THREE MILE ISLAND AQUATIC STUDY

MONTHLY REPORT FOR SEPTEMBER 1982

by

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INTRODUCTION

The ecology of York Haven Pond near the Three Mile Island Nuclear Station (TMINS) has been under investigation since February 1974. Studies initiated in April 1974 include analysis of ambient water quality, ichthyoplankton (far-field), ichthyoplankton entrainment, macroinvertebrates, fish population dynamics, impingement of fishes, creel survey, and thermal plume mapping.

This report discusses the progress of investigations conducted in September 1982.

COMPLIANCE WITH ENVIRONMENTAL TECHNICAL SPECIFICATIONS (ETS)

Objective: To determine compliance with the nonradiological (aquatic) environmental monitoring programs specified in sections 3.1.1.a.(4), 3.1.2.a., 4.2, and 4.6.1 of the ETS and to insure that said programs are performed as detailed in the Generation Procedures Manual.

Progress: Compliance with all programs specified in the ETS and detailed in the Procedures Document was achieved in September (Table 1). The fall fish population estimate program was initiated on 27 September.

A program by program summary of the progress for September follows.

MACROINVERTEBRATES

Objectives: To describe the diversity and distribution of the benthic macroinvertebrates occurring at the five benthos sampling stations near TMINS.

Progress: Replicate (4) benthos samples were taken on 9 and 20 September (Table 1). Enumeration, determination of dry weights, and identification of specimens have been completed through 20 September.

ICHTHYOPLANKTON

Objectives: (1) To determine the species composition, abundance, and distribution of ichthyoplankton in York Haven Pond; and (2) To investigate ichthyoplankton entrained at TMINS Unit 1 and 2 Intakes.

Far-Field

Progress: All data were entered on the computer and proofed. The following tables for the annual report were typed and proofed: station summary, density summary, percent similarity, and species list.

Entrainment

Progress: All data were coded and keypunched. Running tables were generated for the 1982 report.

TRAPNET

Objectives: (1) To determine the distribution and relative abundance of fishes in the Three Mile Island area vulnerable to trapnet; (2) To provide specimens for movements studies; (3) To monitor the occurrence of diseased fishes; (4) To provide specimens for radiation analysis; and (5) To determine reproductive status for fishes throughout the year.

Progress: Samples were taken on 1-3 and 14-16 September (Table 1). A total of 203 fish of 12 species was taken on 1-3 September (Table 2). Most fish (85) and greatest biomass (9.83 kg) occurred at Station 9B2 while most species (9) were found at 11A2. Common fishes included the pumpkinseed (40.9% of the total catch), black crappie (16.7%), white crappie (15.8%), and bluegill (11.8%). Anchor worms parasitized two pumpkinseed and one pumpkinseed exhibited exophthalmia. Two white crappie were found dead in the trapnets. Eight rock bass and three channel catfish were tagged.

A total of 135 fish of 10 species was collected on 14-16 September (Table 3). Most fish (52) were taken at Station 9B2 while most species (8) and greatest biomass (12.52 kg) occurred at 11A3. The pumpkinseed (41.5% of the total catch), black crappie (16.3%), bluegill (14.8%), and white crappie (12.6%) were again most numerous. One redbreast sunfish had a mouth deformity and two pumpkinseed were found dead in the trapnets. Six rock bass, three channel catfish, and one largemouth bass were tagged.

One common carp and one quillback were observed dead in the study area. No pattern of parasite infection, anomaly, or dead fishes was observed with respect to the location of TMINS in September.

SEINE

Objectives: (1) To determine the species composition of fish upstream and downstream from the TMINS Discharge vulnerable to seine; (2) To determine the relative condition factor for important species; and (3) To determine the reproductive status for fishes throughout the year.

Progress: Collections were made at the 10 stations on 1 and 14 September (Table 1). A total of 11,745 fish of 16 species was taken on 1 September (Table 4). Most fish (3,766) and greatest biomass (390.3 g) occurred at Station 10A2 while most species (11) were taken at 1A2. The spotfin shiner was the most abundant species at all stations except 4A2 and comprised 88.3% of the total catch. Slight black spot infestations were observed on 48 spotfin shiner, 2 tessellated darter, 1 river chub, and 1 bluntnose minnow. Anchor worms parasitized 27 mimic shiner, 11 spotfin shiner, 4 bluntnose minnow, 4 pumpkinseed, 4 bluegill, and 3 spottail shiner. Two bluntnose minnow and one comely shiner bore protozoan cysts. One tessellated darter was parasitized by a leech and one spotfin shiner had scoliosis.

Collections taken on 14 September are currently being analyzed; results will be presented in a future progress report.

August collections have now been processed; a total of 6,626 fish of 26 species was taken on 2 August (Table 5). Most fish (1,649) were collected at Station 16A1 while greatest biomass (189.5 g) and most species (13) occurred at 1A2. The spotfin shiner and pumpkinseed/bluegill were most abundant and comprised 62.3% and 25.6% of the total catch, respectively. Anchor worms parasitized 6 mimic shiner, 5 spotfin shiner, 5 pumpkinseed/bluegill, 4 smallmouth bass,

2 bluntnose minnow, 1 spottail shiner, 1 white sucker, and 1 tessellated darter. Twenty-two spotfin shiner, one bluntnose minnow, and one tessellated darter exhibited slight black spot infestations. One spotfin shiner had scoliosis.

A total of 7,995 fish of 20 species was taken on 19 August (Table 6). Most fish (2,732) and greatest biomass (332.0 g) were taken at Station 10B5 while most species (11) occurred at 13B5 and 1A2. The spotfin shiner and mimic shiner were most abundant and comprised 71.8% and 15.4% of the total catch, respectively. Anchor worms parasitized 5 pumpkinseed, 4 mimic shiner, 4 bluntnose minnow, 4 pumpkinseed/bluegill, 3 spotfin shiner, 1 spottail shiner, 1 swallowtail shiner, 1 channel catfish, 1 bluegill, and 1 smallmouth bass. Slight black spot infestations were observed on 34 spotfin shiner, 3 bluntnose minnow, 2 quillback, and 2 tessellated darter. One comely shiner and one bluntnose minnow had protozoan cysts. One spotfin shiner had scoliosis and one mimic shiner was pugheaded.

No pattern of parasite infection or anomaly was observed with respect to the location of TMINS from collections taken on any of the above sample dates.

IMPINGEMENT OF FISH

Objectives: (1) To determine the numbers and species impinged on the river water intake screens; (2) To determine day-night differences in impingement frequency; and (3) To determine the extent of mortality of impinged fish.

Progress: Impingement surveys were conducted on 7-8 and 21-22 September at the TMINS Unit 1 and 2 Intakes (Table 1). Unit 1 impinged 12 fish of 3 species weighing 10.8 g (Tables 7 through 10). All fish were young and dead. Fish numbers and biomass were highest during the

7-8 September survey. The estimated impingement for Unit 1 for September was 180 fish weighing 162.0 g (0.4 lb).

Unit 2 impinged 10 fish of 6 species weighing 99.1 g (Tables 11 through 14). Most fish were young and all were dead. Fish numbers and biomass were highest during the 7-8 and 21-22 September surveys, respectively. The estimated impingement for Unit 2 was 150 fish weighing 1,486.5 g (3.3 lb).

