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APPENDICES

Contact Information / Responsible Parties:

Permittee(s):
BNE Energy
29 South Main Street
Town Center, Suite 200
West Hartford, CT 06107
(800) 450-0503

Contractor Co-Permittee:
To be determined

Contractor Operator(s):
To be determined

Stormwater Manager and SWPPP Contact(s):
BNE Energy
29 South Main Street
Town Center Suite 200
West Hartford, CT 06107
(800) 450-0503

This SWPPP was prepared by:
Curtis Jones, P.E., LEED AP
CIVIL 1
43 Sherman Hill Road
Suite D-101
Woodbury, CT 06798

Section 1.0

PROJECT INTRODUCTION

1.0 PROJECT INTRODUCTION

Project/Site Information:

Project/Site Name:	Wind Colebrook North	
Location:	Winsted- Norfolk Road Colebrook, Connecticut	
Latitude/Longitude:	Latitude: 41º 58' 30" N	Longitude: 73º 08' 28" W

Method for determining latitude/longitude: Google Earth

1.1 SITE SUMMARY

1.1.1 Existing Conditions

Located along the Winsted- Norfolk Road and Rock Hall Road, the project site consists of approximately 125 acres of primarily undeveloped property. Development on the property is limited to a seasonal use building in the southwest corner of the property which services a golf driving range. The Property is located approximately 1,050 feet east of the Norfolk town line town line and is located in Drainage Basin 4302 Mad River which is part of the larger Farmington Regional Basin as indentified in the Atlas of the Public Water Supply Sources and Drainage Basins of Connecticut . The surrounding land is predominately low density residential. The site will be accessed via Rock Hall Road. This access point will be maintained throughout the construction process. Currently, there are no structural stormwater discharge points. All stormwater flows over land to discharge points off site.

1.1.2 Project Description

The Project consists of three GE 1.6MW wind turbines, associated ground equipment, the installation of an access driveway and an electrical connection. The installation of the turbines will require the construction of temporary equipment lay-down areas for the turbines, crane assembly area, access road and associated ground equipment including an electrical collector yard and associated utility infrastructure so that the turbines can be interconnected to the electrical grid. Following completion of the project, all temporary structures will be removed and the site returned to pre-construction conditions as far as practicable.

1.1.3 Site Specific Concerns

The terrain and existing topography of the project site is such that during construction special care will be required to ensure that all BMPs remain intact and are functional.

1.1.4 Construction Schedule

Currently specific dates for construction have not been determined but anticipate construction to begin in Spring 2011. Specific dates will be provided to reviewing officials.

1.2 PROJECT OWNER AND OPERATOR

The project owner and operator, BNE Energy, will be the responsible entity for completing the project. The address and telephone is:
BNE Energy
29 South Main Street
Town Center Suite 200
West Hartford, CT 06107
(800) 450-0503

1.3 SOILS, SLOPES, VEGETATION, AND CURRENT DRAINAGE PATTERNS

1.3.1 Soil type(s)

Based upon a review of typical geologic conditions and the National Soil Cooperative Survey, the soils have been classified as (1) Bice- Millsite complex 3-15% slopes, very rocky, (2) Bice-Millsite complex 15-45% slopes, very rocky, (3) Bice fine sandy loam 3-8% slopes, very stony, (4) Bice fine sandy loam 8-15% slopes, very stony, (5) Bice fine sandy loam 15-25% slopes, very stony, (6) Schroon fine sandy loam 2-15% slopes, very stony, (7) Shelburne fine sandy loam 3- 8% slopes, (8) Shelburne fine sandy loam 8-15% slopes, (9) Shelburne fine sandy loam 8-15% slopes, very stony and (10) Brayton- Loonmeadow complex extremely stony.

1.3.2 Slopes

The project site consists of varying slope conditions ranging from relatively flat conditions in the central portion of the site and moderately steeper slopes in the extreme easterly and westerly portion of the site. The proposed towers are to be located on gentle slopes.

1.3.3 Drainage Patterns

Existing site topography is such that runoff migrates, typically via overland sheet flow from the easterly and westerly upland portions of the site towards the wetlands in the center portion of the site. The flow through the wetlands is generally from the north to the south and southeast through the Mill Brook which is a perennial watercourse.

1.3.4 Vegetation

Six major habitat types have been identified in the Terrestrial Wildlife Habitat & Wetland Impact Analysis prepared by VHB, Inc. These types include (1) second growth Northern Hardwood forest, (2) second growth Northern Hardwoods- Hemlock- White Pine forest, (3) early successional Northern Hardwood forest, (4) Palustrine forested wetlands (which include Mill Brook, a pereenial watercourse), (5) Palustrinescrub- shrub- emergent wetlands and (6) maintained lawn (golf driving range).

1.4 SITE FEATURES AND SENSITIVE AREAS TO BE PROTECTED

1.4.1 Receiving Waters and TMDL Applicability

Mill Brook runs through the property and ultimately receives the storm water runoff from the site.. This water body is not considered impaired and is not listed on the most current 303(d) listing of impaired waterways.

1.4.2 Wetlands

Within to the property boundary a wetland has been identified and delineated. Mitigation and impacts are discussed in the environmental assessment completed by VHB, Inc.

Section 2.0

CONSTRUCTION ACTIVITIES

2.0 CONSTRUCTION ACTIVITIES

2.1 DESCRIPTION OF CONSTRUCTION ACTIVITY

Prior to construction BNE will complete all pre-construction planning activities. BNE will continue to consult with municipalities, state agencies and federal agencies, as applicable, and will conduct site surveys to determine construction methodologies and procedures to minimize adverse effects to the environment and public.

Construction will typically consist of activities such as:

- Surveys to stake access roads and structural locations
- Wetland delineation
- Geotechnical investigations
- Establishment of construction staging area
- Installation of sediment and erosion control devices
- Excavation and installation of access roads
- Excavation and installation of lay-down and equipment assembly areas
- Excavation and installation of foundations and erection of new structures
- Installation of conductors
- Restoration of site, including re-establishment of vegetative areas

2.2 CONSTRUCTION SITE ESTIMATES

The following are estimates of the construction site:

Property Area: 125 acres
Area to be disturbed: 7.86 acres
Percentage impervious area before construction: 0%
Runoff coefficient number (RCN) before construction: 58
Percentage impervious area after construction: 0.98%
Runoff coefficient number (RCN) after construction: 60
Summary of peak flows: See 2.3.3
Summary of groundwater recharge: 0.015 AC-FT

Section 3.0
BEST MANAGEMENT PRACTICES

3.0 BEST MANAGEMENT PRACTICES

Soil erosion and sediment controls are measures that are used to reduce the amount of soil particles that are carried from a land area and deposited in receiving waters. This section provides a general description of the most appropriate control measures proposed for the Project. The permittee's construction contractor(s) and their subcontractors will be responsible for amending the erosion and sediment controls in the SWPPP for their portion(s) of the project as needed. Based on field conditions at the time of construction, the contractors or subcontractors may adjust the locations and types of BMPs so that erosion and sedimentation are controlled to the maximum extent practicable. However, in no case will modifications to the SWPPP result in any less stringent erosion and sedimentation control measures than specified herein.

3.1 STRUCTURAL CONTROL PRACTICES

Structural control practices divert flows from exposed soils, store water flow, or otherwise limit runoff from exposed areas of the site. Such practices may include silt fences, drainage swales, sediment traps, check dams, subsurface drains, pipe slope drains, rock outlet protection (rip-rap), reinforced soil retaining systems, and temporary or permanent sediment basins. Some of these practices may be used as both temporary and permanent control measures. Structural control practices should be placed in upland areas to the degree practicable to prevent erosion and reduce sedimentation in lower elevation areas. See Appendix A for additional information.

3.2 TEMPORARY EROSION CONTROL PRACTICES

Erosion and sediment control measures will be in place prior to the initiation of soil disturbing activities and will be maintained throughout construction. The contractor may need erosion control measures in other locations of the project as work progresses to keep sediment from leaving the construction site. These measures will be determined by the contractor in the field; if measures are changed in the field, the SWPPP must be modified accordingly. All temporary erosion controls will be removed after the protected area is finally stabilized. The minimum temporary erosion and sediment control practices that will be used for the Project are discussed in the following sections. See Appendix D for additional information.

3.2.1 Sediment Fence (GSF)

Will retain sediment from small disturbed areas. Sediment fence will be placed along slopes as shown on construction details. The contractor will use his best judgment to install additional sediment fence as necessary to prevent loss of sediment. Refer to section 5-11 of 2002 Connecticut Guidelines for Soil Erosion and Sediment Control.

Maintenance: Inspect the silt fence at least once a week and within 24 hours of the end of a storm with a rainfall amount of 0.5 inches or greater to determine maintenance needs. When used for dewatering operations, inspect frequently before, during and after pumping operations. Remove the sediment deposits, or if room allows, install a second silt fence up slope from the existing fence when deposits reach approximately one half the height of the existing fence. Replace or repair within 24 hours of an observed failure. Refer to Connecticut Guidelines for Soil Erosion and Sediment Control figure GF-5 for troubleshooting failures. Maintain silt fence until the contributing area is stabilized.

3.2.2 Hay Bale Barrier (HB)

Will retain sediment from small disturbed areas. Hay bales will be placed along slopes as shown on construction details. The contractor will use his best judgment to install additional hay bales as necessary to prevent loss of sediment. Refer to section 5-11 of 2002 Connecticut Guidelines for Soil and Sediment Control.

