NEW JERSEY 1976 STATE WATER QUALITY INVENTORY, report to Congress through the U.S. EPA, prepared by NJ Dept of Environmental Protection, Division of Water Resources September 1977

# NEW JERSEY
# 1976
# STATE WATER QUALITY INVENTORY

REPORT TO CONGRESS
THROUGH THE
U.S. ENVIRONMENTAL PROTECTION AGENCY
(PURSUANT TO SECTION 305 (B), PL 92-500)

Prepared By
NEW JERSEY
DEPARTMENT OF
ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

SEPTEMBER 1977

STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
ROCCO D. RICCI, COMMISSIONER
P. O. BOX 1390
TRENTON, N.J. 08625
609-292-2885

December 21, 1977

Mr. Eckardt C. Beck
Regional Administrator
U.S. Environmental Protection Agency
Region II
26 Federal Plaza
New York, New York 10007

Dear Mr. Beck:

I am pleased to submit New Jersey's 1976 State Water Quality Inventory Report to the U.S. Environmental Protection Agency for forwarding to Congress as required by Section 305(b) of the Federal Water Pollution Act Amendments of 1972. The Reports written by the Delaware River Basin Commission and the Interstate Sanitation Commission for their respective jurisdictional areas are appended to this Report.

This Report includes a compilation of data collected by various Federal, State, and local agencies and represents the best assessment to date of existing water quality in New Jersey. Graphically presented data indicates water quality improvement and degradation which has occurred during the past five years. Anticipated changes resulting from current Departmental programs and activities are also indentified in the Report.

Attainability of the 1983 fishable/swimmable goals of the Act is assessed and resources for achieving these goals are considered. Potential problem areas and past accomplishments affecting these goals are identified. The Report also recommends program activities for meeting the 1983 goals of the Act through all Departmental and Statewide water related programs.

We will continue to refine and expand upon the quality and sources of information included in this Report, particularly in the areas of pollution abatement, cost estimation, non-point source pollution assessment, and toxic substances distribution.

Very truly yours,

Rocco D. Ricci

Rocco D. Ricci, P.E.
Commissioner

# TABLE OF CONTENTS

Appendices

A. DELAWARE RIVER BASIN COMMISSION REPORT ON THE DELAWARE RIVER

B. INTERSTATE SANITATION DISTRICT REPORT

C. SUMMARY OF DISCHARGES ELIMINATED OR REGIONALIZED

D. CONSTRUCTION PROJECTS COMPLETED

# CHAPTER I
## INTRODUCTION AND METHODS

The 1976 Water Quality Inventory is prepared pursuant to Section 305 (b) PL 92-500, which requires an analysis of five basic questions:

1. What is the quality of New Jersey waters today, particularly in our priority basins and priority segments, and where and how has the program made a difference in the last 5 years?

2. What uses of the water are possible today, and what uses will New Jersey waters support when the provisions of the Act are implemented to the extent technically or economically attainable?

3. In what places will these future intended uses differ from the goals of fishable, swimmable waters intended in the Act?

4. What will it cost to achieve these future intended uses?

5. Where and to what extent are non-point sources going to prevent our meeting intended uses? How can they be controlled, and how much would it cost?

This report is organized into eight chapters. Chapter I, Introduction, discusses the legislative requirements, organization, and data base of the Report. Chapter II, is a summary of water quality trends and water quality problems. Chapter III discusses Statewide activities that are necessary to meet the goals of PL 92-500. Chapter III also discusses the feasibility of attaining the 1983 goals. Chapter IV briefly discusses the monetary capital costs of achieving the 1983 goals of PL 92-500. Chapter V, Statewide Distribution of Toxic Substances, discusses the occurrence of toxic substances in the State's surface waters. Chapter V also discusses the need for additional toxic substances monitoring to verify the preliminary observations and conclusions that are stated in this chapter. Chapter VI, Water Quality Inventory, is subdivided into twenty-six segments. The delineation of these segments is based on similar water quality and quantity characteristics, water-related beneficial uses, land uses, and historic population trends. Each segment has five sub-chapters which contain descriptions of the segment's geography, land uses and population, water quality trends, water quality problems, goal assessment, and recommendations for achieving the 1983 goals. Chapter VII, Shellfish Harvest, is a description of trends of shellfish catch and areas available for shellfish harvesting. Chapter VIII, Toxic Materials Spills and Fishkills, summarizes reported spills of toxic substances and fishkills.

The data used for water quality assessment, problem assessment, and goal assessment was obtained from a number of sources.

The water quality data base is for the period 1968 to 1976. This time period is subdivided into two time frames, 1968-1971 and 1972-1976. All water quality characteristics, except percent saturation of dissolved oxygen and fecal coliform, are reported as porcentiles of year-round observations for the entire period of record for each time frame. Percent saturation of dissolved oxygen and fecal coliform levels are reported as percentiles of summer observation for each time frame.

The water quality data has been made available through EPA's computerized water quality data base (STORET) which contains data collected by various federal, interstate, state, county, and regional agencies. For the purposes of this report it has been assumed that all agencies adhere precisely to approved sample collection, transportation and laboratory analytical methods. Realistically, however, the data is subject so tome variation from time tables. Data accuracy will be insured as a consequence of DEP's development and implementation of a quality assurance program.

The water quality assessment compares the above water quality data with specific criteria necessary to maintain or restore water-related beneficial uses. The water quality criteria are based on water-related beneficial uses, water-types (fresh versus tidal waters), and the following sources:

1. New Jersey Department of EnvironmentalProtection, Surface Water Quality Standards, 1974.

2. Proposed Amendment to Surface Water Quality Standards, Proposed Non-Degradation Water Quality Standards For The Pine Barrens Area, NJDEP, 1977.

3. McKee, J.E. andH.W. Wolf, Water Quality Criteria, State Water Quality Control Board, Sacramento, California, Pub. 3-A, 1963.

4. United States Environmental Protection Agency, Quality Criteria For Water, 1976.

These water quality characteristics were selected because, collectively, they are principal indicators of whether or not a specific water-related beneficial use is being attained. However, the reader is cautioned that the Department has not yet acquired sufficient toxic substances data to make conclusions regarding the relationship between the occurrence and public health impacts of these pollutants in drinking water supplies and restoration and maintenance of shellfish harvesting areas and other aquatic life. Further, the Department does not intend that this report be referenced to determine which swimming areas should be closed. This report will identify areas that have elevated levels of fecal coliform. The Department's monitoring program collects fecal coliform data at a frequency that will only provide this latter determination. The local, county and State health departments have had and continue to have the authority to condemn contaminated bathing areas.

The interpretation that appears in the problem and goal assessments sections are the results of numerous interviews with all Basin Managers in the three water quality Elements of the Division of Water Resources. These interviews were supplemented by reviewing various outputs and files maintained by the three Elements.

It is the intent of this report to utilize information from enforcement and planning activities to aid in assessing the water quality of the State's surface waters. The conclusions derived from this analysis from the basis or recommendations regarding water quality standards revisions, water quality management planning, and enforcement activities.

A water quality monitoring station list is associated with each group of graphs. A station was plotted on the graph if four or more water quality samples were collected from a station during a particular time period. Water quality monitoring stations were plotted in a downstream direction. When more than one watercourse was plotted on a graph, a line, representing one of the two time periods, connect those water quality monitoring stations located on the same stream. Therefore, on some graphs monitoring stations are not connected because they represent different watercourses.

The graphs that appear in this report are percentile plots. The ninetieth percentile water quality value is that value such that 90% of the water quality samples at a monitoring station, fall short of this value and only 10% exceed it. The 90% rank is used when water quality criteria are established as a maximum value not to be exceeded (e.g. turbidity). The criterion is exceeded when the 90th percentile value falls above the criterion line. The tenth percentile water quality value is that value such that 10% of the water quality samples fall short of it and 90% exceed it. Such a percentile rank is used when ambient water quality is to exceed a minimum water quality criterion (e.g. percent saturation of dissolved oxygen). The criterion is exceeded when the 10th percentile value falls below the criterion line.

Percentile plots were utilized to compare the ninetieth or tenth percentile instream water quality value with water quality criteria. Ninety and ten percent ranks were utilized because they statistically show unacceptable instantaneous deviations from water quality criteria. These deviations are not usually shown when average values are plotted. The deviations from water quality criteria are values that fall outside acceptable ranges of requirements that are necessary to protect beneficial uses.

