APPENDIX B

TO

OPERATING LICENSES DPR-29 AND DPR-30:

NON-RADIOLOGICAL TECHNICAL SPECIFICATIONS

AND BASES

FOR

QUAD-CITIES STATION UNITS 1 AND 2

ROCK ISLAND COUNTY, ILLINOIS

COMMONWEALTH EDISON COMPANY

AND

IOWA-ILLINOIS GAS AND ELECTRIC COMPANY

DOCKET NUMBERS 50-254 AND 50-265

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1.0 LIMITING CONDITIONS FOR OPERATION

1.1 CHLORINE EFFLUENT

Specification:

A. Normal Operation:

The free chlorine in the circulating water shall be maintained at $\leq$ 1.0 ppm in the center water box of each unit's condenser half during chlorination by the automatic control system.

B. Operation with Inoperable Components:

1. After the automatic feed rate controller is found or made to be inoperable, chlorination may continue on a manual basis, provided the free chlorine is maintained at $\leq$ 1.0 ppm in the center water box of each unit's condenser half as indicated by the automatic analyzer.

2.0 SURVEILLANCE REQUIREMENT

2.1 CHLORINE EFFLUENT

Specification:

A. Normal Operation:

At least once per calendar month during chlorination, a sample shall be taken from the center water box of each unit's condenser half to calibrate the automatic analyzer. In addition, at least once per week it shall be verified by visual observation of the analyzer that the residual in the center water box is being maintained at $\leq$ 1.0 ppm free chlorine.

B. Operation with Inoperable Components:

1. During chlorination with an inoperable automatic feed rate controller, the free chlorine in the center water box shall be verified as being $\leq$ 1.0 ppm by visual observation of the automatic analyzer immediately and daily thereafter.

LIMITING CONDITIONS FOR OPERATION	SURVEILLANCE REQUIREMENT
2. After the automatic analyzer is found or made to be inoperable, chlorination may continue on a manual basis, provided the free chlorine is maintained at $\leq$ 0.5 ppm in the discharge canal downstream of the weir.	2. During chlorination with an inoperable automatic analyzer the free chlorine in the discharge canal shall be verified as being $\leq$ 0.5 ppm by taking grab samples downstream of the weir in the discharge canal during the chlorination period and performing an overflow analysis for free chlorine immediately, and weekly thereafter.
C. Corrective Action: If free chlorine concentration in the discharge canal downstream of the weir exceeds an average of 0.5 ppm, as determined by an analysis of 3 samples, chlorination shall cease until the system is corrected.	C. Monitoring A series of samples will be taken on a weekly basis during chlorination at the end of the discharge canal and at a sampling station just downstream of the side jet discharge to characterize the chlorine discharges to the Mississippi River. These samples will be analyzed for free and combined residual chlorine. Samples will also be taken at the same frequency when not chlorinating to ascertain background conditions.

Bases:

Each Quad Cities unit has its own main condenser. The design of these condensers is such that each main condenser is divided and has two parallel water flow paths. This physical division results in each condenser consisting of two condenser halves, with each condenser half containing an inlet, outlet, and center water box. The water flow in both condenser halves may also be reversed. As such the end water boxes may be either inlet or outlet water boxes depending on the direction of flow.

Chlorination for condenser cleaning purposes is accomplished by the injection of a sodium hypochlorite solution into the inlet water box. An automatic system controls the injection rate to maintain a preset free chlorine level as sampled in the center water box. The use of the center water box as a sampling point provides a common sample point when water flow is in either direction.

The free chlorine level is measured by an automatic analyzer, and the output of this analyzer is used to control the hypochlorite feed valves. A timer is used to control length of injection. Present practice is to inject 10 gpm, 3 times per day for ten minutes in each condenser half, to maintain a .2 to .7 ppm free chlorine level as sampled in the center water box.

The .2 to .7 ppm free chlorine level, as analyzed from the sample in the center water box, is approximately representative of the free chlorine level leaving the exit water box of the condenser half being chlorinated due to the transit times involved both to the analyzer and through the remainder of the condenser itself. This level is also as low as can be detected on commercially available equipment. Upon mixing with the water from the condenser half not being clorinated the free chlorine level is reduced to .1 thru .35 ppm by dilution.

The Limiting Conditions for Operation of 1.0 ppm as measured on the analyzer is a reasonable limit which will allow chlorine discharges to be maintained as low as practicable, and includes some small margin. The Limiting Conditions for Operation of 0.5 ppm as measured in the discharge canal after the weir, provides a comparable limit when the automatic system is out of service.

The 0.5 ppm controlled level at the weir is based on discussions in the draft environmental statement as to the levels expected with the procedures (p 58 ff) and the effects on the aquatic life (p85 ff). It has been found that some fish can detect and avoid levels of chlorine as low as 0.01 ppm,

and probably should not be exposed to levels of 0.1 ppm. Control of the chlorine to a maximum of 0.5 ppm at the condenser outfall (at the weir) should assure that less than 0.1 ppm will be discharged to the river. Therefore, the control level of 0.5 ppm is chosen to assure protection of aquatic life in the weir around the discharge point. To assure that the chlorine limits are not exceeded, monitoring points at the discharge into the river and at the sampling station downstream of the side jet discharge are specified. The chlorine levels at the latter monitoring points could be too low to measure precisely; therefore, a measurable value of 0.5 ppm was specified at the location immediately after discharge from the station condenser and prior to dilution by the river of the discharge.

