as set out in 195.50(a) through (f). Also any incident that results in circumstances listed in 195.52(g).	49 CFR 195.50, 195.52 and 195.54 (Hazardous Liquid Pipeline Safety Act).	NRC, 1-800-424-8802	Notice must be given at the earliest practicable moment and the following information provided: 1. Name and address of the operator. 2. Name and telephone number of the reporter. 3. Location of the failure. 4. The time of the failure. 5. The fatalities and personal injuries, if any. 6. All other significant facts known by the operator that are relevant to the cause of the failure or extent of the damages.	Operator of system.
Hazardous wastes in transport	40 CFR §263.30(a) (RCRA)	1. Local authorities 2. If required by 49 CFR 171.15, notify the NRC at 1-800-424-8802 or 1-202-426-2675 3. Report in writing to Director of Hazardous Materials Regulations, Materials Transportation Bureau, Department of Transportation, Washington, DC 20590	Notification must be immediate. For discharge of hazardous waste by air, rail, highway, or water, the transporter must: 1. Give notice as in 49 CFR 161.15 (if applicable). 2. Report in writing as in 49 CFR 171.16. Wastes transporter (bulk shipment) must give same notice as required by 33 CFR 153.20.	Transporter by air, rail, highway, or water.

Exhibit 1.1-2
State and Federal Reporting Requirements for Hazardous Substance Spills, Leaks, and Discharges
(continued)

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Vinyl Chloride from any manual vent valve, or polyvinyl chloride plants	Clean Air Act 40 CFR 61.64	Administrator of EPA	Within 10 days of any discharge from any manual vent valve, report must be made, in writing, and the following information provided: 1. Source, nature and cause of the discharge 2. Date and time of the discharge 3. Approximate total vinyl chloride loss during discharge 4. Method used for determining loss 5. Action taken to prevent the discharge 6. Measures adopted to prevent future discharges.	Owner or operator of plant.
Radioactive Materials	6 NYCRR §380.7	Commissioner of DEC	1. Notify immediately by telephone when concentration, averaged over a 24-hour period, exceeds or threatens to exceed 5000 times the limits set forth in Schedule 2 of 380.9 (in uncontrolled areas). 2. Notify within 24 hours by telephone when concentration, averaged over 24- hour period, exceeds or threatens to exceed 500 times the limits set forth in Schedule 2 above (in uncontrolled areas). 3. Report within 30 days the concentration and quantity of radioactive material involved, the cause of the discharge, and corrective steps taken or planned to ensure no recurrence of the discharge.	Operator of the radiation installation.

Exhibit 1.1-2
State and Federal Reporting Requirements for Hazardous Substance Spills, Leaks, and Discharges (continued)

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Low Level radioactive wastes in transport. Any suspected or actual uncontrolled releases.	6 NYCRR 381.16 ECL §27-0305 Waste Transporter Permits	DEC and Department of Health	Immediate notification.	Transporter

TECHNICAL

FIELD GUIDANCE

SPILL REPORTING AND INITIAL NOTIFICATION ENFORCEMENT OF SPILLER RESPONSIBILITY

NOTES

Spill Reporting and Initial Notification -
Enforcement of Spiller Responsibility

GUIDANCE SUMMARY-AT-A-GLANCE

Use the "Notification Procedures Checklist" (Exhibit 1.1-3) to document conversations with the responsible party or potentially responsible party (PRP/RP) concerning his or her clean-up responsibilities.

The steps to follow when you inform the PRP/RP of his or her legal responsibility are:

-- Give your name and identify yourself as a DEC employee;

-- Inform them that they have been identified as the party responsible for the spill;

-- Inform PRP/Rps of their liability for all clean-up and removal costs. (If necessary, cite Section 181 of the Navigation Law);

-- Ask PRP/Rps "point blank" if they will accept responsibility for the cleanup; and

-- If the PRP/RP does not accept responsibility, or does not admit to being the PRP/RP, inform him or her that DEC will conduct the cleanup and send the bill to whoever is the PRP/RP. Also inform them that a DEC-conducted cleanup could be more costly than a PRP/RP-conducted cleanup, and that the PRP/RP could face interest charges and penalties for refusing to clean up the spill.

If the PRP/RP accepts responsibility for the cleanup:

(1) Send the PRP/RP a "Spiller Responsibility Letter" (Exhibit 1.1-5) and an "Acceptance of Financial Responsibility Form" (Exhibit 1.1-6) and

(2) Send the PRP/RP an "Option Letter," which should outline the options available to the PRP/RP to clean up the spill. See Exhibit 1.1-4 for a summary of how and when to use these forms and what they may include.

NOTES

1.1.2 Spill Reporting and Initial Notification - Enforcement of Spiller Responsibility

This section provides guidance on those steps you take to inform responsible parties or potentially responsible parties (PRP/Rps) or spillers of their responsibility under state law for cleaning up spills. This guidance applies to all contacts (by phone, by mail, or in person) you have with Rps throughout the response process concerning their fulfillment of this legal responsibility. The possible consequences of an RP's refusal or inability to conduct the spill response are also discussed.

1. State Law and Policy

Under Article 12 of the Navigation Law and Article 71 of the Environmental Conservation law (ECL), those parties responsible for a petroleum release are liable for all costs associated with cleaning up the spill as well as third party damages (see Introduction-A for more information). Section 181 of the Navigation Law states:

> *Any person who has discharged petroleum shall be strictly liable, without regard to fault, for all cleanup and removal costs and all direct damages, no matter by whom sustained as defined in this section.*

There are two ways by which PRP/RPs can pay for the costs associated with cleanups. First, the PRP/RP can reimburse the state for site investigation, clean-up, and remediation costs incurred by the State Oil Spill Fund or federal Leaking Underground Storage Tank (LUST) Trust Fund. Second, the PRP/RP can assume full responsibility for the cleanup from the beginning and bear all costs throughout the clean-up process. It is DEC's policy to make every effort to have PRP/RPs pay for cleanups from the outset.[1]

To achieve PRP/RP-directed and PRP/RP-financed cleanups, your responsibilities are to: (1) identify the PRP/RP(s), (2) inform them of their legal responsibilities for the spill, and (3) ensure that they carry out these responsibilities. All investigations of spills and PRP/RPs should be pursued vigorously and without prejudice. Use to your advantage the argument that having the PRP/RP assume responsibility for clean-up costs benefits both DEC and the spiller. It saves DEC the expense of cost-recovery procedures. It also allows the PRP/RP to be more involved in clean-up decisions (e.g., choosing their clean-up contractors) and, more significantly, it usually results in lower clean-up costs. Because the PRP/RP is responsible for all indirect costs incurred if DEC conducts the cleanup, the spiller will pay for the DEC contractor's clean-up work, as well as the supervision costs incurred by DEC, any third-party claims associated with the spill, and any punitive fines levied.

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[1] Spillers are not only responsible for assuming the costs of a cleanup, but also can be subject to a $25,000 per day fine for not paying the clean-up costs (among other violations). The Navigation Law provides for these penalties in Section 192, which states:

> Any person who knowingly gives or causes to be given any false information as a part of, or in response to, any claim made pursuant to this article for cleanup and removal costs, direct or indirect damages resulting from a discharge, or who otherwise violates any of the provisions of this article or any rule promulgated thereunder or who fails to comply with any duty created by this article shall be liable to a penalty of not more than twenty-five thousand dollars for each offense in court of competent jurisdiction. If the violation is of a continuing nature each day during which it continues shall constitute an additional, separate, and distinct offense. (emphasis added)

2. Notification Process

Part 1, Section 4, of this manual discusses the process of identifying the PRP/RP as part of the spill investigation for a particular site. Once you identify the PRP/RP, follow the guidance provided below for informing the PRP/RP of his or her responsibilities for spill cleanup. If you are uncertain about who the PRP/RP is, apply the procedures outlined below with all suspected RPs until the responsible party or parties are identified.

a. Informing RPs of Their Responsibility at the Spill Scene

It is important to inform PRP/RPs of their legal responsibility to clean up a spill as soon as possible. When you arrive at a spill site, you should immediately inform the representative of any PRP/RP of their liability under the Navigation Law and the Environmental Conservation Law. In doing so, follow the steps covered in the "Notification Procedures Checklist" (Exhibit 1.1-3).

Document completion of the notification steps, and identify your contact(s).

> Although you should be firm and direct in informing the PRP/RP of their responsibility, you should make every attempt to avoid an adversarial relationship with the RP. The full cooperation of the PRP/RP will result in a more efficient and effective cleanup.

b. Informing Spillers of Their Responsibility in Writing

You should send three different letters to the PRP/RP to inform them of their responsibility (see Exhibit 1.1-4, "Notification Forms Summary"). If a site response was initiated and you are able to confirm the spill visually, the "Spiller Responsibility Letter" (Exhibit 1.1-5) along with an "Acceptance of Financial Responsibility Form" (Exhibit 1.1-6) should be sent as soon as possible. In addition, an "Option Letter" that informs the PRP/RP of their possible options for addressing a spill should be sent. These letters should be kept as part of the Corrective Action Plan (CAP) (see Part 1, Section 5, "Corrective Action Plans.")

Exhibit 1.1-3
Notification Procedures Checklist

Completed	Step	Date	Contact(s)
____________	1. Give your name and identify yourself as a DEC employee.		
____________	2. Inform the PRP/RP that he/she has been identified as the party responsible for the spill.		
____________	3. Inform PRP/RPs of their responsibility to pay for all clean-up costs. (As necessary, cite Section 181 of the Navigation Law or Article 71 of the ECL.)		
____________	4. Ask PRP/RPs "point blank" if they will accept responsibility for the cleanup.		
	Response: ______________________________ ______________________________ ______________________________ ______________________________ _________________________		
____________	5. If the PRP/RP does not accept responsibility, or does not admit to being the spiller, inform him/her that DEC will conduct the cleanup and send the bill to whoever is the spiller.		
____________	6. If the PRP/RP does not accept responsibility also inform him or her that a DEC-conducted cleanup could be more costly than a spiller-conducted cleanup, and that the spiller could face interest charges and a fine for refusing to pay for the billed clean-up costs.		

Exhibit 1-A-4

Notification Forms Summary
(Send Forms by Certified Mail)

Notification Form	When and How to Use	Information to be Included
Spiller Responsibility Letter	Send by certified mail to PRP/RP for confirmed spill.	# Spill location; # Spiller's responsibility under the Navigation Law; # Penalties that can be levied if the spiller does not cooperate; and # Deadline for spiller to begin containment and removal of the spill.
Acceptance of Spiller Responsibility Form	Send by certified mail to PRP/RP for confirmed spill.	# Request for spiller's signature acknowledging his or her acceptance of responsibility for the spill cleanup.
Option Letter	Send by certified mail to PRP/RP for confirmed or suspected release (e.g., failed tightness test).	# Spill number; # Date spill was discovered or reported; # Exact location of the spill; # Authority of Article 12 of the Navigation Act; and # Penalties for noncompliance.

Exhibit 1.1-5

Spiller Responsibility Letter

[Date]

[Addressee]
[Address]

Dear [   ]:

This is to inform you that as a result of investigation by our Department, we consider you responsible for Petroleum Spill Number __________, dated _______, at ___________________________. Under Article 12 of the Navigation Law, Section 192, any person who discharges petroleum without a permit and fails to promptly clean up such prohibited discharge may be subject to a penalty of up to $25,000 a day.

Containment and removal of this spill must be initiated within _____ hours.

Your failure to initiate timely spill cleanup and removal, in addition to the penalty stated above, will result in your being billed for all actual costs incurred by New York State as set forth in Section 181 of the Navigation Law. These costs include cleanup and removal, all direct and indirect damages, including damages incurred by third parties.

Sincerely,

Regional Spill Engineer
Region

Exhibit 1.1-6

Acceptance of Spiller Responsibility Letter

[Date]

SPILL #_________

ACCEPTANCE OF FINANCIAL RESPONSIBILITY

___________________________, hereby assumes responsibility for containment and
(Name of Company and Person)

cleanup of ______________ discharged from_______________________
(Substance) (Source)

on _______, and recognizes that the determination of the adequacy and propriety of
(Date)

the containment and cleanup operation continues to rest with the New York State

Department of Environmental Conservation On-Scene Coordinator.

____
(Authorized Signature and Title)

____
(Name and Title Printed)

____
(Address of Company)

____
(Date and Time)

____
(Witness)

NOTES

The "Spiller Responsibility Letter" informs spillers of their responsibility under the Navigation Law and explains the penalties that can be levied if the spiller does not cooperate. It should be sent to the spiller or suspected spiller as soon as a petroleum spill has been confirmed. The letter notifies the spiller that he or she is required to initiate containment and removal of the spill within a period of time you specify.

There are at least three factors you should consider when specifying a deadline in this letter:

The size and nature of the spill;

The proximity of the spill to, or its possible effects on, water supplies (surface or ground water), nearby homes and other structures, and/or sensitive environmental areas; and The possible environmental, safety, and/or human health effects of delaying containment and removal.

The "Acceptance of Spiller Responsibility Form" requires the spiller's signature acknowledging his or her responsibility for containment and cleanup of the spill. This form and the "Spiller Responsibility Letter" should be sent by certified mail.

The "Option Letter" outlines the possible options available to the PRP/RP for cleanup of the spill. The contents of this letter can vary somewhat depending on how the release was discovered (e.g., through a complaint or a failed tightness test), the extent and type of spill, and the policies and procedures of your regional office. There is, however, some information that should appear in every "Option Letter." All "Option Letters" should contain the following: spill number, date the spill was discovered, and exact location of the spill. In addition, the letter should cite the response authority provided DEC by Article 12 of the Navigation Act and describe the penalties for noncompliance.

Each "Option Letter" should outline clearly the options open to the PRP/RP to address the spill and the information you wish submitted, and may also specify certain deadlines for taking action. However, it is up to you to determine the particular options, information requirements, and dates you include in the letter. Depending on the circumstances, you may list in your letter one or several options from which the PRP/RP can choose. For example, when an UST fails an initial tank test the following options could be included:

Conduct separate integrity tests on the piping and the tanks in order to verify the release source within the tank system.

Remove the "non-tight" tank and either remove and dispose of all contaminated soils, or install monitoring wells.

NOTES

- # Install monitoring wells and abandon the "non-tight" tank in-place.
- # Remove the tank within 30 days, according to the requirements for tank removal (outline these requirements in the letter).

The "Option Letter" should always be sent by certified mail. In addition, you should have the PRP/RP inform you as soon as possible about the option(s) he or she has chosen.

Several examples of possible "Option Letters" are included as Exhibits 1.1-7 through 1.1-12. These are provided as examples only; you should use "Option Letters" developed by your own office, or develop your own.

Exhibit 1.1-7 is a sample option letter to an PRP/RP for removal of contaminated soil from an UST release. Note that this option letter includes: (a) specific requirements for removal of the contaminated soil; (b) dates for when the removal must be completed, and (c) requirements for the PRP/RP to forward to DEC copies of the landfill disposal receipt and ample test results. The additional sample option letters apply to the following situations: when an UST has failed an initial tightness test (Exhibit 1.1-8), when an UST fails an isolation tank test (Exhibit 1.1-9), when an UST fails a Petro-tite Systems Test (Exhibit 1.1-10), and ground-water contamination cleanup (Exhibit 1.1-11).

3. Dealing with Uncooperative Spillers

There are generally two ways in which an PRP/RP may fail to fulfill his or her legal responsibilities for spill cleanup: (1) a PRP/RP may refuse from the beginning to accept responsibility, or (2) an PRP/RP may fail to conduct a cleanup in the manner, or in as timely a fashion, as agreed upon with the DEC. If a PRP/RP refuses to cooperate from the outset, try again to change the RP's mind. Send additional notices of spiller responsibility (Exhibit 1.1-12) and/or initiate phone conversations with PRP/RPs to inform them again of the consequences of not cooperating (i.e., higher clean-up costs and possible penalties). If a party claims not to be the PRP/RP, you should inform them of your reasons for believing they are the PRP/RP under the Navigation Law.

If a PRP/RP agrees to conduct and pay for the cleanup and then does not proceed in the manner agreed upon or as quickly as agreed upon, you should inform the PRP/RP immediately that you are dissatisfied with the progress of the cleanup and that DEC is considering taking it over. There are no hard-and-fast rules for deciding when you should take over a cleanup. If possible, you should always work toward having the PRP/RP continue the cleanup in the agreed-upon manner. Attempt to determine why the cleanup is not proceeding as planned and consider means of helping the PRP/RP-directed cleanup get back on track.

Exhibit 1.1-7

Sample Option Letter:
Soil Cleanup Spill

[Date]

[Addressee]
[Address]

Dear [ ]:

This letter is to confirm your - (site meeting) (telephone conversation) with
_____________ of this Department on ___________________________,
(Name) (day) (date) (year)
in regards to the above-mentioned spill site. This site involves ____________________________
(explanation)

The following items were discussed and agreed upon:

1. All contaminated material must be removed and stored on site until it can be properly disposed of at a properly permitted landfill.

2. All contaminated material must be sampled for ____
_____________________________________. The results must be
(analyses)
negative for the material to be considered non-hazardous oily debris. You must contact your selected sanitary landfill to verify the sample analyses that they require for disposal.

3. A hauler with a Part 364 permit must be used to haul the contaminated soil to your selected landfill.

4. Please notify this Department after the work is completed but prior to any backfilling of the spill area so that an inspection of the excavation may be made.

5. Please forward to us a copy of the landfill disposal receipt and the sample results.

A schedule for this work is required by ______________________________.
(day) (date) (year)
Cleanup must be performed by no later than ______________________________.
(day) (date) (year)

If you have any questions, please feel free to contact ____________________________________
(Name)
at 847-4590. Your cooperation will be appreciated.

Very truly yours,

Senior Sanitary Engineer

Exhibit 1.1-8

Sample Option Letter:
Initial Tank Failure

[Date]

[Addressee]
[Address]

Dear [ ]:

This Department received notification on ______________________that (a)
(day) (date) (year)
_______________________tank(s) failed its (their) tank test performed by
(gallons) (product stored)
_____________. On _________, Mr.____________of this Department
(contractor) (date) (name)
discussed with __________ that one of the following options must be done concerning this tank.
(person)

OPTION 1:
1. The tank is to be immediately isolated from the piping and is to be retested. If the tank tests tight, it may remain in service.
2. The lines are to be repaired, if necessary, and retested by a state-approved method. Exposed piping may be air tested.
3. A copy of any test results are to be sent to this office.

OPTION 2: If the tank fails the retest, or if you decide not to retest, the following must now be done:
1. All product must be immediately removed from the tank.
2. The tank itself must be removed within thirty days. A Petroleum Bulk Storage form must be submitted to this Department prior to tank removal.
3. The interior surface of the tank must be cleaned, and all sludge and residue generated by this process must be properly disposed. The tank must be cut open to allow for this work and to ensure proper ventilation of the tank interior.
4. All safety precautions regarding the opening, cleaning and entering of the tank must be followed. The interior atmosphere of the tank may be explosive and proper procedures must be followed.
5. Once the tank has been cleaned out, it may be disposed as scrap.

Mr._______must be notified when you have a firm date for retesting or removal. Please note, we must be present when this tank is removed to determine if any groundwater or soil contamination exists. If groundwater or soil contamination is found, further remedial work will be required.

If you have any questions, please contact________ at 847-4590. Your cooperation will be appreciated.

Sincerely,

[ ]

Exhibit 1.1-9

Sample Option Letter:
Retest Failure, Tank Removal

[Date]

[Addressee]
[Address]

Dear [ ]:

On____________________, a ______gallon _______________, underground store storage tank at the
(day) (date) (year) (#) (material)
above-mentioned address failed a system tank test. On____________________, this tank failed an isolation tank test.
(day) (date) (year)
Since the tank failed the retest, the following must now be done:

1. All product must be immediately removed from the tank.
2. The tank itself must be removed within thirty days. A Petroleum Bulk Storage form (enclosed) must be submitted to this Department prior to tank removal.
3. The interior surface of the tank must be cleaned, and all sludge and residue generated by this process must be properly disposed. The tank must be cut open to allow for this work and to ensure proper ventilation of the tank interior.
4. All safety precautions regarding the opening, cleaning and entering of the tank must be followed. The interior atmosphere of the tank may be explosive and proper procedures must be followed.
5. Once the tank has been cleaned out, it may be disposed as scrap.

____________________of this Department must be notified when you have a firm
(Name)
date for removal. We must be present when this tank is removed to determine if any groundwater or soil contamination exists. If groundwater or soil contamination is found, further remedial work will be required.

For your use, enclosed is a list of contractors that are known by this Department to do this type of work. This list is by no means complete. Any contractor may be used by you for this work.

If you have any questions, please feel free to call _______________________at 847-4590.
(Name)
Your cooperation will be appreciated.

Sincerely,

[ ]

Exhibit 1.1-10

Sample Option Letter:
Failed Tank Test

[Date]

CERTIFIED - RETURN RECEIPT REQUESTED

[Addressee]
[Address]

RE: Spill No.

Gentlemen:

This office has been informed by______(Name)___that __(tank)__ failed a Petrotite systems test. In accordance with Article 12 of the New York State Navigation Law, I must determine if there has been any harm to the lands or the groundwater of the State. In order for me to make this determination, you have three options:

1. Prove that it was not a leaking tank by removing all the piping from the tank and separately Petrotite test the tank. If the tank passes the Petrotite test, it is a piping leak. The tank may then be abandoned or the piping can be repaired, attached to the tank, and the system Petrotite tested.

2. Excavate and remove the tank in the presence of a representative from this office so that an inspection of the tank and the soil can be made. If the tank is sound, and there is no evidence of product loss, nothing further need be done. If there is a problem, proceed as in 3 below.

3. Abandon the tank in-place and install several four (4) inch diameter PVC site wells extending five (5) feet into the groundwater with a screen length of ten (10) feet, with slot size of .020 inches. The exact location and number of wells will be determined by a representative from this office. These wells will be checked for a period of twelve months by New York State, and if there is no evidence of product for that period, the spill will be removed from our listing. If free or dissolved product appears, cleanup must begin immediately.

If cleanup does not begin by__(Date)__ by the responsible party, the State will begin the cleanup and bill the responsible party.

Sincerely,

[ ]

Exhibit 1.1-11

Sample Option Letter:
Ground-water Cleanup

[Date]

[Addressee]
[Address]

Dear [ ]:

This letter is to confirm your (site meeting) (telephone conversation) with (Name) of this Department on (day) (date) (year). Groundwater at this spill site is contaminated with (free floating oil) (dissolved oil components). The following items were discussed and agreed upon:

1. (#) additional four-inch monitoring wells will be installed at the agreed upon locations. A sketch of a typical monitoring well is enclosed for your use.

2. One recovery well will be installed to recover oil product. Groundwater must be pumped to depress the groundwater table. The groundwater must be pumped to an oil-water separator tank. Accumulated oil may be recovered from the well by bailing or by a second pump. A second type of recovery well pumps both oil and water to a separator tank. Oil from the tank is then recovered. You should check with your contractor to determine the best method for the recovery well. Groundwater must be pumped to depress the groundwater table.

3. The discharge water must be sampled for (Contaminates) . Dependent upon the sampling results, it may be discharged with a SPDES permit to (Name) . The water must at all times be sheenless. An air stripper or a carbon filter may be necessary for the discharge water.

4. All collected oil must be properly disposed. Copies of receipts indicating the disposal site must be forwarded to this office.

It was also agreed that these actions be completed by (Date) . Should you have any questions, please do not hesitate to contact (Name) at 847-4590. Your cooperation will be appreciated.

Sincerely,

[ ]

Exhibit 1.1-12

Sample Option Letter:
Soil Disposal, Soil Still On Site

[Date]

[Addressee]
[Address]

Dear [ ]:

A recent inspection by ___(Name)_______of this office indicated that the contaminated soil at your facility still remains on site. We are requesting this oil be removed by__(day) (date) (year)_to an acceptable landfill. Please send a copy of the disposal receipt to this office.

If you cannot remove the soil by that date, please contact this office immediately. If you do not contact this office and the soil still remains on site past_ (Date)_, DEC will have the soil removed from your site. You will then be billed for the costs of removal and disposal as well any relevant penalties.

If you have any questions, please feel free to contact__(Name)________at 847-4590. Your cooperation will be appreciated.

Very truly yours,

Senior Sanitary Engineer

NOTES

If all efforts to encourage a PRP/RP to continue the cleanup fail, send a certified letter (Exhibit 1.1-13) notifying them that their actions have been unsatisfactory and that DEC will assume responsibility for the cleanup. This letter again informs the PRP/RP of his or her liability for all costs incurred by DEC during its cleanup.

Exhibit 1.1-13

Unsatisfactory Cleanup Notice Letter

[Date]

CERTIFIED MAIL SPILL #

[Addressee]
[Address]

Dear Sir:

My letter of (Date) notified you of New York State's interest in a pollution incident for which you are presently considered responsible.

You are hereby given notice that your actions to remove the pollutant and mitigate its effects have been evaluated as unsatisfactory. Effective (Date), the New York State Department of Environmental Conservation will conduct all cleanup activities under the authority of Article 12 of the Navigation Law. Removal will be effected in accordance with the regulations of the Department of Environmental Conservation. You will be billed for all actual costs incurred by New York State as set forth in Section 181 of the Navigation Law, as well as interest and penalties.

Should you require further information concerning this matter, contact: ____(Name)___

.

Sincerely,

[ ]

Received and Acknowledged

______________________	____________	___________
	Time	Date

TECHNICAL

FIELD GUIDANCE

SPILL REPORTING AND INITIAL NOTIFICATIONS - ACCESS AND RIGHT-OF-ENTRY

NOTES

Spill Reporting and Initial Notifications - Access and Right-of-Entry

GUIDANCE SUMMARY AT-A-GLANCE

Section 178 of the Navigation Law gives you the authority to enter private property to investigate or clean up a suspected spill.

In general, you should inform the property owner of your right to enter onto private property and obtain consent from the owner. This consent can be either written or verbal.

Detailed information and procedures for access and right-of-entry is considered confidential for spill responders. This information is contained in Appendix L, and is marked confidential.

1.1.3 Access and Right-of-Entry

This section addresses the right of NYSDEC personnel to enter private property on which a spill has occurred or is suspected, for the purpose of investigating, containing, and/or cleaning up the spill. Detailed information and procedures of access and right-of-entry are considered confidential. Therefore, this information can be found in Appendix L, including your legal rights to enter property and the procedures to follow to ensure that no charges of trespassing are brought against the Department.

1. State Law and Policy

You have the authority, under the Navigation Law, to enter property to investigate or clean up a real or suspected spill. Specifically, Section 178 of the Navigation Law states:

> *The department is hereby authorized to enter and inspect any property or premises for the purpose of inspecting facilities and investigating either actual or suspected sources of discharges or violation of this article or any rule or regulations promulgated pursuant to this article. The department is further authorized to enter on property or premises in order to assist in the cleanup or removal of the discharge. Any information relating to secret processes or methods of manufacture shall be kept confidential.*

In any emergency or non-emergency, you must possess information supporting a reasonable belief to suspect that a spill has occurred or is occurring, or that the spill is impacting the premises for which access is sought. A reasonable belief may be based on a report of a spill or visual observation. For example, if a gasoline station operator reports an unexpected loss of product from his underground storage tanks that are located near private household wells, you might want to investigate those wells and check the water.

Although you have the authority to enter the premises, *it is always advisable to obtain the consent of the property owner or his or her agent before entering the property.* This consent can be either written or verbal. Obtaining this consent may help avoid civil or criminal charges for trespass being logged. In cases where the owner/agent is not available or not ascertainable, entry should be made.

Appendix I – Post-Construction Stormwater Operation and Maintenance (O&M) Manual

Post-Construction Operation and Maintenance (O&M) Manual for Stormwater Management Facilities

for

MILL POINT SOLAR I PROJECT

TOWN OF GLEN
MONTGOMERY COUNTY, NEW YORK
SPDES Permit #: _____________

Prepared for:
ConnectGen Montgomery County LLC
1001 McKinney Street, Suite 700
Houston, TX 77002

Prepared by:
TRC
215 Greenfield Parkway, Suite 102
Liverpool, NY 13088

August 2024

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Appendices:

1.0 Introduction

The stormwater management system for Mill Point Solar I (Facility) consists of infiltration trenches, detention basins, level spreaders, grassed filter strips, and flow diffusers. The following O&M Manual outlines the minimum requirements for maintaining the stormwater management facilities, as required in Section 3.5 of the New York State Stormwater Management Design Manual (SMDM).

1.1 Purpose of the Manual

This manual is intended to outline the requirements for proper maintenance and operation of the stormwater management facilities associated with Facility. Proper maintenance ensures the following:

- Stormwater facilities operate as they were designed;
- Stormwater facilities remain free of sediment, debris, and potential pollutants; and
- Stormwater facilities do not result in adverse downstream impacts to environmentally sensitive areas.

The Facility will be solely-owned, operated, and maintained by ConnectGen Montgomery County, LLC (the Owner). The Owner is responsible for ensuring that the stormwater management facilities installed on the Project Site are properly maintained and that they function as designed. In some cases, the maintenance responsibility may be assigned to others through special maintenance agreements. NYSDEC maintenance guidance and stormwater practice inspection checklists with stormwater management practice schematics for the Project Site are provided in Appendix A and B. Maintenance agreements associated with this Project shall be included in Appendix C of this Manual.

This Manual details the various stormwater facility components and the general operation and maintenance activities required for each component. Additional operation and maintenance information may be found in the SMDM) and the New York State Standards and Specifications for Erosion and Sediment Control.

2.0 Inspection and Maintenance Schedule

The stormwater management systems shall be inspected and maintained regularly to ensure proper site function. Inspection frequency may depend on the stormwater management systems and facilities present at the Facility Site.

A Maintenance Inspection Form shall be completed during each inspection to document the Site conditions and required maintenance activities. Maintenance activities may include, but are not limited to, removal of sediment, trash, or debris; vegetation management; erosion repair; and revegetation of exposed soils. A blank sample Maintenance Inspection Form has been included in Appendix D. Completed Maintenance Inspection Forms shall be incorporated into Appendix E.

3.0 First Year Maintenance

The following maintenance activities are required during the first year following Facility completion:

- Water vegetation once every three days for the first month, then provide a half inch of water per week during the first year. Irrigation plans may be adjusted according to rain events.
- Fertilization may be needed in the fall after the first growing season to increase plant vigor. Fertilizer application and use should be in accordance with local, state, and federal laws and regulations.
- Keep the site free of vehicular and foot traffic and other weight loads.

4.0 General Site Maintenance

Site cover and associated structures should be inspected periodically for the first few months following construction and then on a bi-annual basis. Site inspections should also be performed following major weather events such as, but not limited to, major storm events, thunderstorms, and significant snow melt.

Items to inspect for include, but are not limited to:

- Differential settlement of embankments, cracking, or erosion.
- Lack of vegetative cover density.
- Sediment accumulation on the ground surface or within stormwater management practices or conveyance systems.
- Accumulation of debris, litter, or pollutants such as oil or grease on the ground surface or within stormwater management practices or conveyance systems.
- Damage to or weakness of stormwater management practices or conveyance systems.

4.1 Site Restoration

Areas within a Project Site that have undergone site restoration should be inspected periodically for the first six months and once after each storm event greater than a half-inch.

Items to inspect for include, but are not limited to:

- Checking embankments for subsidence, erosion, cracking, undesirable tree and shrub growth, and the presence of burrowing animals.
- Health and vigor of vegetation such as trees, shrubs, grass, and flowers.
- Accumulation of sediment or vegetative debris such as leaves and branches.

4.2 Tree Planting/Preservation

During the first three years, mulching, watering and protection of young trees is necessary. Inspection of trees should be performed every three months and within the one week of ice storms and high wind events, reaching speeds of 20 mph, until trees have reached maturity. As a minimum, inspection should include assessment of tree health, inspection for evidence of damage or disease, and determining the survival rate of damage and diseased trees. Trees shall be pruned and treated as necessary, and dead trees shall be replaced.

5.0 Winter Maintenance

Plowing and shoveling will be the primary method of snow removal for winter maintenance access across the Facility Site. Winter maintenance access within array areas will be infrequent. Should de-icing materials be required for access during winter months, the Applicant will work with State agencies to determine which de-icing material may be used, specifically on pervious access roads and within agricultural lands.

To prevent impacts to stormwater management facilities, the following winter maintenance limitations, restrictions, and/or requirements are recommended:

- Remove snow and ice from catch basins, inlet and outlet structures, and away from culvert end sections.
- Snow plowed or removed should not be piled at inlets/outlets of stormwater management practices or structures.

6.0 Operation and Maintenance Procedures: Stormwater Management Facilities

6.1 Vegetated Swales

Vegetated swales use grass or other dense vegetation to filter sediment out of stormwater.

General Inspection Requirements

Vegetated swales shall be visually inspected at least twice per year and after major storm events for damage, debris and/or excessive sedimentation. Damage within the swale may include erosion, channeling flows, rills, ponding water, or exposed soils.

Sedimentation

Sediment build-up within the bottom of the swale shall be removed when 25% of the original swale volume has been exceeded. Leaf litter and vegetative debris shall be removed as necessary to prevent stormwater blockage through the swale.

Trash and Debris

If debris or trash is observed, it shall be removed and disposed of properly.

Vegetation Management

Adequate vegetative cover shall be maintained within the swale. Exposed soils shall be seeded and mulched to re-establish vegetation. The vegetation within vegetated wet swales shall be maintained at a height of eight inches. Vegetation within vegetated dry swales shall be mowed during the growing season to maintain a height of four to six inches.

Underdrain System

If an underdrain is present within the swale, vehicular traffic and the use of heavy equipment shall be avoided to prevent damage to the underdrain piping and minimize soil compaction within the swale. The underdrain structure shall be maintained as outline in Section 7.8 of this Manual.

Inlet and Outlet Structures

Inlet and outlet structures associated with the swales shall be maintained as outlined in Section 8.1 of this Manual to prevent impacts to the swale and associated stormwater management facilities. Sedimentation at the swale outlet shall be removed when the riprap or stone at the bottom of the outlet apron are no longer visible due to the sediment deposition. Accumulated sediment within stone apron shall be removed with a hand shovel and disposed of off-site at an approved solid waste disposal facility.

6.2 Riparian Buffers and Filter Strips

Vegetated filter strips or undisturbed natural areas such as riparian buffers are utilized to treat and control stormwater runoff from areas of development. Vegetated filter strips are vegetated surfaces designed to treat sheet flow from adjacent areas and removed pollutants through filtration and infiltration.

General Inspection Requirements

The riparian buffers and/or filter strips shall be inspected annually for damage and debris. Damage may include, but is not limited to, exposed soils, erosion or channelization, and reduction in the buffer length. The buffer length shall be maintained at the design length to ensure effectiveness of the practice.

Erosion and Sedimentation

If sedimentation occurs, the sediment shall be removed with a hand shovel when greater than two inches of sediment is present. If erosion or channelization is experienced, upstream maintenance may be required to repair an underlying problem contributing to the damages.

Vegetation Management

Vegetation within filter strips shall be mowed to a minimum height of four inches with a minimum of four cuttings per year. Exposed soils within filter strips shall be reseeded and mulch, as needed.

Riparian buffers shall remain as undisturbed natural areas to ensure effectiveness of the practice.

Flow Spreaders and Level Spreaders

Flow spreaders or level spreaders installed in association with the riparian buffer or filter strip shall be maintained in accordance with Section 6.3 of this Manual.

6.3 Flow Spreaders/Level Spreader

A flow spreader/level spreader is a device used to distribute stormwater uniformly over the ground surface as sheet flow to prevent concentrated, erosive flows and promote infiltration.

General Inspection Requirements

Flow spreaders/level spreaders shall be inspected semi-annually and following major storm events for the first year. After the first year, the spreaders shall be inspected annually and after major storm events. The spreader shall be inspected for channelization, erosion, trash/debris, and sedimentation.

Erosion and Channelization

Channelization and erosion with the spreaders shall be repaired immediately. Channelization and erosion may occur within the upslope areas, around the weir, or in the stabilized outlet.

Sedimentation

Sediment shall be removed when it has accumulated to 10 to 20 percent of the design volume or channel capacity.

Trash and Debris

Trash and debris shall be removed as necessary and disposed of at an approved solid waste disposal facility.

Vegetated spreaders shall be mowed as necessary. Seed and mulch the disturbed areas as needed to maintain a vegetative cover.

6.4 Infiltration Facilities

Infiltration facilities dispose of stormwater by detaining the water and allowing it to infiltrate into the ground. Infiltration facilities may be designed to handle all or a portion of the runoff from a Project Site, or they may overflow and bypass larger storms to alternate systems.

General Inspection Requirements

Stormwater infiltration systems shall be inspected annually and after major storm events. The facility should be inspected following a storm event to ensure the system is functioning properly and maintaining the capacity to infiltrate the stormwater. A monitoring well may be utilized to inspect the functionality of the system. The system shall be inspected for sedimentation, debris/trash, and damage.

Access and Vegetation Management

Direct access to the infiltration facility shall be available at all times. Vegetation shall be managed to sustain the facility and allow for access. Seed and mulch bare soils are needed to maintain adequate soil cover.

Trash and Debris

Trash and debris shall be removed as needed.

Erosion and Sedimentation

Sediment shall be removed from the system when it accumulates to two inches, or when the system is not draining properly. The sediment shall be removed with a hand shovel and disposed of at an approved solid waste disposal facility. The infiltration facility shall be inspected annually for sediment deposition.
Inspect the system for displacement of aggregate material. Remove the displaced aggregate and repair the infiltration facility as needed to meet the design specifications.

System Functionality and Dewatering

The infiltration system shall fully dewater within 48 hours of a storm event. Damage to the infiltration system shall be repaired immediately following identification. The overflow from the infiltration system shall be inspected for damage and to ensure the system is operating correctly.

