50-320

THREE MILE ISLAND AQUATIC STUDY

Monthly Report for September 1980

by

Ichthyological Associates, Inc.
P.O. Box 223, Etters, PA 17319

George A. Nardacci, Project Leader

For

Metropolitan Edison Company

Ichthyological Associates, Inc.
Edward C. Raney, Ph.D., President
301 Forest Drive
Ithaca, New York 14850

Rcd. 30-X-80
CRH

TABLE OF CONTENTS

TABLE OF TABLES

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 1980.

COMPLIANCE WITH ENVIRONMENTAL TECHNICAL SPECIFICATIONS (ETS)

Objectives: 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 population estimate of fishes program was begun on 29 September.

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

MACROINVERTEBRATES

Objective: 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 8 and 22 September (Table 1). Enumeration and determination of dry weights of the macroinvertebrates have been completed through 22 September; identification of specimens has been completed through 21 July.

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: Identification of all 1980 specimens was completed and computer input of data for table generation was begun.

ENTRAINMENT

Progress: Digital flowmeters were calibrated and most tables for the 1980 annual report were completed in preliminary form.

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 8-10 and 22-24 September (Table 1). A total of 293 fish of 14 species was taken on 8-10 September (Table 2). Most fish (135) and greatest biomass (9.37 kg) occurred at Station 11A2 while most species (10) were found at 11A3. The pumpkinseed (52.6% of the total catch) and bluegill (23.2%) were most abundant. One young American shad was collected at Station 11A3. One brown bullhead, 8 channel catfish, and 5 rock bass were tagged. Recaptured fishes included one channel catfish and one rock bass. One rock bass and one bluegill were parasitized by anchor worms. Two pumpkinseed were found dead in the trapnets. Three male pumpkinseed were ripe.

A total of 347 fish of 13 species was taken on 22-24 September (Table 3). Most fish (119) were taken at Stations 11A2 and 11A3, most species (10) at 9B2, and greatest biomass (18.11 kg) at 11A2. The pumpkinseed (34.6% of the total catch), bluegill (33.7%), and black crappie (13.5%) were common. Thirteen channel catfish, 2 brown bullhead, and 3 rock bass were tagged.

One previously tagged rock bass was recaptured. One pumpkinseed was found dead in the trapnets and one bluegill exhibited a hole on the isthmus between the branchiostegals.

One dead quillback was observed 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 9 and 23 September (Table 1). A total of 1,300 fish of 16 species was taken on 9 September (Table 4). Most fish (395) occurred at Station 10B5 while most species (10) and greatest biomass (355.6 g) were found at 1A2. The spotfin shiner (62.0% of the total catch) and pumpkinseed (17.9%) were common. Anchor worms parasitized the spotfin shiner (4 specimens) and bluntnose minnow, fallfish, shorthead redhorse, and smallmouth bass (1 each). The following fishes bore slight black spot infections: spotfin shiner (92 specimens), bluntnose minnow (31), fallfish (19), white sucker (3), shorthead redhorse and bluegill (2 each), and rock bass and tessellated darter (1 each). Three spotfin shiner bore moderate black spot infections and one tessellated darter was parasitized by a leech.

A total of 1,573 fish of 17 species was taken on 23 September (Table 5). Most fish (499) were taken at Station 9B6, greatest biomass (507.7 g) at 10A2, and most species (8) at 1A2 and 4A2. Common species included the spotfin shiner (43.0% of the total catch), pumpkinseed (28.0%), bluegill (12.3%), and spottail shiner (10.5%).

The following fishes bore slight black spot infections: spotfin shiner (43 specimens), bluntnose minnow (13), fallfish (7), spottail shiner (3), and white sucker and smallmouth bass (1 each). Anchor worms parasitized 4 pumpkinseed, 2 spotfin shiner, 2 bluntnose minnow, and 1 smallmouth bass. Moderate black spot infections were observed on one spotfin shiner and one bluntnose minnow. Leeches parasitized two tessellated darter. One spotfin shiner had a deformed mouth.

No pattern of parasite infection or anomalies was observed with respect to the location of TMINS for either September sample date.

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 11-12 and 25-26 September at the TMINS Unit 1 and 2 Intakes (Table 1). Unit 1 impinged 30 fish of 4 species weighing 112.3 g; most fish were young and all but nine were dead (Tables 6 through 9). Fish biomass and numbers were highest during the 11-12 September survey. More fish were collected at 2000 h than during the other survey periods. The estimated impingement from Unit 1 for September was 450 fish weighing 1,684.5 g (3.7 lb).

Unit 2 impinged 12 fish of 6 species weighing 143.9 g (Tables 10 through 13). Most fish were juvenile and dead. Most fish were impinged during the 25-26 September survey, however the greatest biomass of fish was impinged during the 11-12 September survey. The estimated impingement for September from Unit 2 was 180 fish weighing 2,158.5 g (4.8 lb).

The total estimated impingement at TMINS during September was 630 fish weighing 3,843.0 g (8.5 lb).

ELECTROFISHING

Objectives: (1) To provide specimens for radiation analysis and movement 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 650 specimens of 17 species (Table 14). The pumpkinseed (149 specimens), smallmouth bass (141), quillback (89), redbreast sunfish (61), and walleye (56) were most abundant. A total of 56 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 9 previously tagged fish were recaptured in September. Recaptured fishes included the channel catfish (1 specimen), rock bass (6), smallmouth bass (1), and largemouth bass (1). The largemouth bass made a 0.8 km complex movement across the west channel from Shelley Island to the west shore of the reservoir. The remaining fishes were recaptured in the same zones 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 5, 20, 22, and 28 September (Table 1). The 393 anglers interviewed fished 754.05 hours and caught 763 fish (Tables 15 through 18). The actual harvest was 297 fish or 38.9% of the total catch.

