Rain Garden and Cistern Maintenance Manual

Washington Middle School

1 North 5th Street

Harrison Town

Hudson County

New Jersey

September 2019

Contents

Rain Garden Description

A rain garden is a landscaped, shallow depression that captures, filters, and infiltrates stormwater runoff. The rain garden removes nonpoint source pollutants from stormwater runoff while recharging groundwater. A rain garden has two main goals. The first goal is to serve as a functional system to capture, filter, and infiltrate stormwater runoff at the source, and the second goal is to be an aesthetically pleasing garden. Rain gardens are an important tool for communities and neighborhoods to create diverse, attractive landscapes while protecting the health of the natural environment. Rain gardens:

- capture stormwater runoff reducing erosion and sedimentation and the amount of water that flows to our streams and waterways during rain storms
- protect water quality by filtering out and breaking down pollutants
- infiltrate runoff and thereby recharge groundwater supplies and provide baseflow to nearby streams and waterways
- provide the opportunity to establish native plant communities to promote biodiversity and habitat for beneficial wildlife
- integrate necessary soil improvements and native plants adapted to periodic wet and dry periods mimicking our New Jersey natural landscape

To a certain extent, a traditional landscaped bed or flower garden can provide functions similar to a rain garden. But, to provide all the benefits of a rain garden including capturing, filtering, and infiltrating stormwater runoff, a shallow basin must be dug and planted slightly below-grade to store water. Ideally, a rain garden is planted with a variety of grasses, wildflowers, and woody plants that are adapted to the soil, precipitation, climate, and other specific site conditions. Using native plants with deeper root systems facilitates infiltration and also sustains the landscape through periods of drought.

(SOURCE: "Rain Garden Manual of New Jersey," Rutgers Cooperative Extension)

Cistern Description

A cistern is a tank designed to capture stormwater from rooftops or other surfaces to store stormwater for reuse. Downspouts are redirected into the tank typically with a first flush diverter that helps keep debris out of the cistern tank by diverting the first flush of stormwater into a separate pipe. The water collected by the cistern can then be reused for any non-potable use such as watering gardens or washing vehicles.

Responsible Owner Information

The following individual/s are responsible for preventative and corrective maintenance of the rain garden installed on the property located at 1081 Green Street, Iselin, NJ.

NAME: Washington Middle School

ADDRESS: 1 North 5th Street, Harrison, NJ 07029

PHONE NUMBER: (973) 483-2285

NOTE: Responsibility for maintaining the rain garden shall remain with the owner of the property

Preventative and Corrective Maintenance

Rain Garden

Proper and timely maintenance is important for continuous, effective function of the rain garden. Access to the rain garden from surrounding lawn areas should be maintained at all times. The following maintenance actions are required to keep the rain garden functioning properly.

WATERING

Water is essential for the survival of a newly installed rain garden. The garden should be watered regularly during the first three months and as needed throughout the future in times of drought. Plants should be watered every day for the first week they are in the ground and then once a week after that, unless there is substantial rainfall. In hot weather or times of drought, the rain garden will need water one to two times a week to prevent the loss of plants, even if the garden is already established.

WEEDING

Remove unwanted weeds from the garden by hand. Pull them from the base of the weed to remove the roots. As the garden becomes established, the rain garden plants will spread and out-compete unwanted weeds.

MULCHING

Mulch is used to prevent weeds and retain moisture in the rain garden. During the first year the garden is growing, maintain a 3-inch layer of mulch between plants. As the rain garden plants spread and become denser, you may find mulching the garden more difficult. Mulching beyond the first year is optional. Please be careful not to excessively mulch the garden, and keep mulch away from any drain inlets and outlets.

INSPECTING AND CLEANING INLETS/OUTLETS

Inspect the rain garden's inlets monthly, and be sure to remove any leaves, trash, or debris that may prevent water from passing through. Observe the inlet during rainstorms to make sure stormwater is flowing into the rain garden. After rainstorms, please check the garden to be sure drainage outlet paths are clear and that water is not ponding for more than 48 hours. All structural components should be inspected at least once each year.

NO MOWING

DO NOT mow or use a line-trimmer inside of the rain garden. This damages the plants and can destroy the rain garden.

VEGETATION AND PLANTINGS

During rain garden establishment, vegetation should be inspected bi-weekly. Vegetated areas must be inspected at least once each year for erosion, scour and unwanted growth. Unwanted growth should be removed from the rain garden. Remove and replace any dead plants in the garden as needed.

PRUNING

Prune overgrown material in the garden annually when the plants are dormant. Remove dead plant material and deadhead flowers. This will encourage dense, new vegetative growth.

DRAINAGE

The rain garden is to be inspected twice each year to determine if permeability of the bed has decreased. The rain garden is designed to infiltrate all stormwater runoff within 48 hours. No standing water should be visible 48-72 hours after a storm event. If standing water remains in the rain garden after 72 hours corrective actions will be needed.

Cistern

The cistern should be winterized once there is significant chance for below freezing temperatures (early-mid November). If the cistern is not winterized, the expansion of the ice as the water freezes could damage the cistern. Winterization of the cistern involves fully draining the cistern tank and leaving the valve open to keep the cistern drained in future rain events. There also may be a first flush diverter that is designed to capture the first flush of water to prevent it going into the cistern tank to keep the tank clear of debris. This diverter should be cleaned regularly as needed and should also be left opened up when the cistern is winterized. Once below freezing temperatures end, the cistern may be dewinterized and return to active use.

To maximize the stormwater benefits of the cistern, the cistern should be emptied prior to any major storm event. This allows the cistern to maximize capture of stormwater during the storm and reduce potential flooding and nonpoint source pollution.

Equipment, tools, and supplies

No specialized equipment is needed for routine maintenance. A garden shovel, rake, pruning shears, and water hose are all that is required to keep the rain garden working and healthy.

Maintenance Schedule

Each month and following storm events, the rain garden should be inspected. A schedule with specific inspection notes is attached. It is recommended that photographs be taken during inspections to document conditions.

Estimated Costs

Regular maintenance activities can be completed by the property owner at no additional cost. Below are estimated costs for plants and materials that may be needed as the rain garden matures and develops:

Replacement perennial plantings (1 gallon pots)	$7.00 - $10.00/plant
Replacement shrub plantings (3 gallon pots)	$25.00 - $40.00/plant
Triple-shredded hardwood mulch	$15.00 - $25.00/cubic yard

Maintenance and Inspection Checklist

In addition to the schedule, a maintenance and inspection checklist is attached to assist in documenting the condition, function, and establishment of the rain garden. In addition to completing the form, it is recommended that photos be taken and kept on file.

Construction and Planting Plan

For reference purposes a copy of the construction plans and final planting plan are attached as part of the maintenance plan. These documents provide guidance to all components of the rain garden and the plantings that were installed when the system was constructed.