6.5 Detention Ponds

Detention ponds are designed to hold and slowly release stormwater through infiltration and/or a specially designed stormwater control structure.

General Inspection Requirements

The detention ponds shall be inspected at least once per year and after major storm events. The ponds shall be inspected for erosion, sedimentation, debris/trash, and vegetative debris. The stormwater control structure shall be inspected for sediment, debris/trash, and damage or deterioration.

Access and Vegetation Management

Access to the pond shall be inspected and maintained. Access should extend to the forebay, safety bench, riser, and outlet area.

Vegetation shall be managed around the pond and vegetative debris shall be removed as necessary to prevent accumulation in the pond.

Safety and Security Features

Safety and security features shall be inspected to ensure the features are functioning as designed. A warning sign shall be posted prohibiting swimming, wading, and skating, warning of possible contamination or pollution of the pond water and indicating the maximum pond depth.

Trash and Debris

Trash and debris shall be removed from the pond and on trash racks immediately. The low flow orifice shall be inspection for clogging. Maintenance to the low flow orifice shall be completed as necessary.

Trash and debris shall be disposed of at an approved solid waste disposal facility.

Erosion and Sedimentation

Erosion may occur within the pond, forebay or the outlet area. Erosion shall be repaired immediately to prevent further damage to the pond.

Sediment shall be removed from the pond forebay every five to six years or when sediment has reach 50% of the forebay capacity. Sediment shall be disposed of at an approved solid waste disposal facility.

The pond dimensions and location shall not be altered in any way. Proper notification is required if the pond must be drained for maintenance purposes. Consultation with a licensed engineer may be necessary if erosion issues persist.

Pond Drain

The drain pipe shall be inspected to ensure it is functioning properly. Inspect the pipe for clogging and sediment deposition. The drain pipe should drain the pond to the design level within 24 hours.

7.0 Operation and Maintenance Procedures: Stormwater Structures and Features

7.1 Energy Dissipaters

Energy dissipaters prevent erosion at storm drain or drainage ditch outfalls by reducing the velocity, energy and turbulence of the discharged water. Energy dissipators may include riprap, plunge pools, rock splash pads, or specially designed manholes. Energy dissipators shall be inspected annually and after major storm events to ensure effective function and confirm no damage has occurred. The inspection shall identify areas of erosion, sedimentation, structural damage, and debris or trash to be removed. Erosion may include erosion of the dissipator or evidence of flows going around the structure.

7.2 Storm Culverts and Drainage Pipes

Storm culverts and drainage pipes convey stormwater throughout the Project Site. The storm culverts and drainage pipes shall be inspected annually and after major storm events to assess for damage and obstructions. Storm culverts and drainage pipes may experience damage such as cracking, warping due to compaction, or corrosion. The culverts and piping shall be repaired or replaced when 25% or more of the structure has been compromised.

Sediment build-up and debris/trash shall be removed and disposed of at an approved soil waste disposal facility. Improper removal of sediment and debris/trash may result in flooding and adverse impacts to upstream areas. Use of a hand shovel is recommended for sediment removal.

Riprap outlet protection and stone aprons at the outlets of storm culverts and drainage pipes shall be inspected as detailed in Section 8.1 of this Manual. The inlets and outlets shall be assessed for erosive conditions. Repair to erosion shall be completed as needed.

Vegetation shall be maintained to prevent excess vegetative growth at the inlets and outlets of the culverts and piping.

8.0 Operation and Maintenance Procedures: Miscellaneous Items

8.1 End Sections

End sections are found at the end of pipes and typically include rock outlet protection such as riprap stone aprons. The purpose of riprap aprons placed at the end of pipes is to reduce the velocity, depth, and energy of stormwater, such that the flow will not erode downstream areas.
The end section(s) of pipes, including stone aprons, should be visually inspected for trash and sediment at least twice per year and after major storm events. If trash is observed, it should be removed and disposed of properly. If excess sediment deposition is observed on the stone apron, measures should be taken to remove the sediment. Excessive sedimentation occurs when the

stones on the bottom of the apron are no longer visible due to sediment deposition. It is recommended that accumulated sediments be removed with a hand shovel and disposed of off-site at an approved or otherwise authorized solid waste disposal facility.

8.2 Fences, Gates, and Signage

Fences have been installed around the perimeter of stormwater facilities in order to restrict entry to the facility, and to protecting the public and wildlife. Gates have been installed at various locations along the perimeter fencing to allow for maintenance access. Gates are to be secured shut with a lock except when maintenance operations are actively occurring.

Signage shall be installed at the appropriate stormwater management facilities, as detailed in the SMDM. The Owner/Operator shall erect or post, in the immediate vicinity of stormwater management practices, a conspicuous and legible sign of not less than 18 inches by 24 inches (or 10 inches by 12 inches for footprints smaller than 400 square feet) bearing the following information:

> **Stormwater Management Practice** – *(name of the practice)*
> Project Identification – (SPDES Permit number or similar)
> Must Be Maintained in Accordance With the O&M Plan
> **DO NOT REMOVE OR ALTER**

Inspect the fences, gates, and signage annually for areas needing repair or replacement. Repair or replace damaged or compromised components of the fences, gates, or signage as needed. Maintain the ground underneath the fences and gates as needed to allow safe entry and exit to the stormwater management facility and prevent further erosion impacts. Replace the signage if any information is missing or has been sun-bleached.

8.3 Access Roads, Gravel Parking Areas and Substation Yards

Access Roads

Access roads shall be maintained to allow for safe access to and from the Project Site. The access roads shall be inspected annually and after major storm events to assess for trash/debris, erosion, rilling, sedimentation, or gravel migration. Trash/debris shall be removed as needed and disposed of at an approved solid waste facility. Erosion, sedimentation, rilling, or gravel migration shall be repaired. Vegetation along the access roads shall be maintained as needed to allow for safe access to the Project Site.

Pervious Access Roads

Pervious access roads are to be installed after construction has finalized to prevent sediment tracking into the porous stone material or compaction of the road area. The pervious access road will require little on-going maintenance. The road areas shall be inspected annually and after major storm events to access for trash/debris, erosion, rilling, sedimentation, or gravel migration. Trash/debris shall be removed as needed and disposed of at an approved solid waste facility. Erosion, sedimentation, rilling, or gravel migration shall be repaired. Vegetation along the road areas shall be maintained as needed to allow for safe access to the Project Site.

Gravel Parking Areas

Gravel parking areas typically require little on-going maintenance, due to the limited use of heavy vehicles. The gravel parking areas shall be inspected annually and after major storm events to assess for trash/debris, erosion, rilling, sedimentation, or gravel migration. Trash/debris shall be removed as needed and disposed of at an approved solid waste facility. Erosion, sedimentation, rilling, or gravel migration shall be repaired. Vegetation along the parking areas shall be maintained as needed to allow for safe access to the Project Site.

Substation Yards

Substation yards shall be maintained to allow for safe operation at the Project Site. The substation yards shall be inspected annually and after major storm events to assess for trash/debris, erosion, rilling, sedimentation, or gravel migration. Trash/debris shall be removed as needed and disposed of at an approved solid waste facility. Erosion, sedimentation, rilling, or gravel migration shall be repaired. Vegetation around the substation yards shall be maintained as needed to allow for safe access to the Project Site.

9.0 Operation and Maintenance Procedures: Repair/Replacement Activities

Damage to on-site stormwater facilities and infrastructure may occur and repair or replacement may be necessary to ensure proper function. Components of the stormwater management practices, conveyance systems, or on-site structures which require repair or replacement should be addressed immediately following identification of deficiencies.

Repair of stormwater management facilities shall be completed as outlined in this Manual. Replacement of stormwater facilities or components of a facility may require assessment and design by a licensed engineer. The Owner/Operator shall read local, state, and federal regulations prior to replacement activities to ensure compliance.

10.0 Contact Information

Questions about the stormwater management systems and operation and maintenance procedures should be directed to the Owner/Operator.

Appendix A – NYSDEC Maintenance Guidance

NEW YORK
STATE OF
OPPORTUNITY.

Department of
Environmental
Conservation

MAINTENANCE GUIDANCE

Stormwater Management Practices

March 31, 2017

FINAL

Table of Contents

Section 1. Introduction

1.1. Stormwater Management Practice (SMP) Groups

Stormwater management has become an important function for municipalities to address the quality of local water resources and to adhere to state standards. Increasingly, stormwater management practices (SMPs) are constructed as part of new development or redevelopment projects as retrofits to existing infrastructure and/or as part of local watershed restoration plan efforts.

While SMPs are proliferating, municipalities are charged with a certain level of implementation and oversight. Whether this is a new function for a municipality or an expansion of existing programs, it is important for these local programs to have some degree of guidance to successfully meet the challenge. One important area where guidance has been lacking is how to properly operate and maintain the wide range of SMPs that are constructed. This chapter was developed to address this need. It is widely understood that SMPs will not function properly to protect water resources without attention to operation and maintenance (O&M), and that O&M tasks and responsibilities must be identified and assumed by various stakeholders.

The chapter is structured around a hierarchy concept where O&M responsibilities are addressed by SMP owners/property managers, municipal staff, landscape contractors and professionals with knowledge in stormwater management (Qualified Professional). The hierarchy approach, explained in more detail below in Section 1.2, strives for a cost-efficient way to ensure long-term performance of SMPs.

The maintenance procedures described in this chapter are applied to ten separate SMP groups (**Table 1.1**). These same ten groups are used to separate maintenance inspection guidance, costs, and other guidance in the chapter.

Table 1.1 Practices Discussed in this Chapter, by Group

SMP Group	Practices Included
Rainwater Harvesting	• Rain Barrel • Cistern
Disconnection and Sheetflow	• Rooftop Disconnection • Sheetflow to Filter Strip • Sheetflow to Riparian Buffers
Swales	• Vegetated Swale • Wet Swale
Tree Planting	• Tree Planting
Bioretention	• Bioretention Cell • Dry Swale • Rain Garden • Stormwater Planters • Tree Pits
Green Roofs	• Green Roofs
Permeable Pavements	• Permeable Pavers • Porous Asphalt/Concrete
Ponds and Wetlands	• Wet Pond Design Options • Stormwater Wetland Design Options
Infiltration	• Infiltration Trench • Infiltration Basin • Dry Well
Sand and Organic Filters	• Surface Sand Filters • Underground Sand Filters • Underground Organic Filters

1.2. Maintenance Hierarchy

SMPs require inspections and maintenance to identify small problems before they become more serious and expensive to repair. For example, removing a small amount of sediment from a filtering medium or permeable pavement surface is much less expensive than replacing a surface that has already become clogged. However, it can be cost prohibitive for most communities or SMP owners to hire highly trained staff or contractors to inspect these practices or to carry out the actual maintenance tasks. This can be especially true with the advent of “micro-scale” Green Infrastructure practices, which may be distributed across many individual public and private properties, and where the absolute number of SMPs within a municipality may exceed local government inspection and maintenance capabilities.

Many SMP maintenance problems start out as fairly small, easily rectified issues as long as they are detected early enough through an inspection. For these issues, property owners or managers can likely take care of the issue in an expedient and cost-effective manner.

However, at some point, property owners or managers will encounter an issue where diagnosing the problem and knowing the appropriate remedy will exceed their technical capabilities. At this point, an individual with training in SMP inspection, operation and maintenance, such as a municipal inspector or landscape contractor, may have to be called in for assistance.

Similarly, some problems escalate to the point where a Qualified Professional (i.e. professional engineer or landscape architect) is needed to bring the SMP back to a good functioning condition. The Qualified Professional may need to bring in other experts to assess problems with the SMP. For instance, they may call in a horticulturalist to assess problems with the planting plan.

Figure 1.1 The SMP Maintenance Hierarchy Pyramid

Acknowledging this step-wise approach to SMP inspection and maintenance, the SMP Maintenance Hierarchy concept was developed. The concept uses a combination of skill levels (**Figure 1.1**) as explained in more detail below.

Level 1: Property Owners and Managers, Interns, etc.

This category includes property owners, property managers, or HOA representatives, for privately owned SMPs. For municipally owned SMPS, this could include municipal maintenance staff or interns, and volunteers. These individuals would typically have no or only very limited training in stormwater maintenance and inspection but can use available guidance to quickly identify and rectify common and simple issues with SMP performance. This level completes routine inspections and maintenance activities. For most SMPs, the majority of inspection and maintenance activities can be conducted at this skill level, thus Level 1 forms the base of the Maintenance Hierarchy pyramid. Many well-functioning SMPs can be adequately maintained for long periods of time using Level 1 capabilities.

Although many issues can be addressed at Level 1, these inspectors and maintainers need a relief valve when the SMP problems become harder to diagnose and/or the remedies require a higher level of resources and expertise. Such issues are referred to in this chapter as “kick-outs to Level 2.” For instance, an SMP may have a minor amount of sediment that has accumulated at inlets or on the practice bottom. A Level 1 person may be able to take care of this with a flat shovel and wheel barrow. However, a Level 2 inspection would be triggered if the sediment is deep, widespread, keeps recurring, and/or requires more sophisticated equipment to remove.

Level 2: Trained Municipal Staff

This level of inspection and maintenance is conducted primarily by municipal employees or landscape contractors who have completed training on SMP, inspection, operation and maintenance. Level 2 inspections can take place in response to two circumstances:

1. As part of an ongoing, routine municipal inspection program whereby SMPs are visited on a rotating basis at a frequency established by the local program, or

2. In response to a “kick-out” from a Level 1 inspector based on a specific problem or problems.

Circumstance #2 obviously will require coordination and communication between the Level 1 and Level 2 inspectors, with documentation and background provided by the Level 1 inspector. This is an essential part of making the hierarchy approach successful. In the example above, the Level 2 inspector can better diagnose the sources of the sediment, whether the sediment is affecting performance of the SMP, and the specific tasks needed to remove the sediment and abate the source.

As with kick-outs from Level 1 to Level 2, the same can exist from Level 2 to Level 3. It may be that the Level 2 inspector encounters a problem where a Qualified Professional is needed to re-design certain components of the SMP, and a qualified contractor is needed to undertake a more serious repair. This is when Level 3 is activated.

Level 3: Qualified Professionals

Qualified professionals include professional engineers and landscape architects, who can revisit design issues associated with chronic or serious problems. For repair and maintenance of the SMPs at this level, individuals with specific skills and certifications, such as a certified plumber who has experience working with rainwater harvesting practices or a horticulturalist with knowledge on proper plantings may need to be called in by the Qualified Professional. Level 3 inspection or maintenance is triggered in response to specific problems identified during a Level 2 inspection.

Continuing with the example above, the Level 2 inspector identifies that the sediment is accumulating in the SMP because of the lack of pre-treatment or that the practice is not sized properly for its drainage area. The Level 2 inspector at this point should consult a Qualified Professional (Level 3) who can go back to the original or as-built plan and develop workable solutions.

Table 1.2 further describes how maintenance and inspection activities differ among the three levels of the SMP Maintenance Hierarchy.

Table 1.2 Maintenance/Inspection Hierarchy Levels

	Level 1: Owners and Untrained Staff	**Level 2: Trained Municipal Staff**	**Level 3: Qualified Professionals**
Qualifications/ Training of Inspectors	No special training, but person is provided educational materials	On-the-job training and/or short workshops Define adequate training or provide examples	Professional License such as a PE or RLA
Frequency of Inspection	At least annually	Routine as determined by the local program OR as kick-out from Level 1 inspection	Only as needed from Level 2 inspection
Inspection Guidance	Checklists are included for each practice group in **Section 2** of this chapter and in **Appendix A**.	Guidance for the inspection is included in **Section 3**, and checklists are included in **Appendix B.**	**Section 4** includes guidance for diagnosing typical problems.
Typical Maintenance Activities	Routine mowing. Trash removal. Plant care and upkeep. Mulching as needed. Removal of small amounts of sediment from pretreatment areas of the practice.	Removal of larger amounts of sediment. Structural damage repair. Minor regrading and scarification of soil surface to restore permeability.	Redesign an improperly functioning practice. Includes re-grading of the contributing drainage area, replacing soil media and plantings (new planting plan), or modifying conveyance structures.
Triggers for Inspection or Maintenance by this Level	Regular inspection (no trigger)	Level 1 Inspection Sheets (**Section 2**) describe triggers that warrant a Level 2 Inspection.	Level 2 Inspection Guidance (**Section 3**) describes triggers that warrant a Level 3 Inspection.

1.3. Using the Remainder of this Chapter

This chapter provides guidance for maintaining SMPs, including inspection, maintenance activities, and maintenance planning. The chapter includes four sections as follows:

- **Section 2** outlines Level 1 inspection and maintenance procedures in the form of visual checklists. This includes guidance for inspection of each of the 10 SMP groups/categories included in this chapter, as well as specific kick-outs for Level 2.
- **Section 3** provides guidance for Level 2 inspections as to observed conditions, remedies, and triggers for Level 3.
- **Section 4** is most relevant to Level 3 and includes diagnostic measures for specific problems, as well as guidance for performing repair activities.
- **Section 5** provides an overview of planning for maintenance, including techniques for estimating maintenance costs and elements of a maintenance plan.

Section 2. Level 1 Inspections

2.1. How to Use this Section

Section 2 provides guidance for Level 1 inspections of 10 groups of stormwater management practices (SMPs). See Section 1 of this chapter for an explanation of Level 1 in the Maintenance Hierarchy.

- **Section 2.2** provides general guidance for Level 1 inspections.
- **Sections 2.3 through 2.12** provide detailed Level 1 inspection guidance and inspection forms for each of the 10 practice categories:
    - 2.3 Rainwater Harvesting
    - 2.4 Disconnection and Sheetflow
    - 2.5 Swales
    - 2.6 Tree Planting
    - 2.7 Bioretention
    - 2.8 Green Roofs
    - 2.9 Permeable Pavement
    - 2.10 Ponds and Wetlands
    - 2.11 Infiltration
    - 2.12 Sand and Organic Filters

2.2. General Guidance for Level 1 Inspections

Regardless of which practice you are inspecting, some key procedures and equipment are necessary. Read through this guidance before going on an inspection, and use the specific guidance in **Sections 2.3 through 2.12** for the particular practice type you are inspecting. The Level 1 Inspection can be completed with minimal previous training. Typical Level 1 inspectors may include a property owner or manager (for private SMPs) or perhaps an intern or maintenance or landscape crew members in the case of a publicly owned practice. Level 1 inspections are the most frequent inspections. They are designed to identify key maintenance issues before they become more serious and to help keep up with routine maintenance tasks.

When to Conduct a Level 1 Inspection

The Level 1 Inspection should be conducted at least annually for all practices and is often supplemented with additional visits after large storms, winter salting and sanding, or other seasonal changes. In addition, it is recommended that inspections take place more frequently during the first few years after installation of an SMP. Many issues can be identified and corrected during this early period so that they do not lead to larger problems in subsequent years. Plant establishment and health is one of these key issues. Once the SMP is stable and seems to be functioning properly, the inspections can become less frequent.

What to Take into the Field

The Level 1 Inspection is fairly simple, and it is assumed that very little measurement will be needed. However, the inspector should take pictures to document findings and should also keep a record of the inspections. The list of needs for the Level 1 Inspection includes the following:

1. Safety vest (if SMP is located in an area near traffic)
2. Notes or records from past inspections
3. Digital camera or phone
4. Clipboard and pencils (if using paper forms), or Tablet or smartphone if using digital forms
5. Bug spray (if needed)
6. Sun block (if needed)
7. Tape measure (optional, to measure pipe sizes and SMP dimensions)
8. Letter of permission to access property if the inspector is from an outside agency (e.g., summer intern working for the municipality)
9. Site Plan showing SMPs, Planting Plan (includes planting/seed mixes) and details
10. Engineers scale
11. Flagging/stakes and waterproof marker (to mark problem areas that need to be visited again)

Checklist and Follow-Up Actions

The Level 1 Inspection checklists included in **Sections 2.3 through 2.12** describe follow-up actions for each observed condition (See **Figure 2.2.1** for an example). A Level 1 Inspection Table is available for each component or key area of the particular SMP group. Use as follows:

- Check the box in the LEFT column if the problem is present at the site.
- Check the appropriate follow-up actions in the RIGHT column, or add your own as needed to fix the problem.
- DOCUMENT all your actions. Keep copies of the Level 1 inspection tables, plus notes, photos, or other documentation of corrective measures to fix problems. Record dates of actions and any follow-up inspections. This will be important for communicating with Level 2 inspectors and/or the local stormwater program.
- Activate a Level 2 Inspection (**Section 3**) as guided by the table (shown in blue cells): These blue cells identify conditions when a more detailed inspection will be needed to further diagnose problems. As the problem becomes more severe, it will be necessary to activate a Level 2 inspection. Consult the local stormwater program authority for the most appropriate Level 2 inspection option.

Permeable Pavement 1. Drainage Area

Problem (Check if Present)	Follow-Up Actions
 ☐ Bare soil, erosion of the ground (rills washing out the dirt)	☐ Seed and mulch areas of bare soil to get vegetation established. ☐ Fill in erosion areas with soil, compact, and seed straw to get vegetation established. ☐ If a rill or small channel is forming, try to redirect water flowing to this area by creating a small bern or adding topsoil to area by creating a small berm or adding topsoil to areas that are heavily compacted. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Large areas of soil have been eroded, or larger channels are forming. May require rerouting of flow paths.

Figure 2.2.1. Example of a Level 1 Inspection Checklist, with Follow-Up Actions. Note “Kick-Out to Level 2” highlighted in gray.

2.3. Rainwater Harvesting – Level 1 Inspections

Components of Rainwater Harvesting

Key components to inspect for Rainwater Harvesting systems include the following:

- RWH 1. Conveyance System (gutters, downspouts, other pipes) and Filter
- RWH 2. Storage Tank
- RWH 3. Outlets

Note: The category of Rainwater Harvesting includes:

- *Rain Barrel* – A small tank, usually between 50 and 100 gallons that can be installed directly next to a downspout. Multiple rain barrels can be connected in order to increase rainwater storage capacity. This is the most common form of rainwater harvesting on residential properties.
- *Cistern* – A larger tank that can be installed above ground or below ground, depending on the structural capacity of the material.

Figure 2.3.1 Key Areas for Level 1 Inspection of Rainwater Harvesting Systems

Rainwater Harvesting Level 1 Inspection

Figure 2.3.2 Inspecting the Conveyance System and a Vortex-style Filter

The Level 1 Inspection focuses on the Conveyance System and Filter (RWH 1), Storage Tank (RWH 2), and Outlet (RWH 3). It is recommended that this inspection be conducted two to four times per year, especially in spring and late fall. If possible, inspect the system during or immediately after a storm in order to better see any active blockages, leaks, or other problems.

RWH 1. Conveyance System and Filter

Description: The conveyance system is all the components that collect and convey runoff from the roof toward the storage tank. This typically consists of gutters and downspouts, and sometimes additional drainage pipes. These components need to be kept clear of debris in order to avoid blockages and spilling of runoff out of the gutters. Every proper rainwater harvesting system also has one or more ways of filtering the water coming into the tanks from the conveyance system. These may include screens, first-flush diverters, and vortex filters.

Instruction: Inspect any gutters, downspouts, drainage pipes, and filters connected to the Rainwater Harvesting System. Consult **Table 2.3.1** below:

Table 2.3.1 RWH Conveyance System and Filter

Problem (Check if Present)	Follow-Up Actions
☐ Leaves, sticks, or other debris in gutters and downspouts	☐ Remove all debris by hand. ☐ Other:
☐ Leaves, sticks, or other debris in filter(s)	☐ Clean out all debris and organic matter buildup by hand or by spraying with a hose. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Filter (first-flush diverter or vortex filter outside the tank) does not seem to be operating, is completely clogged, or does not appear to be trapping any debris.
☐ Loose or disconnected junctions between gutters, pipes, or filters	☐ Secure any loose junctions or parts and make sure they are properly sealed to prevent leaks, ☐ Other:

RWH 2. Storage Tank

Description: Many different types and sizes of tanks can be used for rainwater harvesting. They can be situated underground, above ground, or even partially buried. The tank body has an inlet (and/or cover) and one or more outlet points for water to leave the tank. Advanced rainwater harvesting systems usually also have a pump and a filter inside or outside the tank to further clean the stored water and pump it to the point of use.

Instruction: When the tank is full, carefully inspect for any leaks or blockages. Next, drain the tank to inspect interior. For safety reason, visually inspect the inside of the tank without breaking the plane of the opening with any body parts, as this is a confined space that should only be entered by those with special training. Consult **Table 2.3.2** below.

Figure 2.3.3 Inspecting the Storage Tank

Table 2.3.2 RWH Storage Tank

Problem (Check if Present)	**Follow-Up Actions**
☐ Tank is above ground and not freeze proof.	**Winterize the tank by performing the following steps:** ☐ Drain down water level in the tank before winter to avoid damage from freezing temperatures. ☐ Drain water from pipes and pumps. ☐ Disconnect conveyance pipes from the tank to enable roof runoff to bypass the tank during winter.
☐ Tank is full between rain events (harvested water is not being used).	☐ Drain down any remaining water in the tank before predicted rain events.
☐ Mosquito larvae or other insects present in the water	☐ Add mosquito dunks to water. ☐ Ensure that insect screens are installed on all openings and are properly sealed (inlet and outlets). ☐ Other:
☐ Debris, algae, or organic matter accumulated in tank	☐ Remove as much as possible, by hand. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: For large tanks that cannot easily be accessed for inspection and/or cleaning, defer to Level 2 Inspection.
☐ Tank does not appear to fill fully even during large rains, or water level drops quickly after filling.	☐ Kick-Out to Level 2 Inspection: Water is bypassing the tank and/or there are leaks in the tank wall. This will likely require special expertise to diagnose and fix.
☐ Problems with pumps, filters, or other mechanical components	☐ Kick-Out to Level 2 Inspection: This will likely require special expertise to diagnose and fix.

RWH 3. Outlets

Description: An above-ground rainwater harvesting tank usually has at least two outlets—one at the top of the tank where water overflows when the tank is full, and one near the bottom of the tank for delivering the stored water by gravity feed. Many filters also have an outlet pipe to divert the first flush of roof runoff away from the tank. Any overflow outlet that spills onto the ground should have sufficient erosion control (e.g., rock or stone pad) to prevent erosion of the ground.

Instruction: Examine the outlet pipe(s) and the point at which it overflows onto the ground. Consult **Table 2.3.3** below.

Table 2.3.3 RWH Outlets

Problem (Check if Present)	Follow-Up Actions
☐ Slow flow from outlet caused by faulty or clogged valve	☐ If clogging seems to be the problem, ream out sediment from valve if this can be done from exterior. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Valve needs to be replaced or cannot be cleaned out from outside of tank.
☐ Flow from outlet is backing up toward building foundation.	☐ Add flexible pipe to end of outlet pipe to divert flow further away and downhill from building.
☐ Erosion or drainage issues at outlet	☐ Add a gravel and/or stone pad to reduce the impact from the water flowing out of the outlet pipe during storms. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Rills have formed, erosion or drainage problems are more severe or cannot be resolved, or there is discoloration or other unusual conditions around the outlet.

2.4. Disconnection and Sheetflow

Components of Disconnection and Sheetflow

The intent of disconnection and sheetflow is for runoff from small areas of impervious cover to spread out evenly and dissipate in a grassy or vegetated area. It is a low-technology practice intended to reduce runoff at its source. Key components to inspect for Disconnection and Sheetflow include the following:

- D&S 1. Drainage Area
- D&S 2. Level Spreader/Energy Dissipator
- D&S 3. Treatment Area

Figure 2.4.1 Key Areas for Level 1 Inspection of Disconnection and Sheetflow with filter strip shown.

R. Winston, NCSU

Note: The category of Disconnection and Sheetflow includes:

- Rooftop Disconnection – Runoff from a small rooftop is directed to a relatively flat pervious area.
- Sheetflow to Filter Strip – Runoff from a small parking lot, sidewalk, or other small impervious surface is directed to a relatively flat, uniformly graded grassy area.
- Sheetflow to Riparian Buffers – Runoff from a small parking lot, sidewalk, or other small impervious surface is directed to a relatively flat, well-vegetated riparian area.

Disconnection and Sheetflow Level 1 Inspection

The Level 1 Inspection focuses on the Drainage Area (D&S 1), Level Spreader/Energy Dissipater (D&S 2), and Treatment Area (D&S 3). This inspection should be conducted twice per year, preferably in the spring and fall. If possible, inspect the practice during a storm in order to better see any active blockages, bypassing, or other problems.

D&S 1. Drainage Area

Description: The drainage area consists of rooftops and/or impervious surfaces such as parking lots, driveways, or sidewalks. Pervious areas such as lawns or forests may also be part of the drainage area.

Instruction: Visually inspect any surfaces in the drainage area. Consult **Table 2.4.1** below.

Table 2.4.1 D&S Drainage Area

Problem (Check if Present)	Follow-Up Actions
 ☐ Changes in flow; more runoff; runoff bypassing the practice	☐ For rooftop areas, make sure downspouts are still disconnected and conveying water into the treatment area. ☐ Look for and remove any “dams” of sediment and grass clippings that prevent water from entering the treatment area as sheet flow. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Changes to drainage area size or amount of runoff due to construction, tillage, etc.
 ☐ For parking lots in the drainage area—sediment, grass clippings, or other debris has accumulated at pavement edge.	☐ For small, isolated amounts of debris, sweep up by hand and dispose properly so that it will not be exposed to runoff. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Sediment is widespread and cannot be removed by manual sweeping.
 ☐ For parking lots in the drainage area—dips or damage at pavement edge caused flow to concentrate.	☐ Kick-Out to Level 2 Inspection: This will likely require special expertise to diagnose and fix pavement edge.

D&S 2. Level Spreader/Energy Dissipator

Description: Some disconnection and sheetflow practices have a structure in place to dissipate any concentrated runoff and turn it into sheet flow. This may consist of a stone or gravel spreader a concrete or wood level spreader, or other level and stable surface.

Instruction: Inspect the energy dissipator closely, during a rain event if possible. Consult the **Table 2.4.2** below.

Table 2.4.2 D&S Level Spreader/Energy Dissipator

Problem (Check if Present)		Follow-Up Actions
	☐ Debris and/or sediment accumulated behind or around the level spreader.	☐ Remove debris and sediment by hand and ensure that the area behind the level spreader is relatively flat. Too much debris and sediment can cause runoff to bypass the level spreader structure. ☐ Other:
	☐ Sinking, cracking, sloughing, or other structural problem makes the energy dissipator no longer level.	☐ For stone/gravel spreaders, add new material or rake out as needed to make it even. ☐ Other:
		☐ Kick-Out to Level 2 Inspection: Structural issues that cannot be easily fixed by hand

D&S 3. Treatment Area

Description: After runoff is dissipated as sheet flow, it enters the treatment area–a relatively flat grassy or vegetated area.

Instruction: Examine where flow enters the treatment area as well as the whole flow path. Look for signs of concentrated flow. Consult the table below.

Table 2.4.3 D&S Treatment Area

Problem (Check if Present)	Follow-Up Actions
☐ Trash and/or debris in the treatment area	☐ Collect trash/debris and dispose of properly.
 ☐ Grass filter strip has grown very tall, to the point that runoff cannot easily enter or is getting concentrated.	☐ Mow filter strip twice a year or more frequently in a residential yard.
☐ Sparse vegetation or bare spots	☐ For grassy areas, add topsoil (as needed), grass seed mulch, and water during the growing season to re-establish consistent vegetation cover. ☐ Other:
 ☐ Rills or gullies are forming in treatment area where flow has become concentrated	☐ For minor rills, fill in with soil, compact, and add seed and straw to establish vegetation. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Rills are more than 2" to 3" deep and require more than just hand raking and re-seeding.

2.5. Swales

Areas of Swales

- Key areas to inspect for swales include the following:
- SW 1. Drainage Area
- SW 2. Inlets
- SW 3. Swale Surface Area
- SW 4. Vegetation
- SW 5. Outlets

Note: The category of Swales includes:

- Vegetated Swale – shallow channel densely planted with variety of grasses, shrubs, and/or trees (also called bioswale or drainage swale)
- Wet Swale – a cross between a wetland and a swale, this linear system intercepts groundwater to maintain wetland vegetation

For the purposes of this chapter, the term “Swale” will be used to generally describe these practices.

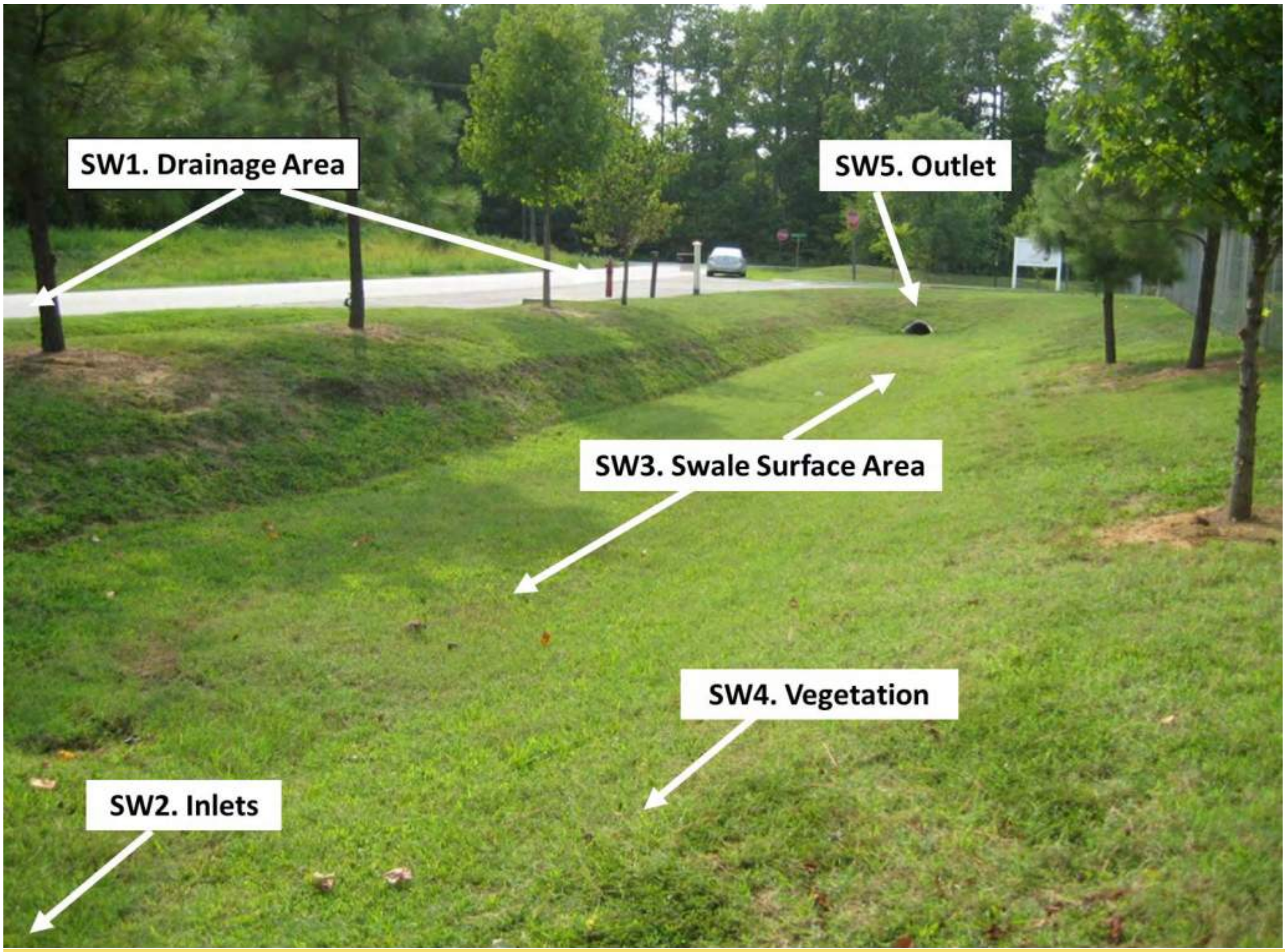


Figure 2.5.1 Key Areas for Level 1 Inspection of Swales Credit

Swale Level 1 Inspection

The Level 1 Inspection focuses on the Drainage Area (SW1), Inlets (SW2), Swale Surface Area (SW3), Vegetation (SW4), and Outlets (SW5). This inspection should be conducted on a regular basis, with an early spring inspection to ensure that the practice has survived the winter, particularly if there has been a significant amount of snow. An inspection during the growing season or in the early fall is also recommended to check on the health of vegetation.

SW 1. Drainage Area

Description: The drainage area sends runoff to and is uphill from the swale. When it rains, water runs off and flows to and along the swale.

Instruction: Look for areas that are uphill from the swale. Consult **Table 2.5.1** below.

Table 2.5.1 SW Drainage Area

Problem (Check if Present)	Follow-Up Actions
 04 11 2011 ☐ Bare soil, erosion of the ground (rills washing out the dirt)	☐ Seed and mulch or sod areas of bare soil to establish vegetation. ☐ Fill in erosion areas with soil, compact, and add seed and straw to establish vegetation. ☐ If a rill or small channel is forming, try to redirect water flowing to this area by creating a small berm or adding topsoil to areas that are heavily compacted. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Large areas of soil have been eroded, or larger channels are forming. May require rerouting of flow paths
 ☐ Piles of grass clippings, mulch, dirt, salt, or other materials	☐ Remove or cover piles of grass clippings, mulch, dirt, etc. ☐ Other:
☐ Open containers of oil, grease, paint, or other substances	☐ Cover or properly dispose of materials; consult your local solid waste authority for guidance on materials that may be toxic or hazardous.
	Kick-Out to Level 2 Inspection: Grass on edge of pavement continues to die off for unknown reasons. Swale edge may need to be replaced with other materials (e.g., stone diaphragm).
☐ Grass dying at edge of road	☐ Seed and mulch; add topsoil or compost if needed. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Grass on edge of pavement continues to die off for unknown reasons. Swale edge may need to be replaced with other materials (e.g., stone diaphragm).

