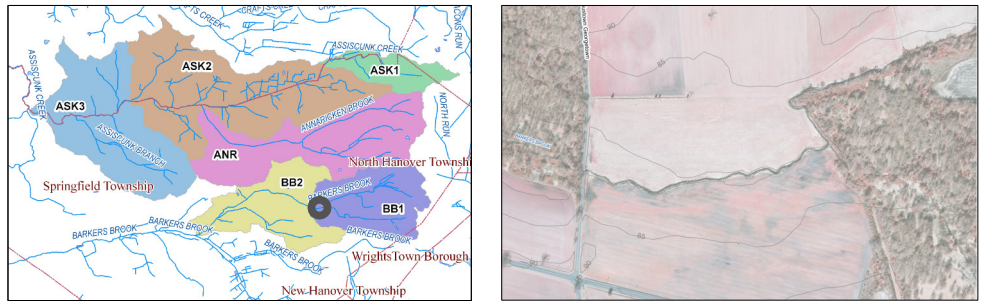
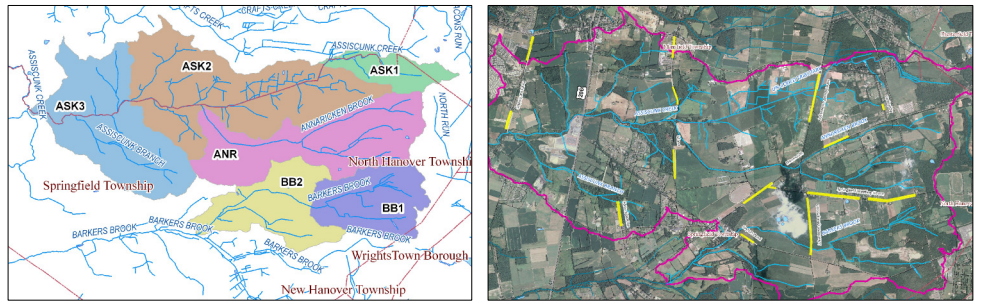
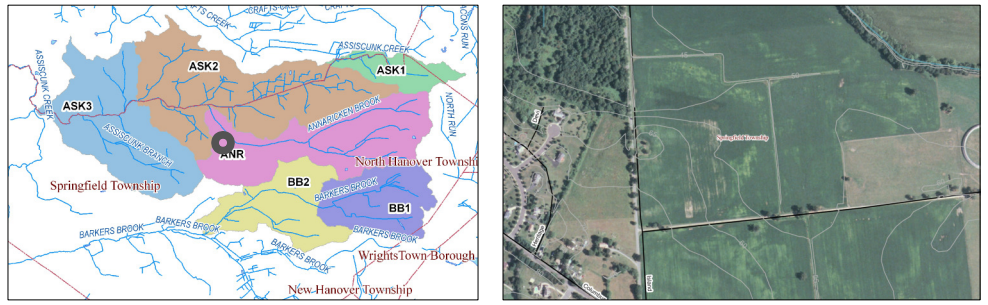
Assiscunk Creek Watershed Restoration and Protection Plan
Best Management Practices Concept Designs



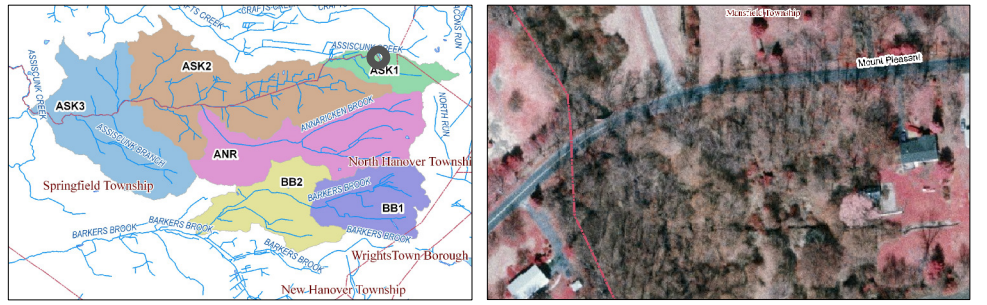
Filter Strip
Barkers Brook
Springfield Township, New Jersey



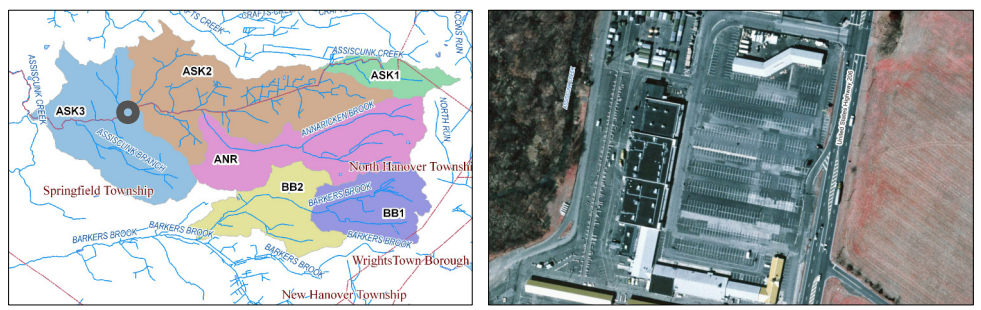
Rural Road Drainage System Retrofits
All Subwatersheds
New Jersey



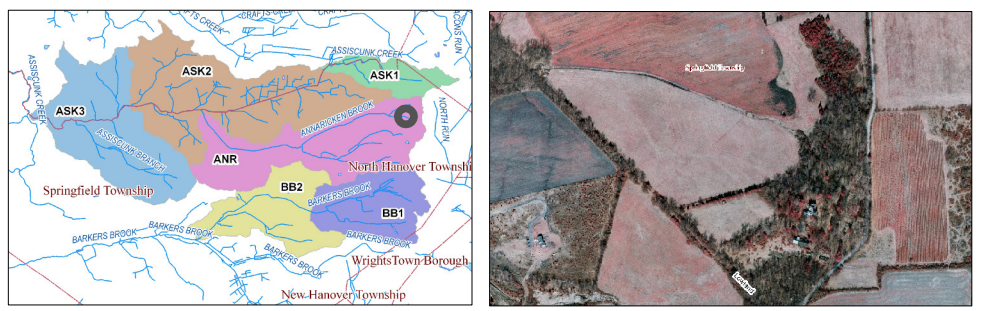
Naturalized Agricultural Drainage Swale
Annaricken Brook
Springfield Township, New Jersey



Stream Corridor Restoration
Assiscunk Creek
Mansfield Township, New Jersey



Columbus Market Parking Lot Retrofit with Filterra® Systems
Assiscunk Creek
Springfield Township, New Jersey



