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November 25, 2008

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: Duke Energy Carolinas, LLC
William States Lee III Nuclear Station - Docket Nos. 52-018 and 52-019
AP1000 Combined License Application for the
William States Lee III Nuclear Station Units 1 and 2
Response to Request for Additional Information
Ltr# WLG2008.11-26

Reference: Letter from J.M. Muir (NRC) to B.J. Dolan (Duke Energy), *Request for Additional Information Regarding the Environmental Review of the Combined License Application for William States Lee Nuclear Station Units 1 and 2*, dated August 21, 2008

This letter provides the Duke Energy response to the Nuclear Regulatory Commission's (NRC) requests for the following additional information (RAI) items listed in the reference letter:

RAI 11, Hydrology
RAI 62, Hydrology

The response to these NRC requests is addressed in the enclosure which also identifies any associated changes that will be made in a future revision of the William States Lee III Nuclear Station application.

If you have any questions or need any additional information, please contact Peter S. Hastings at 980-373-7820.

Bryan J. Dolan
Bryan J. Dolan
Vice President
Nuclear Plant Development

D093
NRO

AFFIDAVIT OF BRYAN J. DOLAN

Bryan J. Dolan, being duly sworn, states that he is Vice President, Nuclear Plant Development, Duke Energy Carolinas, LLC, that he is authorized on the part of said Company to sign and file with the U. S. Nuclear Regulatory Commission this supplement to the combined license application for the William States Lee III Nuclear Station and that all the matter and facts set forth herein are true and correct to the best of his knowledge.

Bryan J. Dolan

Bryan J. Dolan

Subscribed and sworn to me on November 25, 2008

Phoebe P. Elliott

Notary Public

My commission expires: June 26, 2011

SEAL

xc (wo/enclosure):

Michael Johnson, Director, Office of New Reactors
Gary Holahan, Deputy Director, Office of New Reactors
David Matthews, Director, Division of New Reactor Licensing
Scott Flanders, Director, Division of Site and Environmental Reviews
Glenn Tracy, Director, Division of Construction Inspection and Operational Programs
Luis Reyes, Regional Administrator, Region II
Loren Plisco, Deputy Regional Administrator, Region II
Thomas Bergman, Deputy Division Director, DNRL
Stephanie Coffin, Branch Chief, DNRL
Gregory Hatchett, Branch Chief, DSER

xc (w/enclosure):

Linda Tello, Project Manager, DSER
Brian Hughes, Senior Project Manager, DNRL

Lee Nuclear Station Response to Request for Additional Information (RAI)

RAI Letter Dated: August 21, 2008

Reference NRC RAI Numbers: ER RAIs 11 and 62

NRC RAI:

ER RAI 11: Submit a discussion of the diffuser ports and sedimentation, and describe sedimentation issues (and remedies) at Ninety-Nine Islands Dam in the vicinity of the planned construction and operation of the diffuser.

ER RAI 62: After Duke finishes their current study on sedimentation in the vicinity of Ninety - Nine Islands Dam, provide a copy of the report. This report should include information on the expected frequency of dredging required near the discharge.

Duke Energy Response:

Sedimentation in the vicinity of the diffuser located on the Ninety-Nine Islands Dam is discussed below. The report on the sedimentation study is included herein as Attachment 11/62-1.

The exit velocity of wastewater from the discharge pipe is 1.6 ft/s for one unit and 3.2 ft/s for two units, which is 16,000 and 32,000 times greater than the settling velocity, respectively. The calculated settling velocity of sediment typical of that found in Ninety-Nine Islands Reservoir in still water is approximately 0.0001 feet per second (ft/s). As a result, sediment should not settle on the discharge pipe during normal Lee Nuclear Station operations.

Two cases were evaluated to determine if the discharge pipe is susceptible to sediment buildup in the event that both units of the Lee Nuclear Station were shutdown. The two cases evaluated were: (1) one unit of Ninety-Nine Islands Hydro operating and (2) no hydro units operating.

Under one-unit hydro generation, velocities near the diffuser end of the wastewater discharge pipe range from 0.25 to 1.0 ft/s, which should be adequate to prevent sediment from settling on the pipe.

Under the no hydro generation scenario, a hydraulic eddy forms in the area of the wastewater discharge pipe and sediment deposition during these periods may occur. It should be noted that even under the no hydro generation scenario, leakage occurs through the hydro units' wicket gates therefore some continuous flow will always be released from the units but this flow is being ignored for this evaluation. Based on the configuration of Ninety-Nine Islands Reservoir and the bathymetry of the reservoir near the dam, it is likely that the majority of sediments will settle out along the deepest portion of the reservoir forebay away from the diffuser end of the pipe.

If some settling of sediment does occur on the diffuser end of the wastewater discharge pipe, it will likely dissipate rapidly once Ninety-Nine Islands Hydro returns to operation or wastewater is discharged through the 1-inch-diameter holes along the last 65-ft of pipe. This is because both hydro generation velocities (0.25 ft/s to 1.0 ft/s) and wastewater discharge velocities (1.6 ft/s to 3.2 ft/s) greatly exceed the settling velocity of medium grade silt particles (0.0001 ft/s). As a result, there should be minimal risk of having to dredge out the diffuser end of the pipe from sediment loading during a shutdown of both units of the Lee Nuclear Station.

Associated Revisions to the Lee Nuclear Station Combined License Application:

None

Associated Attachment:

Attachment 11/62-1: Discharge Pipe Sedimentation Analysis Report. Prepared by Devine Tarbell & Associates, Inc., November 21, 2008.

