

IPRenewal NPEmails

From: Gray, Dara F [DGray@entergy.com]
Sent: Tuesday, July 05, 2011 6:19 PM
To: Julie.Crocker@Noaa.Gov; Stuyvenberg, Andrew; Imboden, Andy; Turk, Sherwin
Cc: Dacimo, Fred R.; Sutton, Kathryn M.; ezoli@goodwinprocter.com; Dowell, Kelli; Mark Mattson; Caputo, Charles; Curry, John J
Subject: FW: Zebra Mussel Reports for 2003-2010
Attachments: 2010 IP zebra rept.pdf; 2003 IP zebra rept.pdf; 2004 IP zebra rept.pdf; 2005 IP zebra rept.pdf; 2006 IP zebra rept.pdf; 2007 IP zebra rept.PDF; 2008 IP zebra rept.pdf; 2009 IP zebra rept.PDF

Hi Julie and Drew,

Here are the monitoring reports from our “zebra mussel monitoring program” as promised. If you would like a copy of the SOP, please let me know. We hope to have the remainder of the thermal information to you tomorrow. (although it will likely be piece-meal given our email restrictions). Please let me know if you have any questions.

Thanks

From: Mark Mattson [<mailto:mmattson@normandeu.com>]
Sent: Tuesday, June 28, 2011 7:17 PM
To: Gray, Dara F
Cc: Zoli, Elise N
Subject: Zebra Mussel Reports for 2003-2010

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PREPARED IN CONNECTION WITH/ANTICIPATION OF LITIGATION

Dara – attached are the eight most recent annual zebra mussel monitoring reports for IPEC (2003 through 2010). Each annual report presents the cumulative summary of monthly monitoring at the IPEC unit 3 intake and the bio boxes in plant at Unit 2 and Unit 3 of the total biomass of the entire biofouling community (wet weight), and number of each type of mussel species found on the settling plates during each incubation period. Let me know if you also think we should include the project SOP, and I’ll have that made into a PDF and send it along. Take care. Mark

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Mark T. Mattson, Ph.D., Vice President

Normandeu Associates, Inc.

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Subject: FW: Zebra Mussel Reports for 2003-2010
Sent Date: 7/5/2011 6:19:26 PM
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From: Gray, Dara F

Created By: DGray@entergy.com

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Files	Size	Date & Time
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2010 IP zebra rept.pdf	179463	
2003 IP zebra rept.pdf	138939	
2004 IP zebra rept.pdf	190574	
2005 IP zebra rept.pdf	173133	
2006 IP zebra rept.pdf	174742	
2007 IP zebra rept.PDF	199105	
2008 IP zebra rept.pdf	284776	
2009 IP zebra rept.PDF	159438	

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NORMANDEAU ASSOCIATES INC.
ENVIRONMENTAL CONSULTANTS

Ref. No. 20407.005
3 February 2011
(sent by e-mail)

Ms. Dara Gray
Indian Point Energy Center
450 Broadway, Suite 1
Buchanan, New York 10511

Dear Ms. Gray,

This report presents the **November and December 2010** sampling results for the Indian Point Zebra Mussel Monitoring Program, conducted by Normandeau Associates for Entergy (contract 10150496). Settlement plate sampling was conducted on 2 December and 21 December 2010 at Sites 1 and 2 (Unit 3 intake) and Site 3 (one of two bioboxes at Unit 3). The collections from 2 December represent the November sampling period, which had been postponed from late November. The biobox at Site 4 (Unit 3) was sampled on 21 December and the biobox at Site 5 (Unit 2) was sampled on 2 December. No biobox samples from Site 6 (Unit 2) were collected on either date. Cumulative results for calendar year 2010 are summarized in Table 1 (Unit 3 intake plates), Table 2 (Unit 3 intake water quality), and Table 3 (Unit 3 and Unit 2 biobox plates).

Low numbers of zebra mussels (*Dreissena polymorpha*), dark false mussels (*Mytilopsis leucophaeata*), or both, were observed on six of the 15 settlement plates collected on these two sampling dates from the Unit 3 intake after exposure durations ranging from one to six months (Table 1). Most of the observed mussels were on plates that had been exposed for six months. All mussels on the plates were small (0.7 to 2.9 mm), reflecting both the relatively recent settlement (<6 months ago) and slow growth during the colder months. No settled mussels were found on any of the settlement plates that had been deployed for one month in the Unit 2 or Unit 3 bioboxes.

If you have any questions, please contact me by e-mail at plindsay@normandeau.com or by phone at 603-637-1149.

Sincerely,

NORMANDEAU ASSOCIATES INC.
B. Paul Lindsay
Program Manager

Cc: Kelli Dowell
Mark Mattson

Table 1. Density, length, and biomass of bivalves on settlement plates collected at the Indian Point Unit 3 intake catwalk for the Zebra Mussel Monitoring Program during 2010.

Date Collected	Date Set	Exposure Duration (Months)	Site	Biomass (g/m ²)	Detection Limit (no./m ²)	Species	Density (no./m ²)	Length (mm)					
								Mean	S.D.				
22Jun10	14May09	13 ^a	1 ^c										
			1 ^c										
			1 ^c										
			2	821.2	200	ZM	200	0.7					
						DFM	200	0.6					
			2	1360.8	200	ZM	1000	0.8	0.4				
						DFM	400	0.7	0.3				
			2	278.4	200	ZM	400	0.8	0.0				
			22Apr09	14 ^a	1	1	559.0	200	None				
						1 ^c							
						1 ^c							
						1 ^c							
						2	1631.4	200	ZM	200	0.5		
									DFM	200	0.7		
			22Mar09	15 ^a	2	2	265.0	200	ZM	600	0.7	0.1	
									DFM	200	0.6		
									ZM	200	0.6		
			18Dec08	18 ^a	2	2	1082.6	200	ZM	200	0.6		
						None							
16Oct08	17Jun08	20 ^a	2	1490.8	200	None							
			1 ^c										
			1 ^c										
			2 ^d	371.0	200	ZM	600	0.8	0.2				
						DFM	200	0.8					
			2 ^d	627.2	200	ZM	1600	0.7	0.2				
16Oct08	17Jun08	20 ^a	2 ^d			DFM	800	0.6	0.1				
			2 ^d	855.2	200	DFM	400	0.5	0.2				
16Jul10	22Jun10	1	1	346.8	200	None							
			2	223.6	200	ZM	400	0.7	0.1				
						DFM	600	0.2	0.1				
			22Jun10 ^b	1 ^b	1	1	416.4	200	ZM	200	0.4		
									DFM	200	0.2		
			22Jun10 ^b	1 ^b	2	2	339.4	200	None				
						1	405.0	200	DFM	200	0.2		
						2	319.6	200	ZM	800	0.4	0.1	
									DFM	1800	0.3	0.2	
			20Aug10	16Jul10	1	1	1066.4	200	ZM	400	1.2	1.1	
									DFM	600	1.0	0.8	
						2	505.6	200	ZM	400	0.4	0.2	
22Jun10	2	1				1	1192.6	200	ZM	1800	0.9	0.8	
									DFM	1000	0.5	0.6	
22Jun10 ^b	2 ^b	2				2	1462.2	200	ZM	2400	0.5	0.3	
									DFM	1600	0.4	0.2	
						1	898.2	200	ZM	1600	0.4	0.1	
									DFM	1600	0.3	0.2	
22Jun10 ^b	2 ^b	2				2	1136.0	200	ZM	600	0.7	0.5	
									DFM	400	0.5	0.2	

(continued)

Table 1 (continued)

Date Collected	Date Set	Exposure Duration (Months)	Site	Biomass (g/m ²)	Detection Limit (no./m ²)	Species	Density (no./m ²)	Length (mm)		
								Mean	S.D.	
22Sep10	20Aug10	1	1	273.0	200	DFM	200	2.8		
			2	138.2	200	None				
	16Jul10	2	1	1623.4	200	DFM	200	0.7		
			2	1252.4	200	ZM	200	0.4		
	22Jun10	3	1		1960.8	200	DFM	1600	0.5	0.2
				ZM	1400	0.8	0.4			
			DFM	2600	0.6	0.2				
			ZM	200	2.1					
	22Jun10 ^b	3 ^b	1		1868.8	200	DFM	1200	0.5	0.3
				ZM	800	0.4	0.1			
DFM			600	0.6	0.1					
ZM			200	1.4						
			2	1455.4	200	DFM	400	1.0	0.5	
20Oct10	22Sep10	1	1	14.2	20	DFM	20	0.6		
			2	18.6	20	None				
	20Aug10	2	1	685.2	200	ZM	600	0.6	0.6	
			DFM	400	0.6	0.1				
	16Jul10	3	1	2	1026.0	200	ZM	200	0.6	
				ZM	600	0.5	0.2			
			2	2063.2	200	DFM	200	0.2		
						ZM	1000	1.2	0.4	
2Dec10	20Oct10	1	1	4.8	20	DFM	20	1.9		
			2	6.0	20	None				
	22Sep10	2	1	22.2	20	None				
			2	26.6	20	None				
	20Aug10	3	1 ^c							
ZM				1400	1.7	0.7				
			2	2596.0	200	DFM	200	1.0		
21Dec10	2Dec10	1	1	5.0	20	None				
			2	5.0	20	None				
	20Oct10	2	1	4.4	20	None				
			2	10.0	20	None				
	22Sep10	3	1	24.0	20	None				
			2	13.8	20	None				
	22Jun10	6	1		3940.4	200	ZM	400	1.4	0.1
				DFM	800	0.9	0.6			
			ZM	200	0.8					
			DFM	600	0.8	0.2				
22Jun10 ^b	6 ^b	1		591.8	200	ZM	200	0.9		
			DFM	400	0.9	0.4				
		ZM	400	1.3	0.8					
		DFM	600	0.8	0.5					
			2	4828.0	200	ZM	400	1.3	0.8	
						DFM	600	0.8	0.5	

Footnotes for Table 1:

Site codes: 1 = center of intake catwalk, in strong intake current
 2 = north side of intake catwalk, in low-flow area

Species codes: ZM = zebra mussel (*Dreissena polymorpha*)
 DFM = dark false mussel (*Mytilopsis leucophaeata*)
 OB = other bivalves (including unidentified because of damage)
 None = No bivalves present

^a Collection delayed because Site 1 and Site 2 were inaccessible during June 2009-May 2010 due to a problem deploying stairs to the catwalk used for sampling (exposure duration for these plates was longer than originally scheduled)

^b Deployment delayed because Site 1 and Site 2 were inaccessible during June 2009-May 2010 due to a problem deploying stairs to the catwalk used for sampling (exposure duration for these plates was shorter than originally scheduled)

^c Not collected (the settlement plate was missing)

^d Plate had been out of water 11-26 February before it could be transferred to a new rack replacing the old one, which was badly damaged by ice (any settled mussels present on 11 February could have been desiccated)

Table 2. Water quality data collected monthly at the Indian Point Unit 3 intake for the Zebra Mussel Monitoring Program during 2010.

Sampling Date	Surface Temp. (°C)	4-m Temp. (°C)	Conductivity (µmho)	Salinity (ppt)	Dissolved Oxygen (mg/l)	pH	Turbidity (NTU)
22Jun10	24.8	24.8	4150	2.4	6.6	7.4	12.2
16Jul10	28.5	28.5	11000	5.9	6.8	7.4	6.8
26Aug10	27.5	27.5	7000	3.8	5.6	7.4	11.5
22Sep10	24.1	23.8	9990	5.9	7.2	7.1	27.0
20Oct10	13.4	13.1	2440	1.8	7.3	7.4	10.1
2Dec10	7.6	7.6	429	0.4	9.0	7.4	22.5
21Dec10	3.5	3.5	2650	2.5	5.0	7.4	12.2

Sampling was conducted at 4 meters depth for all parameters and at the surface for temperature only.

No sampling at the Unit 3 intake was conducted during January-May 2010 due to lack of access to the sampling site.

Table 3. Density, length, and biomass of bivalves on settlement plates in bioboxes sampling chlorinated service water at Indian Point for the Zebra Mussel Monitoring Program during 2010.