Livestock Managment Practices
Annaricken Brook
Springfield Township, New Jersey

INDEX OF PLAN SHEETS

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

DESIGNED JRT | CHECKED CCO | APPROVED CCO | DATE

ASSISCUNK CREEK WATERSHED RESTORATION AND PROTECTION PLAN
NJDEP 319h GRANT

TITLE SHEET
SHEET 1

RUTGERS COOPERATIVE EXTENSION
WATER RESOURCES PROGRAM
71 COLLEGE FARM ROAD
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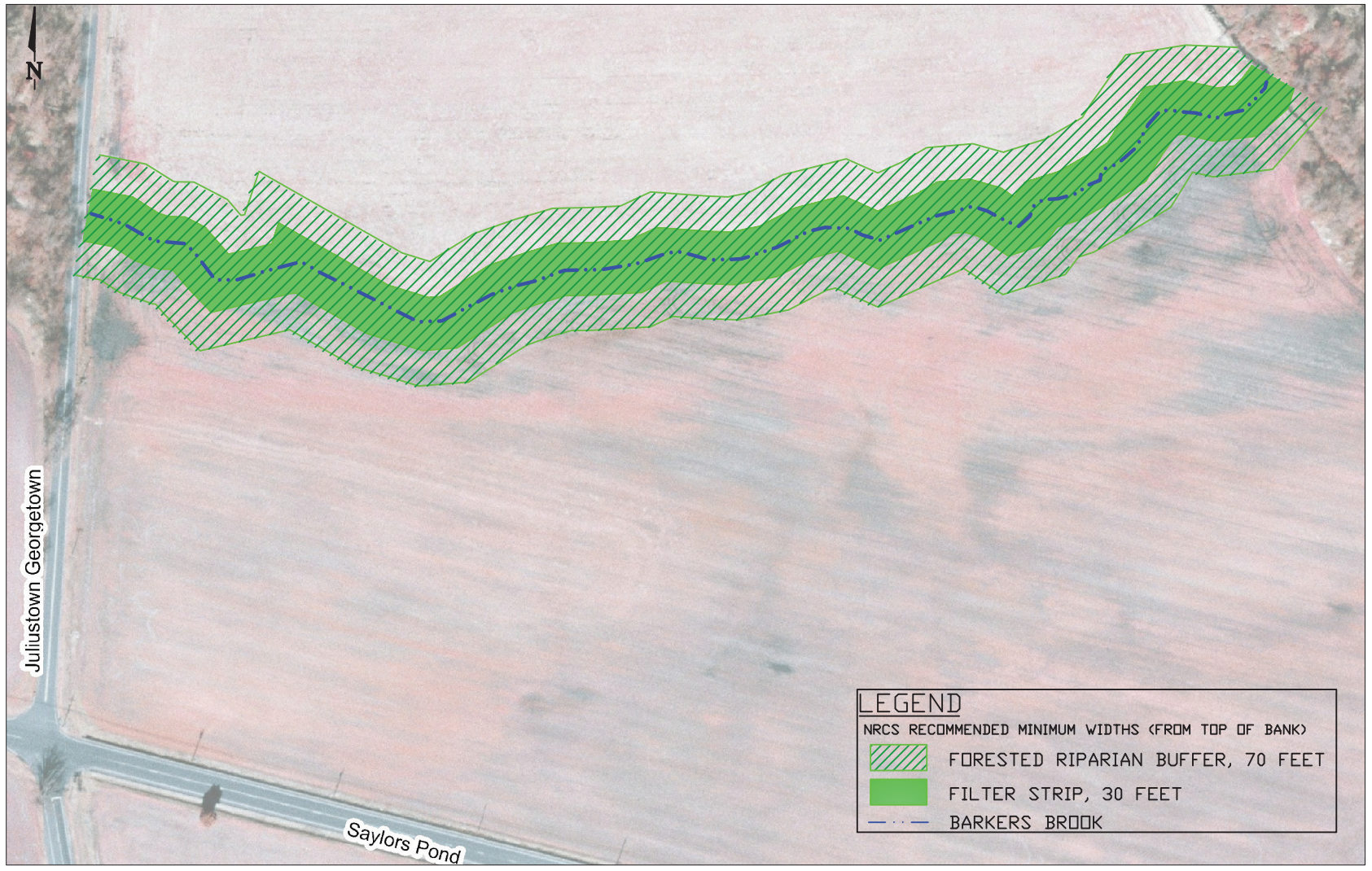
JOB | SHEET # 01 | TOTAL 07



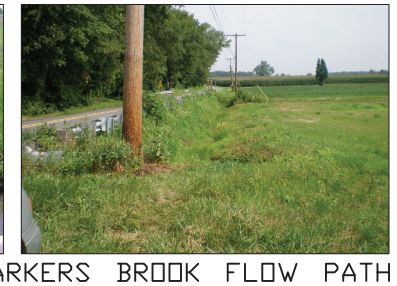
NOTES:

1. PHOTOGRAPHS TAKEN DURING A SCHEDULED SAMPLING EVENT AT SAMPLING LOCATION BB1 (INTERSECTION OF BARKERS BROOK AND JULIUS-GEORGETOWN ROAD). 1,500 LINEAR FEET OF BARKERS BROOK FLOWS WESTWARD THROUGH TWO PLOTS OF AGRICULTURAL LAND WITH NO VEGETATIVE BUFFER ON EITHER SIDE TO PROVIDE RUNOFF INFILTRATION OR TREATMENT.

2. THE PROPOSED FORESTED RIPARIAN BUFFER SHOULD SPAN 70 FEET (FROM TOP OF BANK) ON EITHER SIDE OF BARKERS BROOK.
   - ZONE ONE: THIS ZONE WILL DIRECTLY BORDER BARKERS BROOK. IT WILL CONTAIN TREES AND SHRUBS NECESSARY FOR AQUATIC SHADE, BANK STABILITY, AND WOODY DEBRIS.
   - ZONE TWO: THIS ZONE IS UPGRADIENT OF ZONE ONE AND CONTAINS TREES, SHRUBS, AND GROUND COVER VEGETATION FOR FILTERING SEDIMENT AND POLLUTANTS FROM RUNOFF.
   - ZONE THREE: THIS ZONE IS LANDWARD AND UPGRADIENT OF ZONE TWO. IT CONSISTS OF A STRIP OF HERBACEOUS COVER THAT FUNCTIONS AS A FILTER AND MAXIMIZES SEDIMENT-TRAPPING CAPABILITIES. THIS ZONE IS PROVIDED FOR RUNOFF CONTROL.

3. AN ALTERNATIVE TO A FORESTED RIPARIAN BUFFER IS THE INSTALLATION OF A VEGETATIVE FILTER STRIP SPANNING 30 FEET (FROM TOP OF BANK) ON EITHER SIDE OF BARKERS BROOK. THE STRIP SHOULD BE PLANTED WITH NATIVE HERBACEOUS PLUGS AND GRASSES, SUCH AS SWITCHGRASS, CREEPING RED FESCUE, OR SWEETPEA (NRCS CRITICAL AREA PLANTING STANDARD 342).

4. THE SLOPE OF THE EXISTING AGRICULTURAL LAND IS APPROXIMATELY 1%. THE INSTALLATION OF A FORESTED RIPARIAN BUFFER OR FILTER STRIP WOULD NOT REQUIRE THE LAND TO BE REGRADED. A SOIL SAMPLE AND LAND SURVEY WOULD NEED TO BE COMPLETED FOR FINAL ENGINEERING DESIGNS.



FIGURES 1a AND b. BARKERS BROOK FLOW PATH THROUGH AGRICULTURAL LAND (LEFT) AND BARKERS BROOK INTERSECTION WTIH JULIUS GEORGETOWN ROAD (RIGHT).
SEE NOTE 1.