The mean catch per effort (c/e) was 1.01. Most anglers (232), most hours fished (478.80), largest catch (503), largest harvest (143), and highest mean c/e (1.05) occurred at the General Reservoir.

Smallmouth bass (452 specimens) were caught in greatest numbers. Other common species included the channel catfish (85), unidentified sunfishes (48), rock bass (36), redbreast sunfish (34), and bluegill (31).

Approximately 80% of the anglers interviewed lived in York or Dauphin counties. Most of the anglers reported they eat some of their catch.

AMBIENT WATER QUALITY

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

Progress: Water quality samples were collected on 8 and 22 September at the five river stations (Table 1). Data were analyzed and tabulated; results are presented in Table 19.

On 8 September values for pH, sulfate, and total dissolved solids were highest at Station 1A1 (located above the TMINS Discharge); dissolved oxygen and alkalinity were highest at 1A2. Values for turbidity, total copper, and total zinc (11A1) and water temperature and dissolved copper (9B1) were highest at Stations at or below the Discharge.

On September 22 values for sulfate, total dissolved solids, and total copper were highest at Station 1A1; dissolved oxygen and alkalinity were highest at 1A2. Water temperature was highest at Station 9B1.

Parameters, for which State water quality criteria have been established, were not exceeded at any station on 8 or 22 September.

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.

Progress: Thermal plume mapping was conducted on 24 September (Table 1) in conformance with the requirements that a plume map be done when river flow declines below 10,000 cfs (283.2 m^3/s). During the 24 September mapping river flow was 4,080 cfs (115.5 m^3/s); maximum ΔT at the Discharge was 0.3 C (Table 20). Maximum river water temperature was 23.6 C recorded at 20 and 40 m offshore 1900 m downstream of the Discharge. The plume extended 150 m downstream of the Discharge and was detected out to 40 m offshore (25 m downstream of the Discharge).

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: Sampling for Fall 1980 population estimates was initiated on 29 September (Table 1). Sampling will continue until enough marked fish are recaptured to compute estimates.

Table 1

Sampling conducted in compliance with the Generation Procedures Manual in September 1980.

PROGRAM	Sep 1-6	Sep 7-13	Sep 14-20	Sep 21-27	Sep 28-30
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	
Thermal Plume Mapping				X	
Population Estimates of Fishes					X

1 Program terminated for 1980 as of 31 August.

Table 2

Fishes taken by trapnet on 8-10 September 1980 near TMINS

Station	TM-AQF-1A3		TM-AQF-11A2		TM-AQF-11A3		TM-AQF-9B2		Total	% Catch
Date	8-9	9-10	8-9	9-10	8-9	9-10	8-9	9-10		
Time	1350-1436	1438-1428	1340-1402	1405-1418	1333-1344	1345-1357	1320-1315	1319-1333		
Air Temp (C)	24.5, 27.5	27.5, 22.5	23.5, 27.0	27.0, 22.0	24.0, 27.5	27.5, 21.5	23.5, 25.0	25.0, 22.0		
Water Temp (C)	26.0, 26.0	26.0, 24.5	25.0, 25.0	25.0, 24.5	25.0, 25.0	25.0, 24.0	26.5, 25.5	25.5, 24.5		
Dissolved Oxygen (mg/l)	9.0, 9.8	9.8, 8.8	8.2, 8.0	8.0, 8.5	8.0, 8.0	8.0, 8.1	8.1, 9.2	9.2, 8.6		
pH	8.3, 8.6	8.6, 8.6	8.2, 8.0	8.0, 8.4	7.9, 8.0	8.0, 8.3	8.2, 8.7	8.7, 8.2		
Secchi Disc (cm)	41, 38	38, 43	41, 43	43, 48	46, 43	43, 36	56, 56	56, 43		
River Stage (m)	0.95, 1.08	1.08, 1.01	0.95, 1.08	1.08, 1.01	0.95, 1.08	1.08, 1.01	0.95, 1.08	1.08, 1.01		
Weather	Clear, Partly Cloudy	Partly Cloudy, Clear	Clear, Partly Cloudy	Partly Cloudy, Clear	Clear, Partly Cloudy	Partly Cloudy, Clear	Clear, Partly Cloudy	Partly Cloudy, Clear		
No. of Specimens	20	36	80	55	20	26	50	6	293	
No. of Species	5	7	6	7	6	9	4	4	14	
American shad	-	-	-	-	-	1	-	-	1	0.3
Carp	-	1	-	-	-	-	-	-	1	0.3
Golden shiner	-	-	-	-	-	2	-	-	2	0.7
Spottail shiner	1	-	-	-	-	-	1	-	2	0.7
Spotfin shiner	-	-	-	2	-	-	-	-	2	0.7
Yellow bullhead	-	-	-	-	-	1	-	-	1	0.3
Brown bullhead	-	-	-	-	1	-	-	-	1	0.3
Channel catfish	2	3	3	-	3	1	-	1	13	4.4
Rock bass	-	3	2	2	1	2	-	-	10	3.4
Redbreast sunfish	-	-	-	1	-	-	-	-	1	0.3
Pumpkinseed	12	9	53	39	10	12	17	2	154	52.6
Bluegill	2	8	19	7	4	1	25	2	68	23.2
White crappie	-	5	1	1	-	2	7	1	17	5.8
Black crappie	3	7	2	3	1	4	-	-	20	6.8

Table 3

Fishes taken by trapnet on 22-24 September 1980 near TMINS.

