

Appendix D

Stormwater Retrofit Concept Designs



CONVERT EXISTING TRAFFIC ISLAND TO BIORETENTION AREA TO TREAT 0.28 ACRES IMPERVIOUS AREA

REPLACE CURB WITH CURB STOPS TO ALLOW STORMWATER TO FLOW INTO BASIN

DEPRESS BASIN BOTTOM APPROXIMATELY 3 TO 4 FEET WITH SIDE SLOPES OF 3H:1V OR FLATTER

LANDSCAPE WITH NATIVE PLANTS THAT TOLERATE WET CONDITIONS

CONVERT EXISTING TRAFFIC ISLAND TO BIORETENTION AREA TO TREAT 0.39 ACRES OF IMPERVIOUS SURFACE

REPLACE CURB WITH CURB STOPS TO ALLOW STORMWATER TO FLOW INTO BASIN

REMOVE SIDEWALK AND REPLACE WITH POROUS PAVERS EVEN WITH PARKING LOT ALLOWING STORMWATER TO DRAIN TO BASIN

INSTALL OUTLET STRUCTURE

ROUTE 30 | HYDE AVE

HORZ.: 1 INCH = 30 FEET VERT. HORZ. VERT.: GRAPHIC SCALE



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FRIENDS OF THE HOCKANUM RIVER LINEAR PARK STORMWATER RETROFIT CONCEPT NORTHEAST SCHOOL

TANKERHOOSEN RIVER WATERSHED

CONNECTICUT

PROJ. No.: 20050257.A20 DATE: FEBRUARY 2009

1

MS VIEW:

HORZ.: 1 INCH = 40 FEET VERT. VERT.: GRAPHIC SCALE



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FRIENDS OF THE HOCKANUM RIVER LINEAR PARK STORMWATER RETROFIT CONCEPT I-84 EXIT 67 COMMUTER LOT

TANKERHOOSEN RIVER WATERSHED

CONNECTICUT

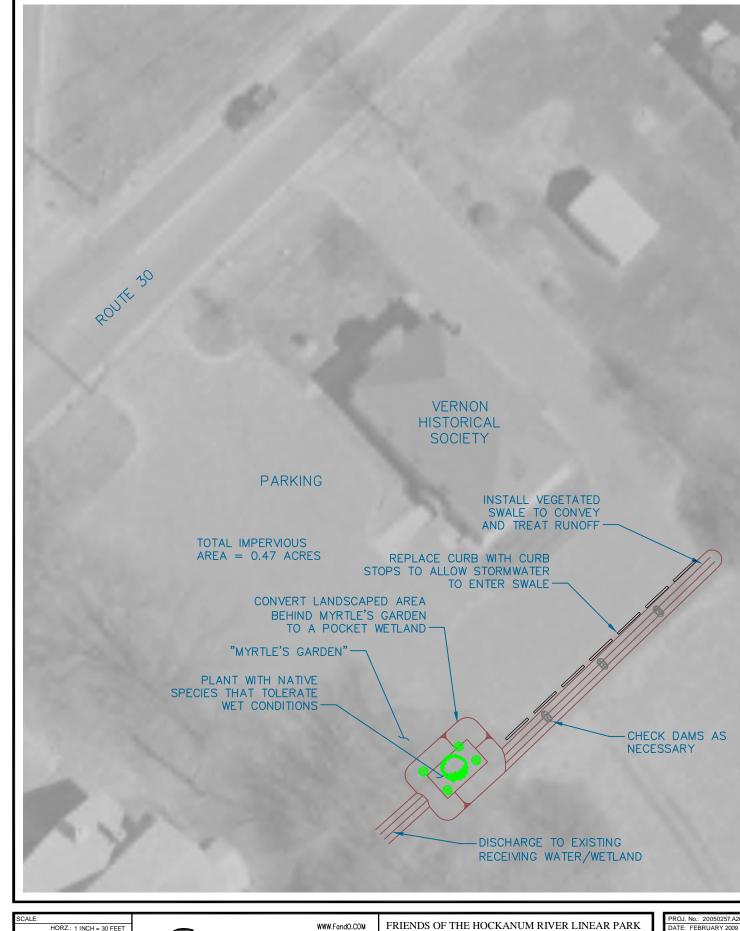
DATE: FEBRUARY 2009

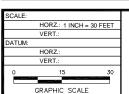
2

MS VIEW:

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MS VIEW:

File Path: H:DWGIP20050257A201Plan/20050257A20CON001.dwg, Layout HISTORICAL SOCIETY Tue, Feb 24, 2009 - 11:14 AM User: DButrick



