Appendix D – CT DEEP Water Quality and Stormwater Fact Sheet Summaries

This Appendix presents the summaries of the CT DEEP Water Quality and Stormwater Fact Sheets for each town or city within the Pequabuck River Watershed: the City of Bristol, Town of Burlington, Town of Farmington, Town of Harwinton, Town of Plainville, Town of Plymouth, and the Town of Wolcott. The complete versions of these fact sheets can be found on the CT DEEP website under "Environmental Quality - Water Quality" (CT DEEP, 2017).

Bristol

About half of Bristol's area contains impervious surfaces that cover between 12-100% of the land, per acre. Land with at least 12% impervious cover is likely contributing stormwater to streams in quantities that are high enough to negatively impact water quality. Several TMDLs and strategies apply to this city in efforts to combat pollutants including bacteria, nitrogen, mercury, and phosphorus in several waterbodies such as Coppermine Brook, Poland River, and the Pequabuck River. Annual stormwater monitoring data for Bristol spans from 2004-2013 over eight sampling events.

- A large spike in 2005 contained *E. coli* levels that were "too numerable to count". In the MS4 permit, *E. coli* results greater than 410 CFU/100 ml in other places other than designated swimming areas require a follow-up investigation. All annual maximum *E. coli* values exceeded this standard; the lowest maximum value was 900 CFU/100 ml in 2006.
- Average total suspended solids (TSS) values for Bristol ranged from 6-71 mg/L throughout the sampling period. Six out of eight years were below the average MS4 stormwater result for TSS reported by all towns covered by the permit of 48 mg/L.
- Any total nitrogen (TN) value that exceeds 2.5 mg/L requires follow-up investigation in order to prevent low oxygen conditions in the Long Island Sound. Bristol yielded four years with maximum TN values below this threshold.
- Total phosphorus (TP) values exceeding 0.3 mg/L require follow-up investigations. Bristol yielded six years beneath this threshold, with only 2006 and 2007 surpassing it. Average TP values remained around 0.05-0.07 mg/L between 2011-2013.
- Turbidity values should not exceed 5 NTU above ambient levels. Average turbidity levels in Bristol measured between 4-22 NTU except for a spike in 2008 which yielded 55 NTU. Since this spike, levels remained below 17 NTU.

Burlington

Only 5% of Burlington's area contains impervious surfaces that cover between 12-100% of the land, per acre. Land with at least 12% impervious cover is likely contributing stormwater to streams in quantities that are high enough to negatively impact water quality. Several TMDLs and strategies apply to this town in efforts to combat pollutants including bacteria, nitrogen, mercury, and phosphorus in several waterbodies such as Coppermine Brook, Poland River, and the Pequabuck River. Annual stormwater monitoring data for Burlington spans from 2007-2013 over seven sampling events.

- A spike in 2009 contained average *E. coli* levels of 1290 CFU/100 ml, much higher than the previous years' averages between 21-128 CFU/100 ml. Since then, *E. coli* concentrations consistently decreased yearly. In the MS4 permit, *E. coli* results greater than 410 CFU/100 ml in other places other than designated swimming areas require a follow-up investigation. Three annual maximum *E. coli* values exceeded this standard, ranging from 910-2910 CFU/100 ml.
- Average total suspended solids (TSS) values for Burlington ranged from 4-31 mg/L throughout the sampling period, each below the average MS4 stormwater result for TSS reported by all towns covered by the permit of 48 mg/L.

- Any total nitrogen (TN) value that exceeds 2.5 mg/L requires follow-up investigation in order to prevent low oxygen conditions in the Long Island Sound. Burlington yielded all but one event with maximum TN values below this threshold; in 2013, a maximum TN value of 5.9 was obtained.
- Total phosphorus (TP) values exceeding 0.3 mg/L require follow-up investigations. All sampling events yielded results beneath this threshold. Average TP values spanned 0.23-0.12 between 2007-2013.
- Turbidity values should not exceed 5 NTU above ambient levels. Average turbidity levels in Burlington hovered around 2 NTU except for a spike in 2008 which yielded 11 NTU.

Farmington

About a quarter of Farmington's area contains impervious surfaces that cover between 12-100% of the land, per acre. Land with at least 12% impervious cover is likely contributing stormwater to streams in quantities that are high enough to negatively impact water quality. Several TMDLs and strategies apply to this city in efforts to combat pollutants including bacteria, nitrogen, mercury, and phosphorus in several waterbodies such as Coppermine Brook, Poland River, and the Pequabuck River. Annual stormwater monitoring data for Farmington spans from 2004-2013 over nine sampling events.

- Average *E. coli* values generally ranged from 1100-11,000 CFU/100 ml, though a spike in 2009 yielded an average value of about 21,000 CFU/100 ml. In the MS4 permit, *E. coli* results greater than 410 CFU/100 ml in other places other than designated swimming areas require a follow-up investigation. All annual maximum *E. coli* values exceeded this standard; the lowest maximum value was 2825 CFU/100 ml in 2007.
- Average total suspended solids (TSS) values for Farmington ranged from 4-105 mg/L throughout the sampling period. Six out of nine years were below the average MS4 stormwater result for TSS reported by all towns covered by the permit of 48 mg/L.
- Any total nitrogen (TN) value that exceeds 2.5 mg/L requires follow-up investigation in order to prevent low oxygen conditions in the Long Island Sound. Farmington yielded two years with maximum TN values below this threshold. The remainders ranged from 2.84-5.06 mg/L.
- Total phosphorus (TP) values exceeding 0.3 mg/L require follow-up investigations. Farmington yielded two years beneath this threshold, with only 2006 and 2012 clearing it.
- Turbidity values should not exceed 5 NTU above ambient levels. Average turbidity levels in Farmington measured between 7-59 NTU except for a spike in 2008 which yielded 156 NTU. Since this spike, levels remained below 27 NTU.

Harwinton

Only 4% of Harwinton's area contains impervious surfaces that cover between 12-100% of the land, per acre. Land with at least 12% impervious cover is likely contributing stormwater to streams in quantities that are high enough to negatively impact water quality. Several TMDLs and strategies apply to this city in efforts to combat pollutants including bacteria, nitrogen, mercury, and phosphorus in several waterbodies such as Coppermine Brook, Poland River, and the Pequabuck River. Annual stormwater monitoring data for Harwinton was not included in the Fact Sheet, as it does not fall under the MS4 General Permit and therefore not required to be monitored.

Plainville

About half (54%) of Plainville's area contains impervious surfaces that cover between 12-100% of the land, per acre. Land with at least 12% impervious cover is likely contributing stormwater to streams in quantities that are high enough to negatively impact water quality. Several TMDLs and strategies apply to this city in efforts to combat pollutants including bacteria, nitrogen, mercury, and phosphorus in several waterbodies such as Coppermine Brook, Poland River, and the Pequabuck River. Annual stormwater monitoring data for Plainville spans from 2004-2014 over nine sampling events.

- Average *E. coli* values generally ranged from 50-10,000 CFU/100 ml, though a spike in 2005 yielded an average value of about 134,000 CFU/100 ml. In the MS4 permit, *E. coli* results greater than 410 CFU/100 ml in other places other than designated swimming areas require a follow-up investigation. All but one annual maximum *E. coli* value exceeded this standard; the lowest maximum value was 109 CFU/100 ml in 2012.
- Average total suspended solids (TSS) values for Plainville ranged from 20-61 mg/L throughout the sampling period. Six out of nine years were below the average MS4 stormwater result for TSS reported by all towns covered by the permit of 48 mg/L.
- Any total nitrogen (TN) value that exceeds 2.5 mg/L requires follow-up investigation in order to prevent low oxygen conditions in the Long Island Sound. Plainville yielded one year (2011) with a maximum TN value below this threshold. The remainders ranged from 2.76-19.58 mg/L.
- Total phosphorus (TP) values exceeding 0.3 mg/L require follow-up investigations. Plainville yielded four years beneath this threshold. 2012 experienced a spike denoting a 12 mg/L maximum sample and a mean of 2.07 mg/L.
- Turbidity values should not exceed 5 NTU above ambient levels. Average turbidity levels in Plainville measured between 6-48 NTU. Average turbidity has remained below 10 NTU since 2012 in Plainville.

<u>Plymouth</u>

Only 13% of Plymouth's area contains impervious surfaces that cover between 12-100% of the land, per acre. Land with at least 12% impervious cover is likely contributing stormwater to streams in quantities that are high enough to negatively impact water quality. Several TMDLs and strategies apply to this city in efforts to combat pollutants including bacteria, nitrogen, mercury, and phosphorus in several waterbodies such as Coppermine Brook, Poland River, and the Pequabuck River. Annual stormwater monitoring data for Plymouth is very limited, spanning from 2006-2007 over two sampling events.

- Average *E. coli* values ranged from 268,000-400,000 CFU/100 ml. In the MS4 permit, *E. coli* results greater than 410 CFU/100 ml in other places other than designated swimming areas require a follow-up investigation. All annual maximum *E. coli* values exceeded this standard; each sampling event yielded at least one sample with an *E. coli* quantity that was "too numerous to count".
- Average total suspended solids (TSS) values for Plymouth ranged from 6-27 mg/L throughout the sampling period, placing both years below the average MS4 stormwater result for TSS reported by all towns covered by the permit of 48 mg/L.
- Any total nitrogen (TN) value that exceeds 2.5 mg/L requires follow-up investigation in order to prevent low oxygen conditions in the Long Island Sound. Plymouth yielded one year with a maximum TN value below this threshold. The remainder was 3.54 mg/L in 2006.
- Total phosphorus (TP) values exceeding 0.3 mg/L require follow-up investigations. In 2007, Plymouth cleared this threshold with a maximum value of 0.2 mg/L of TP. In 2006, this maximum exceeded the standard at 0.32 mg/L.
- Turbidity values should not exceed 5 NTU above ambient levels. Average turbidity levels in Plymouth measured between 20-22 NTU in 2006-2007. The standard deviations for each year were quite high, at around 21-29 NTU, respectively.