Station	TM-AQF-1A3		TM-AQF-11A2		TM-AQF-11A3		TM-AQF-9B2		Total	% Catch
Date	22-23	23-24	22-23	23-24	22-23	23-24	22-23	23-24		
Time	1350-1456	1500-1435	1339-1417	1421-1400	1331-1341	1345-1336	1316-1316	1322-1308		
Air Temp (C)	30.0, 25.0	25.0, 22.0	29.0, 25.5	25.5, 22.5	29.0, 26.0	26.0, 22.5	28.5, 25.5	25.5, 22.0		
Water Temp (C)	27.0, 25.5	25.5, 24.0	24.5, 25.0	25.0, 23.0	25.0, 25.0	25.0, 23.0	26.5, 25.0	25.0, 24.0		
Dissolved Oxygen (mg/l)	13.4, 12.4	12.4, 12.6	9.3, 10.0	10.0, 9.6	9.1, 9.6	9.8, 9.8	7.8, 9.0	9.0, 10.0		
pH	8.8, 8.9	8.9, 8.7	8.6, 8.5	8.5, 8.1	8.6, 8.4	8.4, 8.3	8.7, 8.4	8.4, 8.5		
Secchi Disc (cm)	38, 30	30, 48	38, 36	36, 46	48, 36	36, 53	43, 43	43, 56		
River Stage (m)	0.94, 0.94	0.94, 0.93	0.94, 0.94	0.94, 0.93	0.94, 0.94	0.94, 0.93	0.94, 0.94	0.94, 0.93		
Weather	Partly Cloudy, Partly Cloudy	Partly Cloudy, Clear	Partly Cloudy, Partly Cloudy	Partly Cloudy, Partly Cloudy	Partly Cloudy, Partly Cloudy	Partly Cloudy, Partly Cloudy	Partly Cloudy, Partly Cloudy	Partly Cloudy, Partly Cloudy		
No. of Specimens	39	10	56	63	83	36	18	42	347	
No. of Species	6	3	5	5	9	4	8	7	13	
Carp	-	-	-	-	-	-	1	-	1	0.3
Golden shiner	-	-	-	-	1	-	-	1	2	0.6
Yellow bullhead	-	-	-	-	-	-	1	-	1	0.3
Brown bullhead	-	-	-	-	2	1	-	-	3	0.9
Channel catfish	3	-	4	5	3	-	2	1	18	5.2
Rock bass	1	-	2	-	2	-	-	-	5	1.4
Redbreast sunfish	-	-	-	-	-	-	-	1	1	0.3
Pumpkinseed	4	3	14	16	56	16	2	9	120	34.6
Bluegill	9	2	26	37	12	6	7	18	117	33.7
White crappie	14	5	-	-	4	-	2	4	29	8.4
Black crappie	8	-	10	4	2	13	2	8	47	13.5
Yellow perch	-	-	-	-	1	-	1	-	2	0.6
Walleye	-	-	-	1	-	-	-	-	1	0.3

Table 4

Fishes taken by seine on 9 September 1980 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-9B1	TM-AQF-9B3	TM-AQF-4A2	Total	% Catch
Time	0833	1133	0855	0923	1005	1025	1040	1054	1110	09[illegible]		
Air Temp (C)	22.0	24.0	18.5	20.0	22.0	21.0	22.0	21.5	22.0	[illegible] 0		
Water Temp (C)	23.5	25.0	23.5	23.5	23.0	23.5	24.0	23.5	23.5	24 [illegible]		
Dissolved Oxygen (mg/l)	9.5	14.8	7.6	9.6	8.4	8.1	7.7	8.3	8.6	10.8		
pH	8.9	9.1	8.2	8.2	7.9	7.8	7.8	8.1	8.2	8.2		
Secchi Disc (cm)	38	56	91*	46	51	46	61	61	56	36		
River Stage (m)	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08		
Weather	Clear	Partly Cloudy	Clear	Clear	Clear	Clear	Clear	Clear	Partly Cloudy	Clear		
No. of Specimens	26	395	114	238	246	42	53	19	68	99	1300	
No. of Species	6	9	3	10	6	5	6	4	5	7	16	
No. of Hauls	5	6	5	4	5	4	5	5	5	4	48	
Golden shiner	-	3	-	-	-	-	-	-	-	-	3	0.2
Spottail shiner	1	5	-	22	-	-	33	2	-	6	69	5.3
Swallowtail shiner	-	1	-	-	-	-	-	-	-	-	1	0.1
Spotfin shiner	21	348	112	53	201	-	15	12	43	1	806	62.0
Mimic shiner	-	1	-	-	-	-	-	-	-	-	1	0.1
Bluntnose minnow	-	6	-	40	1	-	1	-	-	16	64	4.9
Fallfish	1	-	-	3	-	16	-	-	-	-	20	1.5
White sucker	-	-	-	1	-	2	-	-	-	-	3	0.2
Northern hog sucker	1	-	-	1	1	2	-	-	1	-	6	0.5
Shorthead redhorse	-	-	-	4	-	-	-	-	-	-	4	0.3
Rock bass	-	-	-	-	-	-	-	-	-	1	1	0.1
Pumpkinseed	1	10	1	102	15	19	1	4	11	69	233	17.9
Bluegill	-	20	-	8	27	3	-	-	12	5	75	5.8
Smallmouth bass	1	-	1	-	1	-	2	1	1	-	7	0.5
Black crappie	-	1	-	-	-	-	-	-	-	-	1	0.1
Tessellated darter	-	-	-	4	-	-	1	-	-	1	6	0.5

* Clear to bottom at indicated depth.

Table 5

Fishes taken by seine on 23 September 1980 near T..ONS.