The total estimated impingement at TMINS during September was 330 fish weighing 1,648.5 g (3.7 lb).

ELECTROFISHING

Objectives: (1) To provide specimens for radiation analysis and movements studies; and (2) To determine the relative abundance of fishes vulnerable to electrofishing in various parts of York Haven Pond.

Progress: Sampling was conducted on four nights in September (Table 1). Twenty-four collections in 12 zones yielded 774 specimens of 19 species (Table 15). The pumpkinseed (185 specimens), quillback (126), redbreast sunfish (116), and smallmouth bass (92) were most abundant. A total of 79 fish was tagged for movements studies.

MOVEMENTS OF FISHES

Objective: To determine if fishes in waters receiving the TMINS effluent mix with fishes from other areas.

Progress: A total of 112 fish was tagged and four previously tagged fish were recaptured in September. Recaptured fishes included one channel catfish that moved 5.6 km downstream and three rock bass that were recaptured in the same areas in which they were tagged.

CREEL SURVEYS

Objectives: (1) To determine the extent and success of sport fishing; and (2) To determine information on angler residence and use of catch.

Progress: Creel surveys were conducted in all areas on 8, 12, 25, and 27 September (Table 1). The 289 anglers interviewed fished 511.05 hours and caught 546 fish (Tables 16 through 19). The actual harvest was 143 fish or 26.2% of the total catch. The mean catch per effort (c/e) was 1.07. Most anglers (128) fished in the General Reservoir. The largest total catch (336), most hours fished (246.12), and highest c/e (1.36) were recorded at the General Reservoir; however, the most fish kept (86) were recorded at the York Haven Generating Station.

Smallmouth bass (265) was the predominant species caught by anglers. Other species frequently caught included unidentified sunfish (75), channel catfish (65), rock bass (40), and walleye (39).

Approximately 76% of the anglers interviewed lived in York or Dauphin counties. Most anglers reported that they eat some of their catch.

AMBIENT WATER QUALITY

Objective: To determine the concentrations of selected water quality parameters in ambient river areas and the TMINS effluent.

Progress: Water quality samples were collected on 9 and 20 September at the five river stations (Table 1). Data were analyzed and tabulated; results are presented in Table 20. On 9 September values for sulfate, total dissolved solids, and dissolved zinc were highest at Station 1A1 (located upstream of the TMINS Discharge); turbidity and alkalinity values were highest at 1A2. Values for dissolved oxygen and water temperature were highest at Stations 11A2 and 9B1, respectively.

On 20 September values for sulfate (1A1), and dissolved oxygen and alkalinity (1A2) were highest at stations located upstream of the Discharge. Values for total dissolved solids, total copper, and total zinc were highest at Station 11A1 (TMINS Discharge), while water temperature, pH, and turbidity were highest at 9B1.

The water quality samples collected in August have now been analyzed; results are presented in Table 21. On 9 August values for sulfate, total dissolved solids, and total zinc were highest at Station 1A1; alkalinity was highest at 1A2. Values for water temperature, dissolved oxygen, total copper, and dissolved zinc were highest at Station 9B1.

On 23 August values for turbidity, sulfate, and total dissolved solids were highest at 1A1; dissolved oxygen and alkalinity were highest at 1A2. Dissolved zinc values were highest at Station 9B1.

Parameters, for which State water quality criteria have been established, were not exceeded at any station on 9 and 23 August or 9 and 20 September.

POPULATION ESTIMATES OF FISHES

Objectives: (1) To determine if differences exist in fish populations between areas receiving the TMINS effluent; and (2) To estimate populations in other areas available for recruitment.

Progress: Fall population estimates sampling was initiated on 27 September (Table 1). Sampling will continue in October until enough recaptures are taken to compute estimates.

THERMAL PLUME MAPPING

Objectives: (1) To determine temperature data; (2) To define the discharge plume; and (3) To check the accuracy of the analytical plume model.

Frogress: Thermal plume mapping was conducted on 29 September (Table 1) at a river flow of 7,660 cfs (216.9 m^3/s); the Δ T at the Discharge was 0.1 C (Table 22). River water temperature varied about ±1.0 C between the Unit 1 Intake and 1900 m downstream of the Discharge. No plume was evident.

Table 1

Sampling conducted in compliance with the Generation Procedures Manual in September 1982.

PROGRAM	Sep 1-4	Sep 5-11	Sep 12-18	Sep 19-25	Sep 26-30
Macroinvertebrates		X		X	
Ichthyoplankton:					
Far-Field [1]					
Entrainment [1]					
Trapnet	X		X		
Seine	X		X		
Impingement of Fish		X		X	
Electrofishing		X		X	
Movements of Fishes	X	X	X	X	
Creel Surveys		X	X	X	X
Ambient Water Quality		X		X	
Population Estimates of Fishes					X
Thermal Plume Mapping					X

1 Sampling terminated for 1982 as of 31 August.

Table 2

Fishes taken by trapnet on 1-3 September 1982 near THINS.

Station	TM-AQF-1A3		TM-AQF-11A2		TM-AQF-11A3		TM-AQF-9B2		Total	% Catch
Date	1-2	2-3	1-2	2-3	1-2	2-3	1-2	2-3		
Time	1425-1441	1444-1440	1416-1415	1418-1417	1408-1352	1355-1354	1356-1317	1320-1329		
Air Temp (C)	24.5, 29.5	29.5, 25.0	24.0, 27.0	27.0, 24.5	24.5, 27.0	27.0, 25.0	24.0, 30.0	30.0, 25.0		
Water Temp (C)	22.5, 25.5	25.5, 25.0	22.5, 24.0	24.0, 24.5	22.5, 24.0	24.0, 24.5	23.0, 24.5	24.5, 24.5		
Dissolved Oxygen (mg/l)	9.8, 10.7	10.7, 9.2	9.0, 9.6	9.6, 8.4	8.8, 9.4	9.4, 8.2	8.7, 10.4	10.4, 9.8		
pH	8.4, 7.9	7.9, 7.8	8.3, 7.8	7.8, 8.4	8.2, 7.9	7.9, 8.3	8.2, 8.1	8.1, 7.9		
Secchi Disc (cm)	48, 61	61, 28	36, 53	53, 28	43, 56	56, 28	46, 58	58, 33		
River Stage (m)	0.98, 0.97	0.97, 0.98	0.98, 0.97	0.97, 0.98	0.98, 0.97	0.97, 0.98	0.98, 0.97	0.97, 0.98		
Weather	Overcast, Partly Cloudy	Partly Cloudy, Partly Cloudy	Overcast, Partly Cloudy	Partly Cloudy, Partly Cloudy	Overcast, Partly Cloudy	Partly Cloudy, Partly Cloudy	Overcast, Partly Cloudy	Partly Cloudy, Partly Cloudy		
No. of Specimens	10	20	24	19	25	20	55	30	203	
No. of Species	3	5	7	8	6	7	7	5	12	
Common carp	-	-	-	-	-	-	1	-	1	0.5
Spotfin shiner	-	-	-	-	-	1	-	-	1	0.5
Shorthead redhorse	-	1	-	1	-	-	-	-	1	0.5
White catfish	-	-	-	-	1	-	-	-	2	1.0
Channel catfish	-	-	1	2	-	-	2	-	5	2.5
Rock bass	-	-	-	1	3	2	1	2	9	4.4
Redbreast sunfish	4	15	6	2	1	1	-	-	10	4.9
Pumpkinseed	-	1	5	6	18	11	12	12	83	40.9
Bluegill	3	2	1	1	1	1	15	4	24	11.8
White crappie	3	1	2	2	1	2	10	10	32	15.8
Black crappie	-	-	8	4	-	2	14	2	34	16.7
Walleye			1	-	-	-	-	-	1	0.5

Table 3

Fishes taken by trapnet on 14-16 September 1982 near TMINS.