Devine Tarbell & Associates, Inc.
Consulting Engineers, Scientists, & Regulatory Specialists
An Employee-Owned Company

November 21, 2008

Mr. Dale Smith
Nuclear Special Projects
Duke Energy Carolinas, LLC
526 S. Church Street
Charlotte, NC 28202

Subject: **Proposed William States Lee III Nuclear Station**
Discharge Pipe Sedimentation Analysis Report

Dear Mr. Smith:

The proposed William States Lee III Nuclear Station (LNS) is located on the Broad River in Cherokee County, North Carolina. Under normal station operations, LNS will discharge wastewater via a submerged diffuser pipe directly into the forebay of Ninety-Nine Islands Hydroelectric Station. The proposed location of the outfall is along the upstream face of Ninety-Nine Islands Dam near the intake structure of Ninety-Nine Islands Hydro. Devine Tarbell & Associates, Inc. (DTA) was enlisted by Duke Energy Carolinas, LLC (Duke) to analyze sedimentation issues near the diffuser pipe to determine if the pipe would be susceptible to being buried in sediment during normal operations and during prolonged periods of non-operation of both units due to an extended outage.

1.0 Diffuser Pipe Description and Operation

The proposed wastewater discharge pipe will be attached to the upstream face of Ninety-Nine Islands Dam and run the entire length of the dam (approximately 925 ft), ending just before the intake structure of Ninety-Nine Islands Hydroelectric Station (reference attached Figure 1). The centerline of the 3-ft diameter discharge pipe will be 6 ft below the full pond elevation of Ninety-Nine Islands Reservoir. As a result, the top of the discharge pipe will be 4.5 ft below full pond. The last 65 ft of the discharge pipe will be perforated with 1-inch-diameter holes and the end of the pipe will be capped, which will create a diffuser effect at the outfall. The 1-inch-diameter holes will only be on the upstream facing portion of the pipe. Thus, wastewater will be discharged directly into the forebay and not into the upstream face of the dam. From the centerline of the pipe, the 1-inch-diameter holes will be 3 inches on center. There will be two rows of holes above the centerline of the pipe and two rows below the centerline of the pipe. Based on this configuration, there will be 16 1-inch-diameter holes per linear foot of pipe. In all, there will be 1,040 1-inch-diameter holes covering the last 65 ft of discharge pipe.

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During normal operations of both units at the proposed LNS, 18.5 cubic feet per second (cfs) of station blowdown will be routed through the wastewater discharge pipe and enter Ninety-Nine Islands Reservoir as described above. Assuming uniform flow from each hole, the calculated initial exit velocity of wastewater through the diffuser is approximately 3.2 feet per second (ft/s) as shown in the equation below:

$$Velocity = \frac{Flow}{Area} = \frac{Flow}{(\#Holes)(\pi)(radius)^2} = \frac{18.5\frac{ft^3}{s}}{(1{,}040)\pi\left(\frac{0.5in}{12\frac{in}{ft}}\right)^2} = \frac{18.5\frac{ft^3}{s}}{5.7ft^2} \cong 3.2\frac{ft}{s}$$

2.0 Sediment Deposition During Normal Station Operations

During normal station operations of both units, 23 cfs will be withdrawn for intake screen wash and other non-consumptive plant uses. Approximately 4.5 cfs will be used for screen wash and the remaining 18.5 cfs will be returned as wastewater and will be continuously discharged through the 65 ft long diffuser section of pipe at an initial exit velocity of 3.2 ft/s. For one unit, initial exit velocity will be 1.6 ft/s.

Duke Environmental Health & Safety personnel collected total suspended sediment (TSS) samples from Ninety-Nine Islands Reservoir on a twice per month basis during 2007. Samples were collected at two locations upstream from the intake structure. At each location, samples were collected at 0.3 meter depth, 3 meter depth, and near the bottom of the reservoir. These samples were analyzed by Duke's certified water quality laboratory to determine TSS, expressed as a dry weight in mg/L. The range of TSS captured during the 2007 sampling events was less than 4 to 204 mg/L.

Texas Oil Tech Laboratories in Houston, Texas, performed further analysis of individual particle sizes captured during three of the monthly sampling events. The three sampling events that were analyzed represented the highest, middle, and lowest monthly TSS sampling events during 2007. In all, five individual samples collected during these three sampling events were analyzed. Based on the analysis performed by Texas Oil Tech Laboratories, the range of particle sizes was from 0.00035 mm (typical of clay particles) to 0.35355 mm (typical of medium grade sand). The median particle size for all five samples was 0.0120 mm, 0.0209 mm, 0.0189 mm, 0.0185 mm, and 0.0151 mm (all typical of fine to medium grade silt). The average of these median particle sizes was 0.0171 mm (typical of medium silt).

Settling velocity of small particles (medium silt) in a viscous fluid (water) is governed by Stokes' Law, which is defined as:

$$V_s = \frac{2}{9}\frac{(\rho_p - \rho_f)}{\mu} g R^2$$

where:

V_s is the particle's settling velocity (m/s)
g is the gravitational acceleration (m/s^2)
ρ_p is the mass density of the particles (kg/m^3)
ρ_f is the mass density of the fluid (kg/m^3)
μ is the fluids dynamic viscosity (Pa s)
R is the radius of the spherical particle (m)

For our purposes:

G = 9.81m/s^2
ρ_p = 1150 kg/m^3
ρ_f = 995.2 kg/m^3 (at 30 deg C)
μ = 0.000798 Pa s (at 30 deg C)
R = 0.0000086 m

Solving Stokes' Law equation:

$$V_s = \frac{2}{9}\frac{(1150 - 995.2)}{0.000798} 9.81 * (0.0000086)^2 = 0.0000309 m/s\left(\frac{3.28 ft}{m}\right) = 0.0001 ft/s$$

The calculated settling velocity of medium-sized silt particles in still water is approximately 0.0001 ft/s. The exit velocity of wastewater from the discharge pipe is 3.2 ft/s, which is 32,000 times greater. As a result, sediment typical of that found in Ninety-Nine Islands Reservoir should not settle on the discharge pipe during normal station operations at LNS.