Maintenance: Inspect the hay bale barrier at least once a week and within 24 hours of the end of a storm with a rainfall amount of 0.5 inches or greater to determine maintenance needs. When used for dewatering operations, inspect frequently before, during and after pumping operations. Remove the sediment deposits, or if room allows, install a secondary barrier up slope from the existing barrier when deposits reach approximately one half the height of the barrier. Replace or repair within 24 hours of an observed failure. Refer to Connecticut Guidelines for Soil Erosion and Sediment Control figure HB-5 for troubleshooting failures. Maintain hay bale barrier until the contributing area is stabilized.

3.2.3 Stone Check Dam (SCD)

Will be used to reduce velocity of concentrated flows, thus reducing erosion of the drainage way.

Maintenance: Inspect the stone check dam at least once a week and within 24 hours of the end of a storm with a rainfall amount of 0.5 inches or greater to determine maintenance needs. Remove the sediment deposits when deposits reach approximately one half the height of the Check dam. Replace or repair within 24 hours of an observed failure. Maintain until the contributing area is stabilized.

3.2.4 Temporary Pipe Slope Drain (TSD)

Will be used to carry water over excessive changes in grade. TSD’s will convey concentrated stormwater runoff flows without causing erosion problems either on or at the toe of the slope.

Maintenance: Inspect the temporary pipe slope drain at least once a week and within 24 hours of the end of a storm with a rainfall amount of 0.5 inches or greater to determine maintenance needs. Repair damage as necessary. Avoid the placement of any material on the top of the pipe and prevent vehicular traffic from crossing the slope drain.

3.2.5 Temporary Diversion (TD)

Will be used to divert sediment laden runoff from a disturbed area to a sediment trapping facility.

Maintenance: When the temporary diversion is located within close proximity to on going construction activities, inspect the diversion at the end of each work day and immediately repair damage caused by construction equipment. Otherwise, inspect the temporary diversion and associated measures at least once a week and within 24 hours of the end of a storm with a rainfall amount of 0.5 inches or greater to determine maintenance needs. Repair within 24 hours of an observed failure.

3.2.6 Temporary Fill Berm (TFB)

Will be used to divert runoff from unprotected fill slopes during construction to a stabilized outlet or sediment trapping facility.

Maintenance: Inspect the temporary fill berm and associated controls at the end of each work day to ensure the criteria for installing the measures have been met. Determine if repair or modification is needed. This measure is temporary and under most situations will be covered the next work day. Maintenance requirements should be minimal. The contractor should avoid placing other material over the berm and construction traffic should not be allowed to cross.

3.2.7 Temporary Sediment Trap (TST)

Will be used to detain sediment laden runoff from small disturbed areas long enough to allow the majority of sediment to settle out.

Maintenance: Inspect the temporary sediment trap and associated controls at least once a week and within 24 hours of the end of a storm with a rainfall amount of 0.5 inches or greater to determine maintenance needs. Check the outlet to verify that it is structurally sound and has not been damaged by erosion or construction equipment. The height of the stone outlet should be maintained at least 1 foot below the crest of the embankment. When sediment has accumulated more than one quarter of the minimum wet storage volume, dewater and remove sediment as necessary to restore the trap to its original dimensions.

3.2.8 Construction Entrance (CE)

Will be used to reduce tracking of sediment off site to paved areas.

Maintenance: Maintain the entrance in a condition which will prevent tracking and washing of sediment onto paved surfaces. Provide periodic top dressing with additional stone or additional length as required. Immediately remove all sediment spilled, dropped, washed or tracked onto paved surfaces.

3.2.9 Tree Protection (TP)

Will be used to ensure the survival of existing desirable trees for their effectiveness in soil erosion and sediment control during construction.

Maintenance: Inspect tree protection zones weekly during site construction for damage to the tree crown, trunk and root system. When trees have been damaged or the protection zone has been compromised, consult an arborist licensed in CT to determine how damage should be addressed.

3.2.10 Temporary Erosion Control Blankets (ECB)

Will be used to provide temporary surface protection to disturbed soils to absorb raindrop impact and to reduce sheet and rill erosion until vegetation is established.

Maintenance: Inspect temporary erosion control blankets at least once a week and within 24 hours of the end of a storm with a rainfall amount of 0.5 inches or greater to determine maintenance needs. Repair any dislodged or failed blankets immediately.

3.3 SOIL STABILIZATION PRACTICES

Soil stabilization involves covering disturbed soils with grass, mulch, straw, geotextiles, trees, vines, or shrubs. Stabilization practices for exposed disturbed soils are extremely important while conducting construction activities. Vegetative cover serves to reduce the erosion potential by absorbing the energy of raindrops, promoting infiltration in lieu of runoff, and reducing the velocity of runoff. Stabilization measures shall be initiated as soon as practicable, but no more than 14 days after construction activities have temporarily or permanently ceased on any portion of the site.

3.4 MAINTENANCE AND INSPECTIONS

All erosion and sediment control devices shall be installed pursuant to the specifications in the construction details and in accordance with the Connecticut General Permit for the Discharge of Stormwater and Dewatering Wastewaters Associated with Construction Activities . They will be maintained so that they remain effective at all times.

Erosion and sediment control devices will be inspected by qualified personnel at least once every seven calendar days or at least once every 14 calendar days and within 24 hours of each 0.5-inch or greater rainfall event. During each inspection, the construction inspector will complete the Inspection and Maintenance Report Form located in the appendix. This form will be copied and used as necessary. Ineffective temporary erosion control measures will be repaired or replaced before the next storm event or as soon as practicable. The permittee will immediately install additional temporary erosion control devices in any area deemed in need of protection.

Following temporary or final stabilization, inspections must be conducted at least once a month. If construction has been halted due to frozen conditions, regular inspections are not mandatory until one month before the expected thaw. If vegetation establishment is not satisfactory, special steps to correct the problem will be implemented such as over seeding, mulching, sodding, or the use of erosion control blankets. Once a definable area of the construction site has been finally stabilized, no further inspection requirements apply to that area.

3.5 FINAL STABILIZATION

3.5.1 Seeding

The contractor will be responsible for labor, materials, tools, equipment, and other related items required for preparing ground, providing for sowing of seeds, fertilizing, mulching and top dressing, and other management practices required for erosion control and to achieve final stabilization. It will be the contractor’s responsibility to make sure that the soil seedbed is not blown, washed, or otherwise removed from the site. The contractor will make repairs (including replacement of lost topsoil and mulch) to the seedbed preparation site in the event of heavy rain, wind, or other natural events that cause damage. When practicable, native plant species should be used for landscaping.

3.5.2 Fertilizer

Soil in areas of disturbance may need supplementation from fertilizer. Soil tests may be necessary to determine the most appropriate fertilizer for each location. Once applied, the fertilizer will be worked into the soil to limit exposure to stormwater. Fertilizer spills will be cleaned up immediately and will not be applied along or in a waterway.

3.5.3 Mulching

Mulching will be used in conjunction with both temporary and permanent seeding practices to enhance success by providing erosion protection prior to the onset of vegetative growth. Mulches enhance plant establishment by moderating soil temperatures and conserving moisture. After seeding, straw or hay mulch will be applied at a rate of two to three tons per acre on the disturbed areas. Other forms of mulch will be applied at a rate designated by the Project Engineer. Mulch will not be applied in wetlands, on lawns, and areas where hydro-mulch is used. Mulch will be anchored immediately after placement on steep slopes and stream banks. Mulch will be held in place by a very thin covering of topsoil, small brush, pins, stakes, wire mesh, asphalt binder, or other adhesive material approved by the project engineer.

3.5.4 Topsoiling

Topsoil should be applied in areas where the subsoil or existing surface soil does not provide an adequate growth medium for the desired vegetation, where soil is too shallow to provide adequate rooting depth, or where the soil contains substances toxic to the desired vegetation. Topsoil shall be reasonably free from subsoil and stumps, roots, brush, stones, and clay lumps or similar objects.

3.5.5 Temporary Control Removal

Temporary erosion controls will be left in place until the Project site is stabilized with a uniform vegetative cover of 70 percent density of the native background vegetative cover on all unpaved areas. Following re-vegetation, the permittee will conduct periodic site visits to make sure that vegetation establishment is satisfactory. If sufficient vegetative cover has not been achieved, additional restoration measures will be implemented. Inspection results will be documented using the Inspection and Maintenance Report Form found in the appendix. All temporary soil erosion and sediment control measures will be removed and disposed of after final site stabilization is achieved and before submitting the Notice of Termination (NOT) to the CT DEP.

Section 4.0

EROSION CONTROL PLAN APPENDICES

4.0 SWPPP APPENDICES

Attach the following documentation to the SWPPP in the following appendices.

