ATTACHMENT G – PLAN SHEETS
(SEE ATTACHED PLANS)

Attachment H: Engineering Documentation

Part 1: Engineering Report Checklist

The following is a checklist of requirements that need to be completed, included and submitted as part of the Engineering Report. Please complete this checklist by identifying where each requirement listed is addressed in the Engineering Report (report title and page numbers). If an item is not applicable, place "NA" in the box. Attach the completed checklist as the cover sheet to engineering reports, as applicable, which fully describe the design of the proposed facilities or other actions and the hydraulic and hydrologic effects thereof. The application instructions (DEP-IWRD-INST-100) should be consulted for a complete description of each item listed. This checklist is required to be signed and sealed by a professional engineer licensed in the State of Connecticut.

Stormwater Management

Location of Item	Item Description
Pg 2 Report	Description of the design storm frequency intensity, volume and duration
Report Figures	Watershed maps, existing and proposed
Pg 2 Report	Computations for Tc
N/A	Imperviousness calculations
Pg 2 Report	NRCS runoff curve numbers, volumetric runoff coefficients
Pg 2 Report	Computations used to determine peak runoff rates, and velocities for each watershed area (24-hour storm): • Stream Channel Protection: 2-year frequency ("over-control" of 2-year storm) • Conveyance Protection: 10-year frequency • Peak Runoff Attenuation: 2-year, 10-year, and 100-year frequency • Emergency Outlet Sizing: safely pass the 100-year frequency or larger storm
n/a	Hydrograph routing calculations
n/a	Description, schematics, and calculations for drainage and stormwater management systems, bridges and culverts
n/a	Infiltration rates
Pg 2 Report	Documentation of sources
HEC-RAS Disk	Computer disk containing input and output data and the associated program for all computer models used in the analyses
HEC-RAS Disk	Hard copy of input and output data including input/output tables
n/a	Detention basin analysis including timing and duration of expected outflow, stream stability analysis and hydrograph summation

Flood Plain Assessment

Location of Item	Item Description
HEC-RAS File	Description or simulation of existing and proposed conditions upstream and downstream of the proposed activity
n/a	(For SCEL applications only) A determination of the effect of the proposed activity on flooding and flood hazards together with an equivalent encroachment on the opposite bank for the flood event establishing the encroachment lines
n/a	For any bridge or culvert placement or replacement with a drainage area of 100 acres or more, plan sheets showing the existing and proposed inundation area for the 2, 10, 25, 50, and 100 year discharges, carried to convergence
Pg 4 Report	A description and analysis of the floodplain modifications required to restore any flood conveyance and flood storage capacity
N/A	Demonstration that backwater from the proposed activity will not impact an existing dam, dike, or similar structure
HEC-RAS File	Backup data and complete hydraulic analysis for proposed modifications to the floodplain including location plan and plot for sections, profile sheet, summary sheet

Dams, Dikes, Diversion Channels, Similar Structures

Location of Item	Item Description
n/a	Primary and emergency spillway and outlet structure erosion protection
n/a	Dam breach analysis
n/a	Geotechnical evaluation
n/a	Construction Specifications for foundation preparation, embankment material, outlet structure, and construction inspection

Soil Erosion and Sediment Control Plan

Location of Item	Item Description
Plan Sheet C.00	Narrative
Sheets C.01-04	Drawings
Sheets C.05-06	Details
n/a	Calculations for Engineered Measures

Professional Certification

For any Engineering Report submitted as part of the IWRD permit application, the following certification must be signed and sealed by a professional engineer licensed to practice in Connecticut and submitted with the Engineering Report Checklist and Report.

"I certify that in my professional judgement, each requirement listed in the Engineering Report Checklist has been addressed in the Engineering Report submitted as part of the IWRD permit application as Attachment H, Part 1 and that the information is true, accurate and complete to the best of my knowledge and belief.

This certification is based on my review of the Engineering Report.

I understand that a false statement made in the submitted information may, pursuant to Section 22a-6 of the General Statutes, be punishable as a criminal offense under Section 53a-157b of the General Statutes, and may also be punishable under Section 22a-438 of the General Statutes."

Signature of Applicant

9/21/10
Date

Al Richmond
Name of Applicant (print or type)

Building & Facilities Planning
Title (if applicable)

Signature of Professional Engineer

09.16.10
Date

J. Andrew Bevilacqua
Name of Professional Engineer (print or type)

18477
P.E. Number (if applicable)

Affix P.E. Stamp Here
(if applicable)

STATE OF CONNECTICUT
J. ANDREW BEVILACQUA
No. 18477
LICENSED
PROFESSIONAL ENGINEER

CITY OF DANBURY

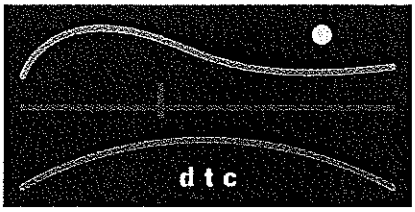
HYDRAULIC ANALYSIS REPORT

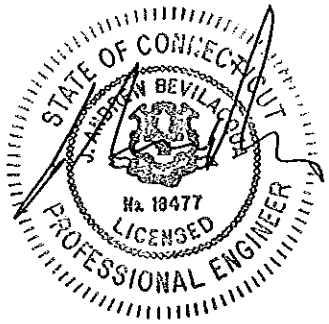
BANK STABILIZATION FOR SECTION OF PADANARAM BROOK
DANBURY, CT

CONNECTICUT DEPARTMENT OF PUBLIC WORKS PROJECT NO. BI-RT-829A

APRIL 2010

SUBMITTED BY:





DIVERSIFIED TECHNOLOGY CONSULTANTS
ENGINEERS – PLANNERS – LANDSCAPE ARCHITECTS – SURVEYORS
HAMDEN, CT

HYDRAULIC ANALYSIS REPORT
BANK STABILIZATION FOR SECTION OF PADANARAM BROOK

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Appendix D – HEC-RAS Summary Tables
Appendix E – CD of HEC-RAS Files

1.0 INTRODUCTION

As part of an on-call contract with the Connecticut Department of Public Works DTC has been tasked to solve a bank stabilization problem on the Padanaram Brook in Danbury, CT adjacent to the Henry Abbott Technical High School. After construction was complete on an addition to the high school, erosion to the bank of the brook became an issue. If allowed to continue the bank erosion has the potential to undermine an existing driveway used to access the school.

After looking at various options, a segmental block retaining wall is the proposed solution to the bank stabilization problem. To implement this solution it will be necessary to temporarily disturb wetlands and watercourses within the Padanaram Brook.

Options for this problem included re-grading the bank with a grouted Rip Rap, a Gabion Block Retaining wall, a cast in place retaining wall and a segmental block retaining wall. The after consulting with DEP Fisheries, it was decided to go with the segmental block retaining wall. To implement this solution it will be necessary to temporarily disturb wetlands and watercourses within the Padanaram Brook.

The wetland and watercourse disturbance will be due to construction of the wall. These activities include the installation of sheet piling at the toe of the bank, excavation, and dewatering. The sheet piles shall be set at 1 foot higher than the 2-year storm as per CT DOT standards for temporary facilities. Once, construction is complete the sheet piles shall be cut down to the mud line of the brook channel. The bank will be back filled with the top three feet consisting of 2 feet of riprap and the top one-foot being natural existing soil. The intent is to restore the bank to its original state after construction.

2.0. HYDROLOGY SUMMARY

The Drainage watershed to the brook at this location was estimated at 7.0 sq. mi. To estimate Peak Flow for this location three sources were compared. The sources were HEC-HMS, USGS Regression Analysis method, and FEMA Flows from the Frequency discharge curve provided in the Flood Insurance Study for the City of Danbury dated April 1982.

2.1 HEC-HMS

With this method soil and land use information, obtained from NCRS, was utilized to develop a Curve number that relates rainfall to runoff. Then, the drainage basin topography, and stream hydraulics were studied to estimate a time of concentration based on sheet flow, shallow concentrated flow and channel flow. This information was entered into the Army Corps of Engineers HEC-HMS software to estimate a Peak Flow.

2.2 FEMA Flows

As part of FEMA's April 1982 Danbury Flood Insurance Study, an analysis of Padanaram Brook was done to estimate peak flows along the brook. This analysis utilized 35 years of flow records from USGS Gaging Station number 01201510 on the Still River and a Log-Pearson Type III statistical analysis of peak flows. From this Data Discharge-Drainage Area Curves were prepared.

2.3 USGS Regression

This method uses StreamStats, which is an integrated GIS application developed by the USGS, to determine the drainage basin boundary of your study area. The boundary area is then input into a separate program called the USGS National Flood Frequency Program to estimate the Peak Flows. This program contains all the USGS developed equations for estimating flood frequency statistics.

A comparison of Peak Flows developed by the three methods follows:

Storm Frequency	HEC-HMS (cfs)	USGS Regression (cfs)	FEMA Flows (cfs)
10	887	699	450
50	1380	1050	1025
100	1710	1210	1450
500	-	1820	2850

2.4 Conclusion

Of the three methods investigated the FEMA flows were selected. The FEMA flows were selected because they are the published regulatory flows for this brook. In general, FEMA flows compare favorably with the other two methods across the range of storms reviewed.

3.0 HYDRAULICS

3.1 General

A hydraulic analysis of Padanaram Brook from the outlet of the shopping center culvert to the Hayestown Avenue culvert was performed using the HEC-RAS computer program. This analysis was performed with brook and culvert geometric information obtained from an actual field survey conducted by LRC during September, 2009. Print outs of the HEC-RAS computations are included in the appendices of this report.

In an attempt to develop a computer model to replicate the current Federal Emergency Management Agency (FEMA) flood study report, a request was sent to FEMA for a copy of the original model input data and hydraulic results from which the regulatory flood study was established. FEMA provided paper copies of the HEC-2 floodway output data for the Padanaram Brook but no input data. Several unsuccessful attempts were made to obtain the original input date. Without the original input data, we were unable to recreate the FEMA study. Therefore, we developed our existing conditions model using surveyed cross sections to reflect current conditions.

A plan view of the brook showing the arrangement of the stream cross-sections is shown in Figure 4. Field surveys were performed of the stream channel and adjacent overbank areas. Limits of this field survey extend from the outlet of the shopping center culvert to the outlet of the Hayestown Avenue Culvert. All cross sections were taken looking downstream with cross section stationing increasing from left to right. Cross sections are stationed along the channel starting with the furthest downstream section STA 8+90, and increasing as you head upstream to STA 14+27. The starting water surface elevation at cross section STA 8+90 is 393.0 feet for the 100-year storm. The starting water surface elevations were obtained from FEMA's Flood Profile of Padanaram Brook. Plotted cross sections are included in this report for existing, and proposed conditions.

A summary of water surface elevations are included in Table 1.

3.2 Existing Conditions

The existing condition was defined as the condition that exists today without any improvements. This condition was based on actual field surveyed cross sections and measurements of the brook and existing culverts upstream and downstream of the proposed bank stabilization area. The existing condition model was analyzed using HEC-RAS.

3.3 Proposed Conditions

The proposed condition was developed based on the existing condition model, with modifications to incorporate the proposed retaining wall. Proposed conditions were analyzed for all storm flows using HEC-RAS. The wall will have a minimal impact on water surface elevations for the 100-year storm. For the 100-year storm, the water surface elevation increases 0.14 feet at station 12+87 just upstream of the wall. The water surface decreases 0.05 feet at station 13+82 before returning to pre-construction levels at station 14+27. The water surface increase occurs along the property owned by the State of Connecticut. On the opposite side of the brook, the water surface increase will not have any impact. The opposite side of the brook is steeply sloped with well-established vegetation.

3.4 Temporary Conditions

To aid in the construction of the wall the installation of sheet piling at the toe of the bank, excavation, and dewatering will be necessary. The sheet piles will be set 1 foot higher than the 2-year storm as per CT DOT standards for temporary facilities. Once, construction is complete the sheet piles shall be cut down to the mud line of the brook channel. The excavation area will then be back filled. The last three feet of back fill will consist of 2 feet of riprap followed by one-foot of natural occurring soil. The intent is to restore the bank to its original state after construction.

3.5 Floodway analysis

A floodway analysis was performed to check the effect of the proposed wall and grading has on the floodway. Since, FEMA's flood study was unavailable, we performed the analysis on the existing conditions model we created using survey data. Method 4 with a 1.0-foot increase was attempted first to try to establish reasonable floodway limits. Next, Method 1 was used to adjust the left and right encroachment stations from method 4 in an attempt to better match the published FEMA Floodway information. Once the floodway was established, we verified that there would be no increase in the Floodway water surface elevations due to proposed conditions.