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	0840	1138	0859	0918	1011	1028	1044	1102	1118	0946		
Air Temp (C)	25.0	26.5	25.0	25.0	26.0	25.5	25.5	26.5	26.0	25.0		
Water Temp (C)	24.5	24.5	24.0	24.5	24.5	25.0	24.5	24.5	25.0	24.5		
Dissolved Oxygen (mg/l)	8.7	9.8	7.6	10.7	10.6	8.1	8.4	9.4	8.9	12.0		
pH	8.5	8.4	8.2	8.5	8.7	8.0	8.0	8.3	8.0	8.6		
Secchi Disc (cm)	71	71	89*	53	56	61	58	58	61	66		
River Stage (m)	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94		
Weather	Partly Cloudy	Partly Cloudy	Partly Cloudy	Partly Cloudy	Partly Cloudy	Partly Cloudy	Partly Cloudy	Partly Cloudy	Partly Cloudy	Partly Cloudy		
No. of Specimens	54	73	38	269	184	160	499	85	160	51	1573	
No. of Species	7	6	3	8	6	7	6	7	7	8	17	
No. of Hauls	5	6	6	4	3	3	4	4	4	4	43	
Golden shiner	-	1	-	-	-	-	-	-	-	-	1	0.1
Spottail shiner	1	-	-	3	-	40	9	23	62	27	165	10.5
Spotfin shiner	12	31	35	5	8	1	474	47	63	1	677	43.0
Mimic shiner	-	-	-	-	-	-	1	-	-	-	1	0.1
Bluntnose minnow	10	5	-	6	-	-	6	3	19	8	57	3.6
Fallfish	-	-	-	1	-	7	-	-	-	-	8	0.5
White sucker	-	-	-	-	-	1	-	-	-	-	1	0.1
Northern hog sucker	1	-	-	1	1	1	-	-	-	-	4	0.2
Shorthead redhorse	-	-	-	-	-	-	-	1	-	-	1	0.1
Rock bass	-	1	-	-	-	-	-	-	-	-	1	0.1
Redbreast sunfish	-	-	-	-	-	-	-	-	-	1	1	0.1
Green sunfish	-	-	-	-	-	-	-	-	-	1	1	0.1
Pumpkinseed	15	13	1	192	102	89	8	5	8	8	441	28.0
Bluegill	14	22	2	57	71	21	-	2	1	3	193	12.3
Smallmouth bass	-	-	-	-	-	-	-	4	1	2	7	0.4
Black crappie	-	-	-	-	1	-	-	-	-	-	1	0.1
Tessellated darter	1	-	-	4	1	-	1	-	6	-	13	0.8

* Clear to bottom at indicated depth.

Table 6

Numbers of fishes impinged at the Unit 1 Intake during a 24-h impingement survey on 11-12 September 1980.

Date	11		12		12			
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)	-5		-5		-5			
River Flow (m^3/s)	115.5		115.5		115.5			
Air Temp (C)	23.0		18.5		25.0			
Water Temp (C)	24.0		23.0		23.0		Total	
Condition of Fish	Alive	Dead	Alive	Dead	Alive	Dead	Alive	Dead
Channel catfish	1	1	-	1	-	-	1	2
Rock bass	1	-	-	-	-	-	1	-
Pumpkinseed	3	6	3	2	-	1	6	9
Bluegill	-	1	-	-	-	-	-	1
Total	5	8	3	3	-	1	8	12

Table 7

Summary of lengths, weights, breeding condition, and numbers of fishes impinged at the Unit 1 Intake on 11-12 September 1980.

Species	Fork Length Range (5mm groups)	Reproductive Status	Total Weight (g)	Total Number
Channel catfish	66-70, 91-95, 106-110	1 Young, 2 Juvenile	30.5	3
Rock bass	61-65	1 Young	5.8	1
Pumpkinseed	21-25, 41-65	11 Young, 4 Juvenile	37.6	15
Bluegill	56-60	1 Juvenile	3.4	1
Total			77.3	20

Table 8

Numbers of fishes impinged at the Unit 1 Intake during a 24-h impingement survey on 25-26 September 1980.

Date	25		26		26			
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)	-6		-6		-6			
River Flow (m^3/s)	110.7		108.4		107.6			
Air Temp (C)	19.5		18.0		19.5			
Water Temp (C)	20.0		20.0		20.0		Total	
Condition of Fish	Alive	Dead	Alive	Dead	Alive	Dead	Alive	Dead
Channel catfish	-	-	-	-	-	1	-	1
Rock bass	-	-	-	-	1	-	1	-
Pumpkinseed	-	1	-	1	-	5	-	7
Bluegill	-	1	-	-	-	-	-	1
Total	-	2	-	1	1	6	1	9

Table 9

Summary of lengths, weights, breeding condition, and numbers of fishes impinged at the Unit 1 Intake on 25-26 September 1980.

Species	Fork Length Range (5 mm groups)	Reproductive Status	Total Weight (g)	Total Number
Channel catfish	66-70	1 Young	3.9	1
Rock bass	61-65	1 Young	6.1	1
Pumpkinseed	26-30, 46-60, 66-70	4 Young, 3 Juvenile	24.0	7
Bluegill	36-40	1 Young	1.0	1
Total			35.0	10

Table 10

Numbers of fishes impinged at the Unit 2 Intake during a 24-h impingement survey on 11-12 September 1980.

Date	11		12		12			
Time	2000		0400		1200			
Volmetric 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)	-4		-4		-4			
River Flow (m^3/s)	115.5		115.5		115.5			
Air Temp (C)	22.0		17.0		25.0			
Water Temp (C)	24.0		22.0		23.0		Total	
Condition of Fish	Alive	Dead	Alive	Dead	Alive	Dead	Alive	Dead
Channel catfish	-	-	-	1	1	1	1	2
Redbreast sunfish	-	1	-	-	-	-	-	1
Pumpkinseed	-	-	-	1	-	-	-	1
Total	-	1	-	2	1	1	1	4

Table 11

Summary of lengths, weights, breeding condition, and numbers of fishes impinged at the Unit 2 Intake on 11-12 September 1980.