# CHAPTER II

## PART 1 SUMMARY OF WATER QUALITY DATA

The following chart provides an overview of the various water quality trends for stream segments throughout the state. Each symbol represents the combined data from several points on each stream. The overall trend for each quality parameter was assigned by averaging the trends for the individual stations. Trends identified in the chart therefore represent trends which exist at more than one-half of the monitoring sites on each stream. Violations of the criteria are not averaged. A segment will appear as violating a criterion if the criterion is exceeded at any site within the segment.

Although the chart presents generalized water quality information, it provides the following information:

(1) the parameters which are violated most frequently,
(2) identification of those segments with numerous criteria violations, and
(3) an average of water quality trends throughout the State.

### KEY TO SYMBOLS

↑ better than the criterion and improving
↓ better than the criterion and degrading

↑▲ worse than the criterion and improving
↓▲ worse than the criterion and degrading

┼ worse than the criterions insufficient data for determining trend

— better than the criterion, insufficient data for determining trend

○ better than the criterion, and stable
⊘ worse than the criterion, and stable

blank insufficient data

TABLE II. 1 STATEWIDE WATER QUALITY TRENDS FOR NEW JERSEY'S SURFACE WATERS

| River Segment | Drainage Area (sq. mi.) | Fecal Coliform | Dissolved Oxygen | Biochemical Oxygen Demand | Suspended Solids | Total Dissolved Solids | Phosphorus | Nitrate | pH |
|---|---|---|---|---|---|---|---|---|---|
| Wallkill River | 210.1 | ↓▲ | ↑ | ↓ | ↑ | — | ↑▲ | ⌀ | ○ |
| Flatbrook River | 65.7 | ○ | ○ | ↑ | — | ○ | — | — | |
| Paulinskill River | 177.4 | ○ | ○ | — | — | — | ⌀ | — | |
| Musconetcong River | 157.6 | + | + | ○ | — | — | + | — | — |
| Pequest River | 158.7 | + | ↑ | | + | — | + | — | |
| Delaware River Tributaries in Hunterdon County | 116.9 | + | — | — | — | — | ⌀ | — | — |
| Assunpink Creek | 89.6 | + | ↓▲ | ○ | ○ | — | ↑▲ | ○ | |
| Doctors Creek | 26.7 | — | ↓ | + | — | — | + | — | + |
| Crosswicks Creek | 139.2 | + | + | ○ | + | — | ○ | + | ○ |
| Assiscunk Creek | 45.3 | + | — | + | — | | ⌀ | — | |
| Rancocas Creek N.B. | 167.0 | + | + | — | — | — | + | — | ○ |
| Rancocas Creek, Mainstem | 346.0 | + | + | ↑ | ↑▲ | — | + | + | — |
| Rancocas Creek, S.W.B. | 78.0 | + | + | ↑ | + | ○ | + | + | ↑ |
| Pennsauken Creek | 35.4 | ↓▲ | + | ↓▲ | ○ | — | ⌀ | ↑▲ | ○ |
| Cooper River | 42.0 | + | + | ↑▲ | ↑▲ | — | ⌀ | + | ○ |
| Newton Creek | | ↓▲ | | ↓▲ | ↑▲ | | + | ↑▲ | ↑ |
| Big Timber Creek | 59.3 | — | ↑▲ | ○ | ↑▲ | | ↑▲ | + | |
| Mantua Creek | 51.2 | + | ○ | + | ○ | — | + | ○ | |
| Raccoon Creek | 32.2 | + | ↓ | ↑▲ | ○ | — | + | ○ | |
| Oldmans Creek | 44.4 | — | — | ↓ | ○ | — | ○ | ○ | ○ |
| Salem River | 113.6 | + | + | + | + | — | + | + | |
| Alloway Creek | 62.1 | + | + | — | + | — | + | + | |

TABLE II.1 STATEWIDE WATER QUALITY TRENDS FOR NEW JERSEY'S SURFACE WATERS (continued)

| River Segment | Drainage Area (sq. mi.) | Fecal Coliform | Dissolved Oxygen | Biochemical Oxygen Demand | Suspended Solids | Total Dissolved Solids | Phosphorus | Nitrate | pH |
|---|---|---|---|---|---|---|---|---|---|
| Cohansey River | 105.4 | ↓▲ | ○ | + | ○ | — | ↑▲ | ○ | ↑ |
| Maurice River | 386.4 | ↓▲ | ↑ | ↑▲ | ↓ | — | ○ | ○ | ↑ |
| Cedar Creek | | ○ | ↑ | | ↑▲ | | | — | ○ |
| Tuckerhoe River | 102.0 | + | ○ | ○ | — | ∅ | — | — | |
| Tuckerton Creek | 11.9 | ∅ | ↑ | ↑▲ | ↑▲ | ∅ | ↑▲ | ↓ | ↑ |
| Mill Creek | 19.7 | ↓ | ↓ | | | ∅ | | | |
| Oyster Creek | 74.0 | ○ | ○ | ↑ | ↑▲ | ∅ | ↑▲ | ○ | ↑ |
| Forked River, N.B. | 142.0 | ↑▲ | ↑▲ | ↑▲ | ↑▲ | ∅ | ↑▲ | ↑ | ○ |
| Great Egg Harbor River | 338.0 | + | ↓▲ | ↑▲ | ○ | — | ∅ | + | |
| Pine Barrens | 760.0 | | | ↑▲ | | ○ | ↑▲ | ↑▲ | |
| Toms River | 191.0 | ↓▲ | ↑ | ↓ | ↓ | | ∅ | ∅ | ○ |
| Metedeconk River, S.B. | 35.0 | | | ↑▲ | ↑▲ | | ↓▲ | ∅ | |
| Metedeconk River, N.B. | 31.0 | ↓▲ | ↑▲ | ↓ | ↓ | | ↓▲ | ∅ | ○ |
| Manasquan River | 80.0 | | ∅ | ○ | | | | + | ○ |
| Shark River | 16.9 | | + | — | | | | + | — |
| Raritan River, S.B. | 276.5 | ↓▲ | ↑▲ | ∅ | ↑▲ | ∅ | ↓▲ | ↓ | ↓▲ |
| Raritan River, N.B. | 190.0 | ∅ | — | ∅ | ↑▲ | | ↓▲ | ∅ | ∅ |
| Raritan River, Mainstem | 1,105.3 | ↓▲ | ↑▲ | ↑▲ | ↑▲ | ↓ | ↓▲ | ↑▲ | — |
| Millstone River | 283.0 | ↓▲ | ↓▲ | ↑▲ | ↑▲ | | ↓▲ | | ↑▲ |
| Stony Brook | | | ↑ | ↓ | ↑▲ | ∅ | ↑▲ | ↑▲ | ↑▲ |

TABLE II-1 STATEWIDE WATER QUALITY TRENDS FOR NEW JERSEY'S SURFACE WATERS (continued)

| River Segment | Drainage Area (sq. mi.) | Fecal Coliform | Dissolved Oxygen | Biochemical Oxygen Demand | Suspended Solids | Total Dissolved Solids | Phosphorus | Nitrate | pH |
|---|---|---|---|---|---|---|---|---|---|
| Lawrence Brook | 4.5 | ↓▲ | + | ↑▲ | ↑▲ | ○ | + | ↑ | ↑ |
| South River | 132.8 | ↓▲ | ↑ | ↑▲ | ↓ | ○ | ↑▲ | + | ↑ |
| Passaic River Freshwater | 772.9 | ↓▲ | ↓▲ | ↑▲ | ↑▲ | ○ | ↓▲ | ∅ | ○ |
| Whippany River | 71.1 | ↑▲ | ↑▲ | ↓▲ | ↑▲ | ↓ | ↓▲ | ↓▲ | ○ |
| Rockaway River | 137.2 | ↓▲ | ↑▲ | ∅ | — | ↓ | ↓▲ | ∅ | ○ |
| Ramapo River | 48.0 | ↓ | ↑ | ○ | ↓ | ○ | ↓▲ | ↓ | ↑▲ |
| Pequannock River | 90.0 | ○ | ↑ | ○ | ↑ | ∅ | ↑▲ | ↓ | ↑ |
| Wanaque River | 84.0 | ↓▲ | ○ | ○ | ↓ | — | ↑▲ | ↑▲ | ↑▲ |
| Passaic River, Tidal | | ↓▲ | ∅ | ↓ | ↓▲ | — | + | ↓ | ↑ |
| Peckmans River | | ↓▲ | ∅ | ↓▲ | ↑▲ | | ↓▲ | ↓▲ | ↑▲ |
| Hackensack River | 202.0 | | | ↑▲ | ↑▲ | | ∅ | ∅ | |

CHAPTER II

PART 2 SUMMARY OF WATER QUALITY PROBLEMS

Dissolved oxygen levels in surface waters flowing through the urbanized northeastern region of the State are depressed from a combination of factors including point, non-point, and intermittent pollutional loadings to reduced stream flows resulting from substantial withdrawls by water purveyors. Restoration of acceptable dissolved oxygen levels will occur only when significant capital expenditures are assigned to these factors.