Wolcott

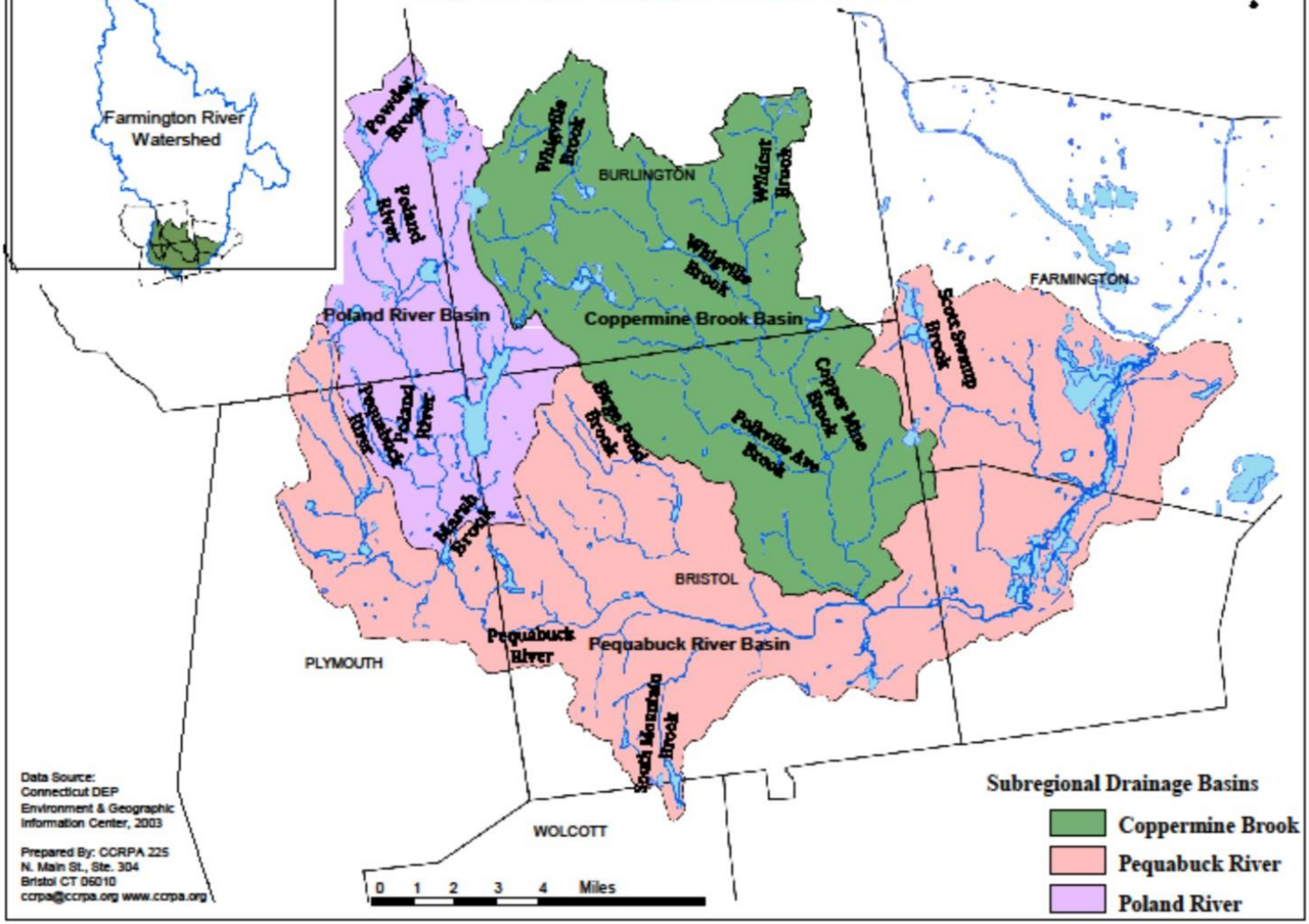
Less than a quarter (19%) of Wolcott's area contains impervious surfaces that cover between 12-100% of the land, per acre. Land with at least 12% impervious cover is likely contributing stormwater to streams in quantities that are high enough to negatively impact water quality. Several TMDLs and strategies apply to this city in efforts to combat pollutants including bacteria, nitrogen, mercury, and phosphorus in several waterbodies such as Coppermine Brook, Poland River, and the Pequabuck River. Annual stormwater monitoring data for Wolcott spans from 2008-2014 over nine sampling events.

- Average *E. coli* values generally ranged from 38-137,000 CFU/100 ml. Three sampling events in 2008, 2009, and 2010 yielded averages around 137,000 as their maximum values were "too numerous to count" while the remaining events yielded mean *E. coli* quantities under 1,100 CFU/100 ml. In the MS4 permit, *E. coli* results greater than 410 CFU/100 ml in other places other than designated swimming areas require a follow-up investigation. All annual maximum *E. coli* values but one exceeded this standard; the lowest maximum value was 100 CFU/100 ml in October 2010.
- Average total suspended solids (TSS) values for Wolcott ranged from 16-190 mg/L throughout the sampling period. Four out of nine sampling events were below the average MS4 stormwater result for TSS reported by all towns covered by the permit of 48 mg/L.
- Any total nitrogen (TN) value that exceeds 2.5 mg/L requires follow-up investigation in order to prevent low oxygen conditions in the Long Island Sound. Wolcott yielded six events with maximum TN values below this threshold. The remainders ranged from 4.18-10.32 mg/L and occurred between 2008-2010.
- Total phosphorus (TP) values exceeding 0.3 mg/L require follow-up investigations. Wolcott yielded five events beneath this threshold.
- Turbidity values should not exceed 5 NTU above ambient levels. Average turbidity levels in Wolcott generally ranged between 12-54 NTU except for a spike in 2012 which yielded 244 NTU.

Appendix E – Pequabuck River Watershed Association Existing BMP Tour Pamphlet

Map1. Pequabuck River Watershed

Regional and Subregional Drainage Basins



Best Management Practices Tour

of the Pequabuck River Watershed

5 October 2019

Itinerary

1. **Middle Street /Brass Mill Dam Removal** Laura A.S. Wildman, P.E., Director, New England Regional Office Princeton Hydro, Water Resources and Fisheries Engineer

2. **Southeast Business Park Stormwater Management Area**
   Carol Noble. P.E., Environmental Engineer, City of Bristol

3. **Low Impact Development – Commercial Site, Barnes Nature Center**
   Scott Heth, Executive Director Environmental Learning Centers of Connecticut

   Sedimentation Basins and Catch Basin Sumps Discussion on the bus ride.
   Vortech stormwater catch basin/screen. Ray Rogozinski, P.E., City Engineer, City of Bristol

4. **Rockwell Park Interventions – Fish Weirs** Carl Swanson, charter member of PRWA, Trout-in-the-Classroom Coordinator, Farmington Valley Trout Unlimited

5. **Rockwell Park Interventions – Slope Protection** Ray Rogozinski, P.E., City Engineer, City of Bristol

Addendum

1. Floodplain and Wetland Land Acquisition – Plainville
2. 3 Wastewater Treatment Plants on the Pequabuck River
3. Drop-Box Drug Disposal & Public Education Program
4. Best Management Practices for Disposal of Snow Accumulations from Roadways and Parking Lots

Middle Street / Bristol Brass Dam Removal

Location: The Middle Street Dam, also known as the Bristol Brass Dam, is located at the southwest corner of the junction of Routes 72 and 229, just upstream of the Middle Street Bridge in Bristol, Connecticut.

Description: The current dam was built in the late 1960s by the Connecticut Department of Transportation, replacing the original granite dam used to divert water to the Bristol Brass Company. The dam is owned by the Connecticut Department of Transportation (ConnDOT) and is registered with the Connecticut Department of Energy and Environmental Protection (CT DEEP). It is a seven (7) foot high concrete spillway that extends ninety-five (95) feet from bank to bank, across the Pequabuck River. The dam/spillway is founded on bedrock that extends upstream throughout most of the impoundment, beneath the impounded sediment. The dam does not serve any flood control function and provides little to no aesthetic or significant historical value to the area.

Problem: The dam is the first full barrier to migratory fish swimming upstream from Long Island Sound, that prevents fish from accessing approximately 8.5 miles of in-stream habitat. In addition, contaminated sediments have built up behind the dam over time, creating a habitat quality issue.