Date Collected	Date Set	Exposure Duration (Months)	Site	Biomass (g/m ²)	Detection Limit (no./m ²)	Species	Density (no./m ²)	Length (mm)	
								Mean	S.D.
22Jun10	May10	1	3	0.8	20	None			
			4	0.6	20	None			
			5 ^a	1.4	20	None			
			5 ^a	1.6	20	None			
			6 ^b						
16Jul10	22Jun10	1	3	4.4	20	None			
			4	2.8	20	None			
			5 ^a	3.8	20	None			
			5 ^a	2.4	20	None			
			6 ^b						
26Aug10	16Jul10	1	3	4.8	20	None			
			4	1.8	20	None			
			5 ^b						
			6 ^b						
22Sep10	26Aug10	1	3	12.8	20	None			
			4	10.6	20	None			
			5 ^b						
			6 ^b						
20Oct10	22Sep10	1	3	3.0	20	None			
			4 ^c						
			5	8.4	20	None			
			6 ^b						
2Dec10	20Oct10	1	3	0.8	20	None			
			4 ^b						
			5	1.0	20	None			
			6 ^b						
21Dec10	2Dec10	1	3	1.8	20	None			
			4	6.2	20	None			
			5 ^b						
			6 ^b						

Footnotes for Table 3:

Site codes: 3 = Unit 3 chemistry room
 4 = Unit 3 central control air conditioning room
 5 = Unit 2 Monitor #1
 6 = Unit 2 Monitor #2

Species codes: ZM = zebra mussel (*Dreissena polymorpha*)
 DFM = dark false mussel (*Mytilopsis leucophaeata*)
 OB = other bivalves (including unidentified because of damage)
 None = No bivalves present

^a Two samples were collected from Site 5, instead of the one scheduled.

^b Sample scheduled for collection by Entergy personnel was not collected.

^c Settlement plate was dry and could not be processed (no water in the biobox).

Ref. Nos. 19713.000
18 December 2003

Ms. Dara Gray
Entergy Nuclear Northeast
Indian Point 3 NPP
P.O. Box 306
Buchanan, New York 10501

Dear Ms. Gray,

This is the **December** report for the 2003 Indian Point Zebra Mussel Monitoring Program, conducted by Normandeau Associates for Entergy (contract 4500522928). Monthly settlement plate sampling was conducted on 9 December 2003 at Unit 3 and on 10 December at Unit 2. Cumulative results for calendar year 2003 are summarized in Table 1 (Unit 3 intake plates), Table 2 (Unit 3 intake water quality), and Table 3 (Unit 3 and Unit 2 biobox plates).

At the Unit 3 intake, no settled bivalves were observed at sites 1 and 2 for the one-month or two-month exposure periods. A single zebra mussel (*Dreissena polymorpha*) was observed on the three-month plate at site 2. Both zebra mussels and dark false mussels (*Mytilopsis leucophaeata*) were present on six-month and twelve-month plates. The highest density for both species combined (3,000 mussels per square meter) was at site 1, in the main intake flow in front of Unit 3, on the six-month plate. Lengths ranged from 0.7 to 1.8 mm for zebra mussels and 0.5 to 3.2 mm for dark false mussels. The small sizes indicated that all specimens were fairly recently settled. The six-month and twelve-month settling plates had a heavy growth of barnacles and hydroids on them.

No bivalves were observed on the exposure plates from bioboxes sampling the Unit 3 chlorinated service water at sites 3 and 4 at Unit 3 or at sites 5 and 6 at Unit 2 (Table 3).

If you have any questions, please call me at 603-472-5191.

Sincerely,

NORMANDEAU ASSOCIATES INC.

B. Paul Lindsay
Program Manager

enclosures

Cc: Vic Nutter
Mark Mattson

Table 1. Density, length, and biomass of bivalves on settlement plates collected at the Indian Point Unit 3 intake catwalk for the Zebra Mussel Monitoring Program during 2004.

Date Collected	Date Set	Exposure		Biomass (g/m ²)	Detection		Density (m ⁻²)	Length (mm)	
		Duration (Months)	Site		Limit (m ⁻²)	Species		Mean	S.D.
8Jan03	4Dec02	1	1	2	20	None			
			2	4	20	None			
	6Nov02	2	1	4	20	None			
5Feb03	3Oct02	3	1	8	20	None			
			2	6	20	None			
	8Jan03	1	1	4	20	None			
5Mar03	4Dec02	2	1	4	20	None			
			2	4	20	None			
	6Nov02	3	1	2	20	None			
15Apr03	5Mar03	1	1	4	20	None			
			2	4	20	None			
	5Feb03	2	1	4	20	None			
13May03	8Jan03	3	1	6	20	None			
			2	4	20	None			
	15Apr03	1	1	2	20	None			
10Jun03	5Mar03	2	1	2	20	None			
			2	2	20	None			
	5Feb03	3	1	4	20	None			
9Jul03	13May03	1	1	6	20	None			
			2	6	20	None			
	15Apr03	2	1	6	20	None			
13May03	5Mar03	3	1	12	20	None			
			2	10	20	None			
	4Dec02	6	1	10	20	None			
15Apr03	5Jun02	12	1	8	20	None			
			2	258	200	None			
	10Jun03	1	1	9.4	20	None			
15Apr03	10Jun03	1	1	9.4	20	None			
			2	9.6	20	DFM	60	0.6	0.2
	13May03	2	1	11.0	20	None			
15Apr03	13May03	2	1	18.4	20	DFM	40	0.4	0.1
			2	18.4	20	DFM	40	0.4	0.1
	15Apr03	3	1	46.6	20	None			
			2	7.6	20	ZM	20	1.0	

(continued)

Table 1 (continued)

Date Collected	Date Set	Exposure		Biomass (g/m ²)	Detection		Density (m ⁻²)	Length (mm)		
		Duration (Months)	Site		Limit (m ⁻²)	Species		Mean	S.D.	
5Aug03	9Jul03	1	1	262.8	200	DFM	200	0.8		
			2	285.8	200	ZM	200	2.0		
	10Jun03	2	1	239.2	200	None				
			2	371.2	200	ZM	4200	2.4	0.4	
	13May03	3	1	869.2	200	DFM	1400	2.1	0.4	
			2	273.2	200	None				
10Sep03	5Aug03	1	1	4.4	20	ZM	20	2.0		
			2	27.8	20	DFM	40	0.8	0.1	
	9Jul03	2	1	2	2812.2	200	ZM	1000	0.9	0.4
				DFM	1080	0.8	0.3			
				ZM	800	1.5	1.0			
				DFM	1000	0.6	0.2			
	10Jun03	3	1	2	1632.4	200	ZM	400	1.0	0.6
				1	676.6	200	ZM	1400	1.2	0.7
	5Mar03	6	1	2	1693.4	200	DFM	2400	1.0	0.5
				DFM	200	0.6				
				ZM	400	1.7	0.2			
				DFM	400	0.8	0.1			
DFM				200	0.3					
2				525.8	200	DFM	200	0.3		
14Oct03	10Sep03	1	1	6.8	20	None				
			2	20.8	20	ZM	80	0.4	0.2	
			DFM	20	0.3					
	5Aug03	2	1	2	253.4	200	None			
				2	168.0	200	ZM	1600	1.1	0.8
	9Jul03	3	1	2	3210.6	200	DFM	2600	1.0	0.4
				ZM	1200	0.7	0.4			
				DFM	1000	0.9	0.3			
ZM				800	0.4	0.2				
18Nov03	14Oct03	1	2	1057.6	200	DFM	800	1.4	0.3	
			1	3.4	20	None				
	10Sep03	2	1	2	2.8	20	None			
				2	33.4	20	None			
	5Aug03	3	1	2	25.6	20	None			
				2	220.2	200	DFM	200	2.0	
9Dec03	18Nov03	1	2	165.8	200	DFM	2800	1.2	0.7	
			ZM	600	2.0	0.1				
			1	20.0	20	None				
	14Oct03	2	1	2	19.4	20	None			
				2	15.0	20	None			
	10Sep03	3	1	2	66.6	20	None			
				2	32.6	20	None			
	10Jun03	6	1	2	45.4	20	ZM	20	1.0	
				DFM	2400	1.4	0.5			
				ZM	600	1.0	0.6			
				DFM	1000	1.1	0.6			
	4Dec02	12	1	2	1138.0	200	DFM	400	1.9	1.3
2				1148.2	200	DFM	2600	1.6	0.8	
2				614.6	200	ZM	200	1.8		

(continued)

Footnotes for Table 1:

Site codes: 1 = center of intake catwalk, in strong intake current
 2 = north side of intake catwalk, in low-flow area

Species codes: ZM = zebra mussel (*Dreissena polymorpha*)
 DFM = dark false mussel (*Mytilopsis leucophaeata*)
 OB = other bivalves (including unidentified because of damage)
 None = No bivalves present

Table 2. Water quality data collected monthly at the Indian Point Unit 3 intake for the Zebra Mussel Monitoring Program during 2004. Sampling was conducted at 4 meters depth for all parameters and at the surface for temperature only.

Sampling Date	Surface Temp. (°C)	4-m Temp. (°C)	Conductivity (µmho)	Salinity (ppt)	Dissolved Oxygen (mg/l)	pH	Turbidity (NTU)
20Jan04	3.0	2.5	122	0.1	13.9	7.1	14.9
12Feb04	0.8	1.0	1740	1.8	11.0	7.5	14.9
9Mar04	2.9	3.0	223	0.2	12.4	7.2	15.2
23Apr04	11.6	11.2	174	0.1	11.0	7.4	20.7

Table 3. Density, length, and biomass of bivalves on settlement plates in bioboxes sampling chlorinated service water at Indian Point for the Zebra Mussel Monitoring Program during 2004.

Date Collected	Date Set	Exposure Duration (Months)	Site	Biomass (g/m ²)	Detection Limit (m ⁻²)	Species	Density (m ⁻²)	Length (mm)	
								Mean	S.D.
8Jan03	4Dec02	1	3	2	20	None			
			4	2	20	None			
5Feb03	8Jan03	1	3	2	20	None			
			4	2	20	None			
5Mar03	5Feb03	1	3	2	20	None			
			4	2	20	None			
15Apr03	5Mar03	1	3 ^a	4	20	None			
			4	2	20	None			
6May03		1	5 ^b	negligible	40	None			
			6 ^b	negligible	40	None			
13May03	15Apr03	1	3	2	20	None			
			4 ^c	2	20	None			
10Jun03	13May03	1	3	2	20	None			
			4	2	20	None			
			5	negligible	40	None			
			6	negligible	40	None			
9Jul03	10Jun03	1	3	2.4	20	None			
			4	1.8	20	None			
			5	0.6	20	None			
			6	0.8	20	None			
5Aug03	9Jul03	1	3	7.8	20	None			
			4	7.4	20	None			
			5 ^d	4.2	20	None			
			6 ^d						
10Sep03	5Aug03	1	3	0.4	20	None			
			4	0.4	20	None			
			5	0.6	20	None			
			6	2.0	20	None			
14Oct03	10Sep03	1	3	2.2	20	None			
			4	2.2	20	None			
			5	5.6	20	None			
			6	1.8	20	None			
18Nov03	14Oct03	1	3	2.0	20	None			
			4	2.0	20	None			
			5	4.0	20	None			
			6	4.2	20	None			
10Dec03	18Nov03	1	3	2.6	20	None			
			4	2.2	20	None			
			5	2.6	20	None			
			6	2.8	20	None			

(continued)

Footnotes for Table 3:

Site codes: 3 = Unit 3 chemistry room
 4 = Unit 3 central control air conditioning room
 5 = Unit 2 Monitor #1
 6 = Unit 2 Monitor #2

Species codes: ZM = zebra mussel (*Dreissena polymorpha*)
 DFM = dark false mussel (*Mytilopsis leucophaeata*)
 OB = other bivalves (including unidentified because of damage)
 None = No bivalves present

- ^a Water flow to the Site 3 biobox was shut off on 27Mar, so that plate was only exposed to incoming water for 22 days.
- ^b The Unit 2 biobox plates for May were collected on 6May, refrigerated, and delivered for analysis on 6Jun.
- ^c There was no water flow to the Site 4 biobox when the 13May sample was collected.
- ^d The Site 5 plate was collected on 12Aug, and the Site 6 plate was not collected in August.

address for Vic Nutter copy:

Mr. Vic Nutter
Entergy Nuclear Operations, Inc.
440 Hamilton Avenue
White Plains, New York 10601-5029

Ref. No. 20114.000
3 January 2005

Ms. Dara Gray
Entergy Nuclear Northeast
Indian Point 3 NPP
P.O. Box 306
Buchanan, New York 10501

Dear Ms. Gray,

This report presents the **December** sampling results for the Indian Point Zebra Mussel Monitoring Program, conducted by Normandeau Associates for Entergy (contract 4500522928). Monthly settlement plate sampling was conducted on 15 December 2004 at Sites 1-4 (Unit 3). Samples from Sites 5 and 6 (Unit 2) were not collected. Cumulative results for calendar year 2004 are summarized in Table 1 (Unit 3 intake plates), Table 2 (Unit 3 intake water quality), and Table 3 (Unit 3 and Unit 2 biobox plates).