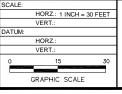
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FRIENDS OF THE HOCKANUM RIVER LINEAR PARK STORMWATER RETROFIT CONCEPT VERNON HISTORICAL SOCIETY

TANKERHOOSEN RIVER WATERSHED

CONNECTICUT

PROJ. No.: 20050257.A20 DATE: FEBRUARY 2009





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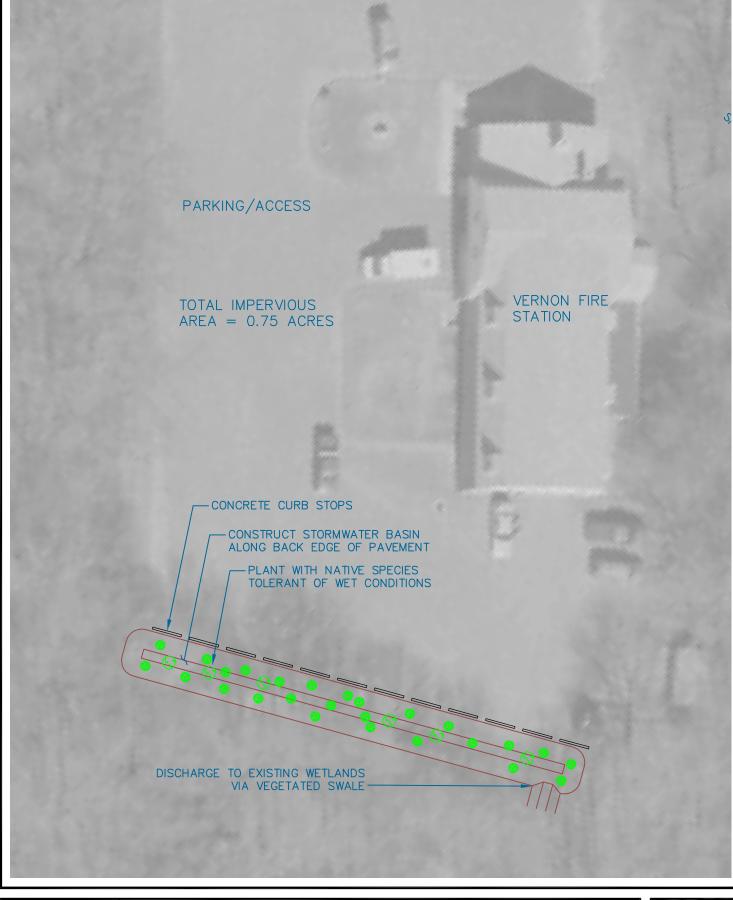
WEST SPRINGFIELD, MA 01089 413.452.0445

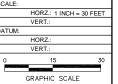
FRIENDS OF THE HOCKANUM RIVER LINEAR PARK STORMWATER RETROFIT CONCEPT VERNON FIRE STATION

TANKERHOOSEN RIVER WATERSHED

CONNECTICUT

PROJ. No.: 20050257.A20 DATE: FEBRUARY 2009







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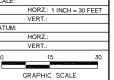
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STORMWATER RETROFIT CONCEPT LAKE STREET SCHOOL

TANKERHOOSEN RIVER WATERSHED

CONNECTICUT

	ر کاری
LAKE STREET SCHOOL	DISCHARGE STOFFEM INC.
IMPERVIOUS AREA SERVED = 1 ACRE	RECONFIGURE CULVERT AND
PLANT WITH NATIVE WATER TOLERANT SPECIES	HEADWALL TO PROMOTE DETENTION REPLACE TRAFFIC ISLAND WITH BIORETENTION AREA
	REPLACE WALKWAY WITH FOOTBRIDGE
	REPLACE CURB WITH CURB STOPS TO ALLOW STORMWATER FLOW INTO BASIN
SCALE: HORZ: 1 INCH = 30 FEET VERT: WWW.FandO.COM	FRIENDS OF THE HOCKANUM RIVER LINEAR PARK PROJ. No.: 20050257.A20 DATE: FEBRUARY 2009