The free chlorine level will further decay in transit to the river such that at operational levels such as these, chlorine discharges to the river will be even further reduced. The monitoring program described will define this reduction and demonstrate that chlorine discharges have been kept to minimal levels.

LIMITING CONDITIONS FOR OPERATION	SURVEILLANCE REQUIREMENT
1.2 TEMPERATURE LIMITATIONS Not applicable during side jet discharge operation.	2.2 TEMPERATURE LIMITATIONS A temperature monitoring program will be conducted as specified in Table 2.3.1 (A).

Bases:

No limiting conditions of operation are applicable to temperature variations during an interim period when Quad Cities Station will operate to meet critical power needs. Reference Commonwealth Edison (Byron Lee, Jr.) letter to Division of Reactor Licensing (Dr. Peter A. Morris) dated April 12, 1972.

LIMITING CONDITIONS FOR OPERATION

1.3 NON-RADIOLOGICAL ENVIRONMENTAL MONITORING

A non-radiological environmental program will be conducted to monitor the effects of plant operation on the environment.

SURVEILLANCE REQUIREMENT

2.3 NON-RADIOLOGICAL ENVIRONMENTAL MONITORING

The non-radiological environmental monitoring program will be conducted as specified in Table 2.3.1.

TABLE 2.3.1

NON-RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

A. TEMPERATURE AND DISSOLVED OXYGEN

Temperature and dissolved oxygen (DO) monitoring at Quad-Cities Station will be conducted to document ambient and discharge plume temperatures and DO in the River at Quad-Cities Station. Three existing temperature sensors and three DO sensors, used to obtain pre-operational data, will be augmented with four additional temperature sensors and one additional DO sensor to define more adequately the thermal regime above and below the plant. Information from the sensors will be telemetered into the station control room and duly recorded.

Specifically, five temperature sensors and two DO sensors will be located in the side jet discharge area; three temperature sensors and one DO sensor will be considered as the minimum necessary to adequately monitor the discharge area. Two temperature sensors and two DO sensors will be located in the intake area to record ambient data; one temperature sensor and one DO sensor will be considered as the minimum necessary to adequately monitor the intake area.

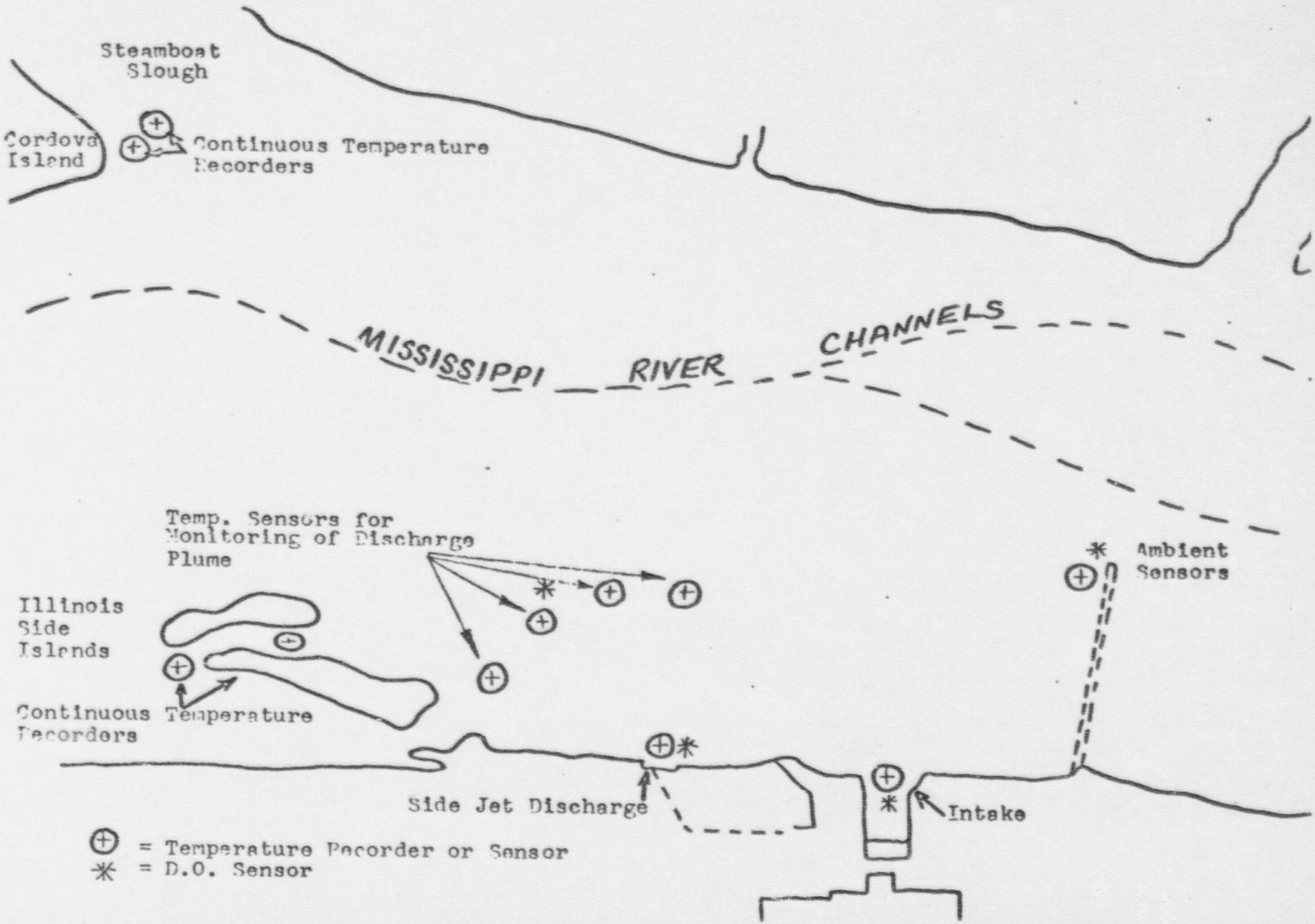
In addition, four continuous recording thermometers will be placed in downstream island areas. Two will be placed in the island area below the side jet discharge and two others in the Steamboat Slough area; one recording thermometer in each area will be considered as the minimum necessary to adequately monitor the downstream island areas. These continuous recorders will monitor the rate of change of River temperature due to Quad-Cities Station cooling water effluent.