Project Goals:
- Movement of river herring, sea lamprey and other species
- Restoration of uninterrupted habitat
- Reintroduction of streamside vegetative buffers
- Future establishment of environmentally sensitive river access
- Addressing the presence of pollutants within the impounded sediment

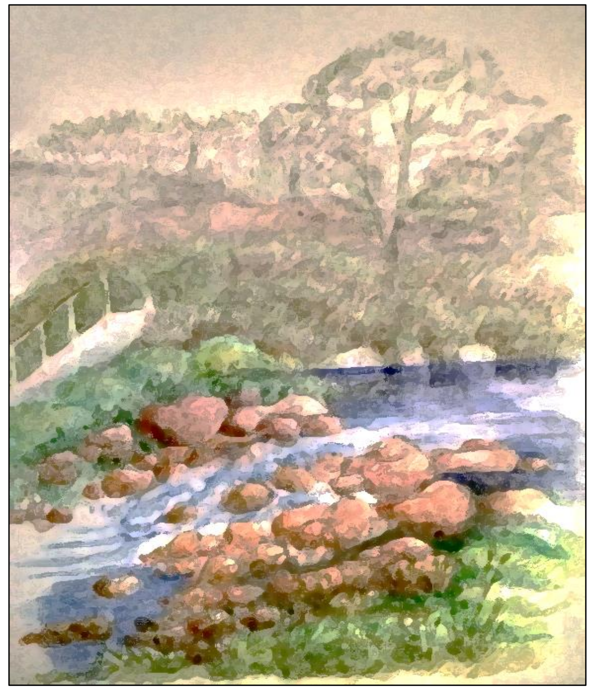
Project Partners: Central Connecticut Regional Planning Agency (now defunct), Long Island Sound Futures Fund, City of Bristol, Connecticut Department of Energy and Environmental Protection (CT DEEP), Pequabuck River Watershed Association (PRWA), Farmington River Watershed Association (FRWA), Lower Farmington River/Salmon Brook Wild & Scenic Study, Trout Unlimited, American Rivers, and Princeton Hydro Engineering, PC.

Project Costs to Date: approximately $100,000

Projected Costs for Completion: approximately $770,000 based on 2014 estimates for construction and oversight

Project History: The City of Bristol and The Central Connecticut Planning Agency (CCRPA) worked for 15 years to initiate the removal of the Middle Street Dam. With a Long Island Sound Futures Fund grant administered by CT DEEP, the City and the CCRPA contracted Princeton Hydro Engineering, PC to design the dam removal. The plans were drawn up in 2010 and dam removal was slated to take place with the construction of the route 72 extension. The project stalled when the CCRPA was dismantled by the governor and the additional funding to complete the project did not come through as expected.

The Middle Street or Bristol Brass



Features of Proposed Dam Removal

Engineering Study: In 2010, Princeton Hydro performed a geomorphic assessment of the Pequabuck River in the vicinity of the dam. A visual assessment of the streambed substrate was conducted as well as assessment of impounded material directly upstream of the dam. Hydrology and hydraulics analysis was conducted by Princeton Hydro to inform feasibility of the design by assessing changes in flood elevations, fish passage conditions, as well impacts to adjacent structures. Storm flow conditions were examined to identify changes to the upstream water surface elevation during high flows under post dam removal conditions. Initial soil sampling was performed in 1999, but was updated 2010, and the project permit applications were submitted to both CT DEEP and the Army Corps of Engineers. In addition, an abandoned pipeline crossing, just upstream of the dam, which also acted as a passage barrier, was removed.

Project Design: The project calls for demolition of the existing dam and installation of rock stabilization along the base of the Route 72 retaining wall and streamside vegetation buffers. The concrete apron, extending below the spillway under the bridge will remain in place for structural stability of the bridge.

Parallel Projects: One partial obstruction to fish passage and one large dam with a working fish ladder are located on the Farmington River downstream of its confluence with the Pequabuck. The large dam is the Rainbow Dam and it is the first dam on the Farmington River. It has a fishway, actively maintained and managed by the CT DEEP. The second structure on the Farmington is the Winchell Smith Dam, which is a low head dam and creates only a partial barrier to fish passage. A fishway design has been prepared for the Winchell Smith Dam but has been on hold pending barrier removal or barrier lowering discussions with the dam's owner. The Spoonville Dam, between the Rainbow and Winchell Smith Dams was fully removed in 2012 in an effort spearheaded by Farmington River Watershed Association.

SOUTHEAST BUSINESS PARK

STORMWATER MANAGEMENT AREA - Bristol

Location: Business Park Drive, Bristol, CT

Date Implemented: June 2017 (mitigation expansion)

Cost: $52,300 (expansion project)

Engineering and Design by: Milone MacBroom

Construction by: Tabacco & Son Builders Inc.

Problem: This Business development areas on Business Park Drive. Stormwater management, including water quantity and water quality improvements and wetland mitigation to support

Remediation: The 2017project included the expansion of the mitigation area, constructed as part of a regional stormwater management system for the business park property development. The regional system consists of an underground storm drain pipes to divert stormwater runoff into the detention pond, designed for both water quality and water quantity treatment. The detention pond discharges to the adjacent wetland mitigation area, which adds additional treatment and storage, prior to discharge to surface waters.

The wetland mitigation project was performed over two periods (2006 and 2017) to compensate for filling of isolated seasonally flooded wetland pockets. The mitigation area was last expanded in Spring 2017 to provide a 2:1 ratio of compensatory area. Using soil borings to determine groundwater elevations, the area was excavated so that it would be supported by a combination of groundwater and surface water flows. Native species were planted, including red maple and pin oak saplings, silky dogwood, steeplebush, and meadow sweet shrubs, as well as herbaceous plants, such as woolgrass, soft rush, sensitive and royal fern, boneset, green bulrush. Seeding included a wet mix and conservation/wildlife mix.

Summary: The constructed detention pond and wetland systems provide a regional stormwater infrastructure to support the development of business lots for Bristol commerce and employment. The systems have successfully been established and are assessed and maintained by City for invasive species management, trimming, and structure maintenance.

Low Impact Development – Commercial Site

Barnes Nature Center - Bristol

Location: 175 Shrub Road, Barnes Nature Center, Environmental Learning Centers of Connecticut

Partners: City of Bristol Engineering Department and Inland/Wetlands Board, Robert Hiltbrand Civil Engineering

Engineering and Design: Robert Hiltbrand Engineering

Project: Environmental Learning Centers of Connecticut applied in 2001 for an Inland Wetlands permit to expand the Barnes Nature Center. The information below is from that application. The expansion more than doubled the foot print of the building and the impervious surface of the parking lot. A low impact development design was implemented for the property development.

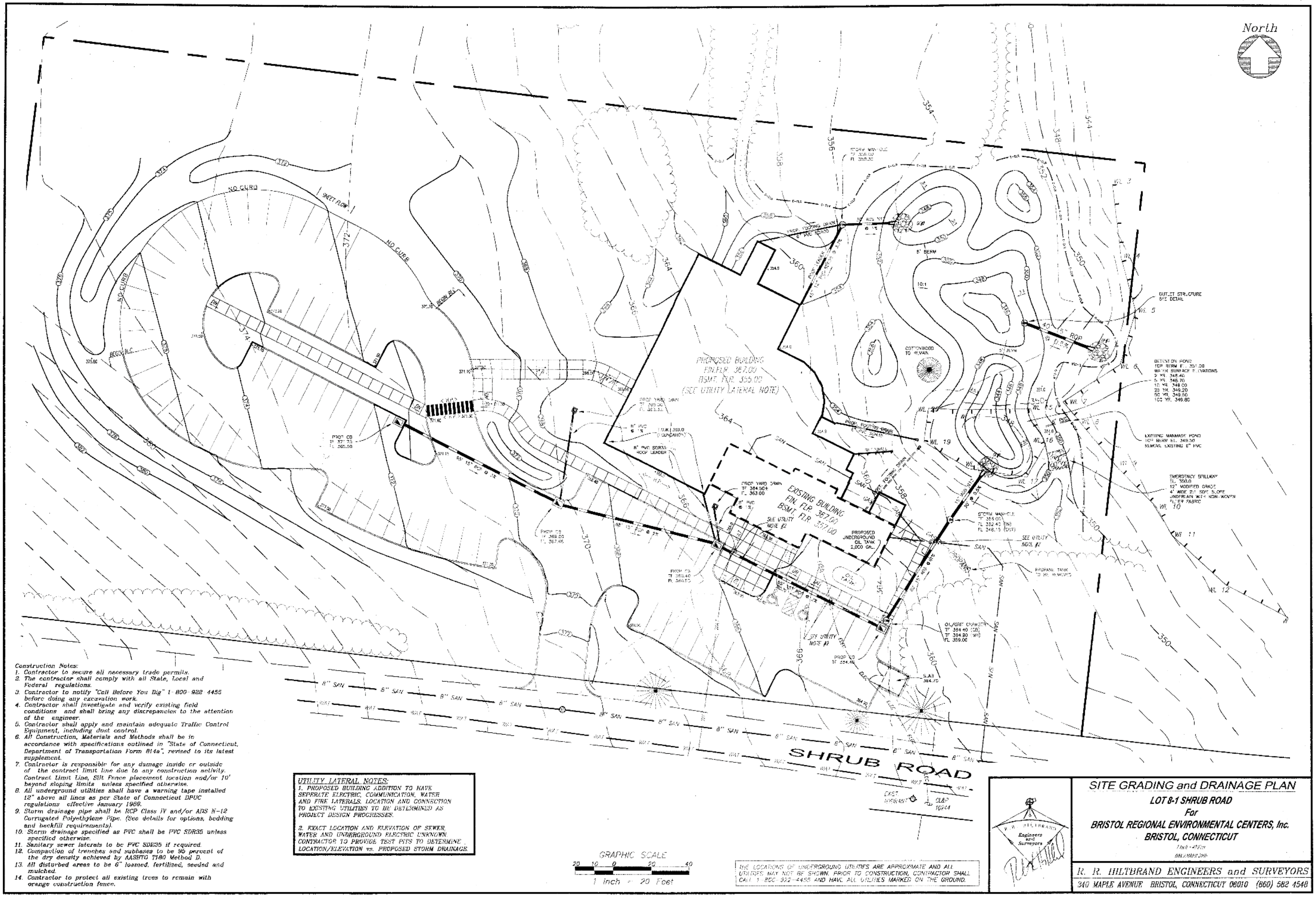
Purpose: Land Development alters the natural hydrologic cycle and storm water management. Low Impact Development (LID) reduces the quantity impacts of storm water (flooding, erosion, property loss, etc.), as well as the water quality impacts by removing pollutants through natural processes such as filtering. LID installations occur with the original building or expansion of property. Thereby, LID installations save planning and engineering costs and, typically, are more effective solutions than retro-fitting installations into the landscape of an existing property.