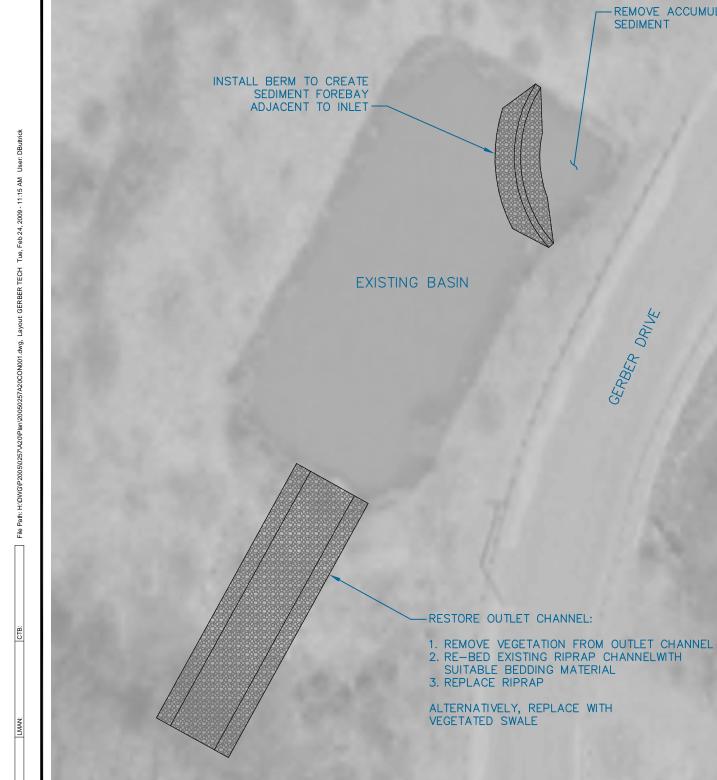




BOLTON NOTCH POND

TANKERHOOSEN RIVER WATERSHED CONNECTICUT

DO DO	IRECT EXISTING 'LEAKOFF' D SWALE VIA RIPRAP OWNCHUTE (TYPICAL FOR OTH LEAKOFFS) CONTRUCT BERM TO FORM SWALE
I-384/ROUTE 6/ROUTE 44 CONNDOT COMMUTER LOT IMPERVIOUS AREA = 0.88 ACRES	SEDIMENT TRAP FOR COARSE POLLUTANTS (TYPICAL FOR BOTH LEAKOFFS) CONSTRUCTED WETLAND OR STORMWATER BASIN OUTLET STRUCTURE
	DISCHARGE TO EXSTING SWALE ROUTE 6 EAST
SCALE: HORZ: 1 INCH = 30 FEET VERT: DATUM: HORZ: HORZ:	FRIENDS OF THE HOCKANUM RIVER LINEAR PARK STORMWATER RETROFIT CONCEPT



HORZ.: 1 INCH = 30 FEET VERT.: HORZ. GRAPHIC SCALE



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FRIENDS OF THE HOCKANUM RIVER LINEAR PARK STORMWATER RETROFIT CONCEPT

GERBER TECHNOLOGIES BASIN

TANKERHOOSEN RIVER WATERSHED

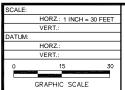
CONNECTICUT

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REMOVE ACCUMULATED SEDIMENT

7

MS VIEW:





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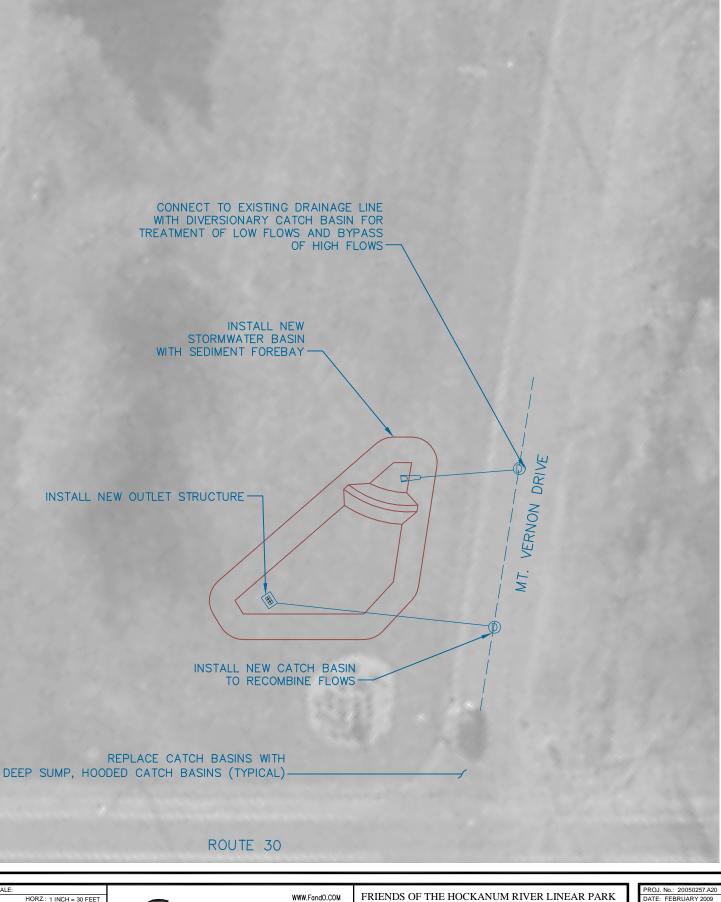
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STORMWATER RETROFIT CONCEPT MOUNT VERNON APARTMENTS