SW 2. Inlets

Description: The inlets to a swale are where water flows in. Depending on the design, water can flow in through:

- Ditch, pipe, or curb opening at top of swale: This is the most common approach, where water enters the swale at the top.
- Along the entire edge of the swale: If the swale is along a roadway or parking lot, water may enter along the long side of the swale through defined curb openings or simply by water flowing into the swale from the pavement edge (known as “sheetflow”).

Instruction: Stand in the swale and look for all the places where water flows in. Consult **Table 2.5.2** below for possible problems.

Table 2.5.2 SW Inlets

Problem (Check if Present)	Follow-Up Actions
☐ Inlets or the swale edge are collecting grit, grass clippings, or debris or have grass/weeds growing. Some water may not be getting into the swale. The objective is to have a clear pathway for water to flow into the swale.	☐ Use a flat shovel to remove grit and debris (especially at curb inlets or opening). Parking lots will generate fine grit that will accumulate at these spots. ☐ Pull out clumps of growing grass or weeds, and scoop out the soil or grit that the plants are growing in. ☐ Remove any grass clippings, leaves, sticks, and other debris that is collecting at inlets or along the edge of the swale where water is supposed to enter. ☐ For pipes and ditches, remove sediment and debris that is partially blocking the pipe or ditch opening where it enters the swale. ☐ Dispose of all material properly in an area where it will not re-enter the swale. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Inlets are blocked to the extent that most of the water does not seem to be entering the swale.
 ☐ Some or all of the inlets are eroding so that rills, gullies, and other erosion are present, or there is bare dirt that is washing into the swale.	☐ For small areas of erosion, smooth out the eroded part and apply rock or stone (e.g., river cobble) to prevent further erosion. Usually, filter fabric is placed under the rock or stone. ☐ In some cases, reseeding and applying an erosion control matting can be used to prevent further erosion. Some of these materials may be available at a garden center, but it may be best to consult a landscape contractor. ☐ Other:
	☐ Level 2 Inspection: Erosion is occurring at most of the inlets or along much of the swale edge. The inlet design may have to be modified.

SW 3. Swale Surface Area

Description: The swale surface area is the vegetated area where water flows during a storm and also the side slopes that slope down into the swale bottom. Depending on the design, the swale may also contain “check dams,” which are small dams made out of earth, stone, wood, or other materials. The check dams slow down and temporarily pond water as it flows down the swale.

Instruction: Examine the entire swale surface and side slopes. Consult **Table 2.5.3** below for possible problems.

Table 2.5.3 SW Surface Area

Problem (Check if Present)	Follow-Up Actions
☐ Minor areas of sediment, grit, trash, or other debris are accumulating in the swale.	☐ Use a shovel to scoop out minor areas of sediment or grit, especially in the spring after winter sanding materials may wash in and accumulate. Dispose of the material where it cannot re-enter the swale. ☐ If removing the material creates a hole or low area, fill with good topsoil and add seed and straw to re-vegetate. ☐ Remove trash, vegetative debris, and other undesirable materials. ☐ If the swale is densely vegetated, it may be difficult to do the maintenance; check for excessive ponding or other issues described in this section to see if the accumulated material is causing a problem. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Sediment has accumulated more than 3 inches deep and covers 25% or more of the swale surface. ☐ The source of sediment is unknown or cannot be controlled with simple measures.
 ☐ There is erosion in the bottom or on the side slopes. Water seems to be carving out rills as it flows through the swale or on the slopes.	☐ Try filling the eroded areas with clean topsoil, and then seed and mulch to establish vegetation. ☐ If the problem recurs, you may have to use some type of matting, stone (e.g., river cobble), or other material to fill in eroded areas. ☐ If the erosion is on a side slope, fill with soil and cover with erosion-control matting or at least straw mulch after re-seeding.
	☐ Kick-Out to Level 2 Inspection: The problem persists or the erosion is more than 3 inches deep and seems to be an issue with how water enters and moves through the swale. ☐ Kick-Out to Level 2 Inspection: The problem does not seem to be caused by flowing water, but a collapse or sinking of the surface (e.g., “sinkhole”) due to some underground problem.
☐ Water does not flow evenly down the length of the swale, but ponds in certain areas for long periods of time (e.g., 72 hours after a storm). The swale does not seem to have “positive drainage.” Check during or immediately after a rain storm.	☐ If the problem is minor (just small, isolated areas), try using a metal rake or other tools to create a more even flow path; remove excessive vegetative growth, sediment, or other debris that may be blocking the flow. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Water ponds in more than 25% of the swale for three days or more after a storm. The issue may be with the underlying soil or the grade of the swale. ☐ Water ponds behind check dams for three days or more after a storm. Check dams may be clogged or not functioning properly.

Table 2.5.3 SW Surface Area

Problem (Check if Present)	Follow-Up Actions
 ☐ Check dams (if present): water is flowing around the edges of check dams, creating erosion or sinkholes on the uphill or downhill side, or the check dams are breaking apart or breaching.	☐ If the problem is isolated to just a few check dams, try simple repairs. ☐ It is very important for the center of each check dam (where most of the water flows) to be lower (by at least several inches) than the edges of the check dams where they meet the side slopes. Also, the check dams should be keyed into side slopes so water does not flow between the check dam and side slope. ☐ Use a level to check the right check-dam configuration, as noted above. Repair by moving around stone, filling and compacting soil, or adding new material so that water will be directed to the center of the check dam instead of the edges. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Many check dams are impacted and/or the problem seems to be a design issue with height, spacing, shape, or materials used to construct them.

SW 4. Vegetation

Description: The health of vegetation within the swale is perhaps the most critical maintenance item for the property owner or responsible party. Many vegetated swales become overgrown, and “desirable” vegetation becomes choked out by weeds and invasive plants. It is important to know what the swale is supposed to look like and what plants seem to be thriving or doing poorly. Periodic maintenance of vegetation will prevent larger problems that are more difficult and costly to manage.

Instruction: Examine the swale vegetation. Consult **Table 2.5.4** below for possible problems.

Table 2.5.4 SW Vegetation

Problem (Check if Present)	Follow-Up Actions
 ☐ Vegetation is too overgrown to access swale for maintenance activities	☐ Mow or bush-hog the path. ☐ Other:
 ☐ Vegetation requires regular maintenance: pulling weeds, removing dead and diseased plants, adding plants to fill in areas that are not well vegetated, etc.	☐ If you can identify which plants are weeds or not intended to be part of the planting plan, eliminate these, preferably by hand pulling. ☐ If weeds are widespread, check with the local stormwater authority and/or Extension Office about proper use of herbicides for areas connected with the flow of water. ☐ Even vegetation that is intended to be present can become large, overgrown, block flow, and/or crowd out surrounding plants. Prune and thin accordingly. ☐ If weeds or invasive plants have overtaken the whole swale, bush-hog the entire area before seed heads form in the spring. It will be necessary to remove the root mat manually or with appropriate herbicides, as noted above. ☐ Replant with species that are aesthetically pleasing and seem to be doing well in the swale. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: You are unsure of the original planting design or the vegetation maintenance task is beyond your capabilities of time, expertise, or resources. If you are unsure of the health of the vegetation (e.g. salt damage, invasives, which plants are undesirable) or the appropriate season to conduct vegetation management, consult a landscape professional before undertaking any cutting, pruning, mowing, or brush hogging.
☐ Vegetation is too thin, is not healthy, and there are many spots that are not well vegetated.	☐ The original plants are likely not suited for the actual conditions within the swale. If you are knowledgeable about plants, select and plant more appropriate vegetation (preferably native plants) so that almost the entire surface area will be covered by the end of the second growing season. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: For all but small practices (e.g., in residential yards), this task will likely require a landscape design professional or horticulturalist.

SW 5. Outlets

Description: These are where water leaves the swale when it fills up or where water reaches the downstream end of the swale. There may be a small stone apron or rock dam here or even an outlet grate.

Instruction: Examine outlets that release water out of the swale. Consult **Table 2.5.5** below for possible problems.

Table 2.5.5 SW Outlets

Problem (Check if Present)	Follow-Up Actions
☐ Outlet is obstructed with mulch, sediment, debris, trash, etc.	☐ Remove the debris and dispose of it where it cannot re-enter the swale. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Outlet is completely clogged or obstructed; there is too much material to remove by hand or with simple hand tools.

2.6. Tree Planting

Tree Planting Actions for Maintenance

Key actions to take for tree planting maintenance include the following:

- TP1. Watering
- TP2. Mulch
- TP3. Pruning
- TP4. Disease or pests

Note: This is a simple, “non-structural” practice and, as such, maintenance tasks are similar to any landscape maintenance. Tree planting can involve individual trees or more, such as reforesting a riparian buffer.

For this type of practice, inspection is part of maintenance to check on the health of the trees.

Figure 2.6.1. Key Areas for Inspection and Maintenance for Tree Planting

Tree Planting Level 1 Inspection

The Level 1 Inspection goes hand in hand with active maintenance and includes watering (TP1), mulching (TP2), and Pruning (TP3). Watering should occur during the growing season. Mulching and pruning occurs once a year in the spring and early spring, respectively.

TP 1. Watering

Description: Proper water management is perhaps the most crucial maintenance activity to ensure survival of newly planted trees. Watering is essential during periods of drought, while over watering can be fatal. Watering options include regular or soaker hoses, sprinklers, buckets, drip irrigation, or installation of larger capacity watering tanks for irrigation systems. Consult the maintenance plan for instructions on the timing, volume, and method of watering that is appropriate for the specific species of trees.

Instruction: Inspect the trees to determine whether they need watering. Consult **Table 2.6.1** below.

Table 2.6.1 TP Watering

Problem (Check if Present)	Follow-Up Actions
☐ Soil is not moist to the touch and/or it has not rained in a week, and leaves/needles are starting to appear wilted/dry.	☐ Water trees deeply and slowly near the base. Soaker hoses and drip irrigation work best for deep watering of trees and shrubs. ☐ Other:

TP 2. Mulch

Description: Mulching is a common method of weed control and moisture retention. Organic mulch should be spread over the soil surface and extend out to a radius of 5 feet or the tree drip line, whichever is less. Slowly decomposing organic mulches, such as shredded bark, compost, leaf mulch, or wood chips provide many added benefits for trees. Mulch that contains a combination of chips, leaves, bark and twigs is ideal for reforestation sites. Consult the maintenance plan for instructions on the timing, depth, and type of mulch application needed for the specific species of trees present.

Instruction: Mulch should be applied twice per year—in the late spring and during leaf fall. Consult the table below for possible problems. Check the depth of mulch regularly. Rake the old mulch to break up any matted layers and to refresh the appearance. Consult **Table 2.6.2** below.

Table 2.6.2 TP Mulch

Problem (Check if Present)	Follow-Up Actions
☐ Mulch is too thin or thick (should be approximately 3" deep) or does not extend to tree canopy (or 5' radius if tree has a larger than 10' canopy reach).	☐ Add or remove mulch around tree canopy to maximum 5' radius but not within 3" of the bark. ☐ If mulch is against the stems or tree trunks, pull it back several inches to expose the base of the trunk and root crown. ☐ Other:

TP 3. Pruning

Description: Pruning is usually not needed for newly planted trees but may be beneficial for tree structure in older trees. If necessary, prune only dead, diseased, broken or crossing branches at planting. As the tree grows, lower branches may be pruned to provide clearance above the ground or to remove dead or damaged limbs that sprout from the trunk.

- Instruction: Examine the branches and tree shape. Consult Table 2.6.3 below for possible problems.

Table 2.6.3 TP Pruning

Problem (Check if Present)	Follow-Up Actions
☐ Presence of suckers, dead or diseased branches, branches that interfere with pedestrian traffic	☐ Selective cutting ☐ Prune to make the tree more aesthetically pleasing and remove disease. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Use an arborist or landscaper for more extensive pruning jobs.

2.7. Bioretention

Areas of Bioretention

Key areas to inspect for Bioretention include the following:

- BR 1. Drainage Area
- BR 2. Inlets
- BR 3. Bioretention Ponding Area
- BR 4. Vegetation
- BR 5. Outlets

Figure 2.7.1. Key Areas for Level 1 Inspection of Bioretention

Note: The category of Bioretention includes:

- Bioretention cells – areas of soil, mulch, and vegetation that treat runoff
- Dry swales – long, linear bioretention cells, sometimes with check dams along a mildly sloping swale
- Rain gardens – usually small-scale bioretention practices on residential or small commercial properties
- Stormwater planters – usually in more urban settings, with soil and plants in a concrete box that receives roof runoff or perhaps other water from the site
- Tree pits – also a more urban practice where the bioretention is confined within some sort of box (e.g., concrete) and places along road curbs or other areas to treat runoff

For the purposes of this chapter, the term “Bioretention cell” will be used to generally describe these practices.

Bioretention Level 1 Inspection

The Level 1 Inspection focuses on the Drainage Area (BR1), Inlets (BR2), Bioretention Ponding Area (BR3), Vegetation (BR4), and Outlets (BR5). This inspection should be conducted on a regular basis, with an early spring inspection to ensure that the practice has survived the winter, particularly if there has been a significant amount of snow. An inspection during the growing season or in the early fall is also recommended to check on the health of vegetation.

BR 1. Drainage Area

Description: The drainage area sends runoff to and is uphill from the Bioretention cell. When it rains, water runs off and flows to the Bioretention cell and ponds within the cell temporarily (usually for no more than 48 hours). Sometimes, the runoff will contain dirt, grit, grass clippings, oil, or other substances that SHOULD NOT be directed to the Bioretention area.

Instruction: Look for areas that are uphill from the Bioretention cell. Consult **Table 2.7.1** below.

Table 2.7.1 BR Drainage Area

Problem (Check if Present)	Follow-Up Actions
 ☐ Bare soil, erosion of the ground (rills washing out the dirt)	☐ Seed and mulch areas of bare soil to establish vegetation. ☐ Fill in erosion areas with soil, compact, and seed and straw to establish vegetation. ☐ If a rill or small channel is forming, try to redirect water flowing to this area by creating a small berm or adding topsoil to areas that are heavily compacted. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Large areas of soil have been eroded, or larger channels are forming. May require rerouting of flow paths.
 ☐ Piles of grass clippings, mulch, dirt, salt, or other materials	☐ Remove or cover piles of grass clippings, mulch, dirt, etc. ☐ Other:
 ☐ Open containers of oil, grease, paint, or other substances	☐ Cover or properly dispose of materials; consult your local solid waste authority for guidance on materials that may be toxic or hazardous. ☐ Other:

BR 2. Inlets

Description: The inlets to a Bioretention cell are where water flows into the cell. Depending on the design, water can flow in through:

- Curb cuts or openings in a parking lot or roadway
- Pipes or ditches that carry water into the Bioretention cell from the drainage area
- Flow directly over the land surface (known as “sheetflow”), sometimes across a strip of rock or stone

Curb cut – flow enter through defined place in curb

Curb cut

Gravel diaphragm – flow enters as sheetflow and is evenly distributed across length of practice

Grass filter strip: accepts sheet flow from the parking lot

Figure 2.7.2 Bioretention Cell Inlets

CSN, 2013

Instruction: Stand in the Bioretention cell itself and look for all the places where water flows in. Often there will be multiple points of inflow to the practice. Consult **Table 2.7.2** below for possible problems.

Table 2.7.2 BR Inlets

Problem (Check if Present)	**Follow-Up Actions**
 ☐ Inlets collect grit and debris or grass/weeds. Some water may not be getting into the Bioretention cell. The objective is to have a clear pathway for water to flow into the cell.	☐ Use a flat shovel to remove grit and debris (especially at curb inlets or openings). Parking lots generate fine grit that will accumulate at these spots. ☐ Pull out clumps of growing grass or weeds and scoop out the soil or grit that the plants are growing in. ☐ Remove any grass clippings, leaves, sticks, and other debris that is collecting at inlets. ☐ For pipes and ditches, remove sediment and debris that is partially blocking the pipe or ditch opening where it enters the Bioretention cell. ☐ Dispose of all material properly where it will not re-enter the Bioretention cell. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Inlets are blocked to the extent that most of the water does not seem to be entering the Bioretention cell.
 ☐ Some or all of the inlets are eroding so that rills, gullies, and other erosion is present, or there is bare dirt that is washing into the Bioretention cell.	☐ For small areas of erosion, smooth out the eroded part and apply rock or stone (e.g., river cobble) to prevent further erosion. Usually, filter fabric is placed under the rock or stone. ☐ In some cases, reseeding and applying erosion-control matting can be used to prevent further erosion. Some of these materials may be available at a garden center, but it may be best to consult a landscape contractor. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Erosion is occurring at most of the inlets, and it looks like there is too much water that is concentrating at these points. The inlet design may have to be modified.

BR 3. Bioretention Ponding Area

Description: The ponding area fills up with water during a rainstorm. If you picture the Bioretention cell as a bathtub, there is the *bottom* (usually flat surface), *side slopes* (areas that slope down to the bottom from the surrounding ground), and *berms or structures that control the depth to which water ponds.*

Instruction: Examine the entire Bioretention surface and side slopes. Consult the table below for possible problems.

Table 2.7.3 BR Ponding Area

Problem (Check if Present)	**Follow-Up Actions**
 ☐ Mulch (if used) needs to be replaced or replenished. The mulch layer had decomposed or is less than 1-inch thick.	☐ Add new mulch to a total depth (including any existing mulch that is left) of 2 to 3 inches. The mulch should be shredded hardwood mulch that is less likely to float away during rainstorms. ☐ Avoid adding too much mulch so that inlets are obstructed or certain areas become higher than the rest of the Bioretention surface. ☐ Other:
 ☐ Minor areas of sediment, grit, trash, or other debris are accumulating on the bottom.	☐ Use a shovel to scoop out minor areas of sediment or grit, especially in the spring after winter sanding materials may wash in and accumulate. Dispose of the material where it cannot re-enter the Bioretention cell. ☐ If removing the material creates a hole or low area, fill with soil mix that matches original mix and cover with mulch so that the Bioretention surface area is as flat as possible. ☐ Remove trash, vegetative debris, and other undesirable materials. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Sediment has accumulated more than 2-inches deep and covers 25% or more of the Bioretention surface. ☐ Kick-Out to Level 2 Inspection: The Bioretention cell is too densely vegetated to assess sediment accumulation or ponding; see BR-4, Vegetation.

 ☐ There is erosion in the bottom or on the side slopes. Water seems to be carving out rills as it flows across the Bioretention surface or on the slopes, or sinkholes are forming in certain areas. ☐ Source: Stormwater Maintenance, LLC.	☐ Try filling the eroded areas with clean topsoil or sand, and cover with mulch. ☐ If the problem recurs, you may have to use stone (e.g., river cobble) to fill in problem areas. ☐ If the erosion is on a side slope, fill with clay that can be compacted and seed and mulch the area. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: The problem persists or the erosion is more than 3-inches deep and seems to be an issue with how water enters and moves through the Bioretention cell. ☐ Kick-Out to Level 2 Inspection: The problem does not seem to be caused by flowing water, but a collapse or sinking of the surface (e.g., “sinkhole”) due to some underground problem.
 ☐ The bottom of the Bioretention cell is not flat, and the water pools at one end, along an edge, or in certain pockets. The whole bottom is not uniformly covered with water. See design plan to verify that Bioretention surface is intended to be flat. Check during or immediately after a rainstorm.	☐ If the problem is minor (just small, isolated areas are not covered with water), try raking the surface OR adding mulch to low spots to create a more level surface. You may need to remove and replace plantings in order to properly even off the surface. ☐ Check the surface with a string and bubble level to get the surface as flat as possible. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Ponding water is isolated to less than half of the Bioretention surface area, and there seem to be elevation differences of more than a couple of inches across the surface.
 ☐ Water stands on the surface more than 72 hours after a rainstorm and /or wetland-type vegetation is present. The Bioretention cell does not appear to be draining properly.	☐ Kick-Out to Level 2 Inspection: This is generally a serious problem, and it will be necessary to activate a Level 2 Inspection.

BR 4. Vegetation

Description: The health of vegetation within the Bioretention cell is perhaps the most critical maintenance item for the property owner or responsible party. Many Bioretention cells become overgrown, and “desirable” vegetation becomes choked out by weeds and invasive plants. It is important to know what the Bioretention cell is supposed to look like and what plants seem to be thriving or doing poorly. Periodic maintenance of vegetation will prevent larger problems that are more difficult and costly to manage.

Instruction: Examine all Bioretention cell vegetation. Consult the table below for possible problems.

Table 2.7.4 BR Vegetation

Problem (Check if Present)	**Follow-Up Actions**
 ☐ Vegetation requires regular maintenance—pulling weeds, removing dead and diseased plants, replacing mulch around plants, adding plants to fill in areas that are not well vegetated, etc.	☐ If you can identify which plants are weeds or not intended to be part of the planting plan, eliminate these, preferably by hand pulling. ☐ If weeds are widespread, check with the local stormwater authority and/or Extension Office about proper use of herbicides for areas connected with the flow of water. ☐ Even vegetation that is intended to be present can become large, overgrown, and/or crowd out surrounding plants. Prune and thin accordingly. ☐ If weeds or invasive plants have overtaken the whole Bioretention cell, bush-hog the entire area before seedheads form in the spring. It will be necessary to remove the root mat manually or with appropriate herbicides, as noted above. ☐ Re-plant with species that are aesthetically pleasing and seem to be doing well in the Bioretention cell. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: You are unsure of the original planting design, or the vegetation maintenance task is beyond your capabilities of time, expertise, or resources. If you are unsure of the health of the vegetation (e.g. salt damage, invasives, which plants are undesirable) or the appropriate season to conduct vegetation management, consult a landscape professional before undertaking any cutting, pruning, mowing, or brush hogging.
 ☐ Vegetation is too thin, is not healthy, and there are many spots that are not well vegetated.	☐ The original plants are likely not suited for the actual conditions within the Bioretention cell. If you are knowledgeable about plants, select and plant more appropriate vegetation (preferably native plants) so that almost the entire surface area will be covered by the end of the second growing season. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: For all but small practices (e.g., rain gardens), this task will likely require a landscape design professional or horticulturalist.

BR 5. Outlets

Description: Outlets are where water leaves the Bioretention cell when there is too much ponded water. There are various ways that outlets are configured. They can be a yard drain type of structure in the Bioretention cell itself or a rock weir where water flows during large storms. Many Bioretention practices have an underdrain, which is like a French drain, that helps the Bioretention cell drain properly after storms. The underdrain pipe may “daylight” (come to the ground surface) at some point downhill from the Bioretention cell.

Instruction: Examine outlets that release water out of the Bioretention cell. Consult the table below for possible problems.

Table 2.7.5 BR Outlets

Problem (Check if Present)	Follow-Up Actions
☐ Erosion at outlet	☐ Add stone to reduce the impact from the water flowing out of the outlet pipe or weir during storms. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Rills have formed and erosion problem becomes more severe.
 ☐ Outlet obstructed with mulch, sediment, debris, trash, etc.	☐ Remove the debris and dispose of it where it cannot re-enter the Bioretention cell. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Outlet is completely clogged or obstructed; there is too much material to remove by hand or with simple hand tools.

2.8. Green Roof

Areas of the Green Roof

Key areas to inspect for green roofs include the following:

GR 1. Vegetation and Surface
GR 2. Overflows and Drains

Note: Green Roofs consist of green infrastructure practices applied on rooftops, wherein stormwater is filtered through a vegetated planting bed. Green Roofs are a unique practice in that they are often covered by a professional ongoing maintenance contract, and their design is highly variable depending on the specific product. This section highlights some key inspection items.

Figure 2.8.1. Key Areas for Level 1 Inspection of Green Roof

Green Roof Level 1 Inspection

The Level 1 Inspection focuses on the Vegetation (GR1), Overflows and Drains (GR2), and the Surface and Soil Medium (GR3). This inspection should be conducted on a regular basis, with an early spring inspection to ensure that the practice has survived the winter, particularly if there has been a cold year.

On a routine basis, the Level 1 Inspector should also ensure that the vegetation is surviving any harsh roof conditions, particularly during dry periods.

GR 1. Vegetation and Surface

Description: The green roof vegetation usually consists of succulent plants, such as sedums, and should form a dense cover over the course of several growing seasons.

Instruction: Visually inspect the surface and vegetation of the practice. Consult **Table 2.8.1** below:

Table 2.8.1 GR Vegetation and Surface

Problem (Check if Present)	**Follow-Up Actions**
☐ Wilting or nutrient-deprived vegetation; bare areas developing on the roof	☐ Water or irrigate. ☐ Prune or remove dead or dying vegetation. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Greater than 20% plant dieoff or wilting, even after rainy periods. May require new vegetation or indicate a problem with the soil medium. ☐ Kick-Out to Level 2 Inspection: Yellowing vegetation may indicate a need for fertilizer, but do not fertilize unless explicitly included in the management plan or with a Level 2 Inspection. ☐ Kick-Out to Level 2 Inspection: Bare areas with no vegetation growing. These may become weed problems in the future.
 ☐ Weeds or moss	☐ Remove weeds by hand. ☐ Apply lime to kill moss. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Weeds cover more than 25% of the surface, or the original planting plan has been compromised.
☐ Ponding between storm events	☐ Kick-Out to Level 2 Inspection: Surface ponding more than 24 hours after a storm event presents a hazard and needs to be addressed immediately.

GR 2. Overflows and Drains

Description: Green roofs typically drain through a network of underdrains to outlet at roof drainage infrastructure. These drainage structures need to be inspected and cleaned periodically to ensure that the medium drains properly.

Instruction: Review the specific maintenance plan for this practice to determine where inspection ports are. Remove the cover and inspect the port.

Table 2.8.2 GR Overflows and Drains

Problem (Check if Present)	Follow-Up Actions
☐ Inspection port for roof drainage (can be clogged with debris)	☐ Remove debris by hand or flush through with a hose. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Debris cannot be removed, or it appears that debris has accumulated in the underdrains.
☐ Damage to other roof drainage structures (e.g., roof scuppers)	☐ Call contractor or individual in charge of regular building maintenance. This is a building maintenance issue. ☐ Other:

2.9. Permeable Pavement

Areas of Permeable Pavement

Key areas to inspect for permeable pavement include the following:

- PP1. Drainage Area
- PP2. Pavement Surface

Note: Permeable pavements include several materials, including porous asphalt materials, which appear similar to an asphalt parking lot, permeable concrete, and “interlocking concrete pavers,” which are individual paving blocks. References to removing and replacing individual blocks of pavement refer only to this last category.

Figure 2.9.1. Key Areas for Level 1 Inspection of Permeable Pavement

Permeable Pavement Level 1 Inspection

The Level 1 Inspection focuses on the Drainage Area (PP1) and the Pavement Surface (PP2). This inspection should be conducted on a regular basis, with an early spring inspection to ensure that the practice has survived the winter, particularly if there has been a significant amount of snow.

On a routine basis, the Level 1 Inspector should also ensure that the pavement area and its drainage are properly managed. Some key activities to avoid include:

1. Applying sand during winter months
2. Certain types of permeable pavement should not be plowed with steel-bladed plows.
3. Poor management of dumpsters
4. Storing or placing dirt, grit, mulch, sand, or other similar materials on or near the pavement surface

PP 1. Drainage Area

Description: The drainage area sends runoff to the Permeable pavement area and is uphill from the Permeable pavement. When it rains, water runs off and flows to the Permeable pavement area, and it may pond there temporarily.

Instruction: Look for areas that are uphill from the Permeable pavement. Consult **Table 2.9.1** below:

Table 2.9.1 PP Drainage Area

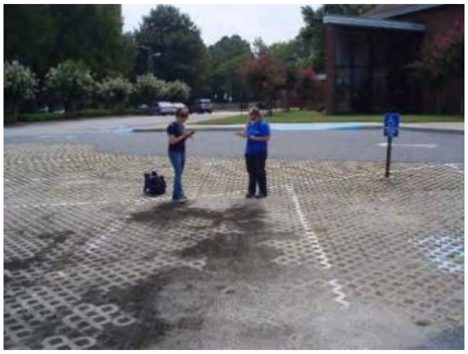
Problem (Check if Present)		**Follow-Up Actions**
 04 11 2011	☐ Bare soil, erosion of the ground (rills washing out the dirt)	☐ Seed and straw areas of bare soil to establish vegetation. ☐ Fill in erosion areas with soil, compact, and seed and straw to establish vegetation. ☐ If a rill or small channel is forming, try to redirect water flowing to this area by creating a small berm or adding topsoil to areas that are heavily compacted. ☐ Other:
		☐ Kick-Out to Level 2 Inspection: Large areas of soil have been eroded, or larger channels are forming. May require rerouting of flow paths.
	☐ Piles of grass clippings, mulch, dirt, salt, or other materials	☐ Remove or cover piles of grass clippings, mulch, dirt, etc. ☐ Other:
	☐ Open containers of oil, grease, paint, or other substances	☐ Cover or properly dispose of materials; consult your local solid waste authority for guidance on materials that may be toxic or hazardous. ☐ Other:

PP 2. Permeable Pavement Surface

Description: The surface of the Permeable pavement should be relatively clean (not a lot of dirt and grit on the surface), free of cracks and broken pavement, and should NOT hold water after a rainstorm for more than a few hours.

Instruction: Examine the entire permeable pavement surface. Consult **Table 2.9.2** below for possible problems.

Table 2.9.2 PP Surface

Problem (Check if Present)	Follow-Up Actions
 ☐ Dirt and grit accumulating on pavement surface	☐ For small areas (e.g., driveways, patios), try a leaf blower or sweep the area to remove the dirt/grit from the Permeable pavement and properly dispose of the material. ☐ If dirt/grit remain in the joint areas between paver blocks, agitate with a rough brush and vacuum the surface with a wet/dry vac. ☐ Remove and replace clogged blocks in segmented pavers. ☐ For larger areas (e.g., parking lots, courtyards), hire a vacuum sweeper to restore the surface to a cleaner condition. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Grit is widespread and cannot be removed by manual sweeping.
 ☐ Grass and weeds are growing on the permeable pavement surface (applies only to pavement types that are not intended to be covered in vegetation).	☐ If paver type is not intended to be covered in vegetation, remove the grass/weeds either mechanically (pulling, by hand or with a flame weeder) or with a herbicide approved for use in or near water (consult your local Extension Office for suggestions). ☐ Follow the actions listed above for removing dirt/grit from the pavement surface. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Grass/weeds cover more than 25% of surface area.
 ☐ Slumping, sinking, cracking, or breaking of the pavement surface *(Source: CSN, 2013)*	☐ For small areas (e.g., patios, small driveway), it may be possible to remove the damaged pavers, check and fill in the underlying gravel, and replace with new materials. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Problem affects more than a small, isolated area. Will typically require a qualified contractor to fix it. ☐ Problem recurs or occurs in multiple small locations.
 ☐ Water stands on Permeable pavement for days after a rainstorm; the Permeable pavement is clogged and doesn't let water through. *(Source: CSN, 2013)*	☐ Kick-Out to Level 2 Inspection: This is generally a serious problem, and it will be necessary to activate a Level 2 Inspection.

2.10. Ponds and Wetlands

Areas of Ponds and Wetlands

Key areas to inspect for ponds and wetlands include the following:

- PO 1. Drainage area
- PO 2. Inlet pipes and swales
- PO 3. Pond area and embankments
- PO 4. Pond outlet

Note: This category includes the following practices:

- *Wet ponds* – have a permanent pool of water and may be divided into various "cells"
- *Stormwater wetlands* – have a variety of depth zones ranging from deep pools to shallow wetlands and are characterized by wetland vegetation

It is recommended strongly to have as-built drawings and copies of previous inspections at hand, if available. Aerial photos may be needed to help direct the inspector to the pond or wetland location if it is obscured by vegetation.

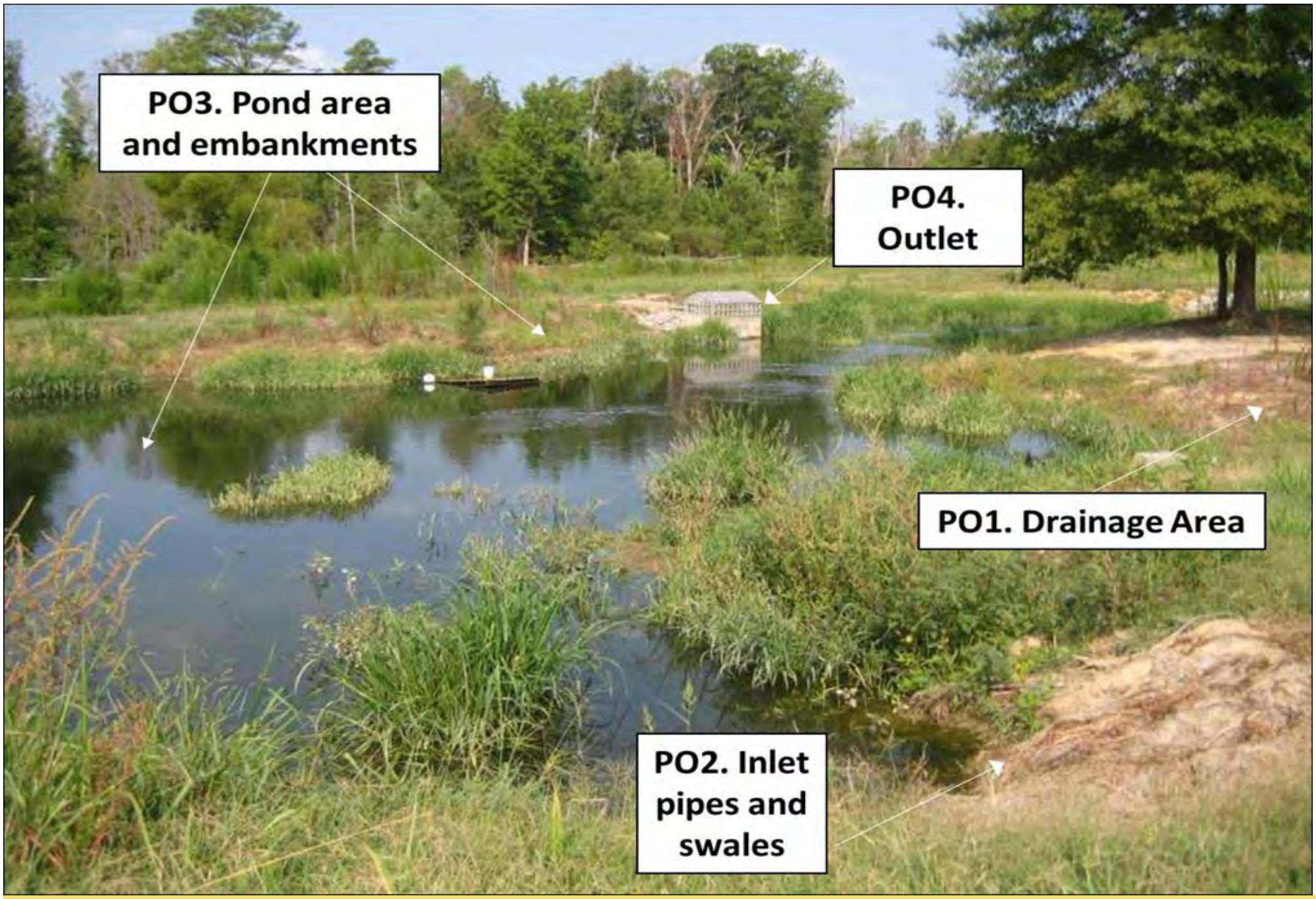


Figure 2.10.1. Key Areas for Level 1 Inspection of a Pond/Wetland

Pond and Wetland Level 1 Inspection

The Level 1 Inspection focuses on the drainage area (PW 1), inlet pipes or swales (PW 2), pond area and embankments (PW 3) and pond outlet structures and outfall (PW 4). This inspection should be conducted on a regular basis to ensure that a buildup of trash, vegetation, or sediment does not interfere with the pre-treatment, pond or wetland, and the outfall's normal flow or function. Pond embankments and dams should be regularly inspected for evidence of erosion, burrowing or tunneling animals, and large woody vegetation growing on the dam.

PW 1. Drainage Area

Description: The drainage area conveys runoff to and is uphill from the pond inlet. When it rains, water runs off through roof drains, yard drains, parking lots, roadways and underdrains to the ponds. Flow is through underground piping systems, overland via swales, or across the ground as sheetflow. Sometimes, the runoff will contain dirt, grit, grass clippings, leaves and woody debris that can collect in the drainage system. If left alone, blockages can occur and increase the chance of shallow flooding or standing water. Standing water in drainage systems foster mosquitos, pipe corrosion, and possible nuisance and odor conditions.

Instruction: Look for areas that are uphill from the pond. Consult **Table 2.10.1** below:

Table 2.10.1 PW Drainage Area

Problem (Check if Present)	Follow-Up Actions
☐ Bare soil, erosion of the ground (rills washing out the dirt)	☐ Seed and straw areas of bare soil to establish vegetation. ☐ Fill in eroded areas with soil, compact, seed and mulch with straw to establish vegetation. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: If a rill or small channel is forming, try to redirect water flowing to this area by creating a small berm or adding topsoil to areas that are heavily compacted. ☐ If large areas of soil have been eroded or larger channels are forming, this may require rerouting of flow paths or use of an erosion-control seed mat or blanket to reestablish acceptable ground cover or anchor sod where it is practical.
 ☐ Piles of grass clippings, mulch, dirt, salt, or other materials	☐ Remove or cover piles of grass clippings, mulch, dirt, etc. ☐ Remove excessive vegetation or woody debris that can block drainage systems. ☐ Other:
 ☐ Open containers of oil, grease, paint, or other substances exposed to rain in the drainage area	☐ Cover or properly dispose of materials; consult your local solid waste authority for guidance on materials that may be toxic or hazardous. ☐ Other:

PW 2. Pond Inlets

Description: Free, unobstructed flow from the drainage area to stormwater ponds is necessary to prevent shallow flooding and even structural damage from flooding. Pond inlets can consist of pipes, ditches, swales, or other means to convey stormwater to the pond or wetland.