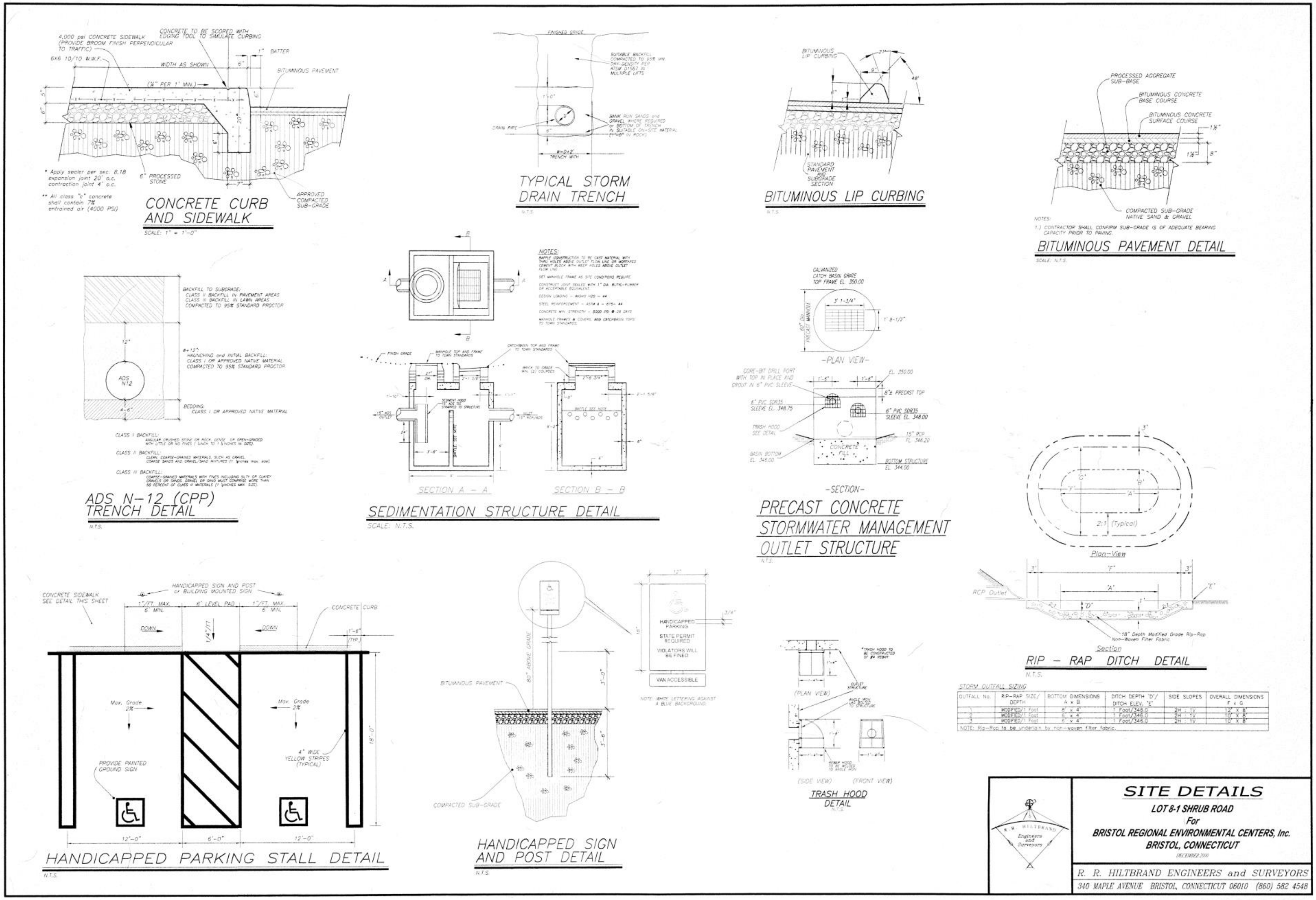
Description: Parking lot runoff and roof runoff drain to a series of stormwater wetlands in the rear of the lot down a steep incline (a 16' drop in elevation from the parking lot to the wetlands). The stormwater wetlands are staged such that the largest retention pond receives the largest quantity of runoff and contains a spillway into the middle detention pond, which itself has an outflow pipe draining to the wooded area of the property. The smallest retention pond receives the least amount of piped runoff.

A grit and oil screen has been installed at the juncture of pipe exiting the parking lot. A rain garden exists on the west side of the building.

Next steps: Current property manager has been alerted to the existence of the grit/oil screen and will plan for its cleaning.

Suggestions for enhancements: Possible green infrastructure installation in the northeast corner where the roof leader does not connect to the backyard wetlands but drains at the corner of the building. Either a rain garden or a wall garden may be good choices.


North
NO CURB
SHEET FLOW
PROPOSED BUILDING
FIN.FLR. 367.00
BSMT. FLR. 355.00
(SEE UTILITY LATERAL NOTE)
EXISTING BUILDING
FIN. FLR. 367.00
BSMT. FLR. 357.00
PROPOSED UNDERGROUND OIL TANK 2,000 GAL.
SEE UTILITY NOTE #2
SHRUB ROAD
8" SAN
WAT
EXIST. HYDRANT
CL&P 10244
GRAPHIC SCALE
1 inch = 20 Feet
Construction Notes:
1. Contractor to secure all necessary trade permits.
2. The contractor shall comply with all State, Local and Federal regulations.
3. Contractor to notify "Call Before You Dig" 1-800-922-4455 before doing any excavation work.
4. Contractor shall investigate and verify existing field conditions and shall bring any discrepancies to the attention of the engineer.
5. Contractor shall apply and maintain adequate Traffic Control Equipment, including dust control.
6. All Construction, Materials and Methods shall be in accordance with specifications outlined in "State of Connecticut, Department of Transportation Form 814a", revised to its latest supplement.
7. Contractor is responsible for any damage inside or outside of the contract limit line due to any construction activity. Contract Limit Line, Silt Fence placement location and/or 10' beyond sloping limits unless specified otherwise.
8. All underground utilities shall have a warning tape installed 12" above all lines as per State of Connecticut DPUC regulations effective January 1989.
9. Storm drainage pipe shall be RCP Class IV and/or ADS N-12 Corrugated Polyethylene Pipe. (See details for options, bedding and backfill requirements).
10. Storm drainage specified as PVC shall be PVC SDR35 unless specified otherwise.
11. Sanitary sewer laterals to be PVC SDR35 if required.
12. Compaction of trenches and subbases to be 95 percent of the dry density achieved by AASHTO T180 Method D.
13. All disturbed areas to be 6" loamed, fertilized, seeded and mulched.
14. Contractor to protect all existing trees to remain with orange construction fence.
UTILITY LATERAL NOTES:
1. PROPOSED BUILDING ADDITION TO HAVE SEPERATE ELECTRIC, COMMUNICATION, WATER AND FIRE LATERALS. LOCATION AND CONNECTION TO EXISTING UTILITIES TO BE DETERMINED AS PROJECT DESIGN PROCRESSES.
2. EXACT LOCATION AND ELEVATION OF SEWER, WATER AND UNDERGROUND ELECTRIC UNKNOWN. CONTRACTOR TO PROVIDE TEST PITS TO DETERMINE LOCATION/ELEVATION vs. PROPOSED STORM DRAINAGE.
THE LOCATIONS OF UNDERGROUND UTILITIES ARE APPROXIMATE AND ALL UTILITIES MAY NOT BE SHOWN. PRIOR TO CONSTRUCTION, CONTRACTOR SHALL CALL 1-800-922-4455 AND HAVE ALL UTILITIES MARKED ON THE GROUND.
R. R. HILTBRAND Engineers and Surveyors
SITE GRADING and DRAINAGE PLAN
LOT 8-1 SHRUB ROAD
For
BRISTOL REGIONAL ENVIRONMENTAL CENTERS, Inc.
BRISTOL, CONNECTICUT
R. R. HILTBRAND ENGINEERS and SURVEYORS
340 MAPLE AVENUE BRISTOL, CONNECTICUT 06010 (860) 582 4540



STORM OUTFALL SIZING

OUTFALL No.	RIP-RAP SIZE/ DEPTH	BOTTOM DIMENSIONS A x B	DITCH DEPTH "D"/ DITCH ELEV. "E"	SIDE SLOPES	OVERALL DIMENSIONS F x G
1	MODIFIED/1 Foot	8' x 4'	1 Foot/346.0	2H : 1V	12' X 8'
2	MODIFIED/1 Foot	6' x 4'	1 Foot/346.0	2H : 1V	10' X 8'
3	MODIFIED/1 Foot	6' x 4'	1 Foot/346.0	2H : 1V	10' X 8'

NOTE: Rip-Rap to be underlain by non-woven filter fabric.