ATTACHMENTS

Maintenance and Inspection Checklist

Construction and Planting Plans

Schedule for Maintenance and Inspection

	First Quarter (Jan-Mar)	Second Quarter (Apr-June)	Third Quarter (July-Sept)	Fourth Quarter (Oct-Dec)
Year 1	Conduct monthly inspection of plantings. Inspect & clean outlet structures after each significant storm event (> 1"). Conduct annual pruning and removal of dead vegetation. Add mulch as desired. Inspect and clear all gutters, downspouts, and piping.	Conduct monthly inspection of plantings. Inspect & clean outlet structures after each significant storm event (> 1"). Repair erosion and replace plantings as needed.	Conduct monthly inspection of plantings. Inspect & clean outlet structures after each significant storm event (> 1"). Remove invasive species/weeds if needed. Inspect and clear all gutters, downspouts, and piping.	Conduct monthly inspection of plantings. Inspect & clean outlet structures after each significant storm event (> 1"). Repair erosion if necessary.
Year 2	Conduct a single quarterly inspection of plantings. Inspect and clean inlet and outlet structures. Conduct annual pruning and removal of dead vegetation. Add mulch as desired. Inspect and clear all gutters, downspouts, and piping.	Conduct a single quarterly inspection of plantings. Inspect and clean inlet and outlet structures. Repair erosion and replace plantings as needed.	Conduct a single quarterly inspection of plantings. Inspect and clean inlet and outlet structures. Remove invasive species/weeds if needed. Inspect and clear all gutters, downspouts, and piping.	Conduct a single quarterly inspection of plantings. Inspect and clean inlet and outlet structures. Repair erosion if necessary.
Year 3	Conduct a single quarterly inspection of plantings. Inspect and clean inlet and outlet structures. Conduct annual pruning and removal of dead vegetation. Add mulch as desired. Inspect and clear all gutters, downspouts, and piping.	Conduct a single quarterly inspection of plantings. Inspect and clean inlet and outlet structures. Repair erosion and replace plantings as needed.	Conduct a single quarterly inspection of plantings. Inspect and clean inlet and outlet structures. Remove invasive species/weeds if needed. Inspect and clear all gutters, downspouts, and piping.	Inspect and clean inlet and outlet structures. Repair erosion if necessary.
Year 4	Inspect and clean inlet and outlet structures. Conduct annual pruning and removal of dead vegetation. Add mulch as desired. Inspect and clear all gutters, downspouts, and piping.	Repair erosion and replace plantings if necessary.	Inspect and clean inlet and outlet structures. Remove invasive species/weeds if needed. Inspect and clear all gutters, downspouts, and piping.	Inspect and clean inlet and outlet structures. Repair erosion if necessary.
Year 5 & Beyond	Inspect and clean inlet and outlet structures. Conduct annual pruning and removal of dead vegetation. Add mulch as desired. Inspect and clear all gutters, downspouts, and piping.		Inspect and clean inlet and outlet structures. Remove invasive species/weeds if needed. Inspect and clear all gutters, downspouts, and piping.	

RUTGERS
New Jersey Agricultural Experiment Station

Water Resources Program

Green Infrastructure Maintenance Report Form

GENERAL INFORMATION	
Name(s) of person inspecting the green infrastructure system:	Date:
Location (address and cross streets/site location name):	Property Owner / Tax Parcel Block & Lot:
Property owner contact information:	Type of green infrastructure system:

EXISTING CONDITIONS
Description of the current site conditions and specific condition of the system:

GENERAL OBSERVATIONS	YES	NO	COMMENTS
1) Any reports of the system not functioning?			
2) Are there any unauthorized or malfunctioning structures located in the system?			
3) Is the system overgrown with vegetation or contain excessive debris/trash?			
4) Is there standing water or evidence of standing water?			
5) Signs of breakage, damage, corrosion or rusting of any structures or components?			
6) Debris or sediment accumulation clogging the system?			
7) Signs of erosion, disturbance, or vandalism?			
8) Is vegetation healthy and thriving?			
9) Is there evidence that anyone has maintained the system in the recent past?			

ADDITIONAL OBSERVATIONS

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New Jersey Agricultural Experiment Station

Water Resources Program

Green Infrastructure Maintenance Report Form

RECOMMENDED MAINTENANCE NEEDS	
Circle all that apply: 1) Remove litter/debris 2) Remove sediment 3) Manage vegetation (weed, prune, water, edge) 4) Clean inlet and/or outlet 5) Replace: Mulch - Stone - Plants 6) Winterize system - Spring set up (cisterns) 7) Repairs needed: (indicate specific requirements)	*Additional notes for maintenance:*
MAINTENANCE SUMMARY	
1) Were all recommended maintenance activities noted above completed? Indicate how many staff and how much time was spent to complete all maintenance activities.	*Description:*
2) Were new materials placed or installed? (Plants, mulch, or stone). Indicate how much material and/or specific plantings used. Attach invoice or purchase order.	*Description:*
3) Are there any indications of the system not functioning properly or any components that need to be repaired or replaced?	*Description:*
4) Is there evidence of significant damage due to vandalism that should be noted and addressed with the owner and/or the authorities?	*Description:*

SUMMARY AND NOTES (briefly describe work completed, effort required, and any contact with property owner, questions, or site specific recommendations for future maintenance):

Be sure to photograph the system before and after maintenance activities!

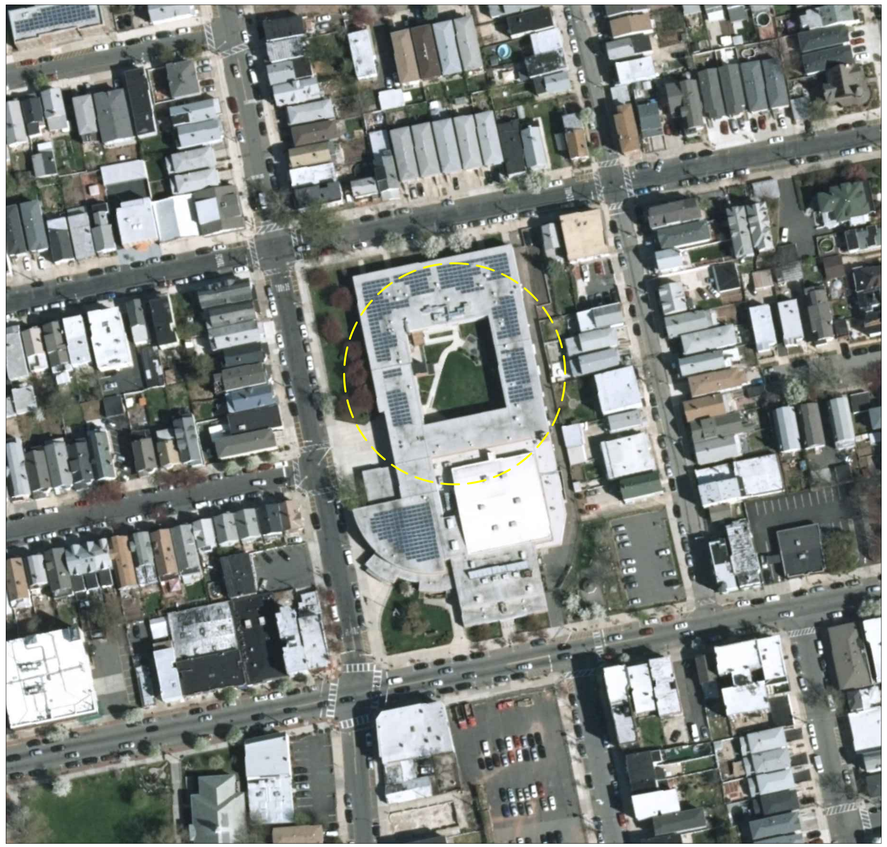
WASHINGTON MIDDLE SCHOOL

GREEN INFRASTRUCTURE IMPLEMENTATION PROJECT
1 N 5TH ST, HARRISON, HUDSON COUNTY, NEW JERSEY
BLOCK 33, LOT 1

PROJECT DESCRIPTION:

A 700 SF RAIN GARDEN WAS INSTALLED INTO THE SCHOOL COURTYARD AROUND AN EXISTING CATCH BASIN. A RAINWATER CISTERN WAS CONNECTED TO AN EXISTING DOWNSPOUT TO COLLECT WATER FOR USE IN THE SCHOOL GARDEN. ADDITIONAL SPACE MAY BE UTILIZED FOR A GREENHOUSE AND AN OUTDOOR CLASSROOM AREA.