At Site 1 and Site 2 in front of the Unit 3 intake, moderate numbers of zebra mussels (*Dreissena polymorpha*) and dark false mussels (*Mytilopsis leucophaeata*) were present on 6-month and 12-month exposure plates. Few of either species were present on the 2-month and 3-month exposure plates and there were none on the 1-month exposure plates. Based on this pattern, most of the settlement occurred before 20 September. Dark false mussels ranged in size from 0.7 to 6.7 mm and zebra mussels were between 1.0 and 4.1 mm.

If you have any questions, please call me at 603-472-5191.

Sincerely,

NORMANDEAU ASSOCIATES INC.

B. Paul Lindsay
Program Manager

enclosures

Cc: Vic Nutter
Mark Mattson

Table 1. Density, length, and biomass of bivalves on settlement plates collected at the Indian Point Unit 3 intake catwalk for the Zebra Mussel Monitoring Program during 2004.

Date Collected	Date Set	Exposure Duration (Months)	Site	Biomass (g/m ²)	Detection Limit (no./m ²)	Species	Density (no./m ²)	Length (mm)		
								Mean	S.D.	
20Jan04	9Dec03	1	1 ^a							
			2	2.0	20	None				
	18Nov03	2	1 ^a							
				2	2.0	20	None			
12Feb04	14Oct03	3	1 ^a							
			2	2.0	20	None				
	20Jan04	1	1 ^a							
				2	3.0	20	None			
9Mar04	9Dec03	2	1 ^a							
			2	2.4	20	None				
	18Nov03	3	1 ^a							
				2	6.0	20	None			
23Apr04	12Feb04	1	1 ^b							
			2	3.0	20	None				
	20Jan04	2	1 ^a							
				2	9.8	20	None			
	9Dec03	3	1 ^a							
18May04			2	2.0	20	None				
	10Sep03	6	1 ^a							
				2	11.2	20	None			
	9Mar04	1	1 ^b							
				2	2.2	20	None			
18Jun04	12Feb04	2	1 ^b							
			2	1.8	20	None				
	20Jan04	3	1 ^a							
				2 ^c						
18Jun04	23Apr04	1	1	3.6	20	None				
			2	4.0	20	None				
	9Mar04	2	1 ^b							
				2	3.2	20	None			
18Jun04	12Feb04	3	1 ^b							
			2	3.8	20	None				
	18May04	1	1	12.6	20	DFM	20	0.6		
				2	10.2	20	DFM	340	0.4	0.1
							ZM	400	0.4	0.1
	23Apr04	2	1	15.8	20	None				
				2	11.8	20	DFM	1600	0.4	0.1
							ZM	1480	0.4	0.1
	9Mar04	3	1 ^b							
				2	5.0	20	DFM	240	0.4	0.1
							ZM	280	0.3	0.1
	9Dec03	6	1 ^a							
			2	12.8	20	DFM	740	0.4	0.1	
						ZM	420	0.3	0.1	
10Jun03	12	1 ^a								
			2 ^d							

(continued)

Table 1. (continued)

Date Collected	Date Set	Exposure Duration (Months)	Site	Biomass (g/m ²)	Detection Limit (no./m ²)	Species	Density (no./m ²)	Length (mm)			
								Mean	S.D.		
22Jul04	18Jun04	1	1	127.6	20	DFM	20	2.2			
			2	155.2	200	None					
	18May04	2	1	608.0	200	None					
			2	152.2	200	DFM	200	2.7			
	23Apr04	3	1		354.2	200	ZM	2600	2.8	0.3	
				2	428.4	200	DFM	600	1.7	0.7	
17Aug04	22Jul04	1	1	16.6	20	ZM	80	0.3	0.1		
			2	19.0	20	DFM	60	0.3	0.1		
	18Jun04	2	1		470.8	200	ZM	120	0.4	0.1	
					266.6	200	DFM	1800	0.4	0.2	
			2			266.6	200	ZM	4200	0.4	0.3
							266.6	200	DFM	600	0.8
	18May04	3	1		569.2	200	ZM	1200	0.6	0.4	
						569.2	200	DFM	1200	0.7	0.8
			2			243.4	200	ZM	3800	0.6	0.8
							243.4	200	ZM	400	1.4
	20Sep04	17Aug04	1	1	12.8	20	DFM	440	0.8	0.3	
				2	20.6	200	ZM	420	1.0	0.5	
22Jul04		2	1		153.8	200	DFM	104000	0.7	0.4	
						153.8	200	ZM	24200	1.1	0.7
			2			35.4	200	DFM	25400	0.6	0.3
							35.4	200	ZM	19400	0.8
18Jun04		3	1		276.4	200	DFM	18000	0.8	0.6	
						276.4	200	ZM	10000	1.0	0.6
			2			224.4	200	DFM	7000	0.6	0.3
							224.4	200	ZM	5400	1.0
9Mar04		6	1 ^b				DFM	2200	0.7	0.3	
			2 ^e				ZM	1000	1.0	0.7	
20Oct04	20Sep04	1	1	7.8	20	ZM	80	3.5	1.8		
			2	4.4	20	DFM	80	1.6	0.3		
	17Aug04	2	1		59.0	200	ZM	40	0.8	0.1	
						59.0	200	DFM	20	0.9	
			2			17.2	200	ZM	1400	1.5	0.8
							17.2	200	DFM	1000	1.2
	22Jul04	3	1		309.0	200	ZM	22000	1.7	0.9	
						309.0	200	DFM	2800	1.6	0.7
			2			54.6	200	ZM	18400	2.4	1.7
							54.6	200	DFM	4200	1.0
	16Nov04	20Oct04	1	1	23.8	20	ZM	14000	1.7	0.9	
				2	4.2	20	DFM	3200	1.0	0.6	
20Sep04		2	1	9.0	20	DFM	20	1.4			
			2	7.4	20	ZM	40	1.7	0.3		
17Aug04		3	1		36.6	200	DFM	20	2.0		
						36.6	200	none			
			2			34.6	200	DFM	9600	1.7	0.4
							34.6	200	ZM	11800	2.5
				34.6	200	DFM	4000	1.8	0.7		
				34.6	200	ZM	7000	2.7	1.2		

(continued)

Table 1. (continued)

Date Collected	Date Set	Exposure Duration (Months)	Site	Biomass (g/m ²)	Detection Limit (no./m ²)	Species	Density (no./m ²)	Length (mm)	
								Mean	S.D.
15Dec04	16Nov04	1	1	6.0	20	None			
			2	5.2	20	None			
	20Oct04	2	1	14.4	20	ZM	40	1.6	0.7
			2	4.6	20	None			
	20Sep04	3	1	56.4	20	DFM	140	2.4	0.8
						ZM	80	1.8	0.2
			2	8.2	20	None			
18Jun04	6		1	1544.0	200	DFM	2200	1.8	1.4
						ZM	2000	2.0	0.9
			2	332.0	200	DFM	3000	2.1	1.6
						ZM	2400	2.5	0.8
9Dec03	12		1 ^a						
			2	328.8	200	DFM	2200	2.9	1.9
						ZM	1200	1.4	0.3

Footnotes for Table 1:

Site codes: 1 = center of intake catwalk, in strong intake current
2 = north side of intake catwalk, in low-flow area

Species codes: ZM = zebra mussel (*Dreissena polymorpha*)
DFM = dark false mussel (*Mytilopsis leucophaeata*)
OB = other bivalves (including unidentified because of damage)
None = No bivalves present

- ^a On 20 January the Site 1 settling plate rack was discovered to have been carried away by ice (replacement plates could not be set).
^b On 12 February a temporary settling rack was placed at Site 1, but by 9 March it also had been carried away by ice (replacement plates could not be set).
^c The 3-month settlement plate at Site 2 was missing on 23 April.
^d The 12-month settlement plate at Site 2 was missing on 18 June.
^e The 6-month settlement plate at Site 2 was missing on 20 September.

Table 2. Water quality data collected monthly at the Indian Point Unit 3 intake for the Zebra Mussel Monitoring Program during 2004.

Sampling Date	Surface Temp. (°C)	4-m Temp. (°C)	Conductivity (µmho)	Salinity (ppt)	Dissolved Oxygen (mg/l)	pH	Turbidity (NTU)
20Jan04	3.0	2.5	122	0.1	13.9	7.1	14.9
12Feb04	0.8	1.0	1740	1.8	11.0	7.5	14.9
9Mar04	2.9	3.0	223	0.2	12.4	7.2	15.2
23Apr04	11.6	11.2	174	0.1	11.0	7.4	20.7
18May04	20.3	19.9	420	0.3	7.8	7.4	13.6
18Jun04	23.5	23.8	2070	1.2	7.0	7.4	12.1
22Jul04	27.4	27.2	6970	3.8	6.5	7.5	9.9
17Aug04	25.3	25.5	2370	1.3	6.5	7.3	16.1
20Sep04	23.9	23.4	225	0.1	7.2	7.3	10.4
20Oct04	17.9	17.8	4520	3.0	7.7	7.3	8.8
16Nov04	10.9	10.9	1310	1.0	9.3	7.3	12.0
15Dec04	4.5	4.5	399	0.4	12.2	7.3	13.5

Sampling was conducted at 4 meters depth for all parameters and at the surface for temperature only.

Table 3. Density, length, and biomass of bivalves on settlement plates in bioboxes sampling chlorinated service water at Indian Point for the Zebra Mussel Monitoring Program during 2004.

Date Collected	Date Set	Exposure Duration (Months)	Site	Biomass (g/m ²)	Detection Limit (no./m ²)	Species	Density (no./m ²)	Length (mm)	
								Mean	S.D.
20Jan04	9Dec03	1	3	4.0	20	None			
			4	2.0	20	None			
			5	2.0	20	None			
			6 ^a						
12Feb04	20Jan04	1	3	10.0	20	None			
			4	1.0	20	None			
			5	2.0	20	None			
			6 ^a						
9Mar04	12Feb04	1	3	3.0	20	None			
			4	3.4	20	None			
			5	1.6	20	None			
			6	0.8	20	None			
23Apr04	9Mar04	1	3	4.8	20	None			
			4	5.8	20	None			
			5	2.6	20	None			
			6	7.4	20	None			
18May04	23Apr04	1	3	3.4	20	None			
			4	2.2	20	None			
19May04	23Apr04	1	5	2.4	20	None			
			6	1.2	20	None			
18Jun04	18May04	1	3	2.0	20	None			
			4	2.2	20	None			
18Jun04	19May04	1	5	0.4	20	None			
			6	0.8	20	None			
22Jul04	18Jun04	1	3	36.0	20	None			
			4	32.0	20	None			
			5	6.0	20	None			
			6	8.0	20	None			
17Aug04	22Jul04	1	3	3.0	20	None			
			4	3.2	20	None			
			5	1.4	20	None			
			6 ^a						
20Sep04	17Aug04	1	3	5.0	20	None			
			4	5.6	20	None			
			5 ^a						
			6 ^a						
20Oct04	20Sep04	1	3	18.0	20	None			
			4	3.8	20	None			
17Aug04	20Sep04	2	5	0.8	20	None			
			6 ^a						
16Nov04	20Oct04	1	3	8.2	20	None			
			4	3.8	20	None			
			5	0.8	20	None			
16Nov04	22Jul04	4 ^b	6	0.4	20	None			
15Dec04	16Nov04	1	3	4.4	20	None			
			4	3.6	20	None			
			5 ^a						
			6 ^a						

(continued)

Footnotes for Table 3:

Site codes: 3 = Unit 3 chemistry room
 4 = Unit 3 central control air conditioning room
 5 = Unit 2 Monitor #1
 6 = Unit 2 Monitor #2

Species codes: ZM = zebra mussel (*Dreissena polymorpha*)
 DFM = dark false mussel (*Mytilopsis leucophaeata*)
 OB = other bivalves (including unidentified because of damage)
 None = No bivalves present

^a Sample scheduled for collection by plant personnel from Unit 2 was not collected.