3.5 Water Surface Profile Comparison

A summary of water surfaces for various storm and site conditions is contained in Table 1

TABLE 1 - SUMMARY of WATER SURFACE ELEVATIONS

HEC-RAS ANALYSIS (Existing, and Proposed Conditions)

RIVER STATION INFORMATION			Q10		Q50		Q100		Q500	
Station Number	FEMA Section	Distance(1) (ft)	Existing (ft)	Proposed (ft)	Existing (ft)	Proposed (ft)	Existing (ft)	Proposed (ft)	Existing (ft)	Proposed (ft)
890.0		0.0	390.00	390.00	391.70	391.70	393.00	393.00	397.20	397.20
1000.0	Q	110.0	391.57	391.57	394.23	394.23	395.87	395.87	399.24	399.24
1084.0		194.0	391.64	391.64	394.31	394.31	396.00	396.00	399.69	399.69
1165.0		275.0	391.71	391.68	394.29	394.23	395.98	395.88	399.49	399.37
1222.0		332.0	392.55	392.71	394.05	394.24	395.84	395.76	399.49	399.40
1287.0		397.0	393.09	393.42	394.68	394.71	395.75	395.89	399.21	399.28
1382.0		492.0	393.94	393.92	395.75	394.74	396.65	395.60	399.40	399.46
1427.00	R	537.0	394.40	394.40	396.66	396.66	398.07	398.07	403.06	403.06

HEC-RAS FLOODWAY ANALYSIS (Existing and Proposed Conditions):

RIVER STATION INFORMATION		Normal Conditions for Q100		Floodway Conditions Q100		Difference (Prop-Exist) Q100		Floodway Conditions Q10		Difference Q10
DTC	FEMA	Existing (ft)	Proposed (ft)	Existing (ft)	Proposed (ft)	Normal (ft)	Floodway (ft)	Existing (ft)	Proposed (ft)	Floodway (ft)
890.0		393.00	393.00	393.00	393.00	0.00	0.00	390.00	390.00	0.00
1000.0		395.87	395.87	395.87	395.87	0.00	0.00	391.57	391.57	0.00
1084.0		396.00	396.00	396.00	396.00	0.00	0.00	391.66	391.66	0.00
1165.0	1.517	395.98	395.88	395.96	395.96	-0.10	0.00	391.72	391.72	0.00
1222.0		395.84	395.76	395.92	395.92	-0.08	0.00	392.57	392.57	0.00
1287.0		395.75	395.89	395.94	395.94	0.14	0.00	393.30	393.30	0.00
1382.0		396.65	396.60	396.76	396.76	-0.05	0.00	393.77	393.77	0.00
1427.0	1.625	398.07	398.07	398.07	398.07	0.00	0.00	394.40	394.40	0.00

REFERENCES:

1. U.S. Department of the Interior, Geological Survey, 7.5-Minute Series Topographic Maps, Scale 1:24,000, Contour Interval 10 feet; Danbury, Connecticut, 1963, Photo revised 1984.

2. Federal Emergency Management Agency, Flood Insurance Study, City of Danbury, Connecticut, Fairfield County, Connecticut, April 1982.

3. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2, Water Surface Profiles, User Manual, Davis, California, September, 1990.

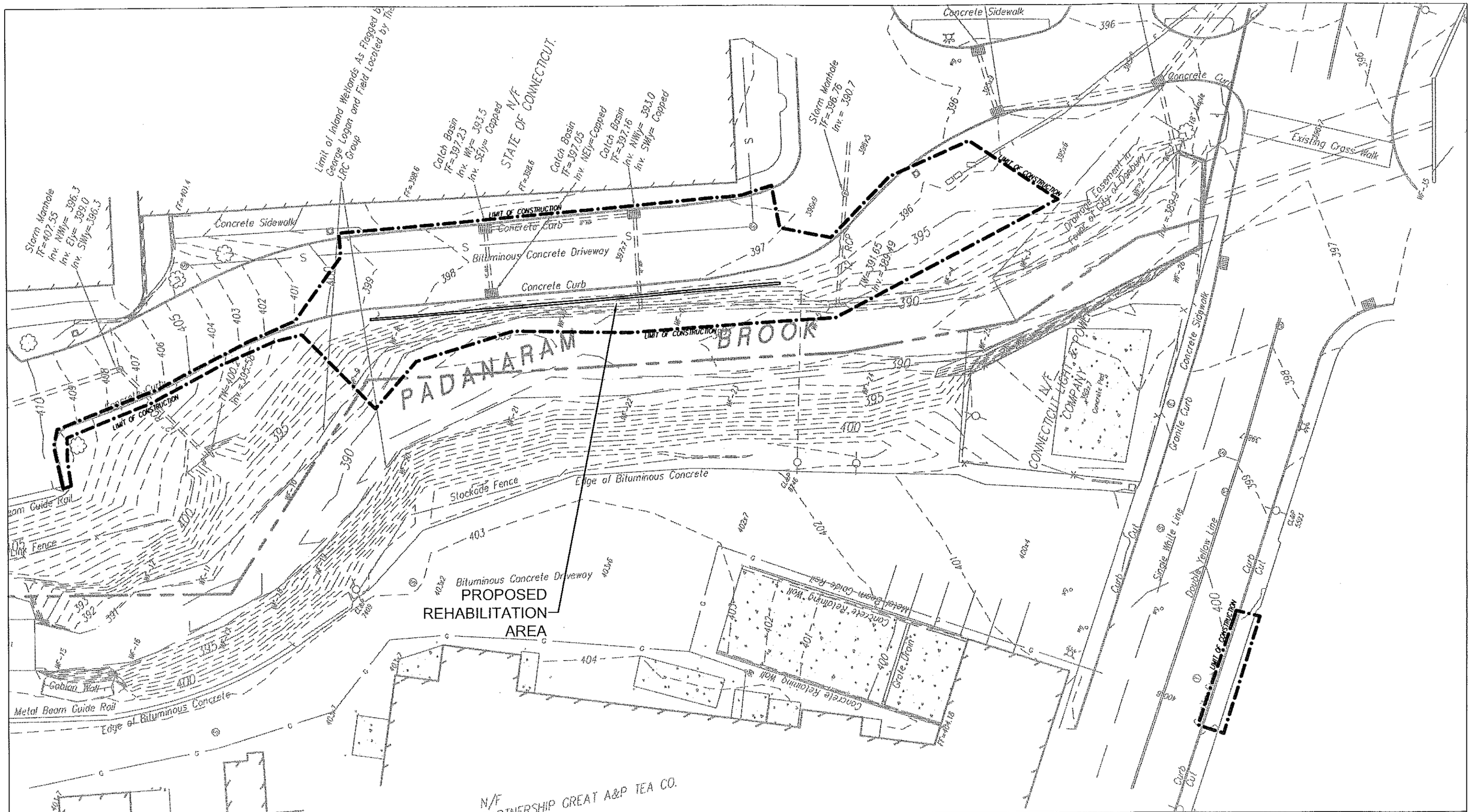
4. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-RAS, Channel Analysis and Water Surface Profiles, User Manual, Davis, California, March, 2008.

5. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-RAS, Channel Analysis and Water Surface Profiles, Hydraulic Reference Manual, Davis, California, March, 2008.

6. State of Connecticut, Department of Transportation, Division of Design Bureau of Highways, Drainage Manual, January, 2000.

7. State of Connecticut, Connecticut General Statutes, Sections 13a-94, 25-68b, and 25-68h.

Appendix A – Figures



NOTES:

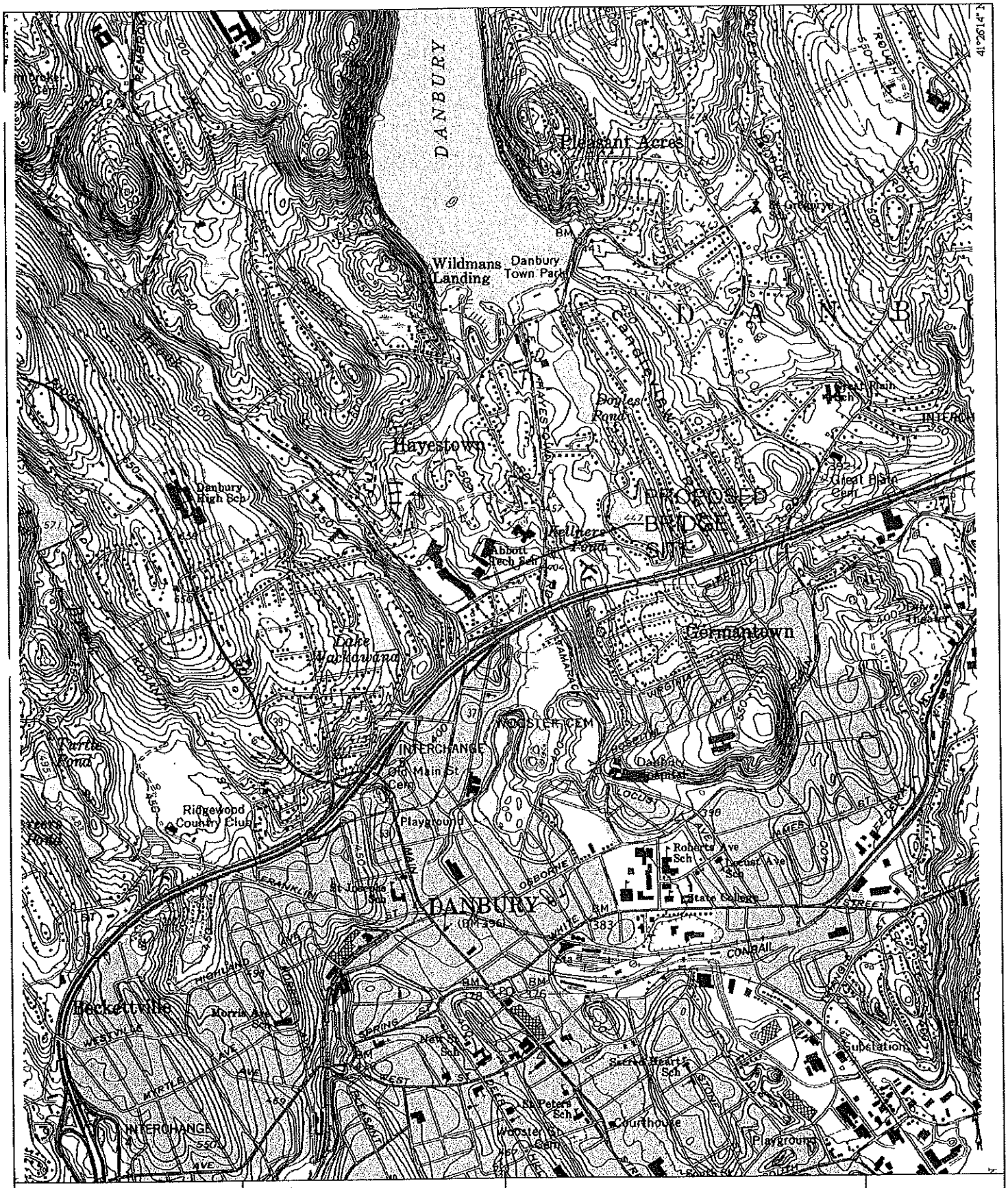
DIVERSIFIED TECHNOLOGY CONSULTANTS
556 WASHINGTON AVENUE NORTH HAVEN CT 06473
203 239 4260 203 234 7270 FAX

PROPROSED BANK STABILIZATION FOR SECTION OF PADANARAM BROOK

NEW HAVEN, CT

Figure 1

DRAWN BY:	FJC
CHECKED BY:	JAB
SCALE:	1"=30'
DATE:	OCTOBER 14, 2009
DTC NUMBER:	07-134-606



DIVERSIFIED TECHNOLOGY CONSULTANTS
2321 WHITNEY AVENUE HAMDEN CT 06518
203 239 4200 203 234 7375 FAX

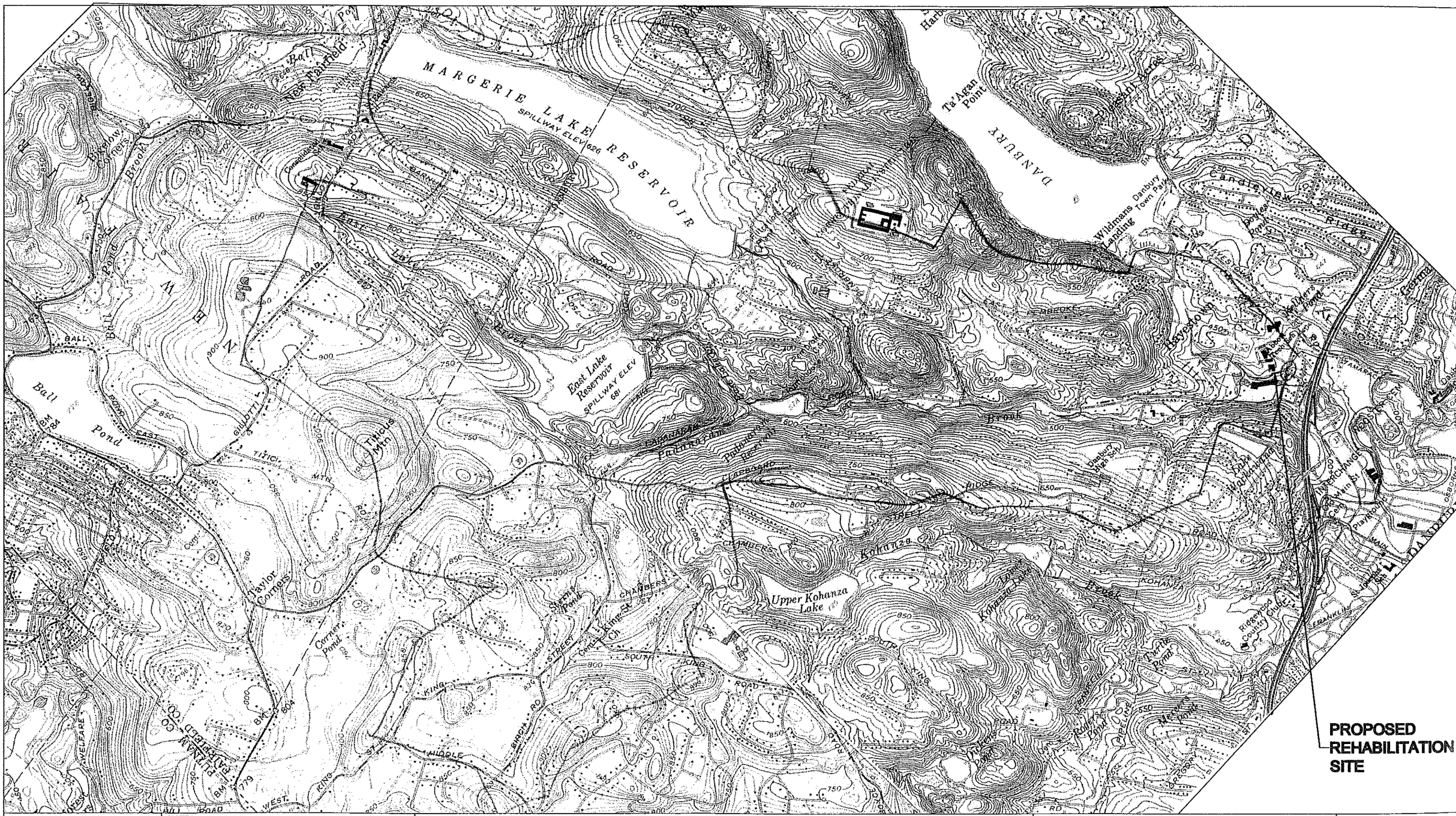
NOTES:

LOCATION PLAN
PADANARAM BROOK

DANBURY , CT

Figure 2

DRAWN BY:	FJC
CHECKED BY:	JAB
SCALE:	1" = 2000'
DATE:	OCTOBER 14, 2009
DTC NUMBER:	07-134-606



DIVERSIFIED TECHNOLOGY CONSULTANTS

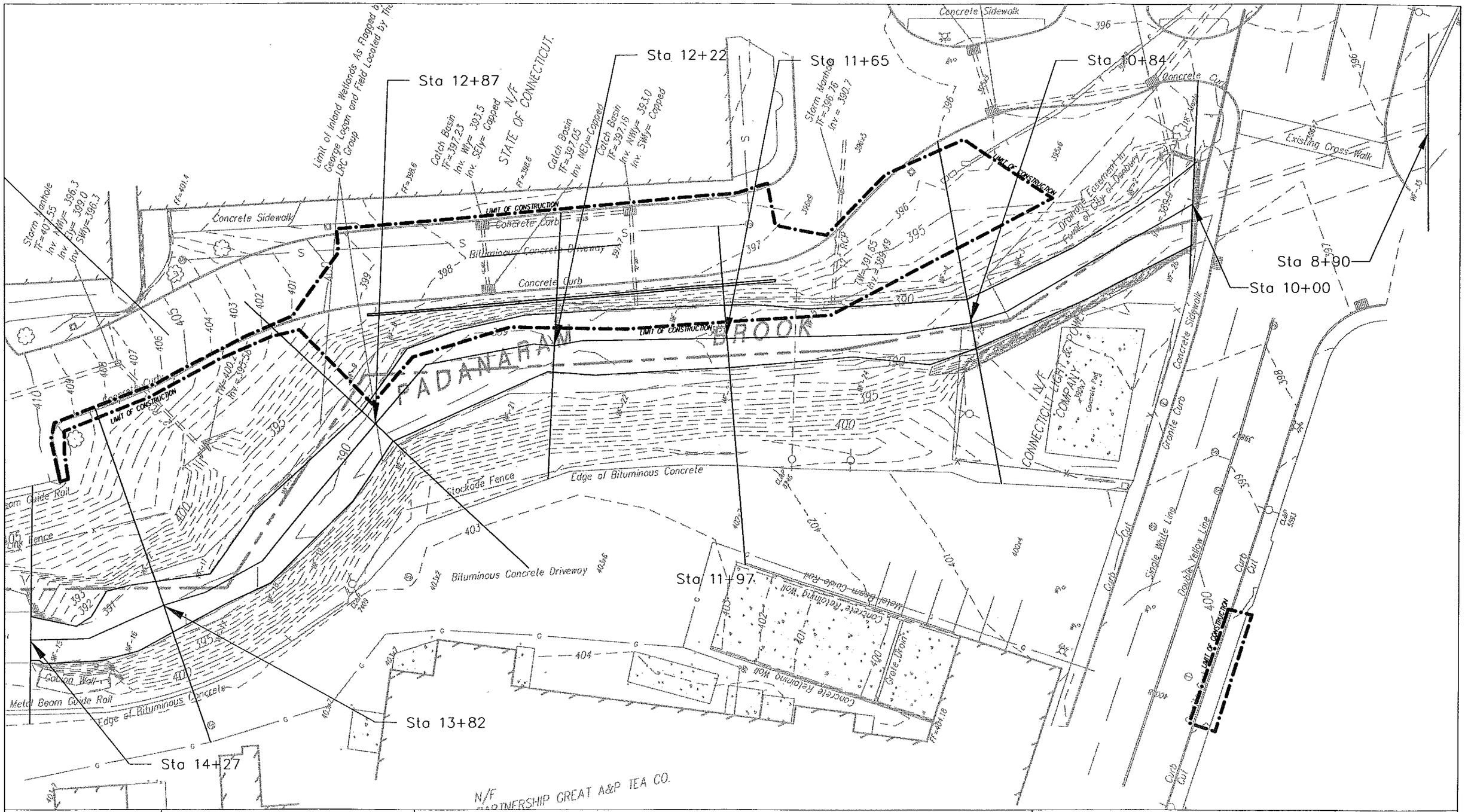
NOTES:

DRAINAGE AREA MAP FOR SECTION OF PADANARAM BROOK

DANBURY, CT

Figure 3

DRAWN BY:	FJC
CHECKED BY:	JAB
SCALE:	1"=2000'
DATE:	OCTOBER 14, 2009
DTC NUMBER:	07-134-606



dtc

DIVERSIFIED TECHNOLOGY CONSULTANTS
556 WASHINGTON AVENUE NORTH HAVEN CT 06473
203 239 4200 203 234 7375 FAX

NOTES:

CROSS SECTION LOCATION PLAN
BANK STABILIZATION FOR SECTION OF PADANARAM BROOK

DANBURY, CT

Figure 4

DRAWN BY:	FJC
CHECKED BY:	JAB
SCALE:	1"=30'
DATE:	OCTOBER 14, 2009
DTC NUMBER:	07-134-606

Appendix B – HEC-RAS Existing Conditions Input

HEC-RAS Version 4.0.0 March 2008
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
X     X  X        X            X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X            X  X     X    X        X
X     X  X        X    X       X   X    X    X        X
X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
```

****

PROJECT DATA
Project Title: 07134606-Abbott Tech
Project File : 07134606-AbbottTec.prj
Run Date and Time: 4/26/2010 4:28:52 PM

Project in English units

****

PLAN DATA

Plan Title: Padanaran-Exist
Plan File : p:\2007\07134 CT DPW Civil On-Call\605-Henry Abbott Tech Brook Hydraulics\606\Calculations\HEC-RAS\07134606-AbbottTec.p01

Geometry Title: Padanaram-Exist
Geometry File : p:\2007\07134 CT DPW Civil On-Call\605-Henry Abbott Tech Brook Hydraulics\606\Calculations\HEC-RAS\07134606-AbbottTec.g03

Flow Title : Padanaram Flows
Flow File : p:\2007\07134 CT DPW Civil On-Call\605-Henry Abbott Tech Brook Hydraulics\606\Calculations\HEC-RAS\07134606-AbbottTec.f01

Plan Summary Information:

Number of:	Cross Sections =	8	Multiple Openings =	0
	Culverts =	1	Inline Structures =	0
	Bridges =	0	Lateral Structures =	0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3

Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

****

FLOW DATA

Flow Title: Padanaram Flows
Flow File : p:\2007\07134 CT DPW Civil On-Call\605-Henry Abbott Tech Brook Hydraulics\606\Calculations\HEC-RAS\07134606-AbbottTec.f01

Flow Data (cfs)

River	Reach	RS	10 yr	50 yr	100 yr	500 yr	2 yr
Padanaram Brook	Main	1427	450	1025	1450	2850	172.7

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Padanaram Brook	Main	10 yr		Known WS = 390
Padanaram Brook	Main	50 yr		Known WS = 391.7
Padanaram Brook	Main	100 yr		Known WS = 393
Padanaram Brook	Main	500 yr		Known WS = 397.2
Padanaram Brook	Main	2 yr		Known WS = 390

****

GEOMETRY DATA

Geometry Title: Padanaram-Exist
Geometry File : p:\2007\07134 CT DPW Civil On-Call\605-Henry Abbott Tech Brook Hydraulics\606\Calculations\HEC-RAS\07134606-AbbottTec.g03

CROSS SECTION

RIVER: Padanaram Brook
REACH: Main RS: 1427

INPUT
Description:
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
500	410.3	505	410	515	405	530	398.7	542	400.95
543.5	400.95	544	391.1	551.5	391.26	558.5	391.6	559	401
560	401	568	402	578	403				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
500	.05	544	.03	558.5	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
544	558.5	47	46	49	.1	.3

CROSS SECTION

RIVER: Padanaram Brook
REACH: Main RS: 1382

INPUT
Description:
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
500	408.4	507	408.6	532	404.3	560	391	568	390.46
578	390.9	585	395	597	402.87	612	403.3		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
500	.05	560	.03	578	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
560	578	92	95	98	.1	.3

CROSS SECTION

RIVER: Padanaram Brook
REACH: Main RS: 1287

INPUT
Description:
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
500	402.5	512	402	512	402.5	525	400	540	393.2
553.1	390.3	559	389.64	567	390.25	585	402.8	600	402.9

```
     629  403.35

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
     500     .05   553.1     .03     567     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         553.1     567               76      69      58             .1       .3

CROSS SECTION


RIVER: Padanaram Brook
REACH: Main               RS: 1222

INPUT
Description:
Station Elevation Data    num=      11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
     500  397.19     512  397.76     525   397.2   525.5   397.7     527     397
     529     395   531.5     392     544     389     552   390.3     563   392.5
     580  403.35

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
     500     .05   531.5     .03     552     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         531.5     552               56      57      59             .1       .3

CROSS SECTION


RIVER: Padanaram Brook
REACH: Main               RS: 1165

INPUT
Description:
Station Elevation Data    num=      13
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
     500   397.2     515     397     515   397.5     518     397     527   389.4
     537  388.71     547   388.8   559.5  394.35     570   402.3     575     403
     580   402.3     596   402.7     612  402.86

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
     500     .05     527     .03     547     .05
```

```
Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           527     547                 80      81    82.5              .1       .3

CROSS SECTION


RIVER: Padanaram Brook
REACH: Main                RS: 1084

INPUT
Description:
Station Elevation Data     num=       9
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*****************************************************************************************
     500     396     512   396.4     525     395     547     390     553  387.76
     561  387.71     570  388.65     571     399     610   400.5

Manning's n Values         num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
     500     .05     547     .03     570     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           547     570                 88      84      79              .1       .3

CROSS SECTION


RIVER: Padanaram Brook
REACH: Main                RS: 1000

INPUT
Description:
Station Elevation Data     num=       9
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*****************************************************************************************
     500  396.08   500.5  396.58     526   397.4   527.5   397.4   527.5  387.93
     555  387.93     555  397.64   556.5  397.64     565  397.84

Manning's n Values         num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
     500     .05   527.5     .03     555     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         527.5     555                110     110     110              .3       .5

CULVERT


RIVER: Padanaram Brook
```

REACH: Main RS: 995

INPUT
Description:
Distance from Upstream XS = 5
Deck/Roadway Width = 100
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 4

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
500	396.5		527.5	396.8	395	555	397.5	395
600	398							

Upstream Bridge Cross Section Data
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
500	396.08	500.5	396.58	526	397.4	527.5	397.4	527.5	387.93
555	387.93	555	397.64	556.5	397.64	565	397.84		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
500	.05	527.5	.03	555	.05

Bank Sta: Left	Right	Coeff Contr.	Expan.
527.5	555	.3	.5

Downstream Deck/Roadway Coordinates
num= 4

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
500	396.5		527.5	396.8	395	555	397.5	395
600	398							

Downstream Bridge Cross Section Data
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
500	396.08	500.5	396.58	526	397.4	526.5	400.36	527.5	400.36
527.5	387.62	555	387.62	555	401.39	556	401.39	556.5	397.64
565	397.84								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
500	.05	527.5	.03	555	.05

Bank Sta: Left	Right	Coeff Contr.	Expan.
527.5	555	.1	.3

```
Upstream Embankment side slope              =      0 horiz. to 1.0 vertical
Downstream Embankment side slope            =      0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =   396.8
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  2

Culvert Name     Shape      Rise    Span
Culvert #1           Box       7      12
FHWA Chart # 58- Rectangular concrete
FHWA Scale # 1 - Side tapered; Less favorable edges
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
                  5     100     .013     .013        0                  .4                 1
Upstream   Elevation =  387.93
           Centerline Station =  533.5
Downstream Elevation =  387.62
           Centerline Station =  533.5

Culvert Name     Shape      Rise    Span
Culvert #2           Box       7      12
FHWA Chart # 58- Rectangular concrete
FHWA Scale # 1 - Side tapered; Less favorable edges
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
                  5     100     .013     .013        0                  .4                 1
Upstream   Elevation =  387.93
           Centerline Station =  549
Downstream Elevation =  387.62
           Centerline Station =  549

CROSS SECTION


RIVER: Padanaram Brook
REACH: Main               RS: 890

INPUT
Description:
Station Elevation Data    num=      11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*****************************************************************************
     500  396.08   500.5  396.58     526   397.4   526.5  400.36   527.5  400.36
   527.5  387.62     555  387.62     555  401.39     556  401.39   556.5  397.64
     565  397.84

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*************************************************
```

500	.05	527.5	.03	555	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
527.5	555	0	0	0	.1	.3

SUMMARY OF MANNING'S N VALUES

River:Padanaram Brook

Reach	River Sta.	n1	n2	n3
Main	1427	.05	.03	.05
Main	1382	.05	.03	.05
Main	1287	.05	.03	.05
Main	1222	.05	.03	.05
Main	1165	.05	.03	.05
Main	1084	.05	.03	.05
Main	1000	.05	.03	.05
Main	995	Culvert		
Main	890	.05	.03	.05

SUMMARY OF REACH LENGTHS

River: Padanaram Brook

Reach	River Sta.	Left	Channel	Right
Main	1427	47	46	49
Main	1382	92	95	98
Main	1287	76	69	58
Main	1222	56	57	59
Main	1165	80	81	82.5
Main	1084	88	84	79
Main	1000	110	110	110
Main	995	Culvert		
Main	890	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Padanaram Brook

Reach	River Sta.	Contr.	Expan.
Main	1427	.1	.3