Dissolved oxygen concentrations in streams within the Atlantic Coastal Plain and the Delaware tributaries below Trenton are expected to improve to satisfactory levels when municipal treatment plants are upgraded to at least secondary treatment and existing discharge configurations are altered to conform to the assimilative capacity of receiving streams. Surface waters in Camden and Mercer Counties may also require relief from urban runoff loadings before oxygen levels are restored.

In some of the water quality assessments in Chapter VI it is often noted that primary contact recreation is precluded by high fecal coliform counts. However, these assessments were not sensitive to physical and safety factors which also preclude primary contact recreation in many of the same waters. Often, designated swimming areas in the vicinity of contaminated waters have been protected from contamination through adequate planning and surveillance programs operated by State and local agencies.

Excessive fecal coliform levels in lakes and streams in southern New Jersey have been caused primarily by malfunctioning septic tanks. Urban runoff from combined and storm sewers and, in some cases, inadequate disinfection of wastewaters (or after growth in receiving waters) has resulted in the high fecal coliform levels found in the lower reaches of most streams in Camden County, Mercer County, and the Urban Northeast. Feedlot runoff probably plays a significant role in elevated bacterial levels in the Delaware River tributaries north of Mercer County.

Nutrients, including phosphorus and nitrogen compounds, are important because of their influence on growth of unsightly aquatic weeds and algae which can deplete dissolved oxygen causing fish mortality. Such problems are usually restricted to sluggish streams and impoundments. New Jersey has approximately 1,000 lakes and ponds within its borders on which DEP is undertaking biological investigations.

Four hundred sixty (460) lakes have been sampled once since the program began in April, 1975 and 299 were sampled twice. Of the lakes sampled in each County, those with the largest percentage of presumed eutrophic conditions occur in Middlesex, Cape May, Sussex, and Salem Counties. The preliminary survey indicates that Passaic County has the lowest percentage of presumed eutrophic lakes, only 3.4%.

Although aestheticly objectionable, a eutrophic condition usually does not present a health hazard and, in most of New Jersey's shallow lakes this condition does not hinder fish populations. In many cases, and over the short term, the high productivity of shallow eutrophic lakes supports larger fish populations. In this regard however problems of the distant future should be considered now.

Nutrients are derived from nearly every type of land use because of their presence in sewage, plant fertilizers and soil minerals. Thus, man's activities which facilitate the movement of nutrients into New Jersey's surface waters extends beyond the urban centers and into the agricultural centers of the State.

Obviously, reduction of nutrient levels must be accomplished through combined controls on runoff from agricultural crop lands, dairy farms, urban streets, etc. as well as on sewage effluent.

Turbidity resulting from suspended particles (non-filtrable residues) is the most aesthetically obvious water quality problem in flowing surface waters. Also, because suspended particles reduce light penetration and, when settled, cover fish eggs and insect larvae, and fill reservoirs, the control of soil erosion from developing areas and cultivated land is essential. Streams located in the piedmont and inner coastal plain belt from the northeastern to the southwestern portion of the State are particularily susceptible to high turbidity levels after precipitation. Cultivation of crop lands and continued development of new areas in this belt intensify the siltation problems mentioned above. Stress to the biota in the Passaic River Basin, the Raritan River Basin, and Delaware River tributaries between Hunterdon and Camden Counties is suspected and should be studied to properly assess the biological integrity of these surface waters.

Similar problems, caused by naturally high levels of suspended particles in tidal marshes are compounded when development encroaches on existing estuaries, as has occurred along New Jersey's Coast from the Hackensack River to Cape May. Aggressive and selective monitoring, enforcement, and planning programs are essential in restoring and protecting the productivity of these salt marshes.

In the vicinity of treated sewage discharges, ammonia concentrations approach toxic levels in the naturally alkaline waters of northwestern New Jersey. This conjecture is based upon ammonia toxicity being a function of elevated temperature and pH levels. These conditions are prevalent in Sussex County during summer months as a result of naturally alkaline groundwater contributions to stream flow and of high photosynthetic activity.

Because data available for assessing the distribution of toxic substances is of questionable reliability but is positive in many instances, only conjecture of the distribution of toxic substances is offered by this report. Intensive monitoring efforts already underway by the D.E.P. are expected to provide desparately needed reliable information for assigning a priority to this potential problem and implementing corrective measures.

# CHAPTER III

## GOALS ASSESSMENT

The Department of Environmental Protection is committed to attaining, the 1983 goal of fishable/swimmable waters set forth in the Federal Water Pollution Control Act Amendments of 1972 wherever possible. High population densities in New Jersey demand high quality waters, but sometimes make the process of achieving these goals complex, expensive or unfeasible. In some regions of New Jersey, particularly the northeast where poor water quality is caused by large volumes of industrial and domestic wastewaters being discharged to comparatively small streams, problems are compounded by the high consumptive demands placed on these resources. Water quality planning throughout New Jersey will set forth necessary restorative programs, recognizing the streams' assimilative capacities and imposing best available treatment technology economically achievable.

The Department expects considerable progress toward achieving these goals. This expectation is based upon sewerage construction programs currently underway, existing water quality data, information or costs of abatement measures, and current planning priorities.

As water quality is restored through the implementation of various planning programs, it is important to know where additional funding and effort will provide the greatest benefits. Therefore, the Department is attempting to identify those areas that are not of fishable, swimmable quality and areas that are not expected to be of fishable, swimmable quality before 1983.

Because of biological or physical factors, the problems noted in this report are often associated with specific regions of the State. Current water quality standards and waste load allocations have not adequately addressed all of these natural stresses. The impending standards revisions and water quality planning programs will address the following problems which are often associated with natural conditions found in various regions of the State.

1. The slow moving streams of New Jersey's coastal plain lack the turbulence to reaerate the relatively large volume of oxygen deficient groundwater which maintains the relatively high base flows during periods of drought. Therefore, the addition of organic substances can significantly deplete the remaining assimilative capacity of these streams.

2. The poorly flushed tidal estuaries of the extensive New Jersey coastline are naturally turbid and carry large amounts of organic matter produced in the tidal marshes. There characteristics cause dissolved oxygen levels to be naturally low in the bays and estuaries. Therefore, the bays and estuaries, like the streams of the coastal plain, lack large reserves of dissolved oxygen for the assimilation of organic wastes.

3. Naturally high calcium carbonate concentrations in the alkaline waters of the northwestern portion of the State render these waters vulnerable to nuisance growths of algae and aquatic weeds. Nutrients added to these waters as a result of agricultural activities or sanitary waste disposal can produce an immediate problem with secondary impact on dissolved oxygen concentrations.

4. The naturally alkaline waters of the Upper Delaware tributaries are especially vulnerable to the toxic effect of ammonia at prevailing high pH values.

5. Low pH is a characteristic of a large part of southern New Jersey. In the Pine Barrens, pH levels below 5 and low dissolved solids levels produce a very sterile and corrosive water. These natural restrictions to the biological prevalence of most fish species and aquatic plants, in conjunction with the high natural color of these waters also limit nuisance growths of algae. These water quality conditions are an integral part of the unique character of the New Jersey Pine Barrens, which the State is attemping to preserve.

6. A clay-marl formation, which extends across Monmouth County in a narrow band from Red Bank southwest, contains natural deposits of certain heavy metals. These metals leach into the headwaters of numerous streams and can reach concentrations toxic to stream biota until the streams past the formation and the concentrations of toxic metals are diluted. Clearly, industrial or non-point source additions of these metals or synergistic substances to these waters could extend the region of toxic influence further downstream because more dilution water would be needed to lower toxicity to a threshold level.

Through successive evaluations of existing natural and manmade pollutional sources as well as the technically and economically feasible methods of controlling them, the Department will continue to assess the attainability of the fishable, swimmable goals. At this time only a rough assessment of the attainability of these goals is possible because so many of the planned corrective measures are yet to be implemented and definitive monitoring data is lacking on several stream segments. Refinement of this assessment will be possible as more and more problems are corrected and additional data is collected and analyzed.

## ASSESSMENT OF SWIMMABILITY

The assessment of the attainability of the swimmable goal is based solely on fecal coliform levels. On this basis, swimmability is assured by 1983 for most of New Jersey's freshwater streams. This includes those streams tributary to the Delaware River above Trenton and those streams in the southern coastal plain where septic tank failures and agricultural runoff are correction of septic system problems in most of these areas is economically and technically feasible.

