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May 25, 2012

LOMC Clearinghouse
847 South Pickett Street
Alexandria, VA 22304-4605

**BELL BEND NUCLEAR POWER PLANT
UPDATED DATA TO SUPPORT THE
SUSQUEHANNA RIVER CLOMR REQUEST
BNP-2012-123 Docket No. 52-039**

- References: 1) Case No.: 11-03-1701R
Susquehanna River
Communities: Township of Salem, and Township of Conyngham, PA
Community Nos.: 420625 and 420600
- 2) BNP-2012-079, M. Caverly to FEMA LOMA Clearinghouse, "Bell Bend Nuclear Power Plant, Data to Support the NBSR CLOMR Request", dated April 26, 2012.

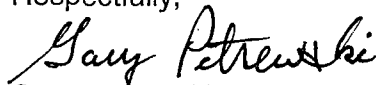
On May 16, 2012 PPL Bell Bend was notified that during the final review of the Susquehanna River Flood Study Report, Rev. 5, submitted on April 26, 2012 (reference 2) FEMA located the previously unavailable FIRM panels for the Township of Conyngham. The review process could not proceed until PPL Bell Bend submitted a revised work map and annotated FIRM for the Township of Conyngham.

Based on your consultant's suggestions, the work map and FIRM were revised and the proposed changes received preliminary acceptance.

Therefore, changes have been made to Appendices B and C of the enclosed Revision 6 of the Flood Study report to include the Conyngham Township FIRM and Current Effective Floodplain Boundaries. The overall Floodplain Map, FS-SR-P1, Rev 5, is included in the report and was updated on 5/17/2012.

Please do not hesitate to contact Brad Wise of my staff [610-774-6508 or bawise@pplweb.com] directly should you have any questions regarding this submittal.

Respectfully,


Gary Petrewski

GP/kw

- Enclosures: 1) Susquehanna River Flood Study, Rev. 6, Including Susquehanna River Floodplain Map, Revision 5.
2) Data DVD (FEMA Only)

cc: (w/ Enclosure 1 Only on Disc)

Ms. Laura Quinn-Willingham
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Manager, Policy Implementation & Outreach
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Ms. Karen J. Karchner
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Ms. Amy Elliott
U.S. Army Corps of Engineers
State College Field Office
1631 South Atherton Street, Suite 102
State College, PA 16801

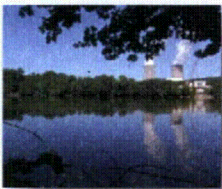
Ms. Jennifer Kagel
United States Fish & Wildlife Service
Pennsylvania Field Office
315 S. Allen St. #322
State College, PA 16801

Enclosure 1

Susquehanna River Flood Study, Rev. 6,
Including Susquehanna River Floodplain Map, Revision 5.

Bell Bend Nuclear Power Plant Flood Study Report Susquehanna River

Salem Township, Luzerne County, PA
LSI Doc. No. FS-SR-001



Prepared for:
PPL Bell Bend, LLC
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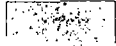


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Rev.6, May 17, 2012



Susquehanna River Flood Study Report

**Land
Studies**

PPL Bell Bend Nuclear Power Plant
Salem Township, Luzerne County, PA
Rev 6, May 17, 2012

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A RECORD OF REVISIONS

Revision	Date	Pages/Sections Changed	Brief Description
0	October 2010	All	Initial release
1	November 2010	All	Replaced the duplicate effective model, which was previously based on the HEC-2 flood model used for the FEMA FIS, with the more recent HEC-RAS model developed by the US Army Corps of Engineers and adopted by FEMA
2	May 2011	Appendix H	Replaced intake structure figures in Appendix H with updated figures from the Joint Permit Plan set by Pennoni Associates, dated May 2011
3	September 2011	All	Used 1977 SRBC current effective model, removed Pending ACOE model
3	September 2011	Appendix E	Added HEC-2 version of Duplicate Effective Model
3	September 2011	Section 3, Appendix I	Added Encroachment Analysis
3	September 2011	Appendix H, Appendix I	All Levees have been removed from the Existing and Proposed Models.
3	September 2011	All	The downstream limit of the Flood Study was moved to Cross Section CU, which is upstream of the Wapwallopen Creek.
3	September 2011	Appendix B	The floodway and 0.2-percent-annual-chance flood delineations have been added to the Floodplain Map in Appendix B.
3	September 2011	Appendix B	Tie-ins from the effective flood hazard boundaries to the proposed delineations have been provided at the upstream and downstream ends of the study reach.
3	September 2011	Appendix B	Annotated FIRM panels have been added in Appendix C
4	December 2011	Appendix H, I	Delete interpolated cross sections in existing and proposed models
4	December 2011	Section 3, Appendix B	Correct Datum Conversion to -0.71 ft.
4	December 2011	Appendix B	Update Floodplain Map per other changes
4	December 2011	Appendix C	Provide more detailed annotated FIRM and FBFM
5	April 2012	Appendix B	Add delineation of 100-yr and 500-yr Floodplain and Regulatory Floodway to Conyngham Township side of River
5	April 2012	Appendix C	Add annotated Conyngham Township Flood Map Index
5	April 2012	Appendix I	Refined proposed cross section geometry at proposed intake structure
5	April 2012	Appendix H, I	Revised geometry of existing and proposed cross sections 133431 and 133138 on left side of River based on GIS topography
5	April 2012	All	Reduced the modeled reach to include only Cross Section CS to CP
6	May 2012	Appendix B, C	Add Conyngham Township FIRM/ Current Effective Flood Boundaries



Susquehanna River Flood Study Report

Rev. 6, May 17, 2012

1 Introduction

PPL is proposing a new facility, the Bell Bend Nuclear Power Plant (BBNPP), on a site near Berwick, PA. The site is located in Salem Township, Luzerne County, northeast of Berwick near the existing Susquehanna Steam Electric Station (SSES) nuclear power plant. The water intake structure for the proposed facility will be located directly east of the proposed site along the Susquehanna River, downstream of the intake structure of the existing plant. The location is approximately 22 miles downstream of Wilkes-Barre, PA and 5 miles upstream of Berwick, PA. A FEMA Flood Study exists for the section of the Susquehanna River that will be impacted by the proposed intake structure. The FEMA study cross-sections were used as a basis for the flood analysis.

The objectives of this study are to determine the hydraulic effect of the proposed intake structure on the Susquehanna River and to determine the extent of the 100-year floodplain. This report presents the existing (pre-construction) floodplain characteristics modeled in HEC-RAS and how they compare to both the original FEMA floodplain characteristics taken from the HEC-2 model and to the proposed (post-construction) floodplain characteristics modeled in HEC-RAS.

1.1 Model Inputs

The following inputs were used in this study:

Flood Insurance Study, Township of Salem, Pennsylvania, Luzerne County, 1979, FEMA Federal Insurance Administration

FEMA FIS HEC-2 input data was acquired from the FEMA Engineering Library in the form of scans of output files.

HEC-RAS River Analysis System Hydraulic Reference Manual, Version 4.0, March 2008, US Army Corps of Engineers Hydraulic Engineering Center

Precipitation Frequency Data Server, National Oceanic and Atmospheric Administration (NOAA) National Weather Service Hydrometeorological Designs Studies Center, Website <http://hdsc.nws.noaa.gov/hdsc/pfds/>

Soil Map 2, Penn State University College of Agricultural Sciences Cooperative Extension Geospatial Technology Program, Website www.soilmap.psu.edu

One (1) foot topographic mapping produced by Peters Consultants, Inc. in November 2007, January 2008, and April 2010.

Susquehanna River Bathymetry Data from "Ecological Studies of the Susquehanna River in the vicinity of the Susquehanna Steam Electric Station." Ecology III, August 1983.

Proposed contours, walls, bridges, and intake structure, as provided by Pennoni and as included in the Joint Permit Drawings for BBNPP dated October 28, 2011

Vertical Datum conversion from NGVD29 to NAVD88 provided by National Geodetic Survey VERTCON process based on Latitude/ Longitude of site.

2 Hydrology

Soils information and geology at the proposed BBNPP site and surrounding area were determined from Penn State University's online soil map tool (www.soilmap.psu.edu). Soils existing in the region of the proposed intake structure include Pope soils and Holly Silt Loams (hydrologic soil groups "B" and "D", respectively). A soils map is included in Appendix A.

The Hamilton Group geologic formation exists beneath the proposed intake structure site. It is an east to west trending band of the lower and middle Devonian-age Hamilton Group and is made up of two formations: the Mahantango Formation and the Marcellus Formation. The Mahantango Formation is composed of gray, brown and olive shale and siltstone while the Marcellus Formation is composed of black, carbonaceous shale. See the geologic map in Appendix A.

The Susquehanna River is 444 miles long, with its headwaters in New York. The entire Susquehanna River Basin covers 27,510 mi²; however, the drainage area to the location of the proposed intake structure equals approximately 10,600 mi². The 100-year peak flow used in the FEMA Flood Insurance Study (FIS) for this drainage area is 260,000 cfs. The maximum recorded flow rate was 345,000 cfs at the Wilkes-Barre gauging station (24 miles upstream) and 363,000 cfs at the Danville gauging station (28 mi downstream) during Hurricane Agnes, which is similar to the 500 year flow rate (340,000 cfs) used in the FIS.

3 Hydraulics

3.1 General Description

The US Army Corps of Engineers HEC-RAS Version 4.1.0 software was used for the hydraulic analysis. HEC-RAS is intended for calculating water-surface profiles for steady or unsteady flow in natural or man-made channels. The computational procedure is based on the solution of the one-dimensional energy equation with energy loss due to friction computed using Manning's equation. The computational procedure is generally known as the Standard Step Method and can be used for subcritical as well as supercritical flow conditions. For this project, the water-surface profile for steady, subcritical flow was calculated.

The original FEMA FIS study was conducted in the vertical datum NGVD 29; therefore, the Existing and Proposed HEC-RAS Conditions were both modeled in the NGVD 29 vertical datum for comparison purposes. To illustrate the 100-year floodplain line in planform, however, the water surface elevations from each study were converted to vertical datum NAVD 88 to correspond to the most recent topographical information available. The conversion factor from NGVD 29 to NAVD 88 is -0.71 ft based on the National Geodetic Survey VERTCON process and the latitude and longitude of the site. Datum conversion documentation is provided in Appendix D.

3.2 FEMA Flood Insurance Study (FIS) HEC-2 Model (Duplicate Effective Model A)

The FEMA FIS HEC-2 input data text file was acquired from the Susquehanna River Basin Commission (SRBC), which conducted the original study. The HEC-2 Input file was truncated to only include the cross sections included in this study. These included Cross Sections CR to CS from the FIS, which were labeled Cross Sections 9 and 10 in the HEC-2 Model. The HEC-2 input file was then run in HEC-2, as required by FEMA to create a "Duplicate Effective Model." The intent of this model was to recreate the original study, with the original software, on our equipment. Because Cross Section CR was the downstream limit of Duplicate Effective Model A, downstream boundary conditions at Section CR were set to match the modeled water surface elevations from the original FIS at this cross section for each profile. The HEC-2 input data and output text files for Duplicate Effective Model A are located in Appendix E.

3.3 FEMA (FIS) HEC-RAS Model (Duplicate Effective Model B)

The FEMA FIS HEC-2 input data was entered into HEC-RAS to develop a "control" model for comparison with the more detailed existing and proposed models to be discussed later. The model includes HEC-2 cross-sections extending from Station 1324+50 (FEMA FIS XS "CR"; HEC-2 cross section 9) to Station 1346+00 (FEMA FIS XS "CS"; HEC-2 cross section 10). The 100-year peak flow used in the FEMA FIS was applied to the model and the 100-year water surface elevation of 512.9 ft was used as the 100-year downstream boundary condition. A subcritical flow regime was selected, as used in the HEC-2 analysis. HEC-RAS data for Duplicate Effective Model B is provided in Appendix F.

3.4 Corrected Effective Model

The Duplicate Effective Model B geometry was enhanced with more accurate topographic data to create a Corrected Effective Model. The FEMA cross-sections were enhanced on the west side of the Susquehanna River with existing topography from an aerial survey supplemented with available GIS data. The river bottom of each cross-section was also supplemented with bathymetry data from the Ecology III report entitled "Ecological Studies of the Susquehanna River in the vicinity of the Susquehanna Steam Electric Station" (August, 1983). The 1983 bathymetry data by Ecology III (formerly Ichthyological Associates, Inc.) was used in this flood study over other bathymetry reports for its accuracy, detail and long span of studied river in the area of the SSES and proposed BBNPP facilities (see Appendix J). The

corrected effective model included the same cross sections as the duplicate effective model and utilized more accurate geometry data, but did not include any man-made features.

3.5 Existing Conditions

The existing conditions model is the basis for comparison for the evaluation of potential changes that could be caused by the proposed BBNPP intake structure. To accurately model the river hydraulics for comparison, two cross sections were added to the corrected effective model. One cross section was added at the location of the existing intake structure for SSES, and one cross section was added at the location of the proposed BBNPP intake. These cross sections were developed based on available one-foot topographical data on the project site, bathymetry data as described above, and available 2-foot GIS contours on the east side of the River. The existing intake structure was modeled as a flow obstruction. The structure dimensions and invert for the water intake were determined from figures 8C, 8D, 8E, and 8F on sheets 3204 and 3205 of the Joint Permit Drawings by Pennoni Associates. Design drawings and photographs of the existing intake structure are provided in Appendix K. Existing Manning's 'n' values were kept consistent with the FEMA FIS Manning's 'n' values.

The 100-year peak flow from the FEMA FIS of 260,000 cfs was used in the HEC-RAS existing conditions model. The downstream boundary condition was the known 100-year water surface elevation taken from the FEMA FIS (512.9 ft). A subcritical flow regime was assumed in the HEC-RAS analysis, consistent with the original model. Based on the model output, the subcritical flow assumption was verified. An encroachment analysis was also included in the Existing Conditions Model to establish the Floodway based on the more accurate geometry data used in this study. The Existing Conditions data is located in Appendix H.

3.6 Proposed Conditions

In the Proposed Conditions model, the existing conditions geometry was altered at Station 1331+38 to reflect the proposed intake structure conditions. The proposed structure was represented by an obstructed area within the cross-sectional geometry. The grading near the structure was also altered in the model; specifically the river bottom elevation was lowered to correctly represent the dredging to occur for the structure's intake invert, and fill was added to reflect the access drive and pad behind the structure. For details of the proposed intake structure, see Appendix K. Floodplain Manning's 'n' values were decreased from existing condition's values to reflect the parking lot/impervious surfaces in proposed conditions.

The same flow information and boundary condition used in the existing conditions model were used in proposed conditions ($Q_{100} = 260,000$ cfs, downstream $WSEL_{100} = 512.9$ ft). An encroachment analysis was also included in the Proposed Conditions Model for comparison with the Existing Conditions Floodway. Proposed Conditions data can be found in Appendix I.

4 Results and Conclusions

A summary of 100-year flood elevations and velocities for all of the above models is provided in Appendix D. Duplicate Effective Model A successfully duplicates the flood elevations reported in the current FIS. Duplicate Effective Model B reports higher water surface elevations and lower velocities than Duplicate Effective Model A. It would appear that this is a result of slightly different modeling routines in HEC-2 and HEC-RAS. The Corrected Effective Model is actually closer to the Duplicate Effective Model A at the upstream limit of the study, with the BFE only 0.05 ft higher.

The Existing Conditions model shows a slight increase in BFE above the existing structure when compared to the Corrected Effective Model. This increase is apparently a result of the addition of the two cross sections at the existing and proposed intake structures, which includes the obstruction created by the existing intake structure.

The Proposed Conditions Model was compared to the Existing Conditions Model to determine the effect of the proposed intake structure on the 100-year flood elevation. The proposed BFE is identical to the BFE in the Existing Conditions model at all cross sections except the proposed intake structure. At the proposed intake structure, the model shows a 100-year WSE decrease of 0.01 ft, and a velocity increase of 0.05 ft/s. The intake structure itself, although modeled as an obstruction, is located primarily in an area that was shown as ineffective flow area in the Existing Conditions model.

Since the proposed water surface elevations are equal to or lower than the existing water surface elevations, it can be concluded that the proposed intake structure for the BBNPP will have no negative hydraulic effect on the Susquehanna River and its floodplain. The elevation and extent of the 100-year floodplain will not be measurably increased at any location as a result of this project.

The Floodway in the Proposed Condition model is identical to that of the Existing Conditions model with the exception of Station 133138, where the Floodway shifts inward slightly to match the face of the proposed intake structure.

The existing and proposed 100-year and 500-year floodplain as well as the Floodway are plotted on the Floodplain Map in Appendix B. The plan vertical datum is NAVD 88. Because all models were prepared based on the NGVD 29 vertical datum, a conversion table is provided in Appendix D.

Appendix A: Maps

- Location Map
- Soils Map
- Geology Map



Source: Berwick, PA USGS 7.5-minute topographic quadrangle

Location

Scale

1" = 2000'

Project Location Map

BBNPP Intake Structure on the Susquehanna River

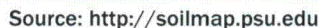


Susquehanna River Flood Study Report

Bell Bend Nuclear Power Plant

Salem Township, Luzerne County, PA

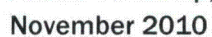
November 2010

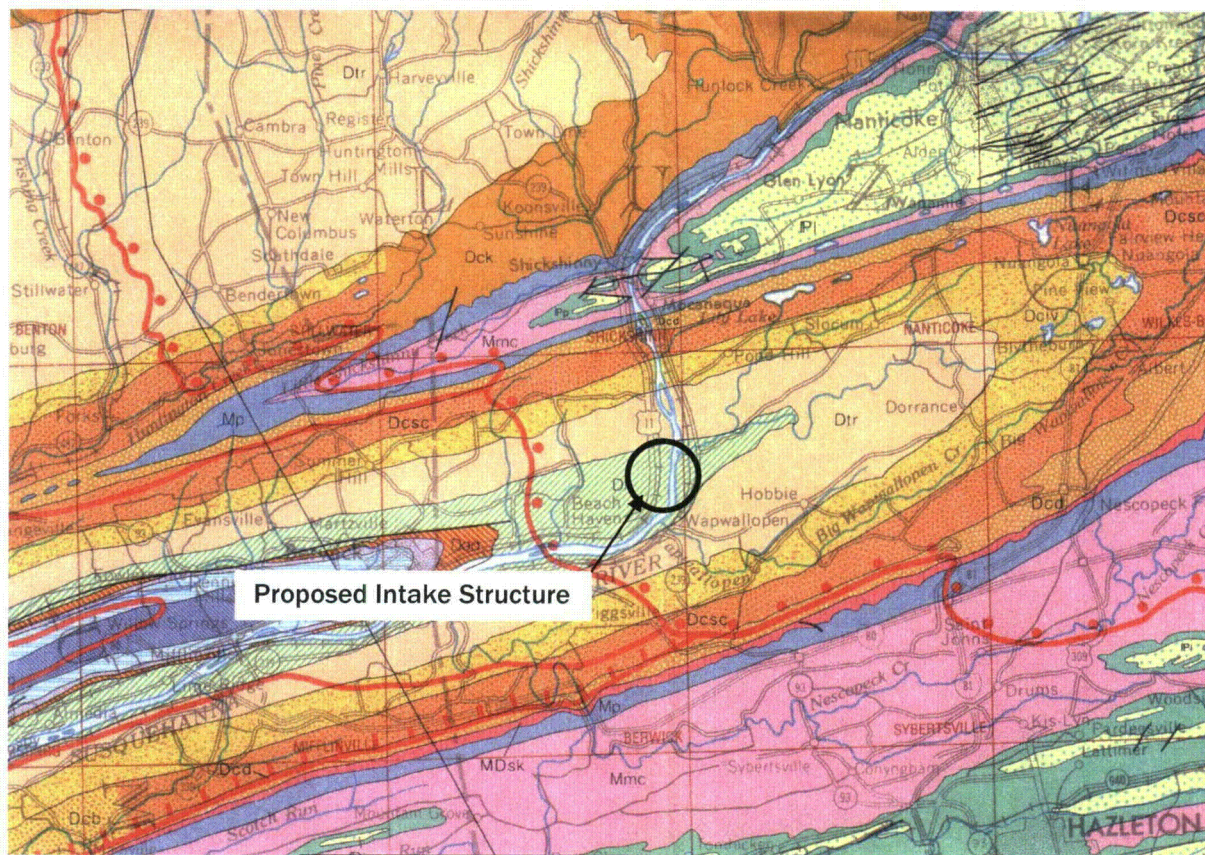


41° 05' 17" N, 76° 07' 54" W

$$1'' = 2000'$$

BBNPP Intake Structure on the Susquehanna River





Geologic Formation

Dh = Hamilton Group

Location

41°05'17" N, 76°07'54" W

Scale

1:250,000

Geology Map

BBNPP Intake Structure on the Susquehanna River



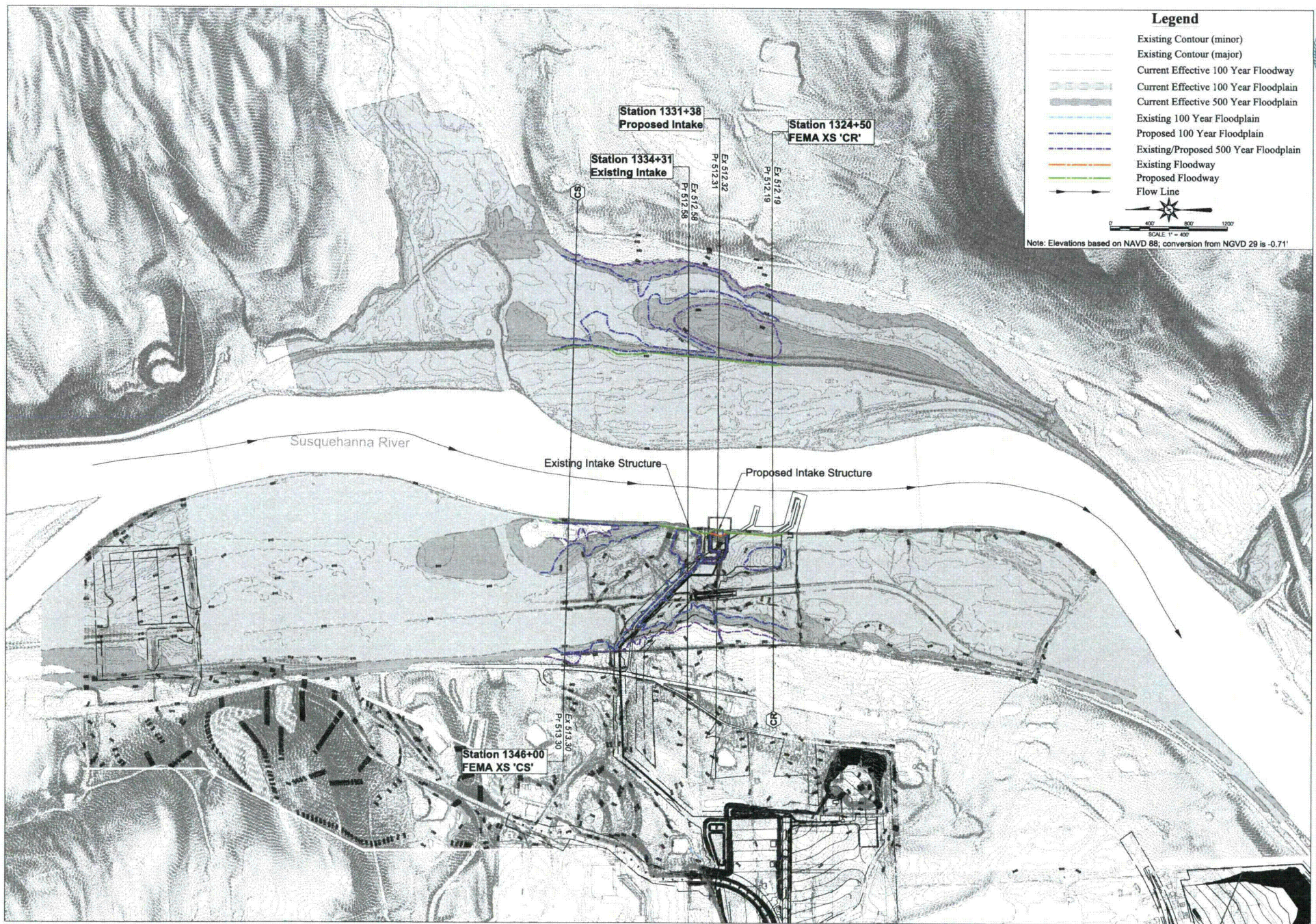
Susquehanna River Flood Study Report

Bell Bend Nuclear Power Plant

Salem Township, Luzerne County, PA

November 2010

Appendix B:
Floodplain Map



Legend

- Existing Contour (minor)
- Existing Contour (major)
- Current Effective 100 Year Floodway
- Current Effective 100 Year Floodplain
- Current Effective 500 Year Floodplain
- Existing 100 Year Floodplain
- Proposed 100 Year Floodplain
- Existing/Proposed 500 Year Floodplain
- Existing Floodway
- Proposed Floodway
- Flow Line