Station	TM-AQF-1A3		TM-AQF-11A2		TM-AQF-11A3		TM-AQF-9B2		Total	% Catch
Date	14-15	15-16	14-15	15-16	14-15	15-16	14-15	15-16		
Time	0947-1004	1006-1001	0935-0950	0952-0946	0923-0932	0934-0929	0909-0915	0917-0900		
Air Temp (C)	21.0, 23.5	23.5, 23.0	21.0, 23.0	23.0, 23.5	21.0, 22.5	22.5, 23.0	20.5, 22.5	22.5, 22.5		
Water Temp (C)	23.5, 23.5	23.5, 23.5	24.0, 24.0	24.0, 24.0	24.0, 24.0	24.0, 24.0	24.5, 24.0	24.0, 23.5		
Dissolved Oxygen (mg/l)	9.4, 9.0	9.0, 8.9	8.7, 9.3	9.3, 8.0	8.2, 9.4	9.4, 7.8	9.2, 9.5	9.5, 8.7		
pH	8.8, 8.3	8.3, 8.4	8.7, 8.6	8.6, 8.4	8.7, 8.4	8.4, 8.3	8.0, 8.7	8.7, 8.5		
Secchi Disc (cm)	41, 64	64, 71	41, 69	69, 74	36, 69	69, 71	[illegible], 76	76, 79		
River Stage (m)	0.94, 0.94	0.94, 0.94	0.94, 0.94	0.94, 0.94	0.94, 0.94	0.94, 0.94	0.94, 0.94	0.94, 0.94		
Weather	Fog, Haze	Haze, Clear	Fog, Haze	Haze, Clear	Fog, Haze	Haze, Clear	Fog, Haze	Haze, Clear		
No. of Specimens	16	19	10	9	18	11	16	36	135	
No. of Species	3	5	6	4	6	5	5	5	10	
Common carp	-	-	-	-	-	1	-	-	1	0.7
Yellow bullhead	-	1	-	-	-	-	-	-	1	0.7
Channel catfish	-	-	-	-	2	1	-	-	3	2.2
Rock bass	-	3	1	3	1	-	1	2	11	8.1
Redbreast sunfish	-	-	1	1	-	1	-	-	3	2.2
Pumpkinseed	6	8	4	4	10	6	8	10	56	41.5
Bluegill	-	2	2	1	3	-	1	11	20	14.8
Largemouth bass	-	-	-	-	1	-	-	-	1	0.7
White crappie	4	2	1	-	-	-	3	7	17	12.6
Black crappie	6	3	1	-	1	2	3	6	22	16.3

Table 4

Fishes taken by seine on 1 September 1982 near TMINS.

Station	TM-AQF-13B5	TM-AQF-10B5	TM-AQF-16A5	TM-AQF-1A2	TM-AQF-?6A1	TM-AQF-10A2	TM-AQF-9B6	TM-AQF-9A1	TM-AQF-9B3	TM-AQF-4A2	Total	% Catch
Time	1157	0850	1130	1105	1021	1010	0949	0930	0912	1047		
Air Temp (C)	22.0	22.0	23.0	21.5	22.0	22.0	21.0	21.5	22.0	22.0		
Water Temp (C)	22.5	22.5	22.0	22.5	22.0	22.5	22.5	22.5	22.0	22.5		
Dissolved Oxygen (mg/l)	9.2	10.4	9.8	10.0	9.7	9.2	9.5	9.8	10.0	11.4		
pH	8.1	8.6	8.7	8.1	8.1	8.0	8.1	8.3	8.3	8.4		
Secchi Disc (cm)	61	69	69*	38	38	38	56	56	41	66		
River Stage (m)	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98		
Weather	Overcast	Overcast	Overcast	Overcast	Overcast	Overcast	Overcast	Overcast	Overcast	Overcast		
No. of Specimens	3199	2497	533	467	100	3766	460	400	203	120	11745	
No. of Species	9	8	5	11	5	5	5	5	6	6	16	
No. of Hauls	2	6	6	5	5	1	4	4	4	4	41	
River chub	-	-	-	1	-	-	-	-	-	-	1	+
Golden shiner	2	8	-	1	-	2	-	-	-	-	13	0.1
Comely shiner	-	-	3	1	-	-	-	-	-	-	4	+
Common shiner	1	-	-	-	-	-	-	-	-	-	1	+
Spottail shiner	10	-	-	2	10	-	-	4	5	-	31	0.3
Swallowtail shiner	18	3	10	-	-	1	-	-	-	-	32	0.3
Spotfin shiner	2522	2383	451	271	77	3692	424	382	163	1	10367	88.3
Mimic shiner	137	55	63	1	1	68	31	1	12	-	374	3.2
Bluntnose minnow	38	6	-	7	-	-	3	3	2	38	97	0.8
Fallfish	-	-	1	-	-	-	-	-	-	-	1	+
Redbreast sunfish	-	-	-	1	-	-	-	-	-	6	7	0.1
Pumpkinseed	148	12	-	167	-	-	1	-	3	38	369	3.1
Bluegill	286	1	-	9	11	-	-	-	-	23	330	2.8
Pumpkinseed/Bluegill	36	28	-	-	-	-	-	-	-	-	64	0.5
Smallmouth bass	-	-	-	-	1	-	-	-	-	-	1	+
White crappie	-	1	-	-	-	-	-	-	-	-	1	+
Tessellated darter	-	-	-	6	-	3	1	10	18	14	52	0.4

* Clear to bottom at indicated depth.
\+ Less than 0.05%.

Table 5

Fishes taken by seine on 2 August 1982 near TMINS.