Instruction: Look for all areas where water flows into the pond during storms. Note that there may be multiple points of inflow and types of structures (e.g., pipes, open ditches, etc.). Consult **Table 2.10.2** below:

Table 2.10.2 Pond Inlets

Problem (Check if Present)		**Follow-Up Actions**
 	☐ Inlets are buried, covered or filled with silt, debris, or trash, or blocked by excessive vegetation.	☐ If the problem can be remedied with hand tools and done in a safe manner, remove vegetation, trash, woody debris, etc. from blocking inlet structures. ☐ Other:
		☐ Kick-Out to Level 2 or 3 Inspection: If the amount of material is too large to handle OR there are ANY safety concerns about working in standing water, soft sediment, etc., the work will likely have to be performed by a qualified contractor.
	☐ Inlets are broken, and, with pieces of pipe or concrete falling into the pond, there is erosion around the inlet, there is open space under the pipe, or there is erosion where the inlet meets the pond	☐ Kick-Out to Level 2 Inspection: These types of structural or erosion problems are more serious and will require a qualified contractor to repair.

PW 3. Pond Area and Embankments

Description: The pond area and embankment can consist of the following elements:

- Pre-treatment cell or small holding area where water first flows into the pond from the various inlets. These are commonly referred to as “forebays” and will be demarcated from the main pond area by small dams made of earth or rock. The purpose of forebays is to capture some of the sediment and pollutants before they reach the deep pool, making maintenance easier over time. Not all ponds will have forebays.
- The pond surface can be open water or a combination of open water and areas with wetland vegetation. Sometimes there is a shallow bench around the perimeter of a pond, known as an “aquatic bench.”
- The “side slopes” are areas around the perimeter of the pond where the surrounding land slopes down to the pond surface.
- Most ponds will have a “riser structure,” where the water exits a pond during storms. This can be a concrete or metal pipe that is open at the top, often with some type of trash rack. Some ponds also have an “emergency spillway,” which is an open, rock-lined channel that carries water from large storms safely across the embankment.
- The dam or embankment holds water in the pond and is constructed of compacted soil, such as clay. There is often a pipe through the embankment that carries water from the riser structure safely through the embankment to the downstream channel.

The pond’s pre-treatment areas or forebays should not be choked with vegetation or full of sediment. Removal of excessive vegetation and sediment and selective replanting are often annual maintenance activities.

Likewise, the pond’s deep pool should not to be choked with vegetation or filled with sediment. Vegetation and sediment bars can restrict flow and cause short circuiting that reduces capture of sediment. Pond volume is to be maintained at the original design capacity and free of sediment bars or debris piles. Sometimes ponds are over-maintained and have no vegetation. Algae and turbidity (muddy water) are common problems in many ponds.

Instruction: Examine both interior and exterior pond banks as well as the pond body. Observe from the inlet pipes to the outfall structure and emergency overflow.

Table 2.10.3 PW Pond Area and Embankments

Problem (Check if Present)		**Follow-Up Actions**
	☐ The pretreatment area(s) or forebay(s) are filled with sediment, trash, vegetation, or other debris.	☐ If the problem can be remedied with hand tools and done in a safe manner, use a flat shovel or other equipment to remove small amounts of sediment. ☐ Remove trash and excessive vegetation from forebays if this can be done in a safe manner. ☐ Other:
		☐ Kick-Out to Level 2 Inspection: Large amounts of sediment or debris will have to be removed by a qualified contractor. ANY condition that poses a safety concern for working in standing water or soft sediments should be referred to a Level 2 Inspection or qualified contractor.

Table 2.10.3 PW Pond Area and Embankments

Problem (Check if Present)		**Follow-Up Actions**
	☐ The pond area itself has accumulated sediment, trash, debris, or excessive vegetation that is choking the flow of the water, OR the pond area is covered with algae or aquatic plants.	☐ Level 1 includes handling only small amounts of material that can be removed by hand, or with rakes or other hand tools. Do not attempt any repair that poses a safety issue. ☐ Other:
		☐ Kick-Out to Level 2 Inspection: Most cases will call for a Level 2 Inspection and/or a qualified contractor. ☐ You are not sure what type and amount of vegetation is supposed to be in the pond. ☐ The algae or aquatic plants should be identified so that proper control techniques can be applied.
	☐ The side slopes of the pond are unstable, eroding, and have areas of bare dirt.	☐ If there are only minor areas, try filling in small rills or gullies with topsoil, compacting, and seeding and mulching all bare dirt areas with an appropriate seed. Alternatively, try using herbaceous plugs to get vegetation established in tricky areas, such as steep slopes. ☐ Other:
		☐ Kick-Out to Level 2 Inspection: Erosion and many bare dirt areas on steep side slopes will require a Level 2 Inspection and repair by a qualified contractor.
	☐ The riser structure is clogged with trash, debris, sediment, vegetation, etc., OR is open, unlocked, or has a steep drop and poses a safety concern. The pond level may have dropped below its "normal" level.	☐ If you can safely access the riser on foot or with a small boat, clear minor amounts of debris and remove it from the pond area for safe disposal. ☐ Other:
		☐ Kick-Out to Level 2 Inspection: The riser cannot be accessed safely, the amount of debris is substantial, or the riser seems to be completely clogged and the water level has risen too high. ☐ There are safety issues with the riser and concern about access to pipes, drops, or any other life safety concern. ☐ The riser is leaning, broken, settling or slumping, corroded, eroded or any other structural problem.

Table 2.10.3 PW Pond Area and Embankments

Problem (Check if Present)		Follow-Up Actions
 08/11/2009	☐ The dam/embankment is slumping, sinking, settling, eroding, or has medium or large trees growing on it.	☐ If there are small isolated areas, try to fix them by adding clean material (clay and topsoil) and seeding and mulching. ☐ Periodically mow embankments to enable inspection of the banks and to minimize establishment of woody vegetation. ☐ Remove any woody vegetation that has already established on embankments. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Most of these situations will require a Level 2 Inspection or evaluation and repair by a qualified contractor. Seepage through the dam or problems with the pipe through the dam can be a serious issue that should be addressed to avoid possible dam failure.
	☐ The emergency spillway or outfall (if it exists) has ☐ erosion, settlement, or loss of material. Rock-lined spillways have excessive debris or vegetation.	☐ Clear light debris and vegetation. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Displacement of rock lining, excessive vegetation and erosion/settlement may warrant review and decision by Level 2 Inspector to check against original plan. ☐ Any uncertainty about the integrity of the emergency spillway should be referred to a Level 2 Inspector. ☐ Erosion or settlement such that design has been compromised should be reviewed by an engineer.

PW 4. Pond Outlet

Description: The pond's outlet enables the ponded water to discharge to downstream drainage systems or stream channels. The outlet is often at the base of the dam/embankment on the downstream side. Inspection of this point can help prevent flooding of the pond and upstream drainage systems and prevent pond failure at a weak point of a pond's containment system.

Instruction: Examine the outlet of the pipe on the downstream side of the dam/embankment where it empties into a stream, channel, or drainage system. Consult the table below for possible problems.

Table 2.10.4 PW Pond Outlet

Problem (Check if Present)	Follow-Up Actions
 ☐ The pond outlet is clogged with sediment, trash, debris, vegetation, or is eroding, caving in, slumping, or falling apart.	☐ If there is a minor blockage, remove the debris or vegetation to allow free flow of water. ☐ Remove any accumulated trash at the outlet. ☐ Outlet:
	☐ Kick-Out to Level 2 Inspection: ☐ If the area at the outlet cannot be easily accessed or if the blockage is substantial, a Level 2 Inspection is warranted. ☐ Erosion at and downstream of the outfall should be evaluated by a qualified professional. ☐ Any structural problems, such as broken pipes, structures falling into the stream, or holes or tunnels around the outfall pipe, should be evaluated by a Level 2 Inspector and will require repair by a qualified contractor. ☐ The pool of water at the outlet pipe is discolored, has an odor, or has excessive algae or vegetative growth.

2.11. Infiltration

Areas of Infiltration

Key areas to inspect for Infiltration include the following:

- IN 1. Drainage Area
- IN 2. Inlets
- IN 3. Infiltration Area
- IN 4. Outlets

Note: The category of Infiltration includes:

- Infiltration Trench – Long, narrow infiltration practice, usually with small gravel at the surface and a reservoir of larger gravel or stone beneath
- Infiltration Basin – Larger practice, usually covered with grass and highly permeable soil beneath
- Dry Well – Small pit filled with stone or gravel, or precast concrete chamber surrounded by stone that receives and stores runoff to enable it to infiltrate into the underlying ground.

Figure 2.11.1 Key Areas for Level 1 Inspection of Infiltration Practice

Infiltration Level 1 Inspection

The Level 1 Inspection focuses on the Drainage Area (IN1), Inlets (IN2), Infiltration Area (IN3), and Outlets (IN4). The purpose of an infiltration practice is to temporarily store collected runoff so that it can percolate into the underlying soil. Using this practice is dependent on having a good on-site soil that is capable of infiltrating the amount of runoff generated by the drainage area. The Level 1 Inspection should be conducted at least twice a year, especially in early spring, to ensure that the practice has survived the winter, particularly if there has been a significant amount of snow.

IN 1. Drainage Area

Description: The drainage area conveys runoff to and is uphill from the Infiltration cell. When it rains, water runs off and flows to the Infiltration cell and soaks into its underlying layers.

Instruction: Look for both pervious and impervious areas that are uphill from the Infiltration cell. Consult **Table 11.1.1** below.

Table 11.1.1 IN Drainage Area

Problem (Check if Present)		**Follow-Up Actions**
	☐ Bare soil, erosion of the ground (rills washing out the dirt)	☐ Seed and straw areas of bare soil to establish vegetation. ☐ Fill in erosion areas with soil, compact, and seed and straw to get vegetation established. ☐ If a rill or small channel is forming, try to redirect water flowing to this area by creating a small berm or adding topsoil to areas that are heavily compacted. ☐ Other:
		☐ Kick-Out to Level 2 Inspection: Large areas of soil have been eroded, or larger channels are forming. May require rerouting of flow paths.
☐ For Dry Wells: Leaves, sticks, or other debris in gutters and downspouts		☐ Remove all debris by hand. ☐ Other:
	☐ Piles of grass clippings, mulch, dirt, salt, or other materials	☐ Remove or cover piles of grass clippings, mulch, dirt, etc. ☐ Other:
	☐ Open containers of oil, grease, paint, or other substances	☐ Cover or properly dispose of materials; consult your local solid waste authority for guidance on materials that may be toxic or hazardous. ☐ Other:

IN 2. Inlets

Description: The inlets to an Infiltration practice are where water flows into the cell. Depending on the design, inlets can be:

- *Curb cuts or openings* in a parking lot or roadway
- *Downspouts* that deliver runoff directly from a rooftop to the Infiltration practice
- *Pipes or ditches* that carry water into the Infiltration practice from the drainage area
- *Flow directly over the land surface* (known as "sheetflow"), sometimes across a strip of rock or stone

Instruction: Look for all the places where water flows into the Infiltration practice. Consult **Table 11.1.2** below for possible problems.

Table 11.1.2 IN Inlets

Problem (Check if Present)	Follow-Up Actions
 ☐ Inlets are collecting grit and debris or grass/weeds are growing. Some water may not be getting into the Infiltration practice.	☐ Use a flat shovel to remove grit and debris (especially at curb inlets or openings). Parking lots generate fine grit that will accumulate at these spots. ☐ Pull out clumps of growing grass or weeds and scoop out the soil or grit that the plants are growing in. ☐ Remove any grass clippings, leaves, sticks, and other debris that is collecting at inlets. ☐ For pipes and ditches, remove sediment and debris that is partially blocking the pipe or ditch opening where it enters the Infiltration practice. ☐ Dispose of all material properly in an area where it will not re-enter the practice. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Inlets are blocked to the extent that most of the water does not seem to be entering the Infiltration practice.
☐ Some or all of the inlets are eroding so that rills, gullies, and other erosion is present, or there is bare dirt that is washing into the Infiltration practice.	☐ For small areas of erosion, smooth out the eroded part and apply rock or stone (e.g., river cobble) to prevent further erosion. Usually, filter fabric is placed under the rock or stone. ☐ In some cases, reseeding and applying erosion-control matting can be used to prevent further erosion. Some of these materials may be available at a garden center, but it may be best to consult a landscape contractor. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Erosion is occurring at most of the inlets and it looks like there is too much water that is concentrating at these points. The inlet design may have to be modified.

IN 3. Infiltration Area

Description: The infiltration area is the area that collects water and allows it to seep into the underlying soil. Some infiltration areas also have a vertical perforated pipe called an *observation well,* which is used to view the water level in the infiltration practice after a storm. If the infiltration practice is working properly, the water in the observation well should be completely drained down within 2 to 3 days of a storm. Depending on the design, the infiltration area can be covered with grass, gravel, or stone.

Instruction: Examine the surface of the infiltration area and the observation well. Consult **Table 11.1.3** below for possible problems. Note: The following Problem and Follow-Up Actions apply to infiltration practice pretreatment areas also.

Table 11.1.3 IN Infiltration Area

Problem (Check if Present)	Follow-Up Actions
 ☐ For grass-covered Infiltration practices: grass has grown very tall, *(Photo credit: Stormwater Maintenance, LLC)*	☐ Mow infiltration area at least twice per year. ☐ Other:
 ☐ For grass-covered Infiltration practices: sparse vegetation cover or bare spots	☐ Add topsoil (as needed), grass seed, straw, and water during the growing season to re-establish consistent grass coverage. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Sparse vegetation cover can be a sign that the infiltration area is not infiltrating at the proper rate and water is standing too long after a storm. The surface may be saturated or squishy, and the conditions do not enable grass to grow. This situation should be evaluated by a Level 2 Inspection and likely corrected by a qualified contractor.
☐ Minor areas of sediment, grit, trash, or other debris are accumulating on the surface.	☐ Use a shovel to scoop out minor areas of sediment or grit, especially in the spring after winter sanding materials may wash in and accumulate. Dispose of the material where it cannot re-enter the Infiltration practice. ☐ If removing the material creates a hole or low area, rake the surface smooth and level. ☐ Remove trash, debris, and other undesirable materials. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Sediment has accumulated more than 2-inches deep and covers 25% or more of the surface of the Infiltration area.

Table 11.1.3 IN Infiltration Area

Problem (Check if Present)	Follow-Up Actions
 ☐ There is erosion on the surface; water seems to be carving out rills as it flows across the surface of the Infiltration area or sinkholes are forming in certain areas.	☐ For minor areas of erosion, try filling the eroded areas with clean topsoil, sand, or stone (whatever the existing cover is). ☐ If the problem recurs, you may have to use larger stone (e.g., river cobble) to fill in problem areas. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: The problem persists or the erosion is more than 3-inches deep and seems to be an issue with how water enters and moves through the infiltration area. ☐ Kick-Out to Level 2 Inspection: The problem does not seem to be caused by flowing water but a collapse or sinking of the surface (e.g., "sinkhole") due to some underground problem.
 ☐ Observation well is damaged or cap is missing	☐ Kick-Out to Level 2 Inspection: Requires replacing pipes or caps.
 ☐ Water still visible in the observation well more than 72 hours after a rain storm. The Infiltration practice does not appear to be draining properly.	☐ Kick-Out to Level 2 Inspection: This is generally a serious problem, and it will be necessary to activate a Level 2 Inspection.

IN 4. Outlets

Description: Outlets are where water exits the surface of the infiltration area during larger storms when the underground infiltration reservoir fills up and the excess water needs somewhere to go. Note that not all infiltration practices will have an identifiable outlet if the design is for all the water to infiltrate into the ground. Outlets may be a berm, stone weir, or pipe.

Instruction: Locate and inspect all outlets. Consult **Table 2.11.4** below for possible problems.

Table 2.11.4 IN Outlets

Problem (Check if Present)	**Follow-Up Actions**
 ☐ Outlet obstructed with sediment, debris, trash, etc.	☐ Remove the debris and dispose of it where it cannot re-enter the infiltration area. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Outlet is completely obstructed; there is too much material to remove by hand or with simple hand tools.
☐ Rills or gullies are forming at outlet.	☐ For minor rills, fill in with soil, compact, and seed and straw to establish vegetation. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Rills are more than 2" to 3" deep and require more than just hand raking and re-seeding.

2.12. Sand and Organic Filters

Components of Sand and Organic Filters

Key areas to inspect for these types of practices include the following:

- SF 1. Drainage Area
- SF 2. Inlets and Pre-treatment
- SF 3. Filter Area

Note: The category of Sand and Organic Filters includes:

- Surface Sand Filters – Surface sand filters (Figure 2.12.1) have a sand layer and often an underdrain layer beneath. Water comes in on the surface.
- Underground Sand Filters – Sand filters can also be in an underground vault or concrete trench in a parking lot or near a building. These are typically accessed through manholes or heavy grates.

Figure 2.12.1. Key Areas for Level 1 Inspection of Sand and Organic Filters

- Underground Organic Filters – These are similar to underground sand filters but may also contain canisters of peat or other organic media that helps filter pollutants from runoff. These types of underground structures will be difficult for Level 1 Inspectors to inspect because they involve pulling off heavy manhole covers or grates. The Level 1 Inspection will focus on any evidence of clogging as observed from the surface.

Figure 2.12.2. Examples of underground filters: Left –Perimeter sand filter in a concrete box (photo shows the filter with the grate top off as the filter is being maintained). The right-hand side is a sedimentation chamber filled with water and the left-hand side is the sand filter chamber. Right –Underground vault filter with special organic filter media inside cartridges.

Sand and Organic Filter Level 1 Inspection

The Level 1 Inspection for Sand and Organic Filters focuses on the Drainage Area (SF1), Inlets (SF2), and Filter Area (SF3). The purpose of a filter practice is to temporarily store collected runoff and have it percolate through a filter media, such as sand, that filters pollutants before the water continues downstream. Most filters have an underdrain system (perforated pipe in a gravel layer) to let the water out of the filter once the filtration takes place. The Level 1 Inspection should be conducted at least annually, especially in early spring, to ensure that the practice has survived the winter, particularly if there has been a significant amount of snow.

SF 1. Drainage Area

Description: The drainage area conveys runoff to and is uphill from the filter.

Instruction: Look for both pervious and impervious areas that are uphill from the filter. Consult **Table 2.12.1** below.

Table 2.12.1 SF Drainage Area

Problem (Check if Present)	Follow-Up Actions
 ☐ Bare soil, erosion of the ground (rills washing out the dirt)	☐ Seed and straw areas of bare soil to get vegetation established. ☐ Fill in erosion areas with soil, compact, and seed and straw to establish vegetation. ☐ If a rill or small channel is forming, try to redirect water flowing to this area by creating a small berm or adding topsoil to areas that are heavily compacted. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Large areas of soil have been eroded, or larger channels are forming. May require rerouting of flow paths.
 ☐ Piles of grass clippings, mulch, dirt, salt, or other materials	☐ Remove or cover piles of grass clippings, mulch, dirt, etc. ☐ Other:
 ☐ Open containers of oil, grease, paint, or other substances	☐ Cover or properly dispose of materials; consult your local solid waste authority for guidance on materials that may be toxic or hazardous. ☐ Other:

SF 2. Inlets

Description: The inlets to a filter are where water flows into the filter. Depending on the design, inlets can be:

- Curb cuts or inlets in a parking lot or roadway
- Downspouts that deliver runoff directly from a rooftop to the filter
- Pipes or ditches that carry water into the filter from the drainage area
- Flow directly over the land surface (known as “sheetflow”)

Above-ground filters can have any of the above. Underground filters most likely have curb inlets or flow directly into a grate that is part of the filter itself (see left-hand side of perimeter sand filter shown in **Figure 2.12.3**).

Figure 2.12.3. Key Areas for Level 1 Inspection of Sand and Organic Filters

Instruction: Look for all the places where water flows into the filter practice. Consult **Table 2.12.2** below for possible problems.

Table 2.12.2 SF Inlets

Problem (Check if Present)		**Follow-Up Actions**
	☐ Inlets are collecting grit and debris or grass/weeds growing. Some water may not be getting into the filter practice.	☐ Use a flat shovel to remove grit and debris (especially at curb inlets or openings). Parking lots generate fine grit that accumulates at these spots. ☐ Pull out clumps of growing grass or weeds and scoop out the soil or grit that the plants are growing in. ☐ Remove any grass clippings, leaves, sticks, and other debris that is collecting at inlets. ☐ For pipes and ditches, remove sediment and debris that is partially blocking the pipe or ditch opening where it enters the Filter practice. ☐ Dispose of all material properly in an area where it will not re-enter the practice. ☐ Other:
		☐ Kick-Out to Level 2 Inspection: Inlets are blocked to the extent that most of the water does not seem to be entering the filter practice.
	☐ Some or all of the inlets are eroding so that rills, gullies, and other erosion are present, or there is dirt washing into the filter practice.	☐ For small areas of erosion, smooth out the eroded part and apply rock or stone (e.g., river cobble) to prevent further erosion. Usually, filter fabric is placed under the rock or stone. ☐ In some cases, reseeding and applying erosion-control matting can be used to prevent further erosion. Some of these materials may be available at a garden center, but it may be best to consult a landscape contractor. ☐ Other:
		☐ Kick-Out to Level 2 Inspection: Erosion is occurring at most of the inlets and it looks like there is too much water concentrating at these points. The inlet design may have to be modified.

Table 2.12.2 SF Inlets

Problem (Check if Present)	Follow-Up Actions
 ☐ For an underground filter, water is ponding and doesn't seem to be getting through the filter.	☐ Kick-Out to Level 2 Inspection: This is generally a more serious problem and should be referred for a Level 2 Inspection because it will require opening up the filter vault to check for clogging.

SF 3. Filter Area (for Surface Sand Filters)

Description: The Filter Area is the area that collects water and allows it to seep into the filter media. Some filters also have a vertical perforated pipe that is the cleanout for the underdrain pipe.

Instruction: Examine the surface of the filter and the observation well, if present. Consult **Table 2.12.3** below for possible problems.

Table 2.12.3 SF Filter Area (for Surface Sand Filters)

Problem (Check if Present)	Follow-Up Actions
 ☐ Filter has grass and vegetation growing on more than 25% of the filter bed, threatening to clog the filter.	☐ Vegetation growing in the filter bed should be removed either manually or with a water-safe herbicide (e.g., glysophate without surfactants). ☐ Other:
	☐ Kick-Out to Level 2 Inspection: The filter seems clogged, or vegetation and weeds have proliferated past the point where the Level 1 person can manage it.
☐ Minor amounts of sediment, grit, trash, or other debris are accumulating on the surface.	☐ Use a shovel to scoop out minor amounts of sediment or grit, especially in the spring after winter sanding materials wash in and accumulate. Dispose of the material where it cannot re-enter the filter. ☐ If removing the material creates a hole or low area, rake the surface smooth and level. ☐ Remove trash, debris, and other undesirable materials. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Sediment (other than sand) has accumulated more than 2-inches deep and covers 25% or more of the surface of the filter area.

Table 2.12.3 SF Filter Area (for Surface Sand Filters)

Problem (Check if Present)	Follow-Up Actions
 ☐ There is erosion on the surface; water seems to be carving out rills as it flows across the filter surface, or sinkholes are forming in certain areas.	☐ For minor areas of erosion, try filling the eroded areas with clean, coarse construction sand. ☐ Other: ☐ Kick-Out to Level 2 Inspection: The problem persists or the erosion is more than 3-inches deep and seems to be an issue with how water enters and moves through the filter area. ☐ Kick-Out to Level 2 Inspection: The problem does not seem to be caused by flowing water but by a collapse or sinking of the surface (e.g., “sinkhole”) due to some underground problem.
 ☐ Water is still visible on the surface and/or the standpipe (if present) more than 72 hours after a rainstorm. The filter practice drains very slowly or is completely clogged.	☐ Kick-Out to Level 2 Inspection: This is generally a serious problem, and it will be necessary to activate a Level 2 Inspection.

Section 3. Level 2 and 3 Inspections

3.1. How to Use this Section

This section provides guidance for Level 2 and 3 inspections for 10 groups of stormwater management practices (SMPs). See Section 1 of this chapter for an explanation of the Maintenance Hierarchy approach.

- Section 3.2 provides general guidance for Level 2 and 3 inspections.
- Sections 3.3 through 3.12 provide detailed Level 2 and 3 inspection guidance for each of the 10 practice categories:
    - 3.3 Rainwater Harvesting
    - 3.4 Disconnection and Sheetflow
    - 3.5 Swales
    - 3.6 Tree Planting
    - 3.7 Bioretention
    - 3.8 Green Roofs
    - 3.9 Permeable Pavement
    - 3.10 Ponds and Wetlands
    - 3.11 Infiltration
    - 3.12 Sand and Organic Filters
- Each section has **tables** containing guidance for Level 2 inspectors on specific SMP conditions and possible repairs for those problems (in left column), as well as lists of conditions that would likely trigger a Level 3 evaluation or maintenance action (right column). In addition, **Appendix B** contains detailed checklists for Level 2 inspectors to use in the field during their inspections.
- **Section 3.13** provides a brief overview for Level 3 inspections and how these fit into the overall hierarchy. However, most of the content for Level 3 maintenance actions is contained in **Section 4.**

3.2. General Guidance for Level 2 and 3 Inspections

The Level 2 inspection will typically be performed by a municipal employee or landscape contractor with some training in stormwater operations and maintenance. Regardless of which type of practice is being inspected, some key procedures and equipment are necessary. Read through this guidance before going on an inspection, and use the specific guidance in **Sections 3.3 through 3.12** for the practice you are inspecting. While much of the equipment and general procedures are somewhat similar to Level 1 inspections, additional information is provided for Level 2 inspectors below.

When to Conduct a Level 2 Inspection

The Level 2 Inspection is needed for two reasons. First, routine inspections to comply with local stormwater regulations typically require a Level 2 inspector. In addition, a Level 2 inspection may be triggered to address or diagnose problems identified during a Level 1 inspection. In this situation, the Level 2 inspector should confer with the Level 1 inspector about problems they have identified and then conduct a follow-up inspection that focuses more on diagnosing the causes of the problems and possible solutions. The checklists in **Appendix B** and other resources cited in **Sections 3.3 through 3.12** can be used as tools.

The frequency of this type of inspection may be defined by the municipality. As with Level 1 inspections, the frequency may change with the age of the SMP, with higher frequencies the first couple of years after installation. Well-established and well-maintained practices may only need to be inspected every few years.

Notifying the Responsible Party

Consult the plan file and maintenance agreement to ascertain the responsible party. Confirm that there is right of access through the local code, signed maintenance agreement, or other means. Contact the responsible party at least three business days in advance of the proposed inspection. If the responsible party cannot be found or contacted, make a reasonable effort through file research to contact a property representative, and document these efforts in writing. If the inspection is in response to a Level 1 inspection and referral to your agency, try to speak with the person who conducted the Level 1 inspection and get any documentation they may have. For publicly owned and managed SMPs, the responsible party will likely be the municipality or other regulated MS4.

What to Take in the Field

Level 2 inspections may require more measurement and, as a result, need some additional materials. In addition, the Level 2 inspection may involve gaining access to private property. Consequently, additional identification is needed for these inspections. A list of recommended items to take in the field is provided in **Table 2.2.1**.

Table 3.2.1 What to Take in the Field for a Level 2 Inspection

- Safety equipment: safety vest, steel-toe shoes, traffic cones if working near traffic, etc.
- Approved plan and as-built (record drawing) if available
- Records of previous inspections if available
- Engineering scale
- Hand level and pocket rod if needed to measure relative elevations
- Digital camera
- Several copies of SMP checklist if paper forms are used (**Appendix B**)
- Clipboard and pencils if paper forms are used
- Dry erase white board and marker (optional) to include in photos to keep track of SMP tracking # in municipal database (see **Figure 3.2** as example)
- Letter on municipal letterhead granting access and/or agency photo badge
- Pipe wrench to open underdrain clean-out caps
- Flashlight to look into underdrain cleanouts and/or manholes
- Manhole puller
- Soil probe or auger
- 100' measuring tape
- Shovel
- Bug spray

Conducting the Inspection

In general, the inspection should follow a consistent, logical approach, such as outlined below.

- Conduct a quick tour of the practice to identify any obvious issues and important components: inlets (number, location), surface area, overflow structures, berms or impoundments, outfalls, downstream conveyance channels or receiving waters. Check these components against the design plan or as-built drawing (if available).
- Starting at the outlet or low point, use the checklists provided in Appendix B to evaluate the practice. The inspection will proceed from the outlet or outfall to the stormwater treatment area, berms, side slopes, inlets, and drainage area. Make sure to fill in key information on the inspection form, such as SMP identifier number, site name, inspector name, date, and weather conditions.

Figure 3.2. A white board and digital camera can be handy to note SMP tracking #, date of inspection, and other forms of documentation. Note that an inspector may alternatively tag photographs, particularly if they are recorded on a smartphone or Tablet.

- Take photos of important components or maintenance concerns, and mark photo locations and direction on a sketch.
- Review the inspection form before leaving the site to make sure that all necessary information has been collected.

Follow-Up Actions

Immediate follow-up actions include entering the inspection information in the appropriate database or hard copy file, downloading and labeling photos, and providing other necessary documentation.

Another possible follow-up action would be to activate a Level 3 inspection in certain situations. The Level 2 inspector will have to make a judgement call as to whether observed problems warrant a Level 3 investigation, and will also have to coordinate with the responsible party to pursue such an investigation. The Level 2 guidance in this chapter summarizes follow-up actions associated with various observations of SMP condition. Note that these tables are divided into “Level 2” and “Triggers for Level 3” follow-up actions, with Level 2 actions in *blue* cells and Level 3 in *green* cells. Consult **Section 4** of this chapter for more guidance on how to diagnose and correct some of the maintenance items included in these tables.

Another follow-up action involves communicating problems and corrective measures to the responsible party (private or public). This may involve instructing the responsible party to undertake a Level 3 inspection or to provide a timeframe for correcting simpler issues that do not require Level 3 involvement. Many local programs have existing procedures for sending letters or activating a compliance procedure. These procedures include verifying that repairs and corrections are completed by the responsible party.

Level 3 Inspection Guidance

The Level 3 inspection is typically conducted by a Qualified Professional such as a professional engineer or Landscape Architect. It is assumed that the Level 3 inspector is knowledgeable in stormwater management, as well as engineering and construction practices. The Level 3 inspector will not typically be completing a full practice inspection. This inspection is conducted only in response to problems identified during the Level 2 inspection, is more diagnostic in nature, assumes a greater degree of initial knowledge, and may require more extensive intervention.

The Level 3 inspection is also more results based in that it will lead to a specific repair to address the issue that triggered the inspection. **Section 4** identifies 12 problems typically addressed in a Level 3 inspection and discusses measures to diagnose the cause of the problem, as well as repairs needed to address it. It should be noted that the problems addressed in each **Section 4** subsection can occur in a variety of SMPs (e.g., erosion is a common issue in almost every type of SMP). As a result, each subsection identifies the SMPs where the problem most commonly occurs and, in some cases, an SMP-specific diagnosis procedure.

3.3. Rainwater Harvesting – Level 2 Inspections and Triggers for Level 3

The most likely triggers for a Level 3 Inspection for Rainwater Harvesting practices are:

- Structural or mechanical problems (e.g., malfunction of the first-flush diverter or vortex filter)
- Accumulation of debris in the tank that cannot be easily removed by hand
- Severe erosion at the outlet

Table 3.3.1 Level 2 Inspection – RAINWATER HARVESTING

Recommended Repairs	**Triggers for Level 3 Inspection**
Observed Condition: Tank is not filling properly or water level drops quickly	
Condition 1: Tank is not filling properly Look for signs of water bypassing the tank. Inspect the conveyance system and filters to make sure that all parts are properly connected and not leaking. Observe the system during a rainstorm to make sure that water is not backing up and spilling out of the gutters or getting excessively diverted by the filter. Adjust angles and placement of filter as needed. Condition 2: Water level drops quickly after filling Requires diagnosis and resolution of problem: • Leaking valve or spigot? • Crack in tank wall? • Pump turning on unnecessarily?	• Gutters, pipes, and/or filter appear to be undersized or not properly designed. • Structural or mechanical problem requires special expertise in rainwater harvesting systems.
Observed Condition: Tank is sinking, leaning, or at risk of collapse	
Condition 1: Foundation is not stable This repair may need specialized equipment and skill, depending on the size and type of tank. For smaller tanks (like rain barrels), drain and disconnect the tank to move it aside. Compact the underlying soil and create a solid, level base for the tank with concrete blocks or gravel. Seek professional help for larger tanks. Condition 2: Other structural problem Seek professional help.	• Tanks cannot be easily adjusted or fixed by hand.
Observed Condition: Severe erosion at outlet	
Condition 1: Erosion gets worse even after re-seeding or adding stone There are several potential solutions to this continued erosion. Add geotextile fabric below the stone to protect the soil. Dig out a pit at the outfall and fill with gravel or stone to absorb the velocity of the water spilling out the tank. If the outlet flows onto a steep slope, consider extending the pipe length to a flatter area. Some of these actions may require help from a contractor.	• Erosion control cannot easily be installed by hand. • Erosion recurs after previous repairs. • Downstream drainage concerns

3.4. Disconnection & Sheet Flow – Level 2 Inspections and Triggers for Level 3

The most likely triggers for a Level 3 Inspection for Disconnection and Sheetflow practices are:

- Significant damage to level spreader/energy dissipator
- Major erosion

Table 3.4.1 Level 2 Inspection – DISCONNECTION AND SHEETFLOW

Recommended Repairs	Triggers for Level 3 Inspection
Observed Condition: Significant sediment on pavement that drains to disconnection area (e.g., grass strip)	
Condition 1: Sediment on parking lot is widespread Enlist a mechanical sweeper or vacuum sweeper to remove sediment across entire pavement surface. Pay special attention to downhill edges of pavement where more sediment may have accumulated.	• Sediment accumulation is so serious that it cannot be sufficiently removed with mechanical sweeper. May indicate a high sediment load from uphill in the drainage area that needs to be mitigated.
Observed Condition: Pavement edge deteriorating	
Condition 1: Dips or damage at pavement edge causing runoff to concentrate Determine whether the damaged edge is causing significant enough concentration of runoff to warrant repair or regrading of the pavement.	• Edge must be patched or re-paved to make secure and level. • Parking lot not draining properly to the energy dissipator and treatment area.
Observed Condition: Level spreader/energy dissipator	
Condition 1: Level spreader sinking or uneven If basic equipment can be used, prop up and secure any section of level spreader that is sinking. Regrade soil all around level spreader and add stone as necessary to prevent erosion and bypassing. Condition 2: Level spreader is broken These repairs can be simple for small, residential-scale practices, such as at a downspout. Ensure the level spreader is level across, keyed in to soil at the edges, and made of durable material that can withstand the flow of water running across it. Larger or more complicated level spreaders (e.g., concrete) will likely require specialized skill and equipment.	• Level spreader requires specialized equipment, regrading, or large amount of material to make level again. • Level spreader needs to be re-designed and replaced.
Observed Condition: Erosion in treatment area	
Condition 1: Rills from concentrated flow Inspect energy dissipator to see whether it needs to be improved to better spread out incoming flow. Regrade flow path to ensure that it is relatively flat (if minor). If major re-grading is needed, the treatment area may need to be redesigned and fixed with specialized equipment.	• Major rills and gullies • Treatment area needs to be re-designed and major grading needed.

3.5. Swales – Level 2 Inspections and Triggers for Level 3

The most likely triggers for a Level 3 Inspection for Swales are:

- Standing water, swale not draining properly (not applicable to wet swales)
- Severe erosion around or under check dams
- Large area of vegetation overrun with weeds and/or invasive species
- Severe erosion at outlet that requires redesign

Table 3.5.1 Level 2 Inspection: SWALE

Recommended Repairs	**Triggers for Level 3 Inspection**
Observed Condition: Water Stands on Surface for More than 72 Hours after Storm	
Condition 1: Small pockets of standing water Use a soil probe or auger to examine the soil profile. If isolated areas have accumulated grit, fines, or vegetative debris or have compacted soil, try scraping off top 3 to 6 inches of soil and replacing with clean material. Also check to see that surface is level and water is not ponding selectively in certain areas. Condition 2: Standing water is widespread or covers entire surface Requires diagnosis and resolution of problem: Bad or compacted soil Filter fabric on the swale bottom Too much sediment/grit washing in from drainage area? Too much ponding depth? Longitudinal slope is too flat?	• Soil is overly compacted or clogged and problem is not evident from Level 2 inspection. • Level 2 inspection identifies problem, but it cannot be resolved easily or is associated with the original design of the practice (e.g., not enough slope down through the swale).
Observed Condition: Vegetation is predominantly weeds and invasive species	
For a small area, weed and dig up invasive plants. Replant with natives or plants from original planting plan. If longer than 100 feet, develop a new planting plan and have it professionally reviewed.	• Vegetation deviates significantly from original planting plan; swale has been neglected and suffered from deferred maintenance. • Owner/responsible party does not know how to maintain the practice. • For large area, hire a professional to develop a grading plan and develop a planting plan.