The bacterial quality of the lower Assunpink River and other Delaware River tributaries in Mercer County are not expected to be restored to swimmable quality by 1983. Although institutional problems have delayed construction of sewage treatment facilities in Camden County, the attainment of swimmable quality in the upper reaches of the Cooper River and other Camden County streams by 1983 is probable. However, until urban runoff to the lower reaches of Mercer and Camden County streams is controlled, bacterial concentrations will not be restored to swimmable levels.

Similar observations are made for northeastern New Jersey, where urban runoff and combined sewer overflows to the tidal reaches of the Passaic, Hackensack, Rahway and Raritan Rivers and the New York-New Jersey interstate waters will cause this condition to persist beyond 1983.

Along most of New Jersey's coast, where infrequently, bacterial levels in some back bays have exceeded the swimmable criterion, swimmability will be enhanced by the sewering of areas thereby eliminating sewage discharges to back bays. With the exception of the southern portion of Cape May County only localized and easily corrected incidences of high coliform concentrations are still being observed. Interim and long term measures to prevent recurrence of recent episodes of bacterial contaminations in southern Cape May County are expected to be completely successful prior to 1983.

## ASSESSMENT OF FISHABILITY

Fishability is dependent on sufficient dissolved oxygen concentrations and on the absence of limiting concentrations of toxic agents and turbidity. Waters suitable for shellfish harvesting depend upon low coliform concentrations. By 1983, fishability is generally assured in the freshwaters of most of the State with the exception of a small number of eutrophic lakes, and in the surface waters of the urban portions of Camden County, Mercer County and the Northeast metropolitan area.

In the upper reaches of the Cooper River and other Camden County streams, numerous point sources of treated sewage prevent restoring dissolved oxygen concentrations to fishable levels. These point sources are scheduled for elimination or upgrading by 1983. In the lower reaches of streams in Camden and Gloucester Counties, the Assunpink Creek (Mercer County) and the Passaic, Hackensack and Raritan estuaries, the oxygen depleting effect of non-point source loadings probably will prevent attainment of oxygen concentrations sufficient to restore populations of indigenous fish species. The elimination of non-point source pollutional loads to these urban areas is not probable in the foreseeable future and certainly not be 1983. Non-point and point sources of heavy metals and other toxic substances may prevent restoration of these waters to fishable by 1983 because of the complexity associated with identifying and eliminating these pollutional sources.

It is likely that, as the use of leaded gasoline declines, the presence of this heavy metal will decline compared to industrial sources of other toxic substances found in the waters of the urbanized regions of the New Jersey-New York interstate region and in the Delaware River estuary.

Unless alternative discharge sites are chosen or expensive advanced technology is applied to discharges into several small tributaries of the Great Egg Harbor, Mullica, and Manasquan Rivers, water quality will not have been raised sufficiently to allow restoration of the natural biological integrity or the fishability of certain reaches of these streams. A combination of treated sewage effluent, landfill leachate, and other oxygen depleting substances from undertermined background sources will be the cause of this failure to meet the goals of the Act by 1983.

On the lower Millstone River, occassional fish kills resulting from diurnal dissolved oxygen fluctuations caused by photosynthetic organisms can be eliminated by 1983. Limiting nutrient inputs to this stream by upgrading treatment of sewage and by controlling nutrients leaching from agricultural and landscaping activities is needed to attain this goal. Other freshwater fish kills of infrequent occurrence and various causes can be controlled through more effective enforcement measures. Prevention of irregular discharges of concentrated salts to the Heathcote Brook (Millstone River tributary) and to the Wickecheoke Creek (Hunterdon County) will cease fish kills in these streams.

These fishkills have been discussed in connection with the goal to attain fishable waters because they are of a recurring nature and therefore severly affect the permanent biological integrity of the surface waters in which they occur.

In New Jersey restoring harvestable fish and shellfish populations to the tidal bays and estuaries adjacent to urban regions is probably the most difficult aspect of the goal presented by the Act. The sometimes irreversible destruction of estuarine ecosystems has been costly because the biota of the salt marshes, estuaries, and bays constitute the principal producers of the marine food chain. The impact of increased soil erosion and urban runoff on the naturally detrimental conditions of high turbidity and low dissolved oxygen in the estuaries can only be reduced by controlling development adjacent to lagoons, back bays, and tidal streams between the Hackensack Meadowlands and Delaware Bay. Because of combinations of low dissolved oxygen concentrations, high coliform levels, thermal overloads, high turbidity levels and, in some instances, the presence of toxic substances, it is unlikely that shellfish harvesting or healthy fish populations will be restored in the upper Delaware estuary, Raritan Bay, lower Passaic, Hackensack and Rahway Rivers, Kill van Kull, Arthur Kill, Newark Bay and the Lower Hudson River, by 1983 or for sometime thereafter. Indeed, although they do not conform to the goals of the Act, nor provide motivating regulations for protecting these tidal waters, lenient turbidity and dissolved oxygen standards imposed by the current TW-2, TW-3, and TW-4 surface water quality classifications (1974, NJDEP) for the urban regions may characterize the economically attainable conditions of the forseeable future. However, before existing conditions are accepted and before these standards begin to dictate policies which perpetuate existing conditions, better assessment of the attainability of more desirable uses for these waters should be attempted.

If protected by prudent planning and active regulatory programs, the estuaries and bays south of this urbanized areas will probably continue to have only a limited number of localized areas inferior in quality to the fishable goal. Lagoon development, landfills, treated wastewater outfalls and activities of similar magnitude will be responsible for minor failures to attain fishable water quality. Again, the extent of water quality problems in this area deserves far more study before the attainability of the goals of the Act can be assessed accurately.

One other question which deserves consideration is whether the biological integrity of the Atlantic Ocean must be considered in long term planning strategies. Certainly it should be the goal of all States to maintain the Ocean in a fishable condition. For a discussion of why this question is of concern the reader should refer to a report of a series of interagency workshops held in November and December 1976 to consider Oxygen Depletion and Associated Environmental Disturbances in the Middle Atlantic Bight in 1976. Though in depth consideration of this question is beyond the scope of this assessment of goals, it should be apparent that prevention of the recurrence of low dissolved oxygen levels in the Ocean observed during the summers of 1976 and 1977 will not be possible prior to 1983 or a much more distant future. This is so whether the 1600 square mile fish kill of 1976 was caused by natural conditions or was induced artifically.

In addition to the major regions discussed above, numerous localized areas of streams will fail to meet the goals of the Act temporarily or permanently. These localized areas are found adjacent to many domestic and industrial wastewater outfalls, below reservoirs with insufficient releases or passing flows during periods of drought, in the vicinity of eroding land parcels, and where deforestation is removing tree canopies which prevent solar warming of naturally cold water streams. Because of their large number, these segments account cumulatively for a significant portion of New Jersey's oxygen stressed, turbid or thermally altered streams. Individual solutions to these numerous problems must involve thoughtful management schemes because correction of these problems will probably require large expenditures relative to the limited benefits which will result.

## Chapter IV

## CAPITAL COSTS OF ACHIEVING 1983 GOALS OF PL 92-500

The 1976 Needs Survey was used to estimate the costs for construction of publicly-owned wastewater treatment facilities. The following table shows EPA estimated of New Jersey's Needs.

In general, the 1976 Needs are lower than the 1974 Needs. This is due to the use of actual costs surveys rather than theoretical costs and stricter and nearly consistent adherence to the Needs Survey Guidlines. Categories I and II in the 1976 Needs Survey have been underestimated by $303 million due to the inconsistent manner in which grant awards or eligible costs were utilized in determining New Jersey's Needs.

EPA has estimated that New Jersey needs are approximately $11 billion for the construction of public facilities. Approximately $1.5 billion is needed for categories I and II, 20% of this can be attributed to the handling of industrial wastes discharged by public entities. Furthermore, New Jersey estimated that industries will invest $0.4 billion[1] to handle industrial wastes. Capital costs necessary to treat industrial wastewater by industry is not considered in USEPA's Needs Assessment. Thus such cost estimates do not appear in the following table. Finally, approximately $8.0 billion is needed to control and treat stormwaters.