Note: Elevations based on NAVD 88; conversion from NGVD 29 is -0.71'



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PROJECT:
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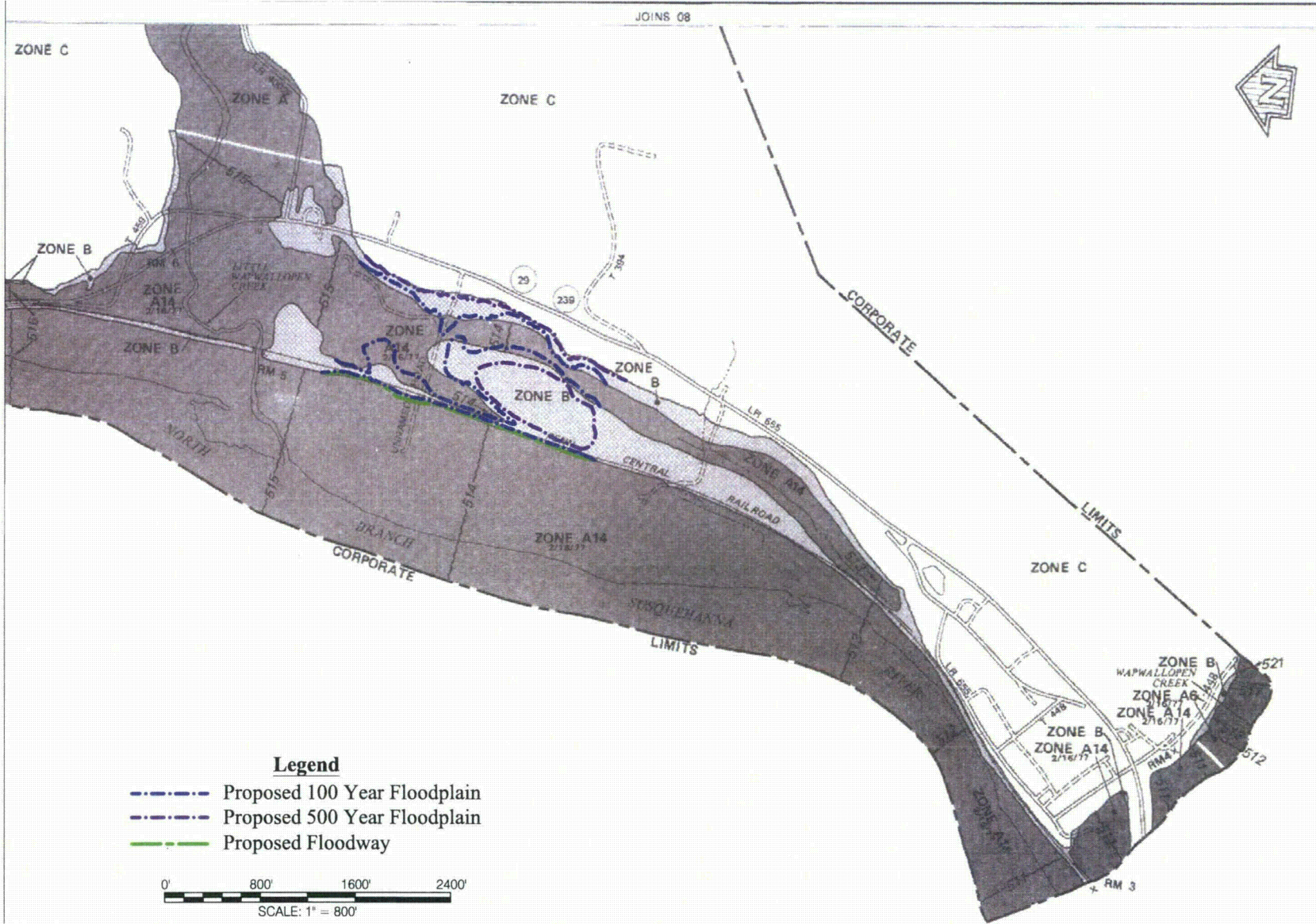
SHEET TITLE:
FLOODPLAIN MAP
FLOOD STUDY - SUSQUEHANNA RIVER
SALEM TOWNSHIP
LUZERNE COUNTY, PENNSYLVANIA

Rev	Date	Description
1	11/18/10	Initial
2	01/01/11	PPLA comments
3	12/01/11	PPLA comments
4	01/10/12	PPLA comments
5	01/10/12	Per Compton Tech

Project Number: E-725-LB
Drawn by: EPU/TC
Checked by: BE
Date: AUGUST 2011
Scale: 1" = 400'
Drawing: E-58.P1
Sheet Number:

1
OF 1

Appendix C: Annotated FIRM



Legend

- Proposed 100 Year Floodplain
- Proposed 500 Year Floodplain
- Proposed Floodway



DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT Federal Insurance Administration	TOWNSHIP OF CONYNGHAM, PA (LUZERNE CO.)		APPROXIMATE SCALE 0 800 1600 2400 3200 FEET
	FLOOD HAZARD BOUNDARY MAP H-12 FLOOD INSURANCE RATE MAP I-12		EFFECTIVE DATE FEBRUARY 16, 1977
H&I-12			

Appendix D:
Flood Model Summary Table



Susquehanna River Flood Study Report

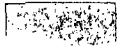
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Bell Bend Nuclear Power Plant
Salem Township, Luzerne County, PA
April 2012

Flood Model Summary Table

(all elevations are NGVD 1929)

River Station/ Cross Section	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Δ WSE (ft)	Vel Chnl (ft/s)	Δ V (ft/s)
134600 HEC-2 XS 10, CS	FEMA (FIS)	260000		513.7		N/A	
	Duplicate Effective A (HEC-2)	260000		513.78	0.08	8.26	N/A
	Duplicate Effective B (HEC-RAS)	260000		514.15	0.37	8.22	-0.04
	Corrected Effective	260000		513.82	-0.33	8.03	-0.19
	Existing Conditions	260000	477.20	514.01	0.19	7.97	-0.06
	Proposed Conditions	260000	477.20	514.01	0.00	7.97	0.00
133431 HEC-2 XS 9.2	Existing Conditions	260000	472.50	513.29		8.49	
	Proposed Conditions	260000	472.50	513.29	0.00	8.49	0.00
133138 HEC-2 XS 9.1	Existing Conditions	260000	474.40	513.03		8.84	
	Proposed Conditions	260000	474.40	513.02	-0.01	8.89	0.05
132450 HEC-2 XS 9, CR	FEMA (FIS)	260000		512.9		N/A	
	Duplicate Effective A (HEC-2)	260000		512.90	0.00	8.69	N/A
	Duplicate Effective B (HEC-RAS)	260000		512.90	0.00	8.60	-0.09
	Corrected Effective	260000		512.90	0.00	7.88	-0.72
	Existing Conditions	260000	467.20	512.90	0.00	7.88	0.00
	Proposed Conditions	260000	467.20	512.90	0.00	7.88	0.00



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Susquehanna River Flood Study Report

PPL Bell Bend Nuclear Power Plant

Salem Township, Luzerne County, PA

April 2012

Vertical Datum Conversion Table

(100-yr WSE)

River Station/ Cross Section	Plan	NGVD 29 W.S. Elev (ft)	NAVD 88 W.S. Elev (ft)
134600 HEC-2 XS 10, CS	Existing Conditions	514.01	513.30
	Proposed Conditions	514.01	513.30
133431 (Existing Intake)	Existing Conditions	513.29	512.58
	Proposed Conditions	513.29	512.58
133138 (Proposed Intake)	Existing Conditions	513.03	512.32
	Proposed Conditions	513.02	512.31
132450 HEC-2 XS 9, CR	Existing Conditions	512.90	512.19
	Proposed Conditions	512.90	512.19

Questions concerning the VERTCON process may be mailed to NGS

Latitude: 041 05 21.19

Longitude: 076 09 57.34

NGVD 29 height:

Datum shift (NAVD 88 minus NGVD 29): -0.216 meter = -0.708 ft.

Appendix E: Duplicate Effective Model A

- HEC-2 Input Data
- HEC-2 Output Data

DUPLICATE EFFECTIVE A - INPUT.TXT

T1	SRBC	SHICKSHINNY PA	SITE UPDATE	EAA PROJECT NO	16213.02
T2	SECTIONS	9 THRU 10		APRIL 11, 2012	
T3	SUSQUEHANNA RIVER	100-YEAR			
J1	4				512.9
J2	+1.0	0	-1.0		
J3	38	43	1	8	26
J3	0	201			
NC	.080	.080	.040	0.10	0.30
QT	4	167000	232000	260000	340000
ET	9				
X1	9	86	1921	2869	2030
GR 575.0	0000	553.9	0056	553.9	0072
GR 522.2	0263	518.7	0331	514.0	0404
GR 509.6	0595	514.9	0625	518.8	0686
GR 530.9	0892	531.8	0979	531.7	1003
GR 516.9	1053	516.9	1057	515.2	1074
GR 501.9	1210	503.5	1244	503.4	1324
GR 503.0	1548	504.7	1602	505.2	1661
GR 502.2	1856	505.5	1921	503.2	1950
GR 481.1	2798	487.5	2816	507.6	2869
GR 506.5	3089	505.7	3175	506.8	3264
GR 511.8	3395	511.8	3402	504.9	3421
GR 512.1	3541	512.2	3637	511.5	3716
GR 520.4	3964	520.0	3975	520.7	3981
GR 520.4	3996	521.4	4026	524.9	4107
GR 527.5	4223	530.8	4305	534.2	4377
GR 541.9	4547	541.9	4584	541.0	4596
GR 556.2	4740	565.0	4831	570.9	4862
GR 575.0	4933				
NC	.060	.060			
ET	10				
X1	10	86	2278	3228	2075
GR 575.0	0000	571.9	0049	570.1	0102
GR 540.0	0266	531.1	0335	522.3	0421
GR 510.5	0592	510.5	0605	510.9	0679
GR 513.3	0969	513.3	1056	513.1	1157
GR 511.4	1264	512.9	1282	512.4	1339
GR 515.1	1370	514.8	1395	510.3	1406
GR 506.2	1679	506.2	1720	506.1	1826
GR 504.8	2073	501.1	2140	500.9	2200
GR 487.7	2348	480.0	2489	480.0	3141
GR 517.9	3247	517.9	3255	517.7	3323
GR 516.0	3602	512.9	3701	510.1	3806
GR 504.0	3990	504.0	4013	505.2	4034
GR 504.9	4064	504.9	4089	513.9	4110
GR 512.5	4529	516.6	4541	515.1	4555
GR 517.5	4580	513.1	4594	515.8	4602
GR 525.4	4698	525.6	4700	525.6	4737
GR 530.9	4881	544.1	4943	547.5	4985
GR 575.0	5162				
EJ					
ER					

1*****
 * HEC-2 WATER SURFACE PROFILES *
 * *
 * Version 4.6.2; May 1991 *
 * *
 * RUN DATE 12APR12 TIME 10:01:08 *

 * U.S. ARMY CORPS OF ENGINEERS *
 * HYDROLOGIC ENGINEERING CENTER *
 * 609 SECOND STREET, SUITE D *
 * DAVIS, CALIFORNIA 95616-4687 *
 * (916) 756-1104 *

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      X   X  XXXXXXX  XXXXX
      X   X  X      X   X
      X   X  X      X
      XXXXXXX XXXX   X
      X   X  X      X
      X   X  X      X   X
      X   X  XXXXXXX  XXXXX
  
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1 12APR12 10:01:08

PAGE 1

 HEC-2 WATER SURFACE PROFILES
 Version 4.6.2; May 1991

THIS RUN EXECUTED 12APR12 10:01:08

T1 SRBC SHICKSHINNY PA SITE UPDATE EAA PROJECT NO 16213.02
 T2 SECTIONS 9 THRU 10 APRIL 11, 2012
 T3 SUSQUEHANNA RIVER 100-YEAR

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
		4							512.9	
J2	NPROF	IPLLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	+1.0	0	-1.0			-.80				

J3 VARIABLE CODES FOR SUMMARY PRINTOUT

	38	43	1	8	26	3	51	52	4	39
	0	201								
NC	.080	.080	.040	0.10	0.30					
QT	4	167000	232000	260000	340000					
ET	9					9.1			1758	2869

DUPLICATE EFFECTIVE A - OUTPUT.TXT

X1	9	86	1921	2869	2030	1650	2050			
GR	575.0	0000	553.9	0056	553.9	0072	544.9	0107	531.8	0190
GR	522.2	0263	518.7	0331	514.0	0404	509.6	0451	509.6	0526
GR	509.6	0595	514.9	0625	518.8	0686	520.6	0743	529.0	0821
GR	530.9	0892	531.8	0979	531.7	1003	516.4	1045	516.9	1052
GR	516.9	1053	516.9	1057	515.2	1074	503.1	1103	501.9	1146
GR	501.9	1210	503.5	1244	503.4	1324	504.9	1410	504.9	1513
GR	503.0	1548	504.7	1602	505.2	1661	505.2	1712	504.0	1794
GR	502.2	1856	505.5	1921	503.2	1950	487.5	1978	481.4	1988
GR	481.1	2798	487.5	2816	507.6	2869	507.6	2956	509.8	3016
GR	506.5	3089	505.7	3175	506.8	3264	506.2	3321	505.1	3387
GR	511.8	3395	511.8	3402	504.9	3421	504.9	3451	510.0	3472
GR	512.1	3541	512.2	3637	511.5	3716	513.3	3819	517.5	3918
GR	520.4	3964	520.0	3975	520.7	3981	520.7	3983	520.7	3987
GR	520.4	3996	521.4	4026	524.9	4107	526.9	4175	527.5	4213
GR	527.5	4223	530.8	4305	534.2	4377	537.0	4473	540.1	4535
GR	541.9	4547	541.9	4584	541.0	4596	544.1	4602	546.6	4648
GR	556.2	4740	565.0	4831	570.9	4862	573.5	4908	573.5	4923
GR	575.0	4933								

1 12APR12 10:01:08

PAGE 2

NC	.060	.060								
ET	10					9.1				
X1	10	86	2278	3228	2075	2160	2125		2139	3228
GR	575.0	0000	571.9	0049	570.1	0102	562.3	0168	540.0	0251
GR	540.0	0266	531.1	0335	522.3	0421	516.0	0493	510.8	0554
GR	510.5	0592	510.5	0605	510.9	0679	513.1	0770	512.9	0868
GR	513.3	0969	513.3	1056	513.1	1157	512.1	1228	511.4	1248
GR	511.4	1264	512.9	1282	512.4	1339	515.1	1356	515.5	1362
GR	515.1	1370	514.8	1395	510.3	1406	509.1	1489	508.0	1576
GR	506.2	1679	506.2	1720	506.1	1826	508.1	1946	505.9	2005
GR	504.8	2073	501.1	2140	500.9	2200	500.7	2278	493.7	2301
GR	487.7	2348	480.0	2489	480.0	3141	487.7	3174	517.0	3228
GR	517.9	3247	517.9	3255	517.7	3323	517.5	3401	516.4	3492
GR	516.0	3602	512.9	3701	510.1	3806	507.3	3870	505.4	3951
GR	504.0	3990	504.0	4013	505.2	4034	512.1	4041	512.1	4049
GR	504.9	4064	504.9	4089	513.9	4110	513.9	4115	512.5	4123
GR	512.5	4529	516.6	4541	515.1	4555	517.5	4567	518.0	4572
GR	517.5	4580	513.1	4594	515.8	4602	513.2	4618	522.6	4660
GR	525.4	4698	525.6	4700	525.6	4737	525.1	4761	522.9	4819
GR	530.9	4881	544.1	4943	547.5	4985	550.1	5023	563.2	5096
GR	575.0	5162								

1 12APR12 10:01:08

PAGE 3

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK	ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK	ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA	
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST	

*PROF 1

0

CCHV= .100 CEHV= .300
*SECNO 9.000

3265 DIVIDED FLOW

9.000	31.80	512.90	.00	512.90	514.00	1.10	.00	.00	505.50
260000.0	12315.1	243182.3	4502.6	8049.9	27988.7	3902.7	.0	.0	507.60
.00	1.53	8.69	1.15	.080	.032	.080	.000	481.10	415.75
.000389	2030.	2050.	1650.	0	0	0	.00	2914.53	3796.11

*SECNO 10.000

3265 DIVIDED FLOW

10.000	33.78	513.78	.00	.00	514.77	.99	.76	.01	500.70
260000.0	13750.9	242116.0	4133.1	8003.7	29323.4	2921.4	1949.5	156.0	517.00
.08	1.72	8.26	1.41	.060	.032	.060	.000	480.00	519.06
.000328	2075.	2125.	2160.	2	0	0	.00	3517.28	4620.58

1

12APR12 10:01:08

PAGE 4

THIS RUN EXECUTED 12APR12 10:01:08

HEC-2 WATER SURFACE PROFILES
Version 4.6.2; May 1991

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

SUSQUEHANNA RIVER 1

SUMMARY PRINTOUT

SECNO	Q	CWSEL	DEPTH	VCH	EG	DIFWSX	DIFKWS	TOPWID	XLCH
9.000	260000.00	512.90	31.80	8.69	514.00	.00	.00	2914.53	.00
10.000	260000.00	513.78	33.78	8.26	514.77	.88	.00	3517.28	2125.00

1

12APR12 10:01:08

PAGE 5

SUMMARY OF ERRORS AND SPECIAL NOTES

1 12APR12 10:01:08

PAGE 6

FLOOD INSURANCE ZONE DATA FOR SUSQUEHANNA RIVER 1

FLOOD HAZARD FACTOR FOR ENTIRE REACH USING SECTIONS

SECTION NUMBER	CUMULATIVE DISTANCE	ELEVATION DIFFERENCE BETWEEN BASE FLOOD AND 10 2 0.2
9.000	0.	512.90 .00 .00
10.000	2125.	513.78 .00 .00

WEIGHTED AVG FOR REACH 513.33		.00 .00

FHF FOR THE REACH = 005 WITH 100.0 PERCENT OF THE REACH WITHIN .5 FEET
 ZONE FOR THE REACH = A 1

Appendix F:

Duplicate Effective Model B

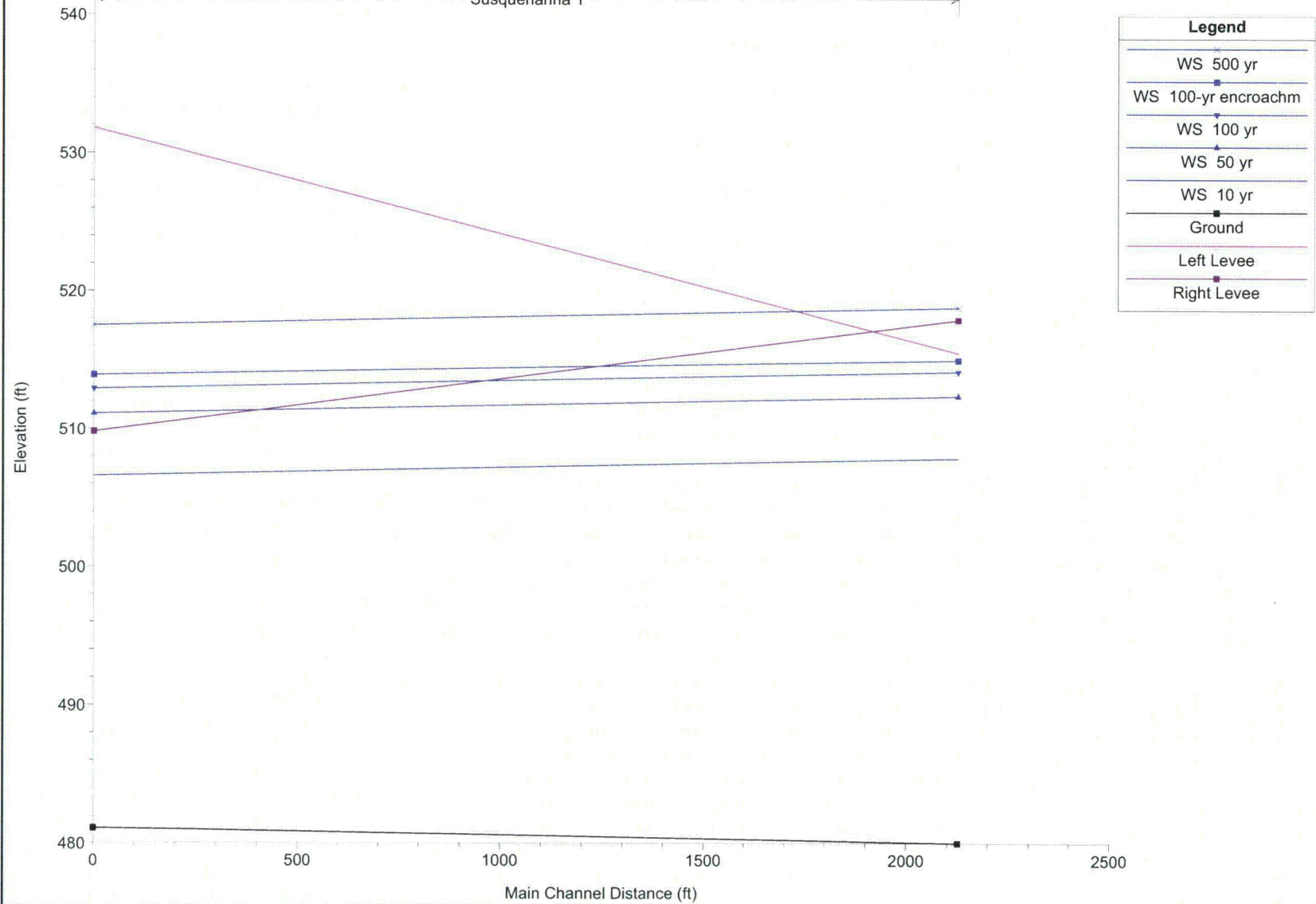
- HEC-RAS Reports
- HEC-RAS Cross-Sections
- HEC-RAS Profiles