Observed Condition: Severe erosion of check dams, inlets, swale bottom, or side slopes	
	- Erosion (rills, gullies) is more than 12-inches deep at inlets or the swale bottom or more than 3-inches deep on side slopes. - Flow paths from the drainage area are higher than expected, such that the swale needs to be redesigned to handle higher flow rates and velocities.
Observed Condition: Significant sediment accumulation, indicating an uncontrolled source of sediment	
Condition 1: Isolated areas of sediment accumulation, generally less than 3-inches deep Sediment source may be from a one-time or isolated event. Remove accumulated sediment and top 2 to 3 inches of swale soil media; replace with clean material. Check drainage area for any ongoing sources of sediment. Condition 2: Majority of the surface is caked with “hard pan” (thin layer of clogging material) or accumulated sediment that is 3-inches deep or more This can be caused by improper construction sequence (drainage area not fully stabilized prior to installation of the swale) or another chronic source of sediment in the drainage area. Augering several holes down along the swale can indicate how severe the problem is; often the damage is confined to the first several inches of soil. Removing and replacing this top layer (or to the depth where sediment incursion is seen in auger holes) can be adequate, as long the problem does not recur.	- More than 2 inches of accumulated sediment cover 25% or more of the swale surface area. - “Hard pan” of thin, crusty layer covers majority of swale surface area and seems to be impeding flow of water along the swale. - New sources of sediment seem to be accumulating with each significant rainfall event.

3.6. Tree Planting – Level 2 Inspections and Triggers for Level 3

A Level 2 Tree Planting inspection should be conducted periodically during the growing season by the Cooperative Extension or an arborist.

Table 3.6.1 Level 2 Inspection: TREE PLANTING	
Recommended Repairs	**Triggers for Level 3 Inspection**
Observed Condition: Appearance of fungus or pest damage	
Condition 1: Fungus, discoloration, browning leaves or holes in leaves Check with arborist or other tree professional about the best way to proceed. This requires a Level 3 inspection. Condition 2: Burrowing insects, holes Check with arborist or other tree professional about the best way to proceed. This requires a Level 3 inspection.	• Any concerns about how to address infestation or disease

3.7. Bioretention – Level 2 Inspections and Triggers for Level 3

The most likely triggers for a Level 3 Inspection for Bioretention are:

- Standing water, clogged media
- Vegetation management
- Bioretention does not conform to original design plan in surface area or storage.
- Severe erosion of filter bed, inlets, or around outlets
- Significant sediment accumulation, indicating an uncontrolled source of sediment

Table 3.7.1 Level 2 Inspection: BIORETENTION **NOTE: Key Source for this Information *(CSN, 2013)***	
Recommended Repairs	**Triggers for Level 3 Inspection**
Observed Condition: Water Stands on Surface for More than 72 Hours after Storm	
Condition 1: Small pockets of standing water Use a soil probe or auger to examine the soil profile. If isolated areas have accumulated grit, fines, or vegetative debris or have bad soil media, try scraping off top 3 inches of media and replacing with clean material. Also check to see that surface is level and water is not ponding selectively in certain areas. Condition 2: Standing water is widespread or covers entire surface Requires diagnosis and resolution of problem: • Clogged underdrain? • Filter fabric between soil media and underdrain stone? • Need to install underdrain if not present? • Too much sediment/grit washing in from drainage area? • Too much ponding depth? • Improper soil media?	• Soil media is clogged and problem is not evident from Level 2 inspection. • Level 2 inspection identifies problem, but it cannot be resolved easily or is associated with the original design of the practice.

Observed Condition: Vegetation is sparse or out of control	
Condition 1: Original design planting plan seems good but has not been maintained, so there are many invasives and/or dead plants Will require some horticultural experience to restore vegetation to intended condition by weeding, pruning, removing plants, and adding new plants. Condition 2: Original design planting plan is unknown or cannot be actualized A landscape architect or horticulturalist will be needed to redo the planting plan. Will likely require analysis of soil pH, moisture, organic content, sun/shade, and other conditions to make sure plants match conditions. Plan should include invasive plant management and maintenance plan to include mulching, watering, disease intervention, periodic thinning/pruning, etc.	• Vegetation deviates significantly from original planting plan; Bioretention has been neglected and suffered from deferred maintenance. • Owner/responsible party does not know how to maintain the practice.
Observed Condition: Bioretention does not conform to original design plan in surface area or storage	
Condition 1: Level 2 Inspection reveals that practice is too small based on design dimension, does not have adequate storage (e.g., ponding depth) based on the plan, and/or does not treat the drainage area runoff as indicated on the plan Small areas of deviation can be corrected by the property owner or responsible party, but it is likely that a Qualified Professional will have to revisit the design and attempt a redesign that meets original objectives or that can be resubmitted to the municipality for approval.	• More than a 25% departure from the approved plan in surface area, storage, or drainage area; sometimes less than this threshold at the discretion of the Level 2 inspector.
Observed Condition: Severe erosion of filter bed, inlets, or around outlets	
Condition 1: Erosion at inlets The lining (e.g., grass, matting, stone, rock) may not be adequate for the actual flow velocities coming through the inlets. First line of defense is to try a more non-erosive lining and/or to extend the lining further down to where inlet slopes meet the Bioretention surface. If problem persists, analysis by a Qualified Professional is warranted. Condition 2: Erosion of Bioretention filter bed This is often caused by “preferential flow paths” through and along the Bioretention surface. The source of flow should be analyzed and methods employed to dissipate energy and disperse the flow (e.g., check dams, rock splash pads). Condition 3: Erosion on side slopes Again, the issue is likely linked with unanticipated flow paths down the side slopes (probably overland flow that concentrates as it hits the edge of the slope). For small or isolated areas, try filling, compacting, and re-establishing healthy ground cover vegetation. If the problem is more widespread, further analysis is required to determine how to redirect the flow.	• Erosion (rills, gullies) is more than 12 inches deep at inlets or the filter bed or more than 3 inches deep on side slopes. • If the issue is not caused by moving water but some sort of subsurface defect. This may manifest as a sinkhole or linear depression and be associated with problems with the underdrain stone or pipe or underlying soil.
Observed Condition: Significant sediment accumulation, indicating an uncontrolled source of sediment	
Condition 1: Isolated areas of sediment accumulation, generally less than 3-inches deep Sediment source may be from a one-time or isolated event. Remove accumulated sediment and top 2 to 3 inches of Bioretention soil media; replace with clean material. Check drainage area for any ongoing sources of sediment. Condition 2: Majority of the surface is caked with “hard pan” (thin layer of clogging material) or accumulated sediment that is 3-inches deep or more This can be caused by an improper construction sequence (drainage area not fully stabilized prior to installation of Bioretention soil media) or another chronic source of sediment in the drainage area. Augering several holes down through the media can indicate how severe the problem is; often the damage is confined to the first several inches of soil media. Removing and replacing this top layer (or to the depth where sediment incursion is seen in auger holes) can be adequate, as long as the problem does not recur.	• More than 2 inches of accumulated sediment cover 25% or more of the Bioretention surface area. • “Hard pan” of thin, crusty layer covers majority of Bioretention surface area and seems to be impeding flow of water down through the soil media. • New sources of sediment seem to be accumulating with each significant rainfall event.

3.8. Green Roof – Level 2 Inspections and Triggers for Level 3

The most likely triggers for a Level 3 Inspection for Green Roofs are:

- Standing water
- Vegetation management
- Structural damage

Table 3.8.1 Level 2 Inspection: GREEN ROOF

Recommended Repairs and Required Skills	Triggers for Level 3 Inspection
Observed Condition: Unhealthy or Dying Vegetation	
	• More than 25% die off • Plants are unhealthy for a prolonged period of time or need to be replanted repeatedly, indicating that a new planting plan may be necessary, or the planting medium is not functioning properly. • pH or other media constituents are not conducive to plant growth, and the media needs to be amended (e.g., lime, fertilizer). This should be handled by a green roof vendor or green roof plant specialist.
Observed Condition: Ponding Between Storm Events or Debris Accumulation	
Condition 1: Further inspection shows debris is clogging the outflow drainpipe Remove debris by hand and revisit within 24 hours to see whether this action fixed the problem. Condition 2: Debris has backed up to include the underdrain Attempt to remove by hand or flush out with a hose.	• Ponding continues even after debris has been removed. This may indicate a problem with either the media or the underdrain system.
Observed Condition: Structural Damage to Overflows	
Condition: If the damage is minor, repair damage directly, per original design drawings	• Most instances of structural damage will need to be referred to the designer or a qualified green roof vendor.
Observed Condition: Roof is Leaking or indication that the membrane has a leak	
Condition: Roof is leaking	• Any leaks in the membrane trigger a Level 3 inspection or an inspection by the original installer or designer.

3.9. Permeable Pavement – Level 2 Inspections and Triggers for Level 3

The most likely triggers for a Level 3 Inspection for Permeable Pavement are:

- Ponding or
- Highly clogged pavement

Table 3.9.1 Level 2 Inspection: PERMEABLE PAVEMENT

Recommended Repairs and Required Skills	Triggers for Level 3 Inspection
Observed Condition: Bare Soil or Erosion in the Drainage Area	
	• Large rills or gullies are forming in the drainage area. • An attempt to regrade the drainage area has been unsuccessful • Fixing the problem would require major regrading (i.e., redirecting more than a 100-square-foot area. • It is not clear why the problem is occurring.
Observed Condition: Dirt or Grit Accumulating, or Grass Growing on Pavement Surface	
Condition 1: Grit beginning to form but is isolated to a small area or does not fill the joints between paver blocks Try to agitate and sweep by hand, or hire a contractor with a vacuum sweeper. Also investigate the drainage area for potential sediment sources. If no obvious sources are found, discuss winter sanding and salting operations with the property owner to identify whether this could be the source. Condition 2: Grit is forming and cannot be removed with agitation and hand sweeping Hire a vendor with a regenerative air vacuum sweeper, maximum power 2,500 rpm; avoid sweepers that use water.	• More than 2 inches of sand/dirt/grit are on some of the pavement surface. • More than 25% of the pavement surface is covered with sand/dirt/grit to the extent that joints between paver blocks are filled. • Regenerative air sweeper cannot remove grit.
Observed Condition: Structural Damage	
Condition 1: Portions of porous asphalt or permeable pavers are damaged, and the cause is known to be at the surface. If the damage is from a single event such as heavy equipment or heavy fallen objects, or the surface has been damaged by wear over time, hire a contractor experienced in permeable pavement installation to repair the damaged areas. Condition 2: Damage to other structures, such as drainage infrastructure If possible, repair or replace damaged items, or hire a contractor with permeable pavement experience if the damaged infrastructure is within the pavement surface.	• More than 25% of the surface needs to be repaired or replaced. • It appears that the underlying material has “caved in,” indicating an underlying water conveyance or soil stabilization issue. • Problem is repaired but recurs within less than five years.

Table 3.9.1 Level 2 Inspection: PERMEABLE PAVEMENT

Recommended Repairs and Required Skills	Triggers for Level 3 Inspection
Observed Condition: Ponding on the Pavement Surface	
Condition 1: Underdrains (if present) may be clogged Check to see whether underdrains are clogged by inspecting cleanouts (if present) or catch basins and looking for debris. If underdrains appear clogged, it may be necessary to hire a router service to ream out the underdrains. Condition 2: At time of Level 2 inspection, water is not ponded, and there is no obvious clogging of the surface. Conduct a flood test to determine whether the ponding is an ongoing problem.	• Water stands on the pavement surface more than 72 hours after a storm, and the problem cannot be resolved by unclogging underdrains. • More than 25% of the pavement surface is covered with sand/dirt/grit to the extent that joints between paver blocks are filled.

Figure 3.9.1. Winter salting, sanding, plowing, and snow storage can cause problems for permeable pavement surfaces, which will trigger a Level 3 investigation.

Figure 3.9.2. A Level 3 investigation is warranted if more than 25% of the permeable pavement surface appears to be clogged, or joints are filled in, or, as shown in the photo, vegetation is growing.

3.10. Ponds & Wetlands – Level 2 Inspections and Triggers for Level 3

The most likely triggers for a Level 3 Inspection for Ponds and Wetlands are:

- Severe erosion
- Excessive algae or aquatic plants
- Settlement and pipe corrosion
- Major sediment buildup

Table 3.10.1 Level Inspection: PONDS and WETLANDS

Recommended Repairs and Required Skills	Triggers for Level 3 Inspection
Observed Condition: Bare Soil or Erosion in the Drainage Area	
Condition 1: Extensive problem spots, but no channels or rills forming Reseed problem areas. If problem persists or grass does not take, consider hiring a landscape contractor. Condition 2: Problem is extensive, and rills/channels are beginning to form May be necessary to divert or redirect water that is causing the erosion problem. If it appears that simple regrading—such as installing a berm or leveling a low spot–will fix the problem, make repairs and ensure that the problem is repaired after the next storm.	• Large rills or gullies are forming in the drainage area. • An attempt to regrade the drainage area has been unsuccessful. • Fixing the problem would require major regrading (i.e., redirecting more than a 100-square-foot area. • It is not clear why the problem is occurring.
Observed Condition: Manholes or Inlet Pipe Buried or Covered with Vegetation	
Condition 1: Nearest manhole and inlet pipe not found Consult as-built drawings to get to closest suspected location and use metal detector to search for metal manhole cover. If unsuccessful, identify nearest drain inlets and approximate pipe direction to locate next manhole. Condition 2: Manhole located and inspected Never enter a manhole, except by following confined-space entry protocols. If outlet pipe is not visible or greater than 25% full of sediment/debris or trash, it will typically require a qualified contractor to flush, clean and clear blockages. Condition 3: Inlet pipe not found at pond Clear vegetation and brush that may be covering the inlet pipe. Buried inlet pipes may be found through use of a metal probe. Condition 4: Inlet pipe buried in sediment or blocked by vegetation Once located, the pipe path can be cleared of vegetation with brush hook or other brush tools. Light digging may clear sediment from the end of the pipe.	• To locate buried manholes and lost storm lines, it is sometimes necessary to hire a pipeline inspection contractor with televising equipment or ground-penetrating radar and enter at the closest upstream access point. • Locating a buried inlet pipe may require wading in the edge of the pond and using a metal probe and brush axe to find and expose the pipe. • If other than light digging is necessary to remove accumulated sediment, a contractor with heavy equipment may be required.

Table 3.10.1 Level Inspection: PONDS and WETLANDS

Recommended Repairs and Required Skills	Triggers for Level 3 Inspection
Observed Condition: Pipe or Headwall Settlement, Erosion, Corrosion or Failure	
Condition 1: Pipe or headwall settlement or failure Severe sinkholes, settlement or corrosion should be kicked out to Level 3 Inspection. Condition 2: Flow not confined to pipe and visible outside pipe wall With flashlight, observe the inside of the pipe and note its condition. Take photographs. Look for sinkholes developing that indicate pipe failure beneath the surface. Kick out to Level 3 inspection.	• Where blockages are visible, a decision is needed on whether to clear them or leave in place. If a third of the pipe is full of sediment, it should be removed by a contractor with pipe-cleaning equipment. • Corrosion of inlet pipes that allows flow around the pipe exterior is a structural concern because it can lead to settlement, sinkholes and undermining pond embankment. Evidence of this type of failure may require specialized pipe-inspection equipment and investigation by an engineer.
Observed Condition: Pond Conditions	
Condition 1: Pond pre-treatment zone is full of sediment or not constructed as shown on as-built drawings. Condition 2: Excessive buildup of sediment or overgrowth If the pre-treatment area or pond pool is overgrown or filled with sediment so that the original design is compromised, corrective measures are required. If plants have died, then replanting is necessary. If none of the original design exists due to alteration or sediment, kick out to Level 3 inspection.	• It may require inspection by an engineer to determine next steps for clearing, replanting or reconstruction. • Erosion or settlement such that design has been compromised should be reviewed by an engineer. Recurring erosion may require redesign and/or regrading to direct flow away from eroding area. • If sediment has filled more than 50% of the pond’s capacity, dredging is likely needed and should be evaluated by a qualified contractor. • Removal or control of excessive algae or aquatic plants can be assessed by a qualified pond maintenance company.

3.11. Infiltration – Level 2 Inspections and Triggers for Level 3

The most likely triggers for a Level 3 Inspection for Infiltration practices are:

- Standing water, clogged media
- Severe erosion of infiltration area, inlets, or around outlets
- Significant sediment accumulation, indicating an uncontrolled source of sediment

Table 3.11.1 Level Inspection: INFILTRATION

Recommended Repairs	Triggers for Level 3 Inspection
Observed Condition: Water Stands on Surface for More than 72 Hours after Storm	
Condition 1: Small pockets of standing water For infiltration basins with soil, use a soil probe or auger to examine the soil profile. For gravel infiltration trenches or basins, use a shovel to dig into the gravel layer where the problem is occurring. If isolated areas have accumulated grit, fine silt, or vegetative debris or have bad soil or clogged gravel, try removing and replacing with clean material. If the practice is supposed to have grass cover, it will likely be necessary to replant once the problem is resolved. Condition 2: Standing water is widespread or covers entire surface Look in the observation well (if it exists) and use a tape measure to estimate the depth of water standing in the soil or gravel. Requires diagnosis and resolution of problem: • Too much sediment/grit washing in from drainage area? • Too much ponding depth? • Improper infiltration media? • Underlying soil not suitable for infiltration? As above, the resolution will likely require replanting and re-establishment of good grass cover if this is part of the design.	• Infiltration media is clogged and problem cannot be diagnosed from Level 2 inspection. • Level 2 inspection identifies problem, but it cannot be resolved easily or it is associated with the original design of the practice.
Observed Condition: Severe erosion of infiltration bed, inlets, or around outlets	
Condition 1: Erosion at inlets The lining (e.g., grass, matting, stone, rock) may not be adequate for the actual flow velocities coming through the inlets. First line of defense is to try a less erosive lining and/or extending the lining further down to where inlet slopes meet the infiltration surface. If problem persists, analysis by a Qualified Professional is warranted. Condition 2: Erosion of infiltration bed This is often caused by “preferential flow paths” along the surface. The source of flow should be analyzed and methods employed to dissipate energy and disperse the flow (e.g., check dams, rock splash pads).	• Erosion (rills, gullies) is more than 12 inches deep • The issue is not caused by moving water but some sort of subsurface defect, which may manifest as a sinkhole or linear depression and be associated with problems with the underlying stone or soil.

Observed Condition: Significant sediment accumulation, indicating an uncontrolled source of sediment	
Condition 1: Isolated areas of sediment accumulation, generally less than 3-inches deep Sediment source may be from a one-time or isolated event. For practices with soil cover, remove accumulated sediment and top 2 to 3 inches of soil; replace with clean material. Check drainage area for any ongoing sources of sediment. Condition 2: Majority of the surface is caked with "hard pan" (thin layer of clogging material) or accumulated sediment that is 3-inches deep or more This can be caused by an improper construction sequence (drainage area not fully stabilized prior to installation of infiltration practice) or another chronic source of sediment in the drainage area. For infiltration basins with soil, augering several holes down through the media can indicate how severe the problem is; often the damage is confined to the first several inches of soil media. Removing and replacing this top layer (or to the depth where sediment incursion is seen in auger holes) can be adequate, as long the problem does not recur.	• Trenches or dry wells with stone or gravel at surface may need to be cleaned out with a vacuum truck because the process of removing the top layer of stone may cause fine silt to drop further down. • More than 2 inches of accumulated sediment cover 25% or more of the infiltration surface area. • "Hard pan" of thin, crusty layer covers majority of Infiltration surface area and seems to be impeding flow of water down through the soil media. • New sources of sediment seem to be accumulating with each significant rainfall event.

3.12. Sand and Organic Filters – Level 2 Inspections and Triggers for Level 3

The most likely triggers for a Level 3 Inspection for Sand and Organic Filters are:

- Standing water, clogged filter media
- Need to pump out sedimentation chamber
- Response to fuel or other spills that make it into the filter

Table 3.12.1 Level 2 Inspection: SAND AND ORGANIC FILTERS

Recommended Repairs	**Triggers for Level 3 Inspection**
Observed Condition: Water Stands on Surface for More than 72 Hours after Storm	
Condition 1: Small pockets of standing water Use a soil probe or auger to examine the sand or filter profile. If isolated areas have accumulated grit, fine silt, vegetative debris, oily sludge or bad sand media, try scraping off top 3 inches of media and replacing with clean, coarse construction sand. Condition 2: Standing water is widespread or covers entire surface Look in the underdrain cleanout (if present) and use a tape measure to estimate the depth of water standing in the sand layer. Requires diagnosis and resolution of problem: • Clogged underdrain • Filter fabric between the sand layer and underdrain gravel OR on top of the sand filter layer (usually held in place by a thin layer of gravel) • Too much sediment/grit/vegetative debris/oily sludge washing in from drainage area • Too much ponding depth • Improper sand media	• Sand or organic media is clogged, but problem was not evident from Level 2 inspection. • Level 2 inspection identifies problem, but it cannot be resolved easily or is associated with the original design of the practice. • The problem seems to be filter fabric placement, but this is specified in the original design. • The entire filter media layer or filter cartridges need to be replaced. • The problem is associated with improper configuration of underdrain pipes or outlet structures.

Observed Condition: Severe erosion of filter bed, inlets, or around outlets

	• Erosion (rills, gullies) is more than 12 inches deep. • The issue is not caused by moving water but some sort of subsurface defect, which may manifest as a sinkhole or linear depression and be associated with problems with the underlying stone or soil.

Observed Condition: Significant sediment accumulation, indicating an uncontrolled source of sediment

Condition 1: Isolated areas of sediment accumulation, generally less than 3-inches deep Sediment source may be from a one-time or isolated event. Remove accumulated sediment and top 2 to 3 inches of sand or filter media; replace with clean material. Check drainage area for any ongoing sources of sediment. Condition 2: Majority of the surface is caked with “hard pan” (thin layer of clogging material) or accumulated sediment that is 3-inches deep or more This can be caused by an improper construction sequence (drainage area not fully stabilized prior to installation of filter practice) or another chronic source of sediment in the drainage area. Augering several holes down through the sand media can indicate how severe the problem is; often the damage is confined to the first several inches of media. Removing and replacing this top layer (or to the depth where sediment incursion is seen in auger holes) can be adequate, as long the problem does not recur.	• More than 2 inches of accumulated sediment cover 25% or more of the filter surface area. • “Hard pan” of thin, crusty layer covers majority of filter surface area that seems to be impeding flow of water down through the filter media. • New sources of sediment seem to be accumulating with each significant rainfall event.

Observed Condition: Underground vault system has standing water and oily sludge floating on top, or other issues that indicate clogging, malfunction, or need for maintenance

Condition: Compare observation to the design or as-built plans to see whether existing conditions match the plan details.	• This condition will almost always warrant conferring with the manufacturer or vendor and/or using the Level 3 inspection process to further diagnose the problem.

Section 4. Diagnostics and Maintenance Measures

4.1. About this Section

Section 4 summarizes the most common problems found in SMPs, as well as typical maintenance or repair solutions. The guidance provided in this section has some similarities to **Section 3** but differs in the following ways:

1. The primary audience for Section 4 is the Level 3 inspector, often a professional engineer, or landscape architect tasked with diagnosing and repairing SMPs that are not working properly. However, the information in Section 4 may also be quite useful for a Level 2 inspector seeking to diagnose a particular problem.
2. The maintenance measures described in this section are more detailed and focus on repairs to specific problems rather than on routine maintenance such as weeding or minor sediment removal.
3. Because the problems described in this section can be applied to several different practices, this section is organized by the type of problem rather than the practice type.

Problems addressed during Level 3 inspection/maintenance are summarized in **Table 4.1**. This list is not exhaustive but does address the most common issues in the SMPs that require some advanced knowledge and skill to inspect and fix. Each problem category is discussed in a separate sub-section.

Table 4.1: Common Inspection/Maintenance Issues for Level 3

Sub-Section/Category	**Description**
4.2 Contributing Drainage Area – Pollutant Sources	Sediment or pollution sources in the Drainage Area
4.3 Physical Obstructions	Physical obstructions to maintenance access, overflow, or emergency spillway
4.4 Erosion	Erosion on side slopes, practice bottom, at inlet or outlets. Rills and gullies forming where there should be sheetflow
4.5 Departures from Design Dimensions	Practice dimensions have been altered, either due to filling with sediment, redesign or filling in, or improper implementation.
4.6 Improper Flow Pathways	Flow is shortcircuiting the practice, or drainage pathways have been otherwise modified.
4.7 Sediment Buildup	Sediment has accumulated in a pool, practice bottom, pre-treatment area, or vault.
4.8 Clogging	The soil media or other components are clogged, and there may be standing water for longer than intended.
4.9 Vegetation	Excessive, inadequate, and/or unhealthy vegetation to support a practice
4.10 Embankment and Overflow Condition	Issues with an embankment or overflow weir or channel
4.11 Structural Damage	SMP infrastructure, such as concrete or metal elements, have been damaged.
4.12 Pool Stability	Permanent pool of water is at the improper elevation.
4.13 Pool Quality	Permanent pool of water suffers from poor quality due to algal growth or other issues.

4.2. Contributing Drainage Area – Pollutant Sources

Issue applies most commonly to: Sheetflow/Disconnection, Swales, Bioretention, Permeable Pavement, Ponds/Wetlands, Infiltration, and Sand/Organic Filters.

Problem #1: Bare soil washing into SMP from drainage area

General Approach for All Practices:

- Identify the specific source(s) of sediment in the drainage area by tracking sediment flow during a rainfall or looking for a track of sediment staining during dry weather.
- For an active sedimentation event, attempt to filter incoming runoff if conditions allow (e.g., enough space upstream of the practice for temporary ponding). Consider installing a silt fence, silt socks (at curb inlets), staked straw bales, or other filtering material at the inlets of the SMP. This will keep at least some of the sediment from getting into the practice.
- Runoff from active construction should not enter the SMP; divert to a temporary and approved sediment control practice.
- For areas of bare soil *not* due to active construction **(bottom photo)**, prep the soil and re-seed/plant with grass species or other thick ground cover appropriate for the region. May also need starter fertilizer, topsoil, and/or compost.
- For steep slopes with bare soil, consider also installing erosion-control matting to hold soil, seed, and straw in place until the vegetation becomes well established.
- For fill and topsoil stockpiles in the drainage area, provide temporary or permanent cover as soon as possible. Alternatively, surround the base of the stockpile with silt fence, or equivalent, to prevent the transport of sediment-laden runoff.

Helpful Skills:

- Erosion and sediment control knowledge and skills
- Landscaping knowledge to understand appropriate ground cover species for re-vegetating bare areas

Equipment Typically Used for Fixing Sediment Sources:

- Silt fencing and other sediment barriers
- Erosion-control matting and/or straw
- Rakes and shovels
- Light excavation or grading equipment for larger jobs
- Equipment to deliver topsoil or compost as needed
- Plants and/or seed mix, plus a way to move and store plant stock without damaging it or drying it out
- Starter fertilizer, topsoil, and/or compost

Problem #2: Other pollution sources in the drainage area

General Approach for All Practices:

- Pollutants may include: road salt, oils, fuels, food grease, wash water, paints and solvents, trash, and many others.
- Identify the source(s) of pollution.
- For pollutants spilled on the ground, remove by hand or use absorbents to soak up wet material. Absorbents and other waste materials shall be disposed of properly.
- For materials stored outside, move them to a covered area or build/add cover over the materials. Provide secondary containment, if possible.
- Make sure all waste containers have lids and fix any leaks (**see poor practices in photo at right**).
- For sites prone to frequent oil leaks and staining (e.g., vehicle maintenance yards), consider installing an oil/water separator to pre-treat runoff that enters the SMP.
- For routine dumping of wash water, grease, paints, or other pollutants, enforce behavior change and explain good housekeeping practices.
- Develop a pollution prevention plan for the site to ensure that hazardous materials and other potential pollutants are not stored where they are exposed to rainfall.
- For areas that receive a heavy salt and/or sand load during the winter, consider diverting upslope runoff, especially for practices such as permeable pavement. Some monitoring of winter road or parking lot clearing activities may also be warranted.

Helpful Skills:

- Knowledge of good housekeeping and pollution prevention practices
- Good communication with employees and managers at site (e.g., for correcting bad site operations)

Equipment Typically Used for Correcting Other Pollutant Sources:

- Tarps to cover stockpiles
- Absorbents to soak up spills
- Secondary containment barriers that will hold back any liquids or solids that may leak out of their primary container
- Storage barns, sheds, pole barns and other permanent cover for potential pollutants

4.3. Physical Obstructions

Issue Applies Most Commonly To: Rainwater Harvesting, Sheetflow/Disconnection, Swales, Bioretention, Green Roofs, Ponds/Wetlands, Infiltration, and Sand/Organic Filters

Problem #1: Maintenance access is obstructed

Ground-Level SMPs:

- Where a path for vehicles and construction equipment to access the practice was established during construction but is now overgrown, remove woody vegetation and any other tall vegetation. This path should be bush hogged once or twice a year.
- If the SMP needs a large quantity of trash and/or sediment removed in areas where access is limited due to steep grades, overgrown vegetation, etc., it will be necessary to establish safe vehicular access by clearing and possibly re-grading the area. It is advisable to have a maintained, all-weather surface to critical parts of the SMP.
- It is most important to provide access nearest to parts of the practice where sediment and trash tend to accumulate the most: forebay and riser structure.
- For an SMP blocked by fences **(photo at right)**, install a gate that is wide enough for vehicles to enter for any current or future maintenance.
- Sometimes access is blocked by unauthorized structures, such as sheds, property fences, retaining walls, etc. Confer with the local stormwater authority on the presence of any maintenance easements and means to gain access to the practice.
- The solutions above should also provide for safe foot access for routine inspection and maintenance.

Rainwater Harvesting:

- Ensure that no structures are covering the filter or the tank's access/inspection port.

Green Roofs

- Ensure that individuals can safely reach the roof with tools in hand (e.g., buckets, pruners, hoses). If the roof cannot be accessed via a walk-through door, this may require installing a wide ladder or fire escape-style stairs on the inside or outside of the building.
- If there is a concern of getting too close to the roof's edge while doing maintenance, install a railing around the edge for safety. Alternatively, for sloped roofs, workers may need to use harnesses during maintenance activities.

Helpful Skills:

- Use of motorized landscaping equipment
- Chainsaw skills
- Use of grading equipment for larger jobs
- *Note*: OSHA safety requirements and certifications may apply to green roof maintenance.

Equipment Typically Used to Regain Proper Access:

- Mower, trimmer
- For very overgrown areas, chainsaw and/or bush hog
- For areas that need to be regraded, excavator, skid steer, or other grading equipment

Problem #2: Flow is obstructed in or out of the practice

General Approach for All Practices:

- Flow can bypass an SMP when there is too much sediment/debris buildup near the inlets or due to grading changes in the drainage area (e.g., repaving of parking lot). If the cause of blockage or bypass is not obvious, inspect the practice during rainfall to watch the flow paths. (See **Section 4.6 – Improper Flow Pathways** for additional guidance.)

- Obstruction of overflow or emergency spillway structures is most often due to buildup of debris, such as trees, sticks, trash. It is *very* important to keep these structures clear of such blockages in order to avoid flooding or a dam breach (**avoid conditions caused by beaver activity - top photo**).

- Where debris cannot easily be cleared by hand, special equipment and skills may be needed. An obstructed riser structure in a wet pond may need to be accessed by boat **(bottom photo)**. In cases where large sticks, tree branches, trash, or other debris obstruct the overflow or spillway, they may need to be cut up by chainsaw. Large debris will usually need to be hauled away with a truck.

Helpful Skills:

- Chainsaw skills
- Muscle strength to haul large debris
- Boating capabilities

Equipment Typically Used to Clear Obstructions:

- Gloves, shovels, pruners, rakes, and other hand tools
- Waders for wetlands
- Chainsaw for large sticks and branches
- Cable puller (come-along) to remove large branches that cannot be pulled out by hand
- Boat and personal floatation device for riser structures in wet ponds
- Truck to haul away debris

4.4. Erosion

Issue Applies Most Commonly To: Sheetflow/Disconnection, Swales, Bioretention, and Ponds/Wetlands

Problem: Erosion on practice surface, inlets, and/or outlets

General Approach for All Practices:

- See **Section 4.10 – Embankment and Overflow Condition** for how to repair erosion on side-slope embankments.
- Rill and gully erosion occurs when runoff flow is concentrated. Deep rills and gully erosion on the practice surface **(top photo)** will require the surface to be regraded to make uniform again. Use the lightest equipment possible in order to minimize soil compaction during excavation.
- After excavation, reseed/plant the area with ground cover that is appropriate for the moisture conditions of the practice. Amend or enhance soil as needed according to a soil test; soil may need more organic material to support plants.
- To prevent further erosion on the surface of the practice, ensure that flow from the inlets can spread out adequately and has enhanced energy dissipation features. This may require installing or enhancing a stone apron outlet protection that flares out and down to the level of the practice to slow and spread out the flow. Other options include check dams, energy dissipation devices, or an armored low-flow channel. A stilling basin **(bottom photo)** can also dissipate flow as it comes out of an inlet or outlet pipe. Apply similar treatments to any outlets that are experiencing erosion.
- Any sloped soils that are disturbed during excavation will likely need erosion-control matting to hold it in place while vegetation becomes established.

Helpful Skills:

- Landscaping/Gardening
- Consult with Cooperative Extension Office or independent laboratory for soil testing
- Skills with excavation equipment
- Knowledge of sediment and erosion control practices and resources appropriate for the area

Equipment Typically Used for Fixing Erosion:

- Rakes, shovels, wheelbarrows, and other “landscaping” equipment
- Light excavation or grading equipment for larger jobs
- Equipment to deliver, unload, and move stone and other materials around
- Plants and/or seed mix, plus a way to move and store plant stock without damaging it or drying it out

4.5. Departure from Design Dimensions

Issue Applies Most Commonly To: Swales, Bioretention, Ponds/Wetlands, Infiltration, and Sand/Organic Filters

Problem: Practice dimensions have been altered

General Approach for All Practices:

- Once constructed, the dimensions of an SMP may become altered from the original design for a variety of reasons. These reasons can include:
- The SMP was not constructed to the proper dimensions at initial installation.
- Sediment accumulation in the SMP reduces the intended storage volume of the practice **(top photo).**
- Redevelopment or regrading of the site encroaches into the footprint of the SMP.
- Dumping of leaves, trash, or other debris into the SMP reduces the intended storage volume of the practice.
- If it appears that the dimensions of an SMP have been altered, proceed as follows:
- Consult the original design or as-built plans and sizing computations for the SMP to identify the intended dimensions and storage volume of the practice. Measure the length, width, and depth of the practice to estimate the current storage volume. Calculate the difference in volume to determine whether it is significant enough to warrant restoring the practice to its original dimensions. If the loss in volume is greater than about 10%, this likely warrants action.
- If the SMP's original storage volume cannot practically be restored because of current site conditions, an additional SMP may need to be built elsewhere on the site in order to regain adequate storage and treatment volume for the site.
- For problems of dumping by individuals on or near the site, install "No Dumping" or similar signage to inform people that this is not an appropriate place to dispose of debris. Any debris that has already been dumped should be removed from the practice either by hand or with equipment.

Helpful Skills:

- Basic surveying
- Understanding stormwater design plans and sizing computations
- Stormwater management design
- Skills with excavation equipment and erosion and sediment control

Equipment Typically Used to Investigate and Fix Dimensions:

- Simple level or survey equipment, tape measure, and other tools to measure SMP dimensions
- Light excavation or grading equipment for larger jobs
- Rakes, shovels, wheelbarrows, and other "landscaping" equipment for small jobs
- Soil stabilization materials

4.6. Improper Flow Paths

Issue Applies Most Commonly To: Rainwater Harvesting, Sheetflow/Disconnection, Swales, Bioretention, Infiltration, and Sand/Organic Filters

Problem #1: Flow intended to go into a practice is diverted by debris or grit buildup or capacity issues at inlets

Bioretention, Swales, Infiltration, Sand/Organic Filters:

- Grit, sediment, leaves, and other debris builds up at curb inlets or other inlets, sometimes to the point where flow is diverted completely around the practice (photos above). This is a common issue for practices that rely on curb cuts or other small inlet structures to get water into the practice for treatment. A minor amount of debris may be OK and not affect the ability of water to enter the practice. However, be aware of conditions where flow *that is supposed to be treated* is diverted to a downgradient storm drain or other structures in such a way that the stormwater treatment is entirely or partially bypassed.

- In many cases, correcting the problem may simply involve removing debris or unclogging the inlet.
- However, this problem can be chronic if the inlet design is susceptible to clogging. This can occur if the slope from the inlet into the practice is flat and/or there are controllable sources of sediment and debris in the drainage area.
- For chronic problems, consider redesigning inlets to be more clog proof. One solution is to build in a 2 to 3-inch drop from the curb inlet onto a gravel or stone diaphragm along the edge of the practice (see example in photo are right).
- Inlets that are undersized for the flow coming to them should be enlarged and armored with an appropriate erosion-resistant lining.

Rainwater Harvesting:

- Water intended to be collected in rainwater harvesting systems is sometimes not delivered to the tank or cistern if the system of gutters, downspouts, pipes, etc. is not sized properly or if the first-flush diverter or vortex filter is not functioning correctly and diverting too much water away from the tank.
- As with inlets, this may simply be a matter of routine cleaning of gutters, downspouts, vortex filters, etc.
- It may also be a design or capacity issue, in which case, installing larger gutters or a more robust piping system may be in order.