3.0 Sediment Deposition during Station Shutdown

DTA also analyzed the case of sediment deposition during station shutdown. In order to maximize the amount of sediment that could deposit on the discharge pipe, it was assumed that both LNS units would be off-line for 4 months or 120 days. The next step of this analysis was to determine if the wastewater discharge pipe is susceptible to being buried in sediment during these prolonged periods of no station operations at LNS. Station operations at Ninety-Nine Islands Hydro were also factored into this analysis. Two scenarios were evaluated: one with station operations at Ninety-Nine Islands Hydro and one without hydro operations. It should be noted that under a low flow condition where Ninety-Nine Islands is operating to pass inflows coming in to the reservoir, a hydro unit is pulsed every hour to pass the inflows so there should not be a case of no hydro operations resulting in spilling over the dam. However to evaluate the most conservative case, it was assumed that the hydro units are not operating.

Figures 2 and 3 depict velocity vectors in Ninety-Nine Islands Hydro forebay in the area of the proposed wastewater discharge pipe. Figure 2 shows velocity conditions with one hydro unit in operation and Figure 3 shows velocity conditions with no hydro units in operation. These measurements were made in August 2007 by DTA personnel using an Acoustic Doppler Current Profiler (ADCP).

Under one-unit hydro generation (Figure 2), velocities near the diffuser end of the wastewater discharge pipe range from 0.25 to 1.0 ft/s, which should be adequate to prevent sediment from settling on the pipe when the pipe is not discharging wastewater.

Under the no hydro generation scenario (Figure 3), a hydraulic eddy forms in the area of the wastewater discharge pipe and sediment deposition during these periods may occur. It should be noted that even under the no hydro generation scenario, leakage occurs through the hydro units' wicket gates. This is being ignored for this analysis. In order to determine how much sediment may be available during these low flow periods, TSS versus flow data was plotted for 2007 (the year in which twice per month TSS data was collected). This relationship is shown in Figure 4. For flows less than 1,800 cfs, it was conservatively assumed that TSS = 20 mg/L based on the field data collected during 2007. For flows higher than 1,800 cfs, Microsoft Excel software was used to determine a linear equation for the relationship between flow and TSS. The resulting equation is:

$$Y = 0.0135X - 4.8793$$

where:

Y is TSS in mg/L, and
X is flow in cfs
The R-squared value for this equation is 0.86

Using this relationship, daily TSS values were determined for 8/1/2002 to 11/29/2002. The resulting daily TSS values are provided in the attached Table 1. Using both the daily average flow rate and corresponding TSS concentration, daily mass loading rates were calculated and are provided in Table 1. Note that this analysis conservatively assumes that 100 percent of the sediment entering Ninety-Nine Islands Reservoir over the 120-day period analyzed deposits directly in front of Ninety-Nine Islands Dam near the proposed location of the wastewater discharge pipe. Using this methodology, the total volume of sediment entering the reservoir over the 120-day period is 6,280 m^3 (or 8,214 yd^3; or 221,743 ft^3).

Under the conservatively assumed no hydro generation scenario, flows through Ninety-Nine Islands Reservoir will spill over the dam. Based on the configuration of Ninety-Nine Islands Reservoir and the bathymetry of the reservoir near the dam, it is likely that the majority of sediments will settle out along the deepest portion of the reservoir forebay (Figure 5). For conservatism, this analysis assumes that 100 percent of the sediment will deposit in this area over the 120-day period. Figure 6 is a cross-section of the reservoir forebay and shows the area where sediments are likely to settle out of the water column. Using Geographic Information System (GIS) software to determine the overall capacity of the reservoir forebay to contain additional sediment loads, it appears that the entire 6,280 m^3 of sediment can be contained at the bottom of the forebay below the wastewater discharge pipe. Also, note that the area where settling is most likely to occur is away from the diffuser end of the pipe. Therefore, it is unlikely that the diffuser end of the pipe will be buried in sediment during extended outage conditions.

If some settling of sediment does occur on the diffuser end of the wastewater discharge pipe, it will likely dissipate rapidly once Ninety-Nine Islands Hydro returns to operation or wastewater is discharged through the 1-inch-diameter holes along the last 65-ft of pipe. This is because both hydro generation velocities (0.25 ft/s to 1.0 ft/s) and wastewater discharge velocities (3.2 ft/s) greatly exceed the settling velocity of medium grade silt particles (0.0001 ft/s). As a result, there should be minimal risk of having to dredge out the diffuser end of the pipe from sediment loading during extended outage conditions.

This report provides the results of DTA's analysis regarding sedimentation issues near the proposed wastewater diffuser pipe using readily available data and analysis as described above. Should you have any questions regarding this submittal or require further information, please contact me at (704) 342-7381 or ty.ziegler@devinetarbell.com.

Sincerely,

DEVINE TARBELL & ASSOCIATES, INC.