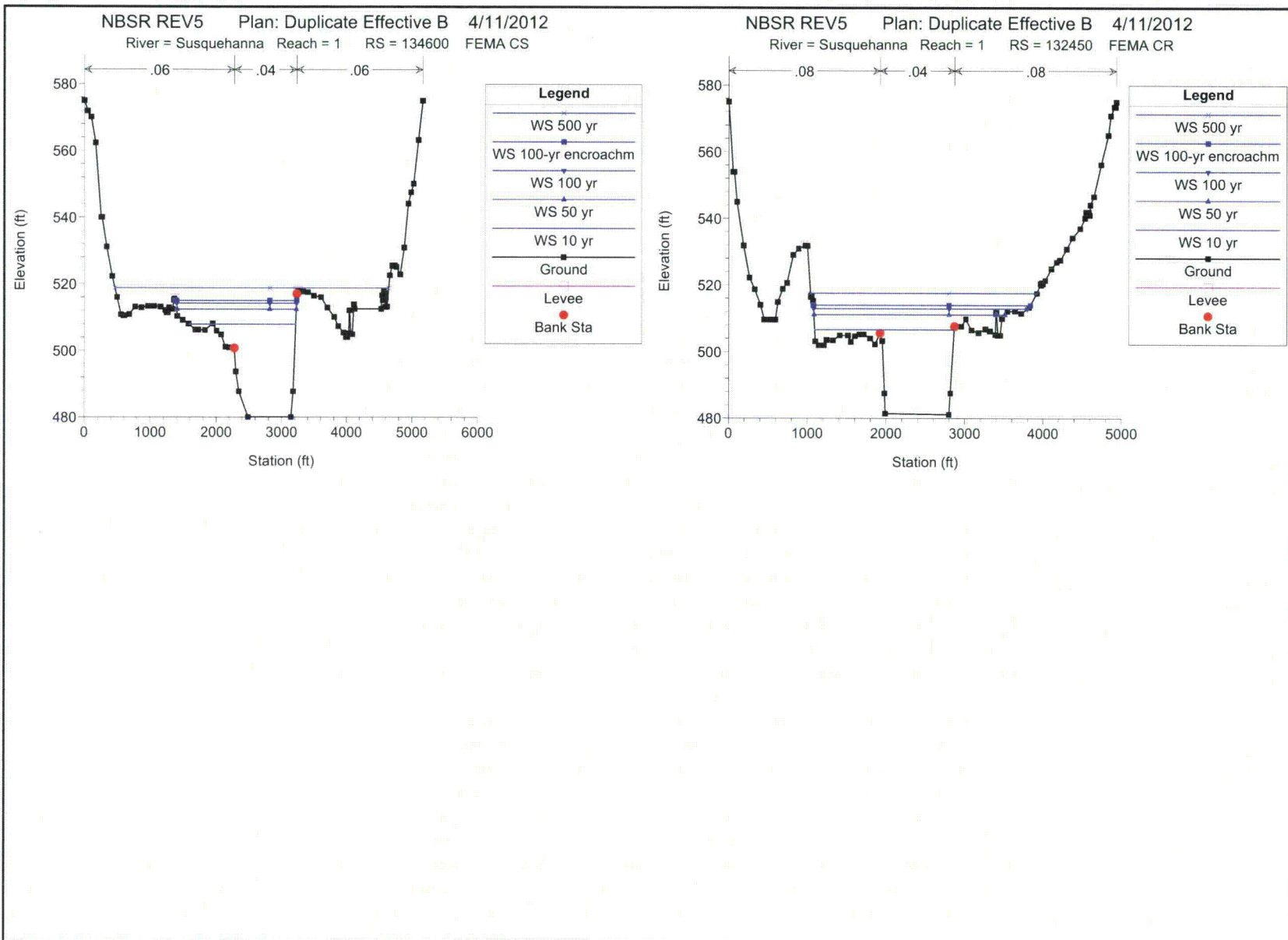
HEC-RAS Plan: DUP B River: Susquehanna Reach: 1

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)	
1	134600	10 yr	167000.00	480.00	507.88	491.71	508.61	0.000467	6.91	25737.34	1609.40	0.24
1	134600	50 yr	232000.00	480.00	512.37	494.35	513.29	0.000497	7.90	33647.18	1818.51	0.26
1	134600	100 yr	260000.00	480.00	514.15	495.40	515.13	0.000500	8.22	36889.98	1826.14	0.26
1	134600	500 yr	340000.00	480.00	518.79	498.16	519.73	0.000440	8.41	59471.97	4181.88	0.25
1	134600	100-yr encroachm	260000.00	480.00	514.98	495.40	515.90	0.000453	7.95	38411.26	1844.11	0.25
1	132450	10 yr	167000.00	481.10	506.60	492.11	507.46	0.000621	7.49	24249.56	1771.75	0.27
1	132450	50 yr	232000.00	481.10	511.10	494.73	512.12	0.000609	8.33	34761.61	2414.55	0.28
1	132450	100 yr	260000.00	481.10	512.90	495.80	513.97	0.000597	8.60	39377.18	2716.60	0.28
1	132450	500 yr	340000.00	481.10	517.50	498.59	518.66	0.000561	9.19	52236.36	2876.02	0.28
1	132450	100-yr encroachm	260000.00	481.10	513.90	495.80	514.86	0.000521	8.22	42117.54	2756.03	0.26

NBSR REV5 Plan: Duplicate Effective B 4/11/2012

Susquehanna 1





HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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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
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 XXXXXX   XXXX   X   X   X   X XXXXX

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PROJECT DATA

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Project File : NBSRREV5.prj
Run Date and Time: 4/11/2012 4:18:30 PM

Project in English units

PLAN DATA

Plan Title: Duplicate Effective B
Plan File : p:\PROJECTS\Environmental\PPL - Wetland Permitting Oversight E-726-L8\TASKS\Task 10 -
Floodplain\Study and Revisions NBSR\NBSR Revisions Feb 2012\Preliminary files to FEMA\4-10-
12\HECRAS\NBSRREV5.p07

Geometry Title: Existing HEC2 FEMA
Geometry File : p:\PROJECTS\Environmental\PPL - Wetland Permitting Oversight E-726-L8\TASKS\Task 10
- Floodplain\Study and Revisions NBSR\NBSR Revisions Feb 2012\Preliminary files to FEMA\4-10-
12\HECRAS\NBSRREV5.g05

Flow Title : FEMA Ex Flow
Flow File : p:\PROJECTS\Environmental\PPL - Wetland Permitting Oversight E-726-L8\TASKS\Task 10
- Floodplain\Study and Revisions NBSR\NBSR Revisions Feb 2012\Preliminary files to FEMA\4-10-
12\HECRAS\NBSRREV5.f02

Plan Summary Information:

Number of:	Cross Sections =	2	Multiple Openings =	0
	Culverts =	0	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: FEMA Ex Flow
Flow File : p:\PROJECTS\Environmental\PPL - Wetland Permitting Oversight E-726-L8\TASKS\Task 10 -
Floodplain\Study and Revisions NBSR\NBSR Revisions Feb 2012\Preliminary files to FEMA\4-10-
12\HECRAS\NBSRREV5.f02

Flow Data (cfs)

River	Reach	RS	10 yr	50 yr	100 yr	500
yr100-yr encroachment						
Susquehanna	1	134600	167000	232000	260000	340000
260000						

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Susquehanna	1	10 yr	Critical	Known WS = 506.6
Susquehanna	1	50 yr	Critical	Known WS = 511.1
Susquehanna	1	100 yr	Critical	Known WS = 512.9
Susquehanna	1	500 yr	Critical	Known WS = 517.5
Susquehanna	1	100-yr encroachment	Critical	Known WS = 513.9

GEOMETRY DATA

Geometry Title: Existing HEC2 FEMA

Geometry File : p:\PROJECTS\Environmental\PPL - Wetland Permitting Oversight E-726-L8\TASKS\Task 10 -
Floodplain\Study and Revisions NBSR\NBSR Revisions Feb 2012\Preliminary files to FEMA\4-10-
12\HECRAS\NBSRREV5.g05

CROSS SECTION

RIVER: Susquehanna

REACH: 1

RS: 134600

INPUT

Description: FEMA CS

Station Elevation Data		Data		num=		86			
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	575	49	571.9	102	570.1	168	562.3	251	540
266	540	335	531.1	421	522.3	493	516	554	510.8
592	510.5	605	510.5	679	510.9	770	513.1	868	512.9
969	513.3	1056	513.3	1157	513.1	1228	512.1	1248	511.4
1264	511.4	1282	512.9	1339	512.4	1356	515.1	1362	515.5
1370	515.1	1395	514.8	1406	510.3	1489	509.1	1576	508
1679	506.2	1720	506.2	1826	506.1	1946	508.1	2005	505.9
2073	504.8	2140	501.1	2200	500.9	2278	500.7	2301	493.7
2348	487.7	2489	480	3141	480	3174	487.7	3228	517
3247	517.9	3255	517.9	3323	517.7	3401	517.5	3492	516.4
3602	516	3701	512.9	3806	510.1	3870	507.3	3951	505.4
3990	504	4013	504	4034	505.2	4041	512.1	4049	512.1
4064	504.9	4089	504.9	4110	513.9	4115	513.9	4123	512.5
4529	512.5	4541	516.6	4555	515.1	4567	517.5	4572	518
4580	517.5	4594	513.1	4602	515.8	4618	513.2	4660	522.6
4698	525.4	4700	525.6	4737	525.6	4761	525.1	4819	522.9
4881	530.9	4943	544.1	4985	547.5	5023	550.1	5096	563.2
5162	575								

Manning's n Values

num=

3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	2278	.04	3228	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
2278	3228	2075	2125	2160		.1	.3
Left Levee	Station=	1362	Elevation=	515.5			
Right Levee	Station=	3247	Elevation=	517.9			

CROSS SECTION

RIVER: Susquehanna

REACH: 1

RS: 132450

INPUT

Description: FEMA CR

Station Elevation Data		Data		num=		86			
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	575	56	553.9	72	553.9	107	544.9	190	531.8
263	522.2	331	518.7	404	514	451	509.6	526	509.6
595	509.6	625	514.9	686	518.8	743	520.6	821	529
892	530.9	979	531.8	1003	531.7	1045	516.4	1052	516.9
1053	516.9	1057	516.9	1074	515.2	1103	503.1	1146	501.9
1210	501.9	1244	503.5	1324	503.4	1410	504.9	1513	504.9
1548	503	1602	504.7	1661	505.2	1712	505.2	1794	504
1856	502.2	1921	505.5	1950	503.2	1978	487.5	1988	481.4
2798	481.1	2816	487.5	2869	507.6	2956	507.6	3016	509.8
3089	506.5	3175	505.7	3264	506.8	3321	506.2	3387	505.1
3395	511.8	3402	511.8	3421	504.9	3451	504.9	3472	510
3541	512.1	3637	512.2	3716	511.5	3819	513.3	3918	517.5
3964	520.4	3975	520	3981	520.7	3983	520.7	3987	520.7

3996	520.4	4026	521.4	4107	524.9	4175	526.9	4213	527.5
4223	527.5	4305	530.8	4377	534.2	4473	537	4535	540.1
4547	541.9	4584	541.9	4596	541	4602	544.1	4648	546.6
4740	556.2	4831	565	4862	570.9	4908	573.5	4923	573.5
4933	575								

Manning's n Values		num=		3	
Sta	n Val	Sta	n Val	Sta	n Val
0	.08	1921	.04	2869	.08

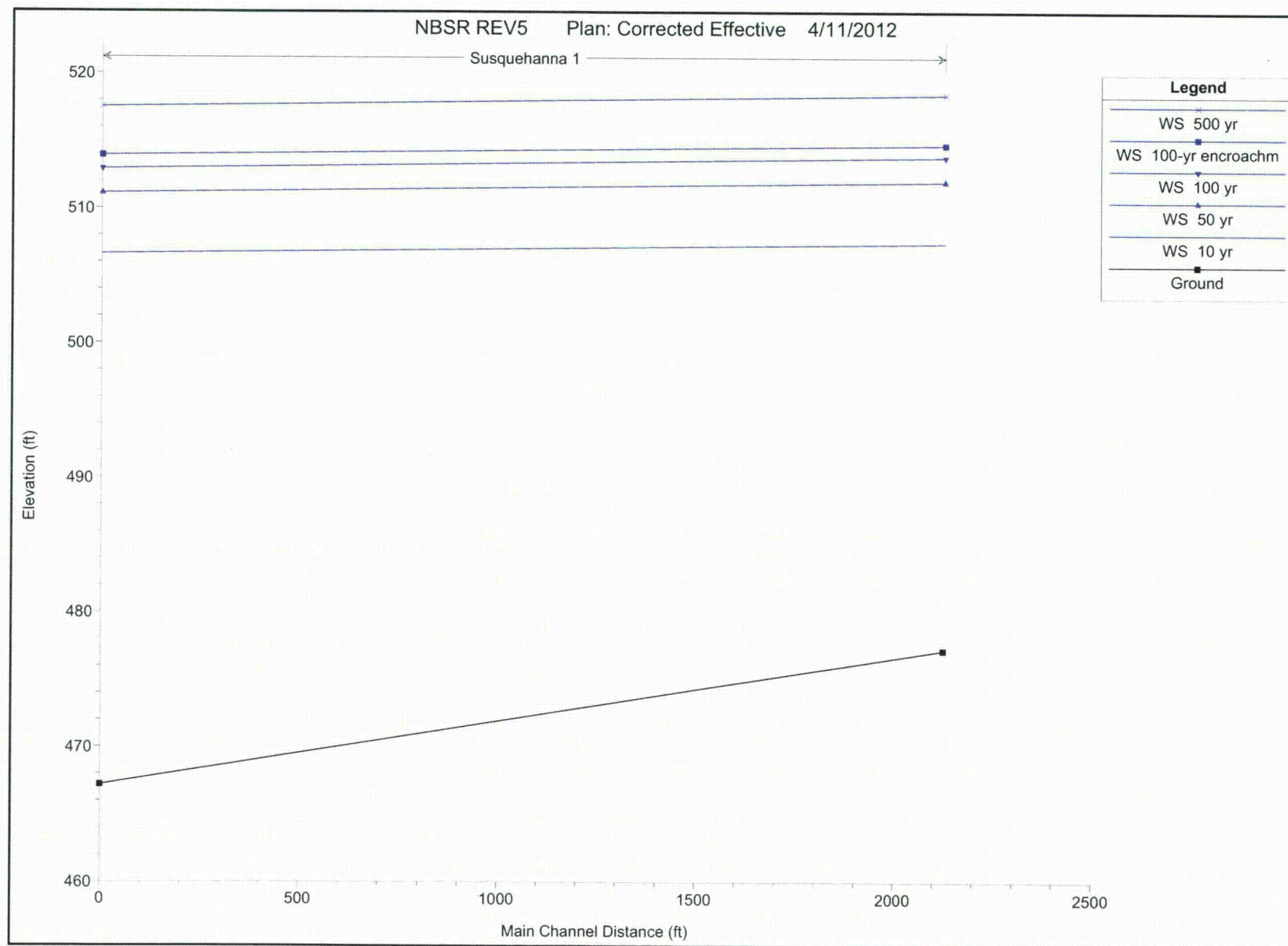
Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	1921	2869		6415.01	5590		.1	.3
Left Levee		Station=		979	Elevation=			531.8
Right Levee		Station=		3016	Elevation=			509.8

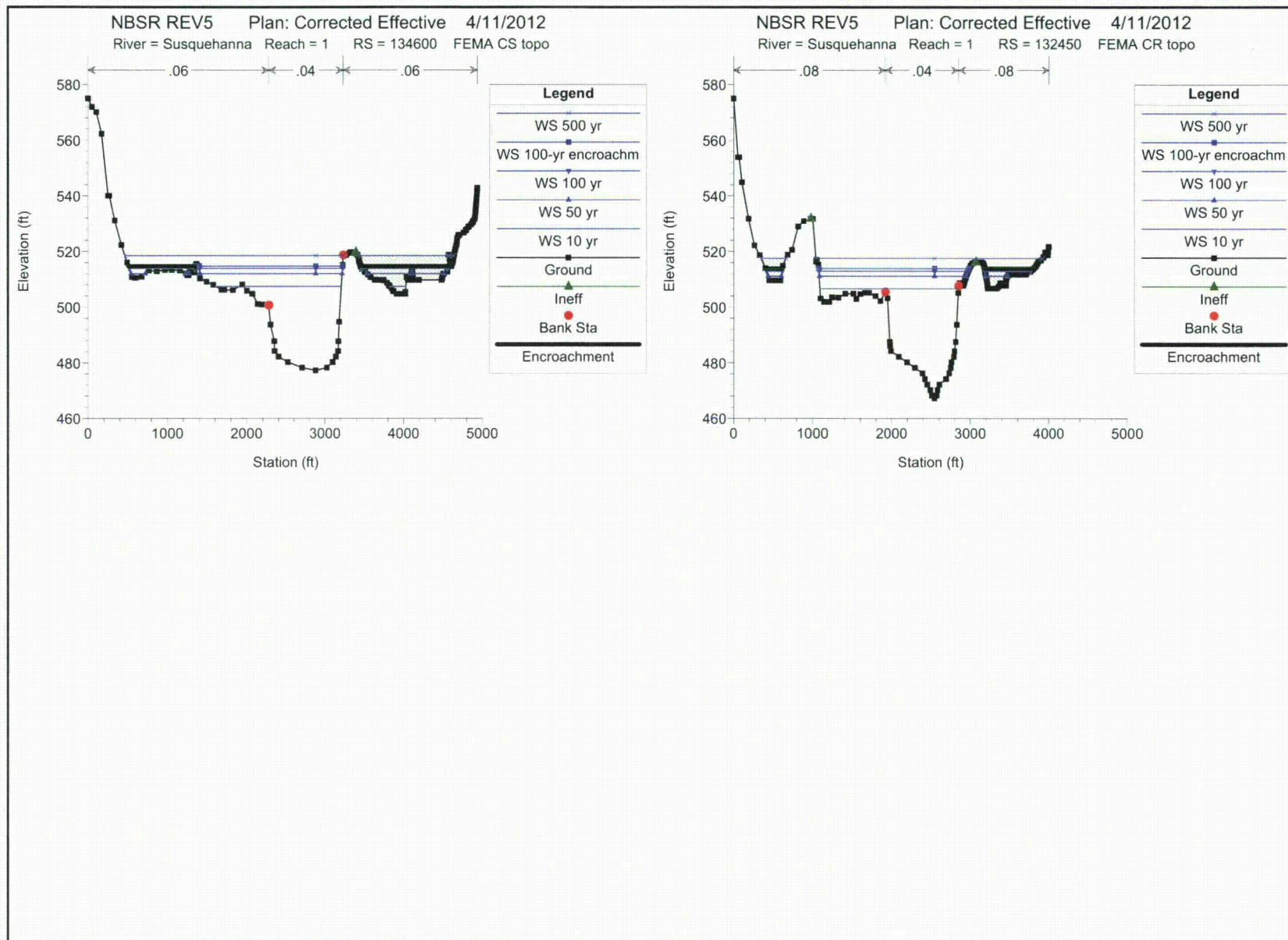
Appendix G: Corrected Effective Model

- HEC-RAS Reports
- HEC-RAS Cross-Sections
- HEC-RAS Profiles

HEC-RAS Plan: CORR River: Susquehanna Reach: 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	134600	10 yr	167000.00	477.20	507.41	490.34	508.11	0.000430	6.75	26083.08	1745.93	0.23
1	134600	50 yr	232000.00	477.20	511.99	493.01	512.89	0.000463	7.74	34266.74	3008.67	0.25
1	134600	100 yr	260000.00	477.20	513.82	494.08	514.76	0.000464	8.03	38517.36	3747.31	0.25
1	134600	500 yr	340000.00	477.20	518.44	496.89	519.49	0.000460	8.69	51120.23	3979.27	0.25
1	134600	100-yr encroachm	260000.00	477.20	514.72	494.10	515.60	0.000420	7.78	39024.80	1833.93	0.24
1	132450	10 yr	167000.00	467.20	506.60	487.76	507.25	0.000374	6.48	27768.00	1757.05	0.22
1	132450	50 yr	232000.00	467.20	511.10	490.43	511.95	0.000412	7.52	35946.14	2307.98	0.23
1	132450	100 yr	260000.00	467.20	512.90	491.50	513.82	0.000420	7.88	39331.48	2671.23	0.24
1	132450	500 yr	340000.00	467.20	517.50	494.34	518.56	0.000426	8.64	53289.80	3195.69	0.25
1	132450	100-yr encroachm	260000.00	467.20	513.90	491.50	514.75	0.000376	7.60	41234.68	1912.36	0.23





HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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X   X XXXXXX   XXXX   XXXX   XX   XXXX
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X   X X       X   X   X   X   X   X
XXXXXXX XXXX   XXX XXXX   XXXXXX   XXXX
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

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PROJECT DATA

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Project File : NBSRREV5.prj
Run Date and Time: 4/11/2012 4:18:39 PM

Project in English units

PLAN DATA

Plan Title: Corrected Effective

Plan File : p:\PROJECTS\Environmental\PPL - Wetland Permitting Oversight E-726-L8\TASKS\Task 10 -
Floodplain\Study and Revisions NBSR\NBSR Revisions Feb 2012\Preliminary files to FEMA\4-10-
12\HECRAS\NBSRREV5.p06

Geometry Title: Corrected Effective

Geometry File : p:\PROJECTS\Environmental\PPL - Wetland Permitting Oversight E-726-L8\TASKS\Task 10 -
Floodplain\Study and Revisions NBSR\NBSR Revisions Feb 2012\Preliminary files to FEMA\4-10-
12\HECRAS\NBSRREV5.g04

Flow Title : FEMA Ex Flow

Flow File : p:\PROJECTS\Environmental\PPL - Wetland Permitting Oversight E-726-L8\TASKS\Task 10 -
Floodplain\Study and Revisions NBSR\NBSR Revisions Feb 2012\Preliminary files to FEMA\4-10-
12\HECRAS\NBSRREV5.f02

Plan Summary Information:

Number of:	Cross Sections =	2	Multiple Openings =	0
	Culverts =	0	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

Encroachment Data

Equal Conveyance =	True
Left Offset =	0
Right Offset =	0

River	Profile	Reach	Method	Value1	Value2
Susquehanna		1			
RS					
139600	50 yr		0	0	0
137275	50 yr		0	0	0
134600	50 yr		0	0	0
133431	50 yr		0	0	0
133138	50 yr		0	0	0
132450	50 yr		0	0	0
130400	50 yr		0	0	0
128690	50 yr		0	0	0
127800	50 yr		0	0	0

River = Susquehanna Reach = 1

RS	Profile	Method	Value1	Value2
139600	100 yr	0	0	0
137275	100 yr	0	0	0
134600	100 yr	0	0	0
133431	100 yr	0	0	0
133138	100 yr	0	0	0
132450	100 yr	0	0	0
130400	100 yr	0	0	0
128690	100 yr	0	0	0
127800	100 yr	0	0	0

River = Susquehanna Reach = 1

RS	Profile	Method	Value1	Value2
139600	500 yr	0	0	0
137275	500 yr	0	0	0
134600	500 yr	0	0	0
133431	500 yr	0	0	0
133138	500 yr	0	0	0
132450	500 yr	0	0	0
130400	500 yr	0	0	0
128690	500 yr	0	0	0
127800	500 yr	0	0	0

River = Susquehanna Reach = 1

RS	Profile	Method	Value1	Value2
139600	100-yr encroachment	1	89	1118
137275	100-yr encroachment	1	387	1725
134600	100-yr encroachment	1	1350	3310
133431	100-yr encroachment	1	1075	2965.8
133138	100-yr encroachment	1	1165	3005
132450	100-yr encroachment	1	1065	3078.44
130400	100-yr encroachment	1	1060	2985
128690	100-yr encroachment	1	860	2090
127800	100-yr encroachment	1	892	2242

FLOW DATA

Flow Title: FEMA Ex Flow

Flow File : p:\PROJECTS\Environmental\PPL - Wetland Permitting Oversight E-726-L8\TASKS\Task 10 - Floodplain\Study and Revisions NBSR\NBSR Revisions Feb 2012\Preliminary files to FEMA\4-10-12\HECRAS\NBSRREV5.f02

Flow Data (cfs)

River	Reach	RS	10 yr	50 yr	100 yr	500
yr100-yr encroachment						
Susquehanna	1	134600	167000	232000	260000	340000
260000						

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Susquehanna	1	10 yr	Critical	Known WS = 506.6
Susquehanna	1	50 yr	Critical	Known WS = 511.1
Susquehanna	1	100 yr	Critical	Known WS = 512.9
Susquehanna	1	500 yr	Critical	Known WS = 517.5
Susquehanna	1	100-yr encroachment	Critical	Known WS = 513.9

GEOMETRY DATA

Geometry Title: Corrected Effective

Geometry File : p:\PROJECTS\Environmental\PPL - Wetland Permitting Oversight E-726-L8\TASKS\Task 10 - Floodplain\Study and Revisions NBSR\NBSR Revisions Feb 2012\Preliminary files to FEMA\4-10-12\HECRAS\NBSRREV5.g04