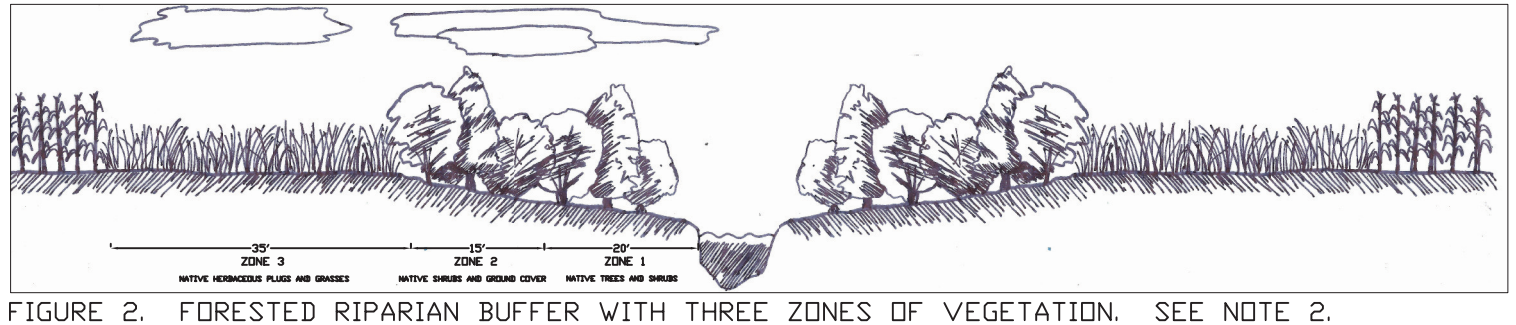
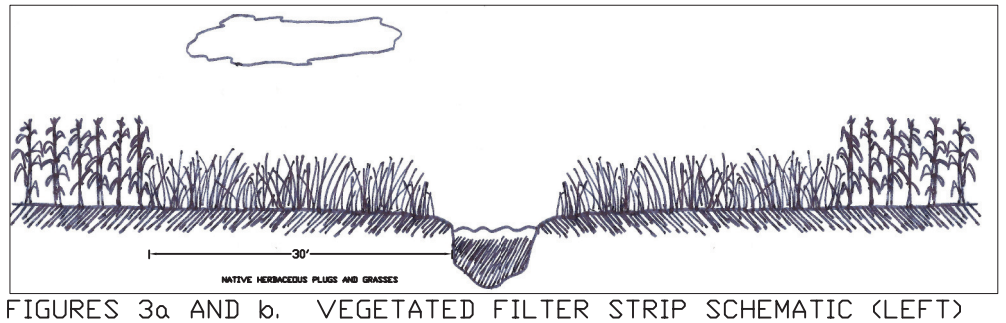
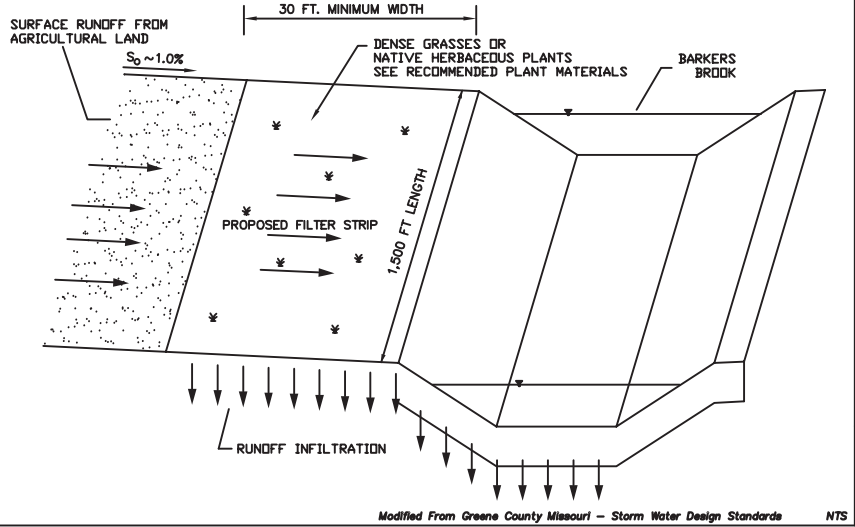


FIGURE 2. FORESTED RIPARIAN BUFFER WITH THREE ZONES OF VEGETATION. SEE NOTE 2.
(SCHEMATIC ADPATED FROM USDA NRCS CONSERVATION PRACTICE JOB SHEET 391)



FIGURES 3a AND b. VEGETATED FILTER STRIP SCHEMATIC (LEFT) AND DIAGRAM OF RUNOFF FLOW PATH (RIGHT).
SEE NOTES 3 AND 4.



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DATE | DATE

ASSISCUNK CREEK WATERSHED RESTORATION AND PROTECTION PLAN
NJDEP 319h GRANT

FILTER STRIP DETAILS
SHEET 2

RUTGERS COOPERATIVE EXTENSION
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NOTES:
1. AERIAL PHOTOGRAPH SHOWS UNMAPPED AGRICULTURAL DRAINAGE SWALE ON AGRICULTURAL PROPERTY. LENGTH IS APPROXIMATELY 1,950 FEET.

2. PHOTOGRAPHS OF SWALE TAKEN FROM ISLAND ROAD, FACING EAST.

3. EXISTING LONGITUDINAL SLOPE: 0.5%. SIDE SLOPES OF EXISTING SWALE ARE UNKNOWN.

4. SWALE SHALL BE DESIGNED ACCORDING TO THE STANDARDS FOR SOIL EROSION AND SEDIMENT CONTROL OF NEW JERSEY.

5. LONGITUDINAL SLOPE OF SWALE SHALL BE REGRADED TO A MINIMUM OF 1.5% WITH MAXIMUM ALLOWABLE SIDE SLOPES OF 3:1.

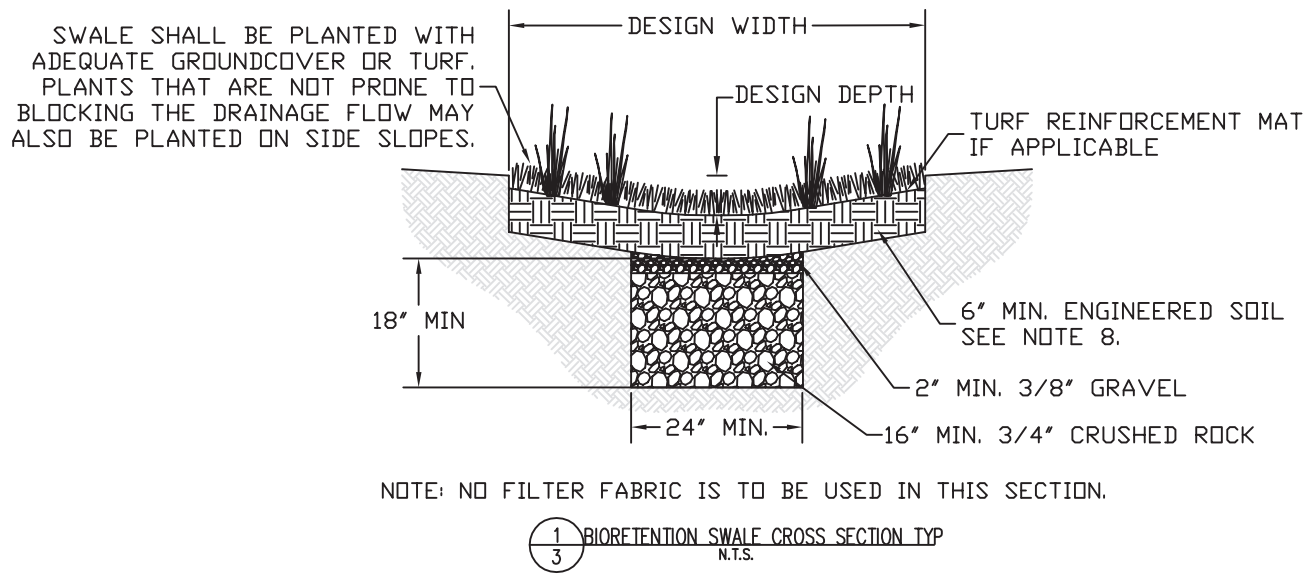
6. THERE SHALL BE A MINIMUM OF ONE FOOT SEPARATING THE SWALE BOTTOM FROM THE SEASONAL HIGH WATER TABLE.