```
*Main            *    1382    *        .1*        .3*
*Main            *    1287    *        .1*        .3*
*Main            *    1222    *        .1*        .3*
*Main            *    1165    *        .1*        .3*
*Main            *    1084    *        .1*        .3*
*Main            *    1000    *        .3*        .5*
*Main            *    995     *Culvert  *          *
*Main            *    890     *        .1*        .3*
*****************************************************
```

Appendix C – HEC-RAS Proposed Condition Input

```
                    HEC-RAS Version 4.0.0 March 2008
                      U.S. Army Corps of Engineers
                     Hydrologic Engineering Center
                           609 Second Street
                           Davis, California


          X     X  XXXXXX    XXXX        XXXX       XX      XXXX
          X     X  X        X    X       X   X     X  X    X
          X     X  X        X            X   X    X    X   X
          XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
          X     X  X        X            X  X     X    X        X
          X     X  X        X    X       X   X    X    X        X
          X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
```

****

PROJECT DATA
Project Title: 07134606-Abbott Tech
Project File : 07134606-AbbottTec.prj
Run Date and Time: 4/26/2010 3:55:44 PM

Project in English units

****

PLAN DATA

Plan Title: Prop Wall
Plan File : p:\2007\07134 CT DPW Civil On-Call\605-Henry Abbott Tech Brook Hydraulics\606\Calculations\HEC-RAS\07134606-AbbottTec.p03

Geometry Title: Padanaram-Wall
Geometry File : p:\2007\07134 CT DPW Civil On-Call\605-Henry Abbott Tech Brook Hydraulics\606\Calculations\HEC-RAS\07134606-AbbottTec.g04

Flow Title : Padanaram Flows
Flow File : p:\2007\07134 CT DPW Civil On-Call\605-Henry Abbott Tech Brook Hydraulics\606\Calculations\HEC-RAS\07134606-AbbottTec.f01

Plan Summary Information:

Number of:	Cross Sections =	8	Multiple Openings =	0
	Culverts =	1	Inline Structures =	0
	Bridges =	0	Lateral Structures =	0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3

Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

****

FLOW DATA

Flow Title: Padanaram Flows
Flow File : p:\2007\07134 CT DPW Civil On-Call\605-Henry Abbott Tech Brook Hydraulics\606\Calculations\HEC-RAS\07134606-AbbottTec.f01

Flow Data (cfs)

River	Reach	RS	10 yr	50 yr	100 yr	500 yr	2 yr
Padanaram Brook	Main	1427	450	1025	1450	2850	172.7

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Padanaram Brook	Main	10 yr		Known WS = 390
Padanaram Brook	Main	50 yr		Known WS = 391.7
Padanaram Brook	Main	100 yr		Known WS = 393
Padanaram Brook	Main	500 yr		Known WS = 397.2
Padanaram Brook	Main	2 yr		Known WS = 390

****

GEOMETRY DATA

Geometry Title: Padanaram-Wall
Geometry File : p:\2007\07134 CT DPW Civil On-Call\605-Henry Abbott Tech Brook Hydraulics\606\Calculations\HEC-RAS\07134606-AbbottTec.g04

CROSS SECTION

RIVER: Padanaram Brook
REACH: Main RS: 1427

```
INPUT
Description:
Station Elevation Data    num=      13
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*******************************************************************************
     500   410.3     505     410     515     405     530   398.7     542  400.95
   543.5  400.95     544   391.1   551.5  391.26   558.5   391.6     559     401
     560     401     568     402     578     403

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
     500     .05     544     .03   558.5     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           544   558.5               47      46      49              .1       .3

CROSS SECTION


RIVER: Padanaram Brook
REACH: Main               RS: 1382

INPUT
Description:
Station Elevation Data    num=       9
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*******************************************************************************
     500   408.4     507   408.6     532   404.3     560     391     568  390.46
     578   390.9     585     395     597  402.87     612   403.3

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
     500     .05     560     .03     578     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           560     578               92      95      98              .1       .3

CROSS SECTION


RIVER: Padanaram Brook
REACH: Main               RS: 1287

INPUT
Description:
Station Elevation Data    num=      11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*******************************************************************************
     500   402.5     512     402     512   402.5     525     400     540   393.2
   553.1   390.3     559  389.64     567  390.25     585   402.8     600   402.9
```

```
     629  403.35

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
**********************************************
     500     .05   553.1     .03     567     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          553.1    567               76      69      58             .1       .3

CROSS SECTION


RIVER: Padanaram Brook
REACH: Main               RS: 1222

INPUT
Description:
Station Elevation Data    num=      12
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
**********************************************************************************
     500  397.19     512  397.76     525   397.2   525.5   397.7     528   397.5
   528.9   392.8     533     392     534   391.4     544     389     552   390.3
     563   392.5     580  403.35

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
**********************************************
     500     .05     534     .03     552     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            534    552               56      57      59             .1       .3

CROSS SECTION


RIVER: Padanaram Brook
REACH: Main               RS: 1165

INPUT
Description:
Station Elevation Data    num=      16
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
**********************************************************************************
     500   397.2     515     397     515   397.5     522   397.5     523   397.5
   523.9     393   526.9     392     527   389.4     537  388.71     547   388.8
   559.5  394.35     570   402.3     575     403     580   402.3     596   402.7
     612  402.86

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
**********************************************
```

```
     500      .05      527      .03      547      .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           527     547               80      81    82.5             .1       .3

CROSS SECTION


RIVER: Padanaram Brook
REACH: Main                RS: 1084

INPUT
Description:
Station Elevation Data    num=       9
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
**********************************************************************************
     500     396     512   396.4     525     395     547     390     553  387.76
     561  387.71     570  388.65     571     399     610   400.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
**********************************************
     500     .05     547     .03     570     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           547     570               88      84      79             .1       .3

CROSS SECTION


RIVER: Padanaram Brook
REACH: Main                RS: 1000

INPUT
Description:
Station Elevation Data    num=       9
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
**********************************************************************************
     500  396.08   500.5  396.58     526   397.4   527.5   397.4   527.5  387.93
     555  387.93     555  397.64   556.5  397.64     565  397.84

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
**********************************************
     500     .05   527.5     .03     555     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         527.5     555              110     110     110             .1       .3

CULVERT
```

RIVER: Padanaram Brook
REACH: Main RS: 995

INPUT
Description:
Distance from Upstream XS = 5
Deck/Roadway Width = 100
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 4

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
500	396.5	527.5	396.8	395	555	397.5	395
600	398						

Upstream Bridge Cross Section Data
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
500	396.08	500.5	396.58	526	397.4	527.5	397.4	527.5	387.93
555	387.93	555	397.64	556.5	397.64	565	397.84		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
500	.05	527.5	.03	555	.05

Bank Sta: Left	Right	Coeff Contr.	Expan.
527.5	555	.1	.3

Downstream Deck/Roadway Coordinates
num= 4

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
500	396.5	527.5	396.8	395	555	397.5	395
600	398						

Downstream Bridge Cross Section Data
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
500	396.08	500.5	396.58	526	397.4	526.5	400.36	527.5	400.36
527.5	387.62	555	387.62	555	401.39	556	401.39	556.5	397.64
565	397.84								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
500	.05	527.5	.03	555	.05

Bank Sta: Left	Right	Coeff Contr.	Expan.
527.5	555	.1	.3

```
Upstream Embankment side slope              =       0 horiz. to 1.0 vertical
Downstream Embankment side slope            =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =   396.8
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  2

Culvert Name     Shape      Rise    Span
Culvert #1           Box       7      12
FHWA Chart # 58- Rectangular concrete
FHWA Scale # 1 - Side tapered; Less favorable edges
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
                 5     100     .013     .013        0                  .4                 1
Upstream   Elevation =  387.93
           Centerline Station =  533.5
Downstream Elevation =  386.93
           Centerline Station =  533.5

Culvert Name     Shape      Rise    Span
Culvert #2           Box       7      12
FHWA Chart # 58- Rectangular concrete
FHWA Scale # 1 - Side tapered; Less favorable edges
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
                 5     100     .013     .013        0                  .4                 1
Upstream   Elevation =  387.93
           Centerline Station =  549
Downstream Elevation =  386.93
           Centerline Station =  549

CROSS SECTION


RIVER: Padanaram Brook
REACH: Main               RS: 890

INPUT
Description:
Station Elevation Data    num=      11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*******************************************************************************
     500  396.08   500.5  396.58     526   397.4   526.5  400.36   527.5  400.36
   527.5  387.62     555  387.62     555  401.39     556  401.39   556.5  397.64
     565  397.84

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
```

```
**********************************************
     500      .05    527.5      .03      555      .05

Bank Sta: Left    Right     Lengths: Left Channel    Right      Coeff Contr.    Expan.
         527.5      555                  0       0        0              .1        .3

*******************************************************************************

SUMMARY OF MANNING'S N VALUES

River:Padanaram Brook
*****************************************************************
*     Reach       *   River Sta.    *   n1     *   n2     *   n3     *
*****************************************************************
*Main             *    1427         *      .05*      .03*      .05*
*Main             *    1382         *      .05*      .03*      .05*
*Main             *    1287         *      .05*      .03*      .05*
*Main             *    1222         *      .05*      .03*      .05*
*Main             *    1165         *      .05*      .03*      .05*
*Main             *    1084         *      .05*      .03*      .05*
*Main             *    1000         *      .05*      .03*      .05*
*Main             *    995          *Culvert  *        *        *
*Main             *    890          *      .05*      .03*      .05*
*****************************************************************

*******************************************************************************

SUMMARY OF REACH LENGTHS

River: Padanaram Brook
*****************************************************************
*     Reach       *   River Sta.    *  Left    * Channel *  Right  *
*****************************************************************
*Main             *    1427         *       47*       46*       49*
*Main             *    1382         *       92*       95*       98*
*Main             *    1287         *       76*       69*       58*
*Main             *    1222         *       56*       57*       59*
*Main             *    1165         *       80*       81*     82.5*
*Main             *    1084         *       88*       84*       79*
*Main             *    1000         *      110*      110*      110*
*Main             *    995          *Culvert  *        *        *
*Main             *    890          *        0*        0*        0*
*****************************************************************

*******************************************************************************

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Padanaram Brook

*****************************************************
*     Reach       *   River Sta.    * Contr.  * Expan.  *
*****************************************************
```