Source: Rainwater Management Solutions 1

Example of enhancing the gutter and piping system leading to a rainwater harvesting system

Helpful Skills:

- Basic surveying
- Typical landscaping skills using materials such as soil, rock/stone, edging material, mulch, etc.
- Light construction of gutters, downspouts, piping
- Some knowledge of first-flush diverter and vortex filter products

Problem #2: Flow is not uniformly accessing the entire treatment area

Bioretention, Swales, Infiltration, Disconnection and Sheetflow, Sand/Organic Filters:

Improper flow path issues in this category include:

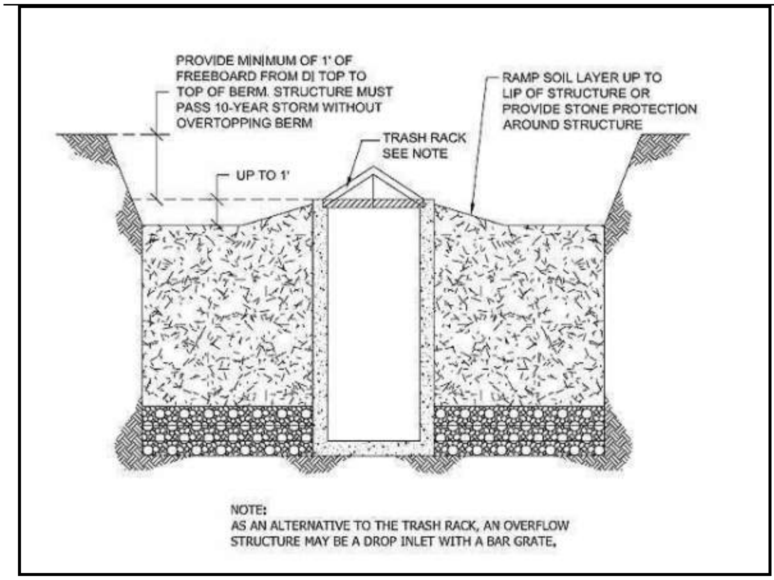
- Water forming channels or rills through the treatment bed of bioretention, swales, infiltration, or surface sand filters, and thus not spreading out across the treatment area surface
- Water ponding only at one end of the treatment area because the surface is not level
- Water piping through weak spots to an outlet or underdrain, such as where soil media meets a concrete structure
- See Section 4.4, Erosion for issues of channeling or erosion on the treatment surface.
- For uneven treatment area and preferential ponding, assess the severity of the problem. Compare the relative elevations of the “high” part of the treatment area (the area where water does NOT seem to pond) and any overflow structure or weir where high water flows will leave the practice. If there is still some freeboard (such that the overflow structure is higher than ALL of the treatment bed surface), then there will still be some ponding for larger rainfall events. Try some minor raking or moving soil media and mulch around to even out the filter bed.
- However, the problem is more serious if parts of the treatment area are higher than the overflow structure. These areas will never be valuable for treatment purposes. The treatment area is supposed to fill up like a bathtub, so some regrading is needed to level out the treatment area.
- If water is piping or shortcircuiting through the soil or sand media, forming sinkholes or otherwise bypassing the intended treatment mechanism, it will be necessary to repair these spots. Around concrete or metal overflow structures, use soil material right around the structure that can be compacted (bioretention soil media tends to be light, sandy, and fluffy and won’t compact very well). Another option is to “ramp up” the soil layer to the lip of the structure so that there won’t be a hydraulic jump at this potentially weak point. See the figure below.

These three issues are illustrated below:

Water from the inlet at top of photo is channeling through the bioretention area.

Water is preferentially ponding only at one end of the bioretention because the surface is not flat.

Water is “piping” down to the underdrain at the weak spot where the soil media meets the concrete overflow structure.



Ramp up soil layer to the lip of the structure to address this being a weak interface where water can work down and create bypassing. (Source: Virginia 2013 Stormwater BMP Specifications, Specification #9, Bioretention, Figure 9.13.)

Impervious Disconnection:

The most likely flow path issues with Impervious Disconnection are: (1) owners intentionally diverting downspouts away from pervious area and onto impervious area **(left photo below),** and (2) slight grading issues diverting the water away from the intended pervious receiving area **(right photo below).**

Both issues are fairly straightforward to address but involve communicating and working with property owners to explain the purpose of disconnection and how to properly maintain it. The second issue may involve some minor regrading or building low-profile berms to get water to flow to the intended disconnection area.

Helpful Skills:

- Rudimentary surveying
- Typical landscaping skills—using materials such as soil, rock/stone, edging material, mulch, etc.

Equipment Typically Used for Inspecting and Fixing Flow Paths

- Surveying equipment (i.e. Site level or total station) to get relative elevations among different parts of treatment area, inlets, overflow structures, etc.
- Small, simple tools—flat shovels, wheelbarrows, rakes, other common landscape/gardening tools
- Large, more complicated equipment—small excavators to move material around or do regrading. Always work from the side of the practice and NOT within the practice itself.

4.7. Sediment Buildup

Issue Applies Most Commonly To: Swales, Bioretention, Permeable Pavement, Ponds/Wetlands, Infiltration, and Sand/Organic Filters

Problem: Sediment accumulation more than 2 inches thick covering 25% or more of the practice surface area

Bioretention, Swales:

- Determine the source(s) of sediment. The most likely sources are: (1) premature installation of the practice during the construction process and discharge of construction site sediment loads; (2) erosion in the contributing drainage area *after* construction is complete; and (3) erosion along the practice side slope or within the practice itself. If it is an ongoing source, it must be abated (see **Sections 4.2, Contributing Drainage Area, and 4.4, Erosion).**
- Use a soil auger to auger holes in various places across the Bioretention or Swale surface area, especially in areas where sediment is accumulating. Determine how deep the sediment is penetrating into the soil media layer. Usually, it will be the top 2 to 3 inches that are most affected. Note that for swales *without* an engineered soil media, the sediment layer will likely be confined to the surface.
- Remove the “fouled” soil media to the affected depth (using flat shovels or small excavators and working from the side) and replace with clean material from an approved vendor (bioretention soil media or equivalent). If no vendors are available in your area, use the soil media specifications from the **Design Manual** to replicate the right mix of sand, topsoil, and composted organic material.
- Check to ensure that the practice is filtering at the proper rate after the next several storm events.

Infiltration:

- For infiltration practices excavated to a suitable infiltrating soil layer (e.g., not stone reservoir layer), use the same procedures as for Bioretention/Swales above.
- For infiltration trenches and basins that have a stone reservoir layer, use similar procedures, but use a shovel to dig into the stone layer to ascertain how deep the sediment incursion is into the stone. Remove down to this layer and replace with clean material.
- If the infiltration practice is clogged, see **Section 4.8: Clogging.**
- As with Bioretention, check for controllable sources of sediment in the Drainage Area (**Section 4.2**).

Permeable Pavement:

- NOTE: Routine sweeping with a regenerative air vacuum (maximum power 2,500 rpm) is important to avoid more costly repairs that result from deferred maintenance. It is best to sweep the pavement surface in the early spring after winter sanding/salting materials or snow piles have led to sediment or winter slag accumulation. Also, if the area is surrounded by tree canopy, fall cleanup is essential, as vegetative debris tends to get pulverized by vehicle traffic and ground into the pavement surface.
- Observe the pavement surface during a storm event to see whether the sediment is clogging the pavement (i.e., standing water on the surface after the storm stops). If so, see **Section 4.8: Clogging.**
- Remove several of the paver blocks in different parts of the structure to ascertain how deep the sediment is penetrating into the bedding and reservoir layers. Most of the time, sediment incursion will be limited to the top 1 or 2 inches of the pavement bedding layer (for permeable interlocking concrete pavers and concrete grid pavers).
- Based on the above observations, it may be worthwhile to quantify the infiltration rate using ASTM C-1701/1701M. This is most useful in conducting the test in the *same place within the pavement surface through the course of several years* to document reduction in infiltration rates. Repair or restorative sweeping is warranted when infiltration rates drop below around 10 inches per hour. NOTE: As stated above, this can likely be avoided if routine annual sweeping is conducted.
- If sediment covers more than 25% of the surface, is deeper than 2 inches, or vegetation is starting to grow where sediment has accumulated, consult a street-sweeping vendor about *restorative* sweeping. In this case, it will be necessary to use a higher RPM sweeper or vacuum sweeper to suck out more of the bedding pea gravel that has been fouled, then replace with clean material.

Infiltration test using ASTM C-1701

Pulling grass and weeds from the joints can damage parking surface if roots are firmly established in the bedding layer.

- Vegetation growing in the pavement joints should be removed either manually or with a water-safe herbicide (e.g., glysophate without surfactants). It is important to not let weeds proliferate in the pavement surface because pulling them out by the roots may damage the pavement structure. (Note: The application of herbicides to control invasive or undesirable vegetation within wetlands or other waters of the U.S. may require an Aquatic Pesticide Permit from the NYS DEC)
- Check the pavement surface after a storm event to ensure that it is draining properly.

The North Carolina State University (NCSU) Stormwater Engineering Group has an informative Urban Waterways publication, *Maintaining Permeable Pavements (2011):* **http://www.bae.ncsu.edu/stormwater/pubs.htm**

Routine, air-vacuum sweeping in the early spring and fall is the best approach for permeable pavement maintenance (Photo source: Toronto and Region Conservation)

Ponds and Wetlands:

- Sedimentation is an inevitable process in ponds and wetlands. NOTE that upstream erosion, especially along stream channels or ditches leading to the practice will accelerate the sedimentation process and lead to more frequent and costly sediment removal operations. Whenever possible, it is important to mitigate any upstream erosion issues.
- Forebays and/or pre-treatment areas should be cleaned out when they reach 50% of their design capacity. Once cleanout is complete, it will be worthwhile to install a graduated rod into the forebay with a clear marking of future sediment clean-out levels.
- The main body of a pond or wetland may need to be dredged on an infrequent basis or when sediment has replaced 50% of the design capacity. There are many dredging methods available. Excavators with long arms can handle most small or moderate-sized ponds. Other methods may be necessary for larger facilities. Dredging can be a complicated operation involving dewatering, storage of wet sediment, and possibly hauling to on-site or off-site disposal or reuse areas. Consult a qualified contractor to explore available methods and costs for the particular application. Once again, installation of a graduated rod can help mark future clean-out levels. Note: The dredging of accumulated sediment within regulated wetlands, ponds or at outlet structure may require permits from NYS DEC and/or USACE. In addition, removed sediment should be properly disposed of in a regulated solid waste management facility or in an upland area that is at least 100 feet from regulated wetlands or streams. Sediment managed in upland disposal areas shall be graded, seeded and mulched.

Sand/Organic Filters:

- See the section above on Bioretention/Swales as some of the procedures will be similar, especially for above-ground filters. It is important to determine whether the drainage area is generating a controllable source of sediment that can be abated.
- Underground trench or vault filters will require routine maintenance to: (1) remove accumulated sediment, trash, and floatables from the sedimentation chamber, usually with a vac truck; and (2) remove sediment, grit, and sludge from the top layer of the filter media and replace with clean material. NOTE: Depending on the configuration of the underground filter, confined-space procedures may apply. For a normally operating practice, these maintenance tasks should be conducted every two to three years. If the filter is treating a stormwater hotspot or a particularly dirty drainage area (e.g., vehicle maintenance, washing, repair), the frequency may increase to annually or more often, as dictated by Level 2 inspections. Also, in these cases, it may be warranted to test the material to ensure proper disposal.
- Some proprietary filters require replacement of special cartridges or filter material. Consult the vendor or manufacturer for special maintenance procedures.

Routine cleaning of a perimeter or "Delaware" sand filter. This can be done from the surface, but deeper, vault-type filters will require confined-space entry procedures.

Helpful Skills:

- Most common contracting skills
- Excavation, dewatering, and sediment disposal in some cases
- Knowledge of maintenance equipment, such as vac trucks, street sweepers, etc.
- Knowledge of preferred conditions for bioretention soil media
- Soil testing in some cases where sediment is being removed from stormwater hotspots

Equipment Typically Used for Sediment Removal Activities:

- Small, simple tools—flat shovels, wheelbarrows, rakes, other common tools
- Larger jobs—small or large excavators, loaders, dewatering equipment (pumps, dirt bags, etc.), trucks to haul material to on-site or off-site disposal or reuse areas, erosion and sediment-control supplies.

4.8. Clogging

Issue Applies Most Commonly To: Bioretention, Permeable Pavement, Infiltration, and Sand/Organic Filters

Problem: Filter media clogged; water standing on practice surface for 48 to 72 hours or longer after a storm

Bioretention:

Standing water on the bioretention surface 48 to 72 hours after a storm event is a sure indication of clogging (top photo). Clogging of bioretention practices can be tricky to diagnose as there are several probable causes:

a. Clogged underdrain
b. Filter fabric between soil media and underdrain stone
c. Too much sediment/grit washing in from drainage area
d. Too much ponding depth
e. Improper soil media

The following procedure can be used to work through diagnosing the most common causes, beginning with the simplest and easiest to fix and progressing through more complex remedies:

1. Look for a thin, crusty layer of sediment that covers some or all of the soil media. It is often grayish in color. This thin layer can sometimes be enough to cause slow drainage. Scrape this crust off and ascertain sources of sediment in the drainage area (see Section 4.2, Contributing Drainage Area). Often, this problem can be caused by the bioretention soil media being installed too early in the construction process, but other chronic sediment sources should also be checked.
2. Open the underdrain cleanout and pour water in to verify that the underdrains are functioning and not clogged or otherwise in need of repair. The purpose of this check is to see whether there is standing water all the way down through the soil. If there is standing water on the surface, *but not in the underdrain*, then there is clogging somewhere in the soil layer. If the underdrain and cleanout have standing water and there is not water coming out the other end (outlet) of the underdrain pipe, then the underdrain is clogged and will need to be rooted out.
3. Use a soil auger to auger several holes down through the soil media to the underdrain layer (if present) or underlying soil. Check to see whether there is a layer of filter fabric at the bottom of the soil layer. The auger will pierce through any filter fabric that is present, and pieces of fabric in the auger bucket should be removed. Notice if the fabric is "blinded" or clogged with sediment. This is a common issue with older bioretention practices. If the practice has a clogged the filter fabric layer, go to step #6, install wick drain.

Filter fabric, where present, is a likely source of clogging.

4. While checking for filter fabric in auger holes, also note whether there is a layer of saturated soil media or bad soil media (e.g., too much clay content) that may be on top of a good media layer. This will be fairly obvious as the top 3 or 4 inches will be mucky and saturated, with dry and sandy media below. If this is the case, it will be necessary to remove the bad material and replace with good, clean bioretention soil media in accordance with the design specifications. Till or incorporate the good material into the underlying existing soil media to establish a good contact.

5. If the entire profile of soil media is bad, has too much clay content, or does not appear to meet the specifications for soil media, it will be worthwhile to test the soil and compare against the recommended specifications (e.g., clay content, particle sizes, etc.). If the soil does NOT meet specifications, see steps #6 and #9 below.
6. If the problem appears to be filter fabric or bad soil media (steps #3 or #5 above), there is a critical decision to be made. It is an expensive proposition to dig up the entire facility to either remove the filter fabric or replace the entire soil layer. If the clogging problem is not severe in nature, an intermediate (and much cheaper) option may be to install wick drains. Using a 6-inch auger bucket, auger numerous vertical holes around the practice surface area, making sure to auger all the way down to the underdrain stone or underlying soil (if there is no underdrain). Hammer 6-inch perforated PVC or other type of pipe into these holes. Perforations should be about 3/8-inch diameter. Fill the pipes with clean underdrain gravel (#57 stone) mixed in with coarse construction sand. These drains will serve to wick fines from the surrounding soil media and will provide alternative drainage. Check after the next several storm events to see whether the wick drains improve drainage.

Adding sand to a wick drain. The vertical perforated PVC pipe has already been placed in the auger hole.

7. Sometimes the cause of saturated soil media is springs or some type of baseflow coming into the practice. This is a more difficult problem as bioretention is not supposed to receive this type of constant flow. It will be necessary to identify and reroute springs or baseflow or perhaps replace the bioretention practice with a different type of practice.
8. Another possible source of poor drainage or clogging is that there can be too much water on top of the soil media when the bioretention practice fills up. Most specifications call for a maximum ponding depth of 12 inches, but sometimes the ponding depth can be 18 or even 24 inches. While this increases the amount of head pushing water down through the soil media, it can also lead to compaction or too much sediment building up. If the bioretention practice has a ponding depth greater than 12 inches, consider configuring the outlet or large storm overflow to reduce the ponding depth to 12 inches or less. Check with the local stormwater authority to ensure that doing this will not compromise the required treatment volume of the practice.
9. If clogging is too severe to be fixed with wick drains or other remedies listed above, it may be necessary to rebuild the bioretention practice by digging up the existing soil, taking out any filter fabric that is between the soil media and underdrain stone, and rebuilding and replanting according to the design specifications.
10. Whatever the chosen remedy, check to ensure that the practice is filtering at the proper rate after the next several storm events.

The Chesapeake Stormwater Network (CSN) has produced an excellent reference guide for inspecting and diagnosing Bioretention issues, *Technical Bulletin #10, Bioretention Illustrated.* This tool can be used as an additional reference and can be downloaded using this link: http://chesapeakestormwater.net/category/publications/

Infiltration:

- Clogging of infiltration practices can be simple to resolve or fatal:
- On the *simple* side, clogging (or poor drainage) may arise from sediment, vegetative debris, parking lot grit, or other debris clogging the top few inches of soil or stone.
- With luck, the practice will have an observation well (vertical perforated PVC pipe with cap that extends through the stone reservoir in an infiltration trench or basin). Check the observation well three days after a storm event of ½-inch or more. If water is standing in the observation well to the surface, then the whole profile may be clogged (see below under *fatal*). If the observation well has only a few inches or no water and there is still water standing on the surface, then surface clogging is a likely culprit.
- For infiltration practices in soil (no stone reservoir), auger several holes around the infiltration surface area. If saturated soil seems to be on top of good, clean, dry soil, then surface clogging seems likely.
- For infiltration trenches and basins with a gravel reservoir, dig several holes around the surface to determine, again, whether there seems to be a layer of gravel clogged with sediment, leaves, vegetative debris, parking lot grit, etc. If possible, dig down to where the gravel meets the underlying soil to see whether a layer of filter fabric is present (which may be common with older practices). If this is the case, blinding of the filter fabric may be a cause of the clogging.
- For surface clogging, remove the affected material down to the level where the soil or gravel seems clean, and replace with clean material. If filter fabric seems to be a problem, it will be necessary to dig up the gravel, remove the filter fabric, and rebuild the reservoir layer in accordance with the current design specifications. In either case, check after a storm event to ensure that this has resolved the issue.
- On the *fatal* side, the underlying soil may not be suitable for infiltration, either due to soil characteristics, compaction during construction, or other causes. Check the original design package to see whether any soil testing was done at the time. It may be worthwhile to auger down to the infiltration interface layer (e.g., where stone reservoir meets the underlying soil and then another several inches below this interface), and take several soil samples for lab analysis to compare to current soil specifications (see information below about infiltration soil analysis).

- It may be that a geotechnical analysis would reveal that there is a good infiltration soil layer, but it is lower than the existing interface. This would still require a complete rebuild and excavation down to the suitable soil layer. Restoring porosity at the designed elevation would require replacing soil above this suitable layer and avoiding compaction.
- Another option would be to convert the practice to a bioretention practice with an underdrain. Check with the local stormwater authority to see whether this would require any site plan or stormwater plan amendments or other permits.
- Many updated state stormwater manuals and specifications include protocols for infiltration soil testing and analysis that reference various ASTM standards. For example, see: *Virginia 2013 BMP Standards & Specifications, Specification #8: Infiltration, Appendix 8-A, Infiltration and Soil Testing* at: **http://www.deq.virginia.gov/fileshare/wps/2013_DRAFT_BMP_Specs/**

Permeable Pavement:

- AS NOTED IN SECTION 4.7 – sediment buildup, routine sweeping with a regenerative air vacuum (maximum power 2,500 rpm) is important to avoid more costly repairs that result from deferred maintenance. Preventative maintenance is the best and most cost-effective way to prevent clogging in the first place.
- If there is standing water on the pavement surface 48 to 72 hours after a storm event of ½-inch or more, then the pavement surface is clogged.
- Check the design plan or as-built plan to see whether the permeable pavement design includes an underdrain. There may also be underdrain cleanouts at the edge of the permeable pavement.
- If there is an underdrain, the first thing to check is whether the underdrain is clogged, crushed, or broken. Check to see whether there is standing water in the underdrain cleanout 48 to 72 hours after a storm event. If the underdrain is dry, pour water into the underdrain with a hose and see whether it comes out the other end. If the underdrain is clogged, snake it out, as this is the first and easiest thing to try.
- If the underdrain is working, then clogging may be due to: (1) clogged surface or bedding layer; or (2) underlying soil is not suitable for infiltration for designs with no underdrain. First, refer to the guidance in Section 4.7 – Sediment Buildup, and then proceed as follows:
- IF THERE IS NO UNDERDRAIN AND THE DESIGN IS BASED ON SOIL INFILTRATION UNDER THE PAVEMENT, it will be worthwhile to check the soil because unclogging the surface layer will likely not fix the problem. Check the original design package for any soil infiltration testing. It is likely worthwhile to remove the entire pavement section in several places down to the soil layer and to do a geotechnical investigation of the soil profile. See: ASTM C-1701/1701M and/or *Virginia 2013 BMP Standards & Specifications, Specification #8: Infiltration, Appendix 8-A, Infiltration and Soil Testing* for examples of soil infiltration protocols (URL above).
- If the soil is not suitable for an infiltration design, it will probably be necessary to rebuild the pavement using an underdrain design or possibly adding subsurface drainage along the perimeter of the parking area.
- IF THERE IS AN UNDERDRAIN OR THE SOIL IS SUITABLE FOR INFILTRATION, the best approach to try to unclog the pavement is restorative sweeping with a vacuum sweeper. Regenerative air sweepers may not have enough suction to relieve the clogging.
- If vacuum sweeping is not successful, it may be necessary to rebuild any layers fouled with sediment and fines. It is likely that this will be confined to the bedding layer and gravel used in the paver stone joints, but some clogging can possibly move down into the underlying stone reservoir layer.
- The North Carolina State University (NCSU) Stormwater Engineering Group has an informative Urban Waterways publication, *Maintaining Permeable Pavements (2011):* **http://www.bae.ncsu.edu/stormwater/pubs.htm**

Water standing on the parking surface 48 to 72 hours after a storm is an indication of clogging. Snow piles at the edge of the photo point to possible clogging from winter sanding or plowing.

Sand/Organic Filters:

- See the section above on Bioretention/Swales as some of the procedures will be similar, especially for above-ground filters.
- Also see Section 4.7 – Sediment Buildup for guidance on routine maintenance of the sedimentation and filter chambers.
- As with Bioretention, there can be various causes for clogged filters:
- Filter fabric layer under the filter media that has blinded or clogged
- Clogging of the surface of the filter layer or filter cartridges
- Bad filter media (e.g., sand or organic media)
- “Plumbing” issues with configuration of overflow and underdrain pipes
- Fortunately, filters are usually confined within concrete vaults or manholes, so diagnosing and rectifying clogging problems should be more straightforward. Check the original design or as-built plans. Some of the following guidance may also be helpful:
- For proprietary cartridge or special filter media structures, consult the vendor or manufacturer for recommended solutions.
- See Section 4.7 for guidance on removing the top layer of filter media and replacing with clean material, as well as vacuuming out any sedimentation chambers.
- If it is suspected that overflow or outlet pipes are not configured correctly, check against the design plans and also standard drawings from the manufacturer.
- Chronic clogging problems are likely due to excessively dirty drainage areas, including uncontrolled sources of sediment, oil and grease washoff, vegetative debris from surrounding trees or shrubs, or other sources. It will be important to check and resolve any controllable sources of clogging in the drainage area (see **Section 4.2 – Contributing Drainage Area**).

Standing water on the parking lot is evidence that this perimeter sand filter (under the sidewalk) is clogged.

Helpful Skills:

- Soil infiltration analysis techniques as per ASTM and/or current BMP design specifications
- Excavation, dewatering, and sediment disposal in some cases
- Knowledge of maintenance equipment, such as vac trucks, street sweepers, etc.
- Knowledge of preferred conditions for bioretention, sand/organic filter media, or standard permeable pavement types and bedding layers
- General practice of trying easier or less expensive strategies before jumping right to wholesale reconstruction of a practice

Equipment Typically Used for Unclogging Activities:

- Soil infiltration testing or geotechnical equipment
- Small or large excavators, loaders, dewatering equipment (pumps, dirt bags, etc.), trucks to haul material to on-site or off-site disposal or reuse areas, erosion and sediment control supplies
- Pavement demolition and repair equipment
- Mulch, plants, filter media, and other materials needed to rebuild practices

4.9. Vegetation

Issue Applies Most Commonly To: Swales, Tree Planting, Bioretention, Green Roofs, and Ponds/Wetlands

Problem #1: Not enough vegetation; vegetation *is unhealthy*

Bioretention, Swales, Tree Planting:

- Test soil/media to ensure proper conditions exist for plant survival.
- Check water drawdown after a storm to make sure that wet/saturated conditions are not the cause of plant failure. If this IS an issue, see **Section 4.8 – Clogging.**
- Amend or enhance soil as needed; soil may need more organic material to support plants, but do NOT use uncomposted organic material or animal waste, as it will likely export undesirable nutrients to the stormwater system.
- If plants have continued to die, consider a different species or entire planting palette or revised planting plan **(photo to right shows the need for a whole new planting plan)**. Also consider using an appropriate bioretention or swale native seed mix to supplement use of plugs or other nursery stock.
- Consult a horticulturalist or plant nursery if there is evidence of disease or pests.
- Replant and add mulch or ground cover as needed.

Ponds and Wetlands:

- See **Section 4.13 – Pool Quality** for general guidance on pond and wetland vegetation maintenance, as well as the following.
- For emergent vegetation, determine whether water depths are too deep or shallow for survival (i.e., depths are different from design depths, or original design included improper vegetation).
- If a small amount of supplemental vegetation is needed, plant wetland plugs per nursery guidance.
- For large-scale plantings, drain the permanent pool and plant during the early spring.

Green Roof:

- Consult with a green roof plant vendor about possible causes of plant failure. Lack of watering during initial establishment could be the main culprit.
- Work with a qualified vendor to develop and install a new planting plan.
- Speak with building facilities maintenance personnel to ensure they understand need for watering and caring for new plants after they are installed.

Helpful Skills:

- Landscaping/gardening
- Consult with Cooperative Extension Office or independent laboratory for soil testing
- If original planting plan is deemed inadequate, consult a landscape architect or horticulturalist to determine whether a revised planting plan is needed.
- Knowledge of native plant and/or wetland plant nurseries in general region

Problem #2: Too much vegetation, overgrown (with invasive species), not maintained

General Approach for All Practices:

- Determine which invasive plants are present. For a list of regulated and prohibited invasive plants in New York State, see *New York State Prohibited and Regulated Plants* (NYS DEC, NYS Agriculture and Markets, 2014) at: http://www.dec.ny.gov/docs/lands_forests_pdf/isprohibitedplants2.pdf . Invasive plants shall be properly disposed of in a manner that renders them non-living and non-viable to prevent the establishment, introduction or spread of disposed species.
- Review whether the original planting plan relied on these plants; for example, some wetland plans may rely on “aggressive colonizers” such as cat tails.
- For more detailed information regarding appropriate control measures for each species, consult the Cornell Cooperative Extension Invasive Species Program at the following link: http://ccetompkins.org/environment/invasive-nuisance-species/invasive-plants. If invasives have taken over the facility, wholesale removal and replanting with desirable species may be necessary.
- If (non-invasive) plants are overgrown, (**example in photo to right**), remove, thin, or trim back excessive vegetation.
- If an entire new planting plan is deemed necessary, use SMP-Specific Guidance in the remainder of this manual, along with landscaping goals for the site location, to devise a plan that allows for adequate growth over a long period of time. A simple, clear planting design (**example in photo below**) with a long-term plan has the best chance of being maintained through time. Maintenance crews need to know which plants are part of the design versus weeds and how the practice should look from year to year.
- Develop a plan to ensure proper weeding, pruning, trimming, and replanting to maintain the plan over time.
- See **Section 4.13 – Pool Quality** for general guidance on pond and wetland vegetation maintenance, as well as the following.

Helpful Skills:

- Knowledge of exotic and invasive species is needed. Consult a local Cooperative Extension Office.
- Specific measures may include mechanical hand pulling, regrading (requires construction equipment), or herbicide/pesticide application *safe for aquatic environments*.
- Landscape architect
- Knowledge of wetland plants (for ponds/wetlands)
- Knowledge of SMP design (to understand hydrologic regime for plant selection)

Equipment Typically Used for Vegetation Maintenance Activities

- Soil auger to diagnose issues of soil drainage that may affect vegetation health
- Rakes, shovels, wheelbarrows, and other “landscaping” equipment
- Light excavation or grading equipment for larger jobs
- Equipment to deliver, unload, and move soil media, mulch, and other materials
- Plants and/or seed mix, plus a way to move and store plant stock without damaging it or drying it out
- Planting bars, soil drills, etc.
- For planting in standing water (e.g., ponds, wetlands), pumps or pump-around systems and dirt bags or other ways to temporarily dewater planting area

4.10. Embankment and Overflow Condition

Issue Applies Most Commonly To: Swales, Bioretention, and especially Ponds/Wetlands

Problem #1: Rill and channel erosion and bare dirt areas of embankments

Bioretention, Swales:

- Erosion and areas of bare dirt indicate two basic issues: 1) soils and moisture levels are not suitable for the plants or turf used; and 2) vegetation cannot take hold because of concentrated flow, physical wear, or poor soil conditions. Address these issues first with a soil/media test to ensure proper conditions exist for plant survival.
- High salt content from winter deicing of pavement is a common culprit of poor soil conditions for roadside plants. If this is the case, restore area with plant species that can tolerate salt levels, or replace edge plants with a stone diaphragm to intercept runoff from road.
- Amend or enhance soil as needed; soil may need more organic material to support dense ground cover.
- For concentrated flow and physical wear, redirect concentrated flow so that it disperses in mulched and vegetated areas. Stake in mulch and replant with vigorous plants recommended through the soils test.
- If plants have continued to die, consider a different species or entire planting palette or a revised planting plan (see **Section 4.9 – Vegetation and photo to right)**. Also consider using an appropriate bioretention or swale native seed mix to supplement use of plugs or other nursery stock.
- Consult a horticulturalist or plant nursery if there is evidence of disease or pests.
- Replant and add mulch or ground cover as needed.

Ponds and Wetlands:

- Where erosion has deposited soil within the pond or wetland water line, remove this material and reshape the slope.
- If a small amount of supplemental vegetation is needed, plant wetland plugs per nursery guidance.
- To address rill and channel erosion, first obtain a soil sample test to get soil amendment recommendations. Undercut the eroded sections and replace with clean amended soil, based on the soil test, and reseed as appropriate for the season.
- It may be necessary to stake in seed blankets or erosion-resistant lining (e.g., erosion-control matting or even rock in extreme situations) to stabilize eroded areas. Again, choose seed types appropriate for the season.
- Based on soil test guidance, reseed bare areas to prevent further erosion.
- For persistent problems, reroute the flow to more stable receiving areas using berms, diversions, etc.

Helpful Skills:

- Landscaping/gardening
- Consult with Cooperative Extension Office or independent laboratory for soil testing.
- If original planting plan is deemed inadequate, consult a landscape architect or horticulturalist to determine whether a revised planting plan is needed.
- Knowledge of sediment and erosion control practices and resources appropriate for the area

Problem #2: Settlement, loss of armoring material, erosion of emergency overflow

General Approach for All Practices:

- Settlement, loss of armoring material, erosion and accumulated debris can affect the dimension, water velocity or capacity of the emergency overflow such that embankment failure could occur in flood events (**photos below**).
- Inspect for exposure of soil or geotextile base material in the overflow and rearmor areas of exposure.
- In cases of settlement, a qualified engineer should be sought to assess its capacity and impact on pond capacity.
- Erosion of spillways should be repaired and revegetated as described for embankments.

Helpful Skills:

- Knowledge of sediment and erosion control practices for the area
- Completion of self-guided training on dam safety through Association of State Dam Safety Officials: http://www.damsafety.org

Problem #3: Impounding structure (embankment or dam) integrity issues due to tunneling or digging animals, woody vegetation or seepage

Ponds/Wetlands:

- Impounding structure stability is a serious concern, especially where trees have become established on the slopes, or there's evidence of animal burrows or seepage.
- The best approach for trees on the crest, slopes, and adjacent to an impounding structure or embankment is to cut them down before they reach significant size. If large trees have been cut down but their root systems not removed, carefully monitor the area around the remaining stumps for signs of seepage.
- Exercise judgement for trees on the surrounding side slopes that are NOT impounding structures (not designed to hold back water in the pool). Sometimes a forested edge can enhance the appeal of a pond, but access for maintenance must also be available, and some trees can drop debris into ponds, leading to quality issues.
- Animal burrows can be dangerous to the structural integrity of the embankment because they weaken it and can create pathways for seepage. Professional exterminators may be needed to trap and remove animal pests.
- Seepage as water flow or boiling sand on the lower portion of the exterior slope or toe area of an impounding structure should be brought to the attention of a qualified engineer.
- Leakage around conveyance structures such as barrel pipes or spillways should be monitored for increase since the last inspection. A qualified engineer is needed to resolve issues of piping or seepage along the barrel pipe through a dam.
- Turbidity or cloudiness in seepage should also be brought to the attention of a qualified engineer.

Helpful Skills:

- Completion of self-guided training on dam safety through the Association of State Dam Safety Officials: http://www.damsafety.org

Equipment Typically Used for Embankment and Overflow Maintenance Activities

- Excavation or grading equipment for larger jobs
- Equipment to deliver, unload, and move soil media, mulch, and other materials
- Plants and/or seed mix, seed blanket and erosion control materials
- Rod and level for settlement measurements
- Clear glass bottle for seepage visual test

4.11. Structural Damage

Issue Applies Most Commonly To: Any Practice

Problem: Structural damage to pipes, headwalls, standpipes, inlet/outlet structures, grates, curbs, and other structural components

- Structural components are necessary for water to flow into and out of stormwater practices as intended. This is a broad category that involves components composed of concrete, metal, plastic, and other materials. Some common examples include:
- Deteriorated or broken curbs that allow water to bypass a practice
- Slumping or sinkholes where soil meets a concrete drop inlet or outlet structure
- Broken or collapsed inlets
- Connections in an inlet or manhole structure that are not parged and are leaky
- Collapsed or crushed pipes (especially corrugated metal)
- Missing or broken steps or other safety features in a manhole or riser structure
- Root penetration and clogging of underdrain or other pipes
- Broken check dams
- There are too many particular instances to mention here, but the general idea is to inspect and repair any structural components that are affecting the performance of a practice or leading to a potential health or safety issue.

Helpful Skills:

- General contracting skills—concrete work, metal, proper joint sealing
- Routing out clogged pipes
- Perhaps CCTV experience to look for broken or clogged pipes

Equipment Typically Used for Fixing Erosion:

- General contracting
- CCTV

4.12. Pool Stability

Issue Applies Most Commonly To: Ponds/Wetlands

Problem: Flooded or dry pond – outlet issues

General Approach for Ponds and Wetlands:

- Note high-water marks on structures or pond banks and compare with outlet structure weir.
- If the outlet weir is submerged, investigate downstream for plugs such as beaver dams, woody debris or sediment bars. Refer to **Section 4.3 – Physical Obstructions** for removal of obstructions.
- If the pond is retaining more water than it is supposed to and there is no flow from the outlet with no visible blockages in the outlet pipe, look for obstructions above the weir or outlet pipe. Woody debris, vegetation and silt can plug outfall weirs or blind rock outfall protection. Removal of such blockages tends to be a hand exercise. A jet/vacuum truck or other heavy equipment may be needed to clear excessive or precarious blockages (**photo on right**).
- If the pond is too low and not holding water in the designated pool, the outlet structure should be closely inspected to see whether it has settled from the original construction or there is leakage through joints or cracks. Finding no deficiencies with the structure, investigate the pond embankment as described in **Section 4.10** for evidence of seepage.
- If there is no evidence of seepage and the outlet structure has no apparent structural defects, an engineer should be consulted to review the pond design and determine the proper outlet elevation.

Helpful Skills:

- The ability to navigate uneven surfaces, to follow ditch banks and to sight drainage obstructions is implicit with this task.
- Ability to use a level to sight adequate elevation fall is helpful.

Equipment Typically Used for Pool Stability Evaluations

- Bright flashlight for pipe inspection
- Manhole hook for manhole cover access
- Brush hook to clear debris and walking surfaces
- Rod and level to check elevation differentials

4.13. Pool Quality

Issue Applies Most Commonly To: Ponds/Wetlands

Problem #1: Littoral shelves and pond edge: not enough vegetation; vegetation *is unhealthy;* invasive plants have taken over

Ponds and Wetlands:

- If there is not enough vegetation or no vegetation, determine whether maintenance practices have killed the plants. If so, work with the owner to educate those responsible for pond maintenance on correct methods. Consult plans for original planting and replant.
- For emergent vegetation, determine whether water depths are too deep or shallow for survival (i.e., depths are different from design depths, or original design included improper vegetation).
- If a small amount of supplemental vegetation is needed, plant wetland plugs per nursery guidance.
- For large-scale plantings, drain the permanent pool and plant during the early spring.If ponds are overgrown so that less than 25% of the surface area is visible, the pond water level should be lowered to enable selective plant removal.
- Invasive plants, such as phragmites or common reed, should be removed with their roots. Be sure to restore areas that have been disturbed with replacement vegetation because root removal exposes soil to erosion. Invasive plants shall be properly disposed of in a manner that renders them non-living and non-viable to prevent the establishment, introduction or spread of disposed species.
- Native plants selected based on environmental conditions have the greatest chance for survival.
- Consult a horticulturalist or plant nursery if there is evidence of disease or pests.