LOCATION MAP:



LEGEND:

- EXISTING DRAINAGE AREA
- EDGE OF PAVEMENT
- EXISTING CENTERLINE
- EXISTING FENCE
- EXISTING TREELINE
- EXISTING TREE
- EXISTING BUILDING
- EXISTING UTILITY POLE
- EXISTING CATCH BASIN
- EXISTING CONTOURS (100)
- EXISTING SPOT ELEVATIONS (100.00 CODE)

SPOT ELEVATION CODES:

CB- CATCH BASIN
F - FENCE
GS - GROUND SHOT
SW - SIDEWALK
PLTR - PLANTER

- PROPERTY LINES
- LIMIT OF WORK
- AREA TO BE DEPAVED
- PROPOSED GREEN INFRASTRUCTURE
- PROPOSED TREE
- PROPOSED CONTOURS (100)

LIST OF DRAWINGS:

SHEET NAME	TITLE
COVER	COVER SHEET
P-1	EXISTING CONDITIONS AND DEMOLITION PLAN
P-2	PROPOSED SITE PLAN
P-3	PLANTING PLAN
DT-1	RAIN GARDEN DETAILS
DT-2	CISTERN DETAILS

GENERAL NOTES:

1. SURVEY CONDUCTED BY RUTGERS COOPERATIVE EXTENSION WATER RESOURCES PROGRAM.
2. ANY OVERHEAD AND UNDERGROUND UTILITIES SHOWN ARE FROM FIELD OBSERVATIONS AND ARE NOT A COMPLETE REPRESENTATION. A UTILITY MARKOUT NEEDS TO BE CONDUCTED PRIOR TO MOBILIZATION. NJ ONE CALL: 811 OR 800-272-1000

CHRISTOPHER C. OBROPTA, Ph.D., P.E.
PROFESSIONAL ENGINEER - NJ LICENSE # 37532

DATE 09/23/19

DRAWN	CHECKED	APPROVED	DATE
MAL	MH	CCO	09/23/19

REVISIONS

No.	DATE	DESCRIPTION

WASHINGTON MIDDLE SCHOOL
GREEN INFRASTRUCTURE IMPLEMENTATION PROJECT
1 NORTH 5TH STREET, HARRISON
HUDSON COUNTY, NJ
COVER SHEET

RUTGERS New Jersey Agricultural Experiment Station

SHEET NAME
COVER

PLAN NOTES:

1. CONTRACTOR SHALL SCHEDULE MEETING WITH ENGINEER AND PROPERTY OWNER PRIOR TO MOBILIZATION.
2. CONTRACTOR SHALL VERIFY ALL INFORMATION INCLUDING ELEVATIONS AND UTILITIES PRIOR TO MOBILIZATION.
3. CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING REQUIRED APPROVALS FROM AUTHORITIES WITH JURISDICTION OVER PROPOSED WORK.
4. CONTRACTOR SHALL COORDINATE AND CONFIRM PROJECT SCHEDULE AND WORKING HOURS WITH ENGINEER AND PROPERTY OWNER AND PROCEED IN ACCORDANCE WITH LOCAL REQUIREMENTS.
5. CONTRACTOR SHALL COORDINATE UTILITY MARK OUT PRIOR TO MOBILIZATION. NJ ONE CALL: 811 OR 800-272-1000
6. CONTRACTOR SHALL CONDUCT PERMEABILITY TESTING TO VERIFY ADEQUATE INFILTRATION RATES IF NOT PREVIOUSLY PERFORMED.
7. CONTRACTOR SHALL DEMO AND REMOVE ALL EXISTING ASPHALT PAVING AS SHOWN ON PLAN.
8. CONTRACTOR SHALL HAUL REMOVED DEBRIS OFF SITE UNLESS OTHERWISE NOTED BY PROPERTY OWNER.

WASHINGTON MIDDLE SCHOOL

CLEVELAND AVENUE

NORTH 5TH STREET

PROPERTY LINE

LIMIT OF WORK (13,000 SF)

SCHOOL GARDEN

RAILINGS

MAINTENANCE STORAGE AREA

FENCE

IMPERVIOUS DRAINAGE AREA 2 (270 SF)

IMPERVIOUS DRAINAGE AREA 1 (2,600 SF)

PERVIOUS DRAINAGE AREA (5,825 SF)

SHORT WALL

EXISTING SEATING AREA

EXISTING CATCH BASIN

MEMORIAL BELL

RAISED PLANTER BED

RAISED PLANTER BED

CONCRETE SIDEWALK

EXISTING CATCH BASIN

SMALL LEDGE

RAISED PLANTER BED

N

0 10' 20'

SCALE 1" = 10'-0"

EXISTING PLAN

CHRISTOPHER C. OBROPTA, Ph.D., P.E.
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WASHINGTON MIDDLE SCHOOL
GREEN INFRASTRUCTURE IMPLEMENTATION PROJECT
1 NORTH 5TH STREET, HARRISON
HUDSON COUNTY, NJ

EXISTING CONDITIONS AND DEMOLITION PLAN

RUTGERS New Jersey Agricultural Experiment Station

SHEET NAME
P-1

PLAN NOTES:

1. CONTRACTOR SHALL SCHEDULE MEETING WITH ENGINEER AND PROPERTY OWNER PRIOR TO MOBILIZATION AND CONSTRUCTION.
2. CONTRACTOR SHALL VERIFY ALL INFORMATION INCLUDING ELEVATIONS AND UTILITIES PRIOR TO CONSTRUCTION.
3. CONTRACTOR SHALL VERIFY ALL PROPOSED MATERIALS WITH PROPERTY OWNER AND ENGINEER PRIOR TO CONSTRUCTION.
4. CONTRACTOR SHALL STAKE OUT LOCATIONS OF PROPOSED RAIN GARDENS, STONE CHANNELS, AND TRENCH DRAIN AND OBTAIN APPROVAL FROM ENGINEER PRIOR TO INSTALLATION.
5. CONTRACTOR SHALL INSTALL CONVENTIONAL ASPHALT AS SHOWN ON PLAN. THE ASPHALT AND CONCRETE MIXING PLANT, HAULING AND PLACING EQUIPMENT, AND INSTALLATION SHALL BE IN CONFORMANCE WITH NAPA IS 131 AND THE NJDOT STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, 2007 OR LATEST VERSION.
6. CONTRACTOR SHALL GRADE SITE AS SHOWN ON PLAN. CUT SOIL SHALL BE REUSED ON SITE FOR FILL LOCATIONS.
7. CONTRACTOR SHALL HAUL EXCESS SOIL OFF SITE UNLESS OTHERWISE NOTED BY PROPERTY OWNER.
8. ALL FINISHED ELEVATIONS SHALL MATCH ADJOINING PAVEMENT ENSURING SMOOTH TRANSITIONS AND NO TRIPPING HAZARDS
9. CONTRACTOR SHALL BE RESPONSIBLE FOR RESTORING ALL AREAS DISTURBED DURING CONSTRUCTION TO ORIGINAL CONDITIONS.

NOTE 1: STONE SHALL BE COMPRISED OF 3"-5" DIAMETER CLEAN, WASHED RIVER STONE. ALL AREAS OF EROSION PROTECTION STONE SHALL BE UNDERLAIN WITH GEOTEXTILE FABRIC (GEOTEX 801 BY PROPEX OR APPROVED EQUIVALENT).
NOTE 2: UNDERDRAIN IS TO BE IMPLEMENTED AS FEASIBLE IF TESTED INFILTRATION IS BELOW 1 IN/HR AT THE SITE. **OR** UNDERDRAIN MAY BE OMITTED BY ENGINEER'S DISCRETION IF THE TESTED INFILTRATION RATE EXCEEDS 1 IN/HR PER NJDEP BMP MANUAL.