Appendix A – Maps and Drawings

- Site Maps
- Site Plan

Appendix B – Inspection and Maintenance Records

- Inspection & Maintenance Log
- Inspection Report
- Maintenance Report

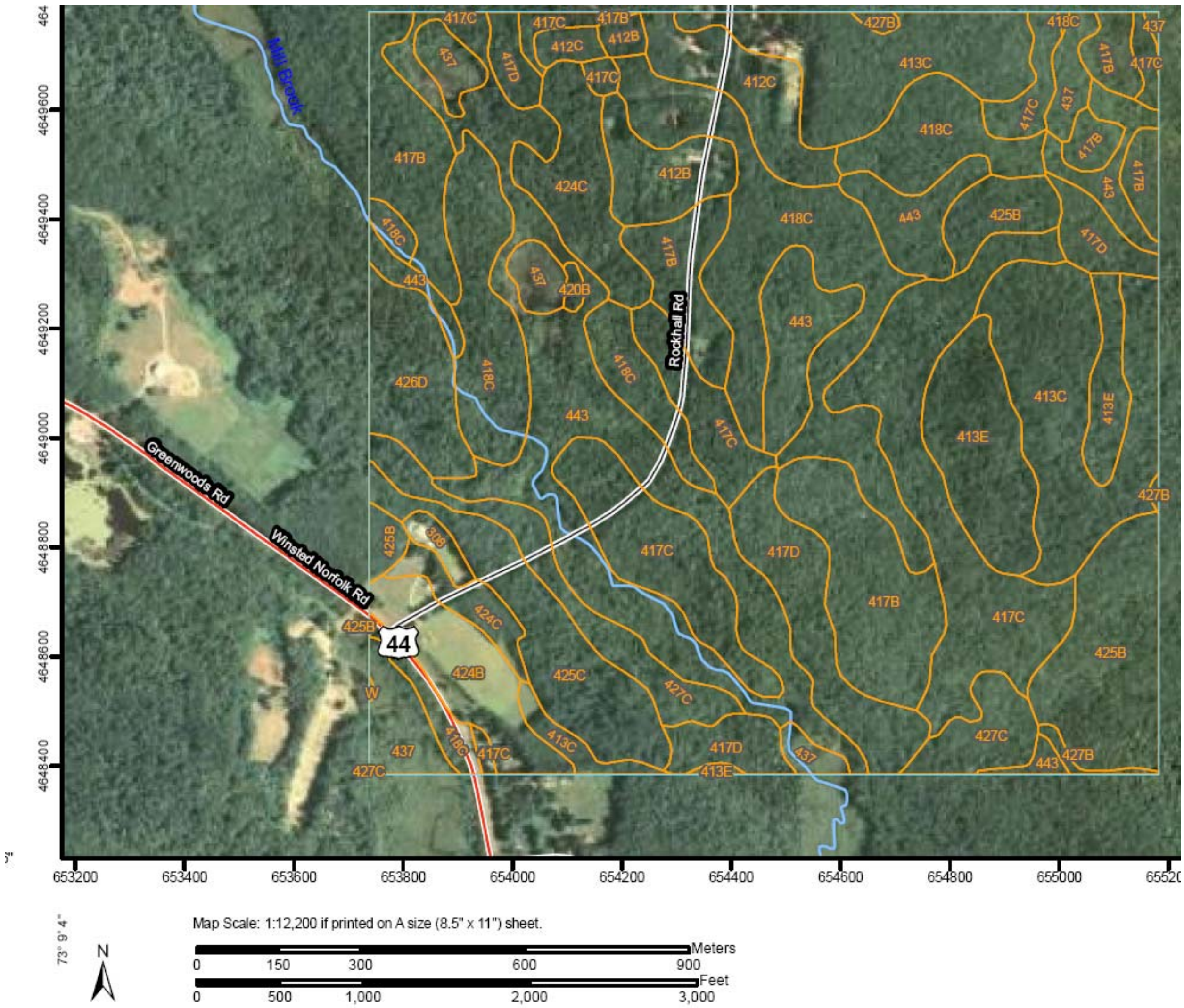
Appendix C – Supporting Calculations

- Calculations for Swales, Culverts, Riprap and Temporary Sediment Traps

Appendix A

MAPS AND DRAWINGS


TOPO! map printed on 03/21/11 from "Untitled.tpo"
73°12'00" W
73°10'00" W
73°08'00" W
73°06'00" W
73°04'00" W
WGS84 73°02'00" W
42°02'00" N
42°01'00" N
42°00'00" N
41°59'00" N
41°58'00" N
41°57'00" N
41°56'00" N
41°55'00" N
NORFOLK
Norfolk
North Colebrook
COLEBROOK
Colebrook
SITE
Robertsville
ALGONQUIN STATE FOREST
Mill Brook
Winsted
WINCHESTER
DENNIS HILL STATE PARK
Mc Claveville
Benedict Pond
Spaulding Pond
Crystal Lake
Lake Winchester
AMERICAN LEGION STATE FOREST
Map created with TOPO!® ©2006 National Geographic ©2005 Tele Atlas, Rel. 8/2005
NATIONAL GEOGRAPHIC
0.0 0.5 1.0 1.5 2.0 2.5 3.0 miles
0 1 2 3 4 5 km
MN TN
14°
03/21/11


Mill Brook
Rockhall Rd
Greenwoods Rd
Winsted Norfolk Rd
44
Map Scale: 1:12,200 if printed on A size (8.5" x 11") sheet.
Meters
Feet
N

Soil Map–State of Connecticut

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features
- Cities

Water Features
- Oceans
- Streams and Canals

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

MAP INFORMATION

Map Scale: 1:2,900 if printed on D size (22" × 34") sheet.

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 18N NAD83

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

Soil Survey Area: State of Connecticut
Survey Area Data: Version 8, Dec 13, 2010

Date(s) aerial images were photographed: 8/14/2006

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.

Map Unit Legend

State of Connecticut (CT600)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
61C	Canton and Charlton soils, 8 to 15 percent slopes, very stony	0.3	0.1%
62D	Canton and Charlton soils, 15 to 35 percent slopes, extremely stony	0.4	0.1%
412B	Bice fine sandy loam, 3 to 8 percent slopes	15.4	3.0%
412C	Bice fine sandy loam, 8 to 15 percent slopes	15.3	3.0%
413C	Bice-Millsite complex, 3 to 15 percent slopes, very rocky	64.9	12.8%
413E	Bice-Millsite complex, 15 to 45 percent slopes, very rocky	23.5	4.6%
417B	Bice fine sandy loam, 3 to 8 percent slopes, very stony	58.1	11.5%
417C	Bice fine sandy loam, 8 to 15 percent slopes, very stony	93.1	18.4%
417D	Bice fine sandy loam, 15 to 25 percent slopes, very stony	18.3	3.6%
418C	Schroon fine sandy loam, 2 to 15 percent slopes, very stony	57.5	11.3%
420B	Schroon fine sandy loam, 3 to 8 percent slopes	0.6	0.1%
424C	Shelburne fine sandy loam, 8 to 15 percent slopes	9.1	1.8%
425B	Shelburne fine sandy loam, 3 to 8 percent slopes, very stony	21.1	4.2%
425C	Shelburne fine sandy loam, 8 to 15 percent slopes, very stony	4.9	1.0%
426D	Shelburne fine sandy loam, 15 to 35 percent slopes, extremely stony	2.8	0.6%
427B	Ashfield fine sandy loam, 2 to 8 percent slopes, very stony	17.3	3.4%
427C	Ashfield fine sandy loam, 8 to 15 percent slopes, very stony	12.3	2.4%
428A	Ashfield fine sandy loam, 0 to 3 percent slopes	2.9	0.6%
437	Wonsqueak mucky peat	22.6	4.5%
443	Brayton-Loonmeadow complex, extremely stony	65.9	13.0%
Totals for Area of Interest		**506.5**	**100.0%**

Appendix B

INSPECTION AND MAINTENANCE RECORDS

INSPECTOR CERTIFICATION

Project:	Wind Colebrook North
Project Location:	Winsted- Norfolk Road Colebrook North
Contractor:	
Address:	
Phone:	
Fax:	

CONSTRUCTION INSPECTION & MAINTENANCE LOG

Date	Activity	Description	(1) Report No.
	❑ Inspection ❑ Maintenance	By: ______________________________	
	❑ Inspection ❑ Maintenance	By: ______________________________	
	❑ Inspection ❑ Maintenance	By: ______________________________	
	❑ Inspection ❑ Maintenance	By: ______________________________	
	❑ Inspection ❑ Maintenance	By: ______________________________	
	❑ Inspection ❑ Maintenance	By: ______________________________	
	❑ Inspection ❑ Maintenance	By: ______________________________	
	❑ Inspection ❑ Maintenance	By: ______________________________	
	❑ Inspection ❑ Maintenance	By: ______________________________	
	❑ Inspection ❑ Maintenance	By: ______________________________	

CONSTRUCTION SITE INSPECTION REPORT

General Information				
Project Name:	Wind Colebrook North			
Location:	Winsted- Norfolk Road Colebrook, Connecticut			
CT DEP Tracking No.		(1) Report No.		
Date of Inspection:		Start / End Time:		
Inspector's Name(s):				
Inspector's Title(s):				
Inspector's Contact Information:				
Describe present phase of construction:				
Type of Inspection: ❑ Regular ❑ Pre-storm event ❑ During storm event ❑ Post-storm event				
Weather Information				
Has it rained since the last inspection? ❑Yes ❑No If yes, provide: Storm Start Date & Time: Storm Duration (hrs): Approximate Rainfall (in):				
Weather at time of this inspection?				
Discharge Information (A)				
Do you suspect that discharges may have occurred since the last inspection? ❑Yes ❑No				
Are there any discharges at the time of inspection? ❑Yes ❑No				
Describe location of any discharges from the site:				

SITE-SPECIFIC BMPs

(B)	BMP Description	BMP Installed and Operating Properly?	Corrective Action Needed	Date for corrective action / responsible party
1		❑Yes ❑No		
2		❑Yes ❑No		
3		❑Yes ❑No		
4		❑Yes ❑No		
5		❑Yes ❑No		
6		❑Yes ❑No		
7		❑Yes ❑No		
8		❑Yes ❑No		
9		❑Yes ❑No		
10		❑Yes ❑No		
11		❑Yes ❑No		
12		❑Yes ❑No		
13		❑Yes ❑No		
14		❑Yes ❑No		
15		❑Yes ❑No		
16		❑Yes ❑No		
17		❑Yes ❑No		
18		❑Yes ❑No		
19		❑Yes ❑No		