Species	Fork Length Range (5 mm groups)	Reproductive Status	Total Weight (g)	Total Number
Channel catfish	56-60, 81-85, 96-100	2 Young, 1 Juvenile	20.6	3
Redbreast sunfish	141-145	1 Adult	72.7	1
Pumpkinseed	81-85	1 Juvenile	10.7	1
Total			104.0	5

Table 12

Numbers of fishes impinged at the Unit 2 Intake during a 24-h impingement survey on 25-26 September 1980.

Date	25		26		26			
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)	-7		-7		-7			
River Flow (m^3/s)	110.7		108.4		107.6			
Air Temp (C)	18.0		18.0		20.0			
Water Temp (C)	20.0		20.0		20.5		Total	
Condition of Fish	Alive	Dead	Alive	Dead	Alive	Dead	Alive	Dead
Rock bass	-	-	1	-	-	-	1	-
Bluegill	1	1	1	-	-	2	2	3
Tessellated darter	-	1	-	-	-	-	-	1
Total	1	2	2	-	-	2	3	4

Table 13

Summary of lengths, weights, breeding condition, and numbers of fishes impinged at the Unit 2 Intake on 25-26 September 1980.

Species	Fork Length Range (5 mm groups)	Reproductive Status	Total Weight (g)	Total Number
Rock bass	61-55	1 Young	16.4	1
Bluegill	56-65, 71-75, 91-95	5 Juvenile	22.7	5
Tessellated darter	41-45	1 Juvenile	0.8	1
Total			39.9	7

Table 14

Numbers of fishes captured by AC electrofisher near THINS in September 1980.

Zone	15B2	16B8	4A1	16A2	15A2	10B1	15A1	11B1	10B3	13A1	10A3	9B5
Date	3 Sep	3 Sep	3 Sep	3 Sep	3 Sep	3 Sep	4 Sep	4 Sep	4 Sep	4 Sep	4 Sep	4 Sep
Time	2015	2058	2134	2211	2252	2344	2010	2044	2105	2148	2228	2303
Duration (min)	17	14	15	19	18	16	16	16	23	22	18	17
Air Temp (C)	21.0	22.0	21.0	20.0	20.0	21.0	26.0	25.0	25.0	25.0	23.0	24.0
Water Temp (C)	27.0	27.0	27.0	27.0	27.0	26.0	27.0	26.0	26.0	26.0	26.0	26.0
Dissolved Oxygen (mg/l)	9.5	9.7	9.6	10.0	8.4	7.9	9.0	11.4	8.3	10.1	9.4	8.9
pH	9.2	8.7	8.3	8.6	8.4	8.5	8.9	9.1	8.6	8.4	8.4	8.3
Conductivity (micromhos/cm)	275	300	450	460	350	360	360	300	350	475	460	460
Secchi Disc (cm)	30	61	30	33	76	61	61	38	76	46	51	51
Volts	200	200	185	180	205	185	190	200	175	175	170	165
Amps	6.0	5.0	7.5	8.0	8.0	8.0	7.0	5.5	8.0	8.0	7.5	8.0
Gizzard shad	11	1	-	1	1	-	-	-	-	2	-	-
Carp	-	4	3	2	1	-	-	-	1	-	1	-
Golden shiner	-	-	-	-	-	-	-	-	1	-	-	-
Quillback	3	2	-	1	4	5	5	5	6	5	2	3
White sucker	-	-	-	-	-	-	-	-	-	-	-	-
Northern hog sucker	-	-	-	-	-	-	3	-	-	-	-	-
Shorthead redhorse	-	-	-	-	-	-	-	-	-	-	2	-
Channel catfish	-	-	-	2	-	-	-	-	-	1	1	-
Rock bass	2	-	-	2	3	-	1	-	-	2	3	-
Redbreast sunfish	-	1	2	2	7	3	7	-	5	4	-	-
Pumpkinseed	-	2	6	9	9	-	-	-	1	13	13	3
Bluegill	-	-	2	1	-	-	-	-	1	-	1	-
Smallmouth bass	1	7	21	9	5	8	7	-	7	11	4	3
Largemouth bass	-	-	2	-	-	-	-	-	6	-	-	-
White crappie	-	-	-	-	-	-	-	-	-	-	-	1
Black crappie	-	-	-	-	-	-	-	-	-	-	-	1
Walleye	-	-	4	9	1	-	-	-	1	4	2	3
No. of Specimens	17	17	40	38	31	16	23	5	29	42	29	14
No. of Species	4	6	7	10	8	3	5	1	9	8	9	6