PROPOSED CISTERN
(205 GALLON BUSHMANN OR EQUIVALENT)
~3' DIAMETER, ~5' HEIGHT

1 LF PVC PIPE TIED TO EXISTING DOWNSPOUT

EXTEND OUTSIDE EDGE OF GARDEN AS NEEDED TO MAINTAIN 3:1 SLOPE

RAIN GARDEN
(700 SF, 550 SF BASE)
MIN BERM ELEV. = 100.25'
PONDING ELEV. = 100.00'
BASE ELEV. = 99.50'

ROCK-LINED OVERFLOW
CREST ELEV = 100.00'

POTENTIAL GREENHOUSE

POTENTIAL OUTDOOR CLASSROOM AREA

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WASHINGTON MIDDLE SCHOOL
GREEN INFRASTRUCTURE IMPLEMENTATION PROJECT
1 NORTH 5TH STREET, HARRISON
HUDSON COUNTY, NJ

PROPOSED SITE PLAN

RUTGERS New Jersey Agricultural Experiment Station

N

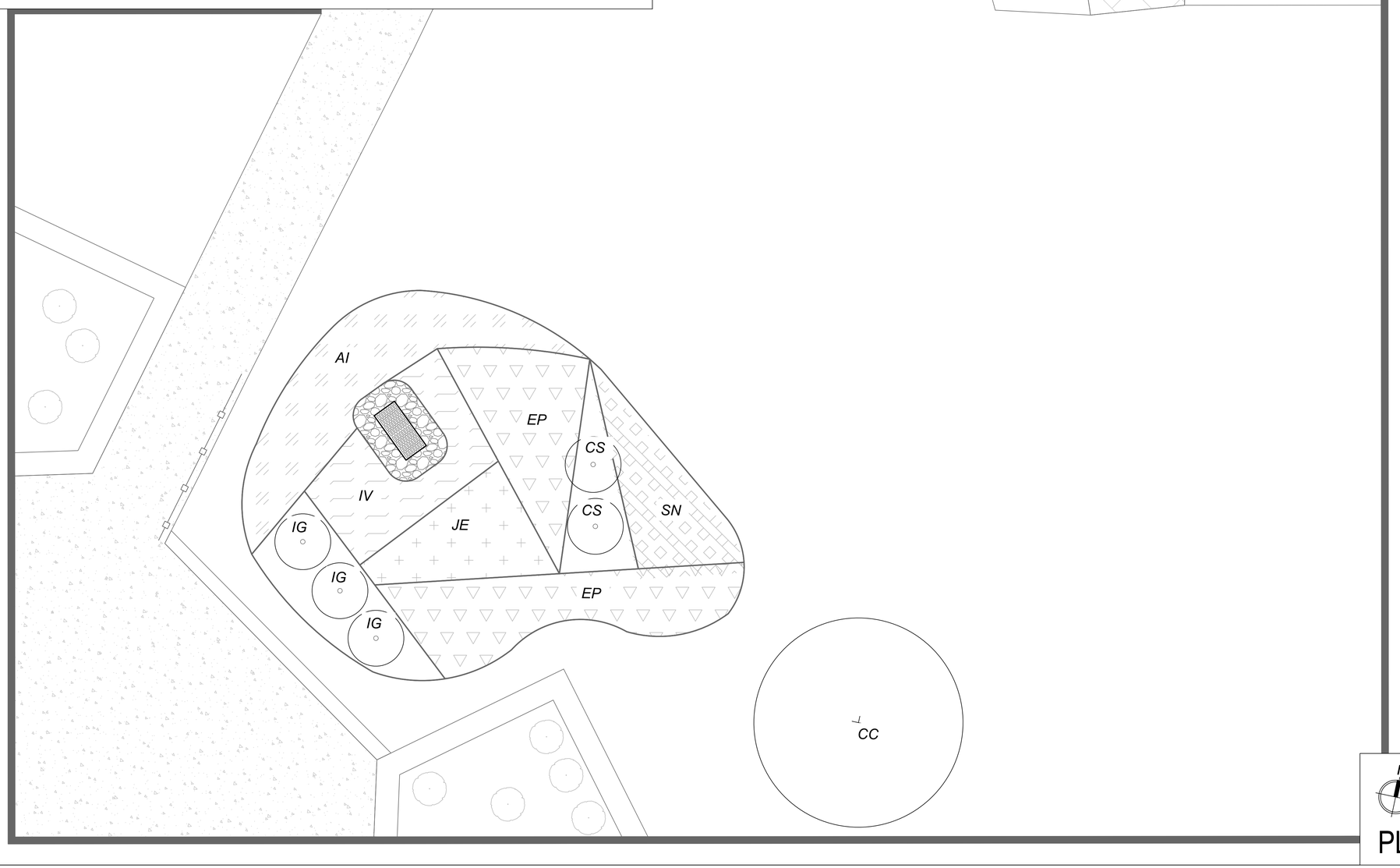
0 5' 10'
SCALE 1" = 5'-0"

SITE PLAN

SHEET NAME
P-2

PLANTING SCHEDULE

PLANT SPECIES				QUANTITY	SIZE
TYPE	KEY	BOTANICAL NAME	COMMON NAME		
RAIN GARDEN					
PERENNIALS	**AI**	*Asclepias incarta*	BUTTERFLY WEED	45	1 QUART
	EP	*Echinacea purpurea*	PURPLE CONEFLOWER	50	PLUG
	IV	*Iris veriscolor*	BLUE FLAG IRIS	30	1 QUART
	JE	*Juncus effusus*	SOFT RUSH	50	PLUG
	SN	*Sorghastrum nutans*	INDIAN GRASS	50	PLUG
SHRUBS	**CS**	*Cornus sericea*	RED TWIG DOGWOOD	2	#2 CONT.
	IG	*Ilex glabra*	INKBERRY HOLLY	3	#2 CONT.
TREES	**CC**	*Cercis canadensis*	EASTERN REDBUD	1	2-3" CAL.
	MV	*Magnolia virginiana*	SWEETBAY MAGNOLIA	1	2-3" CAL.



N

0 4' 8'

SCALE 1" = 4'-0"

PLANTING PLAN

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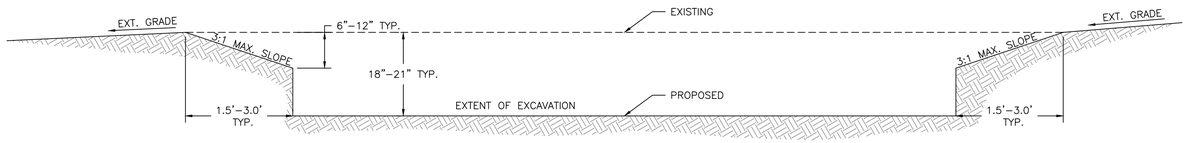
PLANTING PLAN

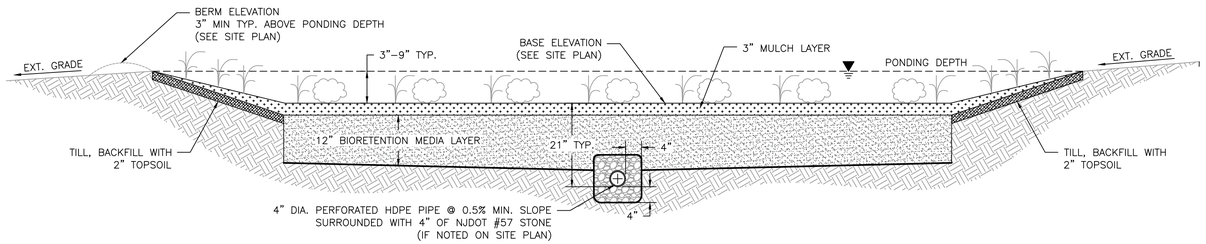
RUTGERS New Jersey Agricultural Experiment Station

SHEET NAME

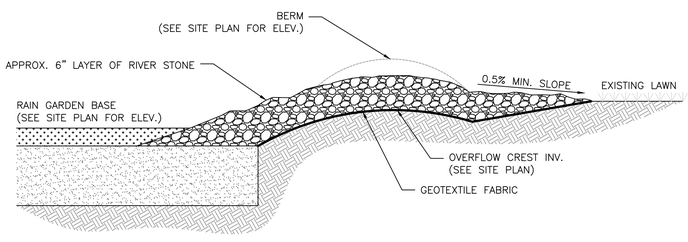
P-3



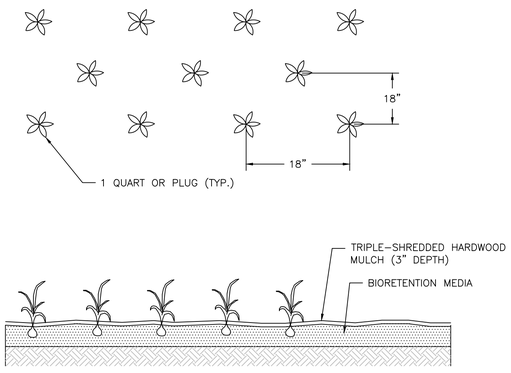
1 DT-1 RAIN GARDEN EXCAVATION SECTION
N.T.S.