^b The Site 6 settling plate was not removed on the August, September, or October sampling dates, but flow was maintained through the biobox, so it was a valid four-month sample.

address for Vic Nutter copy (regular mail):

Mr. Vic Nutter
Entergy Nuclear Operations, Inc.
440 Hamilton Avenue
White Plains, New York 10601-5029

Ref. No. 20407.000
22 December 2005

Ms. Dara Gray
Entergy Nuclear Northeast
Indian Point 3 NPP
P.O. Box 306
Buchanan, New York 10501

Dear Ms. Gray,

This report presents the **December** sampling results for the Indian Point Zebra Mussel Monitoring Program, conducted by Normandeau Associates for Entergy (contract 4500522928). Monthly settlement plate sampling was conducted on 15 December 2005 at Sites 1- 4 (Unit 3) and Site 5 (Unit 2). Entergy did not retrieve the Site 6 settlement plate in December. Cumulative results for calendar year 2005 are summarized in Table 1 (Unit 3 intake plates), Table 2 (Unit 3 intake water quality), and Table 3 (Unit 3 and Unit 2 biobox plates).

Zebra mussels (*Dreissena polymorpha*) and dark false mussels (*Mytilopsis leucophaeata*) were present in modest numbers on settling plates at Unit 3, mostly on plates that had been exposed for at least six months (Table 1). The maximum density was 2,800 per square meter for the two species combined, on the 12-month plate at Site 1. The largest zebra mussel observed was a 3.2-mm specimen on the six-month plate at Site 2. The largest dark false mussel was also 3.2 mm long and from a six-month settlement plate. No mussels were present on the biobox settling plates at Unit 3 or Unit 2.

If you have any questions, please call me at 603-472-5191.

Sincerely,

NORMANDEAU ASSOCIATES INC.

B. Paul Lindsay
Program Manager

enclosures

Cc: Vic Nutter
Mark Mattson

Table 1. Density, length, and biomass of bivalves on settlement plates collected at the Indian Point Unit 3 intake catwalk for the Zebra Mussel Monitoring Program during 2005.

Date Collected	Date Set	Exposure Duration (Months)	Site	Biomass (g/m ²)	Detection Limit (no./m ²)	Species	Length (mm)		
							Density (no./m ²)	Mean	S.D.
8Feb05	15Dec04	2	1 ^{a,b}						
			2 ^a	4.2	20	None			
			1	2.4	20	None			
			2	8.0	20	None			
	16Nov04	3	3	1 ^{a,b}					
				2 ^a	282.0	20	None		
				1	18.0	20	None		
				2	3.2	20	None		
20Oct04	4	4	1 ^a	3.4	20	None			
			2 ^a	2.4	20	None			
10Mar05	8Feb05	1	1	9.0	20	None			
			2	4.8	20	None			
			1 ^c	2.2	20	None			
			2 ^c	3.0	20	None			
	15Dec04	3	3	1 ^b					
				2	6.0	20	None		
20Sep04	6	6	1 ^b						
			2	18.4	20	None			
13Apr05	10Mar05	1	1	9.4	20	None			
			2	5.6	20	None			
	8Feb05	2	2	1	8.0	20	None		
				2	5.2	20	None		
				1 ^c	8.0	20	None		
			2 ^c	3.8	20	None			
11May05	13Apr05	1	1	2.8	20	None			
			2	8.8	20	None			
	10Mar05	2	2	1	14.4	20	None		
				2	7.8	20	None		
	8Feb05	3	3	1	7.4	20	None		
				2	7.0	20	None		
15Jun05	11May05	1	1	27.4	20	None			
			2	29.8	20	None			
	13Apr05	2	2	1	33.4	20	None		
				2	24.8	20	None		
	10Mar05	3	3	1	55.6	20	None		
				2	42.6	20	None		
	20Sep04	6	6	1	28.0	20	None		
				2	42.0	20	DFM	20	0.7
18Jun04	12	12	1	96.2	200	None			
			2	44.4	20	None			
13Jul05	15Jun05	1	1	443.0	200	None			
			2	182.4	200	DFM	200	1.0	
	11May05	2	2	1	688.4	200	DFM	200	2.2
				2	232.4	200	None		
	13Apr05	3	3	1	781.8	200	None		
				2	322.2	200	DFM	400	0.6

(continued)

Table 1. (continued)

Date Collected	Date Set	Exposure Duration (Months)	Site	Biomass (g/m ²)	Detection Limit (no./m ²)	Species	Density (no./m ²)	Length (mm)		
								Mean	S.D.	
10Aug05	13Jul 05	1	1	552.6	200	ZM	2600	0.4	0.1	
						DFM	1800	0.2	0.1	
			2	738.8	200	ZM	600	0.6	0.1	
						DFM	2600	0.4	0.3	
	15Jun05	2	1	2004.8	200	ZM	1000	0.4	0.1	
						DFM	2600	0.4	0.1	
			2	1128.6	200	ZM	200	1.8		
						DFM	600	3.5	3.4	
	11May05	3	1	1627.8	200	ZM	22600	0.3	0.1	
					DFM	14800	0.5	0.7		
2			735.0	200	ZM	1600	3.2	2.5		
					DFM	1400	1.5	0.8		
14Sep05	10Aug05	1	1	1841.0	200	ZM	600	0.6	0.1	
						DFM	4600	0.5	0.3	
				2	904.0	200	None			
	13Jul 05	2	1	2159.2	200	ZM	2400	0.7	0.3	
						DFM	10400	0.9	0.3	
				2	1525.2	200	ZM	200	2.5	
						DFM	200	0.7		
	15Jun05	3	1	3268.0	200	DFM	1200	2.8	1.2	
			2	1566.0	200	ZM	200	3.2		
					DFM	400	1.2	0.4		
10Mar05	6	1	3187.2	200	DFM	1800	2.5	1.6		
		2	1529.6	200	DFM	600	0.8	0.2		
17Oct05	14Sep05	1	1	204.6	200	ZM	600	1.0	0.6	
						DFM	1200	0.6	0.1	
				2	60.8	20	None			
	10Aug05	2	1	3140.2	200	ZM	200	1.6		
						DFM	200	1.2		
				2	2058.0	200	None			
	13Jul 05	3	1	2746.4	200	ZM	1800	0.8	0.1	
						DFM	2400	0.9	0.4	
				2	1386.0	200	DFM	1000	1.0	0.3
9Nov05	17Oct05	1	1	8.6	20	None				
			2	2.0	20	None				
	14Sep05	2	1	185.2	20	ZM	40	1.9	0.2	
						DFM	60	1.0	0.6	
				2	133.0	20	None			
10Aug05	3	1	4184.8	200	DFM	400	0.6	0.1		
		2	2231.6	200	ZM	200	1.3			
					DFM	400	1.0	0.3		
15Dec05	9Nov05	1	1	18.0	20	None				
			2	14.2	20	None				
	17Oct05	2	1	28.0	20	None				
			2	24.0	20	None				
	14Sep05	3	1	281.8	200	None				
			2	2921.4	200	DFM	400	1.1	0.1	
	15Jun05	6	1	3902.4	200	ZM	800	1.7	0.9	
						DFM	1800	1.5	0.8	
			2	2578.0	200	ZM	400	1.9	1.8	
						DFM	600	0.7	0.2	
	15Dec04	12	1	3060.2	200	ZM	1000	1.4	0.4	
					DFM	1800	1.7	0.7		
2			1208.4	200	ZM	200	1.1			
					DFM	600	0.9	0.1		

(continued)

Footnotes for Table 1:

Site codes: 1 = center of intake catwalk, in strong intake current
2 = north side of intake catwalk, in low-flow area

Species codes: ZM = zebra mussel (*Dreissena polymorpha*)
DFM = dark false mussel (*Mytilopsis leucophaeata*)
OB = other bivalves (including unidentified because of damage)
None = No bivalves present

^a Retrieval postponed one month due to excessive ice in January

^b Plate missing due to ice damage

^c Set postponed one month due to excessive ice in January

Table 2. Water quality data collected monthly at the Indian Point Unit 3 intake for the Zebra Mussel Monitoring Program during 2005.

Sampling Date	Surface Temp. (°C)	4-m Temp. (°C)	Conductivity (µmho)	Salinity (ppt)	Dissolved Oxygen (mg/l)	pH	Turbidity (NTU)
8Feb05	2.3	2.5	2130	2.0	13.4	7.4	35.5
10Mar05	2.4	2.5	390	0.4	13.1	7.5	22.0
13Apr05	11.1	10.9	166	0.1	11.0	7.4	59.5
11May05	16.4	16.3	300	0.2	8.6	7.4	14.5
15Jun05	23.9	23.8	1030	0.6	7.7	7.4	7.0
13Jul05	26.6	26.6	4790	2.6	5.9	7.4	9.2
10Aug05	30.3	30.2	7090	3.6	5.5	7.4	8.1
14Sep05	27.2	27.2	8210	4.5	6.2	7.5	8.1
17Oct05	17.2	16.9	301	0.2	8.5	7.4	15.1
9Nov05	10.5	10.1	181	0.1	9.2	7.4	10.3
15Dec05	3.9	4.0	127	0.1	12.0	7.4	31.5

Sampling was conducted at 4 meters depth for all parameters and at the surface for temperature only. No water quality data were collected in January due to excessive ice.

Table 3. Density, length, and biomass of bivalves on settlement plates in bioboxes sampling chlorinated service water at Indian Point for the Zebra Mussel Monitoring Program during 2005.

Date Collected	Date Set	Exposure Duration (Months)	Site	Biomass (g/m ²)	Detection Limit (no./m ²)	Species	Density (no./m ²)	Length (mm)	
								Mean	S.D.
26Jan05	15Dec04	1	3	3.0	20	None			
			4	4.0	20	None			
	16Nov04	2	5	0.4	20	None			
			6	3.0	20	None			
8Feb05	26Jan05	1	3	16.0	20	None			
			4	6.0	20	None			
			5 ^a						
			6 ^a						
10Mar05	8Feb05	1	3	10.6	20	None			
			4	12.6	20	None			
	26Jan05	2	5	4.2	20	None			
			6	9.6	20	None			
13Apr05	10Mar05	1	3	8.2	20	None			
			4	9.4	20	None			
			5	18.2	20	None			
			6	11.8	20	None			
11May05	13Apr05	1	3	1.0	20	None			
			4	1.6	20	None			
			5	1.4	20	None			
			6 ^b						
15Jun05	11May05	1	3	4.0	20	None			
			4 ^c						
			5	1.8	20	None			
			6 ^b						
13Jul05	15Jun05	1	3	6.6	20	None			
			4 ^c	6.4	20	None			
		0.75	5 ^a						
			6 ^a						
10Aug05	13Jul05	1	3	4.8	20	None			
			4	1.8	20	None			
		2	5	9.8	20	None			
			6 ^a						
14Sep05	10Aug05	1	3	1.8	20	None			
			4	3.4	20	None			
			5	10.6	20	None			
			6	13.0	20	None			
17Oct05	14Sep05	1	3	2.2	20	None			
			4	1.0	20	None			
			5	7.6	20	None			
			6 ^a						
9Nov05	17Oct05	0.75	3	18.4	20	None			
			4	1.0	20	None			
16Nov05	17Oct05	1	5	1.6	20	None			
			6 ^a						
15Dec05	9Nov05	1.25	3	5.8	20	None			
			4	11.6	20	None			
15Dec05	16Nov05	1	5	4.6	20	None			
			6 ^a						

(continued)

Footnotes for Table 3:

Site codes: 3 = Unit 3 chemistry room
 4 = Unit 3 central control air conditioning room
 5 = Unit 2 Monitor #1
 6 = Unit 2 Monitor #2

Species codes: ZM = zebra mussel (*Dreissena polymorpha*)
 DFM = dark false mussel (*Mytilopsis leucophaeata*)
 OB = other bivalves (including unidentified because of damage)
 None = No bivalves present

- ^a Sample scheduled for collection by Entergy personnel from Unit 2 was not collected.
- ^b Site 6 sample was not collected in May or June because the biobox was clogged and there was no flow through it.
- ^c Site 4 sample could not be processed in June because the biobox had gone dry. Flow was restored 22 June.

address for Vic Nutter copy (regular mail):

Mr. Vic Nutter
Entergy Nuclear Operations, Inc.
440 Hamilton Avenue
White Plains, New York 10601-5029

Ref. No. 20407.001
20 December 2006
(sent by e-mail)

Ms. Dara Gray
Entergy Nuclear Northeast
Indian Point 3 NPP
P.O. Box 306
Buchanan, New York 10501

Dear Ms. Gray,

This report presents the **December** sampling results for the Indian Point Zebra Mussel Monitoring Program, conducted by Normandeau Associates for Entergy (contract 4500522928). Monthly settlement plate sampling was conducted on 12 December 2006 at Sites 1- 4 (Unit 3). Entergy did not retrieve the Site 5 or Site 6 settlement plates due to a lack of flow to the bioboxes, which cannot be rectified until there is a plant outage. Cumulative results for calendar year 2006 are summarized in Table 1 (Unit 3 intake plates), Table 2 (Unit 3 intake water quality), and Table 3 (Unit 3 and Unit 2 biobox plates).