Table 14 continued

Zone	15B2	16B8	4A1	16A2	15A2	10B1	15A1	11B1	10B3	13A1	10A3	9B5	Total
Date	15 Sep	15 Sep	15 Sep	15 Sep	15 Sep	15 Sep	18 Sep	18 Sep	18 Sep	18 Sep	18 Sep	18 Sep	
Time	2002	2046	2126	2159	2240	2313	1949	2022	2052	2134	2219	2257	
Duration (min)	18	15	16	21	15	15	15	15	21	23	17	16	
Air Temp (C)	18.0	18.0	15.0	14.0	15.0	15.0	19.0	17.0	17.0	17.0	16.0	15.5	
Water Temp (C)	22.0	21.0	22.0	23.0	21.0	22.0	21.5	21.0	21.0	21.0	21.5	21.0	
Dissolved Oxygen (mg/l)	13.3	9.1	11.2	10.0	9.0	9.0	9.8	8.8	9.0	9.2	8.8	8.7	
pH	9.4	9.1	9.0	8.8	9.4	9.3	9.1	8.7	8.7	8.3	8.2	8.1	
Conductivity (micromhos/cm)	300	310	500	500	440	425	425	325	400	525	525	525	
Secchi Disc (cm)	25	61	33	33	58	38	61	51	61	46	46	46	
Volts	205	210	200	165	210	185	190	200	170	175	160	165	
Amps	6.0	6.0	7.5	7.5	7.0	7.5	6.5	6.0	7.0	7.0	7.0	8.0	
Gizzard shad	5	-	-	1	-	-	-	-	-	-	-	-	22
Carp	1	2	1	1	1	1	4	2	1	1	1	-	28
Golden shiner	-	-	-	-	-	-	-	-	-	-	-	-	1
Quillback	3	5	1	5	7	6	6	2	3	5	3	2	8
White sucker	-	-	-	1	-	-	-	-	-	-	-	-	1
Northern hog sucker	1	-	-	-	-	-	-	-	-	1	1	-	6
Shorthead redhorse	-	-	1	-	1	-	-	-	-	-	1	-	5
Channel catfish	-	2	-	2	-	-	2	-	1	2	1	-	14
Rock bass	1	-	3	3	-	-	1	1	-	2	4	-	28
Redbreast sunfish	-	4	-	-	5	2	7	1	4	7	-	-	61
Pumpkinseed	-	3	5	13	3	1	-	5	1	31	29	2	149
Bluegill	-	2	1	-	-	-	-	-	6	7	1	-	22
Smallmouth bass	2	9	4	3	3	4	5	1	3	5	10	9	141
Largemouth bass	-	-	1	-	-	-	-	4	3	-	1	-	17
White crappie	-	-	-	-	-	-	-	-	-	-	-	-	1
Black crappie	-	2	1	-	-	-	-	-	-	1	3	1	9
Walleye	2	1	5	4	-	1	-	3	1	4	6	5	56
No. of Specimens	15	30	23	33	20	15	25	19	23	66	61	19	650
No. of Species	7	9	10	9	6	6	6	8	9	11	12	5	17

Table 15

Creel Survey data from the GR for each survey day in September 1980.

Day	5 Fri			20 Sat			22 Mon			28 Sun			
Weather	Partly Cloudy			Overcast, Partly Cloudy			Partly Cloudy, Clear			Clear			
River Stage (m)		0.95			0.94			0.94			0.91		
Air Temperature (°)	25.0	27.0	28.5	22.0	26.0	25.5	27.0	30.5	28.5	17.5	23.5	22.0	
Water Temperature (C)	27.5	29.0	29.5	22.5	23.5	24.0	23.5	26.5	26.5	16.5	19.5	19.5	
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	8	6	13	32	25	13	4	3	3	31	53	41	232
Fish Caught	16	5	17	102	37	47	11	14	-	88	101	65	503
Fish Kept	3	1	3	24	14	19	5	4	-	31	20	19	143
Hours Fished	12.00	15.50	14.50	100.15	51.75	28.35	14.50	11.00	-	68.50	76.80	85.75	478.80
Catch/Effort (h)	1.33	0.32	1.17	1.02	0.71	1.66	0.76	1.27	-	1.28	1.32	0.76	1.05
Day Totals:													
Anglers		27			70			10			125		
Fish Caught		38			186			25			254		
Fish Kept		7			57			9			70		
Hours Fished		42.00			180.25			25.50			231.05		
Catch/Effort (h)		0.90			0.96			0.97			1.10		

Species	a	b	c	a	b	c	a	b	c	a	b	c	Total		
Carp	-	-	-	-	-	-	-	-	-	1K	-	-	1K	-	1
Channel catfish	1R	2R	-	5R	4K	1K	2K 2R	1R	-	2K 5R	-	-	9K	16R	25
Rock bass	1R	-	-	1K 4R	2K 6R	1K	1K	2K 2R	-	1K 1R	1K 2R	6K 1R	15K	17R	32
Redbreast sunfish	-	-	-	-	-	9K	2K	2K	-	4K	-	2K	19K	-	19
Pumpkinseed	-	-	-	-	-	6K	-	-	-	-	-	-	6K	-	6
Bluegill	-	-	-	-	-	2K 1R	-	-	-	2K	-	-	4K	1R	5
Sunfishes (Lepomis spp.)[1]	-	-	-	2K 8R	2K 3R	-	-	-	-	8R	7R	1R	4K	27R	31
Smallmouth bass	3K 10R	1K 2R	3K 14R	21K 61R	6K 14R	27R	4R	7R	-	21K 43R	17K 72R	4K 44R	83K	298R	381
Black crappie	-	-	-	-	-	-	-	-	-	-	2K	-	2K	-	2
Walleye	1R	-	-	-	-	-	-	-	-	-	-	-	-	1R	1

1 General identification.
R Released.
K Kept.

Table 16

Creel Survey data from the West Dam for each survey day in September 1980.

Day	5 Fri			20 Sat			22 Mon			28 Sun					
Weather	Partly Cloudy			Overcast, Haze			Partly Cloudy, Clear			Clear					
River Stage (m)	0.95			0.94			0.94			0.91					
Air Temperature (C)	24.0	29.0	28.0	22.5	26.0	25.5	28.5	30.5	29.5	17.5	23.5	22.0			
Water Temperature (C)	26.5	29.5	29.5	22.0	22.5	24.5	24.5	27.5	27.5	17.5	21.5	21.5			
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	-	-	-	3	3	5	-	-	-	-	-	-	11		
Fish Caught	-	-	-	18	8	1	-	-	-	-	-	-	27		
Fish Kept	-	-	-	15	6	1	-	-	-	-	-	-	22		
Hours Fished	-	-	-	21.00	4.50	5.25	-	-	-	-	-	-	30.75		
Catch/Effort (h)	-	-	-	0.86	1.78	0.19	-	-	-	-	-	-	0.88		
Day Totals:															
Anglers		-			11			-			-				
Fish Caught		-			27			-			-				
Fish Kept		-			22			-			-				
Hours Fished		-			30.75			-			-				
Catch/Effort (h)		-			0.88			-			-				
Species	a	b	c	a	b	c	a	b	c	a	b	c	Total		
Channel catfish	-	-	-	6K	2R	-	-	-	-	-	-	-	6K	2R	8
Rock bass	-	-	-	-	1K	-	-	-	-	-	-	-	1K	-	1
Redbreast sunfish	-	-	-	2K	-	-	-	-	-	-	-	-	2K	-	2
Bluegill	-	-	-	2K 2R	5K	1K	-	-	-	-	-	-	8K	2R	10
Smallmouth bass	-	-	-	4K 1R	-	-	-	-	-	-	-	-	4K	1R	5
Yellow perch	-	-	-	1K	-	-	-	-	-	-	-	-	1K	-	1