Ty Ziegler, P.E.
Environmental Engineering Manager

Carey Fraser
Technical Editor

Justin Schumacher, E.I.T.
Associate Engineer

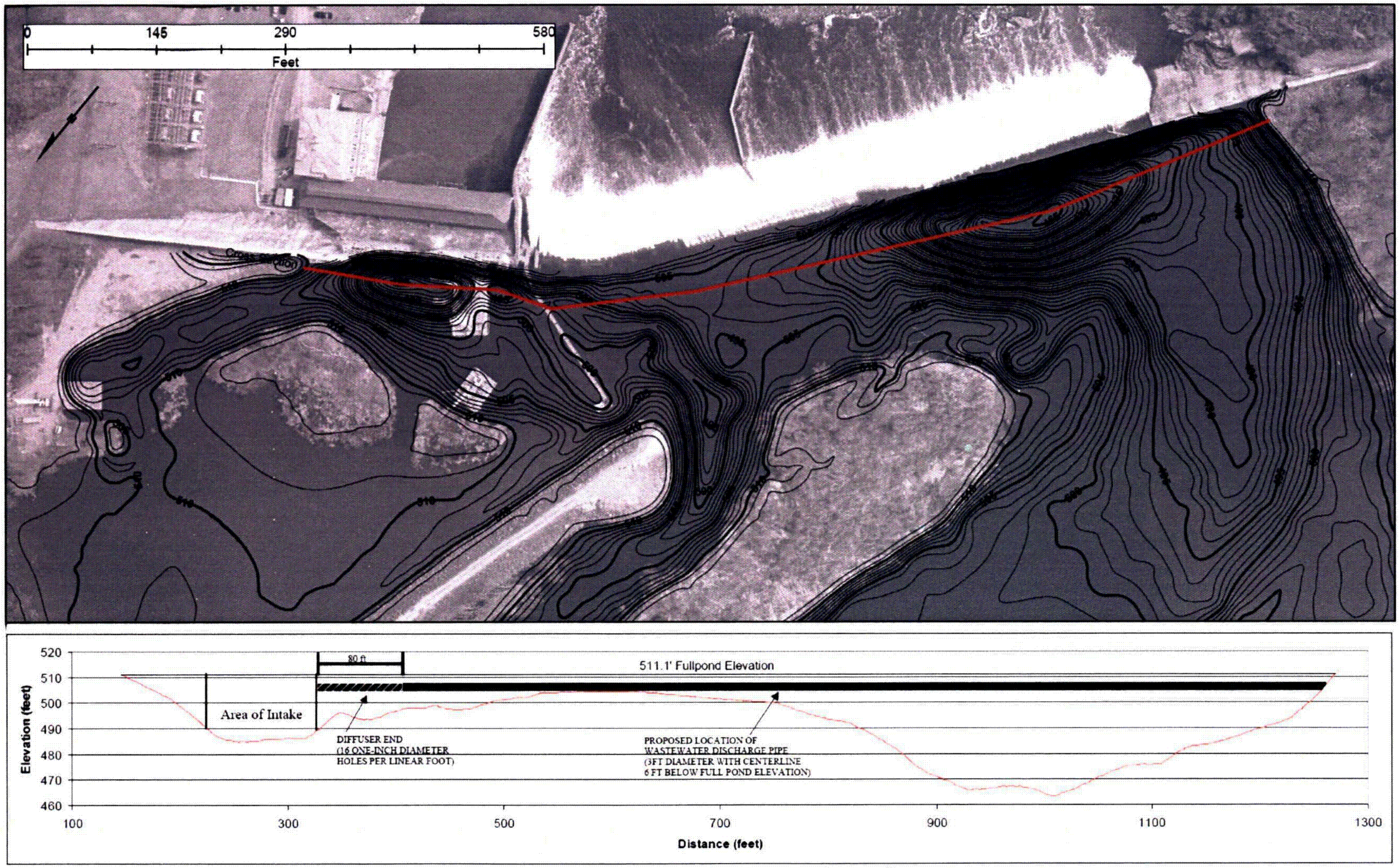
TKZ/cef
Attachments

cc: T. Bowling, Duke Energy
J. Thrasher, Duke Energy
File

ATTACHMENTS

FIGURE 1

NINETY-NINE ISLANDS FOREBAY CROSS-SECTION PROFILE SHOWING LOCATION OF WASTEWATER DISCHARGE PIPE



Ninety-Nine Islands Forebay Cross-Section Profile

Bottom elevations measured 2007. Contours in feet mean sea level.