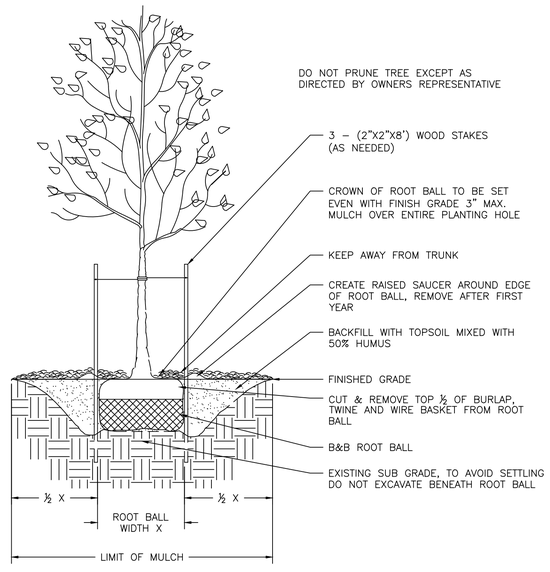
2 DT-1 RAIN GARDEN CROSS-SECTION
N.T.S.



3 DT-1 ROCK-LINED OVERFLOW DETAIL
N.T.S.



4 DT-1 HERBACEOUS PLUG PLANTING DETAIL
N.T.S.



NOTES:
1. DO NOT DAMAGE MAIN ROOTS OR ROOT BALL WHEN INSTALLING TREE STAKE.
2. WATER THOROUGHLY AFTER INSTALLATION.
3. REMOVE SAUCER AND STAKES TWO YEARS OR LESS AFTER INSTALLATION.
4. CONTRACTOR IS NOT TO USE TREE WRAP.

5 DT-1 TREE PLANTING DETAIL
N.T.S.

CONSTRUCTION NOTES:

1. THE CONTRACTOR SHALL VERIFY ALL INFORMATION PRIOR TO EXCAVATION INCLUDING ELEVATIONS AND LOCATIONS OF EXISTING UTILITIES.
2. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IMMEDIATELY IF ANY FIELD CONDITIONS DIFFER MATERIALLY FROM THOSE REPRESENTED ON THESE DRAWINGS AND THE SPECIFICATIONS OR IF, IN THE CONTRACTOR'S OPINION, SAID CONDITIONS CONFLICT WITH THE DESIGNS SHOWN HEREON.
3. THE ENGINEER SHALL INSPECT ALL PLANTING BED AREAS BEFORE MULCHING TO ENSURE THAT ADEQUATE DRAINAGE EXISTS. IF ANY AREAS TO BE MULCHED SHOW EVIDENCE OF POOR DRAINAGE, THE CONTRACTOR SHALL TAKE CORRECTIVE ACTION.
4. THE CONTRACTOR SHALL AVOID DISTURBING ALL EXISTING TREES. ANY DISTURBANCE TO TREES OR TREE ROOTS MUST BE COORDINATED WITH THE PROPERTY OWNER.
5. DIMENSIONS AND SHAPE WILL VARY, REFER TO SITE PLAN.
6. RIVER STONE PROTECTION DIMENSIONS ARE TYPICAL AND MAY VARY PER SITE. CONSULT THE ENGINEER AND SITE PLAN FOR DIMENSIONS ON A PER SITE BASIS.
7. RIVER STONE PROTECTION SHALL SLOPE TO RAIN GARDEN BASE.
8. REFER TO SITE PLAN TO DETERMINE OUTLET TYPE (ROCK–LINED OVERFLOW OR DRAINTECH RISER).
9. REFER TO SITE PLAN FOR ALL ELEVATIONS AND INVERTS.
10. THE CONTRACTOR SHALL EXCAVATE 15" LOWER THAN THE BASE ELEVATION SHOWN ON THE SITE PLANS. THE SLOPES OF THE RAIN GARDEN SHALL BE AT A 3:1 MAXIMUM.
11. THE SUBGRADE OF THE RAIN GARDEN SHALL BE LEVEL TO ENSURE PROPER DRAINAGE. CONTRACTOR SHALL OBTAIN ENGINEER APPROVAL PRIOR TO BACKFILLING WITH 12" OF BIORETENTION MEDIA.
12. THE CONTRACTOR SHALL INSTALL OVERFLOW IF SPECIFIED IN SITE PLANS PRIOR TO BACKFILLING WITH BIORETENTION MEDIA.
13. THE BIORETENTION LAYER SHALL BE LEVEL TO ENSURE PROPER DRAINAGE. CONTRACTOR SHALL OBTAIN ENGINEER APPROVAL PRIOR TO SPREADING MULCH AND PLANTING.
14. INLET AND OUTLET PROTECTION SHALL BE UNDERLAIN WITH GEOTEXTILE FABRIC.
15. INLETS AND OUTLETS SHALL NOT INHIBIT THE FLOW OF WATER FROM THE STREET. THE RIVER STONE SHALL BE PLACED BELOW THE BOTTOM OF THE PIPE.
16. THE CONTRACTOR SHALL TILL THE BERM SECTION AND BACKFILL WITH TOPSOIL.
17. ALL DISTURBED AREAS EXCLUSIVE OF RAIN GARDEN AND SLOPED BERM SHALL BE RESTORED TO ORIGINAL CONDITIONS BY CONTRACTOR.
18. THE CONTRACTOR SHALL HAVE A PRE–CONSTRUCTION MEETING WITH THE PROJECT ENGINEER PRIOR TO ANY WORK ON SITE.
19. CONTRACTOR SHALL PERFORM REQUIRED TESTING TO DETERMINE SOIL PERMEABILITY AND SEASONAL HIGH WATER TABLE ELEVATION AT THE SITE TO VERIFY INFILTRATION CAPABILITIES. TESTING SHALL BE DONE PRIOR TO EXCAVATION AND INSTALLATION OF THE PROPOSED PROJECTS. PROJECT ENGINEER SHALL BE PRESENT DURING TESTING AND SHALL BE INFORMED OF THE RESULTS.

SPECIFICATIONS:

1. MAX COVER OVER TOP OF PIPES IS 4 FT. CONTACT ADS IF OTHERWISE GREATER.
2. THE APPROVAL OF MATERIALS AND MIXING OF SAND, COMPOST, AND SOIL SHALL BE DONE UNDER THE SUPERVISION OF THE PROJECT ENGINEER/LANDSCAPE ARCHITECT. BIORETENTION MEDIA SHALL CONSIST OF 70% SAND AND 30% COMPOST MIXTURE.
3. SAND SHALL AT THE MINIMUM CONFORM TO THE SIEVE ANALYSIS FOR CONCRETE AGGREGATE SAND (ASTM C–33). USGA TEE/GREEN SIEVE GRADATION MIX IS PREFERABLE WHERE AVAILABLE.
4. UNDERLYING SOILS SHALL BE TILLED/SCARIFIED PRIOR TO SPREADING/MIXING OF BIORETENTION MEDIA.
5. ALL BIORETENTION MEDIA SHALL BE PLACED FROM THE SIDES OF THE FACILITIES, AND IN NO EVENT SHALL ANY TRACKED OR WHEELED EQUIPMENT BE PERMITTED TO CROSS THE RAIN GARDEN.
6. RAIN GARDEN SHALL BE CONSTRUCTED TO DIMENSIONS INDICATED ON THE SITE PLAN.
7. 3–5 INCH DELAWARE RIVER STONE SHALL BE USED FOR STONE CHANNEL AND INLET/OUTLET PROTECTION.
8. NON–DYED, TRIPLE–SHREDDED HARDWOOD MULCH SHALL BE USED.
9. PLANTING OF RAIN GARDEN AND SLOPED BERM SHALL BE COMPLETED AS INDICATED ON THE SITE PLAN.
10. THE CONTRACTOR SHALL PERFORM ALL WORK IN CONFORMANCE WITH THE NJDOT STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, 2007 OR LATEST VERSION.