R Released.
K Kept.

Table 17

Creel Survey data from the East Dam for each survey day in September 1980.

Day	5 Fri			20 Sat			22 Mon			28 Sun			
Weather	Partly Cloudy			Partly Cloudy, Haze			Partly Cloudy, Clear			Clear			
River Stage (m)	0.95			0.94			0.94			0.91			
Air Temperature (C)	23.5	27.5	28.0	25.5	25.0	25.5	26.0	31.5	31.5	20.5	21.0	22.5	
Water Temperature (C)	27.0	29.5	29.4	22.5	24.5	24.5	24.5	27.5	29.5	19.0	21.0	22.0	
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	-	-	-	1	-	-	-	-	-	-	-	-	1
Fish Caught	-	-	-	2	-	-	-	-	-	-	-	-	2
Fish Kept	-	-	-	2	-	-	-	-	-	-	-	-	2
Hours Fished	-	-	-	2.00	-	-	-	-	-	-	-	-	2.00
Catch/Effort (h)	-	-	-	1.00	-	-	-	-	-	-	-	-	1.00
Day Totals:													
Anglers		-			1			-			-		
Fish Caught		-			2			-			-		
Fish Kept		-			2			-			-		
Hours Fished		-			2.00			-			-		
Catch/Effort (h)		-			1.00			-			-		

Species	a	b	c	a	b	c	a	b	c	a	b	c	Total	
Smallmouth bass	-	-	-	2K	-	-	-	-	-	-	-	-	2K -	2

K Kept.

Table 18

Creel Survey data from the YHGS for each survey day in September 1980.

Day	5 Fri			20 Sat			22 Mon			28 Sun					
Weather	Partly Cloudy, Overcast			Overcast, Clear			Partly Cloudy, Clear			Clear					
River Stage (m)	0.95			0.94			0.94			0.91					
Air Temperature (C)	27.5	30.0	27.0	27.0	27.5	24.5	26.0	33.5	28.0	21.0	22.0	20.0			
Water Temperature (C)	27.5	30.0	28.5	23.0	23.5	24.5	24.5	27.0	27.0	20.0	20.5	20.5			
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	7	[illegible]	6	16	20	22	2	3	10	21	20	14	149		
Fish Caught	[illegible]	28	18	16	12	25	9	-	8	32	11	6	231		
Fish Kept	39	24	5	11	9	15	3	-	7	7	8	2	130		
Hours Fished	16.75	14.15	9.00	17.75	38.10	47.75	4.00	0.40	6.60	36.65	30.75	20.60	242.50		
Catch/Effort (h)	3.94	1.98	2.00	0.90	0.31	0.52	2.25	-	1.21	0.87	0.36	0.29	0.95		
Day Totals:															
Anglers		21			58			15			55				
Fish Caught		112			53			17			49				
Fish Kept		68			35			10			17				
Hours Fished		39.90			103.60			11.00			88.00				
Catch/Effort (h)		2.81			0.51			1.55			0.56				
Species	a	b	c	a	b	c	a	b	c	a	b	c		Total	
Carp	-	-	-	1R	4K	-	-	-	-	9R	1K	-	5K	10R	15
Channel catfish	4K 19R	9K	2K	-	2K 1R	6K 5R	1R	-	1K	-	-	1K 1R	25K	27R	52
Rock bass	-	1K	-	1K	-	1K	-	-	-	-	-	-	3K	-	3
Redbreast sunfish	6K	-	-	1K	1R	1K	-	-	1K	3K	-	-	12K	1R	13
Pumpkinseed	-	1K	-	-	-	3K	-	-	1K 1R	-	-	-	5K	1R	6
Bluegill	1K	13K	-	-	-	-	-	-	2K	-	-	-	16K	-	16
Sunfishes (Lepomis spp.)[1]	5R	-	-	4K 3R	-	3R	1R	-	-	-	1R	-	4K	13R	17
Smallmouth bass	11K 3R	4R	3K	3K	1K	3K	2K 4R	-	2K	3K 16R	6K 1R	1K 1R	35K	29R	64
White crappie	3K	-	-	-	-	-	-	-	-	-	-	-	3K	-	3
Black crappie	14K	-	-	2K	1K	-	-	-	-	-	-	-	17K	-	17
Yellow perch	-	-	-	1R	-	-	-	-	-	1K	-	-	1K	1R	2
Walleye	-	-	13R	-	1K 1R	1K 2R	1K	-	-	-	1K 1R	2R	4K	19R	23

1 General identification.
R Released.
K Kept.

Table 19

Summary of selected physicochemical parameters taken on 8 and 22 September 1980 near the TMINS. Values are expressed in mg/l except for water temperature (C), pH, and turbidity (JTU).