FIGURE 2

WATER VELOCITY VECTORS IN LOWER NINETY-NINE ISLANDS RESERVOIR WITH ONE UNIT OPERATING

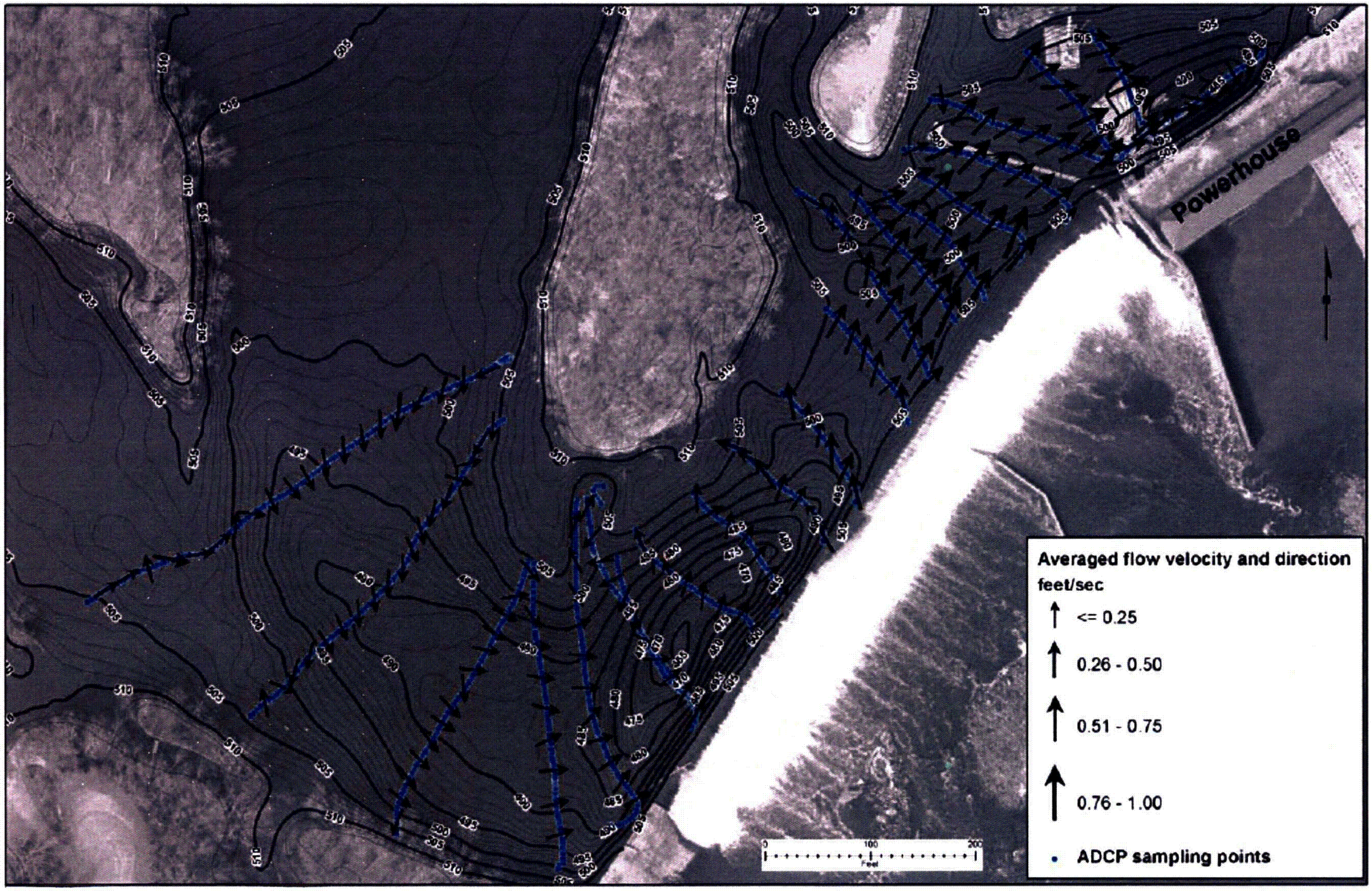


FIGURE 3

WATER VELOCITY VECTORS IN LOWER