CROSS SECTION

RIVER: Susquehanna

REACH: 1 RS: 134600

INPUT

Description: FEMA CS topo

Station Elevation Data		num= 200									
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	575	49	571.9	102	570.1	168	562.3	251	540		
266	540	335	531.1	421	522.3	493	516	554	510.8		
592	510.5	605	510.5	679	510.9	770	513.1	868	512.9		
969	513.3	1056	513.3	1157	513.1	1228	512.1	1248	511.4		
1264	511.4	1282	512.9	1339	512.4	1356	515.1	1362	515.5		
1370	515.1	1395	514.8	1406	510.3	1489	509.1	1576	508		
1679	506.2	1720	506.2	1826	506.1	1946	508.1	2005	505.9		
2073	504.8	2140	501.1	2200	500.9	2278	500.7	2301	493.7		
2348	487.7	2351	484.2	2401	482.2	2521	480.2	2706	478.2		
2881	477.2	3026	478.2	3101	480.2	3141	482.2	3171	484.2		
3174	487.7	3182.5	494.71	3226.5	515.17	3234.13	518.71	3241.76	518.71		
3270	518.71	3313.01	519.44	3328.61	519.71	3339.87	519.71	3382.78	519.71		
3409.31	518.86	3414.11	518.71	3416.02	518.55	3426.3	517.71	3432.19	516.86		
3433.22	516.71	3434.27	516.57	3440.7	515.71	3451.05	514.85	3452.7	514.71		
3454.99	514.57	3468.56	513.71	3499.79	512.91	3507.41	512.71	3514.92	512.51		
3544.48	511.71	3574.42	510.91	3581.73	510.71	3632.47	509.87	3641.81	509.71		
3651.94	509.71	3705.77	509.71	3731.74	509.71	3738.37	509.71	3748.83	509.51		
3789.46	508.71	3810.99	507.87	3815.03	507.71	3819.94	507.54	3843.93	506.71		
3866.07	505.8	3868.29	505.71	3871.45	505.63	3908.53	504.71	3913.05	504.71		
3936.08	504.71	3945.32	504.71	3977.47	504.71	4015.94	504.71	4022.1	504.71		
4023.99	505.45	4037.31	510.71	4049.85	510.71	4051.64	510.71	4051.85	510.58		
4053.27	509.71	4060	509.71	4095.03	509.71	4096.46	510.49	4096.84	510.71		
4097.29	510.92	4098.88	511.71	4103.08	512.57	4103.79	512.71	4105	512.71		
4112.67	512.71	4116.31	511.84	4116.85	511.71	4117.26	511.59	4119.96	510.71		
4120.39	510.57	4123.07	509.71	4196.58	509.71	4485.69	509.71	4490.82	510.45		
4492.63	510.71	4494.43	510.94	4500.32	511.71	4514.26	511.96	4555.91	512.71		
4560.2	514.43	4571	518.71	4578.11	518.71	4579.56	518.71	4582.84	517.85		
4583.41	517.71	4584.21	517.42	4589.01	515.71	4591.69	514.89	4592.25	514.71		
4594.26	514.71	4604.18	514.71	4606.69	514.85	4622.12	515.71	4627.16	516.51		
4628.41	516.71	4629.51	516.91	4634.07	517.71	4639.1	518.56	4640.02	518.71		
4641.3	518.86	4648.43	519.71	4655.73	520.63	4656.34	520.71	4657	520.78		
4665.12	521.71	4672.47	522.58	4673.59	522.71	4677.09	523.59	4677.59	523.71		
4678.08	523.83	4681.55	524.71	4693.59	525.55	4695.91	525.71	4708.29	525.9		
4762	526.71	4785.38	527.47	4792.78	527.71	4798.59	527.93	4818.67	528.71		
4828.41	528.96	4857.39	529.71	4875.48	530.46	4881.63	530.71	4886.22	530.95		
4900.74	531.71	4906.35	532.46	4908.21	532.71	4909.19	532.95	4912.63	533.71		
4915.09	534.58	4915.46	534.71	4915.82	534.83	4918.26	535.71	4920.96	536.62		
4921.25	536.71	4923.9	537.62	4924.17	537.71	4926.3	538.62	4926.52	538.71		
4926.73	538.8	4928.83	539.71	4930.96	540.61	4931.17	540.71	4933.36	541.63		
4933.54	541.71	4936.18	542.65	4936.35	542.71	4936.93	542.77	4937.83	542.87		

Manning's n Values		num= 3	
Sta	n Val	Sta	n Val
0	.06	2278	.04
		3234.13	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
2278	3234.13	2075	2125	2160	.1	.3

Ineffective Flow		num= 1	
Sta L	Sta R	Elev	Permanent
3391.55	4937.83	519.7	F

CROSS SECTION

RIVER: Susquehanna
 REACH: 1 RS: 132450

INPUT
 Description: FEMA CR topo
 Station Elevation Data num= 174

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	575	56	553.9	72	553.9	107	544.9	190	531.8
263	522.2	331	518.7	404	514	451	509.6	526	509.6
595	509.6	625	514.9	686	518.8	743	520.6	821	529
892	530.9	979	531.8	1003	531.7	1045	516.4	1052	516.9
1053	516.9	1057	516.9	1074	515.2	1103	503.1	1146	501.9
1210	501.9	1244	503.5	1324	503.4	1410	504.9	1513	504.9
1548	503	1602	504.7	1661	505.2	1712	505.2	1794	504
1856	502.2	1921	505.5	1950	503.2	1978	487.5	1980	486.2
1992	484.2	2092	482.2	2197	480.2	2296	478.2	2392	476.2
2422	474.2	2452	472.2	2492	470.2	2512	468.2	2542	467.2
2572	468.2	2582	470.2	2607	472.2	2692	474.2	2732	476.2
2752	478.2	2762	480.2	2792	482.2	2802	484.2	2816	487.5
2831	493.71	2849.23	505.09	2853.45	507.71	2856.17	507.93	2866.02	508.71
2870.17	508.71	2871.47	508.71	2877.93	508.49	2900	507.71	2903.48	507.71
2914.15	507.71	2922.04	508.45	2924.85	508.71	2927.78	508.99	2935.2	509.71
2942.21	510.41	2945.18	510.71	2949.08	510.99	2958.95	511.71	2967.35	512.39
2971.21	512.71	2981.71	513.42	2986.11	513.71	2991.24	514	3003.66	514.71
3010.33	515.01	3025.96	515.71	3039.96	515.88	3064.99	516.17	3139.88	516.19

3156.23	515.91	3168.13	515.71	3175.36	515.03	3178.75	514.71	3180.79	514.33
3184.13	513.71	3186.8	513.21	3189.08	512.71	3193.43	512.07	3195.92	511.71
3198.41	511.39	3203.25	510.71	3207.11	510.19	3210.75	509.71	3212.99	509.32
3215.97	508.71	3218.76	508.15	3221.11	507.71	3222.88	507.33	3225.57	506.71
3294.57	506.71	3334.97	506.71	3353.92	507.2	3374.05	507.71	3376.75	509.1
3380.99	508.71	3390.31	508.71	3396.63	508.71	3397.78	508.29	3399.33	507.71
3431.15	507.71	3451.67	507.71	3452.07	508.01	3452.98	508.71	3453.85	509.38
3454.16	509.71	3457.13	510.04	3463.14	510.71	3480.65	511.39	3489.1	511.71
3522.7	511.71	3543.97	511.71	3558.76	511.71	3610.95	511.71	3622.71	511.71
3639.45	511.71	3647.95	511.71	3657.57	511.71	3676.52	511.71	3686.6	511.71
3697.67	511.71	3700.1	511.71	3713.24	511.93	3759.7	512.71	3781.23	513.27
3797.91	513.71	3814.7	514.2	3831.98	514.71	3843.13	515.19	3854.99	515.71
3862.77	516.19	3871.44	516.71	3891.77	516.71	3896.79	516.71	3901.28	516.85
3928.22	517.71	3933.77	518.14	3954.14	519.71	3968.51	519.71	3973.63	519.71
3982.44	519.71	3985.5	519.71	3986.37	519.44	3988.89	518.71	3989.16	518.71
3990.3	518.71	3991.93	519.51	3992.4	519.71	3992.87	519.9	3994.47	520.71
3996.01	521.49	3996.37	521.71	4003.41	521.71	4004.89	521.71		

Manning's n Values				num=	3
Sta	n Val	Sta	n Val	Sta	n Val
0	.08	1921	.04	2853.45	.08

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	1921	2853.45		6415	5590	4710	.1
							.3

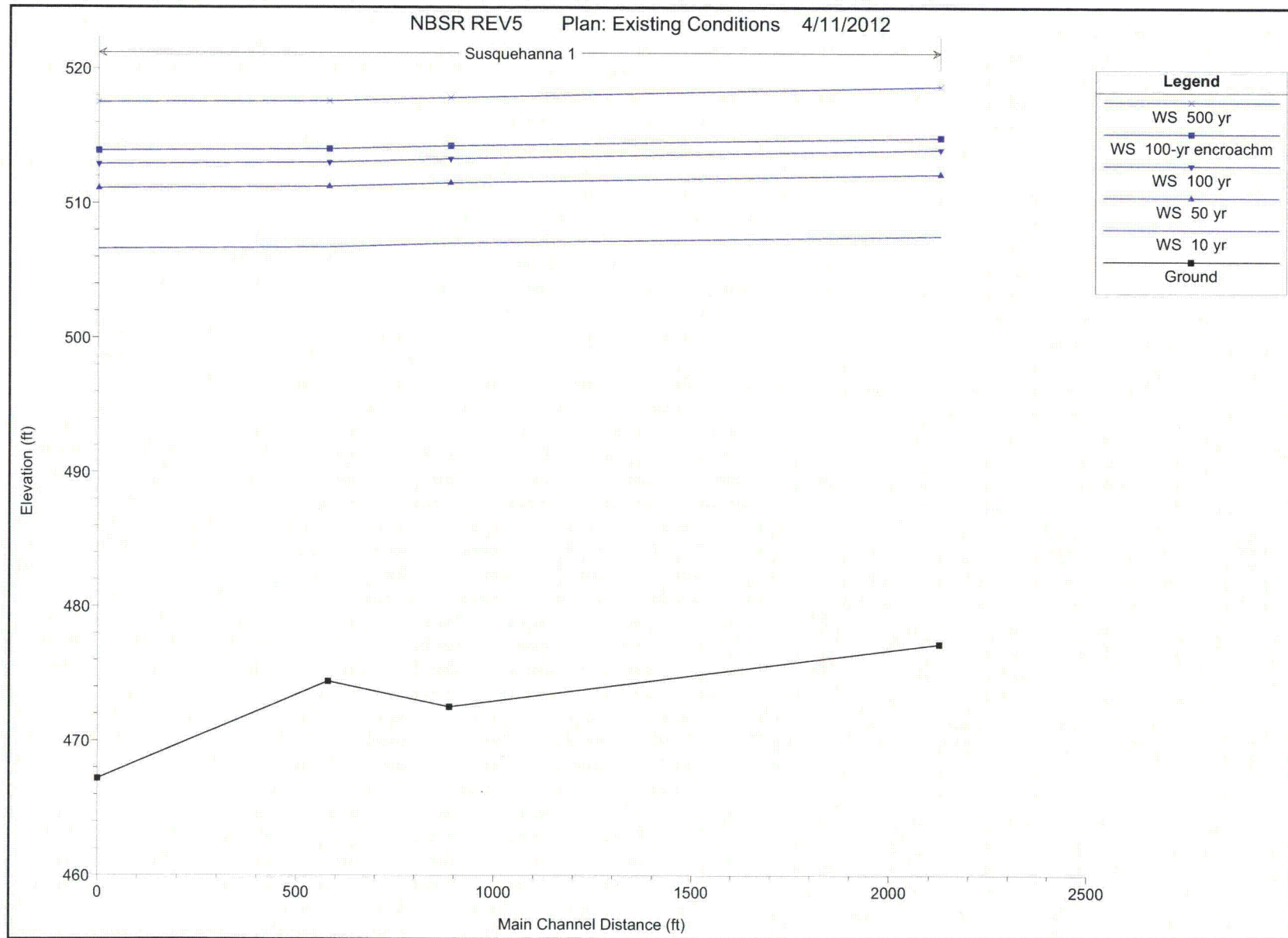
Ineffective Flow	num=	2
Sta L	Sta R	Elev
0	979	531.8
3078.44	4004.89	516.17
		F
		F

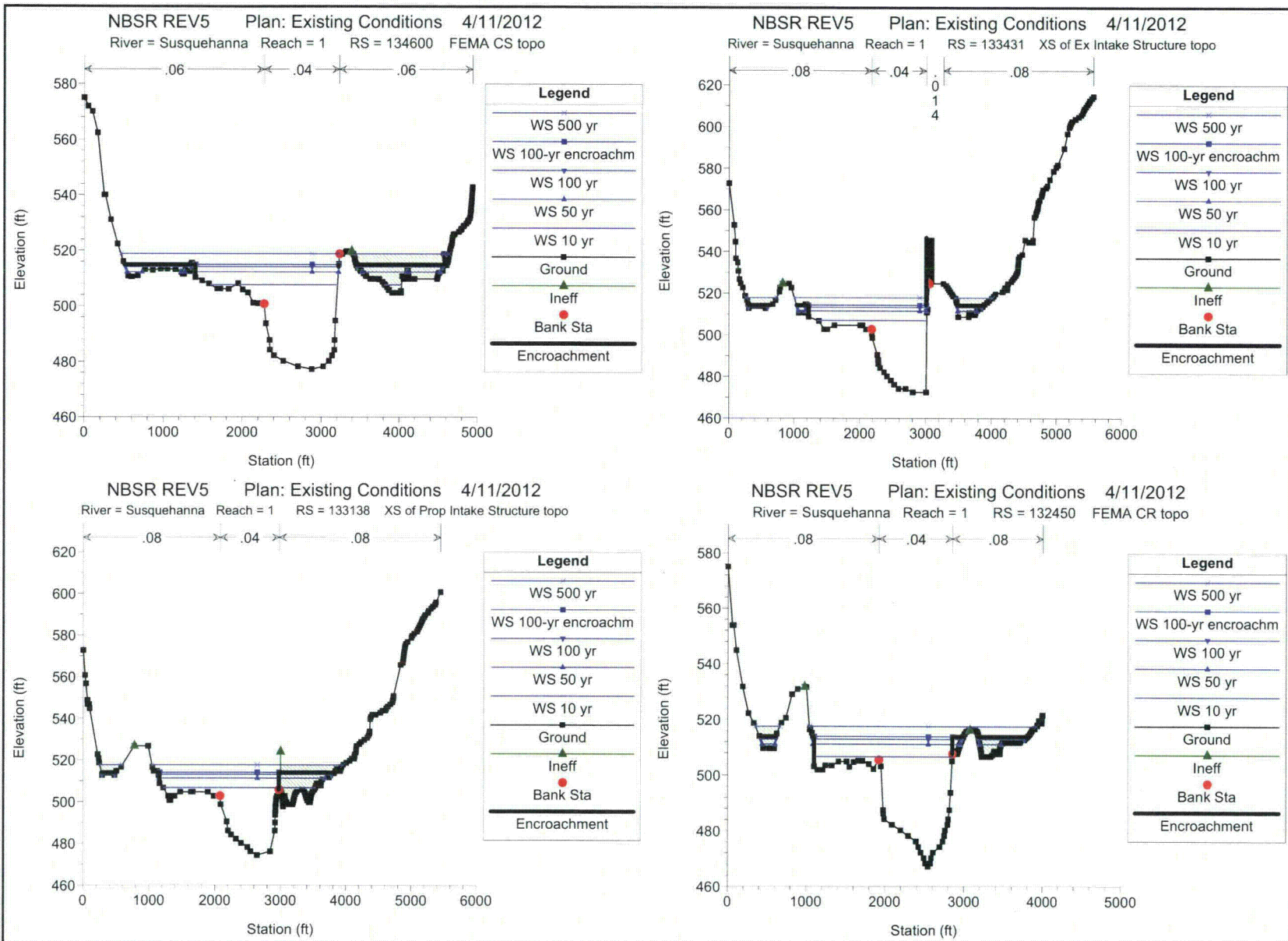
Appendix H: Existing Conditions Model

- HEC-RAS Reports
- HEC-RAS Cross-Sections
- HEC-RAS Profiles

HEC-RAS Plan: EX River: Susquehanna Reach: 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	134600	10 yr	167000.00	477.20	507.58	490.34	508.27	0.000421	6.70	26344.15	1775.79	0.23
1	134600	50 yr	232000.00	477.20	512.18	493.01	513.06	0.000453	7.68	34642.04	3048.43	0.24
1	134600	100 yr	260000.00	477.20	514.01	494.08	514.94	0.000453	7.97	39034.34	3755.26	0.25
1	134600	500 yr	340000.00	477.20	518.70	496.89	519.73	0.000446	8.59	51847.46	3989.25	0.25
1	134600	100-yr encroachm	260000.00	477.20	514.90	494.10	515.77	0.000411	7.72	39320.50	1818.01	0.24
1	133431	10 yr	167000.00	472.50	507.00	487.77	507.74	0.000422	6.96	26026.08	1650.64	0.23
1	133431	50 yr	232000.00	472.50	511.49	490.75	512.47	0.000475	8.11	34012.39	2188.53	0.25
1	133431	100 yr	260000.00	472.50	513.29	491.98	514.35	0.000488	8.49	37436.19	2591.81	0.25
1	133431	500 yr	340000.00	472.50	517.83	495.20	519.11	0.000521	9.48	46404.91	3031.54	0.27
1	133431	100-yr encroachm	260000.00	472.50	514.25	491.98	515.23	0.000440	8.21	38829.16	1782.50	0.24
1	133138	10 yr	167000.00	474.40	506.71	490.64	507.58	0.000585	7.51	24329.00	2306.42	0.27
1	133138	50 yr	232000.00	474.40	511.23	493.68	512.30	0.000598	8.50	32554.30	2524.07	0.28
1	133138	100 yr	260000.00	474.40	513.03	494.87	514.17	0.000596	8.84	35882.32	2826.57	0.28
1	133138	500 yr	340000.00	474.40	517.59	498.04	518.94	0.000601	9.73	44577.62	3248.45	0.29
1	133138	100-yr encroachm	260000.00	474.40	514.03	494.87	515.08	0.000534	8.50	37494.70	1811.64	0.27
1	132450	10 yr	167000.00	467.20	506.60	487.76	507.25	0.000374	6.48	27768.00	1757.05	0.22
1	132450	50 yr	232000.00	467.20	511.10	490.43	511.95	0.000412	7.52	35946.14	2307.98	0.23
1	132450	100 yr	260000.00	467.20	512.90	491.50	513.82	0.000420	7.88	39331.48	2671.23	0.24
1	132450	500 yr	340000.00	467.20	517.50	494.34	518.56	0.000426	8.64	53289.80	3195.69	0.25
1	132450	100-yr encroachm	260000.00	467.20	513.90	491.50	514.76	0.000381	7.62	40530.64	1750.45	0.23





HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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X   X   XXXXXX   XXXX   XXXX   XX   XXXX
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X   X   X       X   X   X   X   X   X
XXXXXXXX XXXX   XXX XXXX XXXXXX XXXX
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X   X   XXXXXX   XXXX   X   X   X   X   XXXXX

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PROJECT DATA

Project Title: NBSR REV5
Project File : NBSRREV5.prj
Run Date and Time: 4/11/2012 4:16:34 PM

Project in English units

PLAN DATA

Plan Title: Existing Conditions

Plan File : p:\PROJECTS\Environmental\PPL - Wetland Permitting Oversight E-726-L8\TASKS\Task 10 -
Floodplain\Study and Revisions NBSR\NBSR Revisions Feb 2012\Preliminary files to FEMA\4-10-
12\HECRAS\NBSRREV5.p04

Geometry Title: Existing Conditions

Geometry File : p:\PROJECTS\Environmental\PPL - Wetland Permitting Oversight E-726-L8\TASKS\Task 10 -
Floodplain\Study and Revisions NBSR\NBSR Revisions Feb 2012\Preliminary files to FEMA\4-10-
12\HECRAS\NBSRREV5.g03

Flow Title : FEMA Ex Flow

Flow File : p:\PROJECTS\Environmental\PPL - Wetland Permitting Oversight E-726-L8\TASKS\Task 10 -
Floodplain\Study and Revisions NBSR\NBSR Revisions Feb 2012\Preliminary files to FEMA\4-10-
12\HECRAS\NBSRREV5.f02

Plan Summary Information:

Number of:	Cross Sections =	4	Multiple Openings =	0
	Culverts =	0	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

Encroachment Data

Equal Conveyance =	True
Left Offset =	0
Right Offset =	0

River =	Susquehanna	Reach =	1
RS	Profile	Method	Value1 Value2
134600	50 yr	0	0 0
133431	50 yr	0	0 0
133138	50 yr	0	0 0
132450	50 yr	0	0 0

River =	Susquehanna	Reach =	1
RS	Profile	Method	Value1 Value2
134600	100 yr	0	0 0
133431	100 yr	0	0 0
133138	100 yr	0	0 0
132450	100 yr	0	0 0

River =	Susquehanna	Reach =	1		
RS	Profile	Method	Value1	Value2	
134600	500 yr	0	0	0	
133431	500 yr	0	0	0	
133138	500 yr	0	0	0	
132450	500 yr	0	0	0	

River =	Susquehanna	Reach =	1		
RS	Profile	Method	Value1	Value2	
134600	100-yr encroachment	1	1406	3224.01	
133431	100-yr encroachment	1	1223.1	3005.6	
133138	100-yr encroachment	1	1161.6	2973.24	
132450	100-yr encroachment	1	1103	2853.45	

FLOW DATA

Flow Title: FEMA Ex Flow
Flow File : p:\PROJECTS\Environmental\PPL - Wetland Permitting Oversight E-726-L8\TASKS\Task 10 - Floodplain\Study and Revisions NBSR\NBSR Revisions Feb 2012\Preliminary files to FEMA\4-10-12\HECRAS\NBSRREV5.f02

Flow Data (cfs)

River	Reach	RS	10 yr	50 yr	100 yr	500
yr100-yr encroachment						
Susquehanna	1	134600	167000	232000	260000	340000
260000						

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Susquehanna	1	10 yr	Critical	Known WS = 506.6
Susquehanna	1	50 yr	Critical	Known WS = 511.1
Susquehanna	1	100 yr	Critical	Known WS = 512.9
Susquehanna	1	500 yr	Critical	Known WS = 517.5
Susquehanna	1	100-yr encroachment	Critical	Known WS = 513.9

GEOMETRY DATA

Geometry Title: Existing Conditions
Geometry File : p:\PROJECTS\Environmental\PPL - Wetland Permitting Oversight E-726-L8\TASKS\Task 10 - Floodplain\Study and Revisions NBSR\NBSR Revisions Feb 2012\Preliminary files to FEMA\4-10-12\HECRAS\NBSRREV5.g03

CROSS SECTION

RIVER: Susquehanna
REACH: 1 RS: 134600

INPUT

Description: FEMA CS topo

Station	Elevation	Data	num=	200						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	575	49	571.9	102	570.1	168	562.3	251	540	
266	540	335	531.1	421	522.3	493	516	554	510.8	
592	510.5	605	510.5	679	510.9	770	513.1	868	512.9	
969	513.3	1056	513.3	1157	513.1	1228	512.1	1248	511.4	
1264	511.4	1282	512.9	1339	512.4	1356	515.1	1362	515.5	
1370	515.1	1395	514.8	1406	510.3	1489	509.1	1576	508	
1679	506.2	1720	506.2	1826	506.1	1946	508.1	2005	505.9	
2073	504.8	2140	501.1	2200	500.9	2278	500.7	2301	493.7	
2348	487.7	2351	484.2	2401	482.2	2521	480.2	2706	478.2	
2881	477.2	3026	478.2	3101	480.2	3141	482.2	3171	484.2	
3174	487.7	3182.5	494.71	3226.5	515.17	3234.13	518.71	3241.76	518.71	
3270	518.71	3313.01	519.44	3328.61	519.71	3339.87	519.71	3382.78	519.71	
3409.31	518.86	3414.11	518.71	3416.02	518.55	3426.3	517.71	3432.19	516.86	
3433.22	516.71	3434.27	516.57	3440.7	515.71	3451.05	514.85	3452.7	514.71	
3454.99	514.57	3468.56	513.71	3499.79	512.91	3507.41	512.71	3514.92	512.51	
3544.48	511.71	3574.42	510.91	3581.73	510.71	3632.47	509.87	3641.81	509.71	
3651.94	509.71	3705.77	509.71	3731.74	509.71	3738.37	509.71	3748.83	509.51	
3789.46	508.71	3810.99	507.87	3815.03	507.71	3819.94	507.54	3843.93	506.71	