7. MAXIMUM ALLOWABLE PONDING DEPTH IS 2 INCHES (WATER QUALITY DESIGN STORM).

8. ENGINEERED SOIL LAYER SHALL BE MINIMUM 6" DEEP. SANDY LOAM SOIL MIX WITH NO MORE THAN 5% CLAY CONTENT. THE MIX SHALL CONTAIN 50-60% SAND, 20-30% COMPOST OR HARDWOOD MULCH, AND 20-30% TOPSOIL.

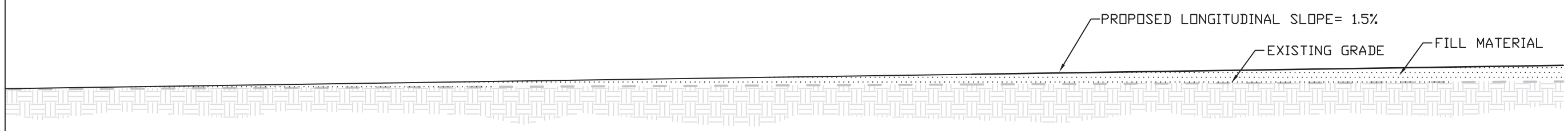
9. SOIL TESTING AND A COMPLETE TOPOGRAPHIC SURVEY WILL BE NECESSARY FOR FINAL ENGINEERING DESIGNS.

FIGURES 1a AND b. UNMAPPED AGRICULTURAL DRAINAGE SWALE FLOWS WESTWARD TOWARD ISLAND ROAD, SPRINGFIELD TOWNSHIP NJ. THIS SWALE DRAINS RUNOFF FROM AGRICULTURAL LANDS TO THE NORTH AND SOUTH. SEE NOTES 1 AND 2.



NOTE: NO FILTER FABRIC IS TO BE USED IN THIS SECTION.

1/3 BIORETENTION SWALE CROSS SECTION TYP
N.T.S.



2/3 BIORETENTION SWALE PROFILE

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ASSISCUNK CREEK WATERSHED RESTORATION AND PROTECTION PLAN
NJDEP 319h GRANT
NATURALIZED AGRICULTURAL DRAINAGE SWALE DETAILS
SHEET 3

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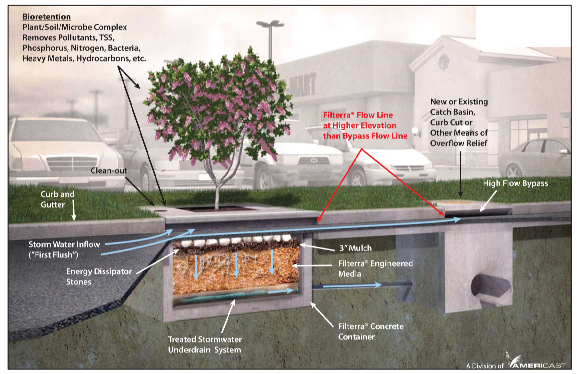
JOB | SHEET # 03 | TOTAL 07

FILTERRA® SPECIFICATIONS:
THE FILTERRA BIORETENTION SYSTEM CONSISTS OF A CONCRETE CONTAINER, A 3-INCH LAYER OF MULCH, 1.5'-3.5' FEET OF FILTER MEDIA, AN OBSERVATION PIPE, AN UNDERDRAIN SYSTEM, AND APPROPRIATE PLANT TYPES FOR THE REGION. STORMWATER RUNOFF DRAINS DIRECTLY FROM IMPERVIOUS SURFACE THROUGH AN INLET STRUCTURE AND FLOWS THROUGH THE MULCH AND FILTER MEDIA. TREATED WATER FLOWS OUT VIA THE UNDERDRAIN SYSTEM CONNECTED TO EXISTING INFRASTRUCTURE. THE CONCRETE CONTAINER AND FILTER MEDIA ARE INSTALLED BELOW GRADE WITH THE ONLY VISIBLE FEATURE BEING A CONCRETE SLAB, THE INLET, AND PLANT MATERIALS.

STANDARD UNIT: 7'X7' OUTSIDE DIMENSION
STANDARD WEIGHT (WITH INSTALLED FILTER MEDIA): 15,000-32,00 LB

ESTIMATED POLLUTANT REMOVAL EFFICIENCY:
- E.COLI: 99%
- ENTEROCOCCUS: 95%
- PREDICTED PHOSPHORUS REMOVAL: 60% - 70%
- PREDICTED NITROGEN REMOVAL: 43%
- FECAL COLIFORM: 98%
- TSS REMOVAL: 85%
- PREDICTED HEAVY METAL REMOVAL: 33% - 82%
- PREDICTED OIL & GREASE: 85%

Source: Americast Inc.



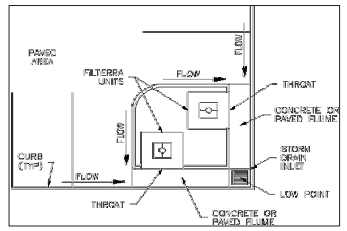
Available Sizes	Total Contributing Drainage Area
4x6 or 6x4	0.17 ac
4x8 or 8x4	0.22 ac
Standard 6x6	0.25 ac
6x8 or 8x6	0.33 ac
6x10 or 10x6	0.42 ac
6x12 or 12x6	0.50 ac

FILTERRA® SYSTEM SIZING GUIDLINES

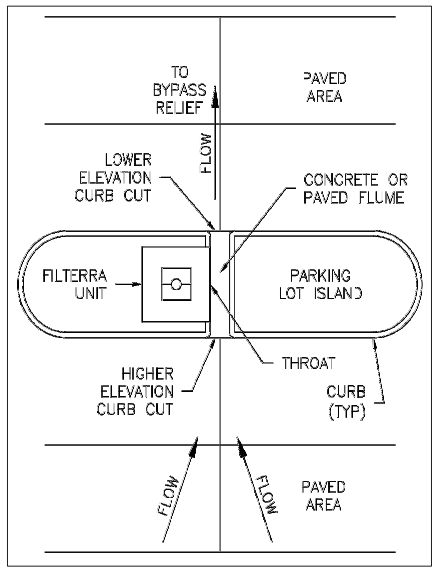

PARKING LOT FOR OFFICE BUILDING AT COLUMBUS FARMER'S MARKET


PARKING LOT NEXT TO SELLER STALLS

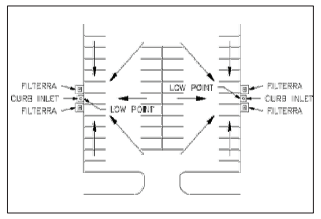

COLUMBUS FARMER'S MARKET FULL PARKING LOT




PARKING LOT CORNER APPLICATION TYP.




PARKING LOT ISLAND APPLICATION TYP.




PARKING LOT CATCH BASIN APPLICATION TYP.

NOTES:

1. COLUMBUS FARMER'S MARKET PARKING LOT AREA IS APPROXIMATELY SEVEN (7) ACRES.

2. THIS SITE REQUIRES TWENTY EIGHT (28) 6'X6' FILTERRA® SYSTEMS OR FOURTEEN (14) 6'X12' FILTERRA® SYSTEMS.

3. A COMPLETE TOPOGRAPHIC SURVEY OF THE SITE WILL BE NECESSARY FOR THE COMPLETION OF FINAL ENGINEERING DESIGNS.

Schematics, diagrams, and information pertaining to Filterra® Units is provided courtesy of Americast.