OPEN LAWN AND TURF AREAS

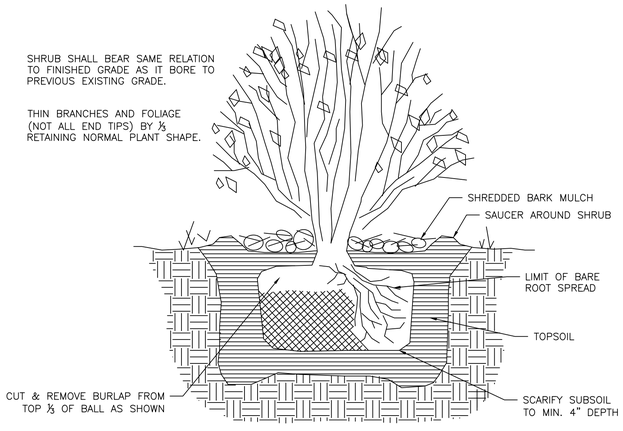
1. SEED ALL REMAINING PARK AREAS WITH TURF TYPE FALL FESCUE AND PERENNIAL RYEGRASS BLEND (LOFTS – SUMMER STRESS MIX II OR APPROVED EQUIVALENT). INSTALL AT A RATE OF 350 LBS. PER ACRE PER MANUFACTURERS SPECIFICATIONS.

TOPSOILING, SEEDING AND MULCHING NOTES

1. ANY UNDISTURBED AREA ON WHICH ACTIVITY HAS CEASED AND WHICH WILL REMAIN EXPOSED FOR MORE THAN 10 DAYS MUST BE SEEDED AND MULCHED IMMEDIATELY. DURING NON–GERMINATING PERIODS, MULCH MUST BE APPLIED AT THE REQUIRED RATES. DISTURBED AREAS WHICH ARE NOT AT FINISHED GRADE AND WHICH WILL BE REDISTURBED WITHIN 1 YEAR SHALL BE SEEDED AND MULCHED WITH A QUICK GROWING TEMPORARY SEEDING MIXTURE AND MULCH. DISTURBED AREAS WHICH ARE EITHER AT FINISHED GRADE OR WILL NOT BE REDISTURBED WITHIN 1 YEAR MUST BE SEEDED AND MULCHED WITH A PERMANENT SEED MIXTURE AND MULCH.
2. DIVERSIONS, CHANNELS, SEDIMENTATION BASINS, SEDIMENT TRAPS, AND STOCKPILES MUST BE SEEDED AND MULCHED IMMEDIATELY.
3. GRADED AREAS SHALL BE TEMPORARILY SEEDED AND MULCHED IMMEDIATELY FOLLOWING EARTH MOVING PROCEDURES. TEMPORARY SEED SHALL BE ANNUAL RYE GRASS APPLIED AT A RATE OF 3 LBS. PER 1000 SQ. FT.
4. AFTER SEEDING, HAY OR STRAW MULCH MUST BE APPLIED AT A RATE OF AT LEAST 3.0 TONS PER ACRE. MULCH SHALL BE ANCHORED BY EITHER CRIMPING WITH A COULTER IMPLEMENT, OR BY STAPLING BIODEGRADABLE NETTING TO THE SURFACE.
5. SITE PREPARATION TO UPLAND AREAS: APPLY 1 TON OF AGRICULTURAL–GRADE LIMESTONE PER ACRE PLUS 10–20–10 FERTILIZER AT THE RATE OF 500 LB. PER ACRE. WORK IN WHERE POSSIBLE. SEEDING OF DISTURBED UPLAND AREAS (BEYOND LIMITS OF RIPARIAN ENHANCEMENT AREA) TO BE DONE USING MIX OF FINE FESCUE AT 35 LBS/ACRE (PURE LIVE SEED) PLUS PERENNIAL RYEGRASS AT 15 LBS/ACRE (PURE LIVE SEED).
6. TOPSOIL SHALL BE A CLEAN FRIABLE LOAM WITH SUFFICIENT ORGANIC CONTENT (2.75%) TO PROMOTE PLANT VIGOR. AMENDMENTS SHALL BE ADDED AS NEEDED TO IMPROVE DEFICIENT SOILS. TOPSOIL SHALL BE RETURNED AT A LOOSE DEPTH OF FIVE INCHES TO ALLOW FOR SETTLEMENT.
7. ESTABLISH PERMANENT SEEDING AS SOON AS POSSIBLE AFTER FINAL GRADING IS COMPLETE. UNLESS OTHERWISE INDICATED, PERMANENT SEEDING SHALL BE SEED MIXTURE SPECIFIED IN TABLE.
8. SEE TABLES FOR SEED SPECIES MIXTURE AND APPLICATION RATES
9. SEED MIXES ARE AVAILABLE AT ERNST CONSERVATION SEEDS IN MEADVILLE, PA. WEBSITE: WWW.ERNSTSEED.COM OR PHONE: 1–800–873–3321.
10. NATIVE SHRUBS AND HERBACEOUS PLUGS ARE AVAILABLE AT PINELANDS NURSERY AND SUPPLY, COLUMBUS NJ.
    WEBSITE: WWW.PINELANDSNURSERY.COM OR
    PHONE 1–800–667–2729

GENERAL LANDSCAPING NOTES

1. ALL PLANT MATERIALS SHALL CONFIRM TO THE AMERICAN ASSOCIATION OF NURSERYMEN'S AMERICAN STANDARD FOR NURSERY STOCK (LATEST EDITION)
2. INSPECTION OF PLANTING BEDS – THE LANDSCAPE ARCHITECT SHALL INSPECT ALL PLANTING AREAS BEFORE ANY TOPSOILING OR PLANTING IS BEGUN TO INSURE THAT ADEQUATE DRAINAGE EXISTS. IF ANY AREAS TO BE LANDSCAPED SHOW EVIDENCE OF POOR DRAINAGE, THE LANDSCAPE ARCHITECT SHALL NOTIFY THE OWNER IMMEDIATELY FOR CORRECTIVE ACTION
3. THE LANDSCAPE ARCHITECT SHALL APPROVE ALL PLANT MATERIAL AND STAKED PLANT LOCATIONS PRIOR TO INSTALLATION. ALL HERBACEOUS PLUG PLANTINGS SHALL BE A MINIMUM 3 INCH DEPTH. PLUGS SHALL BE PLANTED 1 FOOT O.C. AS INDICATED ON PLAN.
4. ALL TREES, SHRUBS, AND GROUNDCOVER SHALL BE PLACED IN CONTINUOUS MULCHED BEDS 4" IN DEPTH. MUCH SHALL BE TRIPLE SHREDDED HARDWOOD.
5. ALL TREES, SHRUBS, AND GROUNDCOVER SHALL BE AS SPECIFIED AND SHALL BE INSTALLED IN ACCORDANCE WITH THE DETAILS AND COMMENTS NOTED ON THE DRAWINGS.
6. TOPSOIL SHALL BE PROVIDED BY THE LANDSCAPE CONTRACTOR FOR PLANTING ACCORDING TO THE PLANS AND DETAILS
7. PREPARED TOPSOIL FOR BACKFILLING AROUND TREE BALLS SHALL BE A MIXTURE OF VOLUME OF THE FOLLOWING MATERIALS IN QUANTITIES SPECIFIED: ⅓ COMPOST, ⅔ TOPSOIL
8. ALL HERBACEOUS PLUG PLANTINGS SHALL BE MINIMUM 3 INCH DEPTH. PLUGS SHALL BE PLANTED 1 FOOT O.C. AS INDICATED ON PLAN.