OVERALL SITE ISSUES

(C)	BMP/activity	Implemented?	Maintained?	Corrective Action	Date for corrective action/responsible person
1	Are all slopes and disturbed areas not actively being worked properly stabilized?	❑Yes ❑No	❑Yes ❑No		
2	Are natural resource areas (e.g., streams, wetlands, mature trees, etc.) protected with barriers or similar BMPs?	❑Yes ❑No	❑Yes ❑No		
3	Are perimeter controls and sediment barriers adequately installed (keyed into substrate) and maintained?	❑Yes ❑No	❑Yes ❑No		
4	Are discharge points and receiving waters free of sediment deposits?	❑Yes ❑No	❑Yes ❑No		
5	Are storm drain inlets properly protected?	❑Yes ❑No	❑Yes ❑No		
6	Is there evidence of sediment being tracked into the street?	❑Yes ❑No	❑Yes ❑No		
7	Is trash/litter from work areas collected and placed in covered dumpsters?	❑Yes ❑No	❑Yes ❑No		

(C)	BMP/activity	Implemented?	Maintained?	Corrective Action	Date for corrective action/responsible person
8	Are washout facilities (e.g., paint, stucco, concrete) available, clearly marked, and maintained?	❑Yes ❑No	❑Yes ❑No		
9	Are vehicle and equipment fueling, cleaning, and maintenance areas free of spills, leaks, or any other deleterious material?	❑Yes ❑No	❑Yes ❑No		
10	Are materials that are potential stormwater contaminants stored inside or under cover?	❑Yes ❑No	❑Yes ❑No		
11	Are non-stormwater discharges (e.g., wash water, dewatering) properly controlled?	❑Yes ❑No	❑Yes ❑No		
12	(Other)	❑Yes ❑No	❑Yes ❑No		
13	(Other)	❑Yes ❑No	❑Yes ❑No		

(C)	BMP/activity	Implemented?	Maintained?	Corrective Action	Date for corrective action/responsible person

GENERAL INSPECTION COMMENTS AND EXPLANATION

General Inspection Comments (D)
Is other descriptive information attached to this inspection report? ❑Yes ❑No

Plan Information (E)
Were all current plan BMP's in place at the time of inspection? ❑Yes ❑No
Are additional BMP's required? ❑Yes ❑No
Does the plan need to be updated? ❑Yes ❑No
Explanation of additional BMP and Plan update requirements:

Certification statement:
I certify that I have thoroughly and completely reviewed the Stormwater Pollution Control Plan for the site. I further certify, based on such review and in my professional judgment, that the

Stormwater Pollution Control Plan has been prepared in accordance with the Connecticut Guidelines for Soil Erosion and Sediment Control, as amended, and the conditions for the General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities issued on October 1, 2002 (or as reissued or modified), and the controls required for such Plan are appropriate for the site. I am aware that there are significant penalties for false statements in this certification, including the possibility of fine and imprisonment for knowingly making false statements.

Name: ____
(Please print)
Signature: ____

Title: ____________________________ Date: _______________________

.

CONSTRUCTION SITE MAINTENANCE REPORT

General Information				
Project Name:	Wind Colebrook North			
Location:	Winsted- Norfolk Road Colebrook, Connecticut			
CT DEP Tracking No.:		(1) Report No.		
Date of Maintenance:		Start / End Time:		
Describe present phase of construction:				
Type of Maintenance: ❑ Regular ❑ Pre-storm event ❑ Post-storm event ❑ Plan Update				

Maintenance Information	
Inspection Report Reference (No., Item)	Maintenance performed:
Performed by:	
Inspection Report Reference (No., Item)	Maintenance performed:
Performed by:	
Inspection Report Reference (No., Item)	Maintenance performed:
Performed by:	
Inspection Report Reference (No., Item)	Maintenance performed:
Performed by:	
Inspection Report Reference (No., Item)	Maintenance performed:
Performed by:	

Inspection Report Reference (No., Item)	Maintenance performed:
Performed by:	
Inspection Report Reference (No., Item)	Maintenance performed:
Performed by:	
Inspection Report Reference (No., Item)	Maintenance performed:
Performed by:	
Inspection Report Reference (No., Item)	Maintenance performed:
Performed by:	
Inspection Report Reference (No., Item)	Maintenance performed:
Performed by:	
Inspection Report Reference (No., Item)	Maintenance performed:
Performed by:	
Inspection Report Reference (No., Item)	Maintenance performed:
Performed by:	
Inspection Report Reference (No., Item)	Maintenance performed:
Performed by:	

Certification statement:
I certify that I have thoroughly and completely reviewed the Stormwater Pollution Control Plan for the site. I further certify, based on such review and in my professional judgment, that the Stormwater Pollution Control Plan has been prepared in accordance with the Connecticut Guidelines for Soil Erosion and Sediment Control, as amended, and the conditions for the General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities issued on October 1, 2002 (or as reissued or modified), and the controls required for such Plan are appropriate for the site. I am aware that there are significant penalties for false statements in this certification, including the possibility of fine and imprisonment for knowingly making false statements.

Name: ____

Signature: ____

Title: ________________________ Date: ____________________

Appendix C
SUPPORTING CALCULATIONS

CALCULATIONS FOR SWALES, CULVERTS, RIP RAP AND TEMPORARY SEDIMENT TRAPS

DRAINAGE CALCULATIONS FOR TEMPORARY DIVERSION #1 (TD1)

10-YEAR DESIGN STORM
3-18-11

Rational Method:
Q = CIA
Where:
Q = flow rate (cfs)
C = runoff coefficient
I = rainfall intensity (in/hr)
A = area (ac.)

Total area contributing to swale: 2.13 ac.
Proposed Land Cover
Grass = 0.15 ac.
Wooded = 1.98 ac.

C = [(.3*.15)+(.2*1.98)]/2.13 = 0.21
Time of Concentration = 20 minutes $\therefore$ I = 3.6 in/hr

Q = C*I*A = .21 * 3.6 * 2.13 = 1.62 cfs

Velocity in grass-lined swale at 5% slope = 3.34 fps.

Worksheet
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	TD1
Flow Element	Trapezoidal Cha
Method	Manning's Formı
Solve For	Channel Depth

Input Data		
Mannings Coeffic	0.030	
Channel Slope	.050000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	2.00	ft
Discharge	1.60	cfs

Results		
Depth	0.20	ft
Flow Area	0.5	ft²
Wetted Perimı	2.89	ft
Top Width	2.80	ft
Critical Depth	0.25	ft
Critical Slope	0.023407	ft/ft
Velocity	3.34	ft/s ← GRASS LINED SWALE
Velocity Head	0.17	ft
Specific Enerç	0.37	ft
Froude Numbı	1.42	
Flow Type	Supercritical	

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DRAINAGE CALCULATIONS FOR TEMPORARY DIVERSION #2 (TD2)

10-YEAR DESIGN STORM
3-18-11

Rational Method:
Q = CIA
Where:
Q = flow rate (cfs)
C = runoff coefficient
I = rainfall intensity (in/hr)
A = area (ac.)

Total area contributing to swale: 0.73 ac.
Proposed Land Cover
Grass = 0.05 ac.
Wooded = 0.68 ac.

C = [(.3*.05)+(.2*0.68)]/.73 = 0.21
Time of Concentration = 12 minutes ∴ I = 4.5 in/hr

Q = C*I*A = .21 * 4.5 * 0.73 = 0.70 cfs

Velocity in grass-lined swale at max 14% slope = 3.51 fps.

Worksheet
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	TD2
Flow Element	Trapezoidal Cha
Method	Manning's Form
Solve For	Channel Depth

Input Data		
Mannings Coeffic	0.030	
Channel Slope	140000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	2.00	ft
Discharge	0.70	cfs

Results		
Depth	0.09	ft
Flow Area	0.2	ft²
Wetted Perim	2.41	ft
Top Width	2.37	ft
Critical Depth	0.15	ft
Critical Slope	0.026813	ft/ft
Velocity	3.51	ft/s ← GRASS LINED SWALE
Velocity Head	0.19	ft
Specific Energ	0.28	ft
Froude Numb	2.13	
Flow Type	Supercritical	

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DRAINAGE CALCULATIONS FOR TEMPORARY DIVERSION #3 (TD3)

10-YEAR DESIGN STORM
3-18-11

Rational Method:
Q = CIA
Where:
Q = flow rate (cfs)
C = runoff coefficient
I = rainfall intensity (in/hr)
A = area (ac.)

Total area contributing to swale: 0.62 ac.
Proposed Land Cover
Grass = 0.06 ac.
Wooded = 0.56 ac.

C = [(.3*.06)+(.2*0.56)]/0.62 = 0.21
Time of Concentration = 25 minutes ∴ I = 3.2 in/hr

Q = C*I*A = .21 * 3.2 * 0.62 = 0.42 cfs

Velocity in grass-lined swale at 12% slope = 2.78 fps.

Worksheet
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	TD3
Flow Element	Trapezoidal Cha
Method	Manning's Form
Solve For	Channel Depth

Input Data		
Mannings Coeffic	0.030	
Channel Slope	120000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	2.00	ft
Discharge	0.42	cfs

Results		
Depth	0.07	ft
Flow Area	0.2	ft²
Wetted Perim	2.32	ft
Top Width	2.28	ft
Critical Depth	0.11	ft
Critical Slope	0.029456	ft/ft
Velocity	2.78	ft/s ← GRASS LINED SWALE
Velocity Head	0.12	ft
Specific Energ	0.19	ft
Froude Numb	1.91	
Flow Type	Supercritical	

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DRAINAGE CALCULATIONS FOR PERMANENT DIVERSION SWALE #1(PDS1)

25-YEAR DESIGN STORM

3-18-11

Rational Method:
Q = CIA
Where:
Q = flow rate (cfs)
C = runoff coefficient
I = rainfall intensity (in/hr)
A = area (ac.)