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ASSISCUNK CREEK WATERSHED RESTORATION AND PROTECTION PLAN
NJDEP 319h GRANT
COLUMBUS MARKET PARKING LOT RETROFIT
FILTERRA SYSTEM DETAILS
SHEET 4

RUTGERS COOPERATIVE EXTENSION
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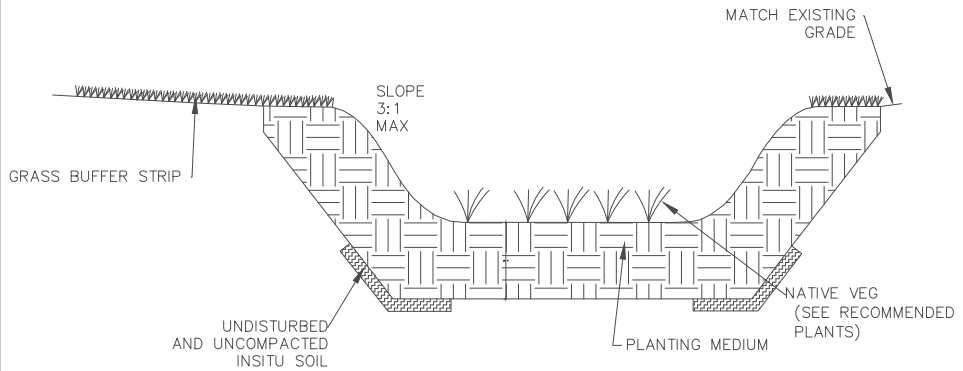
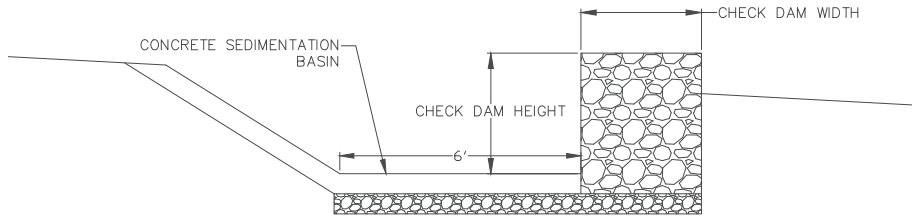
TYPICAL UNDERSIZED AND ERODING DITCH

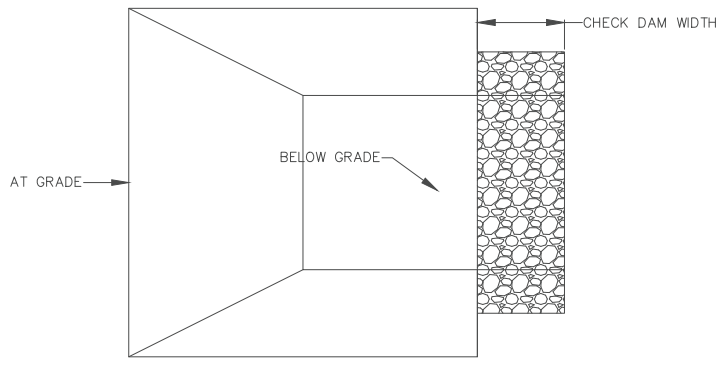


CROSS SECTION TYP

1/5 GRASSED SWALE DETAILS
N.T.S.

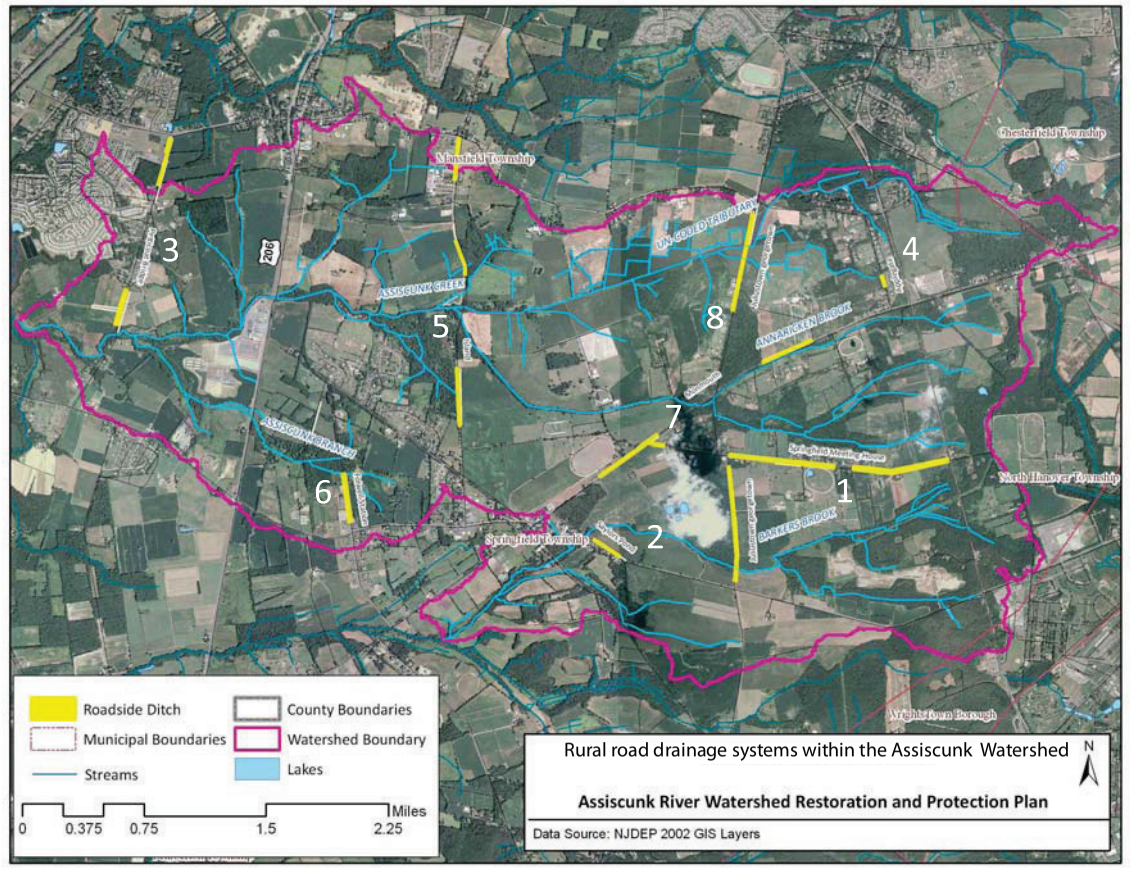


PROFILE VIEW TYP



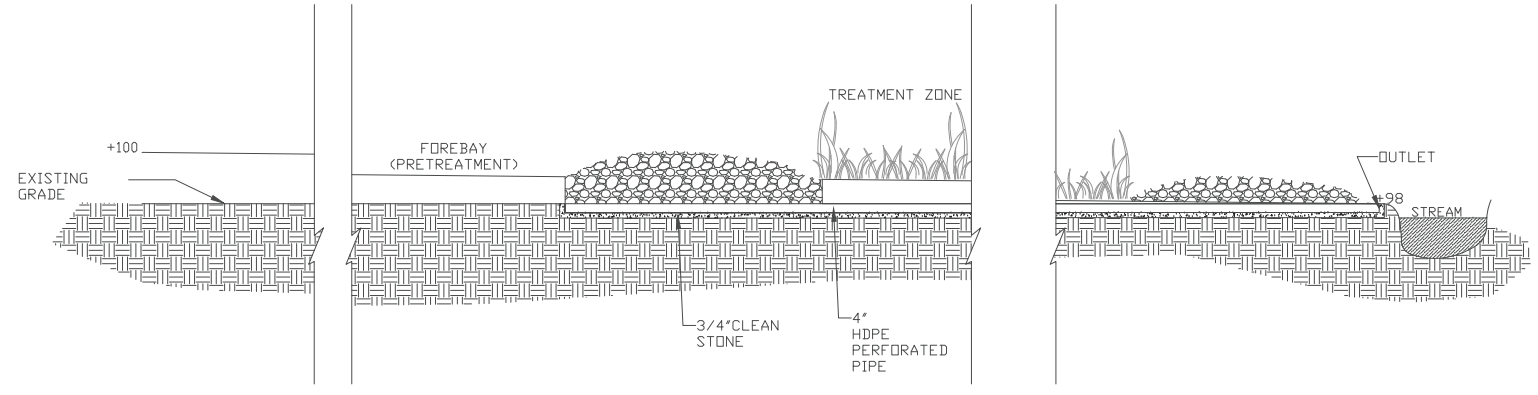
PLAN VIEW TYP

2/5 CONCRETE SEDIMENT FOREBAY DETAIL
N.T.S.