3866.07	505.8	3868.29	505.71	3871.45	505.63	3908.53	504.71	3913.05	504.71
3936.08	504.71	3945.32	504.71	3977.47	504.71	4015.94	504.71	4022.1	504.71
4023.99	505.45	4037.31	510.71	4049.85	510.71	4051.64	510.71	4051.85	510.58
4053.27	509.71	4060	509.71	4095.03	509.71	4096.46	510.49	4096.84	510.71
4097.29	510.92	4098.88	511.71	4103.08	512.57	4103.79	512.71	4105	512.71
4112.67	512.71	4116.31	511.84	4116.85	511.71	4117.26	511.59	4119.96	510.71
4120.39	510.57	4123.07	509.71	4196.58	509.71	4485.69	509.71	4490.82	510.45
4492.63	510.71	4494.43	510.94	4500.32	511.71	4514.26	511.96	4555.91	512.71
4560.2	514.43	4571	518.71	4578.11	518.71	4579.56	518.71	4582.84	517.85
4583.41	517.71	4584.21	517.42	4589.01	515.71	4591.69	514.89	4592.25	514.71
4594.26	514.71	4604.18	514.71	4606.69	514.85	4622.12	515.71	4627.16	516.51
4628.41	516.71	4629.51	516.91	4634.07	517.71	4639.1	518.56	4640.02	518.71
4641.3	518.86	4648.43	519.71	4655.73	520.63	4656.34	520.71	4657	520.78
4665.12	521.71	4672.47	522.58	4673.59	522.71	4677.09	523.59	4677.59	523.71
4678.08	523.83	4681.55	524.71	4693.59	525.55	4695.91	525.71	4708.29	525.9
4762	526.71	4785.38	527.47	4792.78	527.71	4798.59	527.93	4818.67	528.71
4828.41	528.96	4857.39	529.71	4875.48	530.46	4881.63	530.71	4886.22	530.95
4900.74	531.71	4906.35	532.46	4908.21	532.71	4909.19	532.95	4912.63	533.71
4915.09	534.58	4915.46	534.71	4915.82	534.83	4918.26	535.71	4920.96	536.62
4921.25	536.71	4923.9	537.62	4924.17	537.71	4926.3	538.62	4926.52	538.71
4926.73	538.88	4928.83	539.71	4930.96	540.61	4931.17	540.71	4933.36	541.63
4933.54	541.71	4936.18	542.65	4936.35	542.71	4936.93	542.77	4937.83	542.87

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .06 2278 .04 3234.13 .06

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 2278 3234.13 1136 1237 1231 .1 .3
 Ineffective Flow num= 1
 Sta L Sta R Elev Permanent
 3391.55 4937.83 519.7 F

CROSS SECTION

RIVER: Susquehanna
 REACH: 1 RS: 133431

INPUT

Description: XS of Ex Intake Structure topo

Station	Elevation	Data	num=	156
Sta	Elev	Sta	Elev	Sta
0	572.7	78.8	552.7	97.8
144.6	530.7	162.9	526.7	180.5
279.8	516.7	294	514.7	303.4
716.2	516.7	774.5	520.7	783.9
959	522.7	1070.5	510.7	1163
1210.3	512.7	1223.1	508.7	1378.2
1611.8	504.7	2007.6	504.7	2036
2103.6	502.7	2121.6	502.7	2159.6
2189.7	498.7	2268.3	490.51	2282.3
2370.8	482.2	2415.8	480.2	2475.8
2700	474.2	2805.8	472.5	3005.8
3025.91	512.4	3051	524.7	3271
3355	521.7	3374	520.7	3400
3465	516.7	3472	515.7	3494
3664	510.7	3672	510.7	3674
3743	510.7	3747	509.7	3750.5
3833	512.7	3867.89	513.7	3898.07
4008.15	517.7	4032.18	518.7	4060.25
4202.83	522.7	4209.04	522.7	4211.99
4235.95	521.7	4238.63	522.7	4241.08
4323.46	526.7	4346	527.7	4367.77
4400.48	531.7	4402.86	532.7	4404.9
4410.47	536.7	4427.21	537.7	4467.33
4601.96	544.7	4610.4	544.7	4633.16
4676.76	557.7	4680.01	558.7	4696.02
4714.25	562.7	4717.63	563.7	4735.2
4782.1	568.7	4789.08	569.7	4839.38
4956.02	578.7	4996.76	580.7	5019.06
5195.73	599.7	5209.67	600.7	5221.75
5338.74	604.7	5378.85	605.7	5402.62
5451.28	609.7	5474.31	610.7	5495.7
5564.83	614.7			

Manning's n Values num= 4
 Sta n Val Sta n Val Sta n Val
 0 .08 2178.8 .04 3005.8 .014 3271 .08

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

2178.8 3051 308 308 308 .1 .3
 Ineffective Flow num= 2
 Sta L Sta R Elev Permanent
 0 822.6 524.7 F
 3051 5564.83 524.7 F
 Blocked Obstructions num= 1
 Sta L Sta R Elev
 3005.6 3126.6 546.76

CROSS SECTION

RIVER: Susquehanna
 REACH: 1 RS: 133138

INPUT

Description: XS of Prop Intake Structure topo

Station Elevation Data num= 189

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	572.7	26.7	560.7	40.7	556.7	64	548.7	67.2	546.7
87.5	546.7	96.2	544.7	218.1	522.7	236.2	520.7	242.4	518.7
287.7	512.7	473	512.7	505.4	514.7	574.9	516.7	773.6	526.7
989.6	526.7	1053.6	516.7	1072.1	514.7	1109.6	514.7	1126	514.7
1148.6	512.7	1161.6	508.7	1221.5	506.7	1294.6	502.7	1312.9	500.7
1331.2	500.7	1357.7	502.7	1388.1	502.7	1392.4	502.7	1477.3	504.7
1641.5	504.7	1664.8	504.7	1891	504.7	1982.3	502.7	2007.9	502.7
2034.9	502.7	2047.1	502.7	2073.5	502.7	2085.9	498.7	2181.41	490.51
2198.91	486.2	2248.91	484.2	2318.91	482.2	2398.91	480.2	2498.91	478.2
2543.91	476.2	2643.91	474.4	2843.91	476.2	2913.91	486.2	2916.86	490
2918.86	493.7	2920.32	494.7	2921.8	495.7	2923.4	496.7	2925.27	497.7
2927.36	498.7	2929.67	499.7	2932.05	500.7	2935.31	501.7	2943.52	502.7
2963.06	503.7	2969.04	504.7	2973.24	505.7	2994.64	505.7	3004.74	504.7
3013.57	503.7	3026	502.7	3028.68	501.7	3030.68	500.7	3032.23	499.7
3033.87	498.7	3035.51	497.7	3037.66	497.7	3038.77	498.7	3039.95	499.7
3041.11	500.7	3042.22	501.7	3043.38	502.7	3060.1	502.7	3064.47	501.7
3073.93	500.7	3090.68	499.7	3126.35	498.7	3178.01	498.7	3189.73	499.7
3196.95	500.7	3203.57	501.7	3210.79	502.7	3221.85	503.7	3240.95	504.7
3324.78	505.7	3332.28	505.7	3361.51	504.7	3373.64	503.7	3384.23	502.7
3395.37	501.7	3405.85	500.7	3429.02	499.7	3446.45	499.7	3451.98	500.7
3457.93	501.7	3463.46	502.7	3468.3	503.7	3485.04	504.7	3512.29	505.7
3527.37	506.7	3535.95	507.7	3547.43	508.7	3554.76	508.7	3558.22	507.7
3612.45	507.7	3615.63	508.7	3618.81	509.7	3635.96	510.7	3714.53	511.7
3739.9	511.7	3759.44	512.7	3815.92	513.7	3835.52	514.7	3859.17	515.7
3887.84	515.7	3895.56	514.7	3911.24	514.7	3917.73	515.7	3928.88	516.7
3957.67	517.7	4004.78	518.7	4059.33	519.7	4089.71	520.7	4126.51	520.7
4134.94	521.7	4137.66	522.7	4153.41	523.7	4155.79	524.7	4158.26	525.7
4160.73	526.7	4207.72	527.7	4235.73	528.7	4283.39	529.7	4328.9	530.7
4348.11	531.7	4361.63	532.7	4363.45	533.7	4374.29	539.7	4383.63	540.7
4404.88	541.7	4425.38	541.7	4454.79	541.7	4527.03	542.7	4562.7	543.7
4603.66	543.7	4616.66	544.7	4639.94	545.7	4678.93	546.7	4710.52	547.7
4716.57	548.7	4723.67	549.7	4730.77	550.7	4834.9	565.7	4871.02	566.7
4874.35	567.7	4877.98	568.7	4881.31	569.7	4884.79	570.7	4889.17	571.7
4893.86	572.7	4899.45	573.7	4903.98	574.7	4912.29	575.7	4942.27	576.7
4999.83	578.7	5013.48	579.7	5041.8	580.7	5085.44	581.7	5101.37	582.7
5116.5	583.7	5131.22	584.7	5146.88	585.7	5160.4	586.7	5172.98	587.7
5196.94	588.7	5211.66	589.7	5250.61	590.7	5262.52	591.7	5299.54	592.7
5327.25	593.7	5362.32	594.7	5375.44	595.7	5448.65	600.7		

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 0 .08 2073.5 .04 2973.24 .08

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 2073.5 2973.24 631 580 621 .1 .3
 Ineffective Flow num= 2
 Sta L Sta R Elev Permanent
 0 773.6 526.7 F
 2994.64 5448.65 524 T

CROSS SECTION

RIVER: Susquehanna
 REACH: 1 RS: 132450

INPUT

Description: FEMA CR topo

Station Elevation Data num= 174

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	575	56	553.9	72	553.9	107	544.9	190	531.8
263	522.2	331	518.7	404	514	451	509.6	526	509.6

595	509.6	625	514.9	686	518.8	743	520.6	821	529
892	530.9	979	531.8	1003	531.7	1045	516.4	1052	516.9
1053	516.9	1057	516.9	1074	515.2	1103	503.1	1146	501.9
1210	501.9	1244	503.5	1324	503.4	1410	504.9	1513	504.9
1548	503	1602	504.7	1661	505.2	1712	505.2	1794	504
1856	502.2	1921	505.5	1950	503.2	1978	487.5	1980	486.2
1992	484.2	2092	482.2	2197	480.2	2296	478.2	2392	476.2
2422	474.2	2452	472.2	2492	470.2	2512	468.2	2542	467.2
2572	468.2	2582	470.2	2607	472.2	2692	474.2	2732	476.2
2752	478.2	2762	480.2	2792	482.2	2802	484.2	2816	487.5
2831	493.71	2849.23	505.09	2853.45	507.71	2856.17	507.93	2866.02	508.71
2870.17	508.71	2871.47	508.71	2877.93	508.49	2900	507.71	2903.48	507.71
2914.15	507.71	2922.04	508.45	2924.85	508.71	2927.78	508.99	2935.2	509.71
2942.21	510.41	2945.18	510.71	2949.08	510.99	2958.95	511.71	2967.35	512.39
2971.21	512.71	2981.71	513.42	2986.11	513.71	2991.24	514	3003.66	514.71
3010.33	515.01	3025.96	515.71	3039.96	515.88	3064.99	516.17	3139.88	516.19
3156.23	515.91	3168.13	515.71	3175.36	515.03	3178.75	514.71	3180.79	514.33
3184.13	513.71	3186.8	513.21	3189.08	512.71	3193.43	512.07	3195.92	511.71
3198.41	511.39	3203.25	510.71	3207.11	510.19	3210.75	509.71	3212.99	509.32
3215.97	508.71	3218.76	508.15	3221.11	507.71	3222.88	507.33	3225.57	506.71
3294.57	506.71	3334.97	506.71	3353.92	507.2	3374.05	507.71	3376.75	508.1
3380.99	508.71	3390.31	508.71	3396.63	508.71	3397.78	508.29	3399.33	507.71
3431.15	507.71	3451.67	507.71	3452.07	508.01	3452.98	508.71	3453.85	509.38
3454.16	509.71	3457.13	510.04	3463.14	510.71	3480.65	511.39	3489.1	511.71
3522.7	511.71	3543.97	511.71	3558.76	511.71	3610.95	511.71	3622.71	511.71
3639.45	511.71	3647.95	511.71	3657.57	511.71	3676.52	511.71	3686.6	511.71
3697.67	511.71	3700.1	511.71	3713.24	511.93	3759.7	512.71	3781.23	513.27
3797.91	513.71	3814.7	514.2	3831.98	514.71	3843.13	515.19	3854.99	515.71
3862.77	516.19	3871.44	516.71	3891.77	516.71	3896.79	516.71	3901.28	516.85
3928.22	517.71	3933.77	518.14	3954.14	519.71	3968.51	519.71	3973.63	519.71
3982.44	519.71	3985.5	519.71	3986.37	519.44	3988.89	518.71	3989.16	518.71
3990.3	518.71	3991.93	519.51	3992.4	519.71	3992.87	519.9	3994.47	520.71
3996.01	521.49	3996.37	521.71	4003.41	521.71	4004.89	521.71		

Manning's	n	Values	num=	3
Sta	n	Val	n	Val
0	.08	1921	.04	2853.45
				.08

Bank Sta:	Left	Right	Coeff	Contr.	Expan.
	1921	2853.45		.1	.3

Ineffective Flow	num=	2
Sta L	Sta R	Elev
0	979	531.8
3078.44	4004.89	516.17
		F

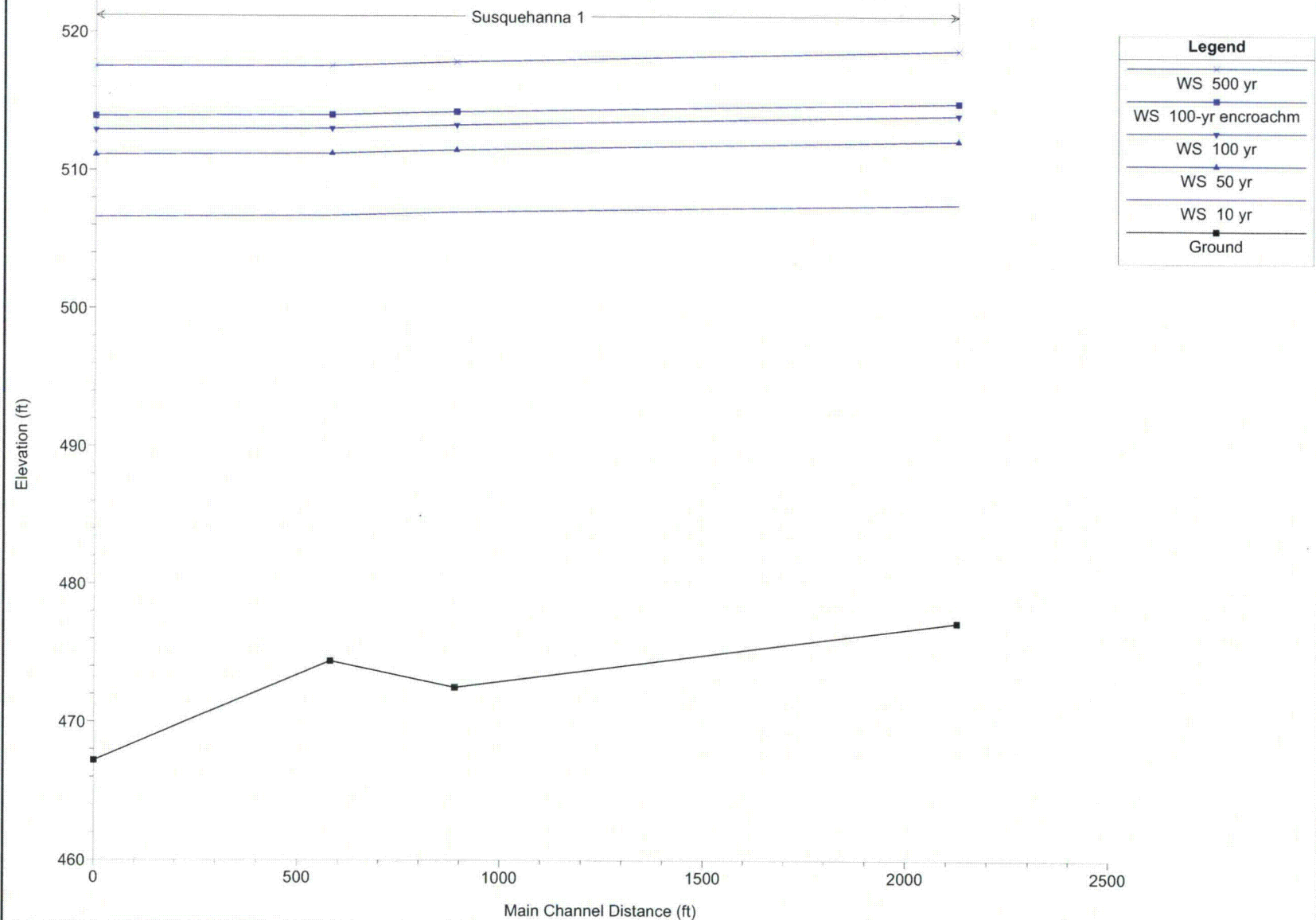
Appendix I: Proposed Conditions Model

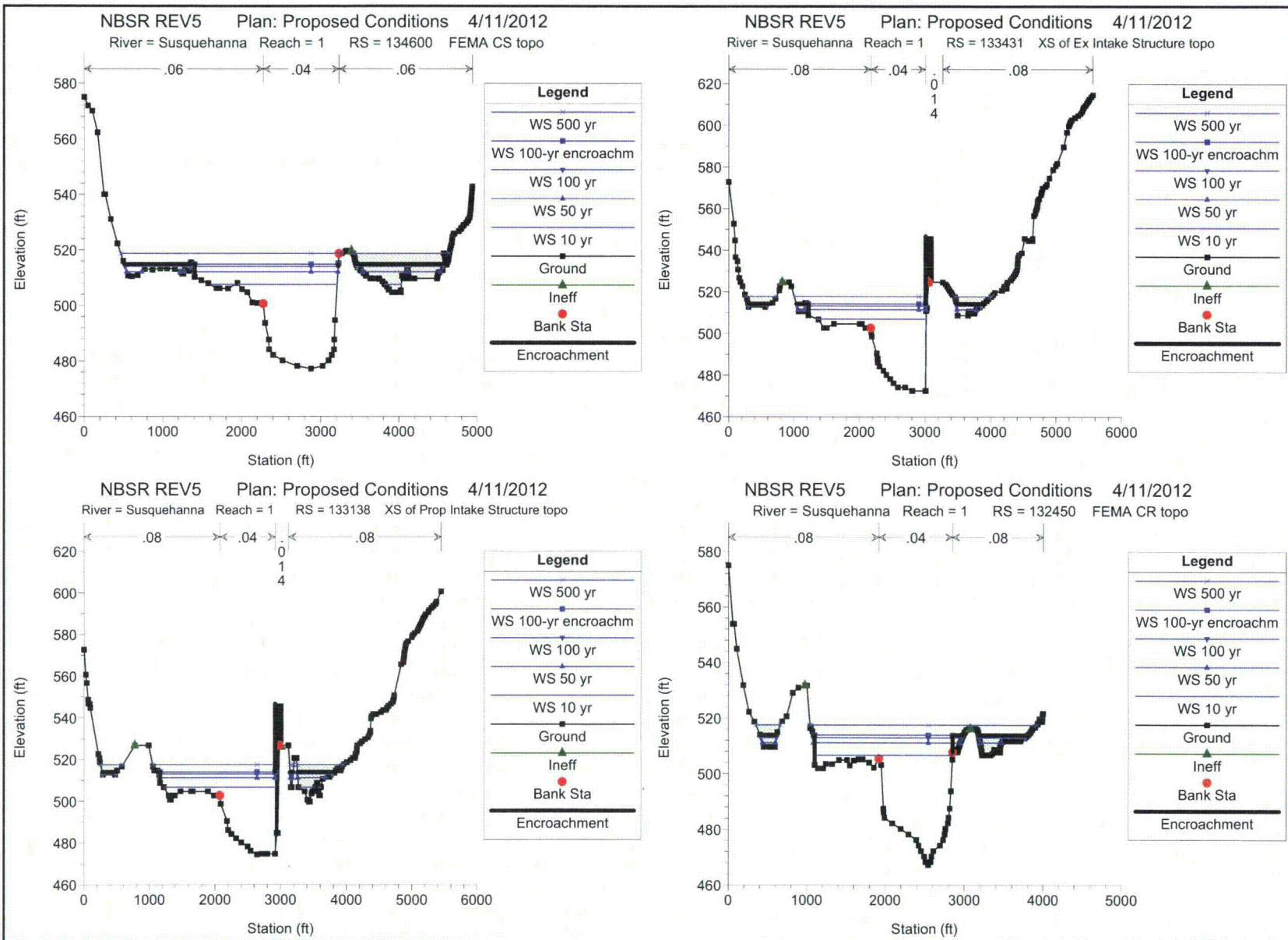
- HEC-RAS Reports
- HEC-RAS Cross-Sections
- HEC-RAS Profiles

HEC-RAS Plan: PRO River: Susquehanna Reach: 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	134600	10 yr	167000.00	477.20	507.56	490.34	508.25	0.000422	6.71	26306.08	1771.47	0.23
1	134600	50 yr	232000.00	477.20	512.17	493.01	513.05	0.000453	7.69	34630.58	3047.08	0.24
1	134600	100 yr	260000.00	477.20	514.01	494.08	514.94	0.000453	7.97	39039.53	3755.34	0.25
1	134600	500 yr	340000.00	477.20	518.72	496.89	519.75	0.000445	8.58	51901.27	4035.43	0.25
1	134600	100-yr encroachm	260000.00	477.20	514.90	494.10	515.77	0.000411	7.72	39322.05	1818.01	0.24
1	133431	10 yr	167000.00	472.50	506.97	487.77	507.72	0.000424	6.96	25982.84	1648.61	0.23
1	133431	50 yr	232000.00	472.50	511.49	490.75	512.47	0.000476	8.11	34001.01	2188.25	0.25
1	133431	100 yr	260000.00	472.50	513.29	491.98	514.35	0.000488	8.49	37440.19	2592.06	0.25
1	133431	500 yr	340000.00	472.50	517.85	495.20	519.13	0.000519	9.48	46446.08	3033.60	0.27
1	133431	100-yr encroachm	260000.00	472.50	514.25	491.98	515.23	0.000440	8.21	38830.79	1782.50	0.24
1	133138	10 yr	167000.00	474.40	506.72	489.81	507.56	0.000535	7.42	24580.08	2008.69	0.25
1	133138	50 yr	232000.00	474.40	511.22	492.82	512.30	0.000575	8.52	32425.30	2212.26	0.27
1	133138	100 yr	260000.00	474.40	513.02	494.05	514.18	0.000582	8.89	35600.79	2526.90	0.27
1	133138	500 yr	340000.00	474.40	517.56	497.22	518.95	0.000608	9.87	43907.57	2980.38	0.28
1	133138	100-yr encroachm	260000.00	474.40	514.01	494.02	515.08	0.000519	8.56	37291.52	1750.00	0.26
1	132450	10 yr	167000.00	467.20	506.60	487.76	507.25	0.000374	6.48	27768.00	1757.05	0.22
1	132450	50 yr	232000.00	467.20	511.10	490.43	511.95	0.000412	7.52	35946.14	2307.98	0.23
1	132450	100 yr	260000.00	467.20	512.90	491.50	513.82	0.000420	7.88	39331.48	2671.23	0.24
1	132450	500 yr	340000.00	467.20	517.50	494.34	518.56	0.000426	8.64	53289.80	3195.69	0.25
1	132450	100-yr encroachm	260000.00	467.20	513.90	491.50	514.76	0.000381	7.62	40530.64	1750.45	0.23

NBSR REV5 Plan: Proposed Conditions 4/11/2012





HEC-RAS Version 4.1.0 Jan 2010
 U.S. Army Corps of Engineers
 Hydrologic Engineering Center
 609 Second Street
 Davis, California

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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
XXXXXXXX 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

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PROJECT DATA

Project Title: NBSR REV5
 Project File : NBSRREV5.prj
 Run Date and Time: 4/11/2012 4:16:29 PM

Project in English units

PLAN DATA

Plan Title: Proposed Conditions
 Plan File : p:\PROJECTS\Environmental\PPL - Wetland Permitting Oversight E-726-L8\TASKS\Task 10 - Floodplain\Study and Revisions NBSR\NBSR Revisions Feb 2012\Preliminary files to FEMA\4-10-12\HECRAS\NBSRREV5.p05

Geometry Title: Proposed Conditions
 Geometry File : p:\PROJECTS\Environmental\PPL - Wetland Permitting Oversight E-726-L8\TASKS\Task 10 - Floodplain\Study and Revisions NBSR\NBSR Revisions Feb 2012\Preliminary files to FEMA\4-10-12\HECRAS\NBSRREV5.g02