```
*Main            *    1427    *       .1*       .3*
*Main            *    1382    *       .1*       .3*
*Main            *    1287    *       .1*       .3*
*Main            *    1222    *       .1*       .3*
*Main            *    1165    *       .1*       .3*
*Main            *    1084    *       .1*       .3*
*Main            *    1000    *       .1*       .3*
*Main            *    995     *Culvert  *         *
*Main            *    890     *       .1*       .3*
*****************************************************
```

Appendix D – HEC-RAS Summary Tables

HEC-RAS Plan: Pad-EX River: Padanaram Brook Reach: Main

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Main	1427	10 yr	450.00	391.10	394.40	394.40	395.95	0.009076	10.02	45.37	14.82	1.00
Main	1427	50 yr	1025.00	391.10	396.66	396.66	399.35	0.007562	13.18	79.15	15.05	1.00
Main	1427	100 yr	1450.00	391.10	398.07	398.07	401.45	0.006949	14.76	100.44	15.20	1.00
Main	1427	500 yr	2850.00	391.10	403.06	403.06	406.45	0.003616	15.39	261.90	58.37	0.79
Main	1427	2 yr	172.70	391.10	392.93	392.93	393.76	0.011264	7.29	23.82	14.66	1.00
Main	1382	10 yr	450.00	390.46	393.94		394.65	0.004212	7.03	75.38	29.39	0.69
Main	1382	50 yr	1025.00	390.46	395.75		397.03	0.004426	9.69	134.79	36.16	0.76
Main	1382	100 yr	1450.00	390.46	396.65		398.35	0.004870	11.33	168.56	39.40	0.82
Main	1382	500 yr	2850.00	390.46	399.40		401.86	0.004525	14.07	290.57	49.38	0.84
Main	1382	2 yr	172.70	390.46	392.52		392.90	0.004658	5.04	37.50	23.98	0.66
Main	1287	10 yr	450.00	389.64	393.09		394.12	0.006872	8.76	66.81	30.55	0.87
Main	1287	50 yr	1025.00	389.64	394.68	394.68	396.45	0.007411	11.96	120.38	36.60	0.97
Main	1287	100 yr	1450.00	389.64	395.75	395.68	397.78	0.006766	13.10	161.60	40.50	0.96
Main	1287	500 yr	2850.00	389.64	399.21		401.35	0.004221	14.14	323.59	53.10	0.82
Main	1287	2 yr	172.70	389.64	392.10		392.49	0.004099	5.25	39.46	24.66	0.63
Main	1222	10 yr	450.00	389.00	392.55	392.55	393.57	0.009348	8.41	61.59	32.04	0.96
Main	1222	50 yr	1025.00	389.00	394.05	394.05	395.72	0.008372	11.03	112.43	35.64	0.99
Main	1222	100 yr	1450.00	389.00	395.84		397.22	0.004311	10.20	180.23	40.08	0.75
Main	1222	500 yr	2850.00	389.00	399.49		400.91	0.002552	10.92	394.55	73.95	0.63
Main	1222	2 yr	172.70	389.00	391.36	391.36	392.02	0.011521	6.61	28.05	23.12	0.98
Main	1165	10 yr	450.00	388.71	391.71		392.52	0.005723	7.45	68.77	29.29	0.78
Main	1165	50 yr	1025.00	388.71	394.29		395.22	0.002950	8.26	155.77	38.15	0.63
Main	1165	100 yr	1450.00	388.71	395.95		396.92	0.002205	8.54	222.87	42.38	0.57
Main	1165	500 yr	2850.00	388.71	399.49		400.73	0.001802	10.13	427.26	66.29	0.55
Main	1165	2 yr	172.70	388.71	390.34		390.84	0.008499	5.80	31.85	24.57	0.85
Main	1084	10 yr	450.00	387.71	391.64		392.12	0.002530	5.60	85.36	30.51	0.53
Main	1084	50 yr	1025.00	387.71	394.31		394.96	0.001688	6.71	182.91	42.53	0.48
Main	1084	100 yr	1450.00	387.71	396.00		396.70	0.001384	7.15	263.21	54.95	0.45
Main	1084	500 yr	2850.00	387.71	399.69		400.49	0.001058	8.10	528.48	89.06	0.42
Main	1084	2 yr	172.70	387.71	390.22		390.43	0.002310	3.74	46.39	24.10	0.47
Main	1000	10 yr	450.00	387.93	391.57	389.95	391.88	0.002015	4.50	100.05	27.50	0.42
Main	1000	50 yr	1025.00	387.93	394.23	391.43	394.77	0.002027	5.92	173.27	27.50	0.42
Main	1000	100 yr	1450.00	387.93	395.87	392.35	396.56	0.002083	6.64	218.38	27.50	0.42
Main	1000	500 yr	2850.00	387.93	399.24	394.84	400.33	0.002416	8.62	387.74	65.00	0.45
Main	1000	2 yr	172.70	387.93	390.13	389.00	390.26	0.001418	2.86	60.46	27.50	0.34

HEC-RAS Plan: Pad-EX River: Padanaram Brook Reach: Main (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Main	995		Culvert									
Main	890	10 yr	450.00	387.62	390.00	389.64	390.73	0.007502	6.88	65.45	27.50	0.79
Main	890	50 yr	1025.00	387.62	391.70	391.11	393.00	0.007378	9.14	112.20	27.50	0.80
Main	890	100 yr	1450.00	387.62	393.00	392.04	394.49	0.006451	9.80	147.95	27.50	0.74
Main	890	500 yr	2850.00	387.62	397.20	394.54	399.01	0.004725	10.80	269.86	47.28	0.61
Main	890	2 yr	172.70	387.62	390.00	388.69	390.11	0.001105	2.64	65.45	27.50	0.30

HEC-RAS Plan: Prop wall River: Padanaram Brook Reach: Main

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Main	1427	10 yr	450.00	391.10	394.40	394.40	395.95	0.009076	10.02	45.37	14.82	1.00
Main	1427	50 yr	1025.00	391.10	396.66	396.66	399.35	0.007562	13.18	79.15	15.05	1.00
Main	1427	100 yr	1450.00	391.10	398.07	398.07	401.45	0.006949	14.76	100.44	15.20	1.00
Main	1427	500 yr	2850.00	391.10	403.06	403.06	406.45	0.003616	15.39	261.90	58.37	0.79
Main	1427	2 yr	172.70	391.10	392.93	392.93	393.76	0.011264	7.29	23.82	14.66	1.00
Main	1382	10 yr	450.00	390.46	393.92		394.64	0.004307	7.08	74.79	29.32	0.70
Main	1382	50 yr	1025.00	390.46	395.74		397.03	0.004470	9.72	134.30	36.11	0.76
Main	1382	100 yr	1450.00	390.46	396.60		398.34	0.005025	11.45	166.58	39.22	0.83
Main	1382	500 yr	2850.00	390.46	399.46		401.87	0.004400	13.95	293.74	49.61	0.83
Main	1382	2 yr	172.70	390.46	392.56		392.93	0.004322	4.92	38.45	24.13	0.64
Main	1287	10 yr	450.00	389.64	393.42		394.21	0.004670	7.73	77.32	32.04	0.73
Main	1287	50 yr	1025.00	389.64	394.71	394.68	396.45	0.007197	11.85	121.71	36.73	0.96
Main	1287	100 yr	1450.00	389.64	395.89		397.80	0.006166	12.71	167.36	41.01	0.92
Main	1287	500 yr	2850.00	389.64	399.28		401.38	0.004083	13.98	327.76	53.38	0.81
Main	1287	2 yr	172.70	389.64	392.22		392.56	0.003347	4.92	42.54	25.39	0.58
Main	1222	10 yr	450.00	389.00	392.71	392.71	393.75	0.008790	8.59	62.79	33.89	0.94
Main	1222	50 yr	1025.00	389.00	394.24	394.24	395.90	0.008122	11.25	117.39	37.11	0.98
Main	1222	100 yr	1450.00	389.00	395.76		397.30	0.005149	11.04	175.87	39.78	0.82
Main	1222	500 yr	2850.00	389.00	399.40		400.98	0.003027	11.79	385.24	73.81	0.68
Main	1222	2 yr	172.70	389.00	391.45	391.45	392.14	0.011298	6.79	27.67	21.90	0.97
Main	1165	10 yr	450.00	388.71	391.68		392.54	0.006114	7.64	64.92	26.57	0.81
Main	1165	50 yr	1025.00	388.71	394.23		395.26	0.003241	8.59	145.26	35.57	0.66
Main	1165	100 yr	1450.00	388.71	395.88		396.96	0.002446	8.93	206.20	38.19	0.60
Main	1165	500 yr	2850.00	388.71	399.37		400.79	0.002031	10.67	397.34	66.13	0.58
Main	1165	2 yr	172.70	388.71	390.31	390.20	390.84	0.009198	5.95	30.65	23.43	0.89
Main	1084	10 yr	450.00	387.71	391.64		392.12	0.002530	5.60	85.36	30.51	0.53
Main	1084	50 yr	1025.00	387.71	394.31		394.96	0.001688	6.71	182.91	42.53	0.48
Main	1084	100 yr	1450.00	387.71	396.00		396.70	0.001384	7.15	263.21	54.95	0.45
Main	1084	500 yr	2850.00	387.71	399.69		400.49	0.001058	8.10	528.48	89.06	0.42
Main	1084	2 yr	172.70	387.71	390.18		390.40	0.002469	3.81	45.44	23.92	0.48
Main	1000	10 yr	450.00	387.93	391.57	389.95	391.88	0.002015	4.50	100.05	27.50	0.42
Main	1000	50 yr	1025.00	387.93	394.23	391.43	394.77	0.002027	5.92	173.27	27.50	0.42
Main	1000	100 yr	1450.00	387.93	395.87	392.35	396.56	0.002083	6.64	218.38	27.50	0.42
Main	1000	500 yr	2850.00	387.93	399.24	394.84	400.33	0.002416	8.62	387.74	65.00	0.45
Main	1000	2 yr	172.70	387.93	390.08	389.00	390.21	0.001520	2.92	59.14	27.50	0.35

HEC-RAS Plan: Prop wall River: Padanaram Brook Reach: Main (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Main	995		Culvert									
Main	890	10 yr	450.00	387.62	390.00	389.64	390.73	0.007502	6.88	65.45	27.50	0.79
Main	890	50 yr	1025.00	387.62	391.70	391.11	393.00	0.007378	9.14	112.20	27.50	0.80
Main	890	100 yr	1450.00	387.62	393.00	392.04	394.49	0.006451	9.80	147.95	27.50	0.74
Main	890	500 yr	2850.00	387.62	397.20	394.54	399.01	0.004725	10.80	269.86	47.28	0.61
Main	890	2 yr	172.70	387.62	390.00	388.69	390.11	0.001105	2.64	65.45	27.50	0.30

HEC-RAS Plan: Ex Floodway River: Padanaram Brook Reach: Main

Reach	River Sta	Profile	W.S. Elev	Prof Delta WS	E.G. Elev	Top Wdth Act	Q Left	Q Channel	Q Right	Enc Sta L	Ch Sta L	Ch Sta R	Enc Sta R
			(ft)	(ft)	(ft)	(ft)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft)
Main	1427	100 yr	398.07		401.45	15.20	0.96	1448.19	0.85		544.00	558.50	
Main	1427	Floodway	398.07	0.00	401.46	14.50		1450.00		544.00	544.00	558.50	558.50
Main	1382	100 yr	396.65		398.35	39.40	129.99	1212.81	107.20		560.00	578.00	
Main	1382	Floodway	396.76	0.11	399.82	17.00		1450.00		560.50	560.00	578.00	577.50
Main	1287	100 yr	395.75		397.78	40.50	305.00	1053.99	91.01		553.10	567.00	
Main	1287	Floodway	395.94	0.19	398.10	30.00	265.34	1099.83	84.84	542.00	553.10	567.00	572.00
Main	1222	100 yr	395.85		397.22	40.09	13.85	1186.43	249.72		531.50	552.00	
Main	1222	Floodway	395.92	0.07	397.48	30.00		1167.55	282.45	534.00	531.50	552.00	564.00
Main	1165	100 yr	395.96		396.92	42.38	65.46	1204.50	180.04		527.00	547.00	
Main	1165	Floodway	395.96	0.00	397.08	31.00		1221.13	228.87	528.00	527.00	547.00	559.00
Main	1084	100 yr	396.00		396.70	54.96	168.59	1279.97	1.44		547.00	570.00	
Main	1084	Floodway	396.00	0.00	396.75	33.00	150.21	1299.79		537.00	547.00	570.00	570.00
Main	1000	100 yr	395.87		396.56	27.50		1450.00			527.50	555.00	
Main	1000	Floodway	395.87	0.00	396.56	27.50		1450.00		527.50	527.50	555.00	555.00
Main	995		Culvert										
Main	890	100 yr	393.00		394.49	27.50		1450.00			527.50	555.00	
Main	890	Floodway	393.00	0.00	394.49	27.50		1450.00		527.50	527.50	555.00	555.00

HEC-RAS Plan: Ex Floodway River: Padanaram Brook Reach: Main

Reach	River Sta	Profile	Prof Delta WS	Top Wdth Act	K Perc L	Enc Sta L	Dist Center L	Center Station	Dist Center R	Enc Sta R	K Perc R	Enc WD
			(ft)	(ft)		(ft)	(ft)	(ft)	(ft)	(ft)		(ft)
Main	1427	100 yr		15.20				551.25				
Main	1427	Floodway	0.00	14.50	0.07	544.00	7.25	551.25	7.25	558.50	0.06	14.50
Main	1382	100 yr		39.40				569.00				
Main	1382	Floodway	0.11	17.00	9.13	560.50	8.50	569.00	8.50	577.50	7.52	17.00
Main	1287	100 yr		40.50				560.05				
Main	1287	Floodway	0.19	30.00	4.07	542.00	18.05	560.05	11.95	572.00	0.90	30.00
Main	1222	100 yr		40.09				541.75				
Main	1222	Floodway	0.07	30.00	0.98	534.00	7.75	541.75	22.25	564.00	1.39	30.00
Main	1165	100 yr		42.38				537.00				
Main	1165	Floodway	0.00	31.00	4.51	528.00	9.00	537.00	22.00	559.00	0.23	31.00
Main	1084	100 yr		54.96				558.50				
Main	1084	Floodway	0.00	33.00	3.13	537.00	21.50	558.50	11.50	570.00	0.10	33.00
Main	1000	100 yr		27.50				541.25				
Main	1000	Floodway	0.00	27.50		527.50		541.25		555.00		27.50
Main	995		Culvert									
Main	890	100 yr		27.50				541.25				
Main	890	Floodway	0.00	27.50		527.50	13.75	541.25	13.75	555.00		27.50

HEC-RAS River: Padanaram Brook Reach: Main Profile: Floodway

Reach	River Sta	Profile	Plan	W.S. Elev	Prof Delta WS	E.G. Elev	Top Wdth Act	Q Left	Q Channel	Q Right	Enc Sta L	Ch Sta L	Ch Sta R	Enc Sta R
				(ft)	(ft)	(ft)	(ft)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft)
Main	1427	Floodway	Ex Floodway	398.07	0.00	401.46	14.50		1450.00		544.00	544.00	558.50	558.50
Main	1427	Floodway	Prop Floodway	398.07	0.00	401.46	14.50		1450.00		544.00	544.00	558.50	558.50
Main	1382	Floodway	Ex Floodway	396.76	0.11	399.82	17.00		1450.00		560.50	560.00	578.00	577.50
Main	1382	Floodway	Prop Floodway	396.76	0.13	399.82	17.00		1450.00		560.50	560.00	578.00	577.50
Main	1287	Floodway	Ex Floodway	395.94	0.19	398.10	30.00	265.34	1099.83	84.84	542.00	553.10	567.00	572.00
Main	1287	Floodway	Prop Floodway	395.94	0.11	398.10	30.00	265.34	1099.83	84.84	542.00	553.10	567.00	572.00
Main	1222	Floodway	Ex Floodway	395.92	0.07	397.48	30.00		1167.55	282.45	534.00	531.50	552.00	564.00
Main	1222	Floodway	Prop Floodway	395.92	0.11	397.48	30.00		1167.55	282.45	534.00	534.00	552.00	564.00
Main	1165	Floodway	Ex Floodway	395.96	0.00	397.08	31.00		1221.13	228.87	528.00	527.00	547.00	559.00
Main	1165	Floodway	Prop Floodway	395.96	0.08	397.08	31.00		1221.13	228.87	528.00	527.00	547.00	559.00
Main	1084	Floodway	Ex Floodway	396.00	0.00	396.75	33.00	150.21	1299.79		537.00	547.00	570.00	570.00
Main	1084	Floodway	Prop Floodway	396.00	0.00	396.75	33.00	150.21	1299.79		537.00	547.00	570.00	570.00
Main	1000	Floodway	Ex Floodway	395.87	0.00	396.56	27.50		1450.00		527.50	527.50	555.00	555.00
Main	1000	Floodway	Prop Floodway	395.87	0.00	396.56	27.50		1450.00		527.50	527.50	555.00	555.00
Main	995			Culvert										
Main	890	Floodway	Ex Floodway	393.00	0.00	394.49	27.50		1450.00		527.50	527.50	555.00	555.00
Main	890	Floodway	Prop Floodway	393.00	0.00	394.49	27.50		1450.00		527.50	527.50	555.00	555.00

HEC-RAS Plan: Prop Floodway River: Padanaram Brook Reach: Main

Reach	River Sta	Profile	W.S. Elev	Prof Delta WS	E.G. Elev	Top Wdth Act	Q Left	Q Channel	Q Right	Enc Sta L	Ch Sta L	Ch Sta R	Enc Sta R
			(ft)	(ft)	(ft)	(ft)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft)
Main	1427	100 Yr	398.07		401.45	15.20	0.96	1448.19	0.85		544.00	558.50	
Main	1427	Floodway	398.07	0.00	401.46	14.50		1450.00		544.00	544.00	558.50	558.50
Main	1382	100 Yr	396.63		398.35	39.35	129.70	1213.31	106.99		560.00	578.00	
Main	1382	Floodway	396.76	0.13	399.82	17.00		1450.00		560.50	560.00	578.00	577.50
Main	1287	100 Yr	395.82		397.79	40.77	307.47	1050.48	92.05		553.10	567.00	
Main	1287	Floodway	395.94	0.11	398.10	30.00	265.34	1099.83	84.84	542.00	553.10	567.00	572.00
Main	1222	100 Yr	395.81		397.27	39.86	65.52	1130.82	253.67		534.00	552.00	
Main	1222	Floodway	395.92	0.11	397.48	30.00		1167.55	282.45	534.00	534.00	552.00	564.00
Main	1165	100 Yr	395.88		396.96	38.19	20.29	1245.42	184.29		527.00	547.00	
Main	1165	Floodway	395.96	0.08	397.08	31.00		1221.13	228.87	528.00	527.00	547.00	559.00
Main	1084	100 Yr	396.00		396.70	54.96	168.59	1279.97	1.44		547.00	570.00	
Main	1084	Floodway	396.00	0.00	396.75	33.00	150.21	1299.79		537.00	547.00	570.00	570.00
Main	1000	100 Yr	395.87		396.56	27.50		1450.00			527.50	555.00	
Main	1000	Floodway	395.87	0.00	396.56	27.50		1450.00		527.50	527.50	555.00	555.00
Main	995		Culvert										
Main	890	100 Yr	393.00		394.49	27.50		1450.00			527.50	555.00	
Main	890	Floodway	393.00	0.00	394.49	27.50		1450.00		527.50	527.50	555.00	555.00

HEC-RAS Plan: Prop Floodway River: Padanaram Brook Reach: Main