Monthly thermal mapping surveys will be performed in the Illinois island area during side jet operation. Each of these surveys shall be conducted at the highest practicable power level. Power level and river flow shall be recorded during the thermal mapping surveys. The thermal survey maps will be included as part of the monitoring program report.

See attached map, Figure 2.3.1, for the location plans of sensors and recorded thermometers.

Fig. 2.3.1

TEMPERATURE AND DO MONITORING STATIONS



B. WATER QUALITY

Monitoring at the Quad-Cities Station will be conducted to determine if differences in water chemistry exist between preoperational and operational periods and between sampling stations above the plant, in the discharge plume, and downstream at the Quad-Cities Station. Three sampling stations for this monitoring are shown in Figure 2.3.2. Stations 1 (above the plant) and 2 (in the discharge plume area) were preoperational monitoring sites. Station 3, in the downstream area just below the Illinois islands, will be added to determine if any changes in water chemistry due to thermal effects persist downstream.

The chemical parameters that will be determined, and sample collection frequencies, are shown in Table B-1. Parameters which, based on previous sampling results, have shown the greatest variations, or any with in-month variation, will be samples on a weekly basis. The remaining parameters will be sampled on a monthly basis.

Samples will be collected at a depth greater than one foot but at least one foot off the bottom.

Laboratory techniques and analytical procedures will follow Standard Methods for the Analysis of Water and Wastewater (1971).