Total area contributing to swale: 2.78 ac.
Proposed Land Cover
Grass = 0.22 ac.
Wooded = 2.56 ac.

C = [(.3*.22)+(.2*2.56)]/2.78= 0.21
Time of Concentration = 18 minutes ∴ I = 4.4 in/hr

Q = C*I*A = .21 * 4.4 * 2.78 = 2.54 cfs

Velocity in riprap-lined swale at 9.9% slope = 2.78 fps.

Worksheet
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	PDS1
Flow Element	Trapezoidal Cha
Method	Manning's Formı
Solve For	Channel Depth

Input Data		
Mannings Coeffic	0.040	
Channel Slope	099000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	2.00	ft
Discharge	2.78	cfs

Results		
Depth	0.27	ft
Flow Area	0.7	ft²
Wetted Perim	3.19	ft
Top Width	3.06	ft
Critical Depth	0.35	ft
Critical Slope	0.038164	ft/ft
Velocity	4.14	ft/s ← MOD. RIPRAP CHANNEL
Velocity Head	0.27	ft
Specific Energ	0.53	ft
Froude Numb	1.56	
Flow Type	Supercritical	

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DRAINAGE CALCULATIONS FOR PERMANENT DIVERSION SWALE #2(PDS2)

25-YEAR DESIGN STORM
3-18-11

Rational Method:
Q = CIA
Where:
Q = flow rate (cfs)
C = runoff coefficient
I = rainfall intensity (in/hr)
A = area (ac.)

Total area contributing to swale: 5.35 ac.
Proposed Land Cover
Grass = .08 ac.
Wooded = 5.27 ac.

C = [(.3*.08)+(.2*5.27)]/5.35= 0.20
Time of Concentration = 21 minutes ∴ I = 4.1 in/hr

Q = C*I*A = .20 * 4.1 * 5.35 = 4.39 cfs

Velocity in riprap-lined swale at 4.5% slope = 2.78 fps.

Worksheet
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	PDS2
Flow Element	Trapezoidal Cha
Method	Manning's Form
Solve For	Channel Depth

Input Data		
Mannings Coeffic	0.040	
Channel Slope	045000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	2.00	ft
Discharge	4.39	cfs

Results		
Depth	0.43	ft
Flow Area	1.2	ft²
Wetted Perim	3.90	ft
Top Width	3.70	ft
Critical Depth	0.45	ft
Critical Slope	0.035723	ft/ft
Velocity	3.61	ft/s ← MOD. RIPRAP CHANNEL
Velocity Head	0.20	ft
Specific Energ	0.63	ft
Froude Numb	1.11	
Flow Type	Supercritical	

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DRAINAGE CALCULATIONS FOR CROSS CULVERT TO LEVEL SPREADER TURBINE 2 ACCESS ROAD STATION 0+55

25-YEAR DESIGN STORM

3-18-11

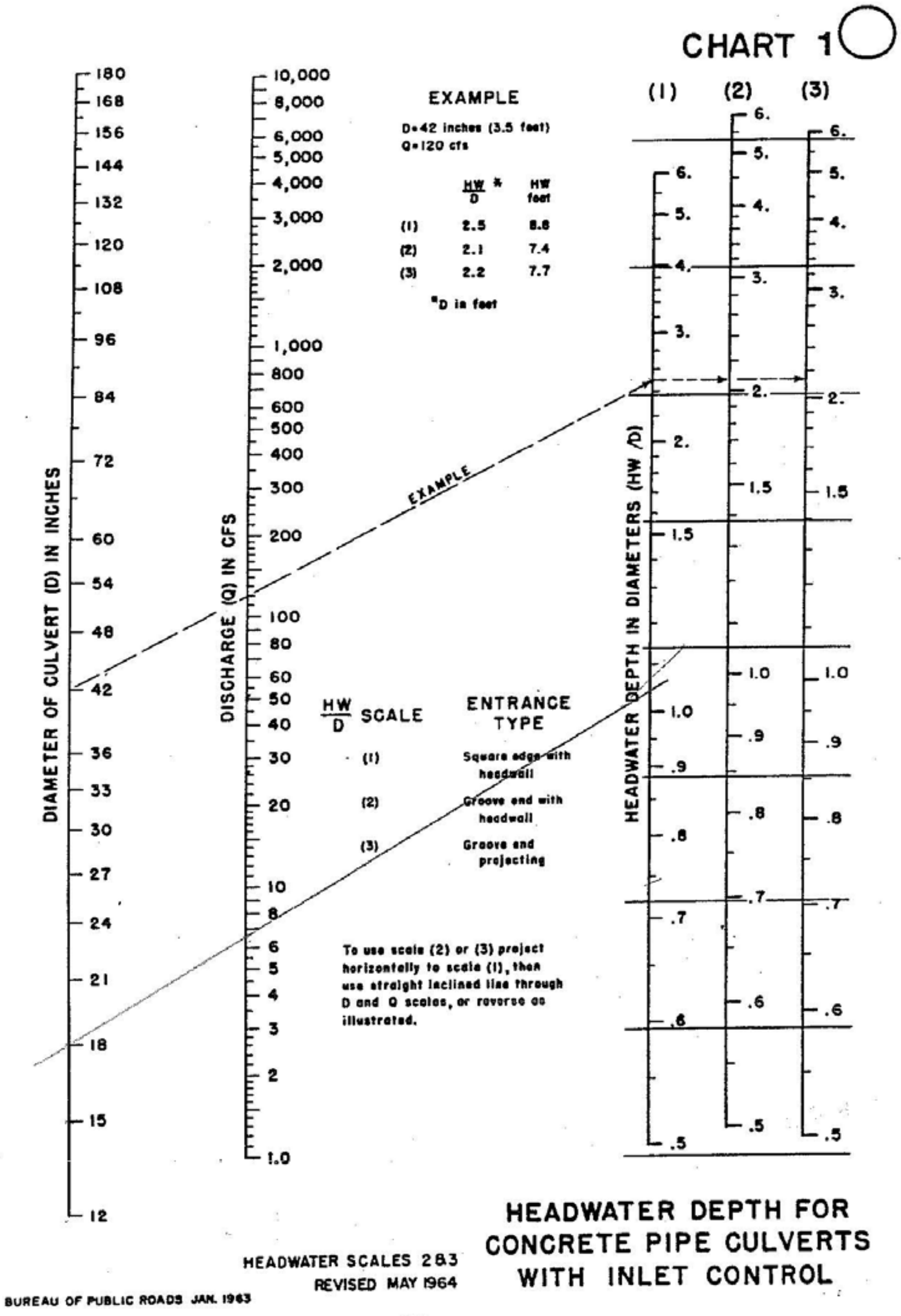
Rational Method:
Q = CIA
Where:
Q = flow rate (cfs)
C = runoff coefficient
I = rainfall intensity (in/hr)
A = area (ac.)

Total area contributing to swale: 8.13 ac.
Proposed Land Cover
Grass = 0.30 ac.
Wooded = 7.83 ac.

C = [(.3*.30)+(.2*7.83)]/8.13= 0.20
Time of Concentration = 21 minutes ∴ I = 4.1 in/hr

Q = C*I*A = .20 * 4.1 * 8.13 = 6.67 cfs

For 18” culvert - HW/D = 1.05



HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

181

CROSS CULVERT, TURBINE 2 ACCESS ROAD
STATION 0+55

CROSS CULVERT
TURBINE 2 ACCESS ROAD

OUTLET PROTECTION - OUTLET VELOCITY ≤ 14 feet/sec

DISCHARGE (cfs)	OUTLET PIPE DIAMETER OR SPAN (in) 12	15	18	24	30	36	42	48	54	60
0-5	***10***	***10***		*USE*						
6	12	11								
7		13	***(12)***							
8		14	13	***12***		*MINIMUM*				
9			14	13						
10			15	13						
11			16	14				*LENGTH*		
12				14						
14				16	***14***					
16				17	15	***14***			*OUTLINED*	
18				18	16	15				
20					17	15	***14***			
22		*USE*			18	16	15			
24						17	15	***14***		
26						17	16	15		
28						18	16	15		
30						19	17	16		
35						20	18	17	***16***	
40			*PREFORMED*				20	18	17	***16***
45							21	19	18	16
50							22	20	18	17
55								21	19	18
60								22	20	19
65								24	21	20
70					*SCOUR*			25	22	20
75								26	23	21
80									24	22
90									26	24
100									28	25
110										27
125							*HOLE*			29
130										30

Table 8-6.1 - Length - L_a (feet)
Type A Riprap Apron

Notes: 1. Bold face outlined boxes indicate minimum L_a to be used for a given pipe diameter or span.
2. Rounding and interpolating are acceptable.