TANKERHOOSEN RIVER WATERSHED

CONNECTICUT

DATE: FEBRUARY 2009



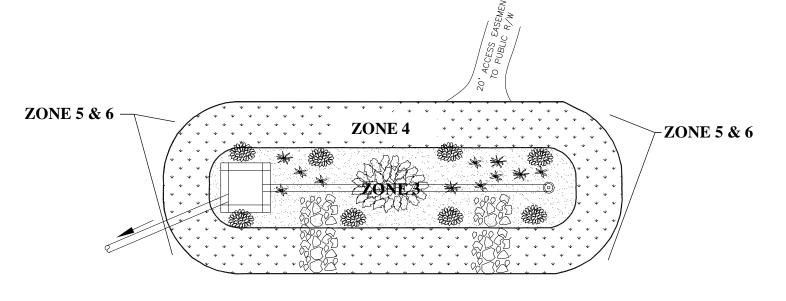


FRIENDS OF THE HOCKANUM RIVER LINEAR PARK STORMWATER RETROFIT DETAILS BIORETENTION AREA

TANKERHOOSEN RIVER WATERSHED CONNECTICUT

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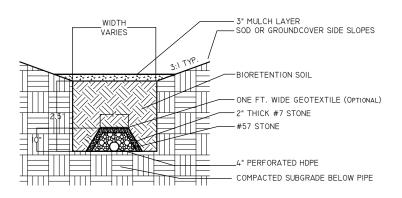
DET 1



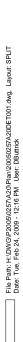
<u>PLAN</u>

NOTES:

- 1. PLANTING ZONES AND PLANT SELECTION PER DETAIL SHEET 7
- ALL PLANTINGS SHALL BE LOCAL NATIVE SPECIES.
- 3. IRRIGATION MAY BE PROVIDED FOR INITIAL ESTABLISHMENT AND DRY SEASONS.



ADAPTED FROM CONNECTICUT STORMWATER QUALITY MANUAL (2004) AND CHARLOTTE - MECKLENBURG, NC POST-CONSTRUCTION BMP DESIGN MANUAL (APRIL 2008)



SCALE: HORZ.: N.T.S. VERT.: DATUM: HORZ.: GRAPHIC SCALE



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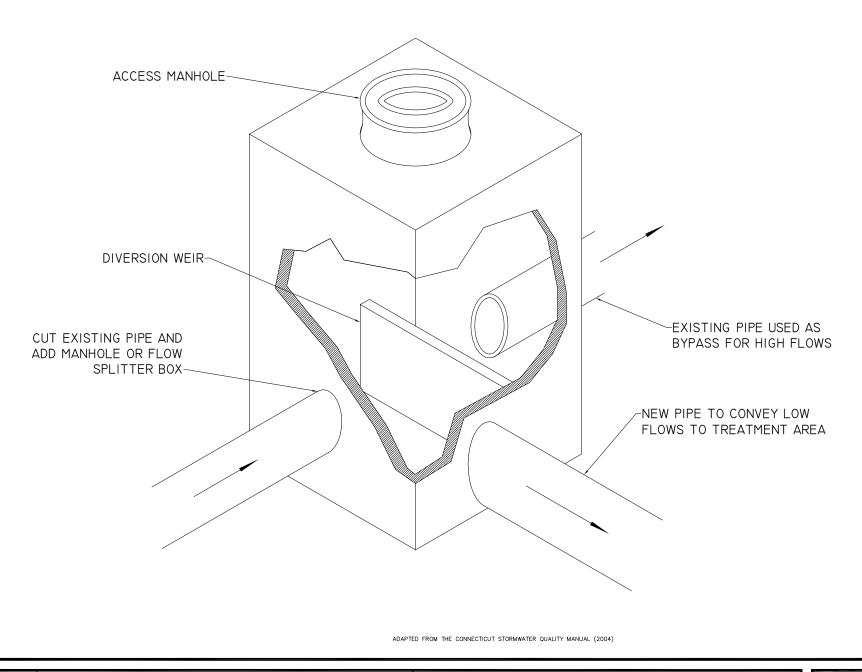
FRIENDS OF THE HOCKANUM RIVER LINEAR PARK STORMWATER RETROFIT DETAILS FLOW SPLITTER