RURAL ROAD DRAINAGE SYSTEMS WITHIN THE ASSISCUNK WATERSHED:

(1) SPRINGFIELD MEETING HOUSE,
(2) SAYLORS POND ROAD,
(3) PETTICOAT BRIDGE ROAD,
(4) APPLEGATE ROAD,
(5) ISLAND ROAD,
(6) FOLWELL STATION ROAD,
(7) MONMOUTH ROAD,
AND
(8) JULIUSTOWN GEORGETOWN ROAD



PROFILE VIEW TYP

CHECK DAM MATERIALS
- GABION
- STONE
- EARTH

3/5 GRASSED SWALE WITH CHECK DAMS AND TREATMENT ZONE DETAIL
N.T.S.

RURALROAD DRAINAGE SYSTEM SWALE DESIGN NOTES:

1. WHERE SPACE ALLOWS, DESIGN SWALE GEOMETRY IN COMPLIANCE WITH THE NEW JERSEY SOIL EROSION AND SEDIMENT CONTROL STANDARDS AND SEED SWALE WITH ROADSIDE SWALE SEED MIX

2. WHERE A STABLE CONDITION CANNOT BE REACHED, LINE EXISTING DITCH WITH RIP-RAP

3. ALLOWABLE VELOCITY RANGES FROM 2.5-3.5 FEET PER SECOND FOR MOST SOILS IN THE STUDY AREA.

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ASSISCUNK CREEK WATERSHED RESTORATION AND PROTECTION PLAN
NJDEP 319h GRANT
RURAL ROAD DRAINAGE SYSTEM DETAILS
SHEET 5

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NOTES:
1. 100 FEET OF ASSISCUNK CREEK IS TARGETED FOR A STREAMBANK RESTORATION PROJECT. THIS SEGMENT OF STREAM IS LOCATED SOUTH OF MOUNT PLEASANT ROAD IN MANSFIELD TOWNSHIP, NEW JERSEY.
2. DETAILS SHOW TYPICAL RESTORATION DESIGNS AND EXAMPLE PLANTING PLAN.
3. A COMPLETE BATHYMETRIC AND TOPOGRAPHIC SURVEY WILL BE NECESSARY FOR COMPLETION OF ENGINEERING DESIGNS.

PLANTING SCHEDULE TYP

8 FT. TO 20FT. ZONE

TREE PLANTINGS
2-5 Gal. planted 12' o.c.
15 plants per 100'

Red Maple
(Acer rubrum)
Smooth Alder
(Alnus serrulata)
River Birch
(Betula nigra)
White Ash
(Fraxinus americana)
Black Gum
(Nyssa sylvatica)
American Sycamore
(Platanus occidentalis)

SHRUB PLANTINGS
1 Gal. planted 6' o.c.
40 plants per 100'

Black Chokeberry
(Aronia melanocarpa)
Sweet Pepperbush
(Clethra alnifolia)
Red-Osier Dogwood
(Cornus stolonifera)
Winterberry
(Ilix verticillata)
Spicebush
(Lindera benzoin)
Arrowwood Viburnum
(Viburnum dentatum)

NATIVE SEED
.4 lbs per 100'

Flood Plain Wildlife Mix
(Ernst Conservation Seed)

2 FT. TO 8 FT. ZONE

SHRUB PLANTINGS
1 Gal. planted 3' o.c.
65 plants per 100'

Red Chokeberry
(Aronia arbutifolia)
Black Chokeberry
(Aronia melanocarpa)
Buttonbush
(Cephalanthus occidentalis)
Sweet Pepperbush
(Clethra alnifolia)
Silky Dogwood
(Cornus amomum)
Red-Osier Dogwood
(Cornus stolonifera)
Winterberry
(Ilix verticillata)
Spicebush
(Lindera benzoin)
Pussy Willow
(Salix discolor)
Arrowwood Viburnum
(Viburnum dentatum)

NATIVE SEED
.4 lbs per 100'

Flood Plain Wildlife Mix
(Ernst Conservation Seed)

0 FT. TO 2 FT. ZONE

HERBACEOUS PLANTINGS
2' plugs planted 1' o.c.
200 plants per 100'

Swamp Milkweed
(Asclepias incarnata)
Fringed Sedge
(Carex crinita)
Shallow Sedge
(Carex lurida)
Awl Sedge
(Carex stipata)
Blue-Flag
(Iris versicolor)
Soft Rush
(Juncus effusus)
Cardinal Flower
(Lobelia cardinalis)
Great Lobelia
(Lobelia siphilitica)
New York Ironweed
(Vernonia noveboracensis)

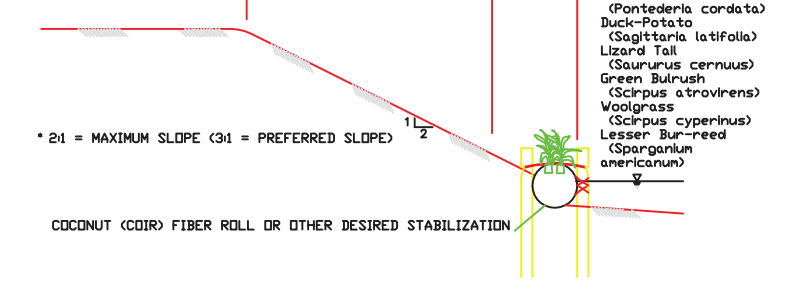
NATIVE SEED
.2 lbs per 100'

FACW Wetland Meadow Mix
(Ernst Conservation Seed)

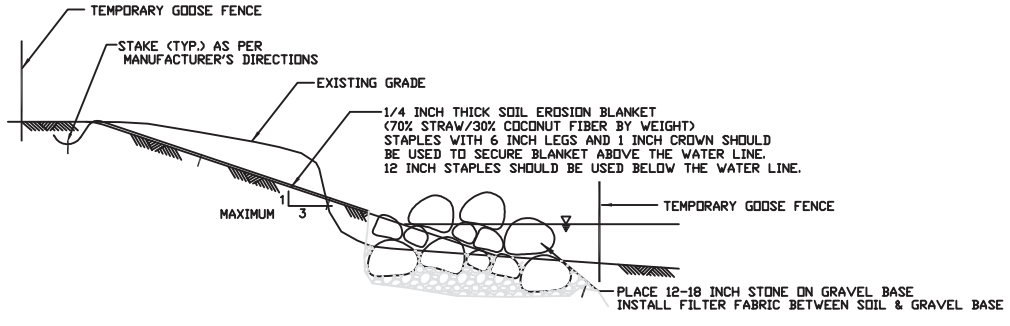
AQUATIC EMERGENTS

HERBACEOUS PLANTINGS
2' plugs planted 2' o.c.
200 plants per 100'