$W_a = 3(S_p) + 0.4(L_a)$

$W_a = 3(1.5) + 0.4(12) = 9.3'$, use 10'W

10'W x 12'L MOD RIPRAP PAD

Cross culvert - Turbine 2 Access Road
Worksheet for Circular Channel

Project Description	
Worksheet	Circular Channel
Flow Element	Circular Channel
Method	Manning's Formu
Solve For	Channel Depth

Input Data		
Mannings Coeffic	0.013	
Channel Slope	010000	ft/ft
Diameter	18.0	in
Discharge	6.67	cfs

Results		
Depth	0.87	ft
Flow Area	1.1	ft²
Wetted Perime	2.59	ft
Top Width	0.00	ft
Critical Depth	1.00	ft
Percent Full	57.9	%
Critical Slope	0.006577	ft/ft
Velocity	6.29	ft/s ← USE MOD. RIPRAP PAD
Velocity Head	0.62	ft
Specific Energ	1.48	ft
Froude Numbe	1.31	
Maximum Disc	11.30	cfs
Discharge Full	10.50	cfs
Slope Full	0.004032	ft/ft
Flow Type	Supercritical	

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DRAINAGE CALCULATIONS FOR PERMANENT DIVERSION SWALE #3(PDS3)
25-YEAR DESIGN STORM
3-18-11

Rational Method:
Q = CIA
Where:
Q = flow rate (cfs)
C = runoff coefficient
I = rainfall intensity (in/hr)
A = area (ac.)

Total area contributing to swale: 8.35 ac.
Proposed Land Cover
Grass = 0.52 ac.
Wooded = 7.83 ac.

C = [(.3*.52)+(.2*7.83)]/8.35= 0.21
Time of Concentration = 22 minutes ∴ I = 4.0 in/hr

Q = C*I*A = .21 * 4.0 * 8.35 = 7.01 cfs

Velocity in riprap-lined swale at max 20.0% slope = 7.02 fps.

Worksheet
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	PDS3
Flow Element	Trapezoidal Cha
Method	Manning's Form
Solve For	Channel Depth

Input Data		
Mannings Coeffic	0.040	
Channel Slope	200000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	2.00	ft
Discharge	7.01	cfs

Results		
Depth	0.37	ft
Flow Area	1.0	ft²
Wetted Perim	3.64	ft
Top Width	3.46	ft
Critical Depth	0.59	ft
Critical Slope	0.033524	ft/ft
Velocity	7.02	ft/s ← MOD. RIPRAP CHANNEL
Velocity Head	0.77	ft
Specific Enerç	1.13	ft
Froude Numb	2.30	
Flow Type	Supercritical	

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STORMWATER POND 1 OUTLET

Worksheet

Worksheet for Circular Channel

Project Description	
Worksheet	Pond 1 outlet
Flow Element	Circular Chann
Method	Manning's Forr
Solve For	Channel Depth

Input Data		
Mannings Coeffic	0.013	
Channel Slope	050000	ft/ft
Diameter	15.0	in
Discharge	2.30	cfs

Results		
Depth	0.34	ft
Flow Area	0.3	ft²
Wetted Perime	1.37	ft
Top Width	0.00	ft
Critical Depth	0.61	ft
Percent Full	27.0	%
Critical Slope	0.005630	ft/ft
Velocity	8.61	ft/s ← USE INT. RIPRAP PAD
Velocity Head	1.15	ft
Specific Energ	1.49	ft
Froude Numbe	3.09	
Maximum Disc	15.54	cfs
Discharge Full	14.44	cfs
Slope Full	0.001268	ft/ft
Flow Type	Supercritical	

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STORMATER POND 1
OUTLET

OUTLET PROTECTION - OUTLET VELOCITY ≤ 14 feet/sec

DISCHARGE (cfs)	OUTLET PIPE DIAMETER OR SPAN (in) 12	15	18	24	30	36	42	48	54	60
0-5	**10**	**10**		**USE**						
6	12	11								
7		13	**12**							
8		14	13	**12**		**MINIMUM**				
9			14	13						
10			15	13						
11			16	14				**LENGTH**		
12				14						
14				16	**14**					
16				17	15	**14**			**OUTLINED**	
18				18	16	15				
20					17	15	**14**			
22		**USE**			18	16	15			
24						17	15	**14**		
26						17	16	15		
28						18	16	15		
30						19	17	16		
35						20	18	17	**16**	
40				**PREFORMED**			20	18	17	**16**
45							21	19	18	16
50							22	20	18	17
55								21	19	18
60								22	20	19
65								24	21	20
70					**SCOUR**			25	22	20
75								26	23	21
80									24	22
90									26	24
100									28	25
110										27
125							**HOLE**			29
130										30

Table 8-6.1 - Length - L_a (feet)
Type A Riprap Apron

Notes: 1. Bold face outlined boxes indicate minimum L_a to be used for a given pipe diameter or span.
2. Rounding and interpolating are acceptable.

$W = 3(S_p) + 0.4(L_a)$
$= 3(1.25) + 0.4(10) = 7.75'$, use 8'

8'W×10'L INT. RIPRAP PAD

October 2000 ConnDOT Drainage Manual

DRAINAGE CALCULATIONS FOR CROSS CULVERT UNDER MAIN ACCESS DRIVE STATION 19+85

25-YEAR DESIGN STORM
3-18-11

Rational Method:
Q = CIA
Where:
Q = flow rate (cfs)
C = runoff coefficient
I = rainfall intensity (in/hr)
A = area (ac.)

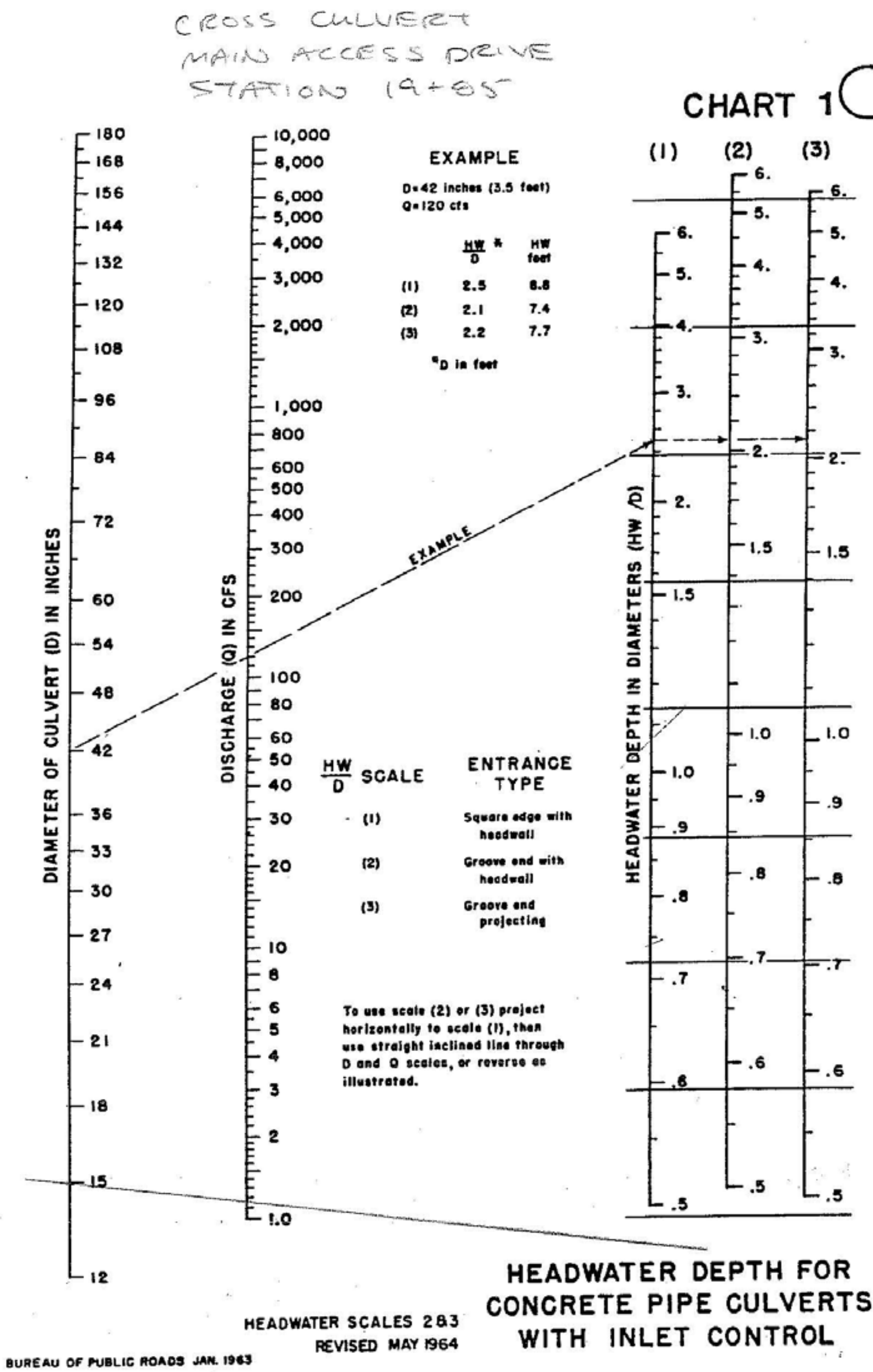
Total area contributing to swale: 1.24 ac.
Proposed Land Cover
Impervious = 0.05
Grass = 0.33 ac.
Wooded = 0.86 ac.