TANKERHOOSEN RIVER WATERSHED

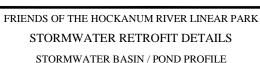
CONNECTICUT

PROJ. No.: 20050257.A20 DATE: FEBRUARY 2009

DET 2







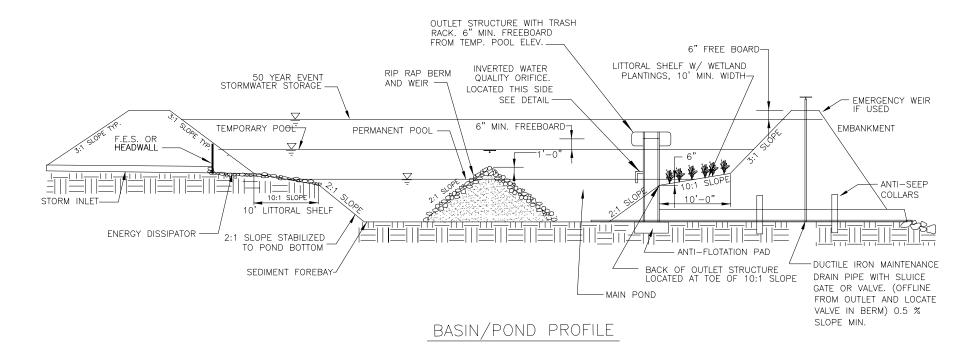
STORMWATER BASIN / POND PROFILE

DET 3

CONNECTICUT

PROJ. No.: 20050257.A20

DATE: FEBRUARY 2009



NOTES:

1. 4-6 INCH LAYER OF AMENDED SOIL IS RECOMMENDED IN ANY AREA WHERE PLANTINGS ARE REQUIRED

ADAPTED FROM THE CONNECTICUT STORMWATER QUALITY MANUAL (2004) AND THE CHARLOTTE - MECKLENBURG, NC POST-CONSTRUCTION BMP DESIGN MANUAL (APRIL 2008)

TANKERHOOSEN RIVER WATERSHED

SCALE:

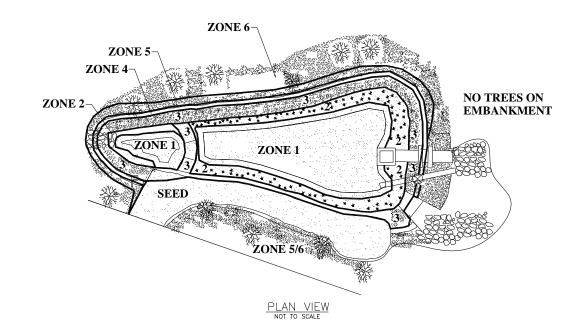
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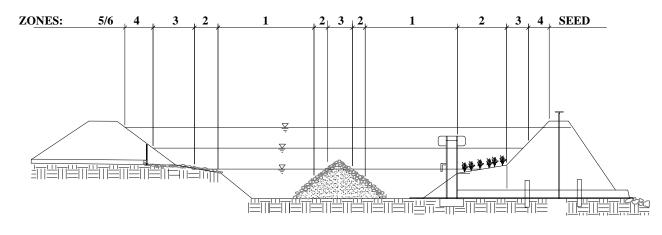
HORZ.: VERT. GRAPHIC SCALE

HORZ.: N.T.S. VERT.:

NOTES:

- PLANTINGS ZONES AND PLANT SELECTION PER NOTES ON DETAIL SHEET 7
 ALL PLANTINGS SHALL BE LOCAL NATIVE
- SPECIES.
- IRRIGATION MAY BE PROVIDED FOR INITIAL ESTABLISHMENT AND DRY SEASONS.





POND CROSS SECTION

ADAPTED FROM THE CONNECTICUT STORMWATER QUALITY MANUAL (2004) AND THE CHARLOTTE - MECKLENBURG, NC POST-CONSTRUCTION BMP DESIGN MANUAL (APRIL 2008)



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FRIENDS OF THE HOCKANUM RIVER LINEAR PARK STORMWATER RETROFIT DETAILS POND PLANTING PLAN