Erosion & Sediment Controls and Stabilization Practices

a. Temporary seeding.
b. Mulching.
c. Stone Rip-rap.

During construction, sheet runoff from the site will be filtered through haybale barriers and silt fences. All storm drain inlets shall be provided with barrier filters. Stone rip-rap shall be provided at the outlets of drainage pipe in which erosive velocities are encountered.

Off Site Vehicle Tracking

Stabilized construction entrances will be installed at all proposed entrances.

Installation, Maintenance and Inspection Procedures of Erosion & Sediment Controls

A. General–

These are the general inspection and maintenance practices that will be used to implement the plan.

- The smallest practical portion of the site will be denuded at one time.
- All erosion control measures will be inspected at least once a week and following any storm event of 0.25 inches or greater.
- All measures will be maintained in good working order; if a repair is necessary, it will be initiated within 24 hours of the report.
- Built up sediment will be removed from the silt fence or haybale barriers when it has reached one third the height of the of the fence or barrier.
- A maintenance inspection report will be made after each inspection.
- The contracter's site superintendent will be responsible for inspections, maintenance and repair activities, and completing the inspection and maintenance report.
- R.R. Hiltbrand Engineers & Surveyors shall inspect the site on a periodic basis to assure compliance with the plan.

B. Filters –

1. Straw/ haybales

a. Sheet Flow Applications
1. Bales shall be placed in a single row , lengthwise on the contour, with the ends of the adjacent bales tightly abutting one another.

2. All bales shall be either wire bound or string tied. Bales shall be installed so that the bindings are oriented around the sides rather than along the tops and bottoms of the bales to prevent deterioration of the bindings.

3. The barrier shall be entrenched and backfilled. A trench shall be excavated the width of a bale and the length of the proposed barrier to a minimum depth of (4) inches. After the bales are staked and chinked, the excavated soil shall be backfilled against the barrier. Backfill soil shall conform to the ground level on the downhill side and shall be built-up to (4) inches against the uphill side of the barrier. Ideally, bales should be placed ten (10) feet away from the toe of slope.

4. Each bale shall be securely anchored by at least two (2) stakes or rebars driven through the bale. The first stake in each bale shall be driven toward the previously laid bale to force the bales together. Stakes and rebars shall be driven deep enough into the ground to securely anchor the bales.

5. The gaps between bales shall be chinked (filled by wedging) with straw/hay to prevent water from escaping between the bales.

2. Silt Fence
a. Synthetic filter fabric shall be a pervious sheet of propylene, nylon, polyester or ethylene yarn and shall be certified by the manufacturer or supplier as conforming to the following requirements.

Physical PropertyTestRequirements

Filtering EfficiencyVTM-5175% minimum

Tensile Strength atVTM-52Extra Strength
25% max. elongation*50 lb/ L in. (min.)

Standard Strength
30 lb/ L in. (min.)

Flow RateVTM-510.3 gal./s.f./min.(min)

* Requirements reduced by 50% after six (6) months of installation

Synthetic filter fabric shall contain ultraviolet ray inhibitors and stabilizers to provied a minimum of six (6) months of expected usable construction life at a temperature range of 0o F to 120o F.

b. The height of a silt fence shall not exceed thirty-six (36) inches.

c. The filter fabric shall be purchased in a continuous roll cut to the length of the barrier to avoid the use of joints. When joints are necessary, filter cloth shall be spliced together only at the support posts, with a min. six (6) inch overlap, and securely sealed.

d. Posts shall be spaced a maximum of ten (10) feet apart at the barrier location and driven securely into the ground (min. of 12 inches).

e. A trench shall be excavated approximately four (4) inches wide and four (4) inches deep along the line of posts and upslope from the barrier.

f. When 'standard strength' filter fabric is used, a wire mesh support fence shall be fastened securely to the upslope side of the posts using heavy duty wire staples at least one inch long, tie wires or hog rings. The wire shall extend no more than 36 inches above the original ground surface.

g. The ' standard strength' filter fabric shall be stapled or wired to the fence, and eight (8) inches of the fabric shall be extended into the trench. The fabric shall not extend more than 36 inches above the original ground surface.

h. When 'extra strength' filter fabric and closer post spacing are used, the wire mesh support fence may be eliminated. In such a case the filter fabric is stapled or wired directly to the posts with all other provisions of item g applying.

i. The trench shall be backfilled and the soil compacted over the filter fabric.

j. Silt fences shall be removed when they have served their useful purpose, but not before the upslope areas have been permanently stabilized.

Sequence of Installation

Sediment barriers shall be installed prior to any soil disturbance of the contributing drainage area above them.

Maintenance

a. Straw/ haybale barrier and silt fence barriers shall be inspected immediately after each rainfall and at least daily during prolonged rainfall. They shall be repaired if there are any signs of erosion or sedimentation below them. Any required repairs shall be made immediately. If there are signs of undercutting at the center or the ends, or impounding of large volumes of water behind them, sediment barriers shall be replaced with a temporary check dam.

b. Should the fabric on a silt fence or filter barrier decompose or become ineffective prior to the end of the expected usable life and the barrier still is necessary, the fabric shall be replaced promptly.

c. Sediment deposits should be removed after each storm event. They must be removed when deposits reach approximately (1/3) the height of the barrier.

d. Any sediment deposits remaining in place after the silt fence or filter barrier is no longer required shall be dressed to conform to the existing grade, prepared and seeded.

C. Mulching

1. Timing

In order for mulch to be effective, it must be in place prior to major storm events There are two (2) types of standards which shall be used to assure this.

a. Apply mulch prior to any storm event.

This is applicable when working within 100 feet of wetlands. It will be necessary to closely monitor weather predictions, usually by contacting the National Weather Service in Massachusetts (508- 822- 0634), to have adequate warning of significant storms.

b. Required mulching within a specified time period.

The time period can range from 14 to 21 days of inactivity on an area, the length of time varying with site conditions. Professional judgement shall be used to evaluate the interaction of site conditions (soil erodibility, season of year, extent of disturbance, proximity to sensitive resources, etc.) and the potential impact of erosion on adjacent areas to choose an appropriate time restriction.

2. Guidelines for winter mulch application.

When mulch is applied to provide protection over winter (past the growing season) it shall be at a rate of 6000 lb. of hay or straw per acre. Attackifier may be added to the mulch.

3. Maintenance

All mulches must be inspected periodically, in particular after rain storms, to check for erosion. If less than 90% of the soil surface is covered by mulch, additional mulch shall be immediately applied.

D. Temporary Grass Cover

1. Seedbed Preparation

Apply fertizer at the rate of 600 lb. / acre of 10-10-10. Apply limestone (equivalent to 50% calcium plus magnesium oxide) at a rate of (3) tons/ acre.

2. Seeding

a. Utilize annual rye grass at a rate of 40 lb./ acre.

b. Where the soil has been compacted by construction operations, loosen soil to a depth of two (2) inches before applying fertilizer, lime and seed.

c. Apply seed uniformly by hand, cyclone seeder, or hydroseeder (slurry including seed and fertilizer). Hydroseedings, which include mulch, may be left on soil surface. Seeding rates must be increased 10% when hydroseeding.

3. Maintenance

Temporary seedings shall be periodically inspected. At a minimum, 95% of the soil surface shall be covered by vegetation. If any evidence of erosion or sedimentation is apparent, repairs shall be made and other temporary measures used in the interim (mulch, filter barriers, check dams, etc.).

E. Storm Drain Inlet Protection

1. Straw Bale Inlet Structure

a. Bales shall be either wire bound or string tied with the bindings oriented around the sides rather than over and under the bales.

b. Bales shall be placed lengthwise in a single row surrounding the inlet, with the ends of adjacent bales pressed together.

c. The filter barrier shall be entrenched and backfilled. A trench shall be excavated around the inlet the width of a bale to a minimum depth of four (4) inches. After the bales are staked, the excavated soil shall be backfilled and compacted against the filter barrier.

d. Each bale shall be securely anchored and held in place by at least two (2) stakes or rebars driven through the bale.

e. Loose straw shall be wedged between bales to prevent water from entering between bales.

F.Stabilized Construction Entrance

1. Specifications

a. Aggregate Size: Use two (2) inch stone , or reclaimed or recycled concrete equivalent.

b. Aggregate thickness: Not less than six (6) inches.

c. Width: Ten (10) foot minimum, but not less than the full width of points where ingress or egress acurrs.

d. Length: As required, but not less than one hundred (50) feet.

e. Geotextile: To be placed over the entire area to be covered with aggregate. Piping of surface water under entrance(s) shall be provided as required.

f. Criteria for Geotextile: The fabrics shall be Trevia Spunbound 1135, Mirafi 6000x, or equal.

2. Maintenance

The entrance(s) shall be maintained in a condition which will prevent tracking of sediment onto the public right-of-way. When washing is required, it shall be completed on an area stabilized with aggregate which drains into an approved sediment trapping device. All sediment shall be prevented from entering storm drains, ditches of waterways.

Timing of Controls/ Measures

As indicated in the sequence of Major Activities the haybales and silt fences shall be installed prior to commencing any clearing, demolition or grading of the site. Structural controls shall be installed concurrently with the applicable activity. Area(s) where construction activity temporarily ceases for more than twenty one (21) days will be stabilized with a temporary seed and mulch within fourteen (14) days of the last disturbance. Once construction activity ceases permanently in an area, silt fences and haybale barriers will be removed once permanent measures are established.