1. American Public Works Association, An Analysis of the Environmental Protection Agency Needs Survey. April 1975.

## Table IV.1

**1976 USEPA NEEDS ASSESSMENT FOR NEW JERSEY**
(Thousands of Dollars)

Categories

| Planning Basins | I Secondary Treatment | II More Stringent Treatment | III A Correction I/I | III B Major Rehabilitation | IV A New Collectors | IV B New Interceptors | V Combined Sewer Overflows[1] | VI Control of Stormwater[1] |
|---|---|---|---|---|---|---|---|---|
| Passaic-Hackensack | 551,566 | 273,090 | 44,206 | 27,842 | 210,816 | 170,221 | | |
| Raritan-Interstate | 115,619 | 52,101 | 45,972 | -0- | 56,346 | 108,035 | | |
| Atlantic Coastal | | | | | | | | |
| North | 80,476 | -0- | 3,299 | -0- | 36,117 | 91,993 | | |
| South | 33,468 | 58,776 | 27,345 | -0- | 23,996 | 83,075 | | |
| Wallkill | -0- | 34,001 | -0- | -0- | 7,133 | 21,728 | | |
| Delaware | | | | | | | | |
| Zone 1 | -0- | 40,817 | 62 | -0- | 20,275 | 3,746 | | |
| Zone 2 | 20,155 | 80,729 | 3,114 | -0- | 10,359 | 9,553 | | |
| Zones 3 and 4 | -0- | 149,152 | 716 | -0- | 14,650 | 84,928 | | |
| Zones 5 and 6 | -0- | 25,966 | 379 | -0- | 17,163 | 5,776 | | |
| State Total | 801,284 | 714,632 | 125,093 | 27,842 | 396,855 | 579,055 | 604,000 | 8,044,465 |
| Grand Total | 11,293,226 | | | | | | | |

1. Estimates by planning basin not available

# CHAPTER V

## PRELIMINARY ANALYSIS OF THE DISTRIBUTION OF TOXIC SUBSTANCES IN NEW JERSEY'S SURFACE WATERS

The following is an analysis of the distribution of toxic substances in the surface waters of New Jersey. This analysis is based upon limited data recently acquired by the D.E.P., U.S.G.S. and E.P.A. and will require confirmation as these sampling programs continue. The data used in this section were summarized from STORET, the EPA national water quality data base. Thus the data are subject to certain variations in analytical accuracy among the laboratories of the participatory agencies. Warning levels of certain toxic substances are based on Quality Criteria for Water (EPA, 1976). Warning levels of certain toxic substances in the bottom muds are based on a magnification factor that accounts for accumulation of these substances in benthal deposits. It is the purpose of this section:

1. To identify surface waters in the State that contain abnormally high toxic substances.

2. To identify the toxic substances which are most problematic.

3. To aid in revising monitoring programs to verify the data in this report.

4. To provide input to the development of statewide water quality standards.

5. To guide other state programs in establishing necessary toxic abatement measures.

The following is a list of substances that were sampled and evaluated:

| | | |
|---|---|---|
| Antimony | (Sb) | Aldrin/Dieldrin |
| Arsenic | (As) | Chlordane |
| Berylium | (Be) | Demeton |
| Cadmium | (Cd) | DDT |
| Chromium | (Cr) | Endosulfan |
| Copper | (Cu) | Endrin |
| Cyanide | (CN) | Guthion |
| Lead | (Pb) | Heptachlor |
| Polychlorinated biphenyls | (PCB) | Lindane |
| Manganese | (Mn) | Malathion |
| Mercury | (Hg) | Methoxychlor |
| Nickel | (Ni) | Parathion |
| Selenium | (Se) | Toxaphene |
| Silver | (Ag) | 2,4,-D |
| Sulfides | ($S^{-2}$) | 2,4,5-T |
| Zinc | (Zn) | |

The table at the end of this section displays the occurrence of warning levels of chlorinated hydrocarbons and organo-phosphorus pesticides, heavy metals, and other toxic substances in New Jersey. This table indicates that aldrin/dieldrin, chlordane and DDT, which are known or suspected carcinogens, are among the most ubiquitous pesticides in the State's surface waters. It is evident from this table that abnormal levels of pesticides, heavy metals, and PCB's are present in the surface waters and bottom muds in the Passaic and Hackensack River Basins. Pesticides, cadmium, and mercury are among the more persistent toxic substances present at warning levels in the Raritan River Basin. Pesticides and PCB's are persistent toxic substances present in the North Atlantic Coastal basins. PCB's, certain heavy metals, and pesticides are present in the South Atlantic Basin and in the Delaware River tributaries in Zones I and II. Cadmium and aldrin/dieldrin are evident in the Delaware tributaries in Zones III and IV. The presence of pesticides is presumed to be due to agricultural and residential use of these substances throughout the State. The presence of heavy metals and other persistant toxic substances is due to the concentration of industrial point sources and urban non-point sources in the lower Passaic, Raritan and Delaware River basins. The presence of heavy metals, in the South Atlantic Basin, may be attributed to urban runoff and surreptitious dumping of chemical wastes because there are no known point source discharges of these substances in the Basin.

It is expected that the presence of certain chlorinated hydrocarbons (DDD/DDT, aldrin/dieldrin, endrin and heptachlor) will diminish because their uses are prohibited or specially restricted (Pesticides Control Regulations, NJAC 7:30-1, NJDEP) in New Jersey. It is also speculated that the concentration of other families of pesticides may be increasing because of additional reliance on alternative types of pesticides. The Department anticipates that the development, implementation, and enforcement of an effective program for the pretreatment of industrial wastewaters will reduce the discharge of toxic substances into the surface waters of New Jersey.

The State has initiated a program on environmental carcinogens and toxic substances because of the potential impact that persistent toxic substances and suspected or known carcinogens have on public health and aquatic biota. This program was developed to determine the role of environmental factors in carcinogenesis, locate specific sources of carcinogens, and develop strategies to focus DEP's regulatory programs on controlling the release of these materials to the environment and reducing exposure to such substances. The program has recently been expanded to include surface and ground water monitoring of toxic and carcinogenic substances. This aspect of the program is being implemented by the areawide water quality management program. It is also important that the ambient water quality monitoring program also be utilized as a data base for the carcinogenic and toxics program. In addition, as the presence and fate of the more conventional toxic substances become known, more attention must be given to developing monitoring techniques to identify exotic organic substances that may enter the State's waters from the extensive manufacture, distribution, and use of chemicals in New Jersey. Techniques must also be developed and investigated (e.g. DEP's current investigation of the AMES test) which rapidly indicate potential impacts of these exotic substances on public health and aquatic life.

Table V.1 Occurrence of Abnormal Concentrations of Toxic Substances in New Jersey Surface Waters and/or Bottom Muds

| River Basin | As | Cd | Cr | Cu | CN | Pb | Mn | Hg | Ni | $S^{-2}$ | Zn | PCBs | Aldrin/ Dieldrin | Chlordane | DDT | Endrin | Heptachlor | Malathion | Parathion | 2,4-D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Passaic-Hackensack | | 1 | | 1 | 1 | 1 | 1 | 1,2 | | 1 | 1,2 | 1 | 1,2 | 1,2 | 1,2 | | | | | |
| Raritan | | 1,2 | | 1,2 | | | | 1 | | 1 | | | 1,2 | 2 | 1,2 | 2 | 1 | | | |
| Atlantic | | | | | | | | | | | | | | | | | | | | |
| North | | | | | 1 | | | | | | | 2 | 2 | | 2 | | | | | |
| South | | 1 | | | | 1 | 1 | 1 | | | 1 | 1,2 | 1,2 | 1,2 | 1,2 | 2 | | | | |
| Delaware River Tributaries-Zones: | | | | | | | | | | | | | | | | | | | | |
| I | | 1 | | | | | | | | | | 2 | 2 | 2 | 1 2 | 2 | | | | |
| II | 1 | 1 | | 1 | | 1 | | 1 | | | 1 | 2 | 2 | 2 | 2 | 2 | | 1 | 1 | 1 |
| III | | 1 | 1 | 1 | | 1 | | | 1 | | 1 | | 2 | | | | | | | |
| IV | | 2 | | 1 | | | 2 | | | | 1,2 | | 2 | | | | | | | |
| Criteria | | | | | | | | | | | | | | | | | | | | |
| Water Column(μg/l) | 50 | 3 | 300 | 10 | 0.005 | 50 | 100 | 0.05 | 100 | 0.002 | 20 | 0.001 | 0.003 | 0.05 | 0.001 | 0.01 | 0.01 | 0.1 | 0.1 | 100 |
| Bottom muds(mg/kg) | 500 | 4 | 3000 | 100 | 0.5 | 500 | 1000 | 0.5 | 1000 | - | 200 | 0.0001 | 0.00003 | 0.0005 | 0.00001 | 0.0001 | 0.0001 | 0.001 | 0.001 | 1 |

1 - Present in surface waters
2 - Present in bottom sediments

# CHAPTER VI

# WATER QUALITY INVENTORY

# WALLKILL RIVER BASIN

## BASIN DESCRIPTION

The Wallkill River, originating in the northwestern corner of New Jersey, flows northward from Lake Mohawk through New York State before its confluence with the Hudson River.