Flow Title : FEMA Ex Flow
 Flow File : p:\PROJECTS\Environmental\PPL - Wetland Permitting Oversight E-726-L8\TASKS\Task 10 - Floodplain\Study and Revisions NBSR\NBSR Revisions Feb 2012\Preliminary files to FEMA\4-10-12\HECRAS\NBSRREV5.f02

Plan Summary Information:

Number of:	Cross Sections =	4	Multiple Openings =	0
	Culverts =	0	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

Encroachment Data

Equal Conveyance =	True
Left Offset =	0
Right Offset =	0

River =	Susquehanna	Reach =	1
RS Profile		Method	Value1 Value2
134600	50 yr		0 0 0

133431	50 yr	0	0	0
133138	50 yr	0	0	0
132450	50 yr	0	0	0

River = Susquehanna		Reach = 1		
RS	Profile	Method	Value1	Value2
134600	100 yr	0	0	0
133431	100 yr	0	0	0
133138	100 yr	0	0	0
132450	100 yr	0	0	0

River = Susquehanna		Reach = 1		
RS	Profile	Method	Value1	Value2
134600	500 yr	0	0	0
133431	500 yr	0	0	0
133138	500 yr	0	0	0
132450	500 yr	0	0	0

River = Susquehanna		Reach = 1		
RS	Profile	Method	Value1	Value2
134600	100-yr encroachment	1	1406	3224.01
133431	100-yr encroachment	1	1223.1	3005.6
133138	100-yr encroachment	1	1165	2915
132450	100-yr encroachment	1	1103	2853.45

FLOW DATA

Flow Title: FEMA Ex Flow

Flow File : p:\PROJECTS\Environmental\PPL - Wetland Permitting Oversight E-726-L8\TASKS\Task 10 - Floodplain\Study and Revisions NBSR\NBSR Revisions Feb 2012\Preliminary files to FEMA\4-10-12\HECRAS\NBSRREV5.f02

Flow Data (cfs)

River	Reach	RS	10 yr	50 yr	100 yr
500 yr100-yr encroachment					
Susquehanna	1	134600	167000	232000	260000
340000	260000				

Boundary Conditions

River	Reach	Profile	Upstream	
Downstream				
Susquehanna	1	10 yr	Critical	Known WS =
506.6				
Susquehanna	1	50 yr	Critical	Known WS =
511.1				
Susquehanna	1	100 yr	Critical	Known WS =
512.9				
Susquehanna	1	500 yr	Critical	Known WS =
517.5				
Susquehanna	1	100-yr encroachment	Critical	Known
WS = 513.9				

GEOMETRY DATA

Geometry Title: Proposed Conditions

Geometry File : p:\PROJECTS\Environmental\PPL - Wetland Permitting Oversight E-726-L8\TASKS\Task 10 - Floodplain\Study and Revisions NBSR\NBSR Revisions Feb 2012\Preliminary files to FEMA\4-10-12\HECRAS\NBSRREV5.g02

CROSS SECTION

RIVER: Susquehanna
REACH: 1

RS: 134600

INPUT

Description: FEMA CS topo

Station	Elevation	Data	num=	200					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	575	49	571.9	102	570.1	168	562.3	251	540
266	540	335	531.1	421	522.3	493	516	554	510.8
592	510.5	605	510.5	679	510.9	770	513.1	868	512.9
969	513.3	1056	513.3	1157	513.1	1228	512.1	1248	511.4
1264	511.4	1282	512.9	1339	512.4	1356	515.1	1362	515.5
1370	515.1	1395	514.8	1406	510.3	1489	509.1	1576	508
1679	506.2	1720	506.2	1826	506.1	1946	508.1	2005	505.9
2073	504.8	2140	501.1	2200	500.9	2278	500.7	2301	493.7
2348	487.7	2351	484.2	2401	482.2	2521	480.2	2706	478.2
2881	477.2	3026	478.2	3101	480.2	3141	482.2	3171	484.2
3174	487.7	3182.5	494.71	3226.5	515.17	3234.13	518.71	3241.76	518.71
3270	518.71	3313.01	519.44	3328.61	519.71	3339.87	519.71	3382.78	519.71
3409.31	518.86	3414.11	518.71	3416.02	518.55	3426.3	517.71	3432.19	516.86
3433.22	516.71	3434.27	516.57	3440.7	515.71	3451.05	514.85	3452.7	514.71
3454.99	514.57	3468.56	513.71	3499.79	512.91	3507.41	512.71	3514.92	512.51
3544.48	511.71	3574.42	510.91	3581.73	510.71	3632.47	509.87	3641.81	509.71
3651.94	509.71	3705.77	509.71	3731.74	509.71	3738.37	509.71	3748.83	509.51
3789.46	508.71	3810.99	507.87	3815.03	507.71	3819.94	507.54	3843.93	506.71
3866.07	505.8	3868.29	505.71	3871.45	505.63	3908.53	504.71	3913.05	504.71
3936.08	504.71	3945.32	504.71	3977.47	504.71	4015.94	504.71	4022.1	504.71
4023.99	505.45	4037.31	510.71	4049.85	510.71	4051.64	510.71	4051.85	510.58
4053.27	509.71	4060	509.71	4095.03	509.71	4096.46	510.49	4096.84	510.71
4097.29	510.92	4098.88	511.71	4103.08	512.57	4103.79	512.71	4105	512.71
4112.67	512.71	4116.31	511.84	4116.85	511.71	4117.26	511.59	4119.96	510.71
4120.39	510.57	4123.07	509.71	4196.58	509.71	4485.69	509.71	4490.82	510.45
4492.63	510.71	4494.43	510.94	4500.32	511.71	4514.26	511.96	4555.91	512.71
4560.2	514.43	4571	518.71	4578.11	518.71	4579.56	518.71	4582.84	517.85
4583.41	517.71	4584.21	517.42	4589.01	515.71	4591.69	514.89	4592.25	514.71
4594.26	514.71	4604.18	514.71	4606.69	514.85	4622.12	515.71	4627.16	516.51
4628.41	516.71	4629.51	516.91	4634.07	517.71	4639.1	518.56	4640.02	518.71
4641.3	518.86	4648.43	519.71	4655.73	520.63	4656.34	520.71	4657	520.78
4665.12	521.71	4672.47	522.58	4673.59	522.71	4677.09	523.59	4677.59	523.71
4678.08	523.83	4681.55	524.71	4693.59	525.55	4695.91	525.71	4708.29	525.9
4762	526.71	4785.38	527.47	4792.78	527.71	4798.59	527.93	4818.67	528.71
4828.41	528.96	4857.39	529.71	4875.48	530.46	4881.63	530.71	4886.22	530.95
4900.74	531.71	4906.35	532.46	4908.21	532.71	4909.19	532.95	4912.63	533.71
4915.09	534.58	4915.46	534.71	4915.82	534.83	4918.26	535.71	4920.96	536.62
4921.25	536.71	4923.9	537.62	4924.17	537.71	4926.3	538.62	4926.52	538.71
4926.73	538.8	4928.83	539.71	4930.96	540.61	4931.17	540.71	4933.36	541.63
4933.54	541.71	4936.18	542.65	4936.35	542.71	4936.93	542.77	4937.83	542.87

Manning's	n	Values	num=	3				
Sta	n	Val	Sta	n	Val	Sta	n	Val
0	.06	2278	.04	3234.13	.06			

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	2278	3234.13		1136	1237	1231		.1	.3
Ineffective Flow			num=	1					
Sta L	Sta R	Elev	Permanent						
3391.55	4937.83	519.7	F						

CROSS SECTION

RIVER: Susquehanna
REACH: 1

RS: 133431

INPUT

Description: XS of Ex Intake Structure topo

Station	Elevation	Data	num=	156					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	572.7	78.8	552.7	97.8	544.7	104.6	536.7	133.7	534.7
144.6	530.7	162.9	526.7	180.5	524.7	213.2	522.7	250	518.7

279.8	516.7	294	514.7	303.4	512.7	560.7	512.7	672.3	514.7
716.2	516.7	774.5	520.7	783.9	522.7	822.6	524.7	924.2	524.7
959	522.7	1070.5	510.7	1163	510.7	1174.4	514.7	1190.3	514.7
1210.3	512.7	1223.1	508.7	1378.2	506.7	1458.6	502.7	1506.7	502.7
1611.8	504.7	2007.6	504.7	2036	504.7	2041	504.7	2095.3	502.7
2103.6	502.7	2121.6	502.7	2159.6	502.7	2178.8	502.7	2182.2	500.7
2189.7	498.7	2268.3	490.51	2282.3	488	2285.8	486.2	2310.8	484.2
2370.8	482.2	2415.8	480.2	2475.8	478.2	2525.8	476.2	2590.8	474.2
2700	474.2	2805.8	472.5	3005.8	472.5	3013.97	510.98	3017.05	511.32
3025.91	512.4	3051	524.7	3271	524.7	3314	523.7	3336	522.7
3355	521.7	3374	520.7	3400	519.7	3419	518.7	3456	517.7
3465	516.7	3472	515.7	3494	508.7	3656	508.7	3660	509.7
3664	510.7	3672	510.7	3674	509.7	3727	509.7	3729	510.7
3743	510.7	3747	509.7	3750.5	509.7	3758	510.7	3786	511.7
3833	512.7	3867.89	513.7	3898.07	514.7	3935.72	515.7	3961.61	516.7
4008.15	517.7	4032.18	518.7	4060.25	519.7	4166.52	520.7	4192.59	521.7
4202.83	522.7	4209.04	522.7	4211.99	521.7	4218.88	521.7	4231.51	521.7
4235.95	521.7	4238.63	522.7	4241.08	523.7	4251.65	524.7	4300.67	525.7
4323.46	526.7	4346	527.7	4367.77	528.7	4384.01	529.7	4396.02	530.7
4400.48	531.7	4402.86	532.7	4404.9	533.7	4406.76	534.7	4408.69	535.7
4410.47	536.7	4427.21	537.7	4467.33	538.7	4511.16	545.7	4569.94	544.7
4601.96	544.7	4610.4	544.7	4633.16	544.7	4634.55	545.7	4655.95	556.7
4676.76	557.7	4680.01	558.7	4696.02	559.7	4703.83	560.7	4711.25	561.7
4714.25	562.7	4717.63	563.7	4735.2	564.7	4766.09	566.7	4773.17	567.7
4782.1	568.7	4789.08	569.7	4839.38	570.7	4858.91	571.7	4897.71	574.7
4956.02	578.7	4996.76	580.7	5019.06	581.7	5120.46	589.7	5169.94	596.7
5195.73	599.7	5209.67	600.7	5221.75	601.7	5239.58	602.7	5289.72	603.7
5338.74	604.7	5378.85	605.7	5402.62	606.7	5413.39	607.7	5425.65	608.7
5451.28	609.7	5474.31	610.7	5495.7	611.7	5510.05	612.7	5540.31	613.7
5564.83	614.7								

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.08	2178.8	.04	3005.8	.014	3271	.08

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

Left	Right	Left	Channel	Right	Coeff	Contr.	Expan.
2178.8	3051	308	308	308	.1	.3	

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	822.6	524.7	F
3051	5564.83	524.7	F

Blocked Obstructions num= 1

Sta L	Sta R	Elev
3005.6	3126.6	546.76

CROSS SECTION

RIVER: Susquehanna
 REACH: 1 RS: 133138

INPUT

Description: XS of Prop Intake Structure topo

Station	Elevation	Data	num=	149
Sta	Elev	Sta	Elev	Sta
0	572.7	26.7	560.7	40.7
87.5	546.7	96.2	544.7	218.1
287.7	512.7	473	512.7	505.4
989.6	526.7	1053.6	516.7	1072.1
1148.6	512.7	1161.6	508.7	1221.5
1331.2	500.7	1357.7	502.7	1388.1
1641.5	504.7	1664.8	504.7	1891
2034.9	502.7	2047.1	502.7	2073.5
2198.91	486.2	2248.91	484.2	2318.91
2543.91	476.2	2643.91	474.4	2715
2942.97	484.71	2957.05	484.71	2980.09
3166.98	506.7	3208.05	520.7	3238.19
3405.85	500.7	3429.02	499.7	3445.28
3513.79	505.7	3527.37	506.7	3548.92
3581.6	502.7	3595.46	502.7	3609.31
3740.39	511.7	3759.44	512.7	3815.92
			513.7	3835.52
			514.7	3859.17
			515.7	

3887.84	515.7	3895.56	514.7	3911.24	514.7	3917.73	515.7	3928.88	516.7
3957.67	517.7	4004.78	518.7	4059.33	519.7	4089.71	520.7	4126.51	520.7
4134.94	521.7	4137.66	522.7	4153.41	523.7	4155.79	524.7	4158.26	525.7
4160.73	526.7	4207.72	527.7	4235.73	528.7	4283.39	529.7	4328.9	530.7
4348.11	531.7	4361.63	532.7	4363.45	533.7	4374.29	539.7	4383.63	540.7
4404.88	541.7	4425.38	541.7	4454.79	541.7	4527.03	542.7	4562.7	543.7
4603.66	543.7	4616.66	544.7	4639.94	545.7	4678.93	546.7	4710.52	547.7
4716.57	548.7	4723.67	549.7	4730.77	550.7	4834.9	565.7	4871.02	566.7
4874.35	567.7	4877.98	568.7	4881.31	569.7	4884.79	570.7	4889.17	571.7
4893.86	572.7	4899.45	573.7	4903.98	574.7	4912.29	575.7	4942.27	576.7
4999.83	578.7	5013.48	579.7	5041.8	580.7	5085.44	581.7	5101.37	582.7
5116.5	583.7	5131.22	584.7	5146.88	585.7	5160.4	586.7	5172.98	587.7
5196.94	588.7	5211.66	589.7	5250.61	590.7	5262.52	591.7	5299.54	592.7
5327.25	593.7	5362.32	594.7	5375.44	595.7	5448.65	600.7		

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.08	2073.5	.04	2915	.014	3117.38	.08

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	2073.5	2980.09		631	580		.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	773.6	526.7	F
3009.5	5448.65	526.18	T

Blocked Obstructions num= 1

Sta L	Sta R	Elev
2915	3039	546.76

CROSS SECTION

RIVER: Susquehanna

REACH: 1 RS: 132450

INPUT

Description: FEMA CR topo

Station	Elevation	Data	num=	174						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	575	56	553.9	72	553.9	107	544.9	190	531.8	
263	522.2	331	518.7	404	514	451	509.6	526	509.6	
595	509.6	625	514.9	686	518.8	743	520.6	821	529	
892	530.9	979	531.8	1003	531.7	1045	516.4	1052	516.9	
1053	516.9	1057	516.9	1074	515.2	1103	503.1	1146	501.9	
1210	501.9	1244	503.5	1324	503.4	1410	504.9	1513	504.9	
1548	503	1602	504.7	1661	505.2	1712	505.2	1794	504	
1856	502.2	1921	505.5	1950	503.2	1978	487.5	1980	486.2	
1992	484.2	2092	482.2	2197	480.2	2296	478.2	2392	476.2	
2422	474.2	2452	472.2	2492	470.2	2512	468.2	2542	467.2	
2572	468.2	2582	470.2	2607	472.2	2692	474.2	2732	476.2	
2752	478.2	2762	480.2	2792	482.2	2802	484.2	2816	487.5	
2831	493.71	2849.23	505.09	2853.45	507.71	2856.17	507.93	2866.02	508.71	
2870.17	508.71	2871.47	508.71	2877.93	508.49	2900	507.71	2903.48	507.71	
2914.15	507.71	2922.04	508.45	2924.85	508.71	2927.78	508.99	2935.2	509.71	
2942.21	510.41	2945.18	510.71	2949.08	510.99	2958.95	511.71	2967.35	512.39	
2971.21	512.71	2981.71	513.42	2986.11	513.71	2991.24	514	3003.66	514.71	
3010.33	515.01	3025.96	515.71	3039.96	515.88	3064.99	516.17	3139.88	516.19	
3156.23	515.91	3168.13	515.71	3175.36	515.03	3178.75	514.71	3180.79	514.33	
3184.13	513.71	3186.8	513.21	3189.08	512.71	3193.43	512.07	3195.92	511.71	
3198.41	511.39	3203.25	510.71	3207.11	510.19	3210.75	509.71	3212.99	509.32	
3215.97	508.71	3218.76	508.15	3221.11	507.71	3222.88	507.33	3225.57	506.71	
3294.57	506.71	3334.97	506.71	3353.92	507.2	3374.05	507.71	3376.75	508.1	
3380.99	508.71	3390.31	508.71	3396.63	508.71	3397.78	508.29	3399.33	507.71	
3431.15	507.71	3451.67	507.71	3452.07	508.01	3452.98	508.71	3453.85	509.38	
3454.16	509.71	3457.13	510.04	3463.14	510.71	3480.65	511.39	3489.1	511.71	
3522.7	511.71	3543.97	511.71	3558.76	511.71	3610.95	511.71	3622.71	511.71	
3639.45	511.71	3647.95	511.71	3657.57	511.71	3676.52	511.71	3686.6	511.71	
3697.67	511.71	3700.1	511.71	3713.24	511.93	3759.7	512.71	3781.23	513.27	
3797.91	513.71	3814.7	514.2	3831.98	514.71	3843.13	515.19	3854.99	515.71	
3862.77	516.19	3871.44	516.71	3891.77	516.71	3896.79	516.71	3901.28	516.85	
3928.22	517.71	3933.77	518.14	3954.14	519.71	3968.51	519.71	3973.63	519.71	

3982.44	519.71	3985.5	519.71	3986.37	519.44	3988.89	518.71	3989.16	518.71
3990.3	518.71	3991.93	519.51	3992.4	519.71	3992.87	519.9	3994.47	520.71
3996.01	521.49	3996.37	521.71	4003.41	521.71	4004.89	521.71		

Manning's n Values		num=		3	
Sta	n Val	Sta	n Val	Sta	n Val
0	.08	1921	.04	2853.45	.08

Bank Sta:	Left	Right	Coeff	Contr.	Expan.
	1921	2853.45		.1	.3

Ineffective Flow	num=		2	
Sta L	Sta R	Elev	Permanent	
0	979	531.8	F	
3078.44	4004.89	516.17	F	

Appendix J:
Bathymetry Data

ECOLOGICAL STUDIES OF THE SUSQUEHANNA RIVER
IN THE VICINITY OF THE
SUSQUEHANNA STEAM ELECTRIC STATION

1983 Annual Report

Theodore V. Jacobsen, Project Director and Editor
Susquehanna SES Biological Laboratory
R.D. 1, Berwick, Pennsylvania 18603

Prepared For

Pennsylvania Power and Light Company
Two North Ninth Street
Allentown, Pennsylvania 18101

Ichthyological Associates, Inc.
301 Forest Drive
Ithaca, New York 14850

August 1984

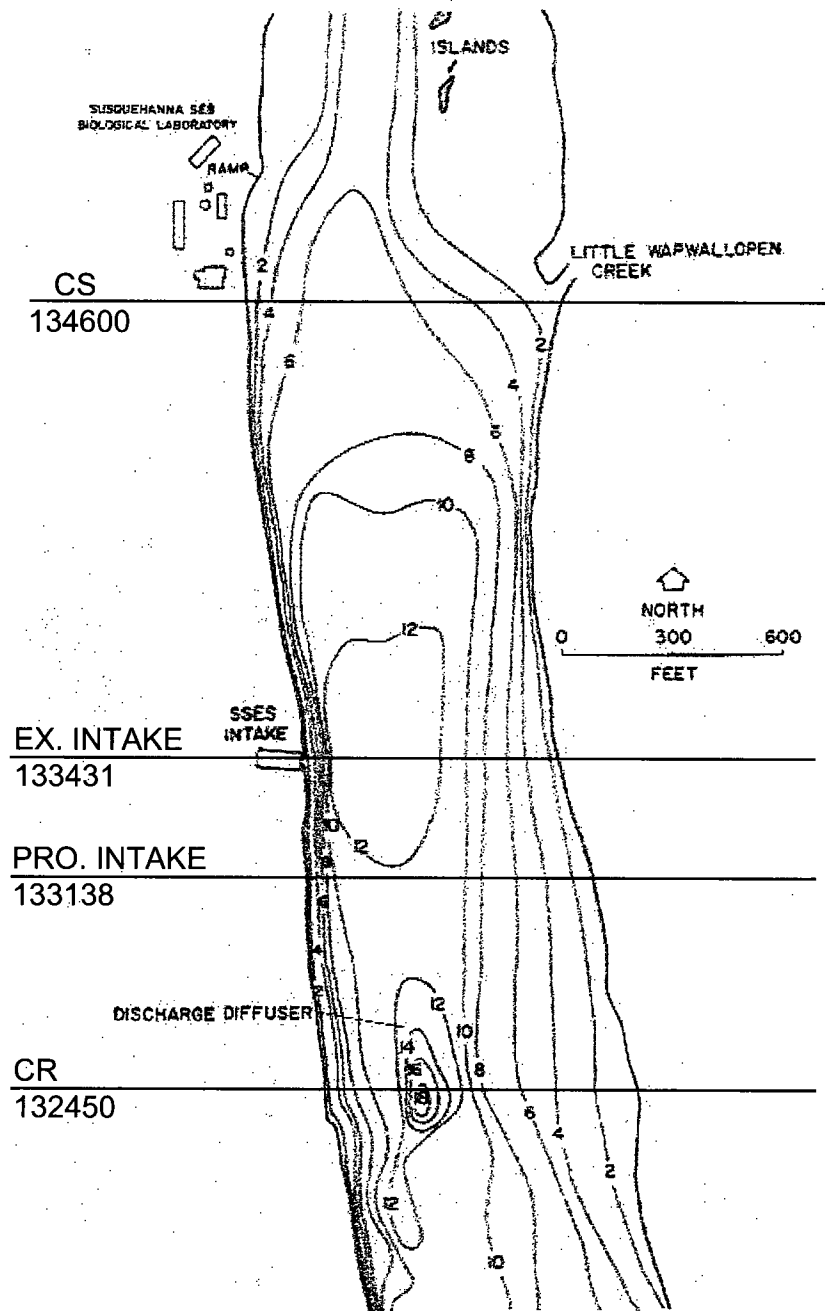


Fig. A-4

Section B (see Fig. A-2) depth contours (2-ft intervals) of the Susquehanna River, 1983.