Station	TM-AQF-13B5	TM-AQF-10B5	TM-AQF-16A5	TM-AQF-1A2	TM-AQF-16A1	TM-AQF-10A2	TM-AQF-9B6	TM-AQF-9A1	TM-AQF-9B3	TM-AQF-4A2	Total	% Catch
Time	1144	0840	1121	1058	1010	0952	0935	0922	0905	1038		
Air Temp (C)	27.0	22.0	25.0	23.0	23.5	22.5	21.5	21.0	21.0	25.0		
Water Temp (C)	26.0	24.5	26.0	24.5	24.5	24.5	24.5	24.5	24.5	26.0		
Dissolved Oxygen (mg/l)	12.6	11.4	9.2	8.4	7.9	7.8	8.1	8.3	8.1	11.4		
pH	8.6	8.7	8.8	8.1	8.2	8.1	8.1	8.2	8.3	8.6		
Secchi Disc (cm)	46	56	58	38	36	30	36	36	36	64		
River Stage (m)	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19		
Weather	Haze	Haze	Haze	Haze	Haze	Haze	Haze	Haze	Haze	Haze		
No. of Specimens	1165	834	105	620	1649	1562	109	32	461	89	6626	
No. of Species	11	9	6	13	10	12	9	5	8	7	26	
No. of Hauls	4	6	5	5	5	4	4	4	4	5	46	
Common carp	-	-	-	1	-	-	-	-	-	-	1	+
River chub	-	1	-	-	-	-	-	-	1	-	2	+
Golden shiner	1	-	-	3	2	4	-	-	-	-	10	0.2
Comely shiner	3	-	-	-	1	1	-	-	-	-	5	0.1
Common shiner	4	-	-	1	1	2	1	-	-	-	9	0.1
Spottail shiner	19	-	1	6	3	3	4	1	6	-	43	0.6
Swallowtail shiner	3	-	-	-	-	3	6	-	-	-	12	0.2
Spotfin shiner	957	690	95	327	711	1290	18	18	21	-	4127	62 3
Mimic shiner	105	32	1	32	87	226	28	1	3	1	516	7.8
Notropis spp.	-	-	-	-	-	1	-	-	-	-	1	+
Bluntnose minnow	30	11	-	-	5	16	12	-	2	2	78	1.2
Blacknose dace	-	1	-	-	-	-	-	-	-	-	1	+
Creek chub	-	-	-	1	-	-	-	-	-	-	1	+
Fallfish	-	-	5	-	-	-	-	-	-	-	5	0.1
Quillback	1	5	-	21	-	-	2	-	1	-	30	6.5
White sucker	-	-	-	2	-	-	-	-	-	-	2	+
Brown bullhead	-	-	-	2	-	-	-	-	-	-	2	+
Banded killifish	-	1	-	-	-	-	-	-	-	-	1	+
Rock bass	-	-	-	5	-	-	-	-	-	-	5	0.1
Pumpkinseed	-	-	-	-	-	-	-	-	-	4	4	0.1
Bluegill	-	5	-	1	-	-	-	-	-	3	9	0.1
Pumpkinseed/Bluegill	36	88	-	218	837	6	29	10	402	67	1693	25.6
Smallmouth bass	-	-	2	-	-	4	-	-	-	6	12	0.2
Largemouth bass	-	-	-	-	-	-	-	-	-	1	1	+
Tessellated darter	6	-	-	-	1	6	9	2	25	5	54	0.8
Shield darter	-	-	1	-	-	-	-	-	-	-	1	+
Walleye	-	-	-	-	1	-	-	-	-	-	1	+

+ Less than 0.05%.

Table 6

Fishes taken by seine on 19 August 1982 near TMINS.

Station	TM-AQF-13B5	TM-AQF-10B5	TM-AQF-16A5	TM-AQF-1A2	TM-AQF-16A1	TM-AQF-10A2	TM-AQF-9B6	TM-AQF-9A1	TM-AQF-9B3	TM-AQF-4A2	Total	% Catch
Time	1226	1537	1249	1314	1406	1427	1447	1507	1522	1343		
Air Temp (C)	28.0	28.5	28.0	27.0	27.5	27.0	28.0	28.0	28.0	28.0		
Water Temp (C)	26.0	28.0	26.0	25.0	25.0	24.5	26.0	26.0	27.0	26.5		
Dissolved Oxygen (mg/l)	10.8	13.6	10.4	11.1	11.2	10.8	11.4	11.6	12.0	12.0		
pH	8.7	9.1	9.4	8.4	8.4	8.1	8.5	8.6	8.8	8.7		
Secchi Disc (cm)	51	71	46*	58	56	38	36	38	36	76		
River Stage (m)	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01		
Weather	Partly Cloudy	Partly Cloudy	Partly Cloudy	Partly Cloudy	Partly Cloudy	Partly Cloudy	Partly Cloudy	Partly Cloudy	Partly Cloudy	Partly Cloudy		
No. of Specimens	2247	2732	248	1079	559	584	438	17	14	77	7995	
No. of Species	11	10	7	11	6	5	5	5	4	8	20	
No. of Hauls	3	6	6	5	4	4	4	4	4	4	44	
Gizzard shad	-	-	-	-	-	-	-	-	1	-	1	+
Golden shiner	6	4	-	6	-	-	-	-	-	-	16	0.2
Comely shiner	-	-	-	4	2	-	-	-	-	-	6	0.1
Common shiner	2	-	-	-	-	-	-	-	-	-	2	+
Spottail shiner	30	2	-	6	-	-	-	-	-	1	39	0.5
Swallowtail shiner	27	25	5	-	-	15	5	-	-	-	77	1.0
Spotfin shiner	1468	2175	212	578	530	418	339	11	-	11	5742	71.8
Mimic shiner	599	369	24	40	10	105	86	1	-	-	1234	15.4
Bluntnose minnow	50	35	1	5	3	37	6	-	1	20	158	2.0
Fallfish	-	-	3	-	-	-	-	-	-	-	3	+
Quillback	3	8	-	-	-	-	-	-	-	-	11	0.1
Brown bullhead	-	-	-	1	-	-	-	1	-	-	2	+
Channel catfish	-	-	-	-	-	-	-	-	8	-	8	0.1
Redbreast sunfish	-	-	-	-	-	-	-	-	-	1	1	+
Pumpkinseed	40	33	-	303	1	-	-	-	-	16	393	4.9
Bluegill	6	10	-	42	13	-	-	-	-	10	81	1.0
Pumpkinseed/Bluegill	10	69	-	86	-	-	-	-	4	-	169	2.1
Smallmouth bass	-	-	1	-	-	-	-	1	-	-	2	+
Largemouth bass	-	-	-	-	-	-	-	-	-	1	1	+
Tessellated darter	6	2	-	7	-	9	2	3	-	17	46	0.6
Banded darter	-	-	2	1	-	-	-	-	-	-	3	+

* Clear to bottom at indicated depth.
\+ Less than 0.05%.

Table 7

Number of fishes impinged at the Unit 1 Intake during a 24-hour impingement survey on 7-8 September 1982.

Date	7		8		8			
Time	2000		0400		1200			
Volumetric Flow Rate (m^3/s)	0.84		0.84		0.84			
Number of River Water Pumps:								
Nuclear Service	1		1		1			
Secondary Service	1		1		1			
Decay Heat	0		0		0			
Intake Velocity (cm/s)	-4		-4		-4			
River Flow (m^3/s)	143.3		143.3		143.3			
Air Temp (C)	20.0		17.0		20.0			
Water Temp (C)	22.5		21.0		21.0			
Condition of Fish	Alive	Dead	Alive	Dead	Alive	Dead	Total Alive	Total Dead
Rock bass	-	1	-	3	-	-	-	4
Pumpkinseed	-	-	-	-	-	1	-	1
Bluegill	-	-	-	3	-	2	-	5
Total	-	1	-	6	-	3	-	10

Table 8

Summary of length, weight, reproductive status, and number of fishes impinged at the Unit 1 Intake on 7-8 September 1982.

Species	Fork Length Range (5 mm groups)	Reproductive Status	Total Weight (g)	Total Number
Rock bass	31-35, 41-45, 56-60	4 Young	8.0	4
Pumpkinseed	21-25	1 Young	0.3	1
Bluegill	16-35	5 Young	1.6	5
Total			9.9	10

Table 9

Number of fishes impinged at the Unit 1 Intake during a 24-hour impingement survey on 21-22 September 1982.