NOTES:
1. DEER PROTECTION REQUIRED AROUND SHRUB PLANTINGS.

6 DT-1 SHRUB PLANTING DETAIL
N.T.S.

CHRISTOPHER C. OBROPTA, Ph.D., P.E.
PROFESSIONAL ENGINEER - NJ LICENSE # 37532

DATE 09/23/19

DRAWN	CHECKED	APPROVED	DATE
MAL	MH	CCO	09/23/19

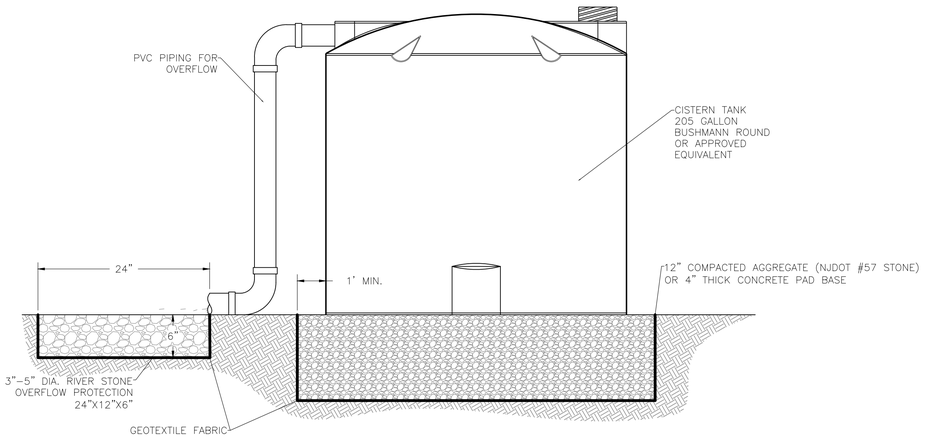
REVISIONS		
No.	DATE	DESCRIPTION

WASHINGTON MIDDLE SCHOOL
GREEN INFRASTRUCTURE IMPLEMENTATION PROJECT
1 NORTH 5TH STREET, HARRISON
HUDSON COUNTY, NJ

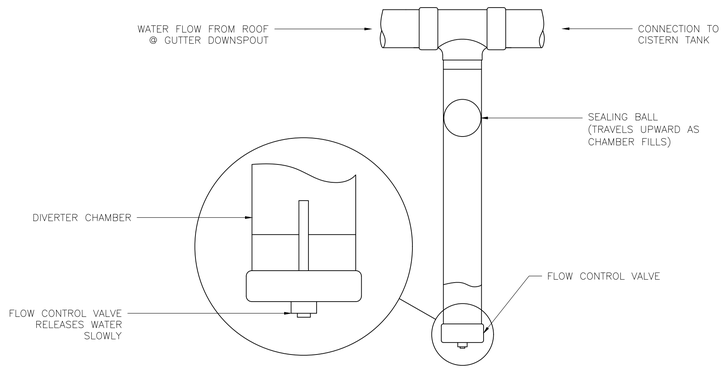
RAIN GARDEN DETAILS

RUTGERS New Jersey Agricultural Experiment Station

SHEET NAME
DT-1



1 DT-2 CISTERN TANK (TYP.)
N.T.S.



2 DT-2 DOWNSPOUT FIRST FLUSH DIVERTER DETAIL
N.T.S.

CONSTRUCTION NOTES:

1. THE CONTRACTOR SHALL VERIFY ALL INFORMATION PRIOR TO INSTALLATION INCLUDING ELEVATIONS AND LOCATIONS OF EXISTING UTILITIES.
2. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IMMEDIATELY IF ANY FIELD CONDITIONS DIFFER MATERIALLY FROM THOSE REPRESENTED ON THESE DRAWINGS AND THE SPECIFICATIONS OR IF, IN THE CONTRACTOR'S OPINION, SAID CONDITIONS CONFLICT WITH THE DESIGNS SHOWN HEREON.
3. THE CONTRACTOR SHALL HAVE A PRE-CONSTRUCTION MEETING WITH THE ENGINEER PRIOR TO ANY WORK ON SITE.
4. THE CONTRACTOR SHALL AVOID DISTURBING EXISTING AREA. ANY DISTURBANCE TO SIDEWALKS OR LANDSCAPED VEGETATION AND TREES MUST BE COORDINATED WITH THE PROPERTY OWNER.
5. THE CONTRACTOR SHALL USE PVC PIPING FOR CONNECTION FROM ROOF TO CISTERN.
6. ALL PIPES USED FOR CONNECTION FROM ROOFTOP TO CISTERN SHALL BE CLEAR OF ANY CLOGS OR OBSTRUCTIONS. ALL PIPES SHALL BE FITTED AND SECURED WITH ADHESIVE IN CONFORMANCE WITH LOCAL PLUMBING CODES.
7. THE CONTRACTOR SHALL PROVIDE A CRUSHED AGGREGATE BASE OR CONCRETE SLAB WITH 4,500 PSI STRENGTH TO SUPPORT THE CISTERN AS INDICATED ON THE PLAN.
8. THE OVERFLOW FROM THE CISTERN SHALL CONNECT TO THE NEAREST STORM SEWER CATCH BASIN INLET.
9. THE CONTRACTOR SHALL NOT MAKE ANY MODIFICATIONS AT THE SITE UNTIL CONSULTING WITH THE ENGINEER.
10. THE CONTRACTOR IS REQUIRED TO SUBMIT SHOP DRAWINGS OF ALL MATERIALS AND CONSTRUCTION METHODS TO THE ENGINEER FOR REVIEW AND APPROVAL PRIOR TO PURCHASE AND INSTALLATION.
11. ALL SYSTEMS SHALL BE TESTED BY THE ENGINEER FOR LEAKS AND WATER TIGHT FITTINGS PRIOR TO ACCEPTANCE AND PAYMENT.
12. THE CONTRACTOR SHALL USE SIMPSON TIE IN CONNECTORS FOR THE SHADE STRUCTURE.
13. THE CONTRACTOR SHALL USE PRESSURE TREATED LUMBER.
14. THE CONTRACTOR SHALL INSTALL CONCRETE FOOTINGS WITH A MINIMUM 3 FOOT DEPTH.
15. THE CONTRACTOR SHALL NOT MAKE ANY MODIFICATIONS AT THE SITE UNTIL CONSULTING WITH THE ENGINEER.

SPECIFICATIONS:

1. CRUSHED AGGREGATE BASE SHALL BE COMPRISED OF NO. 57 STONE. ALTERNATIVE CONCRETE PAD SHALL BE CONCRETE WITH 4,500 PSI STRENGTH.
2. ALL DISTURBED AREAS EXCLUSIVE OF THE CISTERN SHALL BE RESTORED TO ORIGINAL CONDITIONS BY THE CONTRACTOR.
3. CONTRACTOR SHALL PROVIDE SHOP DRAWINGS OF DOWNSPOUT CONNECTIONS TO CISTERN FOR ENGINEERS APPROVAL PRIOR TO INSTALLATION.
4. DIVERTER FILTER BOX SHALL BE RAINHARVESTING® FIRST FLUSH DOWNSPOUT DIVERTER (PRODUCT CODE: WDDS9X) OR EQUIVALENT.
5. OVERFLOW SHALL DISCHARGE TO LAWN AREA UNLESS SPECIFIED OTHERWISE. STONE PROTECTION COMPRISED OF 3"–5" DIA. CLEAN RIVER STONE SHALL BE INSTALLED AS SHOWN IN DETAIL.