C = [(.9*.05)+(.3*.33)+(.2*.86)]/1.24 = 0.24
Time of Concentration = 20 minutes ∴ I = 3.6 in/hr

Q = C*I*A = .25 * 3.6 * 1.24 = 1.14 cfs

For 15” culvert - HW/D = <0.5

Use 5’ X 5’ modified riprap pad at outlet into swale


CROSS CULVERT
MAIN ACCESS DRIVE
STATION 19+85
CHART 1
EXAMPLE
D=42 inches (3.5 feet)
Q=120 cfs
HW/D* HW feet
(1) 2.5 8.8
(2) 2.1 7.4
(3) 2.2 7.7
*D in feet
DIAMETER OF CULVERT (D) IN INCHES
DISCHARGE (Q) IN CFS
HEADWATER DEPTH IN DIAMETERS (HW/D)
HW/D SCALE
ENTRANCE TYPE
(1) Square edge with headwall
(2) Groove end with headwall
(3) Groove end projecting
To use scale (2) or (3) project horizontally to scale (1), then use straight inclined line through D and Q scales, or reverse as illustrated.
EXAMPLE
HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL
HEADWATER SCALES 2&3 REVISED MAY 1964
BUREAU OF PUBLIC ROADS JAN. 1963

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DRAINAGE CALCULATIONS FOR PERMANENT CONVEYANCE SWALE #1 (PCS1) AND CROSS CULVERT UNDER MAIN ACCESS DRIVE AT STATION 15+25

25-YEAR DESIGN STORM
3-18-11

Rational Method:
Q = CIA
Where:
Q = flow rate (cfs)
C = runoff coefficient
I = rainfall intensity (in/hr)
A = area (ac.)

Total area contributing to swale: 0.30 ac.
Proposed Land Cover
Grass = 0.06 ac.
Impervious = 0.24 ac.

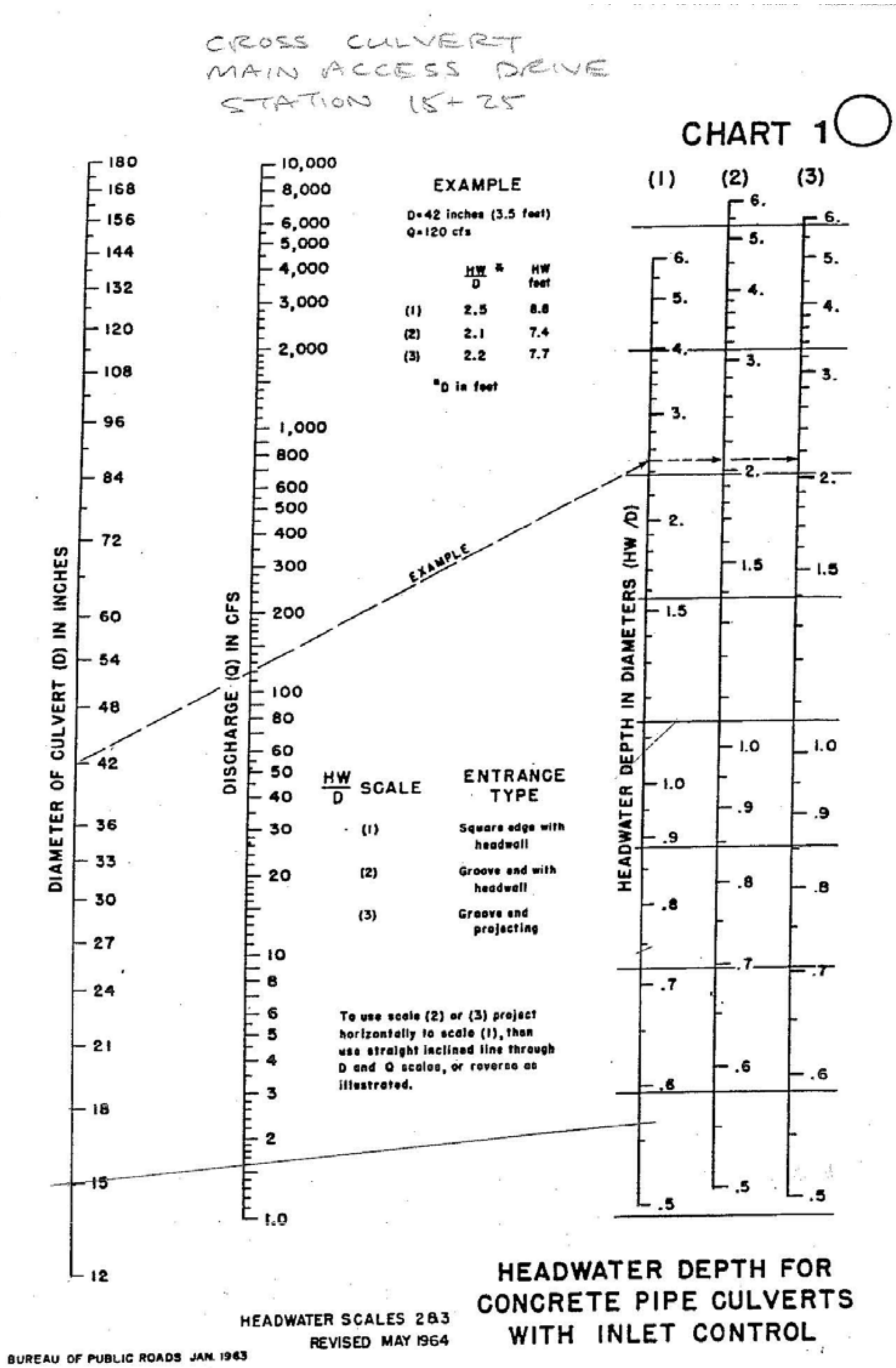
C = [(.3*.06)+(.9*.24)]/.30= 0.78
Time of Concentration = 5 minutes ∴ I = 6.7 in/hr

Q = C*I*A = .78 * 6.7 * 0.30 = 1.57 cfs

Velocity in riprap swale at max 5% slope = 2.73 fps

For 15” culvert - HW/D = 0.55

Use 5’ X 5’ modified riprap pad at outlet into swale



HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

181

Worksheet
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	PCS1
Flow Element	Trapezoidal Cha
Method	Manning's Form
Solve For	Channel Depth

Input Data		
Mannings Coeffic	0.040	
Channel Slope	050000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	2.00	ft
Discharge	1.57	cfs

Results		
Depth	0.23	ft
Flow Area	0.6	ft²
Wetted Perim	3.04	ft
Top Width	2.93	ft
Critical Depth	0.25	ft
Critical Slope	0.041716	ft/ft
Velocity	2.73	ft/s ← MOD RIPRAP SWALE
Velocity Head	0.12	ft
Specific Energ	0.35	ft
Froude Numb	1.09	
Flow Type	Supercritical	

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DRAINAGE CALCULATIONS FOR PERMANENT CONVEYANCE SWALE #2 (PCS2)

25-YEAR DESIGN STORM
3-18-11

Rational Method:
Q = CIA
Where:
Q = flow rate (cfs)
C = runoff coefficient
I = rainfall intensity (in/hr)
A = area (ac.)

Total area contributing to swale: 4.53 ac.
Proposed Land Cover
Impervious = 0.68 ac.
Grass = 0.30 ac.
Wooded = 3.55 ac.

C = [(.9*.68)+(.3*.30)+(.2*3.55)]/4.53 = 0.31
Time of Concentration = 21 minutes ∴ I = 4.1 in/hr

Q = C*I*A = .31 * 4.1 * 4.53 = 5.76 cfs

Velocity in riprap-lined swale at max 15% slope = 5.98 fps

Worksheet
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	PCS2
Flow Element	Trapezoidal Cha
Method	Manning's Formı
Solve For	Channel Depth

Input Data		
Mannings Coeffic	0.040	
Channel Slope	150000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	2.00	ft
Discharge	5.76	cfs

Results		
Depth	0.36	ft
Flow Area	1.0	ft²
Wetted Perim	3.59	ft
Top Width	3.42	ft
Critical Depth	0.53	ft
Critical Slope	0.034409	ft/ft
Velocity	5.98	ft/s ← USE MOD. RIPRAP
Velocity Head	0.56	ft
Specific Energ	0.91	ft
Froude Numb	1.99	
Flow Type	Supercritical	

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DRAINAGE CALCULATIONS FOR PERMANENT CONVEYANCE SWALE #3 (PCS3)

25-YEAR DESIGN STORM
3-18-11

Rational Method:
Q = CIA
Where:
Q = flow rate (cfs)
C = runoff coefficient
I = rainfall intensity (in/hr)
A = area (ac.)

Total area contributing to swale: 2.02 ac.
Proposed Land Cover
Impervious = 0.25 ac.
Grass = 1.21 ac.
Wooded = 0.56 ac.