Date	21		22		22			
Time	2000		0400		1200			
Volumetric Flow Rate (m^3/s)	1.33		1.33		1.33			
Number of River Water Pumps:								
Nuclear Service	1		1		1			
Secondary Service	1		1		1			
Decay Heat	1		1		1			
Intake Velocity (cm/s)	3		3		3			
River Flow (m^3/s)	110.2		110.2		110.2			
Air Temp (C)	18.0		17.0		14.0			
Warter Temp (C)	18.5		18.5		17.0		Total	
Condition of Fish	Alive	Dead	Alive	Dead	Alive	Dead	Alive	Dead
Pumpkinseed	-	-	-	-	-	2	-	2
Total	-	-	-	-	-	2	-	2

Table 10

Summary of length, weight, reproductive status, and number of fishes impinged at the Unit 1 Intake on 21-22 September 1982.

Species	Fork Length Range (5 mm groups)	Reproductive Status	Total Weight (g)	Total Number
Pumpkinseed	21-25, 31-35	2 Young	0.9	2
Total			0.9	2

Table 11

Number of fishes impinged at the Unit 2 Intake during a 24-hour impingement survey on 7-8 September 1982.

Date	7		8		8			
Time	2000		0400		1200			
Volumetric Flow Rate (m^3/s)	1.58		1.58		1.58			
Number of River Water Pumps:								
Nuclear Service	1		1		1			
Secondary Service	1		1		1			
Intake Velocity (cm/s)	5		5		5			
River Flow (m^3/s)	143.3		143.3		143.3			
Air Temp (C)	20.0		16.5		20.0			
Water Temp (C)	22.5		21.0		21.0			
Condition of Fish	Alive	Dead	Alive	Dead	Alive	Dead	Total Alive	Total Dead
Spotfin shiner	-	-	-	3	-	-	-	3
Margined madtom	-	-	-	1	-	-	-	1
Rock bass	-	1	-	-	-	-	-	1
Pumpkinseed	-	1	-	1	-	-	-	2
Total	-	2	-	5	-	-	-	7

Table 12

Summary of length, weight, reproductive status, and number of fishes impinged at the Unit 2 Intake on 7-8 September 1982.

Species	Fork Length Range (5 mm groups)	Reproductive Status	Total Weight (g)	Total Number
Spotfin shiner	41-45, 61-65, 76-80	1 Juvenile, 2 Adult	10.0	3
Margined madtom	51-55	1 Juvenile	1.6	1
Rock bass	36-40	1 Young	1.2	1
Pumpkinseed	26-30, 41-45	2 Young	2.4	2
Total			15.2	7

Table 13

Number of fishes impinged at the Unit 2 Intake during a 24-hour impingement survey on 21-22 September 1982.

Date	21		22		22			
Time	2000		0400		1200			
Volumetric Flow Rate (m^3/s)	1.58		1.58		1.58			
Number of River Water Pumps:								
Nuclear Service	1		1		1			
Secondary Service	1		1		1			
Intake Velocity (cm/s)	3		3		3			
River Flow (m^3/s)	110.2		110.2		110.2			
Air Temp (C)	18.0		17.0		14.5			
Water Temp (C)	18.5		18.5		17.0			
Condition of Fish	Alive	Dead	Alive	Dead	Alive	Dead	Total Alive	Total Dead
Mimic shiner	-	1	-	-	-	-	-	1
Rock bass	-	-	-	1	-	-	-	1
Tessellated darter	-	1	-	-	-	-	-	1
Total	-	2	-	1	-	-	-	3

Table 14

Summary of length, weight, reproductive status, and number of fishes impinged at the Unit 2 Intake on 21-22 September 1982.

Species	Fork Length Range (5 mm groups)	Reproductive Status	Total Weight (g)	Total Number
Mimic shiner	21-25	1 Young	0.2	1
Rock bass	201-205	1 Adult	83.0	1
Tessellated darter	41-45	1 Juvenile	0.7	1
Total			83.9	3

Table 15

Fishes captured by the AC electrofisher near TMINS in September 1982.

Zone	11B1	10B3	10B1	13A1	10A3	9B5	15B2	16B8	4A1	16A2	15A2	15A1
Date	8 Sep	8 Sep	8 Sep	8 Sep	8 Sep	8 Sep	9 Sep	9 Sep	9 Sep	9 Sep	9 Sep	9 Sep
Time	2008	2042	2123	2206	2247	2322	1944	2036	2119	2200	2232	2314
Duration (min)	18	19	22	22	18	20	19	16	16	16	18	18
Air Temp (C)	17.5	18.5	17.5	17.5	17.5	16.5	18.0	18.5	18.5	17.0	17.0	17.0
Water Temp (C)	20.0	20.0	20.0	19.5	20.0	20.0	22.0	21.0	21.5	20.0	21.5	20.0
Dissolved Oxygen (mg/l)	8.9	9.7	10.2	9.0	9.5	9.2	12.1	11.0	12.3	10.6	11.6	11.2
pH	8.5	8.6	8.7	8.0	8.0	7.9	8.8	8.9	8.8	8.5	8.6	8.9
Conductivity (micromhos/cm)	325	375	400	425	440	450	310	325	410	425	390	390
Secchi Disc (cm)	61	71	61	46	46	51	66	91	46	41	63	63
Volts	190	175	180	175	160	165	200	200	195	180	190	180
Amps	6.5	7.5	8.0	7.0	7.5	8.0	6.5	5.0	8.0	9.0	7.0	8.5
Gizzard shad	-	-	-	-	-	-	-	-	-	-	-	-
Muskellunge	-	-	-	-	-	-	1	-	-	-	-	-
Common carp	1	4	1	-	1	1	-	4	-	1	-	-
Quillback	4	2	6	3	2	9	10	10	3	9	14	1
White sucker	-	-	-	-	-	-	-	-	-	1	-	1
Northern hog sucker	-	-	-	2	-	-	-	-	-	-	-	-
Shorthead redhorse	-	-	-	1	-	-	-	3	-	-	-	-
Yellow bullhead	-	-	-	-	-	-	-	1	-	-	-	-
Channel catfish	-	-	-	1	-	-	-	3	-	-	1	
Rock bass	-	-	-	1	1	-	5	5	6	1	3	8
Redbreast sunfish	-	-	4	3	11	1	4	3	7	4	10	4
Pumpkinseed	5	15	9	6	11	2	10	3	17	6	20	-
Bluegill	2	4	2	-	-	1	-	1	5	-	-	-
Smallmouth bass	-	2	1	5	-	1	4	12	6	6	1	9
Largemouth bass	2	1	-	-	-	-	1	-	1	-	-	-
White crappie	1	-	-	-	-	-	1	1	-	-	-	-
Black crappie	-	-	-	-	-	-	-	2	-	-	-	-
Yellow perch	-	-	1	-	-	-	3	-	-	-	-	-
Walleye	1	-	3	6	2	4	1	3	8	4	4	2
No. of Specimens	16	28	27	28	28	19	40	51	53	32	53	25
No. of Species	7	6	8	9	6	7	10	13	8	8	7	6

Table 15 continued.