Figure 2.3.2

Water Quality Evaluation mpling Locations

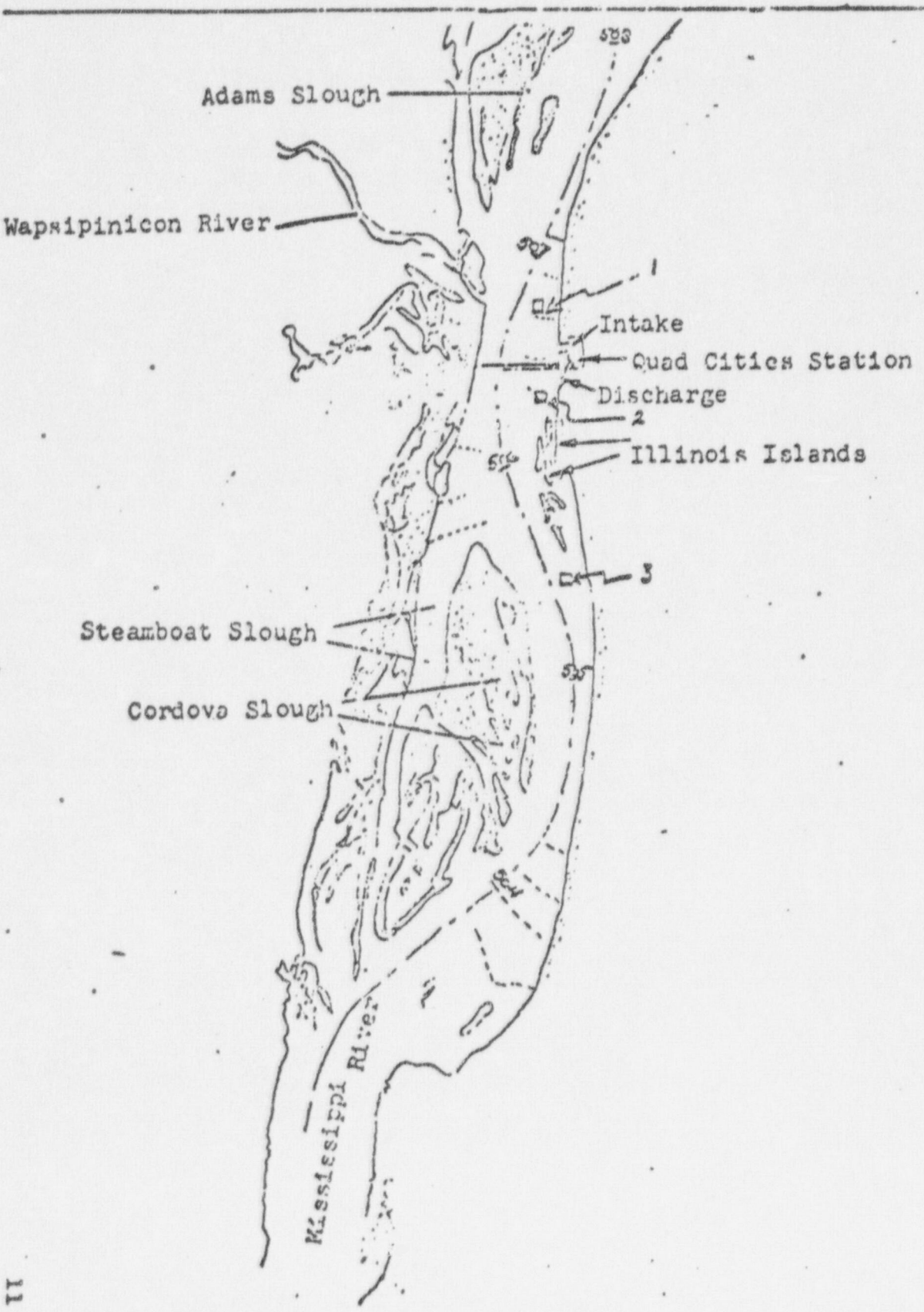


TABLE B-1

WATER QUALITY PARAMETERS TO BE MONITORED & SAMPLING FREQUENCY

WEEKLY (WK) and MONTHLY (MO)

Parameter	Frequency	Parameter	Frequency	Parameter	Frequency
1. Total Bacteria, 20°C	MO	12. pH	WK	25. Ferrous Iron	MO
2. Coliform Bacteria	MO	13. Calcium Hardness	WK	26. Total Iron	MO
3. Fecal Coliform Bacteria	MO	14. Alkalinity	WK	27. Copper	MO
4. Fecal Streptococci Bacteria	MO	15. Total Phosphate	WK	28. Zinc	MO
5. Threshold Odor	MO	16. Orthophosphate (soluble)	WK	29. Lead	MO
6. Color	MO	17. Nitrate Nitrogen	WK	30. Mercury	MO
7. Turbidity	WK	18. Ammonia Nitrogen	WK	31. Total Organic Carbon (TOC)	MO
8. Dissolved Oxygen (D.O.)	WK	19. Cyanides	MO	32. Residual Chlorine	MO*
9. Biochemical Oxygen Demand (BOD)	WK	20. Phenols	MO	33. Silica	MO
10. Chemical Oxygen Demand (COD)	MO	21. Total Dissolved Solids	MO		
11. Temperature	WK	22. Total Suspended Solids	MO		
		23. Specific Conductance	MO		
		24. Manganese	MO		

* Weekly at sampling station #2, which is in the discharge plume, and at the additional station at the end of the discharge canal.

TABLE 2.3.1

NON-RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

1. MACROINVERTEBRATE COMMUNITIES

Operational monitoring of the growth and species composition of periphyton and associated macroinvertebrate communities on artificial substrates will be conducted. Comparison of growth and species composition will be made at all sites between preoperational and operational periods, and between all sites (areas).

The location of substrate samples will be one upstream of the intake, one in the intake canal, one in the Illinois island area, and one in the downstream area, below the mixing zone. These sampling locations are shown in Figure 2.3.3. Samples will be taken monthly.

In addition, an artificial substrate sampler will be placed in the discharge canal to evaluate any effects on periphyton and associated macroinvertebrates in the canal. Samples will be taken monthly.

2. MICROINVERTEBRATE COMMUNITIES

Operational monitoring for plankton (phytoplankton and zooplankton), benthic populations, and sediments will be conducted.

Comparisons of plankton and benthic population characteristics (size, composition and diversity) and sediment composition will be made between preoperational and operational periods and between stations above and below the discharge.

Plankton samples, benthic samples, and sediment samples will be collected at two week intervals. Sample locations are shown in Figure 2.3.4. The sampling locations are: 1) upstream of the intake, 2) in the Illinois island area, 3) just downstream of these islands, 4) in Cordova Slough, 5) in an Illinois shore line area a little over a mile and a half below the plant.

Additional bottom sediment and benthic sampling stations will be established to assess the impact on sedimentation and benthic population on the installation of the diffuser pipe. Three sampling stations will be located immediately above and three immediately below the diffuser system. These are also shown in Figure 2.3.4. Sediment and benthos samples will be collected prior to construction, and every other week during construction and for two months after operation begins.