Waste Disposal

A. Waste Materials

All waste materials will be collected and stored in securely lidded receptacles. All trash and construction debri from the site will be deposited into a dumpster. No construction waste materials will be buried on site. All personnel will be instructed regarding the correct procedure for waste disposal by the superintendent.

B. Hazardous Waste

All hazardous waste materials will be disposed of in the manner specified by local or state regulation or by the manufacturer. Site personnel will be instructed in the practices by the superintendent.

C. Sanitary Waste

All sanitary waste will be collected from the portable units a minimum of once per week by a licensed sanitary waste management contractor.

Spill Prevention

A. Material Management Practices

The following are the materials management practices that will be used to reduce the risk of spills or other accidental exposure of materials and substances during construction to stormwater runoff:

Good Housekeeping:

The following good housekeeping practices will be followed on site during the construction project:

-An effort will be made to store only sufficient amounts of products to do the job.

-All materials stored on site will be stored in a neat, orderly manner in their proper (original if possible) containers and, if possible, under a roof or other enclosure.

-Manufacturer's recommendations for proper use and disposal will be followed.

-The site superintendent will inspect daily to ensure proper use and disposal of materials.

-Substances will not be mixed with one another unless recommended by the manufacturer.

-When ever possible all of a product will be used up before disposing of the container.

Hazardous Products:

The following practices will be used to reduce the risks associated with hazardous materials:

-Products will be kept in their original containers unless they are not resealable.

-Original labels and material safety data will be retained for important product information.

-Surplus product that must be disposed of will be discarded according to the manufacturer's recommended methods of disposal.

B. Product Specific Practices

The following product specific practices will be followed on site:

Petroleum Products:

All on site vehicles will be monitored for leaks and receive regular preventive maintenance to reduce leakage. Petroleum products will be stored in tightly sealed containers which are clearly labeled. Any asphalt based substances used on site will be applied according to the manufacturer's recommendations.

Fertilizers:

Fertilizers used will be applied only in the minimum amounts directed by the specifications. Once applied, fertilizer will be worked into the soil to limit exposure to stormwater. Storage will be in a covered shed or enclosed trailers. The contents of any partially used bags of fertilizer will be transferred to a sealable plastic bin to avoid spills.

Paints:

All containers will be tightly sealed and stored when not required for use. Excess paint will not be discharged to the storm sewer system but will be disposed of properly according to manufacturer's instructions or state and local regulations.

Concrete Trucks:

Concrete trucks will discharge and wash out surplus concrete or drum wash water in a contained area on site..

C. Spill Control Practices

In addition to good housekeeping and material management practices discussed in the previous section the following practices will be followed for spill prevention and cleanup:

-Manufacturer's recommended methods for spill cleanup will be clearly posted and site personnel will be made aware of the procedures and the location of the information and cleanup supplies.

-Materials and equipment necessary for spill cleanup will be kept in the material storage area on site. Equipment and materials will include but not limited to brooms, dustpans, mops, rags, gloves, goggles, kitty litter, sand, sawdust and plastic or metal trash containers specifically for this purpose.

-All spills will be cleaned up immediately after discovery.

-The spill area will be kept well ventilated and personnel will wear appropriate protective clothing to prevent injury from contact with a hazardous substance.

-Spills of toxic or hazardous material will be reported to the appropriate state or local government agency, regardless of the size.

-The spill prevention plan will be adjusted to include measures to prevent this type of spill from recurring and how to cleanup the spill if it recurs. A description of the spill, its cause, and the cleanup measures will be included.

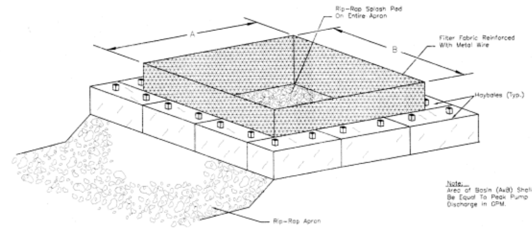
-The site superintendent responsible for day to day operations will be the spill prevention and cleanup coordinator.

Contingency Erosion Plan

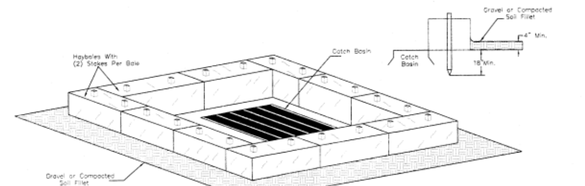
Should unforseen erosion or sedimentation problems arise, the design engineer of record (R.R. Hiltbrand Engineers & Surveyors) and the local enforcement agent shall be notified immediately. An inspection of the affected area(s) shall be promptly performed. A remedial action plan shall be formulated with the local enforcement agent's approval. The site contractor shall then implement the recommended course of action which has been determined by both the engineer and local enforcement agent.

The General Contractor(s) and/or Project Owner(s)

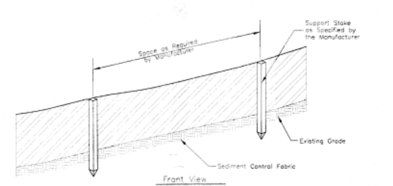
are assigned the responsibility for implementing this erosion and sediment control plan. This responsibility includes the installation and maintenance of control measures, informing all parties engaged on the construction site of the requirements and objectives of the plan, notifying the Planning and Zoning office of any transfer of this responsibility, and for conveying a copy of the Sediment & Erosion Control Plan if the title to the land is transferred.

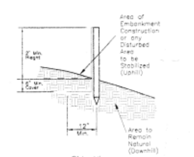


Temporary Sediment Basin For
Dewatering Discharge
N.T.S.



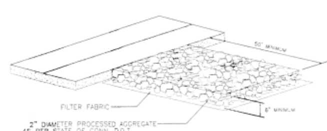
Haybale Inlet Protection
N.T.S.





SILT FENCE
N.T.S.

1. The geotextile fabric shall meet the design criteria for silt fences, of the "Guidelines For Soil Erosion And Sediment Control" Prepared by the Connecticut Council on Soil and Water Conservation, Dated January 1985.
2. The hieght of the barrier shall not exceed 36 inches.
3. When joints are necessary, filter fabric shall be spliced together only at a support post, with a minimum (6) inch overlap, and securley sealed. (See manufactures recommendations)
4. Posts shall be spaced a maximum of (10) feet apart at the barrier location and driven securely into the ground (Min. 12 inches). When extra strength fabric is used without the wire support fence, post spacing shall be as the manufacturer recommends.
5. A trench shall be excavated approx. (6) inches wide by (6) inches deep along the line of the posts and upslope from the barrier in accordance with recommendations.
6. The fabric shall not extend more than (36) inches above the original ground surface, and will extend a minimum of (8) inches into the trench. Filter fabric shall not be stapled to existing trees.
7. The trench shall be backfilled and soil compacted over the filter fabric.
8. Filter barriers shall be removed when the have served their useful purpose. But not before the uphill surface has been permanently stabilized.
9. Filter barriers shall be inspected immediately after each rainfall, and at least daily during prolonged rainfall. Any required repairs shall be made immediately.
10. Should the fabric decompose or become ineffective prior to the end of the expected usable life and the barrier still be necesary, the fabric shall be replaced promptly.
11. Sediment deposits shall be removed when they reach approximately one-half the hieght of the barrier.
12. Any sediment deposits remaing in place after the silt fence or filter barrier is no longer required, shall be dressed to conform to the existing grade, prepared and seeded.



CONSTRUCTION ENTRANCE n.t.s

R. R. HILTBRAND Engineers and Surveyors

Sediment & Erosion Control Notes & Details

LOT 8-1 SHRUB ROAD
For
BRISTOL REGIONAL ENVIRONMENTAL CENTERS, Inc.
BRISTOL, CONNECTICUT

DECEMBER 2000

R. R. HILTBRAND ENGINEERS and SURVEYORS
340 MAPLE AVENUE BRISTOL, CONNECTICUT 06010 (860) 582 4548

SEDIMENTATION BASINS AND CATCH BASIN SUMPS

Need: Catch basin sumps and sedimentation basins provide a mechanism to improve water quality by providing means to block or filter sediments prior to discharge from a storm drain conveyance system. The effectiveness depends on drainage area characteristics, flow and system maintenance.