No zebra mussels (*Dreissena polymorpha*) or dark false mussels (*Mytilopsis leucophaeata*) were observed on 1-month, 2-month, or 3-month settling plates collected in front of the Unit 3 intake in December, but both species were present in low numbers on settling plates that had been exposed for 6 months and 12 months. The observed densities on the 6-month plates and 12-month plates were low compared to densities observed in August and September. The lack of settled mussels on the plates exposed for three months or less and the sizes of the mussels on the plates exposed for 6 and 12 months (0.5-2.2 mm) indicate that the mussels had not settled recently. There were no settled mussels on the biobox plates from Unit 3.

If you have any questions, please call me at 603-472-5191.

Sincerely,

NORMANDEAU ASSOCIATES INC.
B. Paul Lindsay
Program Manager

Cc: Vic Nutter
Mark Mattson

Table 1. Density, length, and biomass of bivalves on settlement plates collected at the Indian Point Unit 3 intake catwalk for the Zebra Mussel Monitoring Program during 2006.

Date Collected	Date Set	Exposure Duration (Months)	Site	Biomass (g/m ²)	Detection Limit (no./m ²)	Species	Length (mm)			
							Density (no./m ²)	Mean	S.D.	
11Jan06	15Dec05	1	1	7.8	20	None				
			2	4.2	20	None				
	9Nov05	2	1	11.4	20	None				
			2	4.4	20	None				
	17Oct05	3	1	10.4	20	None				
			2	11.2	20	None				
15Feb06	11Jan06	1	1	3.0	20	None				
			2	5.8	20	None				
	15Dec05	2	1	3.6	20	None				
			2	8.2	20	None				
	9Nov05	3	1	8.2	20	None				
			2	9.2	20	None				
15Mar06	15Feb06	1	1	20.2	20	None				
			2	17.2	20	None				
	11Jan06	2	1	15.4	20	None				
			2	1.2	20	None				
	15Dec05	3	1	26.6	20	None				
			2	17.8	20	None				
14Sep05	6	1 ^a								
13Apr06	15Mar06	1	1	13.6	20	None				
			2	6.8	20	None				
	15Feb06	2	1	4.8	20	None				
			2	12.2	20	None				
	11Jan06	3	1	6.2	20	None				
			2	10.4	20	None				
17May06	13Apr06	1	1	8.4	20	None				
			2	6.8	20	None				
	15Mar06	2	1	8.6	20	None				
			2	2.4	20	None				
	15Feb06	3	1	7.8	20	None				
			2	5.6	20	None				
14Jun06	17May06	1	1	22.8	20	None				
			2	8.4	20	None				
	13Apr06	2	1	10.6	20	None				
			2	15.8	20	None				
	15Mar06	3	1	26.0	20	None				
			2	12.8	20	None				
15Dec05	6	1	22.4	20	None					
15Jun05	12	1				DFM	20	0.3		
		2				DFM	600	1.9	0.3	
10Jul06	14Jun06	1	1	12.2	20	None				
			2	7.8	20	ZM	40	0.4	0.1	
	17May06	2	1		23.0	20	ZM	80	0.8	0.1
							DFM	140	0.6	0.2
							ZM	80	0.7	0.3
							DFM	40	0.6	0.1
	13Apr06	3	1		119.0	20	ZM	760	0.7	0.2
							DFM	320	0.6	0.2
							ZM	200	0.8	0.1
							DFM	100	0.6	0.1
		2	57.0	20						

(continued)

Table 1 (continued)

Date Collected	Date Set	Exposure Duration (Months)	Site	Biomass (g/m ²)	Detection Limit (no./m ²)	Species	Density (no./m ²)	Length (mm)		
								Mean	S.D.	
25Aug06	10Jul06	1	1	405.6	200	ZM	1000	0.4	0.2	
			2	27.0	20	ZM	60	0.8	0.4	
	14Jun06	2	1	612.2	200	ZM	400	0.6	0.1	
						DFM	600	2.3	2.3	
				2	184.0	200	ZM	2200	0.5	0.2
	17May06	3	1	1124.2	200	ZM	600	0.4	0.1	
						DFM	400	0.8	0.1	
				2	194.6	200	ZM	1600	1.0	1.3
							DFM	1800	0.3	0.3
26Sep06	25Aug06	1	1	185.2	200	None				
			2	87.6	20	None				
	10Jul06	2	1	707.0	200	ZM	1600	0.6	0.3	
						DFM	1000	0.4	0.2	
				2	625.0	200	ZM	2000	0.6	0.2
							DFM	1400	0.4	0.2
	14Jun06	3	1	682.0	200	ZM	800	0.6	0.2	
						DFM	200	0.5		
				2	1267.4	200	ZM	1600	0.5	0.2
							DFM	1000	0.3	0.1
	15Mar06	6	1	1614.2	200	ZM	400	1.2	1.0	
						DFM	800	0.7	0.3	
2				1128.6	200	ZM	1400	0.7	0.4	
						DFM	1000	0.6	0.6	
18Oct06	26Sep06	1	1	17.2	20	None				
			2	11.0	20	None				
	25Aug06	2	1	998.6	200	ZM	400	0.5	0.2	
						DFM	600	0.6	0.1	
				2	237.0	200	None			
					1	1709.4	200	ZM	600	1.0
	10Jul06	3	2	593.8	200	ZM	200	0.5		
						DFM	400	0.9	0.1	
15Nov06	18Oct06	1	1	12.8	20	None				
			2	5.8	20	None				
	26Sep06	2	1	12.2	20	None				
			2	10.8	20	None				
	25Aug06	3	1	2574.0	200	DFM	200	0.6		
			2	300.2	200	None				
12Dec06	15Nov06	1	1	6.0	20	None				
			2	6.4	20	None				
	18Oct06	2	1	7.0	20	None				
			2	9.6	20	None				
	26Sep06	3	1	32.0	20	None				
			2	5.4	20	None				
	14Jun06	6	1	2560.2	200	ZM	400	1.7	0.7	
						DFM	600	0.6	0.1	
				2	914.4	200	ZM	1200	1.1	0.2
							DFM	600	1.0	0.4
							DFM	600	1.0	0.4
15Dec05	12	1	4347.2	200	ZM	800	1.0	0.4		
					DFM	400	0.8	0.1		
			2	2020.0	200	ZM	200	1.7		
						DFM	200	1.5		

Footnotes for Table 1:

Site codes: 1 = center of intake catwalk, in strong intake current
2 = north side of intake catwalk, in low-flow area

Species codes: ZM = zebra mussel (*Dreissena polymorpha*)
DFM = dark false mussel (*Mytilopsis leucophaeata*)
OB = other bivalves (including unidentified because of damage)
None = No bivalves present

^a Plate missing

Table 2. Water quality data collected monthly at the Indian Point Unit 3 intake for the Zebra Mussel Monitoring Program during 2006.

Sampling Date	Surface Temp. (°C)	4-m Temp. (°C)	Conductivity (µmho)	Salinity (ppt)	Dissolved Oxygen (mg/l)	pH	Turbidity (NTU)
11Jan06	3.3	3.2	154	0.1	12.5	7.3	20.9
15Feb06	3.2	3.2	920	0.9	13.0	7.5	18.6
15Mar06	3.8	3.7	1519	1.4	11.5	7.3	18.4
13Apr06	10.0	9.9	3190	2.5	10.1	7.3	18.1
17May06	15.9	15.7	2550	1.7	8.8	7.4	19.1
14Jun06	20.9	20.8	305	0.2	7.7	7.4	17.9
10Jul06	23.9	23.5	1325	0.8	6.1	7.4	18.9
25Aug06	27.3	27.2	7979	4.4	7.0	7.4	7.8
26Sep06	23.3	23.4	4190	2.4	6.5	7.4	10.1
18Oct06	19.0	18.9	2610	1.7	6.8	7.3	7.5
15Nov06	11.6	11.5	605	0.5	10.6	7.4	14.5
12Dec06	8.6	8.5	137	0.1	10.6	7.3	24.9

Sampling was conducted at 4 meters depth for all parameters and at the surface for temperature only.

Table 3. Density, length, and biomass of bivalves on settlement plates in bioboxes sampling chlorinated service water at Indian Point for the Zebra Mussel Monitoring Program during 2006.

Date Collected	Date Set	Exposure Duration (Months)	Site	Biomass (g/m ²)	Detection Limit (no./m ²)	Species	Density (no./m ²)	Length (mm)	
								Mean	S.D.
11Jan06	15Dec05	1	3	2.8	20	None			
			4	4.4					
			5	3.2					
			6 ^a						
15Feb06	11Jan06	1	3	7.2	20	None			
			4	9.0					
			5	2.4					
			6 ^a						
15Mar06	15Feb06	1	3	4.2	20	None			
			4	4.0					
			5 ^a						
			6 ^a						
13Apr06	15Mar06	1	3	0.6	20	None			
			4	2.6					
			5 ^a						
			6 ^a						
17May06	13Apr06	1	3	3.6	20	None			
			4	2.2					
			5 ^a						
			6 ^a						
14Jun06	17May06	1	3	1.0	20	None			
			4	1.6					
			5 ^a						
			6 ^a						
10Jul06	14Jun06	1	3	5.2	20	None			
			4	5.6					
			5 ^a						
			6 ^a						
25Aug06	10Jul06	1	3	3.8	20	None			
			4	6.6					
			5 ^a						
			6 ^a						
26Sep06	25Aug06	1	3	2.4	20	None			
			4	3.2					
			5 ^a						
			6 ^a						
18Oct06	26Sep06	1	3	4.6	20	None			
			4	2.2					
			5 ^a						
			6 ^a						
15Nov06	18Oct06	1	3	4.8	20	None			
			4	1.8					
			5 ^a						
			6 ^a						

(continued)

Table 3. (Continued)

Date Collected	Date Set	Exposure Duration (Months)	Site	Biomass (g/m ²)	Detection Limit (no./m ²)	Species	Density (no./m ²)	Length (mm)
12Dec06	15Nov06	1	3	8.2	20	None		
			4	12.0	20	None		
			5 ^a					
			6 ^a					

Footnotes for Table 3:

Site codes: 3 = Unit 3 chemistry room
4 = Unit 3 central control air conditioning room
5 = Unit 2 Monitor #1
6 = Unit 2 Monitor #2

Species codes: ZM = zebra mussel (*Dreissena polymorpha*)
DFM = dark false mussel (*Mytilopsis leucophaeata*)
OB = other bivalves (including unidentified because of damage)
None = No bivalves present

^a Sample scheduled for collection by Entergy personnel from Unit 2 was not collected.



NORMANDEAU ASSOCIATES INC.
ENVIRONMENTAL CONSULTANTS

Ref. No. 20407.002
7 January 2008
(sent by e-mail)

Ms. Dara Gray
Entergy Nuclear Northeast
Indian Point 3 NPP
P. O. Box 306
Buchanan, New York 10501

Dear Ms. Gray,

This report presents the **December** sampling results for the Indian Point Zebra Mussel Monitoring Program, conducted by Normandeau Associates for Entergy (contract 10150496). Monthly settlement plate sampling was conducted on 18 December 2007 at Sites 1 and 2 (Unit 3 intake) and Sites 3 and 4 (Unit 3 bioboxes). Entergy did not retrieve the Site 5 or Site 6 settlement plates due to a lack of flow to the bioboxes, which cannot be recified until there is a plant outage. Cumulative results for calendar year 2007 are summarized in Table 1 (Unit 3 intake plates), Table 2 (Unit 3 intake water quality), and Table 3 (Unit 3 and Unit 2 biobox plates).