Reach	River Sta	Profile	Prof Delta WS	Top Wdth Act	K Perc L	Enc Sta L	Dist Center L	Center Station	Dist Center R	Enc Sta R	K Perc R	Enc WD
			(ft)	(ft)		(ft)	(ft)	(ft)	(ft)	(ft)		(ft)
Main	1427	100 Yr		15.20				551.25				
Main	1427	Floodway	0.00	14.50	0.07	544.00	7.25	551.25	7.25	558.50	0.06	14.50
Main	1382	100 Yr		39.35				569.00				
Main	1382	Floodway	0.13	17.00	9.13	560.50	8.50	569.00	8.50	577.50	7.52	17.00
Main	1287	100 Yr		40.77				560.05				
Main	1287	Floodway	0.11	30.00	4.07	542.00	18.05	560.05	11.95	572.00	0.90	30.00
Main	1222	100 Yr		39.86				543.00				
Main	1222	Floodway	0.11	30.00	4.57	534.00	9.00	543.00	21.00	564.00	1.41	30.00
Main	1165	100 Yr		38.19				537.00				
Main	1165	Floodway	0.08	31.00	1.42	528.00	9.00	537.00	22.00	559.00	0.24	31.00
Main	1084	100 Yr		54.96				558.50				
Main	1084	Floodway	0.00	33.00	3.13	537.00	21.50	558.50	11.50	570.00	0.10	33.00
Main	1000	100 Yr		27.50				541.25				
Main	1000	Floodway	0.00	27.50		527.50		541.25		555.00		27.50
Main	995		Culvert									
Main	890	100 Yr		27.50				541.25				
Main	890	Floodway	0.00	27.50		527.50	13.75	541.25	13.75	555.00		27.50

Appendix E – CD of HEC-RAS File

Appendix F – Hydrology for Temporary Conditions

Appendix F – Hydrology for Temporary Facilities

Step 1: Determine Impact Ratings

The following selection factors are rated considering their severity as 1, 2, or 3 for low, medium or high conditions.

Potential Loss of Life - If inhabited structures, permanent or temporary, can be inundated or are in the path of a flood wave caused by an embankment failure, then this item will have a multiple of 15 applied. If no possibility of the above exists, then loss of life will be the same as the severity used for the A.D.T.

Property Damages - Private and public structures (houses, commercial, or manufacturing); appurtenances such as sewage treatment and water supply; utility structures either above or below ground, are to have a multiple of 10 applied. Active cropland, parking lots, recreational areas are to have a multiple of 5 applied. All other areas shall use the severity determined by site conditions.

Traffic Interruption - Includes consideration for emergency supplies and rescue; delays; alternate routes; busses; etc. Short duration flooding of a low volume roadway might be acceptable. If the duration of flooding is long (more than a day), and there is a nearby good quality alternate route, then the flooding of a higher volume highway might also be acceptable. The severity of this component is determined by the detour length multiplied by the average daily traffic projected for bi-directional travel.

Detour Length - The length in kilometers (miles) of an emergency detour by other roads should the temporary facility fail.

Height Above Streambed - The difference in elevation in meters (feet) between the traveled roadway and the bed of the waterway.

Drainage Area - The total area contributing runoff to the temporary facility, in km^2 (mi^2).

Average Daily Traffic - The average amount of vehicles traveling bi-directional through the area in a 24-h period.

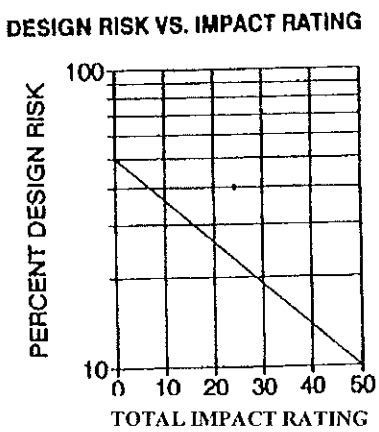
RATING SELECTION

Factor	Rating		
	1	2	3
Loss of Life	See Instructions		
Property Damage	See Instructions		
Traffic Interruptions	< 2000	2000-4000	> 4000
Detour Length, km (mi)	< 8 (< 5)	8-16 (5-10)	> 16 (> 10)
Height Above Streambed, m (ft)	< 3 (< 10)	3-6 (10-20)	> 6 (> 20)
Drainage Area, km^2 (mi^2)	< 2.6 (< 1)	2.6-26.0 (1-10)	> 26.0 (> 10)
Rural ADT	< 400	400-1500	> 1500
Suburban ADT	< 750	750-1500	> 1500
Urban ADT	< 1500	1500-3000	> 3000

IMPACT RATING TABLE

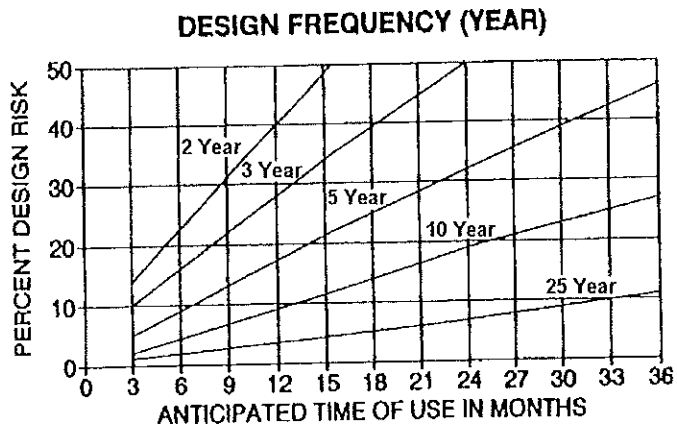
Loss of Life Rating (See Instructions)=	1
Property Damage Rating (See Instructions) =	1
Traffic Interruption Rating =	1
Detour Length Rating =	1
Height Above Streambed Rating =	1
Drainage Area Rating =	2
Average Daily Traffic Rating =	1
Total Impact Rating = (sum of the above) =	8

Step 2: Determine risk percentage



Percent Design Risk = 39

Step 3: Determine Temporary Design Frequency



(for temporary facility)

Design Frequency = 2 **years**

Step 4: Determine Temporary Design Discharge

A. If sufficient discharges have been developed either by the designer or a Flood Insurance Study, then the Temporary Design Discharge should be taken either directly or from a frequency curve plot of the data, based on the design frequency determined in Step 3. Enter the Temporary Design Discharge below. *If Discharge – Frequency information is unavailable, proceed to Step 4 B.*

Temporary Design Discharge = _____ **m³/s (** 173 **cfs)**

2 YR Storm From HEC - HMS

B. Use only when Discharge – Frequency information is unavailable

(1) Determine Multiplier Ratio

Year	Multiplier	Year	Multiplier
2.0	0.8	10.0	1.9
3.0	1.2	25.0	2.7
5.0	1.4		

(2) Compute the Temporary Design Discharge from the following equations

Multiplier _____ × 0.27 ($Q_{50\ yr.}$ _____) = _____ m^3/s (cfs)

Multiplier _____ × 0.20 ($Q_{100\ yr.}$ _____) = _____ m^3/s (cfs)

(3) Select the higher of the two discharges computed in Step 4B-(2). Enter discharge below.

Temporary Design Discharge = _____ m^3/s (cfs)

Attachment H: Engineering Documentation

Part 2: Hydrologic and Hydraulic Consistency Worksheet

Inland Water Resources Division Permit Activities

This worksheet has four sections; only complete the section(s) applicable to the proposed project. Where a question requires a "Yes" or "No" answer, select the appropriate response and explain your response, if required, in the space provided.

Section I: **Floodplain Management** *(if the proposed project involves a structure, obstruction, encroachment or work in a watercourse, floodplain, or coastal high hazard area)*

Section II: **Stormwater Management** *(if the proposed project involves stormwater drainage or stormwater runoff)*

Sections III: **State Grants and Loans** and **Section IV: Disposal of State Land** *(only if the applicant is a state agency seeking flood management certification approval for state grants and loans or disposal of state land)*

Contents:

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   b. *Nonintensive Floodplain Uses* 3
   c. *National Flood Insurance Program (NFIP)* 3
   d. *Municipal Regulations* 3

2. ***Flooding and Flood Hazards***
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   b. *Flood Velocities* 4
   c. *Flood Storage* 4
   d. *Degrading or Aggrading Stream Beds* 4
   e. *Ice Jams* 4
   f. *Storage of Materials & Equipment* 5
   g. *Floodwater Loads* 5

3. ***Standards for Structures in Floodplains or Coastal High Hazard Areas***
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   b. *Structures in Floodplain Areas* 6
   c. *Residential Structures* 6
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   e. *Utilities* 6
   f. *Water Supply Systems* 6
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5. Alterations of Watercourses
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6. Culverts and Bridges
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3. Storm Drainage Systems
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Definitions of terms used in these worksheets are found in Section 25-68b of the Connecticut General Statutes and Section 25-68h-1 of the Regulations of Connecticut State Agencies and in the National Flood Insurance Program Regulations (44 CFR, Chapter 1, Subchapter B, Part 59.1).

Section I: Floodplain Management

Section I: Floodplain Management

Name of Applicant: **CT Dept. of Education**

Name of Proposed Project: **Bank Stabilization of Padanaram Brook**

1. General Criteria

a. *Critical Activity* - Does the proposed project involve the treatment, storage and disposal of hazardous waste or the siting of hospitals, housing for the elderly, schools or residences, in the 0.2 per cent [500 year] floodplain? ☐ Yes ☒ No

If yes, the base flood for the critical activity shall have a recurrence interval equal to the 500 year flood event; if no, the base flood for the activity shall have a recurrence interval equal to the 100 year flood event.

b. *Nonintensive Floodplain Uses* - Will the proposed project promote development in floodplains or will utilities servicing the project be located so as to enable floodplain development?

☐ Yes ☒ No

Explain:

c. *National Flood Insurance Program* (NFIP) - Will the proposed project be located within an area of special flood hazard designated by the Federal Emergency Management Agency (FEMA)?

☒ Yes ☐ No If yes, list the FEMA flood zone(s):

Zone A7

Does the proposed project meet the NFIP minimum standards established in 44 CFR, Chapter 1, Subchapter B, Part 60.3, floodplain management criteria for flood-prone areas?

☒ Yes ☐ No

d. *Municipal Regulations* - Has the municipality in which the proposed project is to be located adopted floodplain regulations containing requirements that are more restrictive than the NFIP floodplain management criteria for flood-prone areas? ☐ Yes ☒ No

If yes, describe the more restrictive requirements:

Does the proposed project comply with the more restrictive standards of the municipality?

☐ Yes ☐ No

Section I: Floodplain Management (continued)

2. *Flooding and Flood Hazards*

a. *Flooding* - Will the proposed project pose any hazard to human life, health or property in the event of a base flood? ☐ Yes ☒ No

If yes, explain:

b. *Flood Velocities* - Will the proposed project cause an increase in flow velocity or depth during the base flood discharge? ☒ Yes ☐ No

If yes, the increase in velocity is: **0.84** fps
and/or the increase in depth is: **0.14** ft.

Will such increase in velocity or depth cause channel erosion or pose any hazard to human life, health or property? ☐ Yes ☒ No

Explain:

The increase in velocity and depth is small and will not increase channel erosion or pose a risk to human life health or property.

c. *Flood Storage* - Will the proposed project affect the flood storage capacity or flood control value of the floodplain? ☐ Yes ☒ No

If yes, describe the effects:

d. *Degrading or Aggrading Stream Beds* - Is the streambed currently degrading or aggrading?

☐ Degrading ☐ Aggrading ☒ Neither

Has the project design addressed degrading or aggrading streambed conditions?

☐ Yes ☒ No

e. *Ice Jams* - Is the watercourse prone to ice jams or floods due to ice? ☐ Yes ☒ No

Has the project design considered ice jams or floods due to ice? ☒ Yes ☐ No

Section I: Floodplain Management (continued)

f. *Storage of Materials & Equipment* - Will the construction or use of the proposed project involve the storage of materials below the 500 year flood elevation that are buoyant, hazardous, flammable, explosive, soluble, expansive or radioactive, or the storage of any other materials which could be injurious to human, animal or plant life in the event of a flood?

☐ Yes ☒ No

If yes, describe the materials and how such materials will be protected from flood damage, secured or removed from the floodplain to prevent pollution and hazards to life and property.

Storage of materials that could be injurious to human health or the environment in the event of flooding is prohibited below the elevation of the 500 year flood. Other material or equipment may be stored below the 500 year flood elevation provided that such material or equipment is not subject to major damage by floods, and provided that such material or equipment is firmly anchored, restrained or enclosed to prevent it from floating away or that such material or equipment can be removed prior to flooding.

g. *Floodwater Loads* - Will structures, facilities and stored materials be anchored or otherwise designed to prevent floatation, collapse, or lateral movement resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy? ☒ Yes ☐ No

3. *Standards for Structures in Floodplains or Coastal High Hazard Areas*

Does the proposed project involve a new or substantially improved structure or facility located within a floodplain or coastal high hazard area? ☐ Yes ☒ No

If yes, complete this subsection; if no, skip to subsection 4 (***Topography Changes within Floodplain***).

a. *Structures in Coastal High Hazard Areas* - Will the structure or facility be located within an NFIP coastal high hazard area? ☐ Yes ☐ No

If no, skip to paragraph 3(b); if yes:

1. Will the structure or facility be located landward of the reach of mean high tide?

   ☐ Yes ☐ No

2. Will a new structure or facility be located on an undeveloped coastal barrier beach designated by FEMA? ☐ Yes ☐ No

3. If the structure or facility is/will be located within a coastal high hazard area, the structure or facility must be elevated on pilings or columns so that the bottom of the lowest horizontal structural member of the lowest floor (excluding the pilings or columns) is elevated to at least one foot above the base flood level and the pile or column foundation and structure attached thereto must be anchored to resist floatation, collapse and lateral movement due to the effects of wind, velocity waters, hurricane wave wash, and base flood water loads acting simultaneously on all building components.

   Does the proposed structure or facility meet these standards? ☐ Yes ☐ No

   The base flood elevation is: ft. (Datum:)

   The elevation of the lowest horizontal structural member is: ft. (Datum:)

Section I: Floodplain Management (continued)

4. Will the space below the lowest floor be either free of obstruction or constructed with non-supporting breakaway walls? ☐ Yes ☐ No

5. Will fill be used for structural support of any buildings within coastal high hazard areas?

   ☐ Yes ☐ No

b. *Structures in Floodplain Areas* - Are the structures residential or nonresidential?