Figure 2.3.3

Macroinvertebrate Communities

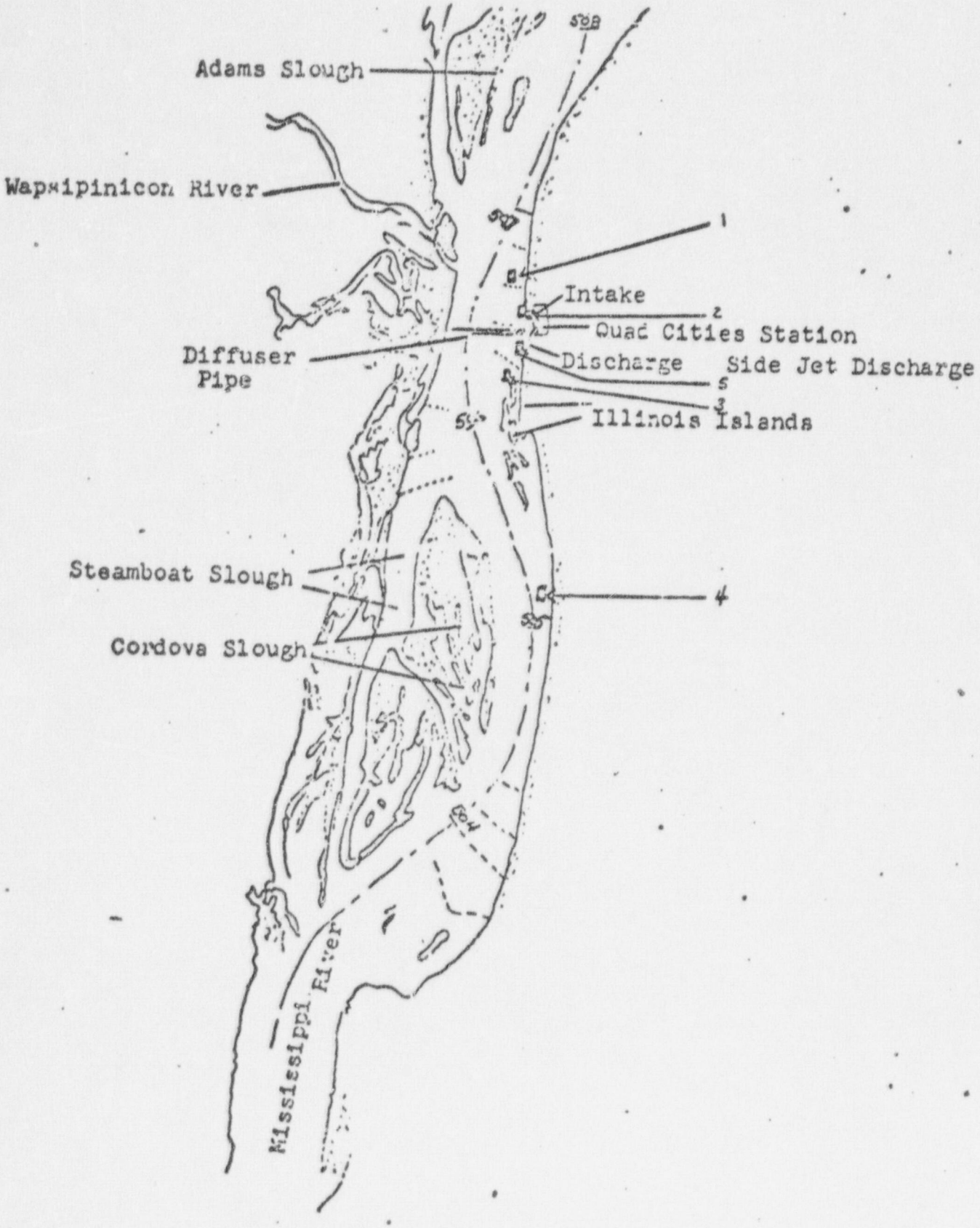
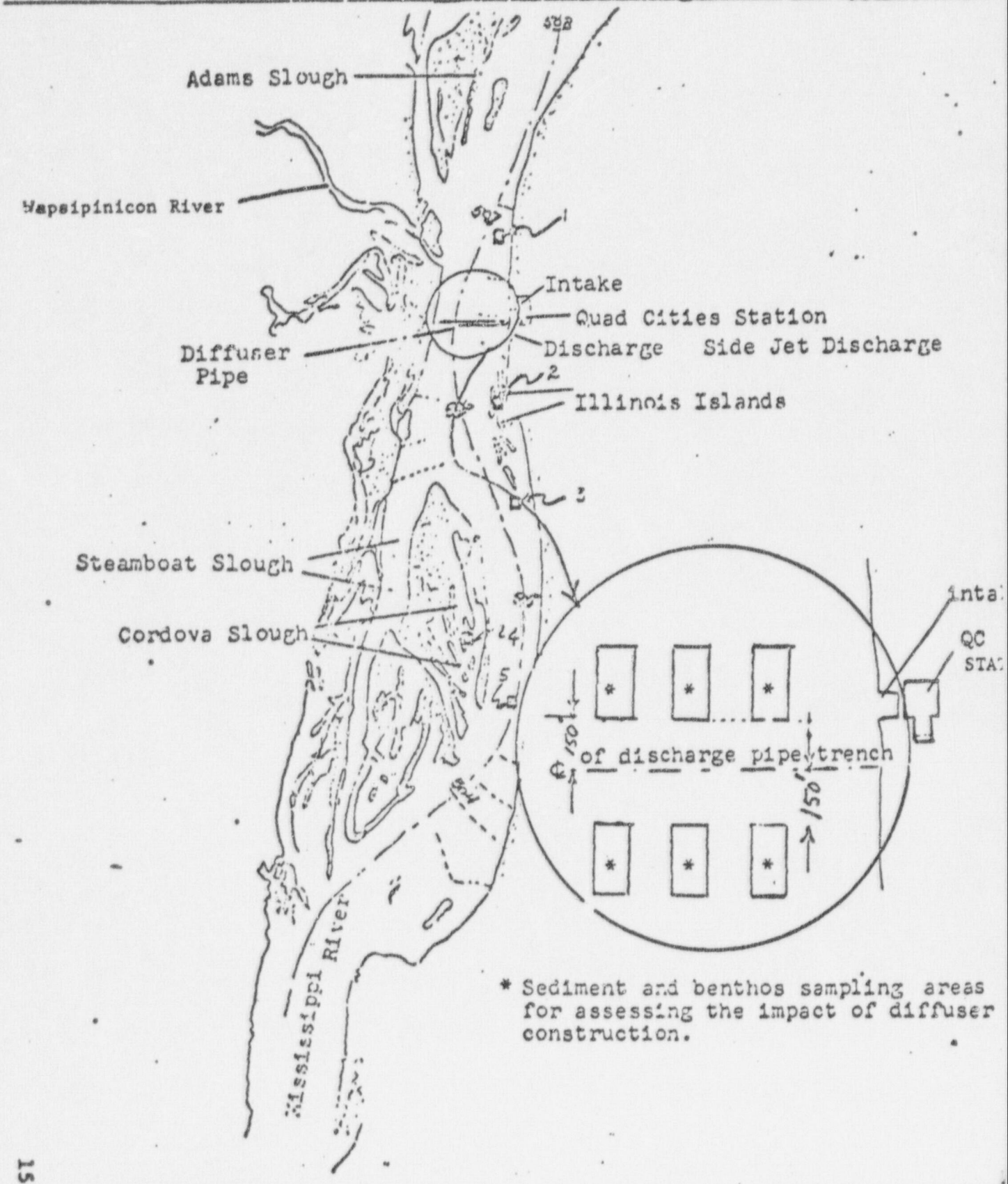