In December, zebra mussels (*Dreissena polymorpha*) and dark false mussels (*Mytilopsis leucophaeata*) were present in low numbers on some of the settling plates exposed for three or more months in front of the Unit 3 intake, with densities ranging up to 600/m² for the two species combined. No mussels of either species were found on settling plates exposed for only one or two months. All settled mussels were fairly small (less than 3 mm long), indicating relatively recent settlement. Sizes ranged from 0.9 to 2.7 mm for zebra mussels and from 0.8 to 2.1 mm for dark false mussels. No mussels of either species were observed on the one-month intake settling plates or on the Unit 3 biobox settling plates.

If you have any questions, please contact me by e-mail at plindsay@normandeau.com or by phone at 603-637-1149 (new direct line).

Sincerely,

NORMANDEAU ASSOCIATES INC.
B. Paul Lindsay
Program Manager

Cc: Rick Buckley
Mark Mattson

Table 1. Density, length, and biomass of bivalves on settlement plates collected at the Indian Point Unit 3 intake catwalk for the Zebra Mussel Monitoring Program during 2007.

Date Collected	Date Set	Exposure Duration (Months)	Site	Biomass (g/m ²)	Detection Limit (no./m ²)	Species	Density (no./m ²)	Length (mm)	
								Mean	S.D.
9Jan07	12Dec06	1	1	6.0	20	None			
			2	5.0	20	None			
	15Nov06	2	1	3.0	20	None			
12Feb07	18Oct06	3	1	2.8	20	None			
			2	3.8	20	None			
			2	2.6	20	None			
20Apr07	9Jan06	1	1 ^a	7.8	20	None			
			2	4.2	20	None			
	12Dec06	2	1	4.2	20	None			
9Jan06	15Nov06	3	2	5.0	20	None			
			1	4.2	20	None			
			2	4.4	20	None			
21May07	12Feb07	2	1 ^b	4.2	20	None			
			2 ^b	5.6	20	None			
			1	5.4	20	None			
12Dec06			2	9.5	20	None			
			1 ^b	2.2	20	None			
			2 ^b	5.8	20	None			
26Sep06			1	3.4	20	None			
			2	8.2	20	None			
			1 ^b	24.6	20	None			
21May07	12Dec06	4	1 ^b	11.6	20	None			
			2 ^b	24.2	20	None			
			1 ^b	13.0	20	None			
15Jun07	20Apr07	1	1	6.2	20	None			
			2	3.8	20	None			
			1 ^c	7.0	20	None			
20Apr07			2 ^c	4.4	20	None			
			1	15.2	20	None			
			2	4.2	20	None			
12Feb07			1	13.6	20	None			
			2	26.6	20	None			
			1	26.2	20	None			
11Jun07	20Apr07	2	2	20.0	20	None			
			1 ^c	21.0	20	None			
			2 ^c	24.0	20	None			
14Jun06	12Dec06	6	1	14.2	20	None			
			2	16.2	20	None			
			1	790.4	200	DFM	200	0.3	
20Apr07	11Jun07	12	2	764.0	200	None			
			1	380.2	200	None			
			2	98.7	20	None			
12Feb07	21May07	2	1	1326.8	200	None			
			2	375.8	200	None			
			1	985.0	200	DFM	200	0.4	
20Apr07			2	553.2	200	None			

(continued)

Table 1. (Continued)

Date Collected	Date Set	Exposure Duration (Months)	Site	Biomass (g/m ²)	Detection Limit (no./m ²)	Species	Density (no./m ²)	Length (mm)	
								Mean	S.D.
14Aug07	11Jul07	1	1	488.4	200	ZM	3600	0.3	0.1
				DFM	3000	0.3	0.2		
				ZM	1000	0.7	0.4		
15Jun07	2	1	1	900.4	200	DFM	400	0.7	0.8
				ZM	3200	0.5	0.2		
				DFM	6400	0.4	0.3		
21May07	3	1	1	561.0	200	ZM	3600	0.4	0.3
				DFM	2800	0.3	0.3		
				ZM	3000	0.6	0.5		
12Sep07	14Aug07	1	1	1751.0	200	DFM	3600	0.5	0.4
				ZM	1400	0.5	0.2		
				DFM	1000	0.3	0.1		
11Jul07	2	1	1	553.6	200	ZM	1000	0.3	0.1
				DFM	3000	0.2	0.1		
				None					
15Jun07	3	1	1	325.0	200	ZM	1200	0.7	0.9
				DFM	1600	0.3	0.1		
				ZM	600	0.5	0.1		
20Apr07	5	1	1	642.4	200	DFM	600	0.4	0.2
				ZM	1200	0.3	0.1		
				DFM	400	0.3	0.0		
22Oct07	12Sep07	1	1	1599.0	200	ZM	1200	0.9	0.3
				DFM	400	0.8	0.8		
				ZM	1000	0.2	0.1		
14Aug07	2	1	1	885.4	200	DFM	600	0.2	0.1
				ZM	400	0.7	0.5		
				DFM	200	0.5	0.1		
11Jul07	3	1	1	1764.0	200	ZM	400	0.7	0.5
				DFM	600	0.2	0.1		
				ZM	400	0.7	0.5		
19Nov07	22Oct07	1	1	1492.4	200	DFM	200	0.5	
				ZM	400	0.4	0.1		
				DFM	800	0.4	0.2		
14Aug07	2	1	1	838.8	200	ZM	1000	0.3	0.1
				DFM	400	0.3	0.1		
				ZM	600	0.3	0.1		
11Jul07	3	1	1	401.0	200	DFM	600	0.6	0.3
				ZM	2000	0.6	0.3		
				DFM	1600	0.6	0.3		
14Aug07	2	1	2	2500.4	200	ZM	400	0.8	0.4
				DFM	400	0.8	0.4		
				ZM	200	0.8	0.8		
11Jul07	3	1	1	1400.8	200	DFM	200	0.8	0.2
				ZM	600	0.8	0.2		
				DFM	800	0.5	0.2		
19Nov07	22Oct07	1	1	1171.8	200	ZM	600	1.0	0.6
				DFM	800	1.0	0.6		
				ZM	600	0.8	0.5		
12Sep07	2	1	2	640.4	200	DFM	1200	0.8	0.5
				ZM	200	0.8	0.5		
				DFM	200	0.8	0.5		
14Aug 07	3	1	1	2.4	20	None			
				3.0	20	None			
				869.4	200	ZM	200	0.8	
14Aug 07	3	1	1	360.6	200	DFM	200	0.7	0.1
				DFM	600	0.7	0.1		
				ZM	200	0.6			
14Aug 07	3	1	1	2381.8	200	DFM	200	0.9	
				ZM	200	0.9			
				DFM	400	0.4	0.1		
14Aug 07	3	1	2	1167.4	200	None			
				ZM	200	0.4	0.1		
				DFM	400	0.4	0.1		

(continued)

Table 1. (Continued)

Date Collected	Date Set	Exposure Duration (Months)	Site	Biomass (g/m ²)	Detection Limit (no./m ²)	Species	Density (no./m ²)	Length (mm)	S.D.
18Dec07	19Nov07	1	1	3.6	20	None			
			2	8.2	20	None			
	22Oct07	2	1	5.0	20	None			
			2	7.2	20	None			
	12Sep07	3	1	1013.0	200	DFM	200	0.8	
			2	650.4	200	None			
	15Jun07	6	1	1992.6	200	DFM	200	2.1	
			2	2402.0	200	ZM	400	1.8	1.3
	12Dec06	12	1	1678.6	200	ZM	200	1.8	
			2	2673.2	200	DFM	400	0.8	0.0
						ZM	200	1.7	

Site codes: 1 = center of intake catwalk, in strong intake current

2 = north side of intake catwalk, in low-flow area

Species codes: ZM = zebra mussel (*Dreissena polymorpha*)

DFM = dark false mussel (*Mytilopsis leucophaeata*)

OB = other bivalves (including unidentified because of damage)

None = No bivalves present

^a Plate missing

^b Duration one month longer than scheduled due to cancelled March sampling (hazardous conditions)

^c Duration one month shorter than scheduled due to cancelled March sampling (deployed one month late)

Table 2. Water quality data collected monthly at the Indian Point Unit 3 intake for the Zebra Mussel Monitoring Program during 2007.

Sampling Date	Surface	4-m	Conductivity (µmho)	Salinity (ppt)	Dissolved			Turbidity (NTU)
	Temp. (°C)	Temp. (°C)			Oxygen (mg/l)	pH		
9Jan07	4.8	4.7	133	0.1	10.9	7.4	19.5	
12Feb07	0.7	0.7	152	0.2	12.9	7.3	19.9	
20Apr07	5.4	5.2	120	0.1	10.8	7.3	52.5	
21May07	16.0	15.7	300	0.2	9.8	7.3	14.4	
15Jun07	22.6	22.5	3370	2.0	6.8	7.4	15.9	
11Jul07	26.0	26.1	7560	4.2	5.6	7.3	6.0	
14Aug07	27.7	27.7	1030	0.5	6.5	7.3	7.6	
12Sep07	26.6	26.6	12120	6.8	6.0	7.4	7.5	
22Oct07 ^a	21.1	20.9	9950	6.2	7.4	7.5	9.0	
19Nov07	12.3	12.4	3950	2.9	9.0	7.4	10.9	
18Dec07	5.9	5.8	2120	1.8	11.9	7.4	14.5	

Sampling was conducted at 4 meters depth for all parameters and at the surface for temperature only. Intake sampling was not conducted in March due to hazardous conditions.

^a Settlement plate samples were collected on 22Oct by Entergy. Water quality measurements to represent that sample collection were taken within two miles of Indian Point Station, on 23Oct (temperature, dissolved oxygen, and conductivity at 7.6 m depth, plus surface temperature) and on 24Oct (pH and turbidity at 3 m depth).

Table 3. Density, length, and biomass of bivalves on settlement plates in bioboxes sampling chlorinated service water at Indian Point for the Zebra Mussel Monitoring Program during 2007.

Date Collected	Date Set	Exposure Duration (Months)	Site	Biomass (g/m ²)	Detection Limit (no./m ²)	Species	Density (no./m ²)	Length (mm)	
								Mean	S.D.
9Jan07	12Dec06	1	3	3.0	20	None			
			4	5.4	20	None			
			5 ^a						
			6 ^a						
12Feb07	9Jan07	1	3	5.6	20	None			
			4	4.4	20	None			
			5 ^a						
			6 ^a						
20Mar07	12Feb07	1	3	4.8	20	None			
			4	3.6	20	None			
			5 ^a						
			6 ^a						
17Apr07	20Mar07	1	3	2.8	20	None			
			4	2.6	20	None			
			5 ^a						
			6 ^a						
21May07	17Apr07	1	3	2.6	20	None			
			4	3.8	20	None			
			5 ^a						
			6 ^a						
15Jun07	21May07	1	3	4.8	20	None			
			4	5.8	20	None			
			5 ^a						
			6 ^a						
11Jul07	15Jun07	1	3	6.8	20	None			
			4	11.0	20	None			
			5 ^a						
			6 ^a						
14Aug07	11Jul07	1	3	3.4	20	None			
			4	2.6	20	None			
			5 ^a						
			6 ^a						
12Sep07	14Aug07	1	3	6.0	20	None			
			4	8.0	20	None			
			5 ^a						
			6 ^a						
22Oct07	12Sep07	1	3	3.6	20	None			
			4	3.0	20	None			
			5 ^a						
			6 ^a						
19Nov07	22Oct07	1	3	5.0	20	None			
			4	2.0	20	None			
			5 ^a						
			6 ^a						

(continued)

Table 3. (Continued)

Date Collected	Date Set	Exposure Duration (Months)	Site	Biomass (g/m ²)	Detection Limit (no./m ²)	Species	Density (no./m ²)	Length (mm)	Mean	S.D.
18Dec07	19Nov07	1	3	4.2	20	None				
			4	7.6	20	None				
			5 ^a							
			6 ^a							

Site codes: 3 = Unit 3 chemistry room

4 = Unit 3 central control air conditioning room

5 = Unit 2 Monitor #1

6 = Unit 2 Monitor #2

Species codes:

ZM = zebra mussel (*Dreissena polymorpha*)

DFM = dark false mussel (*Mytilopsis leucophaeata*)

OB = other bivalves (including unidentified because of damage)

None = No bivalves present

^a Sample scheduled for collection by Entergy personnel from Unit 2 was not collected.