Although the headwaters are subject to flash flooding, in the lower reaches the channel width increases, velocity is reduced, and the flood plain expands forming swamps. As the river approaches the State line, the flood plain forms a fertile agricultural region known as the "black dirt" area which is one of the most intensely farmed regions in New Jersey.

The Wallkill River Basin is primarily rural with small towns, agriculture, and limited industry. Subsequent to the construction of Interstate Route 80 and State Route 15, suburban developments consisting of single family subdivisions, trailer parks, motels, and road side stands have been or are in the process of being constructed.

The waters within the Wallkill Watershed provide an important recreational and agricultural resource. Lake Mohawk, one of the major lakes within the basin, has a surface area of approximately 700 acres and receives heavy recreational utilization. Residential development is dense with approximately 350 homes, all with septic systems, in the immediate lake area.

## WATER QUALITY ASSESSMENT

Surface water quality within the Wallkill watershed is marginal. Fecal coliform levels consistently contravene the New Jersey Surface Water Quality Standards at all stations sampled and are sufficiently high to pose a potential health hazard to bathers. Although dissolved oxygen levels increased throughout the segment, they are generally below the surface water criterion. The five day biochemical oxygen demand is stable and within the criterion in this segment. Due to the geology of the area, the waters within the watershed are naturally basic with pH values usually around 8. The 0.1 mg/l phosphorus criterion for stream waters is exceeded at all stations. Nitrate nitrogen levels are somewhat elevated throughout the watershed and excessive on Papakating Creek. Overall, nutrient levels are elevated and could result in undesirable aquatic weed growth in lakes and in shallow, slow moving reaches. Turbidity, dissolved residue (total dissolved solids), and nonfiltrable residue (suspended solids) increase at downstream stations. The levels at all stations, however, are below the established criteria with the exception of non-filtrable residue at Papakating Creek at Sussex.

(suspended solids) and dissolved residue (total dissolved solids) values are similarly at low natural levels, well below the criteria for those parameters. In addition, biological sampling has confirmed that the Flat Brook is in excellent biological condition.

The overall water quality in the Paulins Kill is considered to be good, although data is lacking for several parameters. The fecal coliform bacteria values, however, do exceed the criterion level at the one station for which there is data. The dissolved oxygen levels appear to be satisfactory with summer saturation values of over 84% being recorded. However the lack of biological oxygen demand and phosphorus and nitrate data makes it impossible to assess the potential oxygen demands on the lower reach of the stream. Limited non-storet nutrient data is, however, available for Paulinskill Lake. Phosphorus concentrations greater than 0.1 mg/l have been recorded in both the inlet and outlet. Although nitrate values in the range of .5-1.5 mg/l have been measured, the super abundance of available phosphorus has caused the lake to be nitrogen limited. As would be expected, the potential for primary productivity is high and the lake is classified as eutrophic. Turbidity, non-filtrable residue and dissolved residue values reflect natural levels and are below the criteria for those parameters.

## PROBLEM ASSESSMENT

As one of the more pristine waterways in the state the Flat Brook has no major water quality problems. The major area of the watershed is forested and, unlike much of Sussex County, there is no major agricultural land use, residential development, or major point source discharge to affect water quality.

In contrast, the Paulins Kill watershed has major agricultural uses and has the potential for increased residential development. At the present there are 9 point source discharges the majority of which, including the Newton STP, discharge into the upper reach of the stream. The Newton STP has a major impact on the water quality of the upper Paulins Kill and Paulinskill Lake. This one discharge accounts for 45% of the total phosphorus load while non-point sources contributed 52% of the phosphorous load reaching Paulinskill Lake.

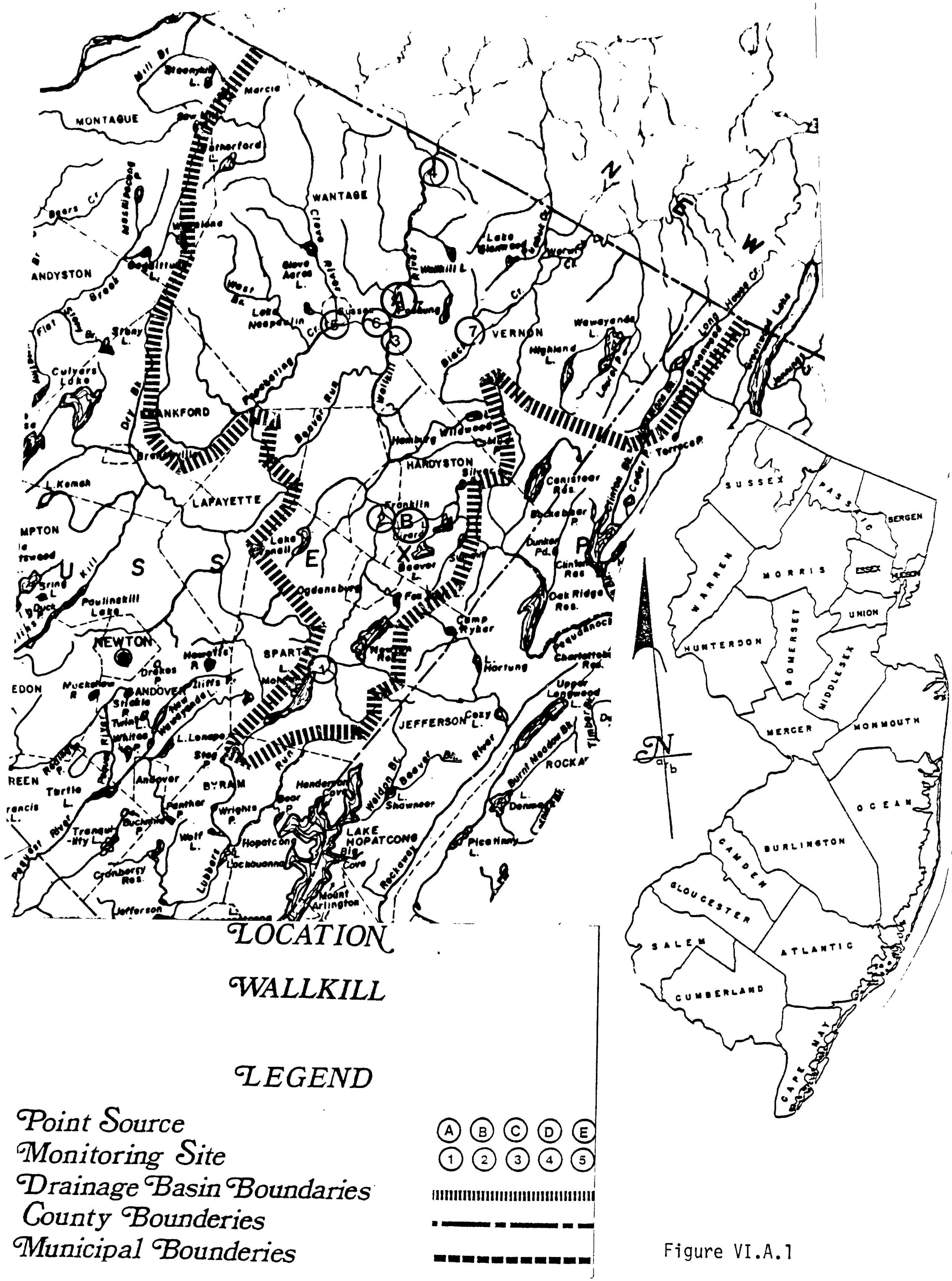
Non-point sources would be expected to contribute almost the total nutrient loading to the river downstream of Paulinskill Lake.

## GOAL ASSESSMENT AND RECOMMENDATIONS

The Flat Brook, classified as a trout production and maintenance stream, currently meets the goal as being suitable for fishing. Excessive fecal coliform counts intimate that the water may not be satisfactory for contact uses and a thorough sampling program should be conducted to resolve the question of the water's bacterial quality and identify the cause of any contamination.