C = [(.9*.25)+(.3*1.21)+(.2*.56)]/2.02 = 0.70
Time of Concentration = 25 minutes ∴ I = 3.2 in/hr

Q = C*I*A = .70 * 3.2 * 2.02 = 4.52 cfs

Velocity in riprap-lined swale at max 5.5% slope = 3.91 fps

Worksheet
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	PCS3
Flow Element	Trapezoidal Cha
Method	Manning's Form
Solve For	Channel Depth

Input Data		
Mannings Coeffic	0.040	
Channel Slope	055000	ft/ft
Left Side Slope	2.00	H : V
Right Side Slope	2.00	H : V
Bottom Width	2.00	ft
Discharge	4.52	cfs

Results		
Depth	0.41	ft
Flow Area	1.2	ft²
Wetted Perim	3.83	ft
Top Width	3.64	ft
Critical Depth	0.46	ft
Critical Slope	0.035635	ft/ft
Velocity	3.91	ft/s ← USE MOD. RIPRAP SWALE
Velocity Head	0.24	ft
Specific Energ	0.65	ft
Froude Numb	1.22	
Flow Type	Supercritical	

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STORMWATER POND 2 OUTLET PROTECTION

Worksheet
Worksheet for Circular Channel

Project Description	
Worksheet	Pond 2 outlet
Flow Element	Circular Chann
Method	Manning's Forr
Solve For	Channel Depth

Input Data		
Mannings Coeffic	0.013	
Channel Slope	066700	ft/ft
Diameter	15.0	in
Discharge	1.13	cfs

Results		
Depth	0.22	ft
Flow Area	0.1	ft²
Wetted Perime	1.08	ft
Top Width	0.00	ft
Critical Depth	0.42	ft
Percent Full	17.6	%
Critical Slope	0.005230	ft/ft
Velocity	7.75	ft/s ← USE MOD. RIPRAP PAD
Velocity Head	0.93	ft
Specific Energ	1.15	ft
Froude Numbe	3.49	
Maximum Disc	17.95	cfs
Discharge Full	16.68	cfs
Slope Full	0.000306	ft/ft
Flow Type	Supercritical	

STORMWATER POND 2
OUTLET

OUTLET PROTECTION - OUTLET VELOCITY ≤ 14 feet/sec

DISCHARGE (cfs)	**OUTLET PIPE DIAMETER OR SPAN (in)** 12	15	18	24	30	36	42	48	54	60
0-5	***10***	***10***		***USE***						
6	12	11								
7		13	***12***							
8		14	13	***12***		***MINIMUM***				
9			14	13						
10			15	13						
11			16	14				***LENGTH***		
12				14						
14				16	***14***					
16				17	15	***14***			***OUTLINED***	
18				18	16	15				
20					17	15	***14***			
22		***USE***			18	16	15			
24						17	15	***14***		
26						17	16	15		
28						18	16	15		
30						19	17	16		
35						20	18	17	***16***	
40			***PREFORMED***				20	18	17	***16***
45							21	19	18	16
50							22	20	18	17
55								21	19	18
60								22	20	19
65								24	21	20
70					***SCOUR***			25	22	20
75								26	23	21
80									24	22
90									26	24
100									28	25
110										27
125							***HOLE***			29
130										30

Table 8-6.1 - Length - L_a (feet)
Type A Riprap Apron

Notes: 1. Bold face outlined boxes indicate minimum L_a to be used for a given pipe diameter or span.
2. Rounding and interpolating are acceptable.

$W_a = 3(S_o) + 0.4 L_a$
$= 3(1.25) + 0.4(10) = 7.75'$, USE 8'

8'W x 10'L MOD. RIPRAP PAD

TEMPORARY SEDIMENT TRAP SIZING
PER 2002 CT DEP E&S MANUAL
3-18-11

TST 1 (MAIN ACCESS DRIVE - STATION 20+00 – TURBINE 3 LOCATION):

Initial Storage Volume = 134 cubic yards per acre of drainage area
V = 134 cubic yards x 0.85 acres = 114 cubic yards
Half of Storage Volume will be wet and half dry = 114 / 2 = 57 cubic yards = 1,539 cubic feet

Vwet = 0.85 x Awet x Dwet
If trap is 2.0’ deep: 1,539 cubic feet = 0.85 x Awet x 2.0’
Awet required = 905 square feet
Use dimension of 20’ x 46’ for Wet Surface Area = Awet = 920 square feet

Vdry = (Awet + Adry)/2 x Ddry
If dry area is 1.5’ high, Adry = 26’ x 52’ = 1,352 sf
Vdry = (920 + 1,352)/2 x 1.5’ = 1,704 cubic feet
Use dimension of 26’ x 52’ for Dry Surface Area

TST 2 (TURBINE 2 LOCATION):

Initial Storage Volume = 134 cubic yards per acre of drainage area
V = 134 cubic yards x 0.89 acres = 119 cubic yards
Half of Storage Volume will be wet and half dry = 119 / 2 = 59.5 cubic yards = 1,606 cubic feet

Vwet = 0.85 x Awet x Dwet
If trap is 2.0’ deep: 1,606 cubic feet = 0.85 x Awet x 2.0’
Awet required = 945 square feet
Use dimension of 20’ x 50’ for Wet Surface Area = Awet = 1,000 square feet

Vdry = (Awet + Adry)/2 x Ddry
If dry area is 1.5’ high, Adry = 26’ x 56’ = 1,456 sf
Vdry = (1,000 + 1,456)/2 x 1.5’ = 1,842 cubic feet
Use dimension of 26’ x 56’ for Dry Surface Area

TST 3 (MAIN ACCESS DRIVE - STATION 10+50 – STORNWATER POND 1 LOCATION):

Initial Storage Volume = 134 cubic yards per acre of drainage area
V = 134 cubic yards x 3.60 acres = 482 cubic yards
Half of Storage Volume will be wet and half dry = 482/2 = 241 cubic yards = 6,507 cubic feet

Vwet = 0.85 x Awet x Dwet
If trap is 3.0' deep: 6,507 cubic feet = 0.85 x Awet x 3.0'
Awet required = 2,552 square feet
Use dimension of 38' x 98' for Wet Surface Area = Awet = 3,724 square feet

Vdry = (Awet + Adry)/2 x Ddry
If dry area is 3.0' high, Adry = 56' x 116' = 6,496 sf
Vdry = (3,724 + 6,496)/2 x 3.0' = 15,330 cubic feet
Use dimension of 56' x 116' for Dry Surface Area

*Note – TST3 is significantly oversized because area will be rough graded to be used as Stormwater Pond post-construction.

TST 4 (MAIN ACCESS DRIVE - STATION 6+50 – STORNWATER POND 2 LOCATION):

Initial Storage Volume = 134 cubic yards per acre of drainage area
V = 134 cubic yards x 1.62 acres = 217 cubic yards
Half of Storage Volume will be wet and half dry = 217/2 = 108.5 cubic yards = 2,930 cubic feet

Vwet = 0.85 x Awet x Dwet
If trap is 3.0' deep: 2,930 cubic feet = 0.85 x Awet x 3.0'
Awet required = 1,149 square feet
Use dimension of 24' x 86' for Wet Surface Area = Awet = 2,064 square feet

Vdry = (Awet + Adry)/2 x Ddry
If dry area is 2.5' high, Adry = 39' x 101' = 3,939 sf
Vdry = (2,064 + 3,939)/2 x 2.5' = 7,504 cubic feet
Use dimension of 39' x 101' for Dry Surface Area

*Note – TST4 is significantly oversized because area will be rough graded to be used as Stormwater Pond post-construction.

TST 5 (STATION 60+80):

Initial Storage Volume = 134 cubic yards per acre of drainage area
V = 134 cubic yards x 0.25 acres = 34 cubic yards
Half of Storage Volume will be wet and half dry = 34 / 2 = 17 cubic yards = 459 cubic feet

Vwet = 0.85 x Awet x Dwet
If trap is 2.0' deep: 459 cubic feet = 0.85 x Awet x 2.0'
Awet required = 270square feet
Use dimension of 12' x 24' for Wet Surface Area = Awet = 288 square feet

Vdry = (Awet + Adry)/2 x Ddry
If dry area is 1.5' high, Adry = 18' x 30' = 540 sf
Vdry = (540 + 288)/2 x 1.5' = 621 cubic feet
Use dimension of 18' x 30' for Dry Surface Area

TST 6 (STATION 64+30):

Initial Storage Volume = 134 cubic yards per acre of drainage area
V = 134 cubic yards x 0.25 acres = 34 cubic yards
Half of Storage Volume will be wet and half dry = 34 / 2 = 17 cubic yards = 459 cubic feet

Vwet = 0.85 x Awet x Dwet
If trap is 2.0' deep: 459 cubic feet = 0.85 x Awet x 2.0'
Awet required = 270square feet
Use dimension of 12' x 24' for Wet Surface Area = Awet = 288 square feet

Vdry = (Awet + Adry)/2 x Ddry
If dry area is 1.5' high, Adry = 18' x 30' = 540 sf
Vdry = (540 + 288)/2 x 1.5' = 621 cubic feet
Use dimension of 18' x 30' for Dry Surface Area

TST 7 (STATION 77+00):

Initial Storage Volume = 134 cubic yards per acre of drainage area
V = 134 cubic yards x 1.85 acres = 248 cubic yards
Half of Storage Volume will be wet and half dry = 248 / 2 = 124 cubic yards = 3,346 cubic feet

Vwet = 0.85 x Awet x Dwet
If trap is 3.0' deep: 3,346 cubic feet = 0.85 x Awet x 3.0'
Awet required = 1,312 square feet
Use dimension of 20' x 66' for Wet Surface Area = Awet = 1,320 square feet

Vdry = (Awet + Adry)/2 x Ddry
If dry area is 2.25' high, Adry = 26' x 72' = 1,872 sf
Vdry = (1,872 + 1,320)/2 x 2.25' = 3,591 cubic feet
Use dimension of 26' x 72' for Dry Surface Area

TST 8 (STATION 28+40):

Initial Storage Volume = 134 cubic yards per acre of drainage area
V = 134 cubic yards x 1.75 acres = 235 cubic yards
Half of Storage Volume will be wet and half dry = 235 / 2 = 117.5 cubic yards = 3,165 cubic feet

Vwet = 0.85 x Awet x Dwet
If trap is 3.0' deep: 3,165 cubic feet = 0.85 x Awet x 3.0'
Awet required = 1,241 square feet
Use dimension of 20' x 64' for Wet Surface Area = Awet = 1,280 square feet

Vdry = (Awet + Adry)/2 x Ddry
If dry area is 2.25' high, Adry = 26' x 70' = 1,820 sf
Vdry = (1,820 + 1,280)/2 x 2.25' = 3,488 cubic feet
Use dimension of 26' x 70' for Dry Surface Area