NORMANDEAU ASSOCIATES INC.
ENVIRONMENTAL CONSULTANTS

Ref. No. 20407.003
5 January 2009
(sent by e-mail)

Ms. Dara Gray
Entergy Nuclear Northeast
Indian Point 3 NPP
P.O. Box 306
Buchanan, New York 10501

Dear Ms. Gray,

This report presents the **December** sampling results for the Indian Point Zebra Mussel Monitoring Program, conducted by Normandeau Associates for Entergy (contract 10150496). Monthly settlement plate sampling was conducted on 18 December 2008 at Sites 1 and 2 (Unit 3 intake). The settlement plates at Sites 3 and 4 (Unit 3 bioboxes) were collected, although the water flow had been shut off some time before they were collected. Entergy did not retrieve the settlement plates at Sites 5 and 6 (Unit 2 bioboxes) due to a lack of flow to the bioboxes. Cumulative results for calendar year 2008 are summarized in Table 1 (Unit 3 intake plates), Table 2 (Unit 3 intake water quality), and Table 3 (Unit 3 and Unit 2 biobox plates).

In December, zebra mussels (*Dreissena polymorpha*) and dark false mussels (*Mytilopsis leucophaeata*) were observed in low numbers on the three-month, six-month, and twelve-month settlement plates from Site 2 at the Unit 3 intake. Densities ranged from 200 to 2,200 zebra mussels and from 200 to 2,000 dark false mussels per square meter, with the lowest densities on the three-month plates. Sizes ranged from 0.4 to 6.5 mm for zebra mussels and from 0.5 to 6.7 for dark false mussels, with 58% of zebra mussels and 57% of false dark mussels ≥ 1.0 mm. No settled mussels were present on exposure plates from the Unit 3 bioboxes.

If you have any questions, please contact me by e-mail at plindsay@normandeau.com or by phone at 603-637-1149.

Sincerely,

NORMANDEAU ASSOCIATES INC.
B. Paul Lindsay
Program Manager

Cc: Rick Buckley
Mark Mattson

Table 1. Density, length, and biomass of bivalves on settlement plates collected at the Indian Point Unit 3 intake catwalk for the Zebra Mussel Monitoring Program during 2008.

Date Collected	Date Set	Exposure Duration (Months)	Site	Biomass (g/m ²)	Detection Limit (no./m ²)	Species	Length (mm)	
							Density (no./m ²)	Mean
30Jan08	18Dec07	1	1 ^a					
			2	5.2	20	None		
	19Nov07	2	1 ^a					
			2	5.0	20	None		
22Oct07	3	1 ^a						
		2	15.0	20	None			
21Feb08	30Jan08	1	2 ^b					
	18Dec07	2	1 ^{a,b}					
			2 ^b					
	19Nov07	3	1 ^{a,b}					
2 ^b								
22Oct07	4	1 ^{a,b}						
26Mar08	30Jan08	2	2 ^c	23.0	20	None		
			2	2.6	20	None		
	18Dec07	3	1 ^d	55.1	20	None		
			1 ^c	15.0	20	None		
			1	57.0	20	None		
			2 ^c	11.6	20	None		
	19Nov07	4	2	5.0	20	None		
			1 ^d	17.4	20	None		
			1 ^c	20.6	20	None		
			2 ^c	1.6	20	None		
	22Oct07	5	1 ^d	40.4	20	None		
			1	1462.0	200	None		
12Sep07	6	2	1977.2	200	None			
15Apr08	26Mar08	1	1	9.0	20	None		
			2	14.8	20	None		
			1 ^e	5.0	20	None		
			2 ^e	9.4	20	None		
			1 ^f	5.8	20	None		
			2	937.0	200	None		
15May08	15Apr08	1	1	3.2	20	None		
			2	8.2	20	None		
	26Mar08	2	1	4.6	20	None		
			2	5.6	20	None		
			1 ^e	5.4	20	None		
			2 ^e	5.2	20	None		
17Jun08	15May08	1	1	39.0	20	None		
			2	11.8	20	None		
	15Apr08	2	1	8.8	20	None		
			2	11.6	20	None		
	26Mar08	3	1	8.0	20	None		
			2	21.6	20	None		
	18Dec07	6	1	50.6	20	None		
			2	10.8	20	None		
	15Jun07	12	1	2068.0	200	None		
			2	1207.0	200	None		

(continued)

Table 1. (Continued)

Date Collected	Date Set	Exposure Duration (Months)	Site	Biomass (g/m ²)	Detection Limit (no./m ²)	Species	Density (no./m ²)	Length (mm)				
								Mean	S.D.			
16Jul08	17Jun08	1	1	224.2	200	None						
			2	206.4	200	None						
	15May08	2	1	629.4	200	None						
			2	313.2	200	None						
	15Apr08	3	1 ^g									
			2	298.0	200	ZM DFM	400 200	0.6 2.7	0.1			
13Aug08	16Jul08	1	1	44.8	20	ZM DFM	400 260	0.6 0.4	0.2 0.2			
			2	47.6	20	ZM DFM	1700 1140	0.5 0.4	0.3 0.2			
			17Jun08	2	1	1451.2	200	ZM DFM	8200 6400	0.5 0.5	0.2 0.3	
					2	411.6	200	ZM DFM	6200 5600	0.5 0.4	0.3 0.2	
	15May08	3	1		104.2	200	ZM DFM	800 1000	0.8 0.5	0.3 0.2		
				2	625.2	200	ZM DFM	2800 1800	0.4 0.5	0.2 0.2		
				15Sep08	13Aug08	1	1 ^g					
							2	85.4	20	ZM DFM	740 820	0.7 0.5
	16Jul08	2	1 ^g	2	298.6	200	ZM DFM	3400 5400	0.7 0.7	0.4 0.4		
				17Jun08	3	1 ^g	2	907.2	200	ZM DFM	2000 2600	0.8 0.8
		26Mar08	6				1 ^g	2	548.8	200	ZM DFM	2200 3600
				16Oct08	24Sep08	1		1	8.0	20	None	
2	94.6	20	DFM				20	0.6				
13Aug08	2	1 ^g	2		486.8	200	ZM DFM	800 400	0.5 0.9	0.1 0.4		
			16Jul08		3	1 ^g	2	3468.2	200	ZM DFM	600 1000	0.8 0.9
12Nov08	16Oct08	1					1	0.4	20	None		
			1 ^h		0.6	20	None					
			2	5.4	20	None						
	24Sep08	2	1		0.6	20	None					
				2	254.2	200	ZM DFM	200 400	1.2 0.8	0.4		
	13Aug08	3	2		1817.8	200	ZM DFM	800 2000	0.7 0.9	0.4 0.3		

(continued)

Table 1. (Continued)

Date Collected	Date Set	Exposure Duration (Months)	Site	Biomass (g/m ²)	Detection Limit (no./m ²)	Species	Density (no./m ²)	Length (mm)	
								Mean	S.D.
18Dec08	12Nov08	1	1	1.0	20	None			
			2	8.8	20	None			
	16Oct08	2	1	1.6	20	None			
			1 ^h	1.2	20	None			
			1 ^h	1.6	20	None			
			2	7.6	20	None			
			2	7.2	20	None			
24Sep08	3		1	7.2	20	None			
			2	273.8	200	ZM	200	1.2	
	17Jun08	6	2	1137.6	200	ZM	1400	1.8	2.2
						DFM	2400	2.0	1.8
18Dec07	12		2	2679.4	200	ZM	2200	1.0	0.4
						DFM	1600	0.8	0.3

Footnotes for Table 1:

Site codes: 1 = center of intake catwalk, in strong intake current
2 = north side of intake catwalk, in low-flow area

Species codes: ZM = zebra mussel (*Dreissena polymorpha*)
DFM = dark false mussel (*Mytilopsis leucophaeata*)
OB = other bivalves (including unidentified because of damage)
None = No bivalves present

^a Not collected: access was denied due to security restrictions

^b Not collected: guard was not able to open the frozen lock

^c Collection delayed 1 month due to missed February collection

^d Collection delayed 2 months due to missed January and February collections

^e Set was delayed 1 month due to missed February collection

^f Set was delayed 2 months due to missed January and February collections

^g Not collected: the entire Site 1 settlement plate rack was missing on 15Sep

^h Duration was shortened due to missing Site 1 settlement plate rack on 15Sep (plate was reset on 16Oct)

Table 2. Water quality data collected monthly at the Indian Point Unit 3 intake for the Zebra Mussel Monitoring Program during 2008.

Sampling Date	Surface Temp. (°C)	4-m Temp. (°C)	Conductivity (µmho)	Salinity (ppt)	Dissolved Oxygen (mg/l)	pH	Turbidity (NTU)
30Jan08	3.4	3.4	910	0.8	12.4	7.4	17.5
26Mar08	6.1	5.9	140	0.1	12.4	7.4	22.5
15Apr08	9.8	9.2	195	0.2	11.1	7.4	15.5
15May08	16.0	15.8	138	0.1	8.5	7.4	14.5
17Jun08	24.2	24.1	6405	3.7	8.5	7.4	9.5
16Jul08	27.4	27.4	6650	3.6	7.6	7.4	5.1
13Aug08	26.3	26.2	3690	2.0	5.8	7.4	8.9
15Sep08	25.9	26.0	5300	2.9	5.5	7.4	9.3
16Oct08	20.5	20.5	9700	6.1	6.5	7.4	9.1
12Nov08	12.4	12.4	4990	3.7	9.6	7.4	9.1
18Dec08	4.0	4.0	130	0.1	11.1	7.4	9.1

Sampling was conducted at 4 meters depth for all parameters and at the surface for temperature only.

No sampling was conducted at the Unit 3 intake in February because the guard could not open the locked gate.

Table 3. Density, length, and biomass of bivalves on settlement plates in bioboxes sampling chlorinated service water at Indian Point for the Zebra Mussel Monitoring Program during 2008.

Date Collected	Date Set	Exposure Duration (Months)	Site	Biomass (g/m ²)	Detection Limit (no./m ²)	Species	Density (no./m ²)	Length (mm)	
								Mean	S.D.
30Jan08	18Dec07	1	3	3.8	20	None			
			4	4.4					
			5 ^a						
			6 ^a						
21Feb08	30Jan08	1	3	0.6	20	None			
			4	0.8					
			5 ^a						
			6 ^a						
26Mar08	21Feb08	1	3	2.4	20	None			
			4	2.0					
			5 ^a						
			6 ^a						
15Apr08	26Mar08	1	3	1.2	20	None			
			4	0.8					
			5 ^a						
			6 ^a						
15May08	15Apr08	1	3	1.2	20	None			
			4	0.6					
			5 ^a						
			6 ^a						
17Jun08	15May08	1	3	0.8	20	None			
			4	0.6					
			5 ^a						
			6 ^a						
16Jul08	17Jun08	1	3	2.2	20	None			
			4	12.0					
			5 ^a						
			6 ^a						
13Aug08	16Jul08	1	3	2.8	20	None			
			4	3.4					
			5 ^a						
			6 ^a						
15Sep08	13Aug08	1	3	1.4	20	None			
			4	18.0					
			5 ^a						
			6 ^a						
15Oct08	15Sep08	1	3	1.0	20	None			
			4	1.0					
			5 ^a						
			6 ^a						
12Nov08	15Oct08	1	3	0.6	20	None			
			4	2.8					
			5 ^a						
			6 ^a						

(continued)

Table 3. (Continued)

Date Collected	Date Set	Exposure Duration (Months)	Site	Biomass (g/m ²)	Detection Limit (no./m ²)	Species	Density (no./m ²)	Length (mm)	
								Mean	S.D.
18Dec08	12Nov08	1	3 ^b	1.0	20	None			
			4 ^b	0.6	20	None			
			5 ^a						
			6 ^a						

Footnotes for Table 3:

Site codes: 3 = Unit 3 chemistry room
 4 = Unit 3 central control air conditioning room
 5 = Unit 2 Monitor #1
 6 = Unit 2 Monitor #2

Species codes: ZM = zebra mussel (*Dreissena polymorpha*)
 DFM = dark false mussel (*Mytilopsis leucophaeata*)
 OB = other bivalves (including unidentified because of damage)
 None = No bivalves present

^a Sample scheduled for collection by Entergy personnel from Unit 2 was not collected.

^b Sample was collected, but there was no flow to the biobox at the time of collection.