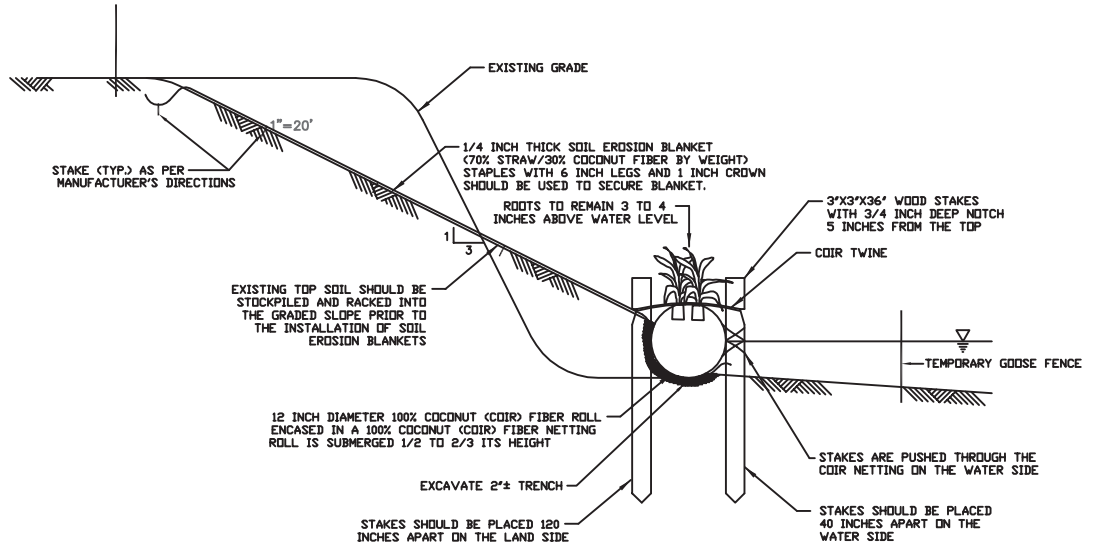
Pickerelweed
(Pontederia cordata)
Duck-Potato
(Sagittaria latifolia)
Lizard Tail
(Saururus cernuus)
Green Bulrush
(Scirpus atrovirens)
Woolgrass
(Scirpus cyperinus)
Lesser Bur-reed
(Sparganium americanum)



FIGURES 1a AND b. EVIDENCE OF BANK EROSION AND INSTABILITY IN ASSISCUNK CREEK WATERSHED. NOTE EXPOSED ROOT SYSTEMS, LEANING VEGETATION, AND CHANNEL INCISION.



SHORELINE WITH STONE TOE AND ECO-NET STABILIZATION TYP



SHORELINE WITH COCONUT FIBER ROLL AND ECO-NET STABILIZATION TYP

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ASSISCUNK CREEK WATERSHED RESTORATION AND PROTECTION PLAN
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STREAM CORRIDOR RESTORATION DETAILS
SHEET 6

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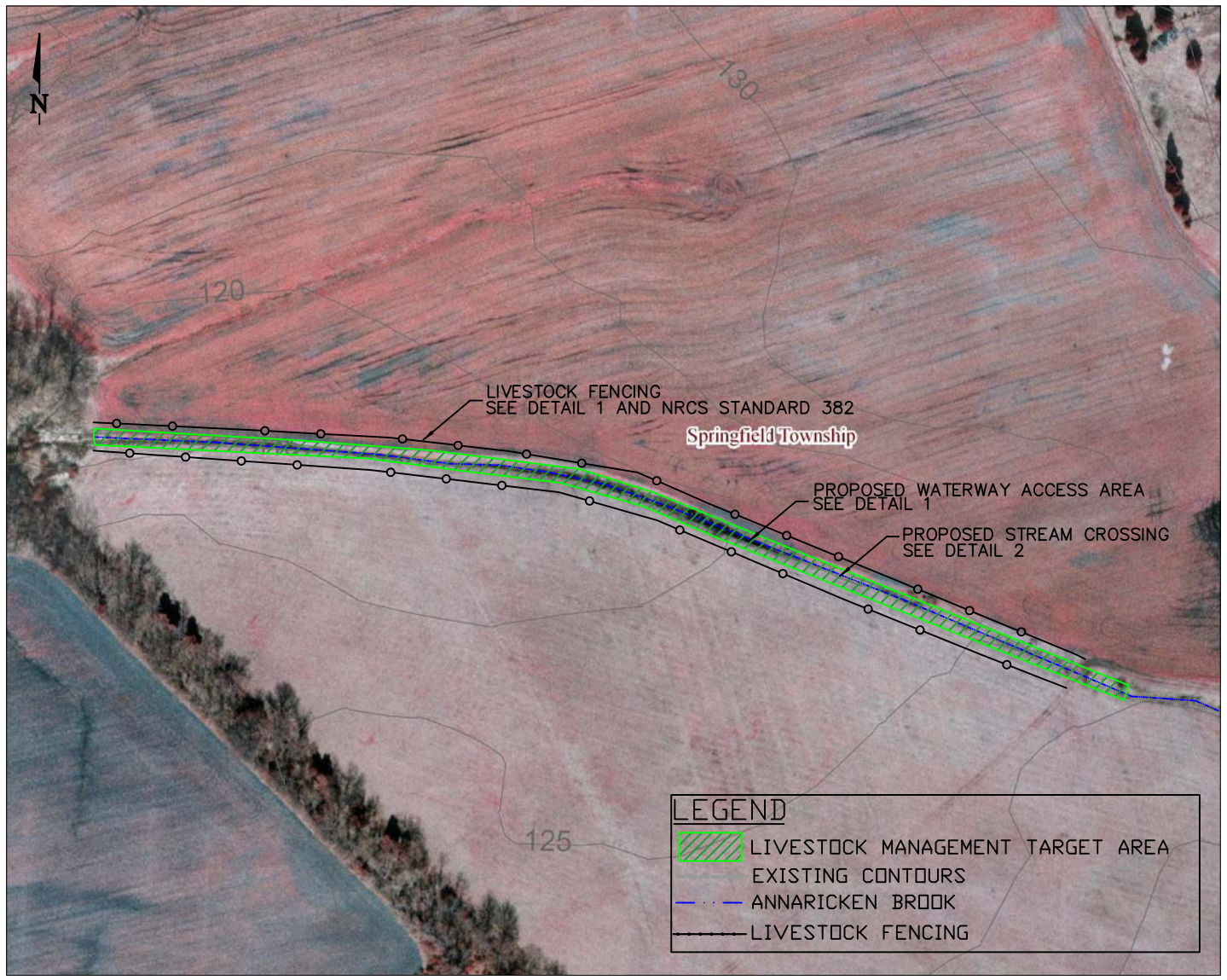
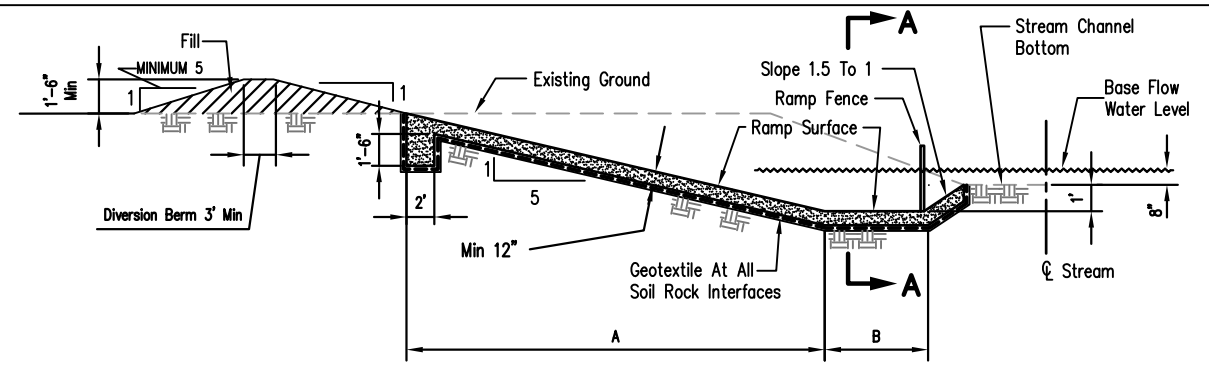
RUTGERS New Jersey Agricultural Experiment Station