Figure 2.3.4

Microinvertebrate Communities



* Sediment and benthos sampling areas for assessing the impact of diffuser construction.

TABLE 2.3.1

NON-RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

E. FISH POPULATION

Monitoring of fish populations and larval fish will be conducted. Sampling will be conducted at 8 sampling stations located as follows: Station 1 located in the Adams Slough area upstream from the plant; Station 2, a channel edge station, located near the Illinois shore upstream from the plant intake; Station 3 located in the Illinois island area below Quad Cities Station; Station 4 located directly below the Illinois islands; Station 5, located in the closed slough area east of Steamboat Slough; Station 6, a channel edge habitat, located near the Illinois shore about one-half mile below the plant; Station 7 located in the midstream of Steamboat Slough; and Station 8 located in the plant intake canal. These stations are shown in Figure 2.3.5.

The same sampling collection procedures used in the preoperational monitoring programs will continue in the operational program to insure comparability of results. Seining, net sets, and drift nets will be used to collect minnows and immature forms. Fyke nets, shoreline seining, gill nets, trawl nets, cove nets, and electro shocking will be used to collect large fish. Based on preoperational experience about 15,000 fish may be studied annually.

The preoperational results have provided baseline, "without heat additions" information on fish. Operational data will be compared with the preoperational data for any indication of change with respect to fish due to thermal additions. Also, comparison will be made between stations affected and not affected by thermal discharge during the operational period for any indications of change.

Observation and analysis will be conducted to determine if thermal additions affect feeding, migration, reproductive patterns, or ectoparasitism. Habitat effects will be evaluated by determining the species composition and abundance at each station. Effects on feeding habits will be determined by stomach analysis