CONNECTICUT TANKERHOOSEN RIVER WATERSHED

PROJ. No.: 20050257.A20 DATE: FEBRUARY 2009

DET 4





MAN

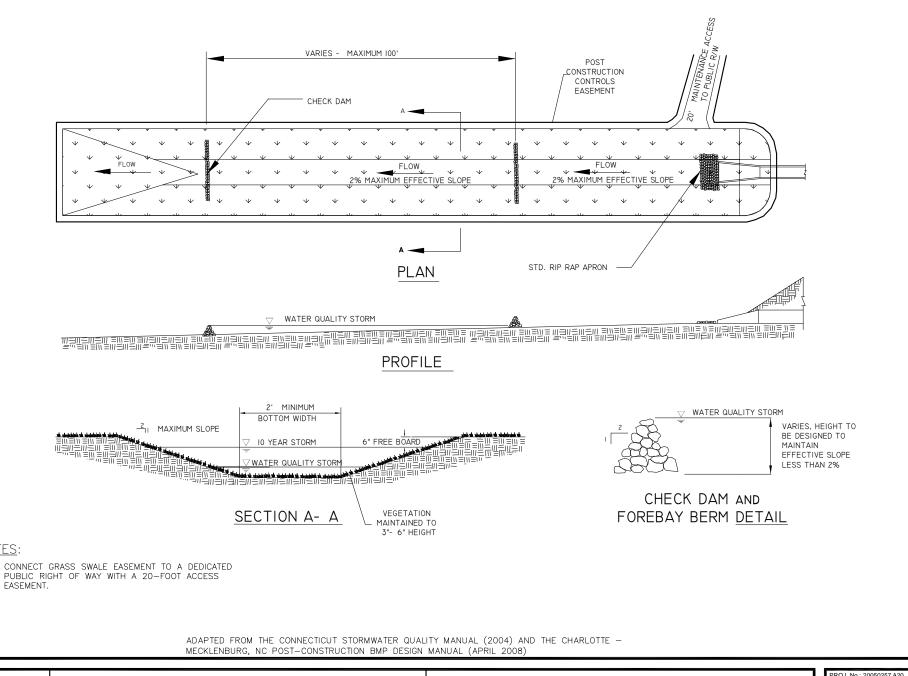
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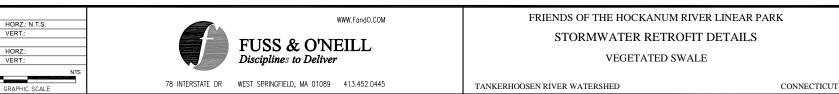
AC VIEW

JCS:

SCALE:

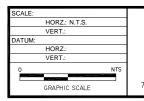
DATUM:





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DET 5





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FRIENDS OF THE HOCKANUM RIVER LINEAR PARK
STORMWATER RETROFIT CONCEPT
POCKET WETLAND

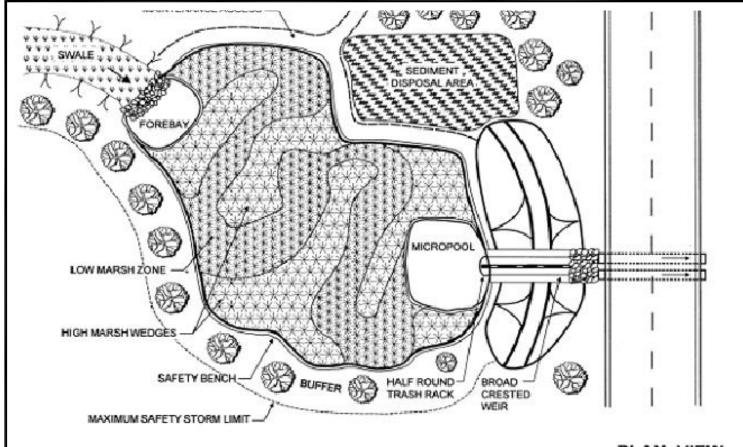
TANKERHOOSEN RIVER WATERSHED

CONNECTICUT

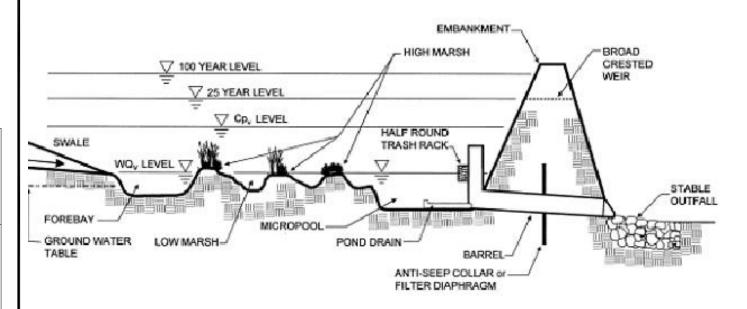
PROJ. No.: 20050257.A20 DATE: FEBRUARY 2009

PROFILE

DET 6



PLAN VIEW



SOURCE: CENTER FOR WATERSHED PROTECTION

FRIENDS OF THE HOCKANUM RIVER LINEAR PARK STORMWATER RETROFIT CONCEPT PLANTING NOTES

CONNECTICUT

PROJ. No.: 20050257.A20 DATE: FEBRUARY 2009

DET 7

GENERAL PLANTING NOTES:

ZONE

2

3

4

5

6

Grasses, Forbs, and Sedges in Zones 1, 2 and 3. Plant selections should be appropriate for the field environmental conditions of the planting site.