CHRISTOPHER C. OBROPTA, Ph.D., P.E.
PROFESSIONAL ENGINEER - NJ LICENSE # 37532
DATE 09/23/19

REVISIONS		
No.	DATE	DESCRIPTION

DRAWN MAL | CHECKED MH | APPROVED CCO | DATE 09/23/19

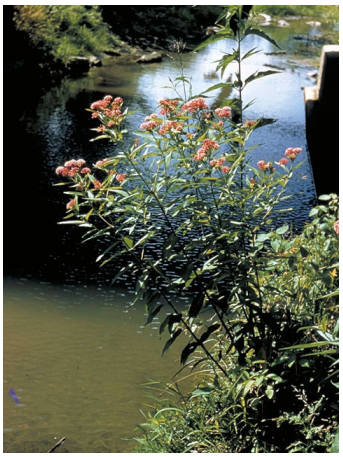
WASHINGTON MIDDLE SCHOOL
GREEN INFRASTRUCTURE IMPLEMENTATION PROJECT
1 NORTH 5TH STREET, HARRISON
HUDSON COUNTY, NJ

CISTERN DETAILS

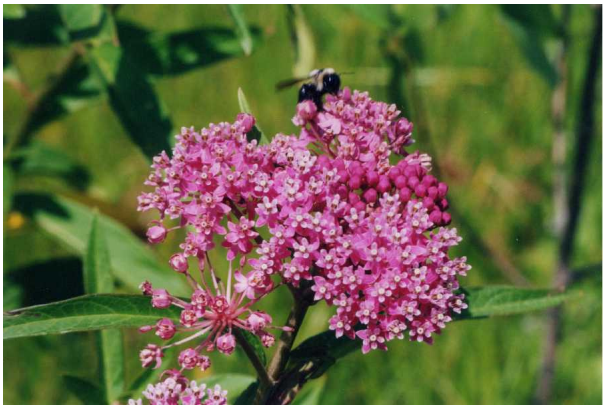
RUTGERS New Jersey Agricultural Experiment Station

SHEET NAME
DT-2

Asclepias incarnata
Swamp milkweed



Summer Foliage



Summer Flower

Characteristics: Herbaceous, perennial, nonpersistent

Appearance:

Height – up to 6 ft.
Flower color – pink to purplish-red
Flowering Period - June through August

Habitat (Community): fresh tidal marshes, nontidal marshes, wet meadows, shrub swamps, forested wetlands (clearings), shores and ditches

Hydrology

Indicator Status – Obligate wetland
Salinity – Not applicable - prefers fresh water
Nontidal regime: Irregularly, seasonally, or regularly inundated or saturated. When flooding is regular, only ground saturation is tolerated.

Wildlife Benefits: **(Roots)** food sparingly used for muskrats; **(Nectar)** food for butterflies.

Distribution: Nova Scotia to Manitoba and Utah, south to Florida, Louisiana, and New Mexico (varieties occur across this range)

Echinacea purpurea
Purple Coneflower

Summer Foliage

Summer Flowers

Characteristics:
Perennial herb

Appearance:
Height – 2-4 ft.
Aerial Spread – 1.5 to 2 ft.
Flower Color – Purplish pink
Flowering Period – June - August

Habitat (Community):
Rocky open woods and dry prairies

Hydrology:
Indicator Status – N/A
Salinity – Low salinity tolerance
Non-Tidal Regime – Low tolerance of drought conditions, but will grow in a wide range of soil textures (prefers well-drained, sandy or richer soils). Will not tolerate water logging.

Wildlife Benefits:
Excellent nectar species for many butterflies; goldfinches eat seeds from late summer into fall

Distribution:
Chiefly in Ozarks and Midwest, from Illinois and southern Iowa to eastern Oklahoma, extreme northeastern Texas, and central Louisiana, east irregularly to southern Michigan, Kentucky, Tennessee, and Georgia, and less commonly to Virginia and North Carolina

Iris versicolor
Blue flag, Blue water iris

Spring/Summer Flower

Green Summer Foliage

Characteristics: Herbaceous, Perennial, Nonpersistent

Appearance:

Height - Up to 4 ft.
Flower Color - Blue or violet
Flowering Period - May through July

Habitat: Swamps, Marshes, and Wet Shores

Hydrology:

Indicator status - Obligate wetland
Salinity - Fresh to moderately brackish
Non-Tidal Regime - Regularly to permanently inundated up to 0.5 feet or saturated

Wildlife Benefits: Food for wildfowl, marsh birds, and persists as cover within a growing season under heavy grazing.

Distribution: Newfoundland to Manitoba, south to Virginia and Minnesota.

Juncus effusus
Soft rush

Foliage and Flowers

Characteristics: Herbaceous, Perennial, Persistent

Appearance:

Height - Up to 3.5 ft.
Flowering Period - July through September

Habitat (Community): Fresh tidal marshes, non-tidal marshes, shrub swamps, wet meadows, and ditches

Hydrology:

Indicator status - Facultative wetland
Salinity - Freshwater
Non-Tidal Regime - Regularly to permanently inundated

Wildlife Benefits: Food for wildfowl, upland game birds, marsh birds, songbirds, and waterfowl; spawning grounds for rock bass, bluegills, and others

Distribution: Throughout the United States

Sorghastrum nutans
Indian grass

Characteristics: Native, perennial, warm-season grass

Appearance:

Height – 3-5 ft**.**
Flower Color – Golden brown
Flowering Period – June to September

Habitat (Community): Deep, well-drained floodplain soils. However, it is highly tolerant of poorly to excessively well-drained soils, acid to alkaline conditions, and textures ranging from sand to clay.

Hydrology:

Indicator Status – Upland
Salinity Tolerance – Medium
Shade Tolerance – Intolerant

Wildlife Benefits: **Cover and food (seeds or rhizomes)** for deer

Distribution: Northeast west to Texas and North Dakota

Cornus sericea
Red-osier dogwood

Summer Foliage and Flowers

Fall Foliage and Fruits

Characteristics: Broad-leaved, deciduous shrub

Appearance:

Height – 6-12 ft**.**
Aerial Spread – 6-12 ft.
Flower Color – White
Flowering Period – Late May through mid-June
Fruit color- White
Fruiting period- September

Habitat (Community): Forested seasonal wetlands, shrub wetlands, stream banks

Hydrology:

Indicator Status – Facultative wetland +
Salinity – freshwater; less than .5 ppt
Non-Tidal Regime – Irregularly to seasonally inundated or saturated

Wildlife Benefits: **Food** for eastern kingbird, brown thrasher, ring-necked pheasant, white-tailed deer, and other hoofed browsers, wild turkey, beaver, ruffed and sharp-tailed grouse, bobwhite, cottontail rabbit, snowshoe hare, woodchuck, raccoon, moose. **Cover and Nesting** for the American goldfinch.

Distribution: Newfoundland and southern Labrador to Yukon Territory, south to Nova Scotia, New England, West Virginia, Ohio, Indiana, Illinois, Iowa, Nebraska, New Mexico, Arizona, and California.

Ilex glabra
Inkberry

Foliage and Fall Fruit

June Foliage

Characteristics: Broad-leaved, evergreen shrub

Appearance:

Height - 6 to 12 ft.
Aerial Spread - 6 to 12 ft.
Flower Color - Greenish to white
Flowering Period - Early May through late June
Fruit Color - Black
Fruiting Period - Late September to late March

Habitat: Forested seasonal wetlands, shrub swamp and sandy woods

Hydrology:

Indicator status - Facultative wetland
Salinity - Resistant, tolerates infrequent flooding by water containing some salt
Non-Tidal Regime - Seasonally inundated or saturated

Wildlife Benefits: **(Fruit)** is food for wild turkey, bobwhite, common flicker, hermit thrush, eastern bluebird, cedar waxwing, rufous-sided towhee, waterfowl; **(Food, Cover, and Nesting)** for mockingbird and American robin.

Distribution: Nova Scotia to Florida and Louisiana along coastal plain