Figure 2.3.5

Fish Population Studies

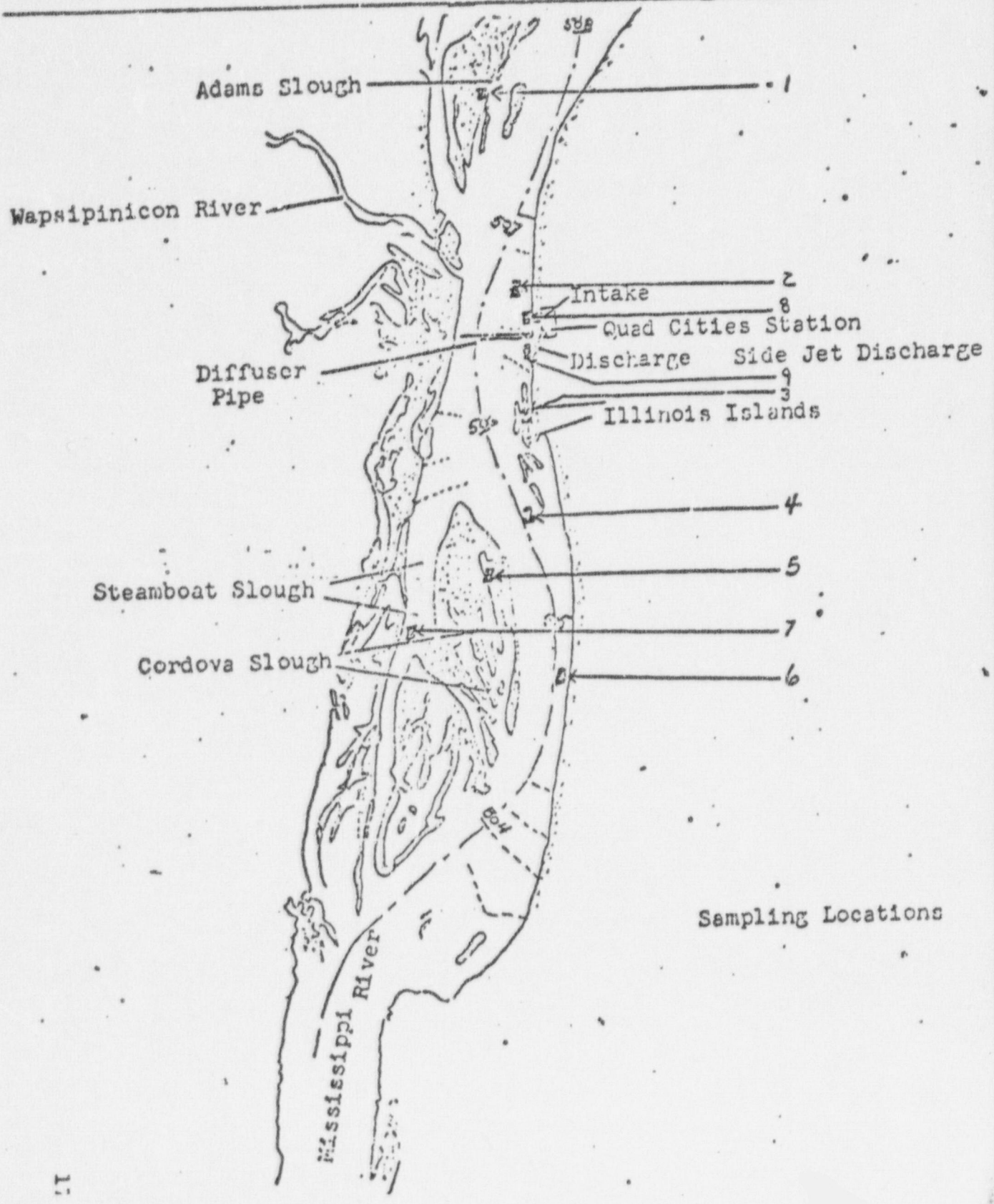


TABLE 2.3.1

NON-RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

3. FISH POPULATION (CONT'D)

of an unbiased sample of fish from each station. Any effect on migration will be determined through a continuing mark-and-recapture program. Of the 15,000 fish captured annually, about 5,000 are expected to be of sufficient size for tagging. Recapture is achieved both by continued sampling and by others who report capture of tagged fish. In this program, particular emphasis will be placed on comparison of pre-operational and operational results.

Effects on reproduction habits will be analyzed through examination of mature fish specimens for sexual ripeness, and by observation of nesting and nursery areas and larval fish. Evaluation will be made of any thermal effects by determining any gross changes in the timing of maturation or other reproductive phenomena (such as appearance of larval forms) and of any changes in the habitat preferences of gravid (ripe) fish or location of nursery areas.

All fish will be examined for external parasites and disease incidence.

To determine general comparability of fish populations being studied for thermal effects, descriptive statistics on relative year class distribution and body condition (length and weight relationships) of the fish at each station will continue to be prepared.

In addition, one more monitoring station will be added to the program. It will be located in the discharge canal to determine if fish are attracted into the canal by the thermal discharge, and to determine any thermal effects on these fish, and to compare earlier mentioned possible effects on these fish with those of other stations.

Sampling frequencies will be weekly at all stations. This frequency is designed to clearly define the effects on fish, especially in their reproductive and larval stages.

A special study will be undertaken to determine the numbers of fish, by species and size, removed from plant intake waters and collected in trash baskets at the plant.

There are three protective devices to prevent larger floating materials and fish from entering the plant intake pumps and condensers. These

TABLE 2.3.1

NON-RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

E. FISH POPULATION (CONT'D)

devices consist of a floating boom at the mouth of the intake canal, designed to help reduce entrance of floating materials into the canal, and a series of bar grills and 3/8 inch mesh traveling screens to prevent all other sizable materials from going through the pumps and condensers. Materials that are trapped on the bar grills are removed by a mechanical lift and dumped into a trash cart. Smaller materials, trapped on the traveling screens, are washed into trash baskets. The materials collected will be examined, all fish and fish remains will be removed for analysis, and afterwards the material will be hauled off site for appropriate disposal.

The fish will be counted, classified as to size, and identified to species. This analysis will be performed twice a week for one year.

F. ORGANISMS IN THE PLANT COOLING WATER SYSTEM

Studies to determine the lethal chemical, mechanical and thermal effects on entrained phytoplankton, zooplankton and larval fish organisms will be conducted for a twelve month operational period of the Quad Cities Station. Studies to determine the effects of mechanical abrasion and chemical additions were conducted during the pre-operational stage.

Samples will be collected by drift nets and by special sampling pumps. Samples will be collected at six stations, as shown on Figure 2.3.6. One station will be in the intake canal, one will be in the condenser discharge area, two will be in the river just above the plant, and two will be in the river about 150 feet below the plant.

Comparison between the intake and condenser discharge sampling stations will indicate effects of passage through the condenser alone. The off-shore distances of the sampling stations in the river above and below the plant will be set so that stations 4 and 6 monitor the effects