Helpful Skills:

- Landscaping/gardening
- If original planting plan is deemed inadequate, consult a landscape architect or horticulturalist to determine whether a revised planting plan is needed.
- Knowledge of native plants and/or wetland plant nurseries in general region
- Familiarity with New York invasive terrestrial and wetland plants and their control: http://nyis.info/

Problem #2: Pond color, scum, odor, algae and plant overgrowth

- Ponds that have algae covering more than 20% of the surface should have maintenance to remove it. Raking or mechanical harvesting of filamentous algae offers short-term control, but feasible long-term strategies should be considered.
- Pond maintenance companies should be relied on to identify the algae and appropriately control them. Pond specialists can control the algae growth in ponds, but its growth and reproduction are dependent on nutrients. When nutrients are in abundance, so will be the algae or vegetation.
- Plants can be used in shallow shelfs at inlets to take up nutrients, but they must be maintained and cuttings removed to take nutrients out of the pond system.
- If (non-invasive) plants are overgrown, remove or trim back excessive vegetation. Remove cuttings and trimmings. Do not allow vegetative debris to remain in the pond.
- Pond clarity and color can be impacted by excessive sediment discharge or flow shortcircuiting. For issues of clarity and color, follow the recommendations in **Section 4.7 – Sediment Buildup**.
- If invasive aquatic plants are identified, follow DEC guidelines for reporting and controlling invasives (see **Section 4.9 – Vegetation**).
- Some color, odor, and pond quality issues can be caused by leaks, spills, and other releases in the drainage area. Any petroleum odor or oily sheen (aside from natural rainbow sheen associated with decomposition of organic matter) should be reported to the appropriate state or local response agency. Other peculiar colors or odors can be investigated in collaboration with relevant agencies. Common issues are grease, paint, or other substances poured into storm drains, dumpster management, and stockpiles of various materials exposed to rainfall.

Helpful Skills:

- Ability to recognize invasive aquatic plants
- Specific measures may include mechanical hand pulling, regrading (requires construction equipment), or herbicide/pesticide application *safe for aquatic environments*.
- Knowledge of wetland plants and common types of algae and aquatic weeds
- Knowledge of types of pond maintenance practices

Equipment Typically Used for Pool Quality Investigations

- High-top rubber boots
- Canoes or small boats
- Brush hook to clear vegetation and access pond bank
- Secchi disk to check and compare pond color and clarity
- Large-mouth bottle to collect algae and water quality samples
- Various materials to control aquatic weeds and algae

Section 5. Planning for Stormwater Maintenance

Often, stormwater practices fall into disrepair because there is no plan in place for ensuring that they are maintained over time. As a result, maintenance can become reactive in nature, resulting in high costs for repairing damaged practices or practices becoming ineffective over time. This section outlines some key elements of stormwater maintenance planning, including:

1. Program models for stormwater maintenance
2. Inspection and maintenance checklists
3. Planning for the costs of stormwater maintenance
4. Identifying the need for infrequent maintenance items

5.1. Program Models for Stormwater Maintenance

The Maintenance Hierarchy concept (See Section 1) is discussed throughout this chapter, but the individuals who will conduct the Level 1, Level 2 and Level 3 inspections and maintenance will vary depending on how the local program is administered. While this chapter does not focus on program elements, it is important to note that the local program requirements will influence who performs ongoing maintenance. This will play an important role in how to develop a comprehensive maintenance plan.

Although there are many options for implementing a stormwater plan, they can be described by three broad categories, including: 1) Private Maintenance; 2) Local Program; and 3) Hybrid Approach. Understanding the program in the local community will influence the best techniques for developing the maintenance plan (**Table 5.1**).

Option 1: Private Maintenance

In this option, maintenance is the responsibility of the private land owner. In regulated MS4s, however, the land owner will periodically report to the local government. In this model, it is important to ensure that the maintenance plan is very easy to understand and includes pictures of key practice elements. If possible, include a list of contractors who will be able to perform maintenance items and how much these will cost. Finally, materials should point homeowners to resources so that they can learn more about the practices on their property. DEC’s Maintenance Photo Library and Training Materials webpage (link) can be useful tools for this purpose.

Option 2: Local Government Maintenance

In this option, the local government takes over maintenance responsibility for all stormwater practices. While it is still important to develop a clear and simple plan, the designer can assume some level of training or supervision for the individuals conducting inspections and maintenance. For publicly maintained practices, it is helpful to find out what resources the local government has in place for developing the plan. These resources may be in the form of existing reporting and tracking procedures, which can be modified for the specific practice, or equipment such as vacuum sweepers. Maintenance access should be made available to local government staff through official easements.

Option 3: Hybrid Approach

In the hybrid approach to stormwater maintenance, larger practices or practices on public land are maintained by the local government, and smaller practices on private property are maintained by the owner. There are other hybrid models, however. For example, the local government may take responsibility for inspections but leave the owner responsible for maintenance items identified during the inspection.

Table 5.1 Maintenance Considerations for Three Program Options

Program Option	Inspection/Maintenance Performed By:	Key Considerations for the Designer
Option 1: Private	Level 1: Property owner or HOA Level 2: Private Contractor Level 3: Certified Contractor	Make the plan very simple and graphic intensive. Include a list of contractors if applicable. Provide links to educational materials.
Option 2: Local Program	Level 1: Interns or Untrained Staff Level 2: Trained Local Staff Level 3: City/Town Engineer or other individual hired by the city or town	Learn about the resources the local program has at its disposal. If government staff are being trained, develop a maintenance plan that is consistent with their knowledge and understanding. Be aware of equipment and materials on hand in this community.
Option 3: Hybrid Approach	Inspection is typically divided, where larger practices or those on private property are maintained by the public entity.	Understand how this maintenance is divided, and develop a plan that is consistent with this arrangement.

Special Considerations for Green Infrastructure Practices

Because many of the Green Infrastructure practices included in this manual, such as Tree Planting, Rain Gardens and Sheetflow and Level Spreaders, are implemented at a very small scale, they present a unique challenge in terms of stormwater maintenance. These practices are more likely to be located on private property. As a result, the designer needs to consider the *Private Maintenance* model. Maintenance plans for these small practices should be as simple as possible, and the designer should ensure that maintenance can be completed with readily available materials.

5.2. Inspection and Maintenance Checklists and Documentation

The checklists included in this chapter are specific to the maintenance hierarchy. The maintenance plan should include inspection checklists for all three hierarchies. In addition, these checklists should be modified to identify the specific practice elements included in each design. The materials developed as a part of the maintenance plan should be provided to the practice owner and local government. (See **Table 5.2**)

Table 5.2. Customizing Checklists and Guidance

Hierarchy	Checklist/Checklist Guidance	Tips for Customizing
Level 1	**Section 2** includes both the checklists and guidance.	Add photographs of the practice (once installed), and include a simple aerial photograph of the site to locate the practice. Include key local government contacts and contractors along with the checklist.
Level 2	**Section 3** includes guidance on how to respond to the Level 1 Inspection and/or activate a Level 3 investigation. **Appendix B** includes routine inspection checklists for the Level 2 Inspector.	Modify to remove elements that are not in this particular practice.
Level 3	Guidance is included in **Sections 3 and 4**.	Typically, this will not need to be modified.

5.3. Budgeting for Maintenance

A maintenance plan should include a budget for annual maintenance. In the Public Maintenance model, a single entity (the local government) will be responsible for maintenance of many practices, so the cost of maintenance for an individual practice may not be as important as estimating the average cost of maintenance across all practices. For privately maintained practices, on the other hand, it is very helpful to develop a cost estimate that is as accurate as possible for the specific location. As a result, two options for estimating costs are presented here, including:

- **Option 1**: Average or Unit Costs
  Generalized cost data are used to estimate an annual cost. This option may be used for a municipality or other institution that manages a large number of practices.
- **Option 2:** Detailed Individual Practice Budget
  Annual costs are estimated using more detailed practice information, as well as more detailed estimates of labor and materials costs.

Option 1: Average or Unit Costs

In this option, annual maintenance costs are estimated on a per-acre basis or based on a percentage of the construction costs. These prices typically range from about 1% to 4% of the construction costs (King and Hagan, 2011; **Table 5.3**).

Table 5.3 Typical Maintenance Costs
(Source: King and Hagan, 2011; Adjusted to 2015 Costs)

Practice	Annual Maintenance Cost (% of Construction)	Annual Maintenance Cost ($/cubic foot of the water quality volume–WQV—treated)
Buffers	4%	$0.25-$0.35
Tree Planting	4%	$0.35
Ponds and Wetlands	4%	$0.22-$0.35
Infiltration Trench/ Basin	2%	$0.25
Filtering Practices	4%	$0.41-$0.47
Bioretention	4%	$0.44
Swales	3%	$0.18-$0.26
Permeable Pavement	1%	$0.64-$0.89

While the costs in **Table 5.3** may be a reasonable starting point, it is important to note that the actual data will vary greatly, depending on labor rates and materials costs. For example, the hourly “Open Shop” labor rate for rough grading is approximately $27/hour in Elmira and $38/hour in New York City (Means, 2015). In addition, costs for labor, materials and equipment will vary depending on the maintenance arrangement (**Table 5.4**).

Table 5.4 Variability in Maintenance Costs Based on Maintenance Arrangement

Maintenance Arrangement	Labor	Materials	Equipment
Public Maintenance (Municipality)	Level 1: Intern Wage Level 2: Staff Salary Level 3: Professional Staff or Contractor	Low: Materials bought in bulk.	Low: Typically owned by Public Works or similar department.
Private Maintenance (Homeowner)	Level 1: Homeowner (Free) or Contractor Level 2: Private Landscaper or Contractor Level 3: Professional Contractor	High: Materials purchased in small quantities.	High: Specialized equipment needs to be rented if needed.
Private Maintenance (Commercial or HOA)	Level 1: Free (with HOA volunteers) or Contracted Labor Rate Level 2: Private Landscaper or Contractor Level 3: Professional Contractor	Varies: Materials may be bought in bulk or on a small scale, depending on the size of the private entity.	High: Specialized equipment needs to be rented if needed.

Option 2: Site-Based Costs

Because both the unit costs of labor and materials and the average annual costs of maintenance can be so highly variable, more detailed data will be needed to estimate costs at a particular site. One approach for estimating these costs is to generate a list of routine maintenance items, along with associated unit costs for labor, materials and equipment. This approach requires the user to enter basic design data for the practice, as well as information regarding local labor rates and other general costs. In the bioretention example below, unit costs are used to estimate routine maintenance costs, including inspections and regular maintenance.

Example Annual Cost Estimation: Bioretention

An example cost estimation for a bioretention cell follows below. The cost estimation tool used in the Maintenance Chapter will be automated. This example demonstrates how the unit cost and typical frequency data will be used to estimate average annual maintenance costs. In it, we are estimating annual maintenance costs for a bioretention practice with characteristics summarized in **Table 5.5**. **Table 5.6** then summarizes activities, their frequency and extent, and associated labor costs.

Using the assumptions for this practice, the annual costs for routine maintenance would be $1,828 ($1.15/cubic foot of Water Quality Volume) in the first year and $1,468 ($0.90/cf WQv) in subsequent years. This value is much higher than the $0.44/cf estimated using general cost data (**Table 5.3**). However, significant cost savings could be realized by using volunteer or intern-level labor for Level 1 inspections and routine maintenance.

Table 5.5. Assumptions for Bioretention Cost Example

Practice Design		**Unit Costs**	
Water Quality Volume (cf)	1,600	Level 1 Labor ($/hr)	$15
Forebay Volume (cf)	400	Level 2 Labor ($/hr)	$35
Total Practice Area (sf)	2,000	Mulch ($/cy)	$10
Filter Area (sf)	1,000	Plants ($/plant)	$1
Ponding Area (sf)	1,500	Trash Tipping Fee	$25
Slope Area (sf)	500	Seed/Mulch for a small area	$10
Turf Area (sf)	No Turf	Average Cost for a PVC Replacement Part (Planning Level)	$100
Inlets (#)	1		

Table 5.6. Bioretention Example - Routine Maintenance Costs

Task	Frequency (x/year, Decimal)	Typical Extent	Extent	Hours (Unit)	Hours/yr	Level	Materials and Equipment	Annual Costs		
								Labor	Materials and Equipment	Total
Level 1 Inspection - 1 to 5-acre drainage	1	Practice	1	1 per inspection	1	1		$15		$15
Level 2 Inspection - 1 to 5-acre drainage	0.2	Practice	1	2 per inspection	0.4	2		$14		$14
Watering - grass and plants: Year 1	16	Weekly for first growing season, over filter surface area	1,000	0.5 per 400 sf area	24	1	Assume minimal cost for water	$360		$360
Trash and Debris Removal	4	Ponding area	1,500	1 per 400 sf practice surface area	15	1	Assume $25 Tipping Fee for Each Trip	$225	$100	$325
Weeding	2	Assume 50% of practice area	1,000	4 per 400 sf practice surface area	20	1		$300		$300
Mulching	1	Ponding area	1,500	4 per 400 sf area	15	1	Bark mulch; assume 15 cy/application	$225	$150	$375
Sediment Removal (minor)	1	Assume one small area per inlet	1	1 per small area	1	1		$15		$15
Erosion Repair (minor)	1	Inlets; assume 25 sf/practice	25	1 per 25 sf	1	1	Seed, mulch and topsoil	$15	$10	$25
Erosion Repair (minor)	1	10% of slope area	50	1 per 25 sf	2	1	Seed, mulch and topsoil	$30	$20	$40
Minor Regrading	0.5	1 spot per 400 sf of practice area	5	1 per repair	2.5	2	Assume done by hand	$88		$88
Planting (plants)	0.2	Assume 50% of practice area	1,000	8 per200 sf	8	1	Assume 500 plants/planting	$120	$100	$220
Minor PVC or Metal Repairs (observation well cap, PVC riser, grates)	0.2	1 per practice	1	1 per repair	0.2	2	Assume about a $100 piece of equipment	$7	$20	$27
Sediment Removal (small forebay)	0.2	per forebay	1	2 per forebay	0.4	2	Assume removal by hand	$14		$14
							Total Costs - Year 1	**$1,428**	**$400**	**$1,828**
							Total Costs - Subsequent Years	**$1,068**	**$400**	**$1,468**

5.4. Planning for “Non-Routine” Maintenance

If the guidance provided in this chapter is followed and practices are designed properly, the routine maintenance (and budget guidance in **Section 5.3**) should be sufficient to keep a practice functioning indefinitely, but planning is needed for infrequent maintenance items. In the initial maintenance plan, identify a few of the most likely infrequent items. If initial routine inspections start to identify a more serious problem, develop a plan and budget for performing the repairs. To be more conservative, another option is to provide a contingency budget to plan for non-routine repairs over the life of the practice.

Note: Maintenance and repairs that rise to a Level 3 inspection may require permits from the NYS DEC and/or US Army Corps of Engineers if they are undertaken within or adjacent to regulated wetlands or other waters of the U.S.

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Appendix B – NYSDEC Stormwater Practice Inspection Checklists

Stormwater Pond/Wetland Operation, Maintenance and Management Inspection Checklist

Project ______________________________
Location: ______________________________
Site Status: ______________________________

Date: ______________________________
Time: ______________________________

Inspector: ______________________________

Maintenance Item	Satisfactory/ Unsatisfactory	Comments
1. Embankment and emergency spillway (Annual, After Major Storms)		
1. Vegetation and ground cover adequate		
2. Embankment erosion		
3. Animal burrows		
4. Unauthorized planting		
5. Cracking, bulging, or sliding of dam		
a. Upstream face		
b. Downstream face		
c. At or beyond toe		
downstream		
upstream		
d. Emergency spillway		
6.Pond, toe & chimney drains clear and functioning		
7.Seeps/leaks on downstream face		
8.Slope protection or riprap failure		
9. Vertical/horizontal alignment of top of dam "As-Built"		

Maintenance Item	**Satisfactory/ Unsatisfactory**	**Comments**
10. Emergency spillway clear of obstructions and debris		
11. Other (specify)		
2. Riser and principal spillway (Annual)		
Type: Reinforced concrete ______ Corrugated pipe _______ Masonry _______ 1. Low flow orifice obstructed		
2. Low flow trash rack. a. Debris removal necessary		
b. Corrosion control		
3. Weir trash rack maintenance a. Debris removal necessary		
b. corrosion control		
4. Excessive sediment accumulation insider riser		
5. Concrete/masonry condition riser and barrels a. cracks or displacement		
b. Minor spalling (<1")		
c. Major spalling (rebars exposed)		
d. Joint failures		
e. Water tightness		
6. Metal pipe condition		
7. Control valve a. Operational/exercised		
b. Chained and locked		
8. Pond drain valve a. Operational/exercised		
b. Chained and locked		
9. Outfall channels functioning		
10. Other (specify)		

Maintenance Item	**Satisfactory/ Unsatisfactory**	**Comments**
3. Permanent Pool (Wet Ponds) (monthly)		
1. Undesirable vegetative growth		
2. Floating or floatable debris removal required		
3. Visible pollution		
4. Shoreline problem		
5. Other (specify)		
4. Sediment Forebays		
1.Sedimentation noted		
2. Sediment cleanout when depth < 50% design depth		
5. Dry Pond Areas		
1. Vegetation adequate		
2. Undesirable vegetative growth		
3. Undesirable woody vegetation		
4. Low flow channels clear of obstructions		
5. Standing water or wet spots		
6. Sediment and / or trash accumulation		
7. Other (specify)		
6. Condition of Outfalls (Annual , After Major Storms)		
1. Riprap failures		
2. Slope erosion		
3. Storm drain pipes		
4.Endwalls / Headwalls		
5. Other (specify)		
7. Other (Monthly)		
1. Encroachment on pond, wetland or easement area		

Maintenance Item	Satisfactory/ Unsatisfactory	Comments
2. Complaints from residents		
3.Aesthetics a. Grass growing required		
b. Graffiti removal needed		
c. Other (specify)		
4. Conditions of maintenance access routes.		
5. Signs of hydrocarbon build-up		
6. Any public hazards (specify)		
8. Wetland Vegetation (Annual)		
1. Vegetation healthy and growing Wetland maintaining 50% surface area coverage of wetland plants after the second growing season. (If unsatisfactory, reinforcement plantings needed)		
2. Dominant wetland plants: Survival of desired wetland plant species Distribution according to landscaping plan?		
3. Evidence of invasive species		
4. Maintenance of adequate water depths for desired wetland plant species		
5. Harvesting of emergent plantings needed		
6. Have sediment accumulations reduced pool volume significantly or are plants "choked" with sediment		
7. Eutrophication level of the wetland.		
8. Other (specify)		

Comments:

Actions to be Taken:

Infiltration Trench Operation, Maintenance, and Management Inspection Checklist

Project:
Location:
Site Status:

Date:

Time:

Inspector:

MAINTENANCE ITEM	SATISFACTORY / UNSATISFACTORY	COMMENTS
1. Debris Cleanout (Monthly)		
Trench surface clear of debris		
Inflow pipes clear of debris		
Overflow spillway clear of debris		
Inlet area clear of debris		
2. Sediment Traps or Forebays (Annual)		
Obviously trapping sediment		
Greater than 50% of storage volume remaining		
3. Dewatering (Monthly)		
Trench dewaters between storms		
4. Sediment Cleanout of Trench (Annual)		
No evidence of sedimentation in trench		
Sediment accumulation doesn't yet require cleanout		
5. Inlets (Annual)		

MAINTENANCE ITEM	SATISFACTORY / UNSATISFACTORY	COMMENTS
Good condition		
No evidence of erosion		
6. Outlet/Overflow Spillway (Annual)		
Good condition, no need for repair		
No evidence of erosion		
7. Aggregate Repairs (Annual)		
Surface of aggregate clean		
Top layer of stone does not need replacement		
Trench does not need rehabilitation		

Comments:

Actions to be Taken:

Open Channel Operation, Maintenance, and Management Inspection Checklist

Project:
Location:
Site Status:

Date:

Time:

Inspector:

MAINTENANCE ITEM	SATISFACTORY/ UNSATISFACTORY	COMMENTS
1. Debris Cleanout (Monthly)		
Contributing areas clean of debris		
2. Check Dams or Energy Dissipators (Annual, After Major Storms)		
No evidence of flow going around structures		
No evidence of erosion at downstream toe		
Soil permeability		
Groundwater / bedrock		
3. Vegetation (Monthly)		
Mowing done when needed		
Minimum mowing depth not exceeded		
No evidence of erosion		
Fertilized per specification		
4. Dewatering (Monthly)		
Dewaters between storms		

MAINTENANCE ITEM	SATISFACTORY/ UNSATISFACTORY	COMMENTS
5. Sediment deposition (Annual)		
Clean of sediment		
6. Outlet/Overflow Spillway (Annual)		
Good condition, no need for repairs		
No evidence of erosion		

Comments:

Actions to be Taken:

Disconnection & Sheetflow Stormwater Management Practices Level 1 Inspection Checklist

SMP ID #		**SMP Owner**		☐ Private ☐ Public
SMP Location (Address; Latitude & Longitude)				
	Latitude		**Longitude**	

Party Responsible for Maintenance	**System Type**		**Type of Site**
☐ Same as SMP Owner ☐ Other ______________________	☐ Seasonal ☐ Continuous Use ☐ Other	☐ Above Ground ☐ Below Ground	☐ Commercial ☐ Industrial ☐ Residential ☐ State

Inspection Date		**Inspection Time**	
Inspector			
Date of Last Inspection			

Table 2.4.1 D&S Drainage Area

Visually inspect any surfaces in the drainage area.

Problem (Check if Present)		**Follow-Up Actions**
	☐ Changes in flow; more runoff; runoff bypassing the practice	☐ For rooftop areas, make sure downspouts are still disconnected and conveying water into the treatment area. ☐ Look for and remove any “dams” of sediment and grass clippings that prevent water from entering the treatment area as sheet flow. ☐ Other:

Table 2.4.1 D&S Drainage Area

Visually inspect any surfaces in the drainage area.

Problem (Check if Present)	Follow-Up Actions
	☐ Kick-Out to Level 2 Inspection: Changes to drainage area size or amount of runoff due to construction, tillage, etc.
 ☐ For parking lots in the drainage area—sediment, grass clippings, or other debris has accumulated at pavement edge.	☐ For small, isolated amounts of debris, sweep up by hand and dispose properly so that it will not be exposed to runoff. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Sediment is widespread and cannot be removed by manual sweeping.
 ☐ For parking lots in the drainage area—dips or damage at pavement edge caused flow to concentrate.	☐ Kick-Out to Level 2 Inspection: This will likely require special expertise to diagnose and fix pavement edge.

Table 2.4.2 D&S Level Spreader/Energy Dissipator

Inspect the energy dissipator closely, during a rain event if possible.

Problem (Check if Present)		Follow-Up Actions
	☐ Debris and/or sediment accumulated behind or around the level spreader.	☐ Remove debris and sediment by hand and ensure that the area behind the level spreader is relatively flat. Too much debris and sediment can cause runoff to bypass the level spreader structure. ☐ Other:
	☐ Sinking, cracking, sloughing, or other structural problem makes the energy dissipator no longer level.	☐ For stone/gravel spreaders, add new material or rake out as needed to make it even. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Structural issues that cannot be easily fixed by hand

Table 2.4.3 D&S Treatment Area

Examine where flow enters the treatment area as well as the whole flow path. Look for signs of concentrated flow.

Problem (Check if Present)		Follow-Up Actions
☐ Trash and/or debris in the treatment area		☐ Collect trash/debris and dispose of properly.
	☐ Grass filter strip has grown very tall, to the point that runoff cannot easily enter or is getting concentrated.	☐ Mow filter strip twice a year or more frequently in a residential yard.

Table 2.4.3 D&S Treatment Area

Examine where flow enters the treatment area as well as the whole flow path. Look for signs of concentrated flow.

Problem (Check if Present)	**Follow-Up Actions**
☐ Sparse vegetation or bare spots	☐ For grassy areas, add topsoil (as needed), grass seed, mulch, and water during the growing season to re-establish consistent vegetation cover. ☐ Other:
 ☐ Rills or gullies are forming in treatment area where flow has become concentrated	☐ For minor rills, fill in with soil, compact, and add seed and straw to establish vegetation. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Rills are more than 2" to 3" deep and require more than just hand raking and re-seeding.

Additional Notes:

Inspector:_______________________________________ Date: __________________

Complete the following if follow-up/corrective actions were identified during this inspection:

Certified Completion of Follow-Up Actions:

> “I hereby certify that the follow-up/corrective actions identified in the inspection performed on _____________ (DATE) have been completed and any required maintenance deficiencies have been adequately corrected.”

Inspector/Operator: _______________________________ Date: __________________

Disconnection & Sheetflow Stormwater Management Practices
Level 2 Inspection Checklist

SMP ID #		**SMP Owner**		☐ Private ☐ Public
SMP Location (Address; Latitude & Longitude)				
	Latitude		**Longitude**	
Party Responsible for Maintenance	**System Type**		**Type of Site**	
☐ Same as SMP Owner ☐ Other ____________________	☐ Seasonal ☐ Continuous Use ☐ Other	☐ Above Ground ☐ Below Ground	☐ Commercial ☐ Industrial ☐ Residential ☐ State	
Inspection Date		**Inspection Time**		
Inspector				
Date of Last Inspection				

Level 2 Inspection – DISCONNECTION AND SHEETFLOW

Recommended Repairs	**Triggers for Level 3 Inspection**
Observed Condition: Significant sediment on pavement that drains to disconnection area (e.g., grass strip)	
☐ Condition 1: Sediment on parking lot is widespread Enlist a mechanical sweeper or vacuum sweeper to remove sediment across entire pavement surface. Pay special attention to downhill edges of pavement where more sediment may have accumulated.	• Sediment accumulation is so serious that it cannot be sufficiently removed with mechanical sweeper. May indicate a high sediment load from uphill in the drainage area that needs to be mitigated. ☐ Level 3 inspection necessary
Observed Condition: Pavement edge deteriorating	
☐ Condition 1: Dips or damage at pavement edge causing runoff to concentrate Determine whether the damaged edge is causing significant enough concentration of runoff to warrant repair or regrading of the pavement.	• Edge must be patched or re-paved to make secure and level. • Parking lot not draining properly to the energy dissipator and treatment area. ☐ Level 3 inspection necessary
Observed Condition: Level spreader/energy dissipator	
☐ Condition 1: Level spreader sinking or uneven If basic equipment can be used, prop up and secure any section of level spreader that is sinking. Regrade soil all around level spreader and add stone as necessary to prevent erosion and bypassing. ☐ Condition 2: Level spreader is broken These repairs can be simple for small, residential-scale practices, such as at a downspout. Ensure the level spreader is level across, keyed in to soil at the edges, and made of durable material that can withstand the flow of water running across it. Larger or more complicated level spreaders (e.g., concrete) will likely require specialized skill and equipment.	• Level spreader requires specialized equipment, regrading, or large amount of material to make level again. • Level spreader needs to be re-designed and replaced. ☐ Level 3 inspection necessary

Level 2 Inspection – DISCONNECTION AND SHEETFLOW

Recommended Repairs	**Triggers for Level 3 Inspection**
Observed Condition: Erosion in treatment area	
☐ Condition 1: Rills from concentrated flow Inspect energy dissipator to see whether it needs to be improved to better spread out incoming flow. Regrade flow path to ensure that it is relatively flat (if minor). If major re-grading is needed, the treatment area may need to be redesigned and fixed with specialized equipment.	• Major rills and gullies • Treatment area needs to be re-designed and major grading needed. ☐ Level 3 inspection necessary

Notes:

Inspector:______________________________________ Date: __________________

Complete the following if follow-up/corrective actions were identified during this inspection:

Certified Completion of Follow-Up Actions:

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Inspector/Operator: _______________________________ Date: ___________________

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

Infiltration Stormwater Management Practices
Level 1 Inspection Checklist

SMP ID #		**SMP Owner**		☐ Private ☐ Public
SMP Location (Address; Latitude & Longitude)				
	Latitude		**Longitude**	

Party Responsible for Maintenance	**System Type**		**Type of Site**
☐ Same as SMP Owner ☐ Other ____________________	☐ Seasonal ☐ Continuous Use ☐ Other	☐ Above Ground ☐ Below Ground	☐ Commercial ☐ Industrial ☐ Residential ☐ State

Inspection Date		**Inspection Time**	
Inspector			
Date of Last Inspection			

IN Drainage Area

Look for both pervious and impervious areas that are uphill from the Infiltration cell.

Problem (Check if Present)		**Follow-Up Actions**
	☐ Bare soil, erosion of the ground (rills washing out the dirt)	☐ Seed and straw areas of bare soil to establish vegetation. ☐ Fill in erosion areas with soil, compact, and seed and straw to get vegetation established. ☐ If a rill or small channel is forming, try to redirect water flowing to this area by creating a small berm or adding topsoil to areas that are heavily compacted. ☐ Other:

IN Drainage Area

Look for both pervious and impervious areas that are uphill from the Infiltration cell.

Problem (Check if Present)		Follow-Up Actions
		☐ Kick-Out to Level 2 Inspection: Large areas of soil have been eroded, or larger channels are forming. May require rerouting of flow paths.
☐ For Dry Wells: Leaves, sticks, or other debris in gutters and downspouts		☐ Remove all debris by hand. ☐ Other:
	☐ Piles of grass clippings, mulch, dirt, salt, or other materials	☐ Remove or cover piles of grass clippings, mulch, dirt, etc. ☐ Other:
	☐ Open containers of oil, grease, paint, or other substances	☐ Cover or properly dispose of materials; consult your local solid waste authority for guidance on materials that may be toxic or hazardous. ☐ Other:

IN Inlets

Look for all the places where water flows into the Infiltration practice.

Problem (Check if Present)	Follow-Up Actions
 ☐ Inlets are collecting grit and debris or grass/weeds are growing. Some water may not be getting into the Infiltration practice.	☐ Use a flat shovel to remove grit and debris (especially at curb inlets or openings). Parking lots generate fine grit that will accumulate at these spots. ☐ Pull out clumps of growing grass or weeds and scoop out the soil or grit that the plants are growing in. ☐ Remove any grass clippings, leaves, sticks, and other debris that is collecting at inlets. ☐ For pipes and ditches, remove sediment and debris that is partially blocking the pipe or ditch opening where it enters the Infiltration practice. ☐ Dispose of all material properly in an area where it will not re-enter the practice. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Inlets are blocked to the extent that most of the water does not seem to be entering the Infiltration practice.
☐ Some or all of the inlets are eroding so that rills, gullies, and other erosion is present, or there is bare dirt that is washing into the Infiltration practice.	☐ For small areas of erosion, smooth out the eroded part and apply rock or stone (e.g., river cobble) to prevent further erosion. Usually, filter fabric is placed under the rock or stone. ☐ In some cases, reseeding and applying erosion-control matting can be used to prevent further erosion. Some of these materials may be available at a garden center, but it may be best to consult a landscape contractor. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Erosion is occurring at most of the inlets and it looks like there is too much water that is concentrating at these points. The inlet design may have to be modified.

IN Infiltration Area

Examine the surface of the infiltration area and the observation well. Note: The following Problem and Follow-Up Actions apply to infiltration practice pretreatment areas also.

Problem (Check if Present)	Follow-Up Actions
 ☐ For grass-covered Infiltration practices: grass has grown very tall, *Photo credit: Stormwater Maintenance, LLC*	☐ Mow infiltration area at least twice per year. ☐ Other:
 ☐ For grass-covered Infiltration practices: sparse vegetation cover or bare spots	☐ Add topsoil (as needed), grass seed, straw, and water during the growing season to re-establish consistent grass coverage. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Sparse vegetation cover can be a sign that the infiltration area is not infiltrating at the proper rate and water is standing too long after a storm. The surface may be saturated or squishy, and the conditions do not enable grass to grow. This situation should be evaluated by a Level 2 Inspection and likely corrected by a qualified contractor.
☐ Minor areas of sediment, grit, trash, or other debris are accumulating on the surface.	☐ Use a shovel to scoop out minor areas of sediment or grit, especially in the spring after winter sanding materials may wash in and accumulate. Dispose of the material where it cannot re-enter the Infiltration practice. ☐ If removing the material creates a hole or low area, rake the surface smooth and level. ☐ Remove trash, debris, and other undesirable materials. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Sediment has accumulated more than 2-inches deep and covers 25% or more of the surface of the Infiltration area.

IN Infiltration Area

Examine the surface of the infiltration area and the observation well. Note: The following Problem and Follow-Up Actions apply to infiltration practice pretreatment areas also.

Problem (Check if Present)	Follow-Up Actions
 ☐ There is erosion on the surface; water seems to be carving out rills as it flows across the surface of the Infiltration area or sinkholes are forming in certain areas.	☐ For minor areas of erosion, try filling the eroded areas with clean topsoil, sand, or stone (whatever the existing cover is). ☐ If the problem recurs, you may have to use larger stone (e.g., river cobble) to fill in problem areas. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: The problem persists or the erosion is more than 3-inches deep and seems to be an issue with how water enters and moves through the infiltration area. ☐ Kick-Out to Level 2 Inspection: The problem does not seem to be caused by flowing water but a collapse or sinking of the surface (e.g., “sinkhole”) due to some underground problem.
 ☐ Observation well is damaged or cap is missing	☐ Kick-Out to Level 2 Inspection: Requires replacing pipes or caps.

IN Infiltration Area

Examine the surface of the infiltration area and the observation well. Note: The following Problem and Follow-Up Actions apply to infiltration practice pretreatment areas also.

Problem (Check if Present)	**Follow-Up Actions**
 ☐ Water still visible in the observation well more than 72 hours after a rain storm. The Infiltration practice does not appear to be draining properly.	☐ Kick-Out to Level 2 Inspection: This is generally a serious problem, and it will be necessary to activate a Level 2 Inspection.

IN Outlets

Locate and inspect all outlets.

Problem (Check if Present)	**Follow-Up Actions**
 ☐ Outlet obstructed with sediment, debris, trash, etc.	☐ Remove the debris and dispose of it where it cannot re-enter the infiltration area. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Outlet is completely obstructed; there is too much material to remove by hand or with simple hand tools.
☐ Rills or gullies are forming at outlet.	☐ For minor rills, fill in with soil, compact, and seed and straw to establish vegetation. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Rills are more than 2" to 3" deep and require more than just hand raking and re-seeding.

Additional Notes:

Inspector:______________________________ Date: ______________

Complete the following if follow-up/corrective actions were identified during this inspection:

Certified Completion of Follow-Up Actions:

> "I hereby certify that the follow-up/corrective actions identified in the inspection performed on _____________ (DATE) have been completed and any required maintenance deficiencies have been adequately corrected."

Inspector/Operator: ______________________________ Date: ______________

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

Infiltration Stormwater Management Practices
Level 2 Inspection Checklist

SMP ID #		**SMP Owner**		☐ Private ☐ Public

SMP Location (Address; Latitude & Longitude)				
	Latitude		**Longitude**	

Party Responsible for Maintenance	**System Type**		**Type of Site**
☐ Same as SMP Owner ☐ Other ________________________	☐ Seasonal ☐ Continuous Use ☐ Other	☐ Above Ground ☐ Below Ground	☐ Commercial ☐ Industrial ☐ Residential ☐ State

Inspection Date		**Inspection Time**	

Inspector	
Date of Last Inspection	

Level 2 Inspection: INFILTRATION

Recommended Repairs	**Triggers for Level 3 Inspection**
Observed Condition: Water Stands on Surface for More than 72 Hours after Storm	
☐ Condition 1: Small pockets of standing water For infiltration basins with soil, use a soil probe or auger to examine the soil profile. For gravel infiltration trenches or basins, use a shovel to dig into the gravel layer where the problem is occurring. If isolated areas have accumulated grit, fine silt, or vegetative debris or have bad soil or clogged gravel, try removing and replacing with clean material. If the practice is supposed to have grass cover, it will likely be necessary to replant once the problem is resolved. ☐ Condition 2: Standing water is widespread or covers entire surface Look in the observation well (if it exists) and use a tape measure to estimate the depth of water standing in the soil or gravel. Requires diagnosis and resolution of problem: • Too much sediment/grit washing in from drainage area? • Too much ponding depth? • Improper infiltration media? • Underlying soil not suitable for infiltration? As above, the resolution will likely require replanting and re-establishment of good grass cover if this is part of the design.	• Infiltration media is clogged and problem cannot be diagnosed from Level 2 inspection. • Level 2 inspection identifies problem, but it cannot be resolved easily or it is associated with the original design of the practice. ☐ Level 3 Inspection necessary
Observed Condition: Severe erosion of infiltration bed, inlets, or around outlets	
☐ Condition 1: Erosion at inlets The lining (e.g., grass, matting, stone, rock) may not be adequate for the actual flow velocities coming through the inlets. First line of defense is to try a less erosive lining and/or extending the lining further down to where inlet slopes meet the infiltration surface. If problem persists, analysis by a Qualified Professional is warranted. ☐ Condition 2: Erosion of infiltration bed This is often caused by "preferential flow paths" along the surface. The source of flow should be analyzed and methods employed to dissipate energy and disperse the flow (e.g., check dams, rock splash pads).	• Erosion (rills, gullies) is more than 12 inches deep • The issue is not caused by moving water but some sort of subsurface defect, which may manifest as a sinkhole or linear depression and be associated with problems with the underlying stone or soil. ☐ Level 3 Inspection necessary

Notes:

Inspector:_______________________________________ Date: __________________

Complete the following if follow-up/corrective actions were identified during this inspection:

Certified Completion of Follow-Up Actions:

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Inspector/Operator: _______________________________ Date: ___________________

Permeable Pavement Stormwater Management Practices Level 1 Inspection Checklist

SMP ID #		**SMP Owner**		☐ Private ☐ Public
SMP Location (Address; Latitude & Longitude)				
	Latitude		**Longitude**	

Party Responsible for Maintenance	**System Type**		**Type of Site**
☐ Same as SMP Owner ☐ Other ______________________	☐ Seasonal ☐ Continuous Use ☐ Other	☐ Above Ground ☐ Below Ground	☐ Commercial ☐ Industrial ☐ Residential ☐ State

Inspection Date		**Inspection Time**	
Inspector			
Date of Last Inspection			

PP Drainage Area

Look for areas that are uphill from the Permeable pavement.

Problem (Check if Present)		**Follow-Up Actions**
	☐ Bare soil, erosion of the ground (rills washing out the dirt)	☐ Seed and straw areas of bare soil to establish vegetation. ☐ Fill in erosion areas with soil, compact, and seed and straw to establish vegetation. ☐ If a rill or small channel is forming, try to redirect water flowing to this area by creating a small berm or adding topsoil to areas that are heavily compacted. ☐ Other:

PP Drainage Area

Look for areas that are uphill from the Permeable pavement.