Appendix K:
Supplemental Intake Structure Information

- Existing Structure Detail
- Photographs of Existing and Proposed Site
- Details of Proposed Structure

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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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
XXXXXXXX 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   XXXXXX   XXXX   X   X   X   X   XXXXX

```

PROJECT DATA

Project Title: NBSR REV5
Project File : NBSRREV5.prj
Run Date and Time: 4/11/2012 4:16:29 PM

Project in English units

PLAN DATA

Plan Title: Proposed Conditions
Plan File : p:\PROJECTS\Environmental\PPL - Wetland Permitting Oversight E-726-L8\TASKS\Task 10 - Floodplain\Study and Revisions NBSR\NBSR Revisions Feb 2012\Preliminary files to FEMA\4-10-12\HECRAS\NBSRREV5.p05

Geometry Title: Proposed Conditions

Geometry File : p:\PROJECTS\Environmental\PPL - Wetland Permitting Oversight E-726-L8\TASKS\Task 10 - Floodplain\Study and Revisions NBSR\NBSR Revisions Feb 2012\Preliminary files to FEMA\4-10-12\HECRAS\NBSRREV5.g02

Flow Title : FEMA Ex Flow

Flow File : p:\PROJECTS\Environmental\PPL - Wetland Permitting Oversight E-726-L8\TASKS\Task 10 - Floodplain\Study and Revisions NBSR\NBSR Revisions Feb 2012\Preliminary files to FEMA\4-10-12\HECRAS\NBSRREV5.f02

Plan Summary Information:

Number of:	Cross Sections =	4	Multiple Openings =	0
	Culverts =	0	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

Encroachment Data

Equal Conveyance =	True
Left Offset =	0
Right Offset =	0

River =	Susquehanna	Reach =	1
RS Profile		Method	Value1 Value2
134600	50 yr		0 0 0

133431	50 yr	0	0	0
133138	50 yr	0	0	0
132450	50 yr	0	0	0

River = Susquehanna		Reach = 1		
RS	Profile	Method	Value1	Value2
134600	100 yr	0	0	0
133431	100 yr	0	0	0
133138	100 yr	0	0	0
132450	100 yr	0	0	0

River = Susquehanna		Reach = 1		
RS	Profile	Method	Value1	Value2
134600	500 yr	0	0	0
133431	500 yr	0	0	0
133138	500 yr	0	0	0
132450	500 yr	0	0	0

River = Susquehanna		Reach = 1		
RS	Profile	Method	Value1	Value2
134600	100-yr encroachment	1	1406	3224.01
133431	100-yr encroachment	1	1223.1	3005.6
133138	100-yr encroachment	1	1165	2915
132450	100-yr encroachment	1	1103	2853.45

FLOW DATA

Flow Title: FEMA Ex Flow

Flow File : p:\PROJECTS\Environmental\PPL - Wetland Permitting Oversight E-726-L8\TASKS\Task 10 - Floodplain\Study and Revisions NBSR\NBSR Revisions Feb 2012\Preliminary files to FEMA\4-10-12\HECRAS\NBSRREV5.f02

Flow Data (cfs)

River	Reach	RS	10 yr	50 yr	100 yr
500 yr100-yr encroachment					
Susquehanna	1	134600	167000	232000	260000
340000	260000				

Boundary Conditions

River	Reach	Profile	Upstream	
Downstream				
Susquehanna	1	10 yr	Critical	Known WS =
506.6				
Susquehanna	1	50 yr	Critical	Known WS =
511.1				
Susquehanna	1	100 yr	Critical	Known WS =
512.9				
Susquehanna	1	500 yr	Critical	Known WS =
517.5				
Susquehanna	1	100-yr encroachment	Critical	Known
WS = 513.9				

GEOMETRY DATA

Geometry Title: Proposed Conditions

Geometry File : p:\PROJECTS\Environmental\PPL - Wetland Permitting Oversight E-726-L8\TASKS\Task 10 - Floodplain\Study and Revisions NBSR\NBSR Revisions Feb 2012\Preliminary files to FEMA\4-10-12\HECRAS\NBSRREV5.g02

CROSS SECTION

RIVER: Susquehanna

REACH: 1

RS: 134600

INPUT

Description: FEMA CS topo

Station Elevation Data

num= 200

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	575	49	571.9	102	570.1	168	562.3	251	540
266	540	335	531.1	421	522.3	493	516	554	510.8
592	510.5	605	510.5	679	510.9	770	513.1	868	512.9
969	513.3	1056	513.3	1157	513.1	1228	512.1	1248	511.4
1264	511.4	1282	512.9	1339	512.4	1356	515.1	1362	515.5
1370	515.1	1395	514.8	1406	510.3	1489	509.1	1576	508
1679	506.2	1720	506.2	1826	506.1	1946	508.1	2005	505.9
2073	504.8	2140	501.1	2200	500.9	2278	500.7	2301	493.7
2348	487.7	2351	484.2	2401	482.2	2521	480.2	2706	478.2
2881	477.2	3026	478.2	3101	480.2	3141	482.2	3171	484.2
3174	487.7	3182.5	494.71	3226.5	515.17	3234.13	518.71	3241.76	518.71
3270	518.71	3313.01	519.44	3328.61	519.71	3339.87	519.71	3382.78	519.71
3409.31	518.86	3414.11	518.71	3416.02	518.55	3426.3	517.71	3432.19	516.86
3433.22	516.71	3434.27	516.57	3440.7	515.71	3451.05	514.85	3452.7	514.71
3454.99	514.57	3468.56	513.71	3499.79	512.91	3507.41	512.71	3514.92	512.51
3544.48	511.71	3574.42	510.91	3581.73	510.71	3632.47	509.87	3641.81	509.71
3651.94	509.71	3705.77	509.71	3731.74	509.71	3738.37	509.71	3748.83	509.51
3789.46	508.71	3810.99	507.87	3815.03	507.71	3819.94	507.54	3843.93	506.71
3866.07	505.8	3868.29	505.71	3871.45	505.63	3908.53	504.71	3913.05	504.71
3936.08	504.71	3945.32	504.71	3977.47	504.71	4015.94	504.71	4022.1	504.71
4023.99	505.45	4037.31	510.71	4049.85	510.71	4051.64	510.71	4051.85	510.58
4053.27	509.71	4060	509.71	4095.03	509.71	4096.46	510.49	4096.84	510.71
4097.29	510.92	4098.88	511.71	4103.08	512.57	4103.79	512.71	4105	512.71
4112.67	512.71	4116.31	511.84	4116.85	511.71	4117.26	511.59	4119.96	510.71
4120.39	510.57	4123.07	509.71	4196.58	509.71	4485.69	509.71	4490.82	510.45
4492.63	510.71	4494.43	510.94	4500.32	511.71	4514.26	511.96	4555.91	512.71
4560.2	514.43	4571	518.71	4578.11	518.71	4579.56	518.71	4582.84	517.85
4583.41	517.71	4584.21	517.42	4589.01	515.71	4591.69	514.89	4592.25	514.71
4594.26	514.71	4604.18	514.71	4606.69	514.85	4622.12	515.71	4627.16	516.51
4628.41	516.71	4629.51	516.91	4634.07	517.71	4639.1	518.56	4640.02	518.71
4641.3	518.86	4648.43	519.71	4655.73	520.63	4656.34	520.71	4657	520.78
4665.12	521.71	4672.47	522.58	4673.59	522.71	4677.09	523.59	4677.59	523.71
4678.08	523.83	4681.55	524.71	4693.59	525.55	4695.91	525.71	4708.29	525.9
4762	526.71	4785.38	527.47	4792.78	527.71	4798.59	527.93	4818.67	528.71
4828.41	528.96	4857.39	529.71	4875.48	530.46	4881.63	530.71	4886.22	530.95
4900.74	531.71	4906.35	532.46	4908.21	532.71	4909.19	532.95	4912.63	533.71
4915.09	534.58	4915.46	534.71	4915.82	534.83	4918.26	535.71	4920.96	536.62
4921.25	536.71	4923.9	537.62	4924.17	537.71	4926.3	538.62	4926.52	538.71
4926.73	538.8	4928.83	539.71	4930.96	540.61	4931.17	540.71	4933.36	541.63
4933.54	541.71	4936.18	542.65	4936.35	542.71	4936.93	542.77	4937.83	542.87

Manning's n Values

num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	2278	.04	3234.13	.06

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	2278	3234.13		1136	1237	1231	
Ineffective Flow			num=	1			
Sta L	Sta R	Elev	Permanent				
3391.55	4937.83	519.7	F				

CROSS SECTION

RIVER: Susquehanna

REACH: 1

RS: 133431

INPUT

Description: XS of Ex Intake Structure topo

Station Elevation Data

num= 156

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	572.7	78.8	552.7	97.8	544.7	104.6	536.7	133.7	534.7
144.6	530.7	162.9	526.7	180.5	524.7	213.2	522.7	250	518.7

279.8	516.7	294	514.7	303.4	512.7	560.7	512.7	672.3	514.7
716.2	516.7	774.5	520.7	783.9	522.7	822.6	524.7	924.2	524.7
959	522.7	1070.5	510.7	1163	510.7	1174.4	514.7	1190.3	514.7
1210.3	512.7	1223.1	508.7	1378.2	506.7	1458.6	502.7	1506.7	502.7
1611.8	504.7	2007.6	504.7	2036	504.7	2041	504.7	2095.3	502.7
2103.6	502.7	2121.6	502.7	2159.6	502.7	2178.8	502.7	2182.2	500.7
2189.7	498.7	2268.3	490.51	2282.3	488	2285.8	486.2	2310.8	484.2
2370.8	482.2	2415.8	480.2	2475.8	478.2	2525.8	476.2	2590.8	474.2
2700	474.2	2805.8	472.5	3005.8	472.5	3013.97	510.98	3017.05	511.32
3025.91	512.4	3051	524.7	3271	524.7	3314	523.7	3336	522.7
3355	521.7	3374	520.7	3400	519.7	3419	518.7	3456	517.7
3465	516.7	3472	515.7	3494	508.7	3656	508.7	3660	509.7
3664	510.7	3672	510.7	3674	509.7	3727	509.7	3729	510.7
3743	510.7	3747	509.7	3750.5	509.7	3758	510.7	3786	511.7
3833	512.7	3867.89	513.7	3898.07	514.7	3935.72	515.7	3961.61	516.7
4008.15	517.7	4032.18	518.7	4060.25	519.7	4166.52	520.7	4192.59	521.7
4202.83	522.7	4209.04	522.7	4211.99	521.7	4218.88	521.7	4231.51	521.7
4235.95	521.7	4238.63	522.7	4241.08	523.7	4251.65	524.7	4300.67	525.7
4323.46	526.7	4346	527.7	4367.77	528.7	4384.01	529.7	4396.02	530.7
4400.48	531.7	4402.86	532.7	4404.9	533.7	4406.76	534.7	4408.69	535.7
4410.47	536.7	4427.21	537.7	4467.33	538.7	4511.16	545.7	4569.94	544.7
4601.96	544.7	4610.4	544.7	4633.16	544.7	4634.55	545.7	4655.95	556.7
4676.76	557.7	4680.01	558.7	4696.02	559.7	4703.83	560.7	4711.25	561.7
4714.25	562.7	4717.63	563.7	4735.2	564.7	4766.09	566.7	4773.17	567.7
4782.1	568.7	4789.08	569.7	4839.38	570.7	4858.91	571.7	4897.71	574.7
4956.02	578.7	4996.76	580.7	5019.06	581.7	5120.46	589.7	5169.94	596.7
5195.73	599.7	5209.67	600.7	5221.75	601.7	5239.58	602.7	5289.72	603.7
5338.74	604.7	5378.85	605.7	5402.62	606.7	5413.39	607.7	5425.65	608.7
5451.28	609.7	5474.31	610.7	5495.7	611.7	5510.05	612.7	5540.31	613.7
5564.83	614.7								

Manning's n Values		num= 4		Sta n Val		Sta n Val		Sta n Val	
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.08	2178.8	.04	3005.8	.014	3271	.08		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
2178.8	3051	308	308	308	.1	.3	

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	822.6	524.7	F
3051	5564.83	524.7	F

Blocked Obstructions num= 1

Sta L	Sta R	Elev
3005.6	3126.6	546.76

CROSS SECTION

RIVER: Susquehanna
 REACH: 1 RS: 133138

INPUT