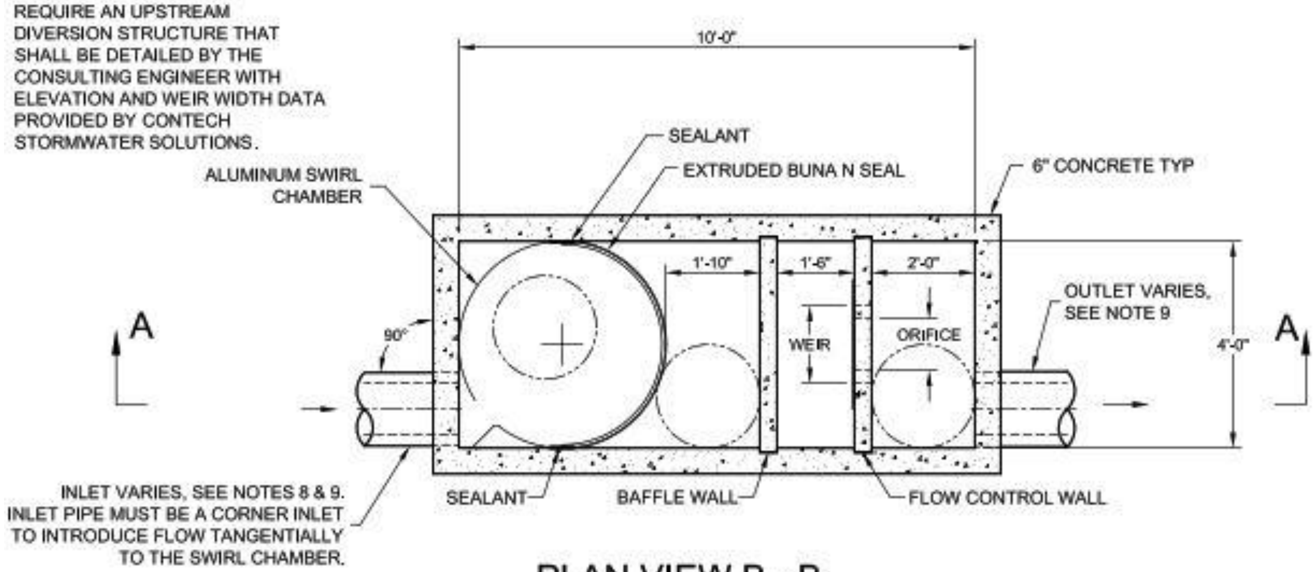
Remediation: Catch basin sedimentation basins can be temporary or permanent. Construction projects generally use temporary filter systems such as "silt sacks" or other flow filters which are meant to separate and collect sediments from stormwater and store the sediments until they are removed during maintenance. The Vortech System diagram below provides an example of a permanent sedimentation basin that can be installed on-line into a storm conveyance system.

Placement: Bristol has two Vortech systems in place along the Pequabuck. One is at the south terminus of Waterbury Road where it meets Route 72. Our river turns slight north and passes through a channeled bridge under Route 72 into the west end of Rockwell Park.

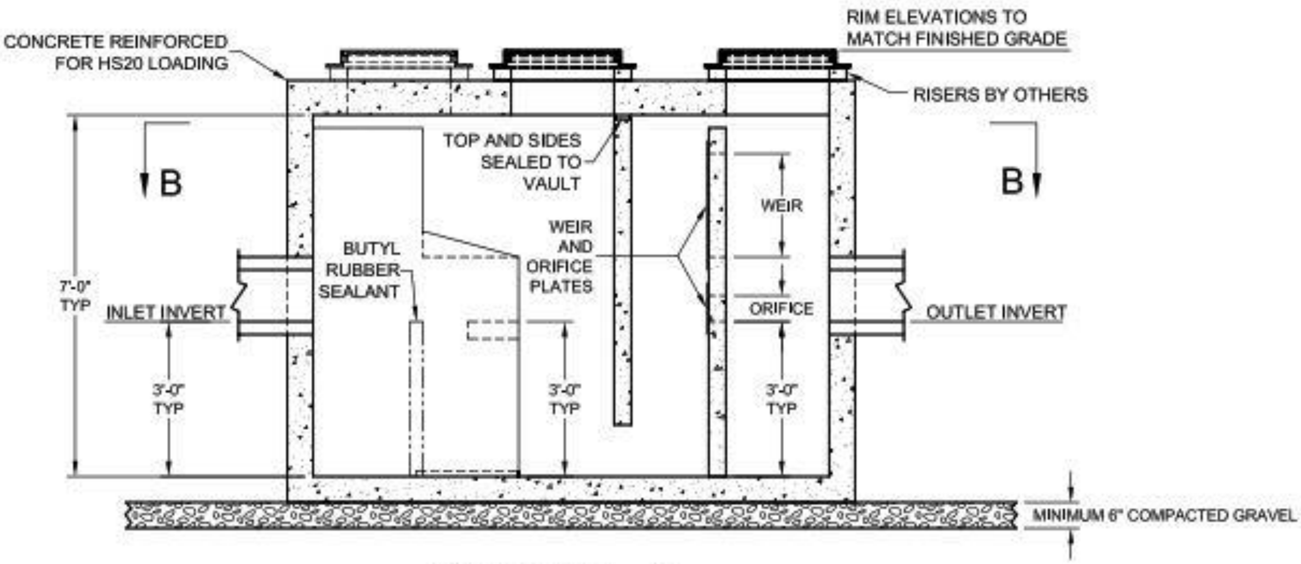
The second Vortech system was installed February 2018 upstream of the North River's confluence with the Pequabuck, which is channeled without sunlight for ½ mile parallel to North Main Street on the east.

The open circle indicates the location of a Vortech unit, which removes and stores sediment, prior to the storm water draining into the Pequabuck River. Sedimentation basins, such as the Vortech unit require periodic cleaning to remain effective.

NOTE:
VORTECHS SYSTEMS INSTALLED IN
A BYPASS CONFIGURATION
REQUIRE AN UPSTREAM
DIVERSION STRUCTURE THAT
SHALL BE DETAILED BY THE
CONSULTING ENGINEER WITH
ELEVATION AND WEIR WIDTH DATA
PROVIDED BY CONTECH
STORMWATER SOLUTIONS.



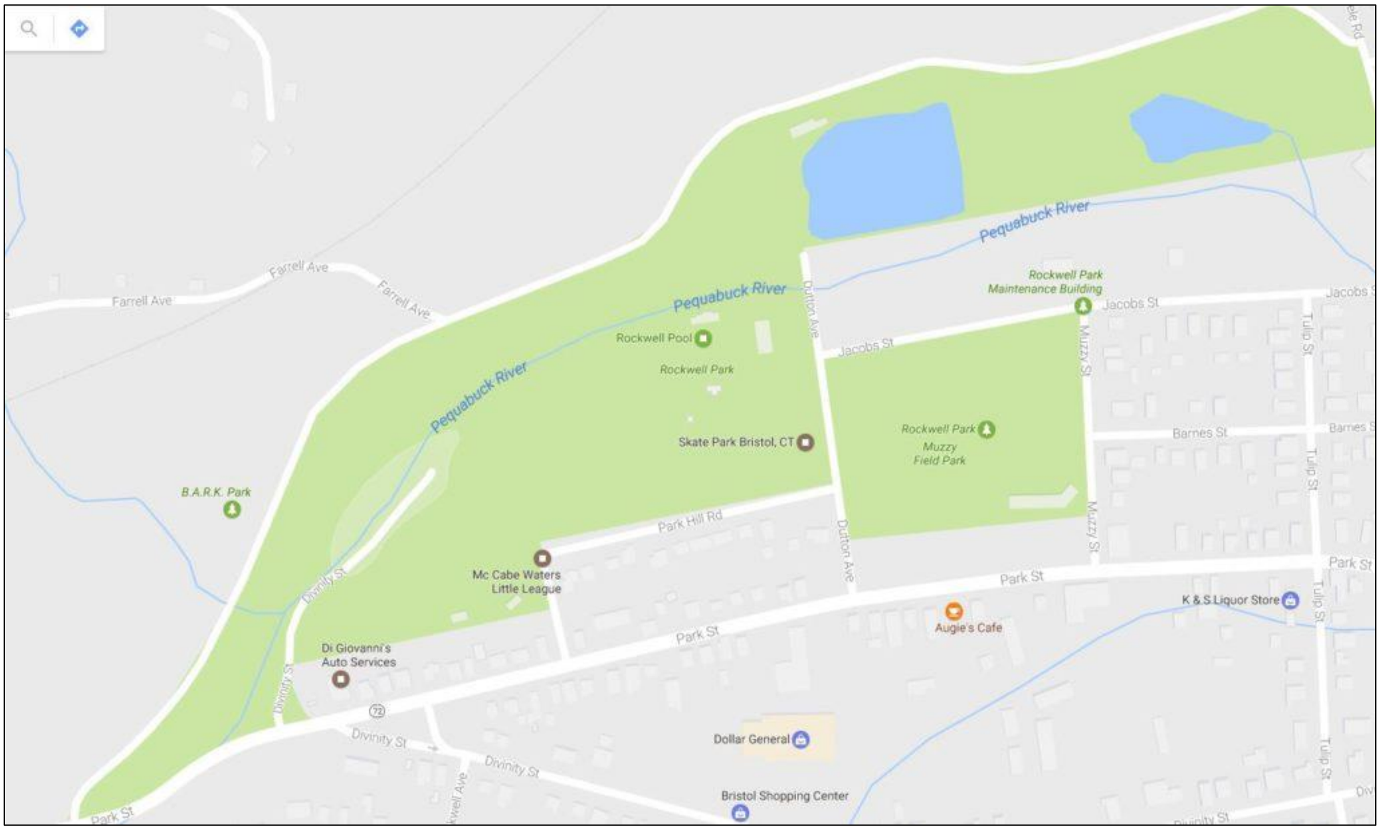
PLAN VIEW B - B



SECTION A - A

Rockwell Park River Interventions - Bristol

Location: Rockwell Park is an elongated area of 104 acres, extending from Steele Road in the east to Park Street and Terryville Road in the west. A mile-long stretch of the Pequabuck River roughly bisects the western two-thirds of the park. The northernmost portions of the park are heavily wooded steep terrain and are undeveloped except for hiking trails. The southern portions are more level, and include two artificial ponds, a large lawn for passive recreation, and a cluster of sports fields and playgrounds.