Zone	11B1	10B3	10B1	13A1	10A3	9B5	15B2	16B8	4A1	16A2	15A2	15A1	Total
Date	21 Sep	21 Sep	21 Sep	21 Sep	21 Sep	21 Sep	23 Sep	23 Sep	23 Sep	23 Sep	23 Sep	23 Sep	
Time	1933	2008	2048	2131	2206	2238	1940	2024	2113	2145	2226	2303	
Duration (min)	20	19	18	18	15	19	18	1[illegible]	15	19	17	18	
Air Temp (C)	17.5	17.0	17.5	17.0	16.5	15.5	14.5	[illegible].0	12.5	12.0	12.0	11.0	
Water Temp (C)	19.0	18.5	18.5	19.0	18.5	18.0	18.0	16.5	17.0	16.5	16.5	16.0	
Dissolved Oxygen (mg/l)	9.7	10.4	11.2	9.6	9.2	8.6	9.9	10.0	8.5	8.3	9.9	9.7	
pH	8.7	8.4	8.3	8.2	8.1	7.9	8.3	8.7	8.2	8.2	8.8	8.7	
Conductivity (micromhos/cm)	340	410	430	460	490	480	310	350	410	410	450	440	
Secchi Disc (cm)	61	63	69	61	58	61	46	91*	56	51	71	66	
Volts	190	180	180	180	170	170	190	200	190	185	180	185	
Amps	5.5	8.0	8.0	7.0	8.5	9.0	5.5	5.0	7.0	8.9	7.5	7.5	
Gizzard shad	2	2	-	-	-	-	10	-	-	-	-	-	14
Muskellunge	-	-	-	-	-	-	-	-	-	-	-	-	1
Common carp	1	-	-	-	-	-	1	3	-	5	1	3	27
Quillback	2	5	5	-	1	7	18	2	1	2	7	3	126
White sucker	-	-	-	-	-	-	-	-	-	3	1	1	7
Northern hog sucker	-	-	-	-	-	-	-	-	-	-	-	-	2
Shorthead redhorse	-	-	-	-	-	-	-	1	-	-	-	-	5
Yellow bullhead	-	-	-	-	-	-	-	1	-	-	-	-	2
Channel catfish	-	-	-	-	1	-	-	2	-	-	-	3	11
Rock bass	-	-	-	2	3	1	-	9	4	4	1	5	59
Redbreast sunfish	-	-	-	2	1	-	5	9	3	3	12	30	116
Pumpkinseed	4	13	2	6	7	1	2	9	9	7	18	3	185
Bluegill	-	7	-	-	-	-	1	3	1	1	2	-	30
Smallmouth bass	-	1	1	7	2	1	2	10	-	5	5	11	92
Largemouth bass	1	3	-	-	-	-	-	-	1	-	-	-	10
White crappie	-	1	-	-	-	-	-	-	-	-	-	-	4
Black crappie	-	-	-	-	-	1	-	1	2	-	3	-	9
Yellow perch	-	1	-	-	-	-	1	-	-	-	-	-	6
Walleye	2	-	1	5	4	2	3	3	1	2	4	[illegible]	68
No. of Specimens	12	33	9	22	19	13	43	53	22	32	54	62	774
No. of Species	6	8	4	5	7	6	9	12	8	9	10	9	19

Creel survey data from the GR for each survey day in September 1982.

Day	8 Wed			12 Sun			25 Sat			27 Mon			
Weather	Overcast			Fog, Overcast			Fog, Partly Cloudy, Overcast			Overcast, Partly Cloudy			
River Stage (m)	3.19			3.13			3.15			3.18			
Air Temperature (C)	16.5	17.0	18.0	22.5	29.0	26.5	17.0	20.5	18.5	17.5	21.0	20.0	
Water Temperature (C)	21.5	21.5	21.5	23.0	26.5	26.5	17.0	19.5	19.0	17.5	17.5	18.5	
Times:													
a) morning (0900-1300)	a			a			a			a			
b) afternoon (1301-1700)		b			b			b			b		
c) evening (1701-2100)			c			c			c			c	TOTAL
Total Per Time Period:													
Anglers	6	5	7	19	11	19	20	21	14	-	3	3	128
Fish Caught	25	17	5	64	22	63	32	71	24	-	1	12	336
Fish Kept	4	5	-	15	9	4	2	9	5	-	-	-	53
Hours Fished	8.17	16.18	2.92	44.00	14.50	56.50	18.51	41.68	33.16	-	4.50	6.00	246.12
Catch/Effort (h)	3.06	1.05	1.71	1.45	1.52	1.12	1.73	1.70	0.72	-	0.22	2.00	1.36
Day Totals:													
Anglers		18			49			55			6		
Fish Caught		47			149			127			13		
Fish Kept		9			28			16			-		
Hours Fished		27.27			115.00			93.35			10.50		
Catch/Effort (h)		1.72			1.30			1.36			1.24		

Species	a	b	c	a	b	c	a	b	c	a	b	c	Total	
Common carp	-	-	-	-	-	-	-	-	-	-	-	1R	- 1R	1
Channel catfish	1R	1K	-	4K 5R	1R	1K	-	-	2K 4R	-	-	-	8K 11R	19
Rock bass	2K	2K	-	1R	2R	6R	1K 2R	1K 6R	1K 1R	-	-	4R	7K 22R	29
Bluegill	-	-	-	1K 2R	-	1R	-	1R	-	-	-	-	1K 4R	5
Sunfishes (Lepomis spp.)[1]	1K 2R	-	-	1R	5K 3R	21R	1R	17R	2R	-	-	-	6K 47R	53
Smallmouth bass	1K 17R	2K 12R	5R	9K 40R	4K 7R	3K 31R	1K 25R	8K 38R	1K 12R	-	1R	7R	29K 195R	224
Largemouth bass	-	-	-	1K	-	-	2R	-	1K	-	-	-	2K 2R	4
Yellow perch	1R	-	-	-	-	-	-	-	-	-	-	-	- 1R	1

1 General identification.
K Kept.
R Released.

Table 17

Creel survey data from the West Dam for each survey day in September 1982.

Day	8 Wed			12 Sun			25 Sat			27 Mon			
Weather	Overcast			Fog, Overcast			Fog, Partly Cloudy, Overcast			Overcast, Partly Cloudy			
River Stage (m)	3.19			3.13			3.15			3.18			
Air Temperature (C)	16.0	17.0	18.0	24.5	31.0	26.5	16.0	22.0	20.0	17.5	21.0	20.0	
Water Temperature (C)	20.5	20.5	21.0	23.0	27.0	26.5	17.5	20.0	20.5	17.5	18.0	18.5	
Times:													
a) morning (0900-1300)	a			a			a			a			
b) afternoon (1301-1700)		b			b			b			b		
c) evening (1701-2100)			c			c			c			c	TOTAL
Total Per Time Period:													
Anglers	-	-	-	1	8	-	-	12	3	-	-	-	24
Fish Caught	-	-	-	2	10	-	-	27	4	-	-	-	43
Fish Kept	-	-	-	-	-	-	-	4	-	-	-	-	4
Hours Fished	-	-	-	0.25	21.50	-	-	31.50	3.00	-	-	-	56.25
Catch/Effort (h)	-	-	-	8.00	0.46	-	-	0.86	1.34	-	-	-	0.76
Day Totals:													
Anglers		-			9			15			-		
Fish Caught		-			12			31			-		
Fish Kept		-			-			4			-		
Hours Fished		-			21.75			34.50			-		
Catch/Effort (h)		-			0.55			0.90			-		

Species	a	b	c	a	b	c	a	b	c	a	b	c	Total	
Channel catfish	-	-	-	-	6R	-	-	2K 20R	-	-	-	-	2K 26R	28
Rock bass	-	-	-	-	2R	-	-	-	-	-	-	-	- 2R	2
Smallmouth bass	-	-	-	2R	2R	-	-	2K 3R	3R	-	-	-	2K 10R	12
Walleye	-	-	-	-	-	-	-	-	1R	-	-	-	- 1R	1

K Kept.
R Released.