## STATION LIST

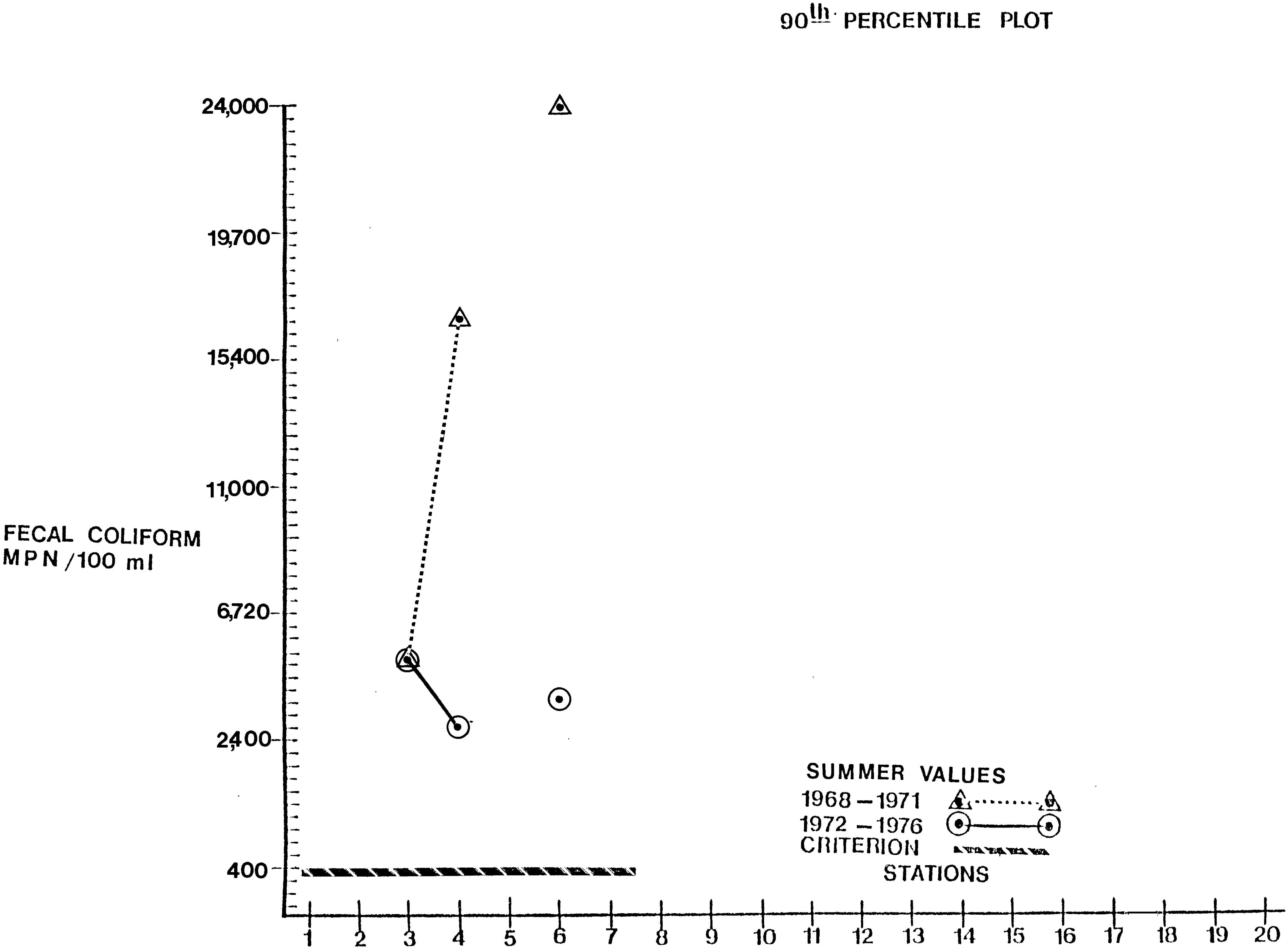
| Station No. | Location |
|---|---|
| 1. | Wallkill River at Mohawk Lake outlet |
| 2. | Wallkill River at Franklin |
| 3. | Wallkill River at Sussex |
| 4. | Wallkill River near Unionville |
| 5. | Papakating Creek at Sussex |
| 6. | Papakating Creek off Wallkill River confluence |
| 7. | Black Creek near Vernon. |



MONTAGUE
WANTAGE
ANDYSTON
VERNON
FRANKFORD
HARDYSTON
LAFAYETTE
Franklin
Ogdensburg
NEWTON
SPARTA
ANDOVER
BYRAM
JEFFERSON
LAKE HOPATCONG
Mount Arlington
S U S S E X
LOCATION
WALLKILL
LEGEND
Point Source
Monitoring Site
Drainage Basin Boundaries
County Bounderies
Municipal Bounderies
A B C D E
1 2 3 4 5
SUSSEX
PASSAIC
BERGEN
WARREN
MORRIS
ESSEX
HUDSON
UNION
HUNTERDON
SOMERSET
MIDDLESEX
MERCER
MONMOUTH
OCEAN
BURLINGTON
CAMDEN
GLOUCESTER
SALEM
ATLANTIC
CUMBERLAND
CAPE MAY


Figure VI.A.1

Figure VI.A.2



90th PERCENTILE PLOT
FECAL COLIFORM
MPN /100 ml
24,000
19,700
15,400
11,000
6,720
2,400
400
SUMMER VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Figure VI.A.3

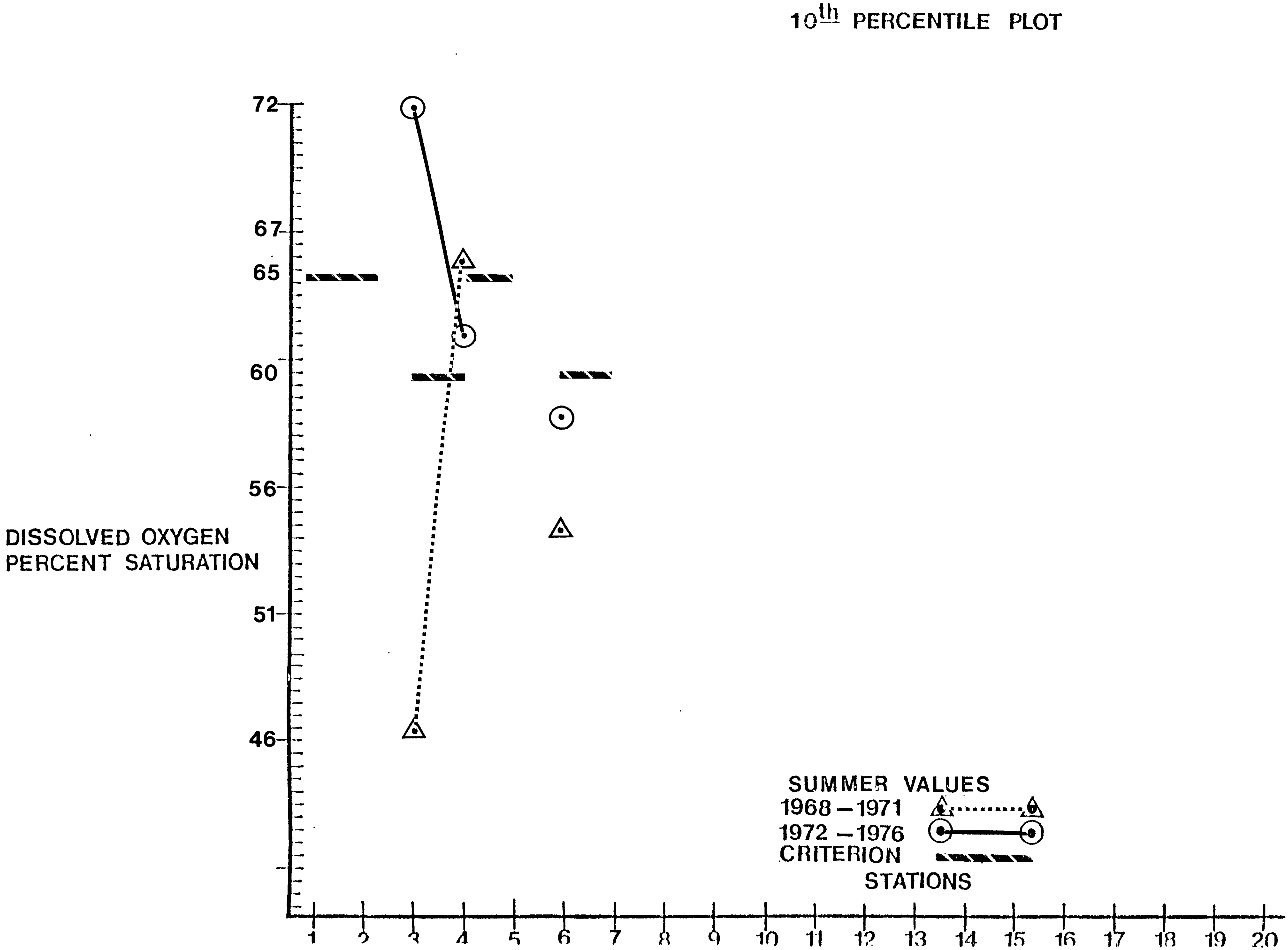

10th PERCENTILE PLOT
72
67
65
60
56
51
46
DISSOLVED OXYGEN
PERCENT SATURATION
SUMMER VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Figure VI.A.4