Location	Date	Water Temperature (C)	pH	Dissolved Oxygen	Turbidity (JTU)	Alkalinity as $CaCO_3$	Sulfate	Total Dissolved Solids	Total Copper	Dissolved Copper	Total Zinc	Dissolved Zinc
TM-AQI-1A1	8 Sep	23.5	8.8	6.1	10	65	139	333	0.004	0.002	0.015	0.009
TM-AQI-1A2		23.0	8.5	8.2	11	111	85	298	0.004	0.002	0.015	0.007
TM-AQI-11A1		24.5	8.3	7.6	13	83	116	318	0.005	0.002	0.016	0.009
TM-AQI-11A2		23.5	8.4	7.7	11	90	108	318	0.004	0.002	0.014	0.009
TM-AQI-981		26.0	8.3	8.0	10	74	123	308	0.004	0.003	0.013	0.009
TM-AQI-1A1	22 Sep	24.0	8.9	6.0	15	64	155	342	0.007	0.003	0.020	0.006
TM-AQI-1A2		24.0	8.9	10.0	15	107	100	315	0.006	0.002	0.020	0.007
TM-AQI-11A1		24.0	8.6	8.5	11	90	125	322	0.005	0.003	0.018	0.007
TM-AQI-11A2		24.0	8.6	8.5	10	88	126	330	0.005	0.003	0.016	0.007
TM-AQI-981		26.0	8.7	9.6	9	73	141	333	0.005	0.003	0.015	0.005
					MEAN VALUES FOR SEPTEMBER 1980							
TM-AQI-1A1	Sep	23.8	-	6.0	12	64	147	338	0.006	0.002	0.018	0.008
TM-AQI-1A2		23.5	-	9.1	13	109	92	306	0.005	0.002	0.018	0.007
TM-AQI-11A1		24.2	-	8.0	12	86	120	329	0.005	0.002	0.017	0.008
TM-AQI-11A2		23.8	-	8.1	10	89	117	324	0.004	0.002	0.015	0.008
TM-AQI-981		26.0	-	8.8	10	74	132	320	0.004	0.003	0.014	0.007

Table 20

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, 24 September 1980.

Air Temp (C):
Wind Speed (kph):
River Flow (m^3/s): 115.5

Dew Point (C):
Wind Direction:
River Elevation (m): 84.6

	Start	Finish
Time:	0918	1003
Station Operation Level (%):		
Unit 1	0	0
Unit 2	0	0
Nuclear Service Pumps:		
Unit 1	1	1
Unit 2	1	1

	Start	Finish
Secondary Service Pumps:		
Unit 1	1	1
Unit 2	1	1
Decay Heat Pumps:		
Unit 1	0	0
Effluent Rate (m^3/s):	1.7	1.6
Intake Temp (C):	23.0	22.3
Effluent Temp (C):	22.5	22.3

Distance From Three Mile Island Shore				
40 m	20 m	5 m	Depth	
22.4	22.4	22.5	S	Unit 1 Intake
22.4	22.4	22.5	0.5	
22.4	22.4	22.5	1.0	
22.4	22.4	22.5	1.5	
22.5	22.5	22.4	S	25 m Upstream of
22.5	22.5	22.4	0.5	Discharge
22.5	22.5	22.5	1.0	
22.5	22.5		1.5	
22.5	22.7	22.8	S	Discharge (D)
22.5	22.7	22.8	0.5	
22.5	22.7	22.7	1.0	
22.5	22.7		1.5	
22.7	22.7	22.7	S	25 m Downstream of D
22.7	22.7	22.7	0.5	
22.7	22.7	22.7	1.0	
22.7			1.5	
22.6	22.7	22.7	S	50 m Downstream of D
22.6	22.7	22.7	0.5	
22.7	22.7	22.7	1.0	
22.7	22.7	22.7	1.5	
22.6	22.7	22.7	S	75 m Downstream of D
22.6	22.7	22.7	0.5	
22.5	22.7	22.7	1.0	
22.5	22.7	22.7	1.5	
22.5	22.6	22.6	S	100 m Downstream of D
22.5	22.6	22.6	0.5	
22.5	22.6	22.6	1.0	
22.5	22.6		1.5	
22.5	22.6	22.6	S	125 m Downstream of D
22.5	22.6	22.6	0.5	
22.5	22.6	22.6	1.0	
22.5			1.5	

Distance From Three Mile Island Shore				
40 m	20 m	5 m	Depth	
22.6	22.6	22.6	S	150 m Downstream of D
22.6	22.5	22.6	0.5	
22.6	22.5	22.6	1.0	
22.6	22.6		1.5	
22.5	22.6	22.5	S	200 m Downstream of D
22.5	22.6	22.5	0.5	
22.5	22.6	22.5	1.0	
22.5	22.6	22.6	1.5	
22.5	22.5	22.5	S	300 m Downstream of D
22.5	22.5	22.5	0.5	
22.5	22.5	22.5	1.0	
22.5	22.5		1.5	
	22.5		2.0	
22.5	22.5	22.5	S	400 m Downstream of D
22.5	22.5	22.5	0.5	
22.5	22.5	22.5	1.0	
22.5	22.5		1.5	
22.5	22.5		2.0	
22.5	22.5		2.5	
22.6	22.6	22.5	S	800 m Downstream of D
22.6	22.6	22.6	0.5	
22.6	22.6		1.0	
22.6	22.6		1.5	
	22.6		2.0	
22.7	22.7	22.4	S	1000 m Downstream of D
22.7	22.7	22.4	0.5	
22.7	22.7		1.0	
22.6	22.7		1.5	
22.6			2.0	
23.6	23.6	23.5	S	1900 m Downstream of D
23.6	23.6	23.5	0.5	
23.6	23.6		1.0	
23.6	23.6		1.5	
23.5	23.6		2.0	
23.5			2.5	