JOB | SHEET # 06 | TOTAL 07

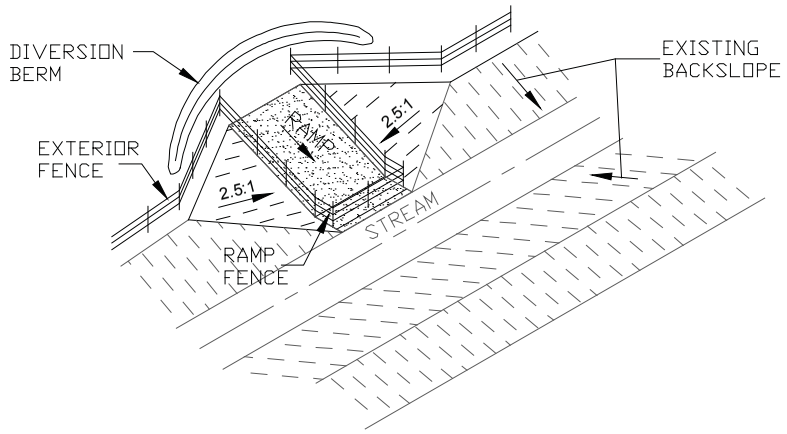


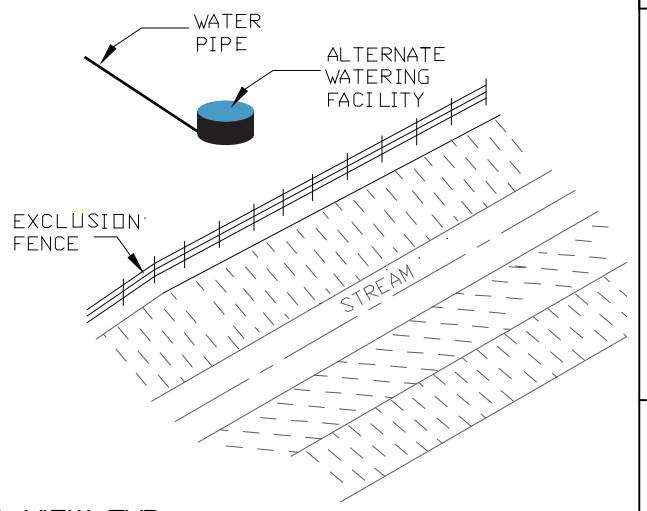
NOTES:

1. APPROXIMATELY 1,000 FEET OF ANNARICKEN BROOK, LOCATED NORTH OF LOWLAND ROAD IN SPRINGFIELD TOWNSHIP, NEW JERSEY, IS TARGETED FOR LIVESTOCK MANAGEMENT PRACTICES. THE SITE IS LOCATED ADJACENT TO EQUINE FACILITIES.
2. THE ACCESS RAMP SHOULD BE USED ONLY ON STABLE STREAM CHANNELS NOT SUBJECT TO CHANNEL DOWNCUTTING.
3. SURFACING MATERIAL SHALL BE COMPACTED SO THAT THE ENTIRE SURFACE IS TRAVERSED BY NOT LESS THAN ONE TREAD TRACK OF THE LOAD HAULING EQUIPMENT.
4. DIVERSION BERM SHALL BE CONSTRUCTED TO DIRECT SURFACE FLOW AWAY FROM EXCAVATED RAMP, AS DIRECTED BY THE ENGINEER.
5. ALL DISTURBED AREAS NOT COVERED BY GRAVEL SHALL BE SEEDED IN ACCORDANCE WITH CRITICAL AREA PLANTING STANDARD (PRACTICE CODE 342).
6. EXCAVATED MATERIAL SHALL BE REMOVED FROM SITE, USED FOR DIVERSION BERM, OR PLACED AT LEAST 12 FEET FROM TOP EDGE OF BACK SLOPE AND SPREAD SO THAT THE HEIGHT DOES NOT EXCEED 1 FOOT.
7. STREAM CROSSING CULVERTS SHOULD BE CONSTRUCTED ON A STRAIGHT UNOBSTRUCTED SEGEMENT OF STREAM.
8. APPROPRIATE EROSION AND SEDIMENT CONTROLS, INCLUDING SILT FENCING AND/OR STRAW BALES, SHOULD BE INSTALLED PARALLEL TO THE STREAM TO PREVENT DOWNSTREAM IMPACTS.



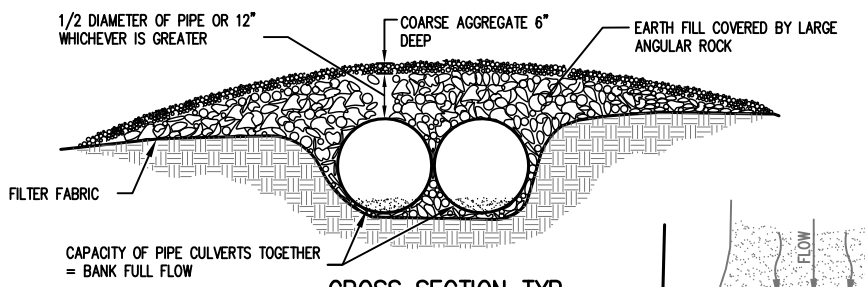
CROSS SECTION TYP



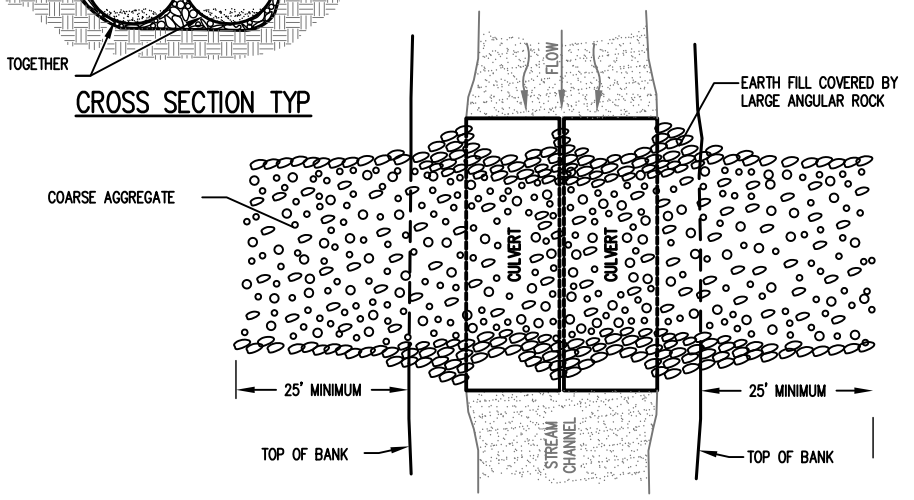


ISOMETRIC VIEW TYP

1/7 WATERWAY ACCESS DETAILS
N.T.S.



CROSS SECTION TYP



PLAN VIEW TYP

2/7 STREAM CROSSING DETAILS
N.T.S.

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

DESIGNED JRT | CHECKED CCO | APPROVED CCO | DATE

ASSISCUNK CREEK WATERSHED RESTORATION AND PROTECTION PLAN
NJDEP 319h GRANT

LIVESTOCK MANAGEMENT DETAILS
SHEET 7

RUTGERS COOPERATIVE EXTENSION
WATER RESOURCES PROGRAM
14 COLLEGE FARM ROAD
NEW BRUNSWICK, NJ 08901
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