STORMWATER STRUCTURE PLANTING ZONES

PERMANENT POOL ELEVATION

INUNDATED WITH I TO 3 FEET OF WATER THROUGHOUT THE GROWING SEASON

INUNDATED WITH 0.5 TO I FOOT OF WATER THROUGHOUT THE GROWING SEASON REGULARY INUNDATED, RANGING FROM 0.5 FT ABOVE TO 0.5 FT.BELOW THE

PERIODICALLY OR SEASONALLY INUNDATED, FROM 0.5 FT. ABOVE THE PERMANENT

SURFACE ELEVATION TO THE 10- YEAR WATER SURFACE ELEVATION

ABOVE THE 10- YEAR WATER SURFACE ELEVATION

POOL ELEVATION TO THE APPROXIMATE 2- YEAR STORM WATER SURFACE ELEVATION INFREQUENTLY OR IRREGULARLY INUNDATED, FROM THE APPROXIMATE 2- YEAR WATER

- •Zone 1 Deep Water Emergents: The designer should employ a method of "triangular spacing", and an approximate density of about 0.5 plants per square foot. A minimum of 2 herbaceous species shall be selected, for placement in each of the Zone 1 planting areas.
- •Zone 2 Shallow Water Bench Emergents: The designer should employ a method of "triangularspacing", and an approximate density of about 0.5 plants per square foot. A minimum of 3 herbaceous species shall be selected, for placement in each of the Zone 2 planting areas.
- •Zone 3 Shoreline Fringe: The designer should employ a method of "triangular spacing", and an approximate density of about 0.5 plants per square foot. A minimum of 4 herbaceous species shall be selected, for placement in each of the Zone 3 planting areas.

Grasses, Forbs, and Sedges (Seed Mixes) in Zones 4, 5 and 6.

DESCRIPTION DEEP WATER AREA

SHALLOW WATER BENCH

SHORELINE FRINGE

RIPARIAN FRINGE

FLOODPLAIN TERRACE

UPLAND

•Zone 4 - Riparian Fringe, Zone 5 - Floodplain Terrace and Zone 6 - Planting zones shall receive preparation and seeding, with an appropriate seed mix, for establishing Native Wet Meadow, or Native Dry Meadow.

Trees, Shrubs, and Vines in Zones 4, 5 and 6 (ALL BMP's EXCEPT BIORETENTION): In designing and executing the plantings for Zone 4 - Riparian Fringe, Zone 5 - Floodplain Terrace and Zone 6 -

- Upland Plantings, the designer should consider the following:
 •Employ a method of "random spacing", and a density of 1000 stems per acre. A full 70% of the species shall be Large Maturing Deciduous Tree species, and 30% shall be Small Maturing Deciduous Tree, Evergreen Tree, Deciduous Shrub, or Evergreen Shrub species.
- A minimum of 5 Large Maturing Deciduous Tree species shall be selected for each planting area and a minimum of 3 Small Maturing Deciduous Tree, Evergreen Tree, Deciduous Shrub or Evergreen Shrub species shall be selected for each planting area.
- •The use of 3 plants of the same genus does not constitute the minimum selection and should be avoided.
- •In addition to the 5 large stock tree and the 3 small stock tree requirements, each planted area shall contain, interspersed randomly among the stock, large maturing decidious trees at a planting density of 20 trees per acre, and a minimum size of two-inch caliper (2"cal.).

Trees, Shrubs, and Vines in BIORETENTION AREAS ONLY: In designing and executing the plantings for Bioretention Areas, the designer should consider the following:

- •Employ a method of "random spacing", and a density of 2000 stems per acre. A maximum of 10% of the species shall be Large Maturing Deciduous Tree species, and 90% shall be Small Maturing Deciduous Tree, Evergreen Tree, Deciduous Shrub, or Evergreen Shrub species. Up to 25% of the Small Maturing Tree requirement (90%) may be substituted with certain grasses that grow to 3-ft to 5-ft in height if planted in five or seven-gallon pots.
- A minimum of 3 Large Maturing Deciduous Tree species shall be selected for each planting area,
- a minimum of 3 Small Maturing Deciduous Tree, Evergreen Tree, Deciduous Shrub or Evergreen Shrub species shall be selected for each planting area.
- •The use of 3 plants of the same genus does not constitute the minimum selection and should be avoided.