NINETY-NINE ISLANDS RESERVOIR WITH NO UNITS OPERATING

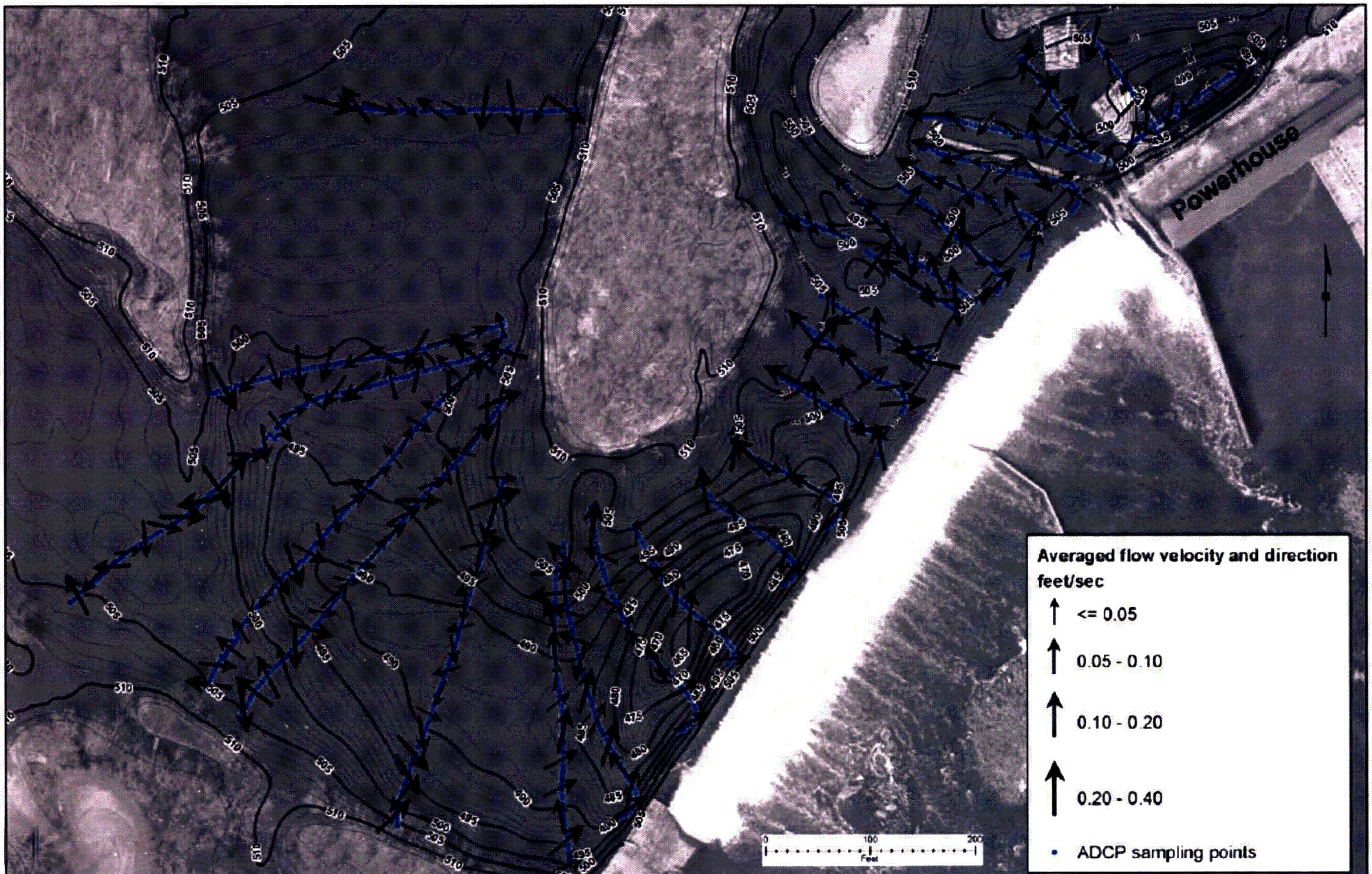


FIGURE 4
NINETY-NINE ISLANDS RESERVOIR TSS VERSUS FLOW RELATIONSHIP

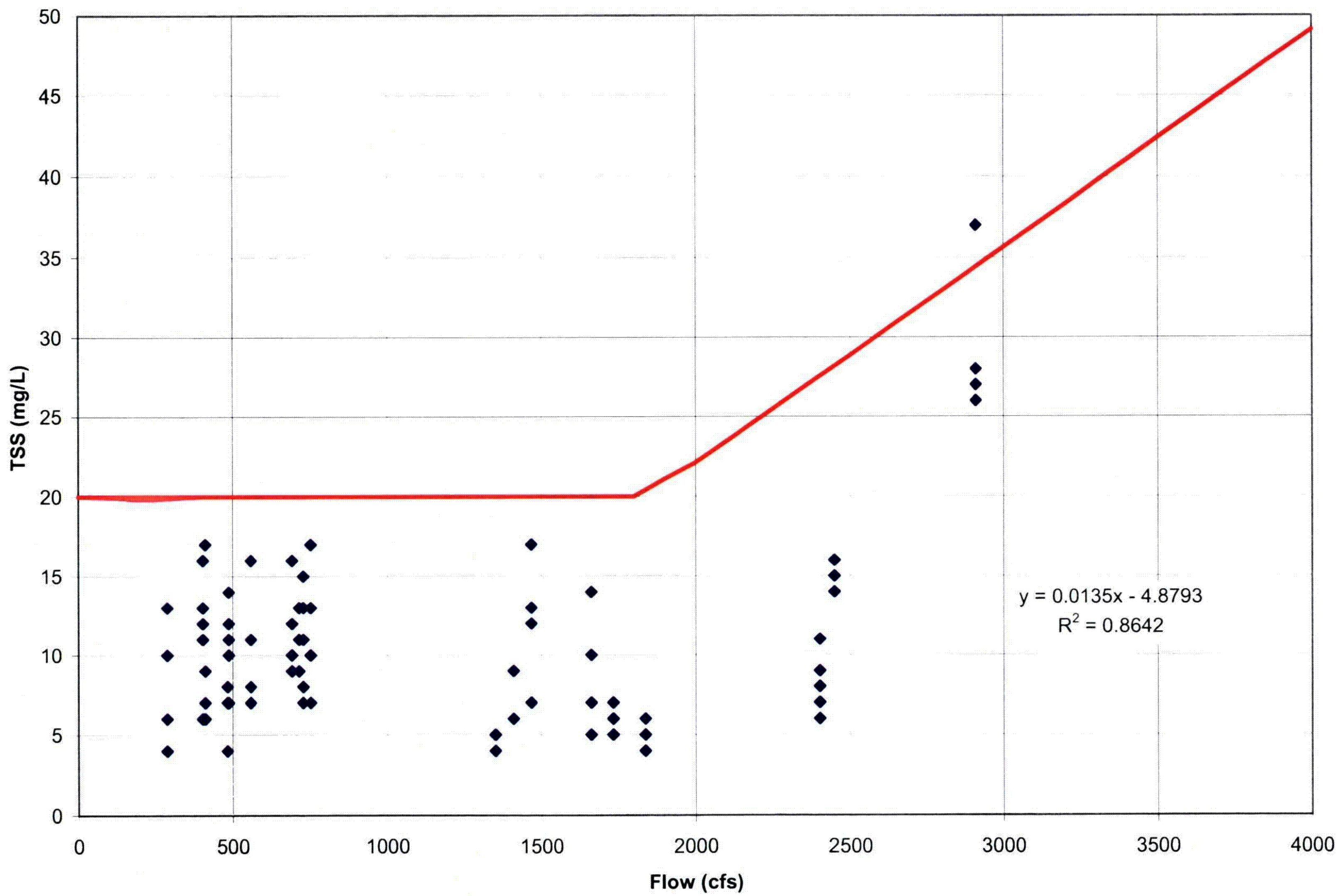