Table 18

Creel survey data from the East Dam for each survey day in September 1982.

Day	8 Wed			12 Sun			25 Set			27 Mon			
Weather	Overcast			Fog, Overcast			Fog, Partly Cloudy, Overcast			Overcast, Partly Cloudy			
River Stage (m)	3.19			3.13			3.15			3.18			
Air Temperature (C)	16.0	18.0	18.5	26.5	31.0	26.5	16.5	21.0	20.5	17.5	21.0	20.0	
Water Temperature (C)	22.5	22.0	22.0	24.0	28.0	27.0	17.5	18.5	18.5	17.5	18.0	18.5	
Times:													
a) morning (0900-1300)	a			a			a			a			
b) afternoon (1301-1700)		b			b			b			b		
c) evening (1701-2100)			c			c			c			c	TOTAL
Total Per Time Period:													
Anglers	-	-	-	2	5	-	-	1	-	-	2	-	10
Fish Caught	-	-	-	2	6	-	-	1	-	-	-	-	9
Fish Kept	-	-	-	-	-	-	-	-	-	-	-	-	-
Hours Fished	-	-	-	1.00	3.50	-	-	0.25	-	-	3.00	-	7.75
Catch/Effort (h)	-	-	-	2.00	1.71	-	-	4.00	-	-	-	-	1.16
Day Totals:													
Anglers		-			7			1			2		
Fish Caught		-			8			1			-		
Fish Kept		-			-			-			-		
Hours Fished		-			4.50			0.25			3.00		
Catch/Effort (h)		-			1.78			4.00			-		

Species	a	b	c	a	b	c	a	b	c	a	b	c	Total	
Channel catfish	-	-	-	-	-	-	-	1R	-	-	-	-	1R	1
Sunfishes (Lepomis spp.)[1]	-	-	-	1R	5R	-	-	-	-	-	-	-	6R	6
Smallmouth bass	-	-	-	1R	-	-	-	-	-	-	-	-	1R	1
Largemouth bass	-	-	-	-	1R	-	-	-	-	-	-	-	1R	1

1 General identification.
K Kept.
R Released.

Table 19

Creel survey data from the YHGS for each survey day in September 1982.

Day	8 Wed			12 Sun			25 Sat			27 Mon			
Weather	Overcast			Haze, Overcast			Partly Cloudy, Overcast			Overcast, Partly Cloudy			
River Stage (m)	3.19			3.13			3.15			3.18			
Air Temperature (C)	17.0	18.0	19.0	26.0	29.0	24.5	18.0	21.5	18.0	19.0	23.5	19.0	
Water Temperature (C)	19.5	20.5	20.5	25.0	27.0	24.5	17.5	18.5	18.0	17.5	18.0	18.0	
Times:													
a) morning (0900-1300)	a			a			a			a			
b) afternoon (1301-1700)		b			b			b			b		
c) evening (1701-2100)			c			c			c			c	TOTAL
Total Per Time Period:													
Anglers	8	11	10	6	9	4	16	6	12	3	14	28	127
Fish Caught	11	8	8	-	10	3	24	6	27	-	17	44	158
Fish Kept	4	1	-	-	5	2	16	5	4	-	12	37	86
Hours Fished	12.00	16.34	12.25	3.75	15.75	3.50	48.00	8.92	17.92	3.00	18.00	41.50	200.93
Catch/Effort (h)	0.92	0.49	0.65	-	0.63	0.86	0.50	0.67	1.51	-	0.94	1.06	0.79
Day Totals:													
Anglers		29			19			34			45		
Fish Caught		27			13			57			61		
Fish Kept		5			7			25			49		
Hours Fished		40.59			23.00			74.84			62.50		
Catch/Effort (h)		0.66			0.56			0.76			0.98		

Species	a	b	c	a	b	c	a	b	c	a	b	c	Total	
Common carp	-	-	3R	-	2R	-	3K	-	2R	-	4R	-	3K	11R	14
Channel catfish	3K	-	-	-	-	-	5K	3K	1R	-	-	5R	11K	6R	17
Rock bass	-	-	-	-	-	-	2K	1K	3K 1R	-	-	1K 1R	7K	2R	9
Bluegill	-	-	-	-	-	-	1R	-	-	-	-	-	-	1R	1
Sunfishes (Lepomis spp.)[1]	2R	-	-	-	4K 2R	-	-	1K	1R	-	2K	4K	11K	5R	16
Smallmouth bass	3R	1R	4R	-	1K 1R	1K	2K 5R	1R	3R	-	2K	3K 1R	9K	19R	28
Largemouth bass	-	-	-	-	-	-	-	-	-	-	-	1K	1K	-	1
Black crappie	-	-	-	-	-	-	1K	-	-	-	-	-	1K	-	1
Crappies (Pomoxis spp.)[1]	-	-	-	-	-	1K 1R	-	-	-	-	4K	25K	30K	1R	31
Yellow perch	-	-	-	-	-	-	-	-	-	-	1K	1K	2K	-	2
Walleye	1K 2R	1K 6R	1R	-	-	-	3K 2R	-	1K 15R	-	3K 1R	2K	11K	27R	38

1 General identification.
K Kept.
R Released.

Table 20

Summary of selected physicochemical parameters taken on 9 and 20 September 1982 near the TMINS. Values are expressed in mg/l except for water temperature (C), pH, and turbidity (NTU).

Location	Date	Water Temperature (C)	pH	Dissolved Oxygen	Turbidity (NTU)	Alkalinity as $CaCO_3$	Sulfate	Total Dissolved Solids	Total Copper	Dissolved Copper	Total Zinc	Dissolved Zinc
TM-AQI-1A1	9 Sep	19.0	7.7	6.7	6.0	69.0	107.0	307	0.005	0.003	0.009	0.005
TM-AQI-1A2		19.5	8.0	7.6	10.0	78.0	85.0	288	0.004	0.002	0.010	0.003
TM-AQI-11A1		19.5	8.1	8.0	7.0	64.5	101.0	302	0.005	0.003	0.009	0.003
TM-AQI-11A2		19.5	8.1	8.2	7.5	65.5	89.0	300	0.004	0.003	0.009	0.003
TM-AQI-9B1		20.0	8.1	7.8	9.5	77.0	89.0	291	0.003	0.002	0.010	0.002
TM-AQI-1A1	20 Sep	19.0	7.3	7.8	7.6	67.5	124.0	318	0.004	0.002	0.013	0.005
TM-AQI-1A2		19.0	7.5	10.2	7.0	102.0	70.0	284	0.003	0.002	0.011	0.005
TM-AQI-11A1		19.5	7.6	8.8	7.5	75.0	105.0	319	0.005	0.003	0.014	0.004
TM-AQI-11A2		19.5	7.4	9.0	7.1	75.5	114.0	305	0.004	0.003	0.011	0.004
TM-AQI-9B1		20.0	7.7	9.0	7.9	77.0	110.0	306	0.004	0.002	0.013	0.005
					MEAN VALUES FOR SEPTEMBER 1982							
TM-AQI-1A1	Sep	19.0	-	7.2	6.8	68.2	115.5	312	0.004	0.002	0.011	0.005
TM-AQI-1A2		19.2	-	8.9	8.5	90.0	77.5	286	0.004	0.002	0.010	0.004
TM-AQI-11A1		19.5	-	8.4	7.2	69.8	103.0	310	0.005	0.003	0.012	0.004
TM-AQI-11A2		19.5	-	8.6	7.3	70.5	101.5	302	0.004	0.003	0.010	0.004
TM-AQI-9B1		20.0	-	8.4	8.7	77.0	99.5	298	0.004	0.002	0.012	0.004