☐ Residential ☐ Nonresidential If *nonresidential*, skip to paragraph 3(d) below.

c. *Residential Structures* - If the structure or facility is for human habitation will the lowest floor of such structure or facility, including its basement, be elevated one foot above the level of the 500 year flood?

☐ Yes ☐ No

The 500 year flood elevation is: ft. (Datum:)

The elevation of the lowest floor, including basement, is: ft. (Datum:)

d. *Non-residential Structures* - If the structure or facility is not intended for residential uses, will the lowest floor of such structure or facility, including its basement, be elevated to or above the 100 year flood height or be floodproofed to that height, or in the case of a critical activity, the 500 year flood height?

☐ Yes ☐ No

If yes, the structure will be: ☐ Elevated ☐ Floodproofed

The base flood elevation is: ft. (Datum:)

The elevation of the lowest floor, including basement, is: ft. (Datum:)

The structure is floodproofed to: ft. (Datum:)

Note: for insurance purposes nonresidential structures must be floodproofed to at least one foot above the base flood elevation. DEP strongly encourages that the height of floodproofing incorporate one foot of freeboard.

e. *Utilities* - Will service facilities such as electrical, heating, ventilation, plumbing, and air conditioning equipment be constructed at or above the elevation of the base flood or floodproofed with a passive system? ☐ Yes ☐ No

f. *Water Supply Systems* - Does the proposed project include a new or replacement water supply system?
☐ Yes ☐ No

If yes, is the water supply system designed to prevent floodwaters from entering and contaminating the system during the base flood? ☐ Yes ☐ No

g. *Sanitary Sewage Systems* - Does the proposed project include a new or replacement sanitary sewage or collection system? ☐ Yes ☐ No

If yes, is the sanitary sewage system designed to minimize or eliminate the infiltration of flood waters into the systems and discharges from the systems into flood waters during the base flood?

☐ Yes ☐ No

h. *Foundation Drains* - Are foundation drains of buildings designed to prevent backflow from the 100 year frequency flood into the building?

☐ Yes ☐ No ☐ No foundation drains

Section I: Floodplain Management (continued)

4. *Activity within Floodplain*

Does the proposed project involve activity in a floodplain including but not limited to filling, dumping, construction, excavating, or grading?

☒ Yes ☐ No If no, skip to subsection 5 ***(Alterations of Watercourses)***.

If yes, does the proposed project include encroachments, including fill, new construction, substantial improvements, or other development within a NFIP adopted regulatory floodway?

☒ Yes ☐ No If yes, skip to paragraph 4(b) below.

a. *No Regulatory Floodway* - The NFIP requires that until a regulatory floodway is designated, that no new construction, substantial improvements, or other development (including fill) shall be permitted within Zones A1-30 and AE unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one foot at any point. (If no regulatory floodway has been adopted, project impacts may be evaluated by considering an equivalent conveyance loss on the opposite side of the river from the proposed project.)

Is the proposed project consistent with this requirement? ☒ Yes ☐ No

b. *Floodway Encroachments* - Will the proposed encroachment into the floodway result in any increase in flood levels during either the 100 year or 10 year discharges?

100 year: ☐ Yes; the increase is: (in 1/100ths of a foot) ☒ No

If yes, has the applicant received approval of such increase in accordance with 44 CFR, Chapter 1, Subchapter B, Part 65.12? ☐ Yes ☐ No

10 year: ☐ Yes; the increase is: (in 1/100ths of a foot) ☒ No

c. *Coastal Areas* - Flood hazard potential in coastal areas shall be evaluated considering surface profiles of the combined occurrence of tides, storm surges, and peak runoff. The starting water surface elevation for the base flood in watersheds with time of concentrations of over 6 hours shall be the 10 year frequency tidal surge level.

If the proposed project is in a coastal area, have the hydraulic analyses incorporated these criteria?

☐ Yes ☐ No ☒ Not in Coastal Area

5. *Alterations of Watercourses*

Does the proposed project include the construction or alteration to a natural perennial watercourse or man-made channel?

☒ Yes ☐ No If no, skip to subsection 6 ***(Culverts and Bridges)***; if yes, complete the following subsection:

a. *Topography Change* - Is the watercourse or channel located within a regulatory floodway or Zone A1-30 or AE as designated by the NFIP? ☒ Yes ☐ No

b. *Hydraulic Capacity* - Does the channel have a minimum flow capacity of a flood equal to at least the 25 year frequency flood? ☒ Yes ☐ No

The channel capacity is designed for the: **100** year flood.

Does the channel have an inner channel with a capacity of a 2 year frequency flood? ☒ Yes ☐ No

Section I: Floodplain Management (continued)

c. *Aquatic Habitat* - Channel alterations should be designed to create aquatic habitats suitable for fisheries, including suitable habitat for maintaining fish populations and to enable fish passage, and to maintain or improve water quality, aesthetics, and recreation.

Has the applicant had any pre-application meetings or correspondence with DEP Fisheries?

☒ Yes ☐ No

Check each of the following criteria that have been incorporated into the project design:

☒ 1. artificial channel linings have been avoided;

☒ 2. the channel will encourage ecological productivity and diversity;

☒ 3. the channel and its banks will be compatible with their surroundings;

☒ 4. the channel will vary in its width, depth, invert elevations, and side slopes to provide diverse aquatic habitat;

☒ 5. straightening existing channels and thereby decreasing their length has been avoided;

☒ 6. the channel will not create barriers to upstream and downstream fish passage;

☐ 7. the channel will contain pools and riffles and a low flow channel to concentrate seasonal low water flows;

☐ 8. the channel will contain flow deflectors, boulders and low check dams to enhance aquatic habitat;

☒ 9. stream bank vegetation will be preserved where feasible and disturbed stream bank areas will be replanted with suitable vegetation;

☒ 10. clean natural stream bed materials of a suitable size will be incorporated in the new channel; and

☒ 11. construction of the proposed project will be scheduled to minimize conflicts with spawning, stocking, and recreational fishing seasons.

Describe how the above aquatic habitat design criteria have been incorporated into the project design:

All proposed work will be limited to the banks of the brook. Work in the stream channel is limited to sheet piling placed at the edge of the channel. This is necessary to create a cofferdam which will provide a safe dry work condition during construction. There is no anticipated impact to aquatic habitat due to sheetpiling.

Section I: Floodplain Management (continued)

6. *Culverts and Bridges*

Does the proposed project involve the repair or new construction of a culvert or bridge?

☐ Yes ☒ No If no, go to subsection 7 ***(Temporary Hydraulic Facilities)***.

If yes, complete this subsection:

a. *Fish Passage* - Does the culvert design allow for the passage of fish? ☐ Yes ☐ No

If yes, describe the specific design provisions for fish passage:

b. *Depressed Structural Floors* - Is the rigid structural floor of the culvert or bridge depressed below the normal stream bed to allow a natural stream bed to form over the floor?

☐ Yes ☐ No ☐ No rigid structural floor

c. *Multiple Openings* - The use of a single large culvert or bridge opening is preferred over the use of multiple small openings. Has the design minimized the use of multiple small openings?

☐ Yes ☐ No

If no, explain:

d. *Sag Vertical Curves* - Does the design utilize solid parapet walls in the sag part of a vertical curve?

☐ Yes ☐ No ☐ Not located in a sag vertical curve

e. *Debris Blockage* - Is the culvert or bridge prone to blockage by debris? ☐ Yes ☐ No

If yes, has the project design incorporated measures to minimize the potential for debris blockage?

☐ Yes ☐ No

f. *Topography Change* - Is the culvert or bridge located within a regulatory floodway or Zone A1-30 or AE as designated by the NFIP? ☐ Yes ☐ No

Section I: Floodplain Management (continued)

g. *State Highways* - Does the watercourse pass under a state roadway?

☐ Yes ☐ No If no, skip to paragraph 6(g)(2).

If yes, culverts and bridges for state highways shall be designed in accordance with the Connecticut Department of Transportation (DOT) Drainage Manual and all applicants should refer to it for specific design criteria. In general, however, the Drainage Manual requires the following:

(Place a check mark for all applicable criteria utilized)

☐ *Minor Structures* - Minor structures have a drainage area of less than one square mile in which there is no established watercourse. They shall be designed to pass the 25 year frequency discharge.

☐ *Small Structures* - Small structures have a drainage area of less than one square mile in which there is an established watercourse. *They* shall be designed to pass the 50 year frequency discharge.

☐ *Intermediate Structures* - Intermediate structures have a drainage area greater than one square mile and less than 10 square miles. They *shall* be designed to pass the 100 year frequency discharge with reasonable underclearance.

☐ *Large Structures* - Large structures have a drainage area greater than 10 square miles and less than 1000 square miles. They shall be designed to pass the 100 year frequency discharge with an underclearance not less than two feet.

☐ *Monumental Structures* - Monumental structures *have* a drainage area greater than 1000 square miles. They shall be designed to meet the requirements of the Connecticut Department of Environmental Protection, U.S. Army Corps of Engineers, and the U.S. Coast Guard.

☐ *Tidal Structures* - Tidal structures are subject to tidal action and shall be classified as minor, small, intermediate, etc. depending on their drainage area. These structures shall be designed in accordance with the previously listed *classifications*. However if the highway is subject to frequent tidal flooding, the design storm may be made consistent with the frequency of flooding by tidal action. The proposed culvert or bridge is classified as:

☐ Tidal, minor

☐ Tidal, small

☐ Tidal, intermediate

☐ Tidal, large

☐ Tidal, monumental

1. Has the structure been designed in accordance with the criteria established in the DOT Drainage Manual? ☐ Yes ☐ No

   If no, describe the lower design standards and the reasons for not complying with the DOT Drainage Manual:

Section I: Floodplain Management (continued)

2. Will the proposed culvert or bridge increase upstream water surface elevations in the event of a base flood above that which would have been obtained in the natural channel if the highway embankment were not constructed? ☐ Yes ☐ No

   If yes, is the increase in elevation more than one foot? Describe:

3. Will the proposed culvert or bridge be designed so that flooding during the design discharge does not endanger the roadway or cause damage to upstream developed property? (NOTE: The design discharge for culverts and bridges on state highways should be that which was determined by FEMA. If the applicant judges that the FEMA discharge is inappropriate, the project should be analyzed for both the applicant's computed flow and the FEMA discharge. The project, however, must still meet the standards of the NFIP.) ☐ Yes ☐ No

   Explain:

h. *Local Roads & Driveways* - Local roads (not state highways) and driveways may be designed for flood frequencies and underclearances less stringent than those specified in the DOT Drainage Manual when (check all that have been incorporated into the project design):

☐ 1. the road is at or close to the floodplain grade

☐ 2. water surface elevations are not increased by more than one foot nor cause damage to upstream properties

☐ 3. provisions are made to barricade the road when overtopped

☐ 4. the road or driveway is posted as being subject to flooding

☐ 5. the road or driveway has low traffic volume

☐ 6. alternate routes are available

The culvert or bridge has been designed to pass the: year frequency discharge with an underclearance of: feet.

Utilizing the DOT Drainage Manual classifications listed under paragraph 6(g) above, the culvert or bridge is classified as a: structure.

Section I: Floodplain Management (continued)

h. If the culvert or bridge is designed to standards lower than which is stipulated in the DOT Drainage Manual, list such standards and the reasons for the lower design standards:

i. *Downstream Peak Flows* - Will the proposed culvert or bridge increase downstream peak flows by decreasing existing headwater depths during flooding events? ☐ Yes ☐ No

If yes, describe the selected design criteria and the impacts to downstream properties:

7. *Temporary Hydraulic Facilities*

Temporary hydraulic facilities include all channels, culverts or bridges which are required for haul roads, channel relocations, culvert installations, bridge construction, temporary roads, or detours. They are to be designed with the same care which is used for the primary facility.

If the proposed activity involves a temporary hydraulic facility(s), has such facility been designed in accordance with Chapter 6, Appendix F, "Temporary Hydraulic Facilities," of the DOT Drainage Manual?

☒ Yes ☐ No ☐ No temporary hydraulic facilities

If yes, the design flood frequency is the: **2** year flood.