FIGURE 5

ELEVATION CONTOURS OF NINETY-NINE ISLANDS RESERVOIR AT 2-FOOT INTERVALS

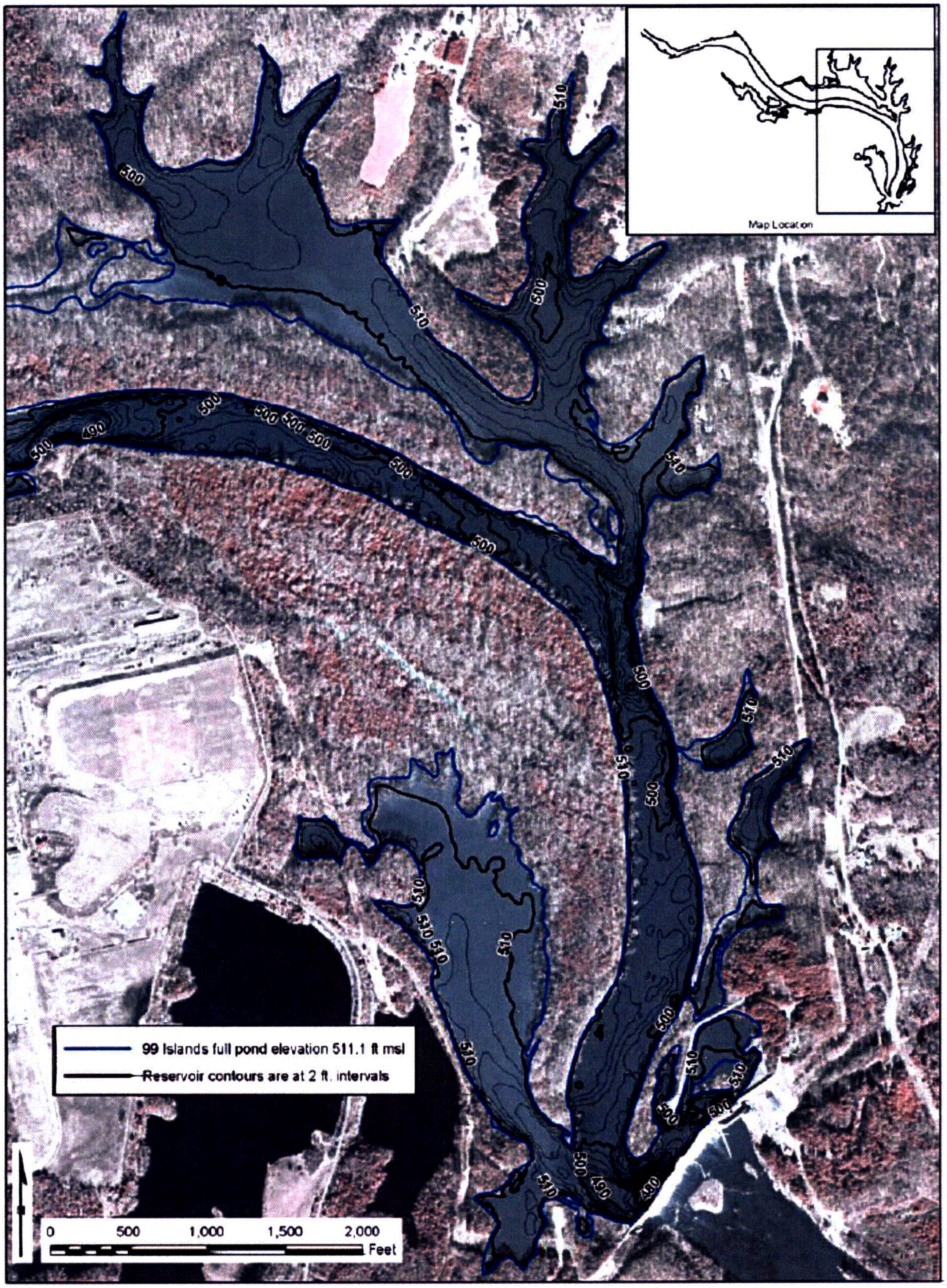
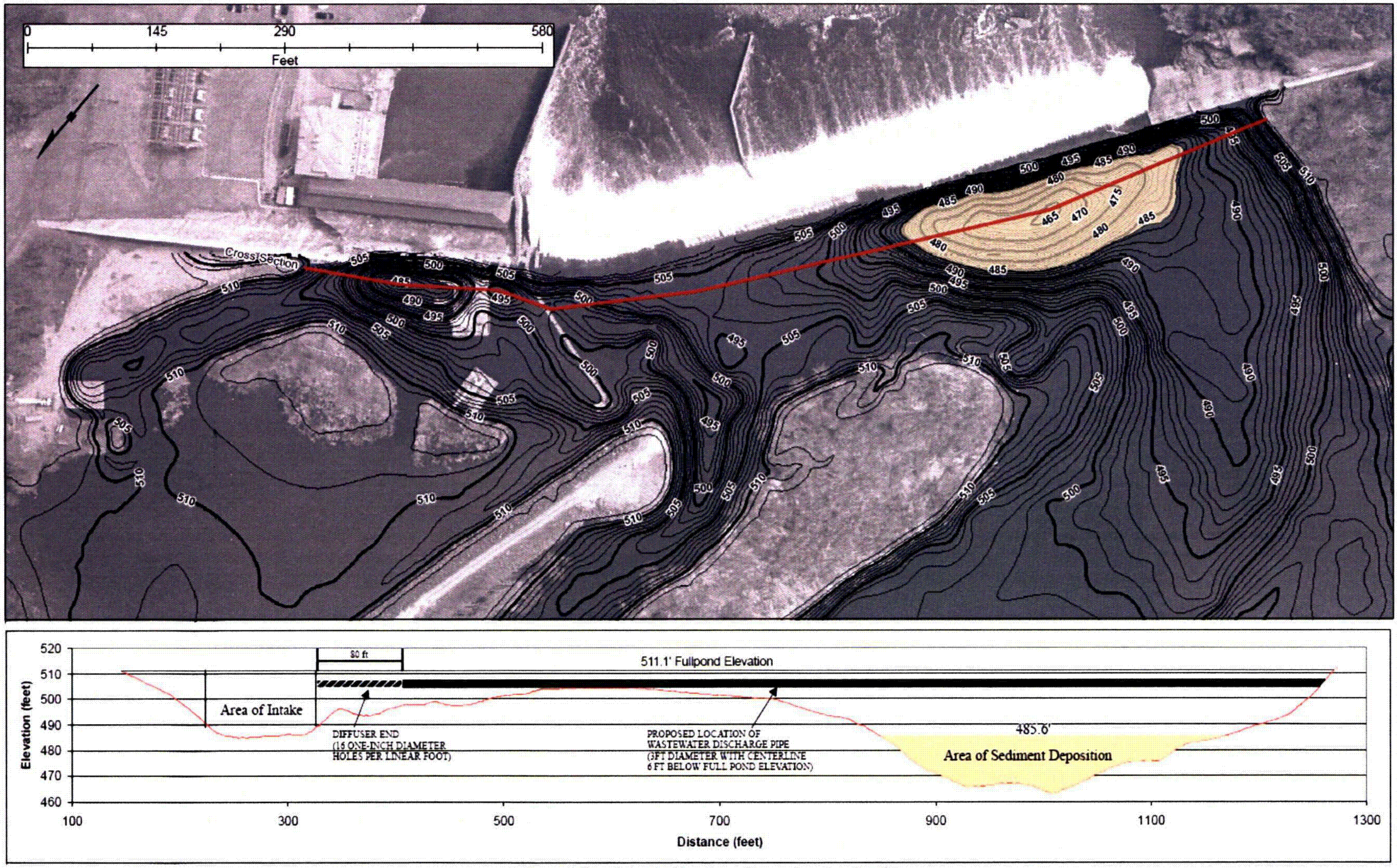