Problem (Check if Present)		Follow-Up Actions
 04 11 2011		☐ Kick-Out to Level 2 Inspection: Large areas of soil have been eroded, or larger channels are forming. May require rerouting of flow paths.
	☐ Piles of grass clippings, mulch, dirt, salt, or other materials	☐ Remove or cover piles of grass clippings, mulch, dirt, etc. ☐ Other:
	☐ Open containers of oil, grease, paint, or other substances	☐ Cover or properly dispose of materials; consult your local solid waste authority for guidance on materials that may be toxic or hazardous. ☐ Other:

PP Surface

Examine the entire permeable pavement surface.

Problem (Check if Present)		Follow-Up Actions
	☐ Dirt and grit accumulating on pavement surface	☐ For small areas (e.g., driveways, patios), try a leaf blower or sweep the area to remove the dirt/grit from the Permeable pavement and properly dispose of the material. ☐ If dirt/grit remain in the joint areas between paver blocks, agitate with a rough brush and vacuum the surface with a wet/dry vac. ☐ Remove and replace clogged blocks in segmented pavers. ☐ For larger areas (e.g., parking lots, courtyards), hire a vacuum sweeper to restore the surface to a cleaner condition. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Grit is widespread and cannot be removed by manual sweeping.
	☐ Grass and weeds are growing on the permeable pavement surface (applies only to pavement types that are not intended to be covered in vegetation).	☐ If paver type is not intended to be covered in vegetation, remove the grass/weeds either mechanically (pulling, by hand or with a flame weeder) or with a herbicide approved for use in or near water (consult your local Extension Office for suggestions). ☐ Follow the actions listed above for removing dirt/grit from the pavement surface. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Grass/weeds cover more than 25% of surface area.
	☐ Slumping, sinking, cracking, or breaking of the pavement surface *(Source: CSN, 2013)*	☐ For small areas (e.g., patios, small driveway), it may be possible to remove the damaged pavers, check and fill in the underlying gravel, and replace with new materials. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Problem affects more than a small, isolated area. Will typically require a qualified contractor to fix it. ☐ Problem recurs or occurs in multiple small locations.
	☐ Water stands on Permeable pavement for days after a rainstorm; the Permeable pavement is clogged and doesn't let water through. *(Source: CSN, 2013)*	☐ Kick-Out to Level 2 Inspection: This is generally a serious problem, and it will be necessary to activate a Level 2 Inspection.

Additional Notes:

Inspector:____ Date: ___________________

Complete the following if follow-up/corrective actions were identified during this inspection:

Certified Completion of Follow-Up Actions:

> “I hereby certify that the follow-up/corrective actions identified in the inspection performed on ______________ (DATE) have been completed and any required maintenance deficiencies have been adequately corrected.”

Inspector/Operator: _________________________________ Date: ___________________

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

Permeable Pavement Stormwater Management Practices Level 2 Inspection Checklist

SMP ID #		**SMP Owner**		☐ Private ☐ Public
SMP Location (Address; Latitude & Longitude)				
	Latitude		**Longitude**	
Party Responsible for Maintenance	**System Type**		**Type of Site**	
☐ Same as SMP Owner ☐ Other ________________	☐ Seasonal ☐ Continuous Use ☐ Other	☐ Above Ground ☐ Below Ground	☐ Commercial ☐ Industrial ☐ Residential ☐ State	
Inspection Date		**Inspection Time**		
Inspector				
Date of Last Inspection				

Level 2 Inspection: PERMEABLE PAVEMENT

Recommended Repairs and Required Skills	**Triggers for Level 3 Inspection**
Observed Condition: Bare Soil or Erosion in the Drainage Area	
☐ Condition 1: Extensive problem spots, but no channels or rills forming Reseed problem areas. If problem persists or grass does not take, consider hiring a landscape contractor. ☐ Condition 2: Problem is extensive, and rills/channels are beginning to form May be necessary to divert or redirect water that is causing the erosion problem. If it appears that simple regrading—such as installing a berm or leveling a low spot–will fix the problem, make repairs and check to ensure that the problem is repaired after the next storm.	• Large rills or gullies are forming in the drainage area. • An attempt to regrade the drainage area has been unsuccessful • Fixing the problem would require major regrading (i.e., redirecting more than a 100-square-foot area. • It is not clear why the problem is occurring. ☐ Level 3 inspection necessary
Observed Condition: Dirt or Grit Accumulating, or Grass Growing on Pavement Surface	
☐ Condition 1: Grit beginning to form but is isolated to a small area or does not fill the joints between paver blocks Try to agitate and sweep by hand, or hire a contractor with a vacuum sweeper. Also investigate the drainage area for potential sediment sources. If no obvious sources are found, discuss winter sanding and salting operations with the property owner to identify whether this could be the source. ☐ Condition 2: Grit is forming and cannot be removed with agitation and hand sweeping Hire a vendor with a regenerative air vacuum sweeper, maximum power 2,500 rpm; avoid sweepers that use water.	• More than 2 inches of sand/dirt/grit are on some of the pavement surface. • More than 25% of the pavement surface is covered with sand/dirt/grit to the extent that joints between paver blocks are filled. • Regenerative air sweeper cannot remove grit. ☐ Level 3 inspection necessary

Level 2 Inspection: PERMEABLE PAVEMENT

Recommended Repairs and Required Skills	**Triggers for Level 3 Inspection**
Observed Condition: Structural Damage	
☐ Condition 1: Portions of porous asphalt or permeable pavers are damaged, and the cause is known to be at the surface. If the damage is from a single event such as heavy equipment or heavy fallen objects, or the surface has been damaged by wear over time, hire a contractor experienced in permeable pavement installation to repair the damaged areas. ☐ Condition 2: Damage to other structures, such as drainage infrastructure If possible, repair or replace damaged items, or hire a contractor with permeable pavement experience if the damaged infrastructure is within the pavement surface.	• More than 25% of the surface needs to be repaired or replaced. • It appears that the underlying material has “caved in,” indicating an underlying water conveyance or soil stabilization issue. • Problem is repaired but recurs within less than five years. ☐ Level 3 inspection necessary
Observed Condition: Ponding on the Pavement Surface	
☐ Condition 1: Underdrains (if present) may be clogged Check to see whether underdrains are clogged by inspecting cleanouts (if present) or catch basins and looking for debris. If underdrains appear clogged, it may be necessary to hire a router service to ream out the underdrains. ☐ Condition 2: At time of Level 2 inspection, water is not ponded, and there is no obvious clogging of the surface. Conduct a flood test to determine whether the ponding is an ongoing problem.	• Water stands on the pavement surface more than 72 hours after a storm, and the problem cannot be resolved by unclogging underdrains. • More than 25% of the pavement surface is covered with sand/dirt/grit to the extent that joints between paver blocks are filled. ☐ Level 3 inspection necessary

Notes:

Inspector:____ Date: ___________________

Complete the following if follow-up/corrective actions were identified during this inspection:

Certified Completion of Follow-Up Actions:

> “I hereby certify that the follow-up/corrective actions identified in the inspection performed on _____________ (DATE) have been completed and any required maintenance deficiencies have been adequately corrected.”

Inspector/Operator: ________________________________ Date: ___________________

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

Pond and Wetland Stormwater Management Practices
Level 1 Inspection Checklist

SMP ID #		**SMP Owner**		☐ Private ☐ Public
SMP Location (Address; Latitude & Longitude)				
	Latitude		**Longitude**	

Party Responsible for Maintenance	**System Type**		**Type of Site**
☐ Same as SMP Owner ☐ Other ______________________	☐ Seasonal ☐ Continuous Use ☐ Other	☐ Above Ground ☐ Below Ground	☐ Commercial ☐ Industrial ☐ Residential ☐ State

Inspection Date		**Inspection Time**	
Inspector			
Date of Last Inspection			

PW Drainage Area

Look for areas that are uphill from the pond.

Problem (Check if Present)	**Follow-Up Actions**
☐ Bare soil, erosion of the ground (rills washing out the dirt)	☐ Seed and straw areas of bare soil to establish vegetation. ☐ Fill in eroded areas with soil, compact, seed and mulch with straw to establish vegetation. ☐ Other:

☐ Bare soil, erosion of the ground (rills washing out the dirt)	☐ Kick-Out to Level 2 Inspection: If a rill or small channel is forming, try to redirect water flowing to this area by creating a small berm or adding topsoil to areas that are heavily compacted. ☐ If large areas of soil have been eroded or larger channels are forming, this may require rerouting of flow paths or use of an erosion-control seed mat or blanket to reestablish acceptable ground cover or anchor sod where it is practical.
 ☐ Piles of grass clippings, mulch, dirt, salt, or other materials	☐ Remove or cover piles of grass clippings, mulch, dirt, etc. ☐ Remove excessive vegetation or woody debris that can block drainage systems. ☐ Other:
 ☐ Open containers of oil, grease, paint, or other substances exposed to rain in the drainage area	☐ Cover or properly dispose of materials; consult your local solid waste authority for guidance on materials that may be toxic or hazardous. ☐ Other:

Pond Inlets

Look for all areas where water flows into the pond during storms. Note that there may be multiple points of inflow and types of structures (e.g., pipes, open ditches, etc.).

Problem (Check if Present)	Follow-Up Actions
 ☐ Inlets are buried, covered or filled with silt, debris, or trash, or blocked by excessive vegetation.	☐ If the problem can be remedied with hand tools and done in a safe manner, remove vegetation, trash, woody debris, etc. from blocking inlet structures. ☐ Other:
	☐ Kick-Out to Level 2 or 3 Inspection: If the amount of material is too large to handle OR there are ANY safety concerns about working in standing water, soft sediment, etc., the work will likely have to be performed by a qualified contractor.

Pond Inlets

Look for all areas where water flows into the pond during storms. Note that there may be multiple points of inflow and types of structures (e.g., pipes, open ditches, etc.).

Problem (Check if Present)		Follow-Up Actions
	☐ Inlets are buried, covered or filled with silt, debris, or trash, or blocked by excessive vegetation.	☐ Kick-Out to Level 2 or 3 Inspection: If the amount of material is too large to handle OR there are ANY safety concerns about working in standing water, soft sediment, etc., the work will likely have to be performed by a qualified contractor.
	☐ Inlets are broken, and, with pieces of pipe or concrete falling into the pond, there is erosion around the inlet, there is open space under the pipe, or there is erosion where the inlet meets the pond	☐ Kick-Out to Level 2 Inspection: These types of structural or erosion problems are more serious and will require a qualified contractor to repair.

PW Pond Area and Embankments

Examine both interior and exterior pond banks as well as the pond body. Observe from the inlet pipes to the outfall structure and emergency overflow.

Problem (Check if Present)		Follow-Up Actions
	☐ The pretreatment area(s) or forebay(s) are filled with sediment, trash, vegetation, or other debris.	☐ If the problem can be remedied with hand tools and done in a safe manner, use a flat shovel or other equipment to remove small amounts of sediment. ☐ Remove trash and excessive vegetation from forebays if this can be done in a safe manner. ☐ Other:

PW Pond Area and Embankments

Examine both interior and exterior pond banks as well as the pond body. Observe from the inlet pipes to the outfall structure and emergency overflow.

Problem (Check if Present)		Follow-Up Actions
	☐ The pretreatment area(s) or forebay(s) are filled with sediment, trash, vegetation, or other debris.	☐ Kick-Out to Level 2 Inspection: Large amounts of sediment or debris will have to be removed by a qualified contractor. ANY condition that poses a safety concern for working in standing water or soft sediments should be referred to a Level 2 Inspection or qualified contractor.
	☐ The pond area itself has accumulated sediment, trash, debris, or excessive vegetation that is choking the flow of the water, OR the pond area is covered with algae or aquatic plants.	☐ Level 1 includes handling only small amounts of material that can be removed by hand, or with rakes or other hand tools. Do not attempt any repair that poses a safety issue. ☐ Other:
		☐ Kick-Out to Level 2 Inspection: Most cases will call for a Level 2 Inspection and/or a qualified contractor. ☐ You are not sure what type and amount of vegetation is supposed to be in the pond. ☐ The algae or aquatic plants should be identified so that proper control techniques can be applied.
	☐ The side slopes of the pond are unstable, eroding, and have areas of bare dirt.	☐ If there are only minor areas, try filling in small rills or gullies with topsoil, compacting, and seeding and mulching all bare dirt areas with an appropriate seed. Alternatively, try using herbaceous plugs to get vegetation established in tricky areas, such as steep slopes. ☐ Other:
		☐ Kick-Out to Level 2 Inspection: Erosion and many bare dirt areas on steep side slopes will require a Level 2 Inspection and repair by a qualified contractor.

PW Pond Area and Embankments

Examine both interior and exterior pond banks as well as the pond body. Observe from the inlet pipes to the outfall structure and emergency overflow.

Problem (Check if Present)		**Follow-Up Actions**
	☐ The riser structure is clogged with trash, debris, sediment, vegetation, etc., OR is open, unlocked, or has a steep drop and poses a safety concern. The pond level may have dropped below its “normal” level.	☐ If you can safely access the riser on foot or with a small boat, clear minor amounts of debris and remove it from the pond area for safe disposal. ☐ Other:
		☐ Kick-Out to Level 2 Inspection: The riser cannot be accessed safely, the amount of debris is substantial, or the riser seems to be completely clogged and the water level has risen too high. ☐ There are safety issues with the riser and concern about access to pipes, drops, or any other life safety concern. ☐ The riser is leaning, broken, settling or slumping, corroded, eroded or any other structural problem.
	☐ The dam/embankment is slumping, sinking, settling, eroding, or has medium or large trees growing on it.	☐ If there are small isolated areas, try to fix them by adding clean material (clay and topsoil) and seeding and mulching. ☐ Periodically mow embankments to enable inspection of the banks and to minimize establishment of woody vegetation. ☐ Remove any woody vegetation that has already established on embankments. ☐ Other:
		☐ Kick-Out to Level 2 Inspection: Most of these situations will require a Level 2 Inspection or evaluation and repair by a qualified contractor. Seepage through the dam or problems with the pipe through the dam can be a serious issue that should be addressed to avoid possible dam failure.

PW Pond Area and Embankments

Examine both interior and exterior pond banks as well as the pond body. Observe from the inlet pipes to the outfall structure and emergency overflow.

Problem (Check if Present)		Follow-Up Actions
	☐ The emergency spillway or outfall (if it exists) has ☐ Erosion, settlement, or loss of material. Rock-lined spillways have excessive debris or vegetation.	☐ Clear light debris and vegetation. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Displacement of rock lining, excessive vegetation and erosion/settlement may warrant review and decision by Level 2 Inspector to check against original plan. ☐ Any uncertainty about the integrity of the emergency spillway should be referred to a Level 2 Inspector. ☐ Erosion or settlement such that design has been compromised should be reviewed by an engineer.

PW Pond Outlet

Examine the outlet of the pipe on the downstream side of the dam/embankment where it empties into a stream, channel, or drainage system.

Problem (Check if Present)	Follow-Up Actions
 ☐ The pond outlet is clogged with sediment, trash, debris, vegetation, or is eroding, caving in, slumping, or falling apart.	☐ If there is a minor blockage, remove the debris or vegetation to allow free flow of water. ☐ Remove any accumulated trash at the outlet. ☐ Outlet: ☐ Kick-Out to Level 2 Inspection: ☐ If the area at the outlet cannot be easily accessed or if the blockage is substantial, a Level 2 Inspection is warranted. ☐ Erosion at and downstream of the outfall should be evaluated by a qualified professional. ☐ Any structural problems, such as broken pipes, structures falling into the stream, or holes or tunnels around the outfall pipe, should be evaluated by a Level 2 Inspector and will require repair by a qualified contractor. ☐ The pool of water at the outlet pipe is discolored, has an odor, or has excessive algae or vegetative growth.

Additional Notes:

Inspector:____ Date: ___________________

Complete the following if follow-up/corrective actions were identified during this inspection:

Certified Completion of Follow-Up Actions:

> "I hereby certify that the follow-up/corrective actions identified in the inspection performed on _____________ (DATE) have been completed and any required maintenance deficiencies have been adequately corrected."

Inspector/Operator: ________________________________ Date: ___________________

Pond and Wetland Stormwater Management Practices Level 2 Inspection Checklist

SMP ID #		**SMP Owner**		☐ Private ☐ Public
SMP Location (Address; Latitude & Longitude)				
	Latitude		**Longitude**	
Party Responsible for Maintenance	**System Type**		**Type of Site**	
☐ Same as SMP Owner ☐ Other ____________________	☐ Seasonal ☐ Continuous Use ☐ Other	☐ Above Ground ☐ Below Ground	☐ Commercial ☐ Industrial ☐ Residential ☐ State	
Inspection Date		**Inspection Time**		
Inspector				
Date of Last Inspection				

Level 2 Inspection: PONDS and WETLANDS

Recommended Repairs and Required Skills	**Triggers for Level 3 Inspection**
Observed Condition: Bare Soil or Erosion in the Drainage Area	
☐ Condition 1: Extensive problem spots, but no channels or rills forming Reseed problem areas. If problem persists or grass does not take, consider hiring a landscape contractor. ☐ Condition 2: Problem is extensive, and rills/channels are beginning to form May be necessary to divert or redirect water that is causing the erosion problem. If it appears that simple regrading—such as installing a berm or leveling a low spot–will fix the problem, make repairs and ensure that the problem is repaired after the next storm.	• Large rills or gullies are forming in the drainage area. • An attempt to regrade the drainage area has been unsuccessful. • Fixing the problem would require major regrading (i.e., redirecting more than a 100-square-foot area. • It is not clear why the problem is occurring. ☐ Level 3 inspection necessary
Observed Condition: Manholes or Inlet Pipe Buried or Covered with Vegetation	
☐ Condition 1: Nearest manhole and inlet pipe not found Consult as-built drawings to get to closest suspected location and use metal detector to search for metal manhole cover. If unsuccessful, identify nearest drain inlets and approximate pipe direction to locate next manhole. ☐ Condition 2: Manhole located and inspected Never enter a manhole, except by following confined-space entry protocols. If outlet pipe is not visible or greater than 25% full of sediment/debris or trash, it will typically require a qualified contractor to flush, clean and clear blockages. ☐ Condition 3: Inlet pipe not found at pond Clear vegetation and brush that may be covering the inlet pipe. Buried inlet pipes may be found through use of a metal probe. ☐ Condition 4: Inlet pipe buried in sediment or blocked by vegetation Once located, the pipe path can be cleared of vegetation with brush hook or other brush tools. Light digging may clear sediment from the end of the pipe.	• To locate buried manholes and lost storm lines, it is sometimes necessary to hire a pipeline inspection contractor with televising equipment or ground-penetrating radar and enter at the closest upstream access point. • Locating a buried inlet pipe may require wading in the edge of the pond and using a metal probe and brush axe to find and expose the pipe. • If other than light digging is necessary to remove accumulated sediment, a contractor with heavy equipment may be required. ☐ Level 3 inspection necessary

Level 2 Inspection: PONDS and WETLANDS

Recommended Repairs and Required Skills	**Triggers for Level 3 Inspection**
Observed Condition: Pipe or Headwall Settlement, Erosion, Corrosion or Failure	
☐ Condition 1: Pipe or headwall settlement or failure Severe sinkholes, settlement or corrosion should be kicked out to Level 3 Inspection. ☐ Condition 2: Flow not confined to pipe and visible outside pipe wall With flashlight, observe the inside of the pipe and note its condition. Take photographs. Look for sinkholes developing that indicate pipe failure beneath the surface. Kick out to Level 3 inspection.	• Where blockages are visible, a decision is needed on whether to clear them or leave in place. If a third of the pipe is full of sediment, it should be removed by a contractor with pipe-cleaning equipment. • Corrosion of inlet pipes that allows flow around the pipe exterior is a structural concern because it can lead to settlement, sinkholes and undermining pond embankment. Evidence of this type of failure may require specialized pipe-inspection equipment and investigation by an engineer. ☐ Level 3 inspection necessary
Observed Condition: Pond Conditions	
☐ Condition 1: Pond pre-treatment zone is full of sediment or not constructed as shown on as-built drawings. ☐ Condition 2: Excessive buildup of sediment or overgrowth If the pre-treatment area or pond pool is overgrown or filled with sediment so that the original design is compromised, corrective measures are required. If plants have died, then replanting is necessary. If none of the original design exists due to alteration or sediment, kick out to Level 3 inspection.	• It may require inspection by an engineer to determine next steps for clearing, replanting or reconstruction. • Erosion or settlement such that design has been compromised should be reviewed by an engineer. Recurring erosion may require redesign and/or regrading to direct flow away from eroding area. • If sediment has filled more than 50% of the pond's capacity, dredging is likely needed and should be evaluated by a qualified contractor. • Removal or control of excessive algae or aquatic plants can be assessed by a qualified pond maintenance company. ☐ Level 3 inspection necessary

Notes:

Inspector:____ Date: ___________________

Complete the following if follow-up/corrective actions were identified during this inspection:

Certified Completion of Follow-Up Actions:

> "I hereby certify that the follow-up/corrective actions identified in the inspection performed on _____________ (DATE) have been completed and any required maintenance deficiencies have been adequately corrected."

Inspector/Operator: _________________________________ Date: ___________________

Swale Stormwater Management Practices
Level 1 Inspection Checklist

SMP ID #		**SMP Owner**		☐ Private ☐ Public

SMP Location (Address; Latitude & Longitude)				
	Latitude		**Longitude**	

Party Responsible for Maintenance	**System Type**		**Type of Site**
☐ Same as SMP Owner ☐ Other ____________________	☐ Seasonal ☐ Continuous Use ☐ Other	☐ Above Ground ☐ Below Ground	☐ Commercial ☐ Industrial ☐ Residential ☐ State

Inspection Date		**Inspection Time**	
Inspector			
Date of Last Inspection			

SW Drainage Area

Look at areas that are uphill from the swale.

Problem (Check if Present)	Follow-Up Actions
 ☐ Bare soil, erosion of the ground (rills washing out the dirt)	☐ Seed and mulch or sod areas of bare soil to establish vegetation. ☐ Fill in erosion areas with soil, compact, and add seed and straw to establish vegetation. ☐ If a rill or small channel is forming, try to redirect water flowing to this area by creating a small berm or adding topsoil to areas that are heavily compacted. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Large areas of soil have been eroded, or larger channels are forming. May require rerouting of flow paths
 ☐ Piles of grass clippings, mulch, dirt, salt, or other materials	☐ Remove or cover piles of grass clippings, mulch, dirt, etc. ☐ Other:
 ☐ Open containers of oil, grease, paint, or other substances	☐ Cover or properly dispose of materials; consult your local solid waste authority for guidance on materials that may be toxic or hazardous.
☐ Grass dying at edge of road	☐ Seed and mulch; add topsoil or compost if needed. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Grass on edge of pavement continues to die off for unknown reasons. Swale edge may need to be replaced with other materials (e.g., stone diaphragm).

SW Inlets

Stand in the swale and look for all the places where water flows in.

Problem (Check if Present)	Follow-Up Actions
☐ Inlets or the swale edge are collecting grit, grass clippings, or debris or have grass/weeds growing. Some water may not be getting into the swale. The objective is to have a clear pathway for water to flow into the swale.	☐ Use a flat shovel to remove grit and debris (especially at curb inlets or opening). Parking lots will generate fine grit that will accumulate at these spots. ☐ Pull out clumps of growing grass or weeds, and scoop out the soil or grit that the plants are growing in. ☐ Remove any grass clippings, leaves, sticks, and other debris that is collecting at inlets or along the edge of the swale where water is supposed to enter. ☐ For pipes and ditches, remove sediment and debris that is partially blocking the pipe or ditch opening where it enters the swale. ☐ Dispose of all material properly in an area where it will not re-enter the swale. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Inlets are blocked to the extent that most of the water does not seem to be entering the swale.
 ☐ Some or all of the inlets are eroding so that rills, gullies, and other erosion are present, or there is bare dirt that is washing into the swale.	☐ For small areas of erosion, smooth out the eroded part and apply rock or stone (e.g., river cobble) to prevent further erosion. Usually, filter fabric is placed under the rock or stone. ☐ In some cases, reseeding and applying an erosion control matting can be used to prevent further erosion. Some of these materials may be available at a garden center, but it may be best to consult a landscape contractor. ☐ Other:
	☐ Level 2 Inspection: Erosion is occurring at most of the inlets or along much of the swale edge. The inlet design may have to be modified.

SW Surface Area

Examine the entire swale surface and side slopes.

Problem (Check if Present)	**Follow-Up Actions**
☐ Minor areas of sediment, grit, trash, or other debris are accumulating in the swale.	☐ Use a shovel to scoop out minor areas of sediment or grit, especially in the spring after winter sanding materials may wash in and accumulate. Dispose of the material where it cannot re-enter the swale. ☐ If removing the material creates a hole or low area, fill with good topsoil and add seed and straw to re-vegetate. ☐ Remove trash, vegetative debris, and other undesirable materials. ☐ If the swale is densely vegetated, it may be difficult to do the maintenance; check for excessive ponding or other issues described in this section to see if the accumulated material is causing a problem. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Sediment has accumulated more than 3 inches deep and covers 25% or more of the swale surface. ☐ The source of sediment is unknown or cannot be controlled with simple measures.
 ☐ There is erosion in the bottom or on the side slopes. Water seems to be carving out rills as it flows through the swale or on the slopes.	☐ Try filling the eroded areas with clean topsoil, and then seed and mulch to establish vegetation. ☐ If the problem recurs, you may have to use some type of matting, stone (e.g., river cobble), or other material to fill in eroded areas. ☐ If the erosion is on a side slope, fill with soil and cover with erosion-control matting or at least straw mulch after re-seeding.
	☐ Kick-Out to Level 2 Inspection: The problem persists or the erosion is more than 3 inches deep and seems to be an issue with how water enters and moves through the swale. ☐ Kick-Out to Level 2 Inspection: The problem does not seem to be caused by flowing water, but a collapse or sinking of the surface (e.g., “sinkhole”) due to some underground problem.
☐ Water does not flow evenly down the length of the swale, but ponds in certain areas for long periods of time (e.g., 72 hours after a storm). The swale does not seem to have “positive drainage.” Check during or immediately after a rain storm.	☐ If the problem is minor (just small, isolated areas), try using a metal rake or other tools to create a more even flow path; remove excessive vegetative growth, sediment, or other debris that may be blocking the flow. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Water ponds in more than 25% of the swale for three days or more after a storm. The issue may be with the underlying soil or the grade of the swale. ☐ Water ponds behind check dams for three days or more after a storm. Check dams may be clogged or not functioning properly.

SW Surface Area

Examine the entire swale surface and side slopes.

Problem (Check if Present)	Follow-Up Actions
 ☐ Check dams (if present): water is flowing around the edges of check dams, creating erosion or sinkholes on the uphill or downhill side, or the check dams are breaking apart or breaching .	☐ If the problem is isolated to just a few check dams, try simple repairs. ☐ It is very important for the center of each check dam (where most of the water flows) to be lower (by at least several inches) than the edges of the check dams where they meet the side slopes. Also, the check dams should be keyed into side slopes so water does not flow between the check dam and side slope. ☐ Use a level to check the right check-dam configuration, as noted above. Repair by moving around stone, filling and compacting soil, or adding new material so that water will be directed to the center of the check dam instead of the edges. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Many check dams are impacted and/or the problem seems to be a design issue with height, spacing, shape, or materials used to construct them.

SW Vegetation

Assess the swale vegetation.

Problem (Check if Present)	Follow-Up Actions
 . ☐ Vegetation is too overgrown to access swale for maintenance activities	☐ Mow or bush-hog the path. ☐ Other:

SW Vegetation

Assess the swale vegetation.

Problem (Check if Present)	Follow-Up Actions
 ☐ Vegetation requires regular maintenance: pulling weeds, removing dead and diseased plants, adding plants to fill in areas that are not well vegetated, etc.	☐ If you can identify which plants are weeds or not intended to be part of the planting plan, eliminate these, preferably by hand pulling. ☐ If weeds are widespread, check with the local stormwater authority and/or Extension Office about proper use of herbicides for areas connected with the flow of water. ☐ Even vegetation that is intended to be present can become large, overgrown, block flow, and/or crowd out surrounding plants. Prune and thin accordingly. ☐ If weeds or invasive plants have overtaken the whole swale, bush-hog the entire area before seed heads form in the spring. It will be necessary to remove the root mat manually or with appropriate herbicides, as noted above. ☐ Replant with species that are aesthetically pleasing and seem to be doing well in the swale. ☐ Other: ☐ Kick-Out to Level 2 Inspection: You are unsure of the original planting design or the vegetation maintenance task is beyond your capabilities of time, expertise, or resources. If you are unsure of the health of the vegetation (e.g. salt damage, invasives, which plants are undesirable) or the appropriate season to conduct vegetation management, consult a landscape professional before undertaking any cutting, pruning, mowing, or brush hogging.
☐ Vegetation is too thin, is not healthy, and there are many spots that are not well vegetated.	☐ The original plants are likely not suited for the actual conditions within the swale. If you are knowledgeable about plants, select and plant more appropriate vegetation (preferably native plants) so that almost the entire surface area will be covered by the end of the second growing season. ☐ Other: ☐ Kick-Out to Level 2 Inspection: For all but small practices (e.g., in residential yards), this task will likely require a landscape design professional or horticulturalist.

SW Outlets

Examine outlets that release water out of the swale.

Problem (Check if Present)	Follow-Up Actions
☐ Outlet is obstructed with mulch, sediment, debris, trash, etc.	☐ Remove the debris and dispose of it where it cannot re-enter the swale. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Outlet is completely clogged or obstructed; there is too much material to remove by hand or with simple hand tools.

Additional Notes:

Inspector:____ Date: ___________________

Complete the following if follow-up/corrective actions were identified during this inspection:

Certified Completion of Follow-Up Actions:

> “I hereby certify that the follow-up/corrective actions identified in the inspection performed on _____________ (DATE) have been completed and any required maintenance deficiencies have been adequately corrected.”

Inspector/Operator: ________________________________ Date: ___________________

Swale Stormwater Management Practices
Level 2 Inspection Checklist

SMP ID #		**SMP Owner**		☐ Private ☐ Public
SMP Location (Address; Latitude & Longitude)				
	Latitude		**Longitude**	

Party Responsible for Maintenance	**System Type**		**Type of Site**
☐ Same as SMP Owner ☐ Other __________________________	☐ Seasonal ☐ Continuous Use ☐ Other	☐ Above Ground ☐ Below Ground	☐ Commercial ☐ Industrial ☐ Residential ☐ State

Inspection Date		**Inspection Time**	
Inspector			
Date of Last Inspection			

Level 2 Inspection: SWALE

Recommended Repairs	Triggers for Level 3 Inspection
Observed Condition: Water Stands on Surface for More than 72 Hours after Storm	
☐ Condition 1: Small pockets of standing water Use a soil probe or auger to examine the soil profile. If isolated areas have accumulated grit, fines, or vegetative debris or have compacted soil, try scraping off top 3 to 6 inches of soil and replacing with clean material. Also check to see that surface is level and water is not ponding selectively in certain areas. ☐ Condition 2: Standing water is widespread or covers entire surface Requires diagnosis and resolution of problem: • Bad or compacted soil • Filter fabric on the swale bottom • Too much sediment/grit washing in from drainage area? • Too much ponding depth? • Longitudinal slope is too flat?	• Soil is overly compacted or clogged and problem is not evident from Level 2 inspection. • Level 2 inspection identifies problem, but it cannot be resolved easily or is associated with the original design of the practice (e.g., not enough slope down through the swale). ☐ Level 3 inspection necessary
Observed Condition: Vegetation is predominantly weeds and invasive species	
For a small area, weed and dig up invasive plants. Replant with natives or plants from original planting plan. If longer than 100 feet, develop a new planting plan and have it professionally reviewed.	• Vegetation deviates significantly from original planting plan; swale has been neglected and suffered from deferred maintenance. • Owner/responsible party does not know how to maintain the practice. • For large area, hire a professional to develop a grading plan and develop a planting plan. ☐ Level 3 inspection necessary

Notes:

Inspector:____ Date: __________________

Complete the following if follow-up/corrective actions were identified during this inspection:

Certified Completion of Follow-Up Actions:

> “I hereby certify that the follow-up/corrective actions identified in the inspection performed on _____________ (DATE) have been completed and any required maintenance deficiencies have been adequately corrected.”

Inspector/Operator: ________________________________ Date: __________________

Appendix C – Maintenance Agreements

Appendix D – Blank Maintenance Inspection Form

Post-Construction Operation and Maintenance Manual: Maintenance Inspection Form

Project Name:	
Inspection Date:	
Inspection Time:	
Inspector's Name:	

Inspection Item	**Inspection Frequency**	**Maintenance Required?**	**Comments**
Swale(s)			
Free of trash, debris, and pollutants?	Quarterly		
Erosion and/or sedimentation observed?	Annually		
Spillway is stable and is free of erosion or sedimentation?	Annually		
Channel dewaters between storm events?	Quarterly		
Blockage of flow present in the swale, culverts or underdrains?	Quarterly		
Vegetation is healthy and sufficient ground cover is observed?	Quarterly		
Vegetation is mowed to a minimum height of 8 inches?	Quarterly		
Riparian Buffers and Filter Strips			
Free of trash, debris, and pollutants?	Annually		
Erosion and/or sedimentation observed?	Annually		
Vegetation is healthy and sufficient ground cover is observed?	Annually		
Vegetation is mowed to a minimum height of 4 inches (minimum of 4 cuttings per year)?	Quarterly		
Buffer length has not been reduced?	Annually		
Flow Spreaders/Level Spreaders			
Free of trash, debris, and pollutants?	Annually		
Erosion and/or sedimentation observed?	Annually		
Channelization around the weir is observed?	Annually		
Rock outlet protection is displaced?	Annually		
Vegetation is healthy and sufficient ground cover is observed?	Annually		
Vegetation is mowed to a minimum height of 8 inches?	Annually		

Inspection Item	Inspection Frequency	Maintenance Required?	Comments
Detention Pond			
Free of trash, debris, and pollutants?	Annually		
Erosion and sedimentation not observed?	Annually		
Stormwater control structure is free of sediment, debris/trash, and no damage was observed?	Annually		
Vegetation is healthy and sufficient ground cover is observed?	Annually		
Vegetation is mowed to a minimum height of 8 inches?	Annually		
Sediment has reached 50% of the forebay capacity?	Annually		
Security features around the pond are in good condition?	Annually		
Infiltration Facilities			
Facility is functioning properly?	Annually		
Free of trash, debris, and pollutants?	Monthly		
System is draining properly?	Monthly		
Sediment accumulation has reached 2 inches or greater?	Annually		
Vegetation is healthy and sufficient ground cover is observed?	Annually		
Vegetation is mowed to a minimum height of 8 inches?	Annually		
Overflow area is in good condition?	Annually		
Energy Dissipaters			
Free of trash, debris, and pollutants?	Annually		
Erosion and/or sedimentation observed?	Annually		
Facility is operating properly?	Annually		
Storm Culverts and Drainage Pipes			
Free of trash, debris, and pollutants?	Annually		
Culvert/pipe is free of obstructions and functioning properly?	Annually		
Vegetation at the inlet and outlet is properly maintained?	Annually		
Culvert/pipe is not damaged (cracked, warped, corroded, etc.)?	Annually		
25% or more of the culvert/pipe structure has been compromised?	Annually		

Inspection Item	Inspection Frequency	Maintenance Required?	Comments
End Sections			
Free of trash, debris, and pollutants?	Semi-Annually		
Erosion and/or sedimentation is observed?	Semi-Annually		
Rocks at the outlet have not been displaced or are insufficient?	Semi-Annually		
Vegetation is impeding the flow of stormwater from the structure?	Semi-Annually		
Fences, Gates, and Signage			
Fencing and gates are in working order and are not damaged?	Annually		
Signage is legible and displayed clearly?	Annually		
Vegetation is maintained to not impede gated access or block signage?	Annually		
Access Roads			
Road surface is free of riling?	Annually		
Geo-web/grid is not exposed?	Annually		
Gravel cover is sufficient, and the road has maintained the proper grade?	Annually		
Erosion and/or sedimentation observed?	Annually		
Free of trash, debris, and pollutants?	Annually		
Vegetation is healthy and sufficient ground cover is observed?	Annually		
Vegetation is mowed to a minimum height of 4 inches?	Annually		
Pervious Access Roads			
Road surface is free of riling?	Annually		
Geo-web/grid is not exposed?	Annually		
Gravel cover is sufficient, and the road has maintained the proper grade?	Annually		
Erosion and/or sedimentation observed?	Annually		
Free of trash, debris, and pollutants?	Annually		
Vegetation is healthy and sufficient ground cover is observed?	Annually		
Vegetation is mowed to a minimum height of 4 inches?	Annually		
Gravel Parking Areas			
Road surface is free of riling?	Annually		
Geo-web/grid is not exposed?	Annually		

Inspection Item	Inspection Frequency	Maintenance Required?	Comments
Gravel cover is sufficient, and the road has maintained the proper grade?	Annually		
Erosion and/or sedimentation observed?	Annually		
Free of trash, debris, and pollutants?	Annually		
Vegetation is healthy and sufficient ground cover is observed?	Annually		
Vegetation is mowed to a minimum height of 4 inches?	Annually		
Gravel Substation Yard			
Surface is free of riling?	Annually		
Gravel cover is sufficient, and has maintained the proper grade?	Annually		
Erosion and/or sedimentation observed?	Annually		
Free of trash, debris, and pollutants?	Annually		
Vegetation is healthy and sufficient ground cover is observed?	Annually		
Vegetation is mowed to a minimum height of 4 inches?	Annually		

Appendix E – Completed Maintenance Inspection Forms