Describe the temporary facilities:

Sheet piling is proposed along the toe of the channel as part of a coffer dam. The coffer dam will aid in dewatering the site for the construction of the retaining wall. The sheet piling will be set one foot higher than the 2-year storm. After construction, the sheet piling will be cut off to the mud line of the brook channel. The area will then be back filled with the final three feet being 2-feet of rip rap topped by one of soil. It is the intent to return the bank as close as possible to exiting conditions.

Section II: Stormwater Management

Name of Applicant: **CT Dept. of Education**

Name of Proposed Project: **Bank Stabilization of Padanaram Brook**

1. *Stormwater Runoff*

The proposed project will (check all that apply):

- ☐ Increase the area of impervious surfaces
- ☐ Increase runoff coefficients
- ☐ Alter existing drainage patterns
- ☐ Alter time of concentrations
- ☐ Change the timing of runoff in relation to adjacent watersheds

Will the proposed project impact downstream areas by increasing peak flow rates, the timing of runoff, or the volume of runoff? ☐ Yes ☒ No

If yes, describe the downstream impacts for the 2, 10 and 100 year frequency discharges:

The pre and post development peak flow rates at the downstream design point are as follows:

Return Frequency (Year)	Peak Discharges (CFS)	
	Pre-Development	Post-Development
2		
10		
100		

The above peak discharges were computed utilizing the: hour duration storm. This duration storm was selected because:

Section II: Stormwater Management (continued)

Describe the location of the design point and why this location was chosen:

2. *Stormwater Detention Facilities*

Does the proposed project include the construction of any stormwater detention facilities?

☐ Yes ☒ No If no, skip to subsection 3 *(Storm Drainage Systems)*.

If yes, has the DEP determined whether a dam construction permit is required? ☐ Yes ☐ No

The pre and post development peak flow rates at the downstream design point are as follows:

Return Frequency (Year)	Peak Discharges (CFS)		
	Pre-Development	Post-Development (without detention)	Post-Development (with detention)
2			
10			
100			

The above peak discharges were computed utilizing the: hour duration storm. This duration storm was selected because:

Describe the location of the design point and why this location was chosen:

Section II: Stormwater Management (continued)

If the proposed project increases peak flow rates for the 2, 10 or 100 year frequency discharges, describe the impacts to downstream areas:

Will the detention facility aggravate erosion along the downstream channel? ☐ Yes ☐ No

In certain situations, detention of stormwater aggravates downstream flooding. This occurs when the discharge from a subwatershed is delayed by a detention facility so that it adds to the peak discharge from another subwatershed. Adding the hydrographs of the two subwatersheds results in a higher peak discharge over that which would occur if detention were not present.

Is the location of the detention facility within the watershed suitable for detention? ☐ Yes ☐ No

Explain:

3. *Storm Drainage Systems*

Does the proposed project include the construction of subsurface storm drainage systems?

☐ Yes ☒ No If no, you have completed Section II of the worksheets.

If yes, complete this subsection:

a. *DOT Standards* - Is the proposed storm drainage system designed in accordance with the Connecticut Department of Transportation's (DOT) Drainage Manual? ☐ Yes ☐ No

If no, describe the lower design standards and the reasons for not complying with the Drainage Manual:

b. *Design Storm* - Is the storm drainage system designed for a ten year frequency storm without closing the use of the facility? ☐ Yes ☐ No

c. *Future Development* - Has the design of the system considered future development of adjacent properties? ☐ Yes ☐ No

Section II: Stormwater Management (continued)

d. *Outlet Protection* - Have the outlets from the system been designed to minimize the potential for downstream erosion? ☐ Yes ☐ No

e. *Overland Flow* - Has the use of curbing been minimized to encourage overland dispersed flow through stable vegetated areas? ☐ Yes ☐ No

f. *Vegetated Filter Strips* - Has the design incorporated the use of vegetated filter strips or grass swales to improve the quality of water outletting from the storm drainage system? ☐ Yes ☐ No

g. *Stormwater Treatment* - Describe features of the stormwater collection system intended to improve the quality of stormwater runoff prior to its discharge to surface waters.

h. *E & S Control Plan* - Has the design and installation of the storm drainage system been coordinated with the soil erosion and sediment control plan prepared in accordance with the 2002 Connecticut Guidelines for Soil Erosion and Sediment Control? ☐ Yes ☐ No

Explain:

ATTACHMENT I – FLOOD CONTINGENCY PLAN

Attachment I – Flood Contingency Plan

Construction Flood Contingency Operations Plan

During construction activities within the stream bed, on an daily basis, the contractor will monitor TV and/or radio weather forecasts for impending storm events. If a high probability of significant rain (greater than 0.1") is predicted within 4 hours, the following measures will be taken to secure the site:

1. All new activity within the stream bed will cease. Areas currently being worked will be quickly stabilized.
2. All construction equipment and personnel will be moved above the predicted 100 year flood elevation.
3. All erosion control measures (including sediment check dams) will be inspected, cleaned and repaired as necessary.
4. Work may not resume until floodwaters subside, and work areas are properly dewatered.

To protect for off hours storm events, the above operations will also be performed on a daily basis at the conclusion of construction activities for the day.

If greater than 1" of rain is predicted, in addition to the above measures, all sediment check dams will be removed and material placed above the predicted 100 year flood elevation.

Post Construction Flood Contingency Operations Plan

None needed.

ATTACHMENT J – SOIL SCIENTIST REPORT

09.01.09
DTC
RECOM
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ENGINEERED SOLUTIONS

dtc

LAND
STRUCTURES
WATER

September 1, 2009

J. Andrew Bevilacqua, P.E.
Associate & Manager of Civil Engineering
Diversified Technology Consultants, Inc.
2321 Whitney Avenue
Suite 301
Hamden, CT 06518

Re: Wetland and Watercourse Delineation
Portion of Henry Abbott Technical School
Hayestown Avenue
Danbury, Connecticut

Dear Mr. Bevilacqua:

Diversified Technology Consultants, Inc. (DTC) conducted a site inspection of the referenced property to determine the presence or absence of wetlands and/or watercourses, to demarcate (flag) the boundaries of wetlands and watercourses identified, and to identify onsite soil types.

The limit of investigation on the project site consisted of approximately 1.65 acres west and southwest of the Henry Abbott Technical School. The investigation consisted of an area immediately surrounding the Padanaram Brook. The weather on the day of the investigation was sunny with temperatures in the 70s.

During the September 1, 2009 investigation an inland wetland and watercourse system was identified and delineated. The system is a watercourse, Padanaram Brook, with a narrow wetland buffer along portions of the brook. The vegetative cover is primarily broadleaved deciduous woodland. Wetland soils are primarily poorly drained fine sandy loams that formed from glacial till. The boundaries of the wetland and watercourse system were marked onsite with flags numbered 1 to 13, 15 to 26, 30 to 32 and 35 to 37.

Five soil map units were identified on the property (two wetland and three upland). Each map unit represents a specific area on the landscape and consists of one or more soils for which the unit is named. Other soils (inclusions that are generally to small to be delineated separately) may account for 10 to 15 percent per map unit. A complete description of each soil map can be found in the Soil Survey, State of Connecticut (Natural Resources Conservation Service, USDA).

2321 WHITNEY AVENUE HAMDEN CENTER II HAMDEN CT 06518

203 239 4200 PH 203 234 7376 FAX

Symbol	Name	Parent Material	Drainage Class
Upland Soil			
273E	Urban land-Charlton-Chatfield complex, rocky, 15 to 45 percent slopes	Glacial Till	Moderately Well Drained
306	Udorthents-Urban land complex	Excavated or Filled Soil (>2 feet)	Well Drained to Moderately Well Drained
308	Urban Land	Buildings, Paved Roads, Parking lots	Not Applicable
Wetland Soil			
84D	Paxton and Montauck fine sandy loams	Glacial Till	Very Poorly Drained
308	Udorthents, smoothed	Excavated or Filled Soil (>2 feet)	Poorly Drained

On September 1, 2009, DTC completed a limited investigation at a portion of Henry Abbott Technical School property in Danbury, Connecticut and identified and delineated a wetland and watercourse system along the western property boundary. The wetland and watercourse boundaries are subject to change until adopted by local, state, or federal regulatory agencies. If you should have any questions or comments, please do not hesitate to contact DTC.

Sincerely,

DIVERSIFIED TECHNOLOGY CONSULTANTS, INC.

Ethan Stewart
Soil Scientist

ATTACHMENT M – ALTERNATIVES ASSESSMENT

Attachment M: Alternatives Assessment

This proposed project will be designed with a view toward utilizing the least damaging alternative for fulfilling the project objectives. The following alternatives were considered in the development of the design:

1. No Action: This alternative was rejected because it will not address the problems of the bank erosion and the impending access drive destabilization.
2. Postponing Action Pending Further Study: Detailed study has already been performed on the proposed project areas from a hydrologic and hydraulic standpoint. No further study is warranted.
3. Taking Action of a Different Nature: Alternative options for addressing the flooding concerns have been considered:
    1. Re-grade slope stabilize with grouted rip rap
    2. Gabion Block Retaining Wall
    3. Cast-in-place Retaining Wall
4. Conducting the Proposed Activity in a Different Location: Due to the nature and specific location of the site, any proposed improvements, at another location would not correct the erosion problem

ATTACHMENT N – Applicant Compliance Form

Applicant Compliance Information

DEP ONLY
App. No. _____
Co./Ind. No. _____

Applicant Name: **CT Dept. of Education**
(as indicated on the *Permit Application Transmittal Form*)

If you answer *yes* to any of the questions below, you must complete the Table of Enforcement Actions on the reverse side of this sheet as directed in the instructions for your permit application.

A. During the five years immediately preceding submission of this application, has the applicant been convicted in any jurisdiction of a criminal violation of any environmental law?

☐ Yes ☐ No

B. During the five years immediately preceding submission of this application, has a civil penalty been imposed upon the applicant in any state, including Connecticut, or federal judicial proceeding for any violation of an environmental law?

☐ Yes ☐ No

C. During the five years immediately preceding submission of this application, has a civil penalty exceeding five thousand dollars been imposed on the applicant in any state, including Connecticut, or federal administrative proceeding for any violation of an environmental law?

☐ Yes ☐ No

D. During the five years immediately preceding submission of this application, has any state, including Connecticut, or federal court issued any order or entered any judgement to the applicant concerning a violation of any environmental law?

☐ Yes ☐ No

E. During the five years immediately preceding submission of this application, has any state, including Connecticut, or federal administrative agency issued any order to the applicant concerning a violation of any environmental law?

☐ Yes ☐ No

Table of Enforcement Actions

(1) Type of Action	(2a) Date Commenced	(2b) Date Terminated	(3) Jurisdiction	(4) Case/Docket/ Order No.	(5) Description of Violation

☐ Check the box if additional sheets are attached. Copies of this form may be duplicated for additional space.

ATTACHMENT Q – DEP Fisheries Correspondence

Bevilacqua, Andrew

From: Mysling, Donald [Donald.Mysling@ct.gov]
Sent: Thursday, November 05, 2009 3:02 PM
To: Bevilacqua, Andrew
Subject: RE: Padanaram Brook - Danbury (Abbott Tech)
Importance: Low

Andy,

In review of your design alternatives, site photos, and aerial photo review, the retaining wall alternative is preferred.

Don Mysling, Senior Fisheries Biologist
CT DEP Inland Fisheries Division
Habitat Conservation & Enhancement Program
Western Headquarters, 230 Plymouth Road, Harwinton, CT 06791
(P) 860.567.8998 (E-mail) *donald.mysling@ct.gov*

From: Bevilacqua, Andrew [mailto:andrew.bevilacqua@teamdtc.com]
Sent: Tuesday, November 03, 2009 2:29 PM
To: Mysling, Donald
Subject: Padanaram Brook - Danbury (Abbott Tech)

Don,

As we discussed, attached, please find a pdf file of a couple of alternate treatment options for the stream slope, and a couple of recent pictures. As I mentioned, DEP IWRD suggested that you have a look at our options before we proceed further on the design effort.

Please give me a call to discuss. I'd be happy to meet with you to go over this if you desire.

Thanks,

J. Andrew Bevilacqua, P.E.
Associate & Manager of Civil Engineering
Diversified Technology Consultants
2321 Whitney Avenue
Suite 301
Hamden, CT 06518
(203) 239-4200 (v)
(203) 234-7376 (f)
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