Table 21

Summary of selected physicochemical parameters taken on 9 and 23 August 1982 near the TMINS. Values are expressed in mg/l except for water temperature (C), pH, and turbidity (NTU).

Location	Date	Water Temperature (C)	pH	Dissolved Oxygen	Turbidity (NTU)	Alkalinity as $CaCO_3$	Sulfate	Total Dissolved Solids	Total Copper	Dissolved Copper	Total Zinc	Dissolved Zinc
TM-AQI-1A1	9 Aug	25.5	8.8	8.3	6.4	66.2	100.0	275	0.004	0.002	0.015	0.006
TM-AQI-1A2		25.5	8.6	9.5	9.1	103.0	59.7	264	0.003	0.002	0.013	0.008
TM-AQI-11A1		25.5	8.6	9.7	12.0	92.5	68.7	260	0.004	0.002	0.014	0.008
TM-AQI-11A2		25.5	8.7	9.4	10.5	92.5	72.0	266	0.004	0.002	0.013	0.008
TM-AQI-9B1		26.0	8.8	9.8	12.0	83.6	78.2	270	0.005	0.002	0.014	0.009
TM-AQI-1A1	23 Aug	20.5	8.4	9.8	10.0	67.8	88.9	260	0.003	0.002	0.018	0.007
TM-AQI-1A2		21.0	8.7	10.8	8.5	84.4	62.6	248	0.002	0.002	0.015	0.008
TM-AQI-11A1		21.0	8.7	10.3	7.2	76.9	72.8	247	0.002	0.002	0.018	0.008
TM-AQI-11A2		21.5	8.7	10.0	6.0	74.4	65.0	256	0.003	0.002	0.015	0.007
TM-AQI-9B1		21.5	8.7	10.7	8.5	76.4	73.3	251	0.003	0.002	0.017	0.009
					MEAN VALUES FOR AUGUST 1982							
TM-AQI-1A1	Aug	23.0	-	9.0	8.2	67.0	94.4	268	0.004	0.002	0.016	0.006
TM-AQI-1A2		23.2	-	10.2	8.8	93.7	61.2	256	0.002	0.002	0.014	0.008
TM-AQI-11A1		23.2	-	10.0	9.6	84.7	70.8	254	0.003	0.002	0.016	0.008
TM-AQI-11A2		23.5	-	9.7	8.2	83.4	68.5	261	0.004	0.002	0.014	0.008
TM-AQI-9B1		23.8	-	10.2	10.2	80.0	75.8	260	0.004	0.002	0.016	0.009

Table 22

Thermal plume temperature data (C) taken at 0.5 m intervals surface (S) to bottom at 5 m, 20 m, and 40 m offshore, above and below the TMINS Discharge, 29 September 1982.

Air Temp (C):
Wind Speed (km/h):
River Flow (m^3/s): 216.9

Dew Point (C):
Wind Direction:
River Elevation (m): 84.5

Time:	Start 1409	Finish 1531
Station Operation Level (%):		
Unit 1	0	0
Unit 2	0	0
Nuclear Service Pumps:		
Unit 1	1	1
Unit 2	1	1
Secondary Service Pumps:		
Unit 1	1	1
Unit 2	1	1
Decay Heat Pumps:		
Unit 1	0	0
Effluent Rate (m^3/s):	1.26	1.26
Intake Temp (C):	17.7	18.4
Effluent Temp (C):	17.6	18.2

Distance From Three Mile Island Shore				
40 m	20 m	5 m	Depth	
18.2	17.7	17.7	S	Unit 1 Intake
18.2	17.7	17.7	0.5 m	
18.2	17.7	17.7	1.0	
	17.7	17.7	1.5	
		17.6	2.0	
		17.6	2.5	
		17.6	3.0	
17.7	17.6	17.8	S	25 m Upstream of
17.7	17.6	17.7	0.5	Discharge
17.7	17.6		1.0	
17.7			1.5	
17.7			2.0	
17.7	17.7	17.8	S	Discharge (D)
17.7	17.7	17.7	0.5	
17.7	17.7	17.7	1.0	
17.7			1.5	
17.6	17.7	17.7	S	25 m Downstream of D
17.6	17.6	17.7	0.5	
17.6	17.6		1.0	
17.6			1.5	
17.6	* 17.6	17.7	S	50 m Downstream of D
17.6	17.6	17.7	0.5	
17.6	17.6		1.0	
17.6	17.6		1.5	
17.7	17.6	17.6	S	75 m Downstream of D
17.7	17.6	17.6	0.5	
17.7	17.6		1.0	
17.7	17.6		1.5	
17.8	17.7	17.7	S	100 m Downstream of D
17.8	17.7	17.7	0.5	
17.8	17.7	17.7	1.0	
17.7	17.7		1.5	
17.7	17.8	17.7	S	125 m Downstream of D
17.7	17.8	17.7	0.5	
17.7	17.8		1.0	
17.7	17.8		1.5	

Distance From Three Mile Island Shore				
40 m	20 m	5 m	Depth	
17.7	17.9	17.8	S	150 m Downstream of D
17.7	17.9	17.8	0.5	
17.7	17.9		1.0	
	17.9		1.5	
17.7	17.8	17.9	S	200 m Downstream of D
17.7	17.8	17.9	0.5	
17.7	17.8		1.0	
18.1	17.7	17.8	S	300 m Downstream of D
18.1	17.7	17.8	0.5	
18.1	17.7		1.0	
18.1	17.7		1.5	
18.0			2.0	
17.8	17.8	17.8	S	400 m Downstream of D
17.8	17.8	17.8	0.5	
17.8	17.8		1.0	
17.8	17.7		1.5	
17.8			2.0	
17.8			2.5	
18.2	18.1	18.2	S	800 m Downstream of D
18.2	18.1	18.2	0.5	
18.1	18.0		1.0	
18.0	17.9		1.5	
17.9			2.0	
18.0	17.9	18.2	S	1000 m Downstream of D
18.0	17.9		0.5	
18.0	17.9		1.0	
17.9	17.8		1.5	
18.1	18.0	18.7	S	1900 m Downstream of D
18.0	18.0	17.9	0.5	
17.9	18.0	17.7	1.0	
17.9	17.9		1.5	
17.8	17.7		2.0	