History: In 1914, Albert F. Rockwell, local business tycoon, gave the city of Bristol 80 acres to develop as the city's first public park, later adding about 15 more. The park was designed by the Boston landscape architect Sheffield Arnold and completed in 1920. (In addition to Rockwell Park, Arnold designed Stanley Park in New Britain and the campus of the Loomis Institute (now Loomis-Chaffee) in Windsor.) Arnold's design provided winding drives, undulating walking paths, and an excavated lagoon with a bathing beach and bathhouses. The Bristol property, left largely in its original wooded state, soon attracted scores of local nature lovers and the park quickly became a popular venue for company outings, barbecues, clambakes, and band concerts. While Rockwell focused on the natural environment, his wife, Nettie, took a special interest in the children's playground. Nettie purchased the most modern equipment available for the playground, which an early article described as "the best of its kind to be found anywhere." Following her husband's death in 1925, she continued to provide financial support for the park, and she left the Bristol park system a generation endowment upon her own death in 1938.

Rockwell Park was listed on the National Register of Historic Places in 1987 as a prime example of early 20th century landscape architecture.

Bathhouse and slide tower view from sandy beach of lagoon. Rockwell Park, Bristol, Connecticut. National Park Service, National Register of Historic Places

Rockwell Park Lagoon, Bristol – Archives & Special Collections at the Thomas J. Dodd Research Center, University of Connecticut Libraries: Southern New England Telephone Company Records

The sandy beach has been transformed into an amphitheater, host to concerts, and site of wedding ceremonies

Mrs. Rockwell's playground continues to boast modern equipment, such as this water feature and a skate park while retaining historic features such as the stone tower on the right side of this photo.

Several interventions have been installed or are proposed for the River within park boundaries, including dam removal, fish weirs, tree cover and riprap embankments.

Dam Removal

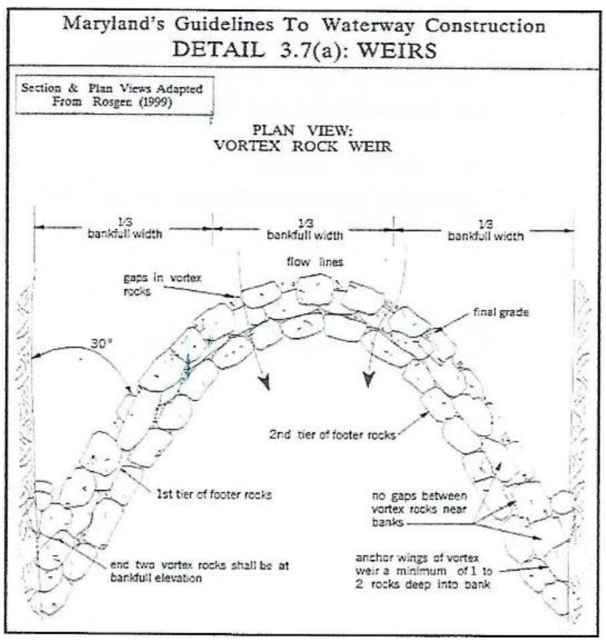
In 1930, a 3' tall dam was built just upstream of the current swimming pool to create a swimming hole. This dam was breached by a high-water event over 50 years ago. In the 1990s, the remainder of the dam was removed collaboratively by Pequabuck River Watershed Association and Farmington Valley Trout Unlimited members to improve fish passage in the river.

Fish Weirs

Trout and Atlantic salmon habitat impairment resulting from physical alteration, bank erosion, or sediment deposition is a primary concern for the river. Increased runoff from an increasingly developed watershed has caused the channel to widen and become shallow. Deep pool habitat has decreased due either to channel widening or from sediment deposition. Deep pools are an important habitat feature critical for fish survival either during summer low-flow periods or during severe winters when ice may encapsulate shallow pools or riffles.

Two vortex, or cross vane rock weirs were proposed to promote pool development. A vortex weir is horseshoe-shaped with the apex of the structure pointing upstream. The arms of the structure are angled to the riverbanks so that flows are directed away from the banks and deeper pool areas are created downstream of the weir. The rocks near the central portion of the structure are positioned to create spaces or vortices that cause water velocities to maintain pool habitat by scour. A rock overhang was proposed to be installed adjacent to one of the weirs to provide shoreline cover for fish.

In July 2002, under the direction of Don Mysling, partners CT DEP Inland Fisheries Division City of Bristol Parks Department Farmington Valley Chapter, Trout Unlimited and the Pequabuck River Watershed Association installed the weirs, for a total cost of $8,000. Tim Boborske Masonry donated the labor. Currently, the weirs are only partially functioning, having been extensively damaged by hurricane Irene in 2011.



Typical construction of a fish weir

Newly constructed fish weir in Rockwell Park, upstream view

ROCKWELL PARK SLOPE PROTECTION - Bristol

Location: Pequabuck River at Rockwell Park

Date Implemented: The project received final permits from DEEP and the Army Corp of Engineers built the project in May 2012.

Partners: USDA, Natural Resources Conservation Service, formerly known as the Soil Conservation Service is an agency of the United States Department of Agriculture

Cost: $174,500 ($148,300 federal, $26,200 local)

Engineering and Design by: Milone MacBroom

Construction by: Martin Laviero Contractor Inc.

Problem: Hurricane Irene had uprooted trees and eroded the existing steep slope which extends over 50 feet vertically to private property on Steele Road. Bank stabilization was needed to safeguard life and property.

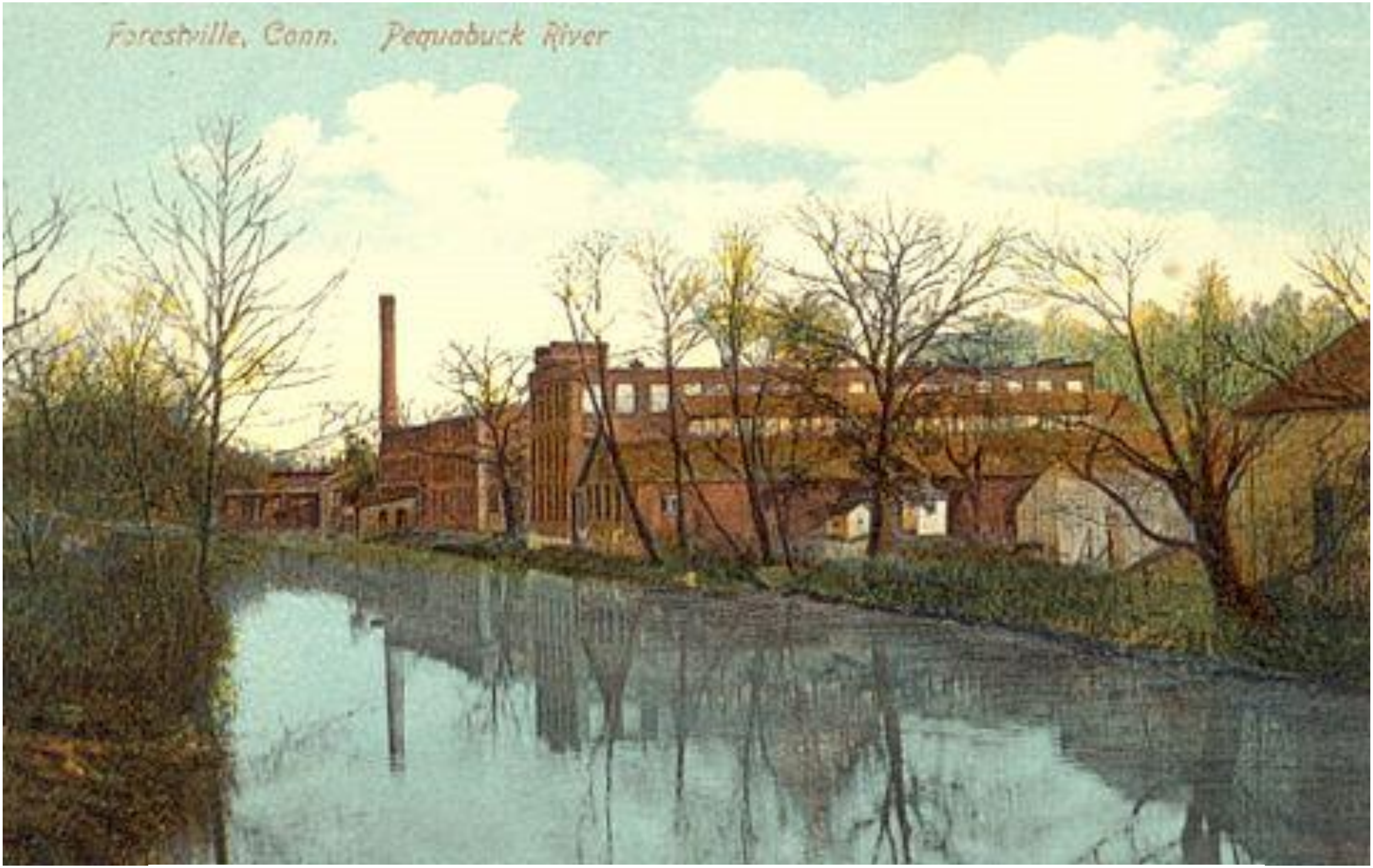
Description: Due to site conditions, the project required construction sequencing for pollution controls, including suitable erosion and sediment control measures, stabilization controls, temporary stabilized access road, selective tree cutting, location and protection of utilities.

Stabilization of the slope with soil nail netting and stabilization of the streambed with riprap, earthwork, boulders and gabion walls was constructed. The project completed structural controls to stabilize and extend the life of the slope protections.

Restoration: Restoration of areas used for access road and staging areas was one final step of the project.

Erosion evidence after storm Irene in 2011 destabilized the bank in the east end of Rockwell Park, which extends over 50 feet vertically to private property on Steele Road.

Typical riprap embankments at Rockwell Park today



Pequabuck River | Forestville, Connecticut (early 20th century)