ADAPTED FROM THE CONNECTICUT STORMWATER QUALITY MANUAL (2004) AND THE CHARLOTTE - MECKLENBURG, NC POST-CONSTRUCTION BMP DESIGN MANUAL (APRIL 2008)



Appendix E

Site-Specific Stormwater Retrofit Cost Estimates

Site-Specific Stormwater Retrofit Cost Estimates – Tankerhoosen River Watershed Management Plan

						Design, Permitting, Contingency			espan			ost/yr
	Unit Cost	Unit	Units	Construction Cost (2009)	% Construction	Cost	Total Cost	Lifespan (yrs)	Annual Cost Over Lifespan	O&M (% Cost)	O&M (\$/yr)	Total Capitalized Cost/yr over lifespan
Tankerhoosen Lake Carling and Foundation 1 100 700 200 110 700 20 10 20 10 10 10 10												
Sediment Forebay	77,000	(BEC estimate)	1	\$93,700	32%	\$30,000	\$123,700	30	\$6,310	6%	\$380	\$6,690
4 Deep Sump CBs, piping, and swale	20,000	total, 2004 dollars (BEC estimate)	1	\$24,300	32%	\$7,800	\$32,100	50	\$1,250	15%	\$190	\$1,440
Northeast School												
Bioretention Area 1	\$14.56	/ft² (commercial/ industrial area	2892	\$42,100	32%	\$13,500	\$55,600	15	\$4,660	8%	\$370	\$5,030
Bioretention Area 2	\$14.56	/ft² (commercial/ industrial area	2137	\$31,100	32%	\$10,000	\$41,100	15	\$3,440	8%	\$280	\$3,720
SW Basin	\$7.27	/ft ³ (developed area)	2495	\$18,100	32%	\$5,800	\$23,900	30	\$1,220	6%	\$70	\$1,290
Mount Vernon Apartments												
SW Basin	\$7.27	/ft ³ (developed area)	5862	\$42,600	32%	\$13,600	\$56,200	30	\$2,870	6%	\$170	\$3,040
Deep sump CBs	\$3,125.00	ea.	6	\$18,800	32%	\$6,000	\$24,800	50	\$960	20%	\$190	\$1,150
Fire Station (Route 30)	47.07	1 (63 ())	007/	404 (00	000/	*	400 500		T #4 450		400	44.540
SW Basin	\$7.27	/ft ³ (developed area)	2976	\$21,600	32%	\$6,900	\$28,500	30	\$1,450	6%	\$90	\$1,540
Vegetated Swale	\$14.56	/ft²	59	\$900	32%	\$300	\$1,200	10	\$140	7%	\$10	\$150
Vernon Historical Society (Route 30) Pocket Wetland	30.6V^0.71 (03\$)	/ft³	1001	\$5,500	32%	\$1,800	\$7,300	10	\$860	6%	\$50	\$910
Vegetated swale	\$14.56	/ft ²	1081 657	\$9,600	32%	\$1,800	\$12,700	10 10	\$1,490	6%	\$90	\$1,580
ConnDOT Commuter Lot (Route 6/44 and I-38		/11	037	\$7,000	J2 /0	\$3,100	\$12,700	10	Ψ1,470	070	¥7U	\$1,500
Vegetated swale	\$14.56	/ft²	532	\$7,700	32%	\$2,500	\$10,200	29	\$530	7%	\$40	\$570
SW Basin	\$7.27	/ft ³ (developed area)	7105	\$51,700	32%	\$16,500	\$68,200	30	\$3,480	6%	\$210	\$3,690
ConnDOT Commuter Lot (I-84, Exit 67)				, ,								,
SW Basin	\$7.27	/ft ³ (developed area)	5299	\$38,500	32%	\$12,300	\$50,800	30	\$2,590	6%	\$160	\$2,750
Vegetated Swale	\$14.56	/ft²	103	\$1,500	32%	\$500	\$2,000	10	\$230	7%	\$20	\$250
Gerber Technologies Office Building												
Sediment Forebay	\$50	/yd ³ of riprap	40	\$2,000	32%	\$600	\$2,600	30	\$130	30%	\$40	\$170
Discharge Channel	\$3.86	/ft2	2324	\$9,000	32%	\$2,900	\$11,900	30	\$610	10%	\$60	\$670
Lake Street School	Τ	1612 to a great and 171	1			1	ı	1	1		1	
Bioretention	\$14.56	/ft² in commercial/ industrial area	4900	\$71,300	32%	\$22,800	\$94,100	15	\$7,880	8%	\$630	\$8,510
N											1	
Note:	40/											
Rate of Inflation used =	4% 7%							-	 		1	
Interest (discount) rate used =	1%											