Description: XS of Prop Intake Structure topo

Station Elevation Data		num= 149		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	572.7	26.7	560.7	40.7	556.7	64	548.7	67.2	546.7
87.5	546.7	96.2	544.7	218.1	522.7	236.2	520.7	242.4	518.7
287.7	512.7	473	512.7	505.4	514.7	574.9	516.7	773.6	526.7
989.6	526.7	1053.6	516.7	1072.1	514.7	1109.6	514.7	1126	514.7
1148.6	512.7	1161.6	508.7	1221.5	506.7	1294.6	502.7	1312.9	500.7
1331.2	500.7	1357.7	502.7	1388.1	502.7	1392.4	502.7	1477.3	504.7
1641.5	504.7	1664.8	504.7	1891	504.7	1982.3	502.7	2007.9	502.7
2034.9	502.7	2047.1	502.7	2073.5	502.7	2085.9	498.7	2181.41	490.51
2198.91	486.2	2248.91	484.2	2318.91	482.2	2398.91	480.2	2498.91	478.2
2543.91	476.2	2643.91	474.4	2715	474.71	2797.8	474.71	2915	474.71
2942.97	484.71	2957.05	484.71	2980.09	526.7	3117.38	526.7	3156.65	506.7
3166.98	506.7	3208.05	520.7	3238.19	520.7	3268.24	506.7	3361.51	504.7
3405.85	500.7	3429.02	499.7	3445.28	499.7	3468.3	503.7	3485.04	504.7
3513.79	505.7	3527.37	506.7	3548.92	508.7	3556.56	508.7	3572.62	504.7
3581.6	502.7	3595.46	502.7	3609.31	506.7	3635.96	510.7	3714.53	511.7
3740.39	511.7	3759.44	512.7	3815.92	513.7	3835.52	514.7	3859.17	515.7

3887.84	515.7	3895.56	514.7	3911.24	514.7	3917.73	515.7	3928.88	516.7
3957.67	517.7	4004.78	518.7	4059.33	519.7	4089.71	520.7	4126.51	520.7
4134.94	521.7	4137.66	522.7	4153.41	523.7	4155.79	524.7	4158.26	525.7
4160.73	526.7	4207.72	527.7	4235.73	528.7	4283.39	529.7	4328.9	530.7
4348.11	531.7	4361.63	532.7	4363.45	533.7	4374.29	539.7	4383.63	540.7
4404.88	541.7	4425.38	541.7	4454.79	541.7	4527.03	542.7	4562.7	543.7
4603.66	543.7	4616.66	544.7	4639.94	545.7	4678.93	546.7	4710.52	547.7
4716.57	548.7	4723.67	549.7	4730.77	550.7	4834.9	565.7	4871.02	566.7
4874.35	567.7	4877.98	568.7	4881.31	569.7	4884.79	570.7	4889.17	571.7
4893.86	572.7	4899.45	573.7	4903.98	574.7	4912.29	575.7	4942.27	576.7
4999.83	578.7	5013.48	579.7	5041.8	580.7	5085.44	581.7	5101.37	582.7
5116.5	583.7	5131.22	584.7	5146.88	585.7	5160.4	586.7	5172.98	587.7
5196.94	588.7	5211.66	589.7	5250.61	590.7	5262.52	591.7	5299.54	592.7
5327.25	593.7	5362.32	594.7	5375.44	595.7	5448.65	600.7		

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.08	2073.5	.04	2915	.014	3117.38	.08

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

2073.5	2980.09	631	580	621	.1	.3
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Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	773.6	526.7	F
3009.5	5448.65	526.18	T

Blocked Obstructions num= 1

Sta L	Sta R	Elev
2915	3039	546.76

CROSS SECTION

RIVER: Susquehanna
 REACH: 1 RS: 132450

INPUT

Description: FEMA CR topo

Station	Elevation	Data	num=	174						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	575	56	553.9	72	553.9	107	544.9	190	531.8	
263	522.2	331	518.7	404	514	451	509.6	526	509.6	
595	509.6	625	514.9	686	518.8	743	520.6	821	529	
892	530.9	979	531.8	1003	531.7	1045	516.4	1052	516.9	
1053	516.9	1057	516.9	1074	515.2	1103	503.1	1146	501.9	
1210	501.9	1244	503.5	1324	503.4	1410	504.9	1513	504.9	
1548	503	1602	504.7	1661	505.2	1712	505.2	1794	504	
1856	502.2	1921	505.5	1950	503.2	1978	487.5	1980	486.2	
1992	484.2	2092	482.2	2197	480.2	2296	478.2	2392	476.2	
2422	474.2	2452	472.2	2492	470.2	2512	468.2	2542	467.2	
2572	468.2	2582	470.2	2607	472.2	2692	474.2	2732	476.2	
2752	478.2	2762	480.2	2792	482.2	2802	484.2	2816	487.5	
2831	493.71	2849.23	505.09	2853.45	507.71	2856.17	507.93	2866.02	508.71	
2870.17	508.71	2871.47	508.71	2877.93	508.49	2900	507.71	2903.48	507.71	
2914.15	507.71	2922.04	508.45	2924.85	508.71	2927.78	508.99	2935.2	509.71	
2942.21	510.41	2945.18	510.71	2949.08	510.99	2958.95	511.71	2967.35	512.39	
2971.21	512.71	2981.71	513.42	2986.11	513.71	2991.24	514	3003.66	514.71	
3010.33	515.01	3025.96	515.71	3039.96	515.88	3064.99	516.17	3139.88	516.19	
3156.23	515.91	3168.13	515.71	3175.36	515.03	3178.75	514.71	3180.79	514.33	
3184.13	513.71	3186.8	513.21	3189.08	512.71	3193.43	512.07	3195.92	511.71	
3198.41	511.39	3203.25	510.71	3207.11	510.19	3210.75	509.71	3212.99	509.32	
3215.97	508.71	3218.76	508.15	3221.11	507.71	3222.88	507.33	3225.57	506.71	
3294.57	506.71	3334.97	506.71	3353.92	507.2	3374.05	507.71	3376.75	508.1	
3380.99	508.71	3390.31	508.71	3396.63	508.71	3397.78	508.29	3399.33	507.71	
3431.15	507.71	3451.67	507.71	3452.07	508.01	3452.98	508.71	3453.85	509.38	
3454.16	509.71	3457.13	510.04	3463.14	510.71	3480.65	511.39	3489.1	511.71	
3522.7	511.71	3543.97	511.71	3558.76	511.71	3610.95	511.71	3622.71	511.71	
3639.45	511.71	3647.95	511.71	3657.57	511.71	3676.52	511.71	3686.6	511.71	
3697.67	511.71	3700.1	511.71	3713.24	511.93	3759.7	512.71	3781.23	513.27	
3797.91	513.71	3814.7	514.2	3831.98	514.71	3843.13	515.19	3854.99	515.71	
3862.77	516.19	3871.44	516.71	3891.77	516.71	3896.79	516.71	3901.28	516.85	
3928.22	517.71	3933.77	518.14	3954.14	519.71	3968.51	519.71	3973.63	519.71	

3982.44	519.71	3985.5	519.71	3986.37	519.44	3988.89	518.71	3989.16	518.71
3990.3	518.71	3991.93	519.51	3992.4	519.71	3992.87	519.9	3994.47	520.71
3996.01	521.49	3996.37	521.71	4003.41	521.71	4004.89	521.71		

Manning's n Values			num= 3		
Sta	n Val	Sta	n Val	Sta	n Val
0	.08	1921	.04	2853.45	.08

Bank Sta:	Left	Right	Coeff	Contr.	Expan.
	1921	2853.45		.1	.3

Ineffective Flow			num= 2		
Sta L	Sta R	Elev	Permanent		
0	979	531.8	F		
3078.44	4004.89	516.17	F		

Appendix J:
Bathymetry Data

ECOLOGICAL STUDIES OF THE SUSQUEHANNA RIVER
IN THE VICINITY OF THE
SUSQUEHANNA STEAM ELECTRIC STATION

1983 Annual Report

Theodore V. Jacobsen, Project Director and Editor
Susquehanna SES Biological Laboratory
R.D. 1, Berwick, Pennsylvania 18603

Prepared For

Pennsylvania Power and Light Company
Two North Ninth Street
Allentown, Pennsylvania 18101

Ichthyological Associates, Inc.
301 Forest Drive
Ithaca, New York 14850

August 1984

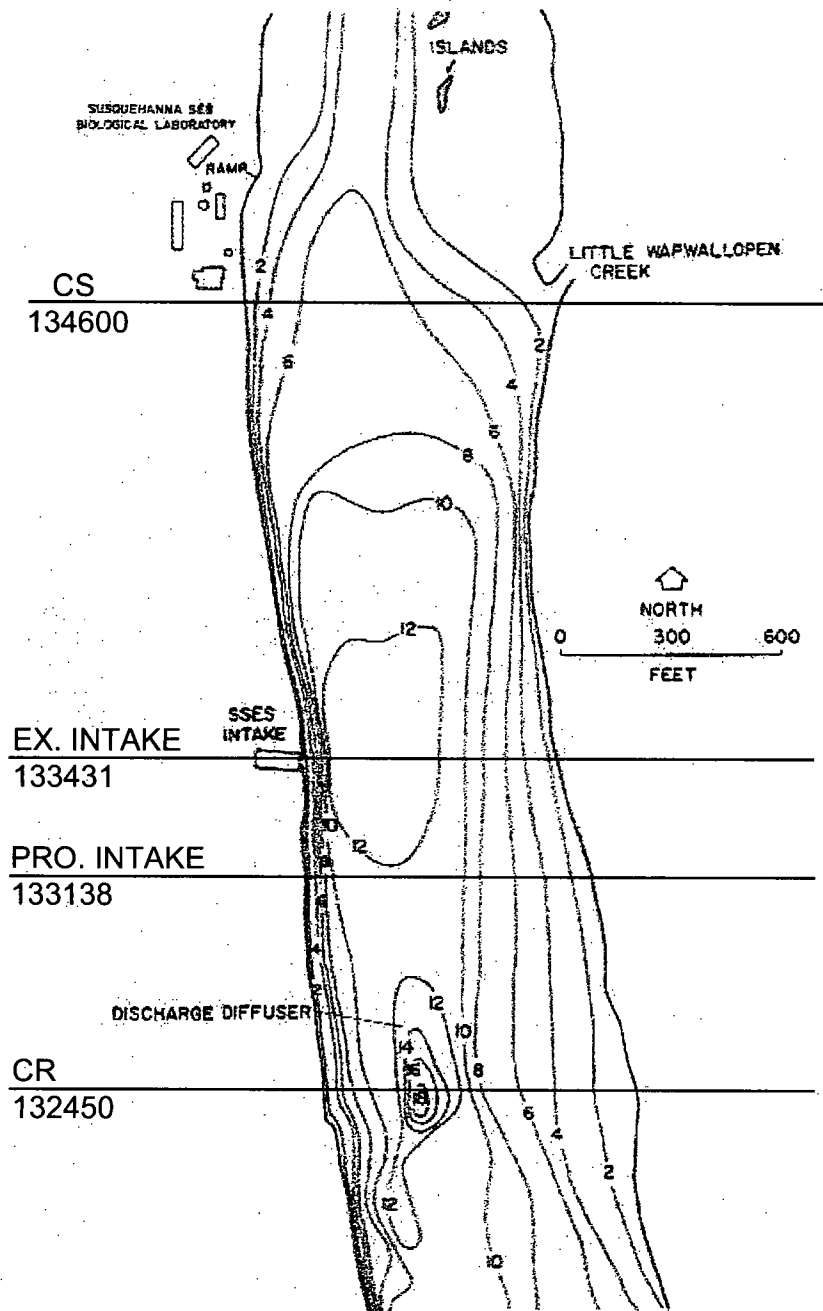


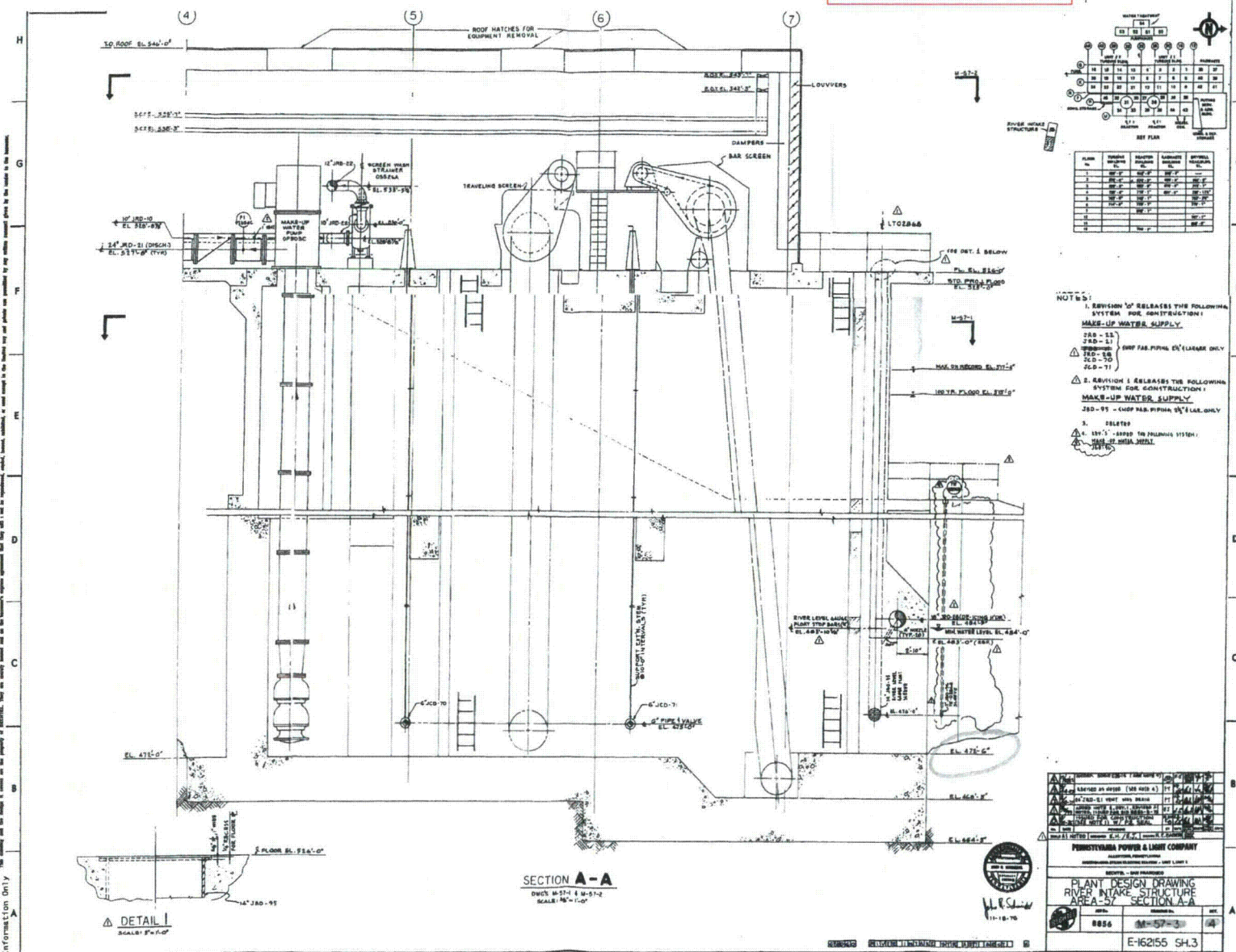
Fig. A-4

Section B (see Fig. A-2) depth contours (2-ft intervals) of the Susquehanna River, 1983.

Appendix K:
Supplemental Intake Structure Information

- Existing Structure Detail
- Photographs of Existing and Proposed Site
- Details of Proposed Structure

Existing Intake Structure Detail



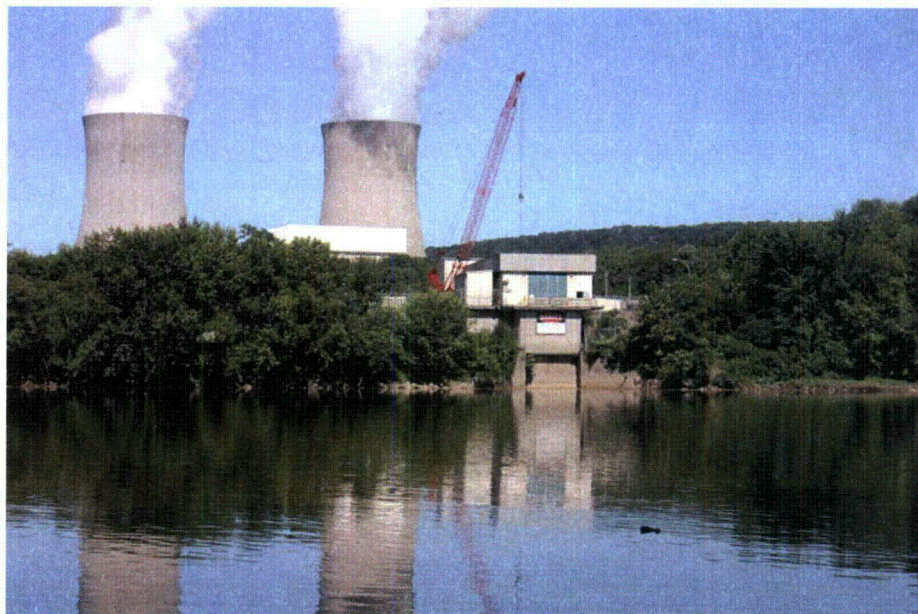


Intake Structure Photograph Log

Susquehanna River Flood Study Report

Bell Bend Nuclear Power Plant

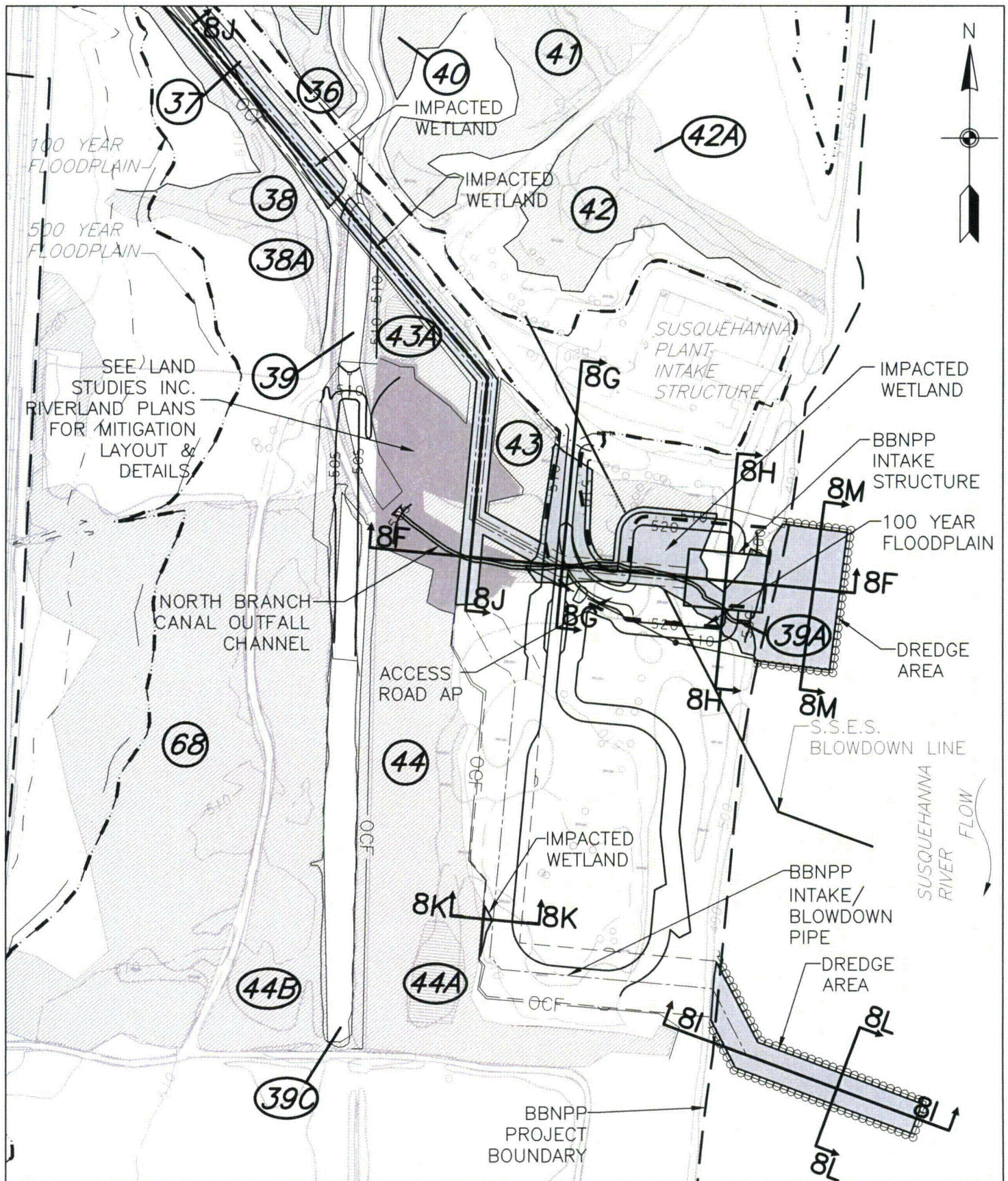
November 2010



Existing Intake Structure on the Susquehanna River, Station 1334+31



Susquehanna River, looking upstream of the Existing Intake Structure



Pennoni

Pennoni Associates Inc.
100 N. Wilkes-Barre Blvd.
Wilkes-Barre, PA 18702

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CHECKED BY: LGB

JOB No. PPLS 0902

SCALE: HORZ. 1"=200'
VERT. N/A

DATE: 06/15/2011

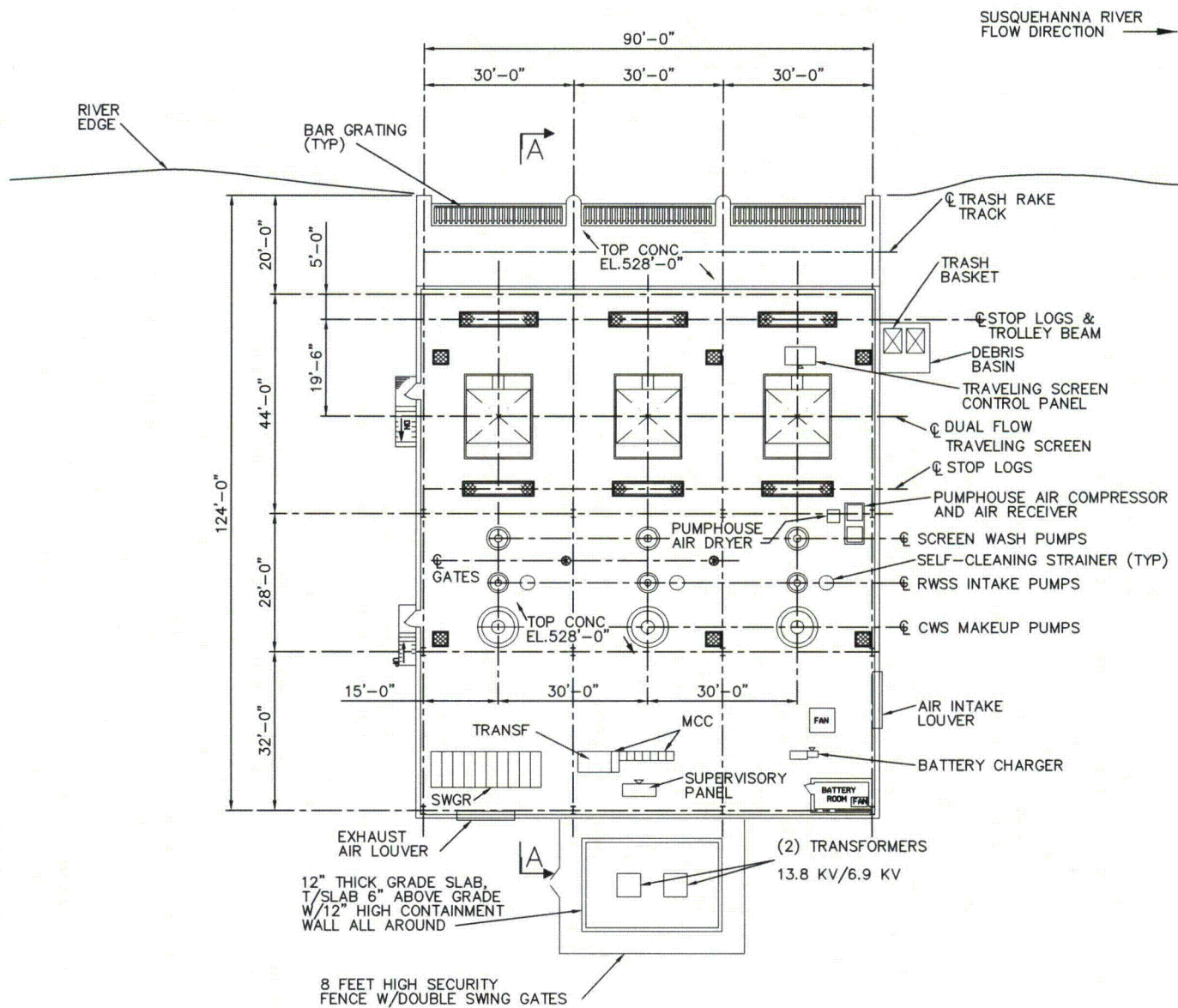
JPA PERMIT SUBMITTAL

BELL BEND NUCLEAR POWER PLANT
LUZERNE COUNTY, PENNSYLVANIA

APPLICATION BY:
PPL NUCLEAR DEVELOPMENT, LLC

FIGURE 8A — SITE LAYOUT

REV 1 : 10/28/2011 REV. STREAM NAME/PROJECT BND/ FLOOD LINES
REV 0 : 06/15/2011 INITIAL SUBMISSION



UPPER PLAN

TOP CONCRETE EL 528'-0"
N.T.S.

DRAWING SOURCE: S&L DRAWING NO.
12198-004-RWSS-004, REV. 2

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JOB No. PPLS 0902

SCALE: NTS DATE: 06/15/2011

JPA PERMIT SUBMITTAL

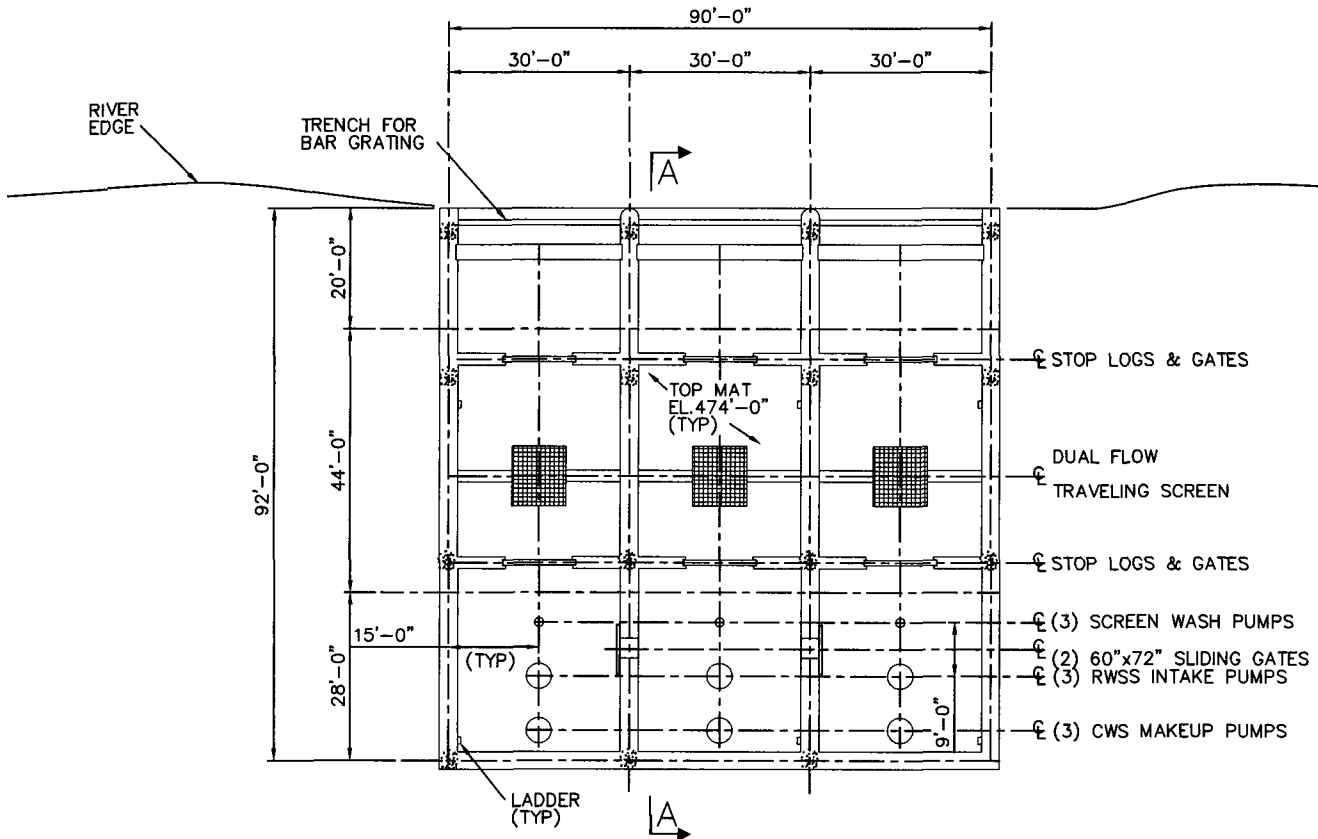
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LUZERNE COUNTY, PENNSYLVANIA

APPLICATION BY:
PPL NUCLEAR DEVELOPMENT, LLC

FIGURE 8C - INTAKE STRUCTURE PLAN

REV 0 : 06/15/2011 INITIAL SUBMISSION

SUSQUEHANNA RIVER
FLOW DIRECTION →



LOWER PLAN

TOP OF MAT EL. 474'-0"
N.T.S.

FOR SECTION A-A
SEE FIGURE 8E

DRAWING SOURCE: S&L DRAWING NO.
12198-004-RWSS-004, REV. 2

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CHECKED BY: LGB

JOB No. PPLS 0902

SCALE: NTS

DATE: 06/15/2011

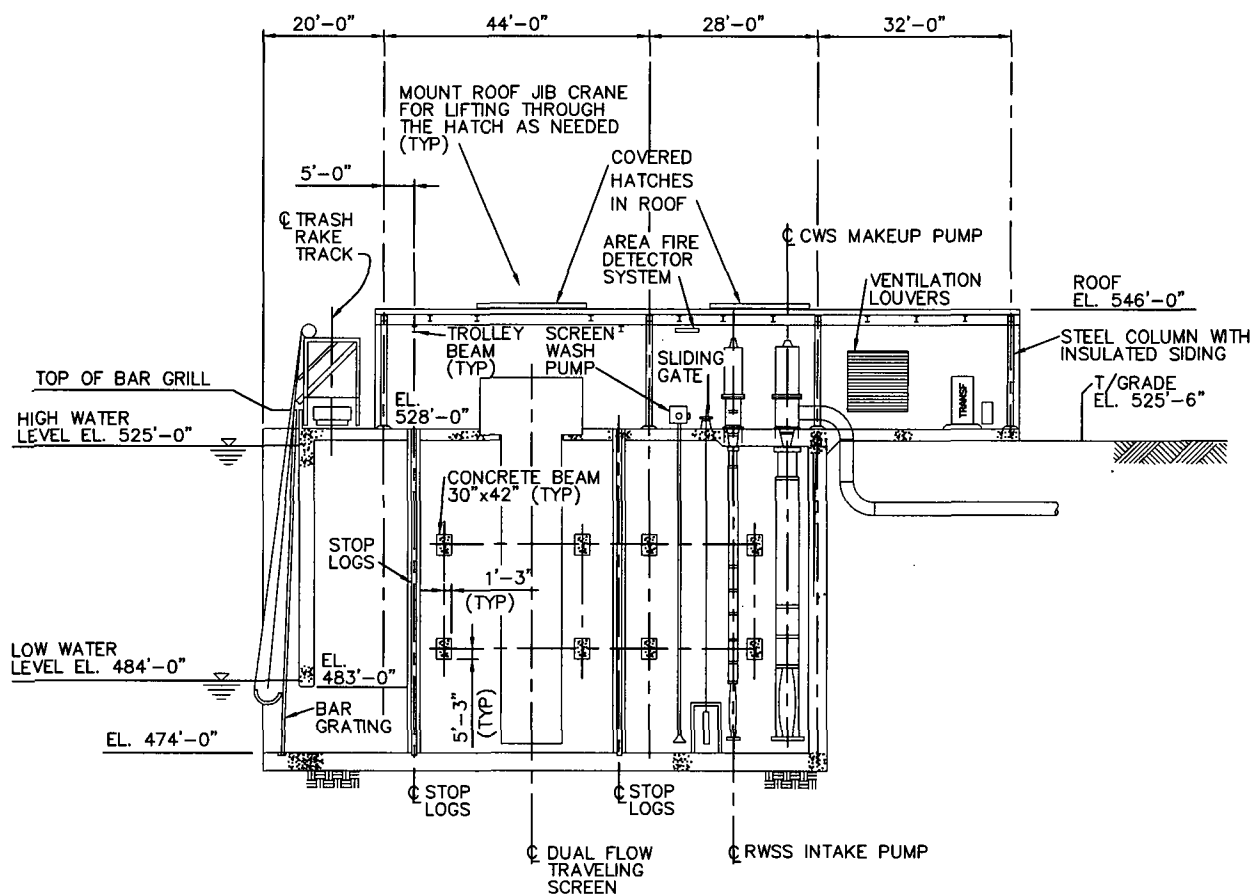
JPA PERMIT SUBMITTAL

BELL BEND NUCLEAR POWER PLANT
LUZERNE COUNTY, PENNSYLVANIA

APPLICATION BY:
PPL NUCLEAR DEVELOPMENT, LLC

FIGURE 8D - INTAKE STRUCTURE PLAN

REV 0 : 06/15/2011 INITIAL SUBMISSION



SECTION A-A

N.T.S.

FOR SECTION LOCATION
SEE FIGURE 8D

DRAWING SOURCE: S&L DRAWING NO.
12198-004-RWSS-004, REV. 2

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DRAWN BY: WCK

CHECKED BY: LGB

JOB No. PPLS 0902

SCALE: NTS

DATE: 06/15/2011

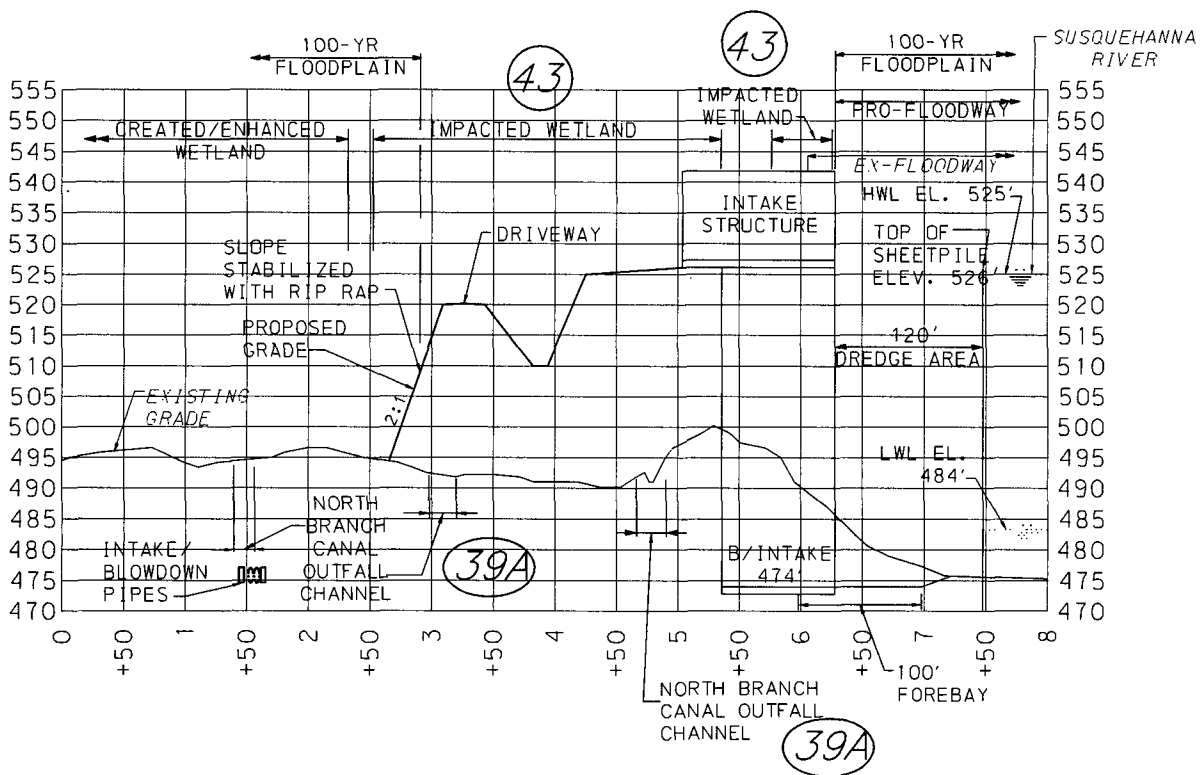
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BELL BEND NUCLEAR POWER PLANT
LUZERNE COUNTY, PENNSYLVANIA

APPLICATION BY:
PPL NUCLEAR DEVELOPMENT, LLC

FIGURE 8E -- INTAKE STRUCTURE PLAN

REV 0 : 06/15/2011 INITIAL SUBMISSION



NOTE: FLOOD ELEVATION FROM
FEMA FIRM MAP PANEL NUMBER
420625 0020 B IS 512.5.

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DRAWN BY: WCK

CHECKED BY: LGB

JOB No. PPLS 0902

SCALE: HORZ. 1"=150'
VERT. 1"=30'

DATE: 06/15/2011

JPA PERMIT SUBMITTAL

BELL BEND NUCLEAR POWER PLANT
LUZERNE COUNTY, PENNSYLVANIA

APPLICATION BY:
PPL NUCLEAR DEVELOPMENT, LLC

FIGURE 8F — INTAKE STRUCTURE
CROSS SECTION

REV 1: 10/28/2011 REVISED STREAM NAME / FLOODWAY
REV 0: 06/15/2011 INITIAL SUBMISSION