Figure 2.3.6

Organisms In The Plant Cooling Water System

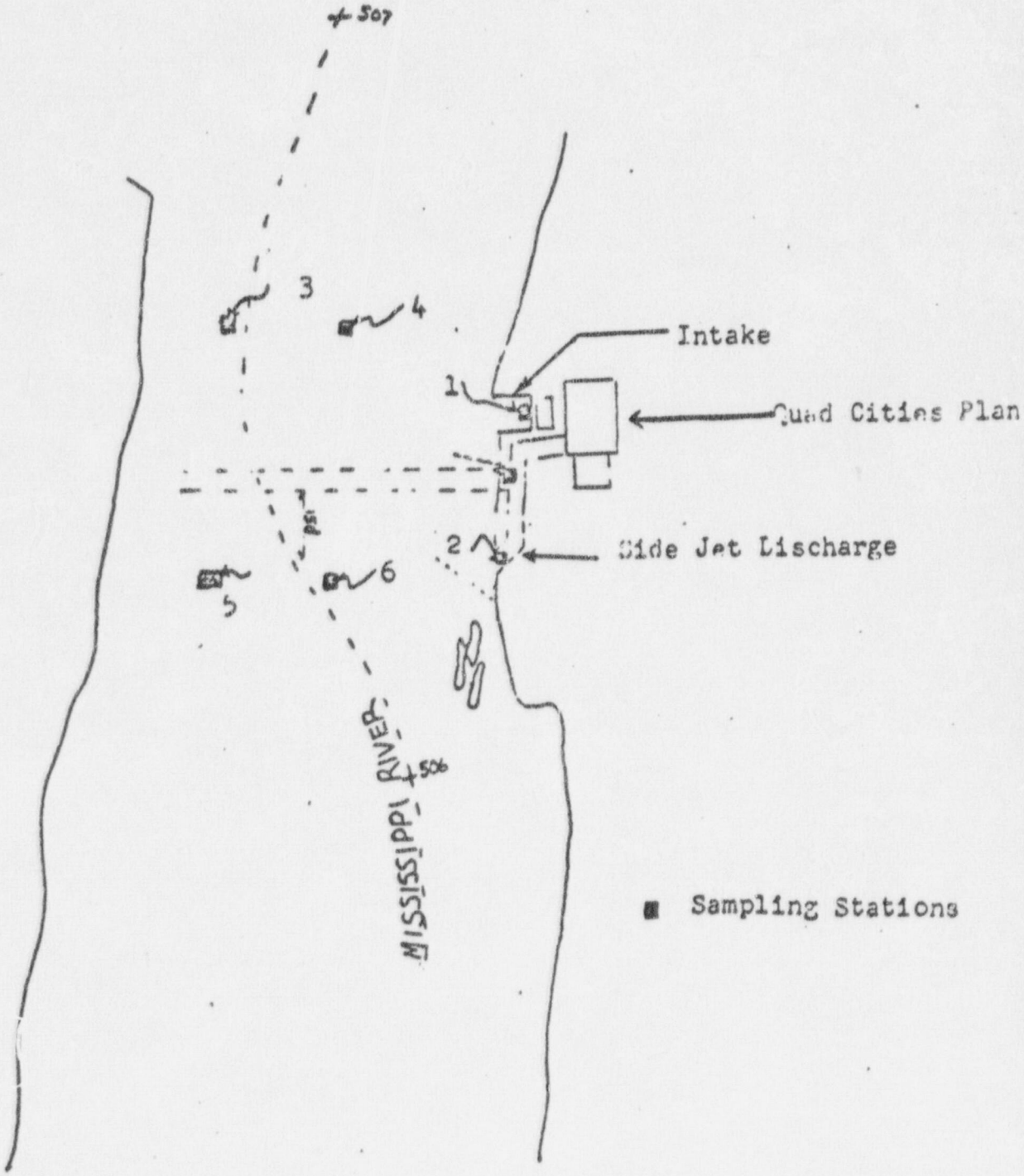


TABLE 2.3.1

NON-RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

F.	ORGANISMS IN THE PLANT COOLING WATER SYSTEM (CONT'D)	of shorter distances of travel, 3 and 5 longer distances of travel. Sampling will be every two weeks. Some sampling will be conducted during chlorination of the condensers, some while not chlorinating, to determine the separate effect of chlorination. Sampling will be conducted at various station loads to determine the effect of various heat rises across the condensers. The percent of immediate and residual mortality (survival) will be measured at all sampling locations to determine differential mortality (survival) rates before and after passage through the cooling water system.

NON-RADIOLOGICAL ENVIRONMENTAL MONITORING (CONT'D)

Bases:

Possible short-term but reversible environmental effects may occur from interim operation of Quad Cities Station. Internal staff experts and outside biological consultants have designed the non-radiological environmental monitoring program to determine the impact of interim plant operation, provide comprehensive records of ambient variations, and develop knowledge for possible corrective action. Reference: STATEMENT ON THE ENVIRONMENTAL EFFECTS OF TESTING AND OPERATION OF QUAD CITIES STATION USING THE SIDE-JET DISCHARGE DURING THE PERIOD APRIL-AUGUST 1972, prepared by Industrial BIO-TEST Laboratories, Inc. and Dr. Donald B. McDonald as Exhibit #3 to the Commonwealth Edison (Byron Lee, Jr.) - Division of Reactor Licensing (Dr. Peter A. Morris) letter dated April 12, 1972.

3.0 REPORTING REQUIREMENTS

3.1 Chlorine Effluent Reports

A. A letter will be sent to the Directorate of Licensing (within 30 days after a Limiting Condition of Operation is exceeded) describing the occurrence and justifying corrective action.

B. A report will be sent to the Directorate of Licensing (within 60 days after operation of the side-jet discharge has ceased) describing the results of the chlorine monitoring program through the period of operation with the side jet.

3.2 Non-Radiological Environmental Report

A report will be sent to the Directorate of Licensing (within 60 days after operation of the side-jet discharge has ceased) describing the results of the environmental monitoring program through the period of operation of the side jet.

This report will include conclusions derived from data collected on temperature, dissolved oxygen, water quality, macroinvertebrate communities, microinvertebrate communities, fish population, and organisms in the plant cooling water system.

Since the possibility of short term but reversible environmental effects are recognized, this report will include a definitive compendium of any such occurrences. Likewise, this report will include a discussion of those means to be taken to assist natural recovery from any such temporary effects.