NORMANDEAU ASSOCIATES INC.
ENVIRONMENTAL CONSULTANTS

Ref. No. 20407.004

8 October 2009

(sent by e-mail)

Ms. Dara Gray
Entergy Nuclear Northeast
Indian Point 3 NPP
P.O. Box 306
Buchanan, New York 10501

Dear Ms. Gray,

This report presents the **June-September** sampling results for the Indian Point Zebra Mussel Monitoring Program, conducted by Normandeau Associates for Entergy (contract 10150496). Monthly settlement plate sampling was conducted on 19 June and 1 September 2009 at Sites 3 and 4 (Unit 3 bioboxes). Entergy did not retrieve settlement plates from Sites 3 and 4 in July or August. Sampling could not be conducted at Sites 1 and 2 (Unit 3 intake) during June-September because problems with the stairway to the catwalk used for sampling prevented access to the sampling location. Entergy did not retrieve settlement plates during June-September from Sites 5 and 6 (Unit 2 bioboxes) due to a lack of flow to the bioboxes. Cumulative results for calendar year 2009 are summarized in Table 1 (Unit 3 intake plates), Table 2 (Unit 3 intake water quality), and Table 3 (Unit 3 and Unit 2 biobox plates).

No zebra mussels (*Dreissena polymorpha*) or dark false mussels (*Mytilopsis leucophaeata*) were observed on any of the settlement plates from the Unit 3 bioboxes.

If you have any questions, please contact me by e-mail at plindsay@normandeau.com or by phone at 603-637-1149.

Sincerely,

NORMANDEAU ASSOCIATES INC.
B. Paul Lindsay
Program Manager

Cc: Kelli Dowell
Mark Mattson

Table 1. Density, length, and biomass of bivalves on settlement plates collected at the Indian Point Unit 3 intake catwalk for the Zebra Mussel Monitoring Program during 2009.

Date Collected	Date Set	Exposure Duration (Months)	Site	Biomass (g/m ²)	Detection Limit (no./m ²)	Species	Density (no./m ²)	Length (mm)	
								Mean	S.D.
19Jan09	18Dec08	1	1	1.2	20	None			
			2	1.2	20	None			
	12Nov08	2	1	1.6	20	None			
16Oct08			2	1.0	20	None			
	16Oct08	3	1 ^a						
			2	0.8	20	None			
11Feb09	19Jan09	1	1 ^a						
			2	1.0	20	None			
	18Dec08	2	1 ^a						
12Nov08			2	3.6	20	None			
	12Nov08	3	1 ^a						
			2	2.8	20	None			
24Mar09	11Feb09	1	1 ^b						
			2	2.4	20	None			
	19Jan09	2	1 ^b						
18Dec08			2 ^c	2.0	20	None			
	18Dec08	3	1 ^b						
			2 ^c	4.6	20	None			
15Sep08			1 ^b						
			6						
			2 ^c	112.4	200	None			
22Apr09	24Mar09	1	2	6.4	20	None			
			1 ^d	16.6	20	None			
	11Feb09	2	1	43.4	200	None			
19Jan09			2	23.6	20	None			
	19Jan09	3	1 ^{da}						
			1	7.8	20	None			
18Dec08			2 ^c	8.4	20	None			
	18Dec08	4	1 ^d	8.2	20	None			
			1 ^d	3.6	20	None			
14May09	22Apr09	1	1	13.6	20	None			
			2	2.2	20	None			
	24Mar09	2	1	9.2	20	None			
11Feb09			2	5.0	20	None			
	11Feb09	3	1	34.4	20	None			
			2	3.2	20	None			
Jun09	14May09	1	1 ^e						
			2 ^e						
	22Apr09	2	1 ^e						
22Apr09			2 ^e						
	22Apr09	2	1 ^e						
			2 ^e						
22Apr09 ^d			1 ^e						
	22Apr09 ^d	2	1 ^e						
			2 ^e						
24Mar09			2 ^e						
	24Mar09	3	1 ^e						
			2 ^e						
18Dec08			1 ^e						
	18Dec08	6	1 ^e						
			2 ^e						
16Oct08 ^f			1 ^e						
	16Oct08 ^f	8	1 ^e						
			2 ^e						
17Jun08			1 ^e						
	17Jun08	12	2 ^e						

(continued)

Table 1 (continued)

Date Collected	Date Set	Exposure Duration (Months)	Site	Biomass (g/m ²)	Detection Limit (no./m ²)	Species	Density (no./m ²)	Length (mm)
Jul09	14May09	2	1 ^e					
			1 ^e					
			2 ^e					
			2 ^e					
			1 ^e					
			1 ^e					
22Apr09	22Apr09	3	1 ^e					
			1 ^e					
			2 ^e					
			2 ^e					
			1 ^e					
			1 ^e					
			2 ^e					
			2 ^e					
			1 ^e					
			1 ^e					
			2 ^e					
			2 ^e					
22Apr09	22Apr09	4	1 ^e					
			1 ^e					
			2 ^e					
			2 ^e					
			1 ^e					
			1 ^e					
			2 ^e					
			2 ^e					
			1 ^e					
			1 ^e					
			2 ^e					
			2 ^e					
22Apr09	22Apr09	5	1 ^e					
			1 ^e					
			2 ^e					
			2 ^e					
			1 ^e					
			1 ^e					
			2 ^e					
			2 ^e					
			1 ^e					
			1 ^e					
			2 ^e					
			2 ^e					
22Apr09	22Apr09	5	1 ^e					
			1 ^e					
			2 ^e					
			2 ^e					
			1 ^e					
			1 ^e					
			2 ^e					
			2 ^e					
			1 ^e					
			1 ^e					
			2 ^e					
			2 ^e					
22Apr09 ^d	22Apr09 ^d	4	1 ^e					
			1 ^e					
			2 ^e					
			2 ^e					
			1 ^e					
			1 ^e					
			2 ^e					
			2 ^e					
			1 ^e					
			1 ^e					
			2 ^e					
			2 ^e					
24Mar09	24Mar09	5	1 ^e					
			1 ^e					
			2 ^e					
			2 ^e					
			1 ^e					
			1 ^e					
			2 ^e					
			2 ^e					
			1 ^e					
			1 ^e					
			2 ^e					
			2 ^e					
18Dec08	18Dec08	8	1 ^e					
			1 ^e					
			2 ^e					
			2 ^e					
			1 ^e					
			1 ^e					
			2 ^e					
			2 ^e					
			1 ^e					
			1 ^e					
			2 ^e					
			2 ^e					
16Oct08 ^f	16Oct08 ^f	9	1 ^e					
			1 ^e					
			2 ^e					
			2 ^e					
			1 ^e					
			1 ^e					
			2 ^e					
			2 ^e					
			1 ^e					
			1 ^e					
			2 ^e					
			2 ^e					
17Jun08	17Jun08	13	1 ^e					
			1 ^e					
			2 ^e					
			2 ^e					
			1 ^e					
			1 ^e					
			2 ^e					
			2 ^e					
			1 ^e					
			1 ^e					
			2 ^e					
			2 ^e					
16Oct08 ^f	16Oct08 ^f	9	1 ^e					
			1 ^e					
			2 ^e					
			2 ^e					
			1 ^e					
			1 ^e					
			2 ^e					
			2 ^e					
			1 ^e					
			1 ^e					
			2 ^e					
			2 ^e					
17Jun08	17Jun08	14	1 ^e					
			1 ^e					
			2 ^e					
			2 ^e					
			1 ^e					
			1 ^e					
			2 ^e					
			2 ^e					
			1 ^e					
			1 ^e					
			2 ^e					
			2 ^e					
14May09	14May09	4	1 ^e					
			1 ^e					
			2 ^e					
			2 ^e					
			1 ^e					
			1 ^e					
			2 ^e					
			2 ^e					
			1 ^e					
			1 ^e					
			2 ^e					
			2 ^e					
24Mar09	24Mar09	6	1 ^e					
			1 ^e					
			2 ^e					
			2 ^e					
			1 ^e					
			1 ^e					
			2 ^e					
			2 ^e					
			1 ^e					
			1 ^e					
			2 ^e					
			2 ^e					

(continued)

Table 1 (continued)

Date Collected	Date Set	Exposure Duration (Months)	Site	Biomass (g/m ²)	Detection Limit (no./m ²)	Species	Density (no./m ²)	Length (mm)
Sep09	18Dec08	9	1 ^e 2 ^e					
	16Oct08 ^f	11	1 ^e					
	17Jun08	15	2 ^e					

Footnotes for Table 1:

Site codes:

- 1 = center of intake catwalk, in strong intake current
- 2 = north side of intake catwalk, in low-flow area

Species codes:

- ZM = zebra mussel (*Dreissena polymorpha*)
- DFM = dark false mussel (*Mytilopsis leucophaeata*)
- OB = other bivalves (including unidentified because of damage)
- None = No bivalves present

- ^a Not collected (the settlement plate was missing)
- ^b Not collected because Site 1 was inaccessible due to diver activity
- ^c Plate had been out of water 11-26 February before it could be transferred to a new rack replacing the old one, which was badly damaged by ice (any settled mussels present on 11 February could have been desiccated)
- ^d Collection or deployment delayed one month (Site 1 was inaccessible due to diver activity in March)
- ^e Not collected because Site 1 and Site 2 were inaccessible during June-September due to problem deploying stairs to the catwalk used for sampling
- ^f October replacement for lost plate originally deployed in June

Table 2. Water quality data collected monthly at the Indian Point Unit 3 intake for the Zebra Mussel Monitoring Program during 2009.

Sampling Date	Surface		Conductivity (μmho)	Salinity (ppt)	Dissolved		pH	Turbidity (NTU)
	Temp. ($^{\circ}\text{C}$)	4-m Temp. ($^{\circ}\text{C}$)			Oxygen (mg/l)			
19Jan09	0.0	0.4	535	0.5	12.5	7.4	10.0	
11Feb09	1.6	1.4	2480	2.5	12.1	7.4	13.5	
24Mar09	3.7	4.2	1850	1.7	11.3	7.5	20.5	
22Apr09	9.8	9.8	3650	2.9	11.6	7.4	21.5	
14May09	16.5	16.3	299	0.2	9.5	7.4	11.9	
Jun09								
Jul09								
Aug09								
Sep09								

Sampling was conducted at 4 meters depth for all parameters and at the surface for temperature only.

No sampling at the Unit 3 intake was conducted during June-September due to lack of access to the sampling site.

Table 3. Density, length, and biomass of bivalves on settlement plates in bioboxes sampling chlorinated service water at Indian Point for the Zebra Mussel Monitoring Program during 2009.

Date Collected	Date Set	Exposure Duration (Months)	Site	Biomass (g/m ²)	Detection Limit (no./m ²)	Species	Density (no./m ²)	Length (mm)		
								Mean	S.D.	
19Jan09	18Dec08	1	3	2.8	20	None				
			4 ^a	2.2	20	None				
			5 ^b							
			6 ^b							
11Feb09	19Jan09	1	3	0.8	20	None				
			4	2.6	20	None				
			5 ^b							
			6 ^b							
24Mar09	11Feb09	1	3 ^c	1.0	20	None				
			4							
			5 ^b							
			6 ^b							
22Apr09	11Feb09	2 ^c	3	3.2	20	None				
			4	5.6	20	None				
			5 ^b							
			6 ^b							
14May09	22Apr09	1	3	3.4	20	None				
			4	2.8	20	None				
			5 ^b							
			6 ^b							
19Jun09	14May09	1	3	4.6	20	None				
			4	5.2	20	None				
			5 ^b							
			6 ^b							
Jul09			3 ^b							
			4 ^b							
			5 ^b							
			6 ^b							
Aug09			3 ^b							
			4 ^b							
			5 ^b							
			6 ^b							
9Sep09	19Jun09	3	3	13.0	20	None				
			4	2.2	20	None				
			5 ^b							
			6 ^b							

Footnotes for Table 3:

Site codes: 3 = Unit 3 chemistry room
 4 = Unit 3 central control air conditioning room
 5 = Unit 2 Monitor #1
 6 = Unit 2 Monitor #2

Species codes: ZM = zebra mussel (*Dreissena polymorpha*)
 DFM = dark false mussel (*Mytilopsis leucophaeata*)
 OB = other bivalves (including unidentified because of damage)
 None = No bivalves present

^a The Site 4 sample was collected in January, although there was no flow to the biobox at the time of collection.

^b Sample scheduled for collection by Entergy personnel was not collected.

^c The Site 3 sample was not collected in March because of a power outage.