FIGURE 6
NINETY-NINE ISLANDS FOREBAY CROSS-SECTION PROFILE SHOWING SEDIMENT DEPOSITION AREA



Ninety-Nine Islands Forebay Cross-Section Profile
Bottom elevations measured 2007. Contours in feet mean sea level.

TABLE 1
NINETY-NINE ISLANDS RESERVOIR SEDIMENTATION ANALYSIS

Ninety-Nine Islands Reservoir Sedimentation Analysis											
Date	Flow (cfs)	TSS (mg/L)	Volume of Sediment (m^3)	Date	Flow (cfs)	TSS (mg/L)	Volume of Sediment (m^3)	Date	Flow (cfs)	TSS (mg/L)	Volume of Sediment (m^3)
08/01/02	308	20	13	09/14/02	113	20	5	10/28/02	770	20	33
08/02/02	284	20	12	09/15/02	162	20	7	10/29/02	1,432	20	61
08/03/02	271	20	12	09/16/02	721	20	31	10/30/02	1,606	20	68
08/04/02	241	20	10	09/17/02	1,010	20	43	10/31/02	1,167	20	50
08/05/02	214	20	9	09/18/02	745	20	32	11/01/02	1,167	20	50
08/06/02	193	20	8	09/19/02	507	20	22	11/02/02	1,282	20	55
08/07/02	192	20	8	09/20/02	561	20	24	11/03/02	736	20	31
08/08/02	193	20	8	09/21/02	568	20	24	11/04/02	880	20	37
08/09/02	152	20	6	09/22/02	656	20	28	11/05/02	720	20	31
08/10/02	111	20	5	09/23/02	511	20	22	11/06/02	1,421	20	60
08/11/02	74	20	3	09/24/02	381	20	16	11/07/02	1,294	20	55
08/12/02	47	20	2	09/25/02	225	20	10	11/08/02	1,078	20	46
08/13/02	95	20	4	09/26/02	889	20	38	11/09/02	1,201	20	51
08/14/02	103	20	4	09/27/02	1,998	22	94	11/10/02	1,029	20	44
08/15/02	148	20	6	09/28/02	2,818	33	199	11/11/02	1,001	20	43
08/16/02	213	20	9	09/29/02	2,010	22	95	11/12/02	3,211	38	263
08/17/02	211	20	9	09/30/02	1,305	20	56	11/13/02	3,338	40	285
08/18/02	245	20	10	10/01/02	1,224	20	52	11/14/02	2,668	31	177
08/19/02	274	20	12	10/02/02	914	20	39	11/15/02	2,114	24	106
08/20/02	418	20	18	10/03/02	973	20	41	11/16/02	2,541	29	159
08/21/02	275	20	12	10/04/02	538	20	23	11/17/02	4,539	56	545
08/22/02	262	20	11	10/05/02	613	20	26	11/18/02	3,812	47	378
08/23/02	244	20	10	10/06/02	595	20	25	11/19/02	2,784	33	194
08/24/02	214	20	9	10/07/02	721	20	31	11/20/02	2,183	25	114
08/25/02	191	20	8	10/08/02	462	20	20	11/21/02	1,721	20	73
08/26/02	178	20	8	10/09/02	182	20	8	11/22/02	1,825	20	77
08/27/02	210	20	9	10/10/02	254	20	11	11/23/02	1,790	20	76
08/28/02	216	20	9	10/11/02	817	20	35	11/24/02	1,085	20	46
08/29/02	288	20	12	10/12/02	769	20	33	11/25/02	1,111	20	47
08/30/02	198	20	8	10/13/02	701	20	30	11/26/02	1,374	20	58
08/31/02	202	20	9	10/14/02	595	20	25	11/27/02	1,640	20	70
09/01/02	210	20	9	10/15/02	728	20	31	11/28/02	1,374	20	58
09/02/02	210	20	9	10/16/02	3,823	47	380	11/29/02	1,019	20	43
09/03/02	215	20	9	10/17/02	3,731	45	361				
09/04/02	340	20	14	10/18/02	2,171	24	113	**Total Volume**		**m^3**	**6,280**
09/05/02	119	20	5	10/19/02	1,756	20	75			**yd^3**	**8,214**
09/06/02	143	20	6	10/20/02	1,038	20	44			**ft^3**	**221,743**
09/07/02	146	20	6	10/21/02	811	20	35				
09/08/02	141	20	6	10/22/02	977	20	42				
09/09/02	166	20	7	10/23/02	1,098	20	47				
09/10/02	169	20	7	10/24/02	744	20	32				
09/11/02	144	20	6	10/25/02	869	20	37				
09/12/02	127	20	5	10/26/02	1,124	20	48				
09/13/02	114	20	5	10/27/02	931	20	40				