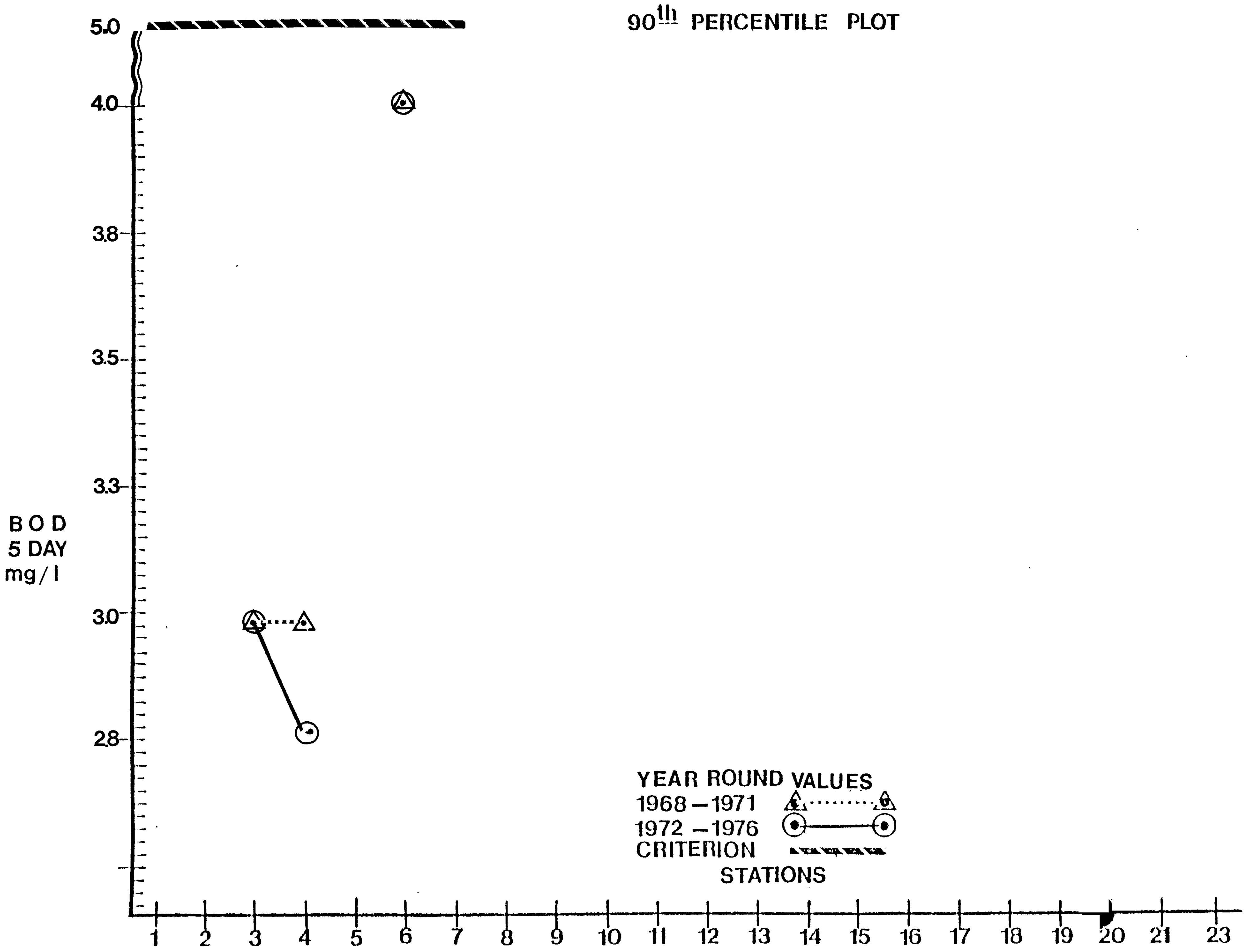

90th PERCENTILE PLOT
5.0
4.0
3.8
3.5
3.3
3.0
2.8
BOD
5 DAY
mg/l
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
23

Figure VI.A.5

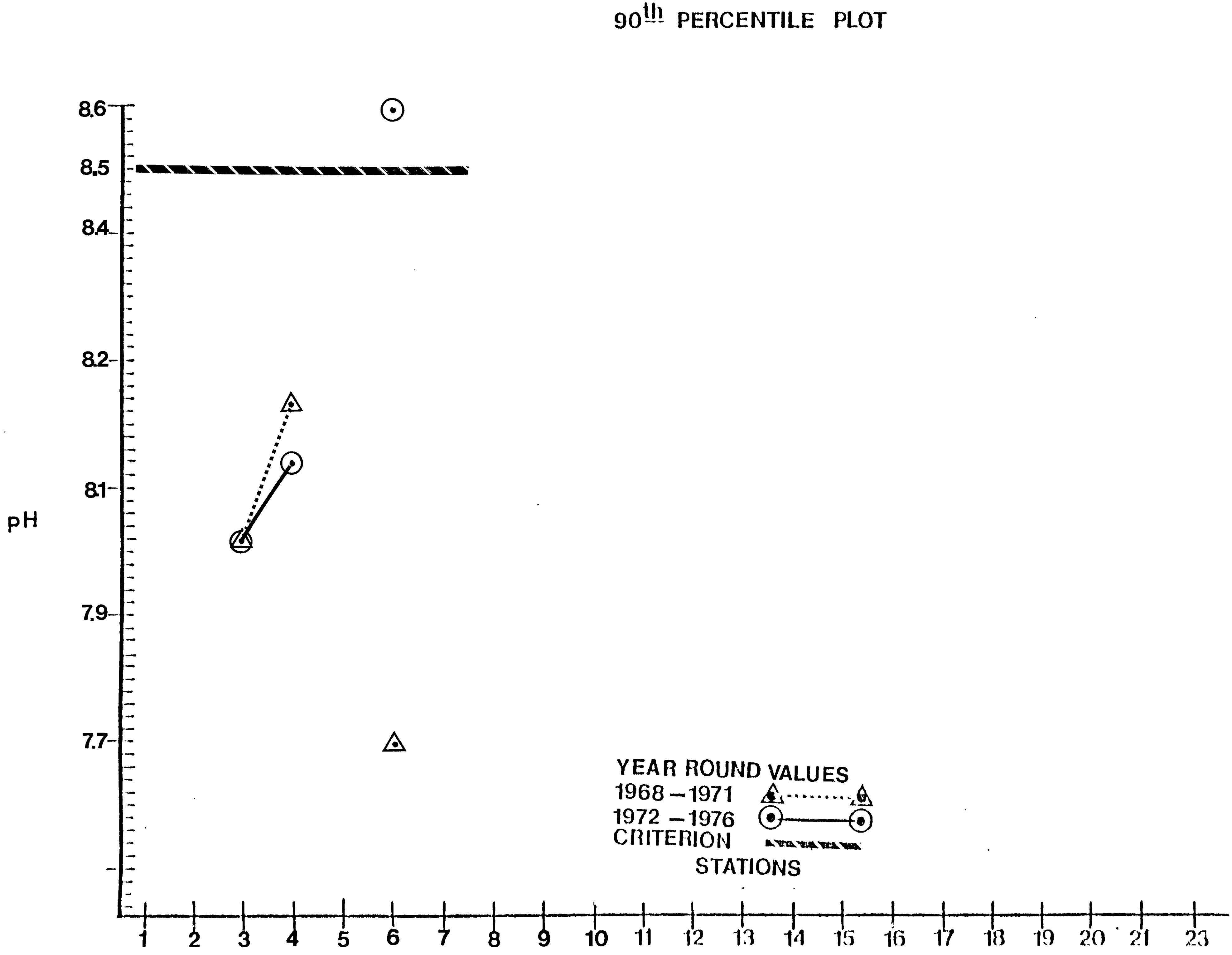

90th PERCENTILE PLOT
8.6
8.5
8.4
8.2
8.1
7.9
7.7
pH
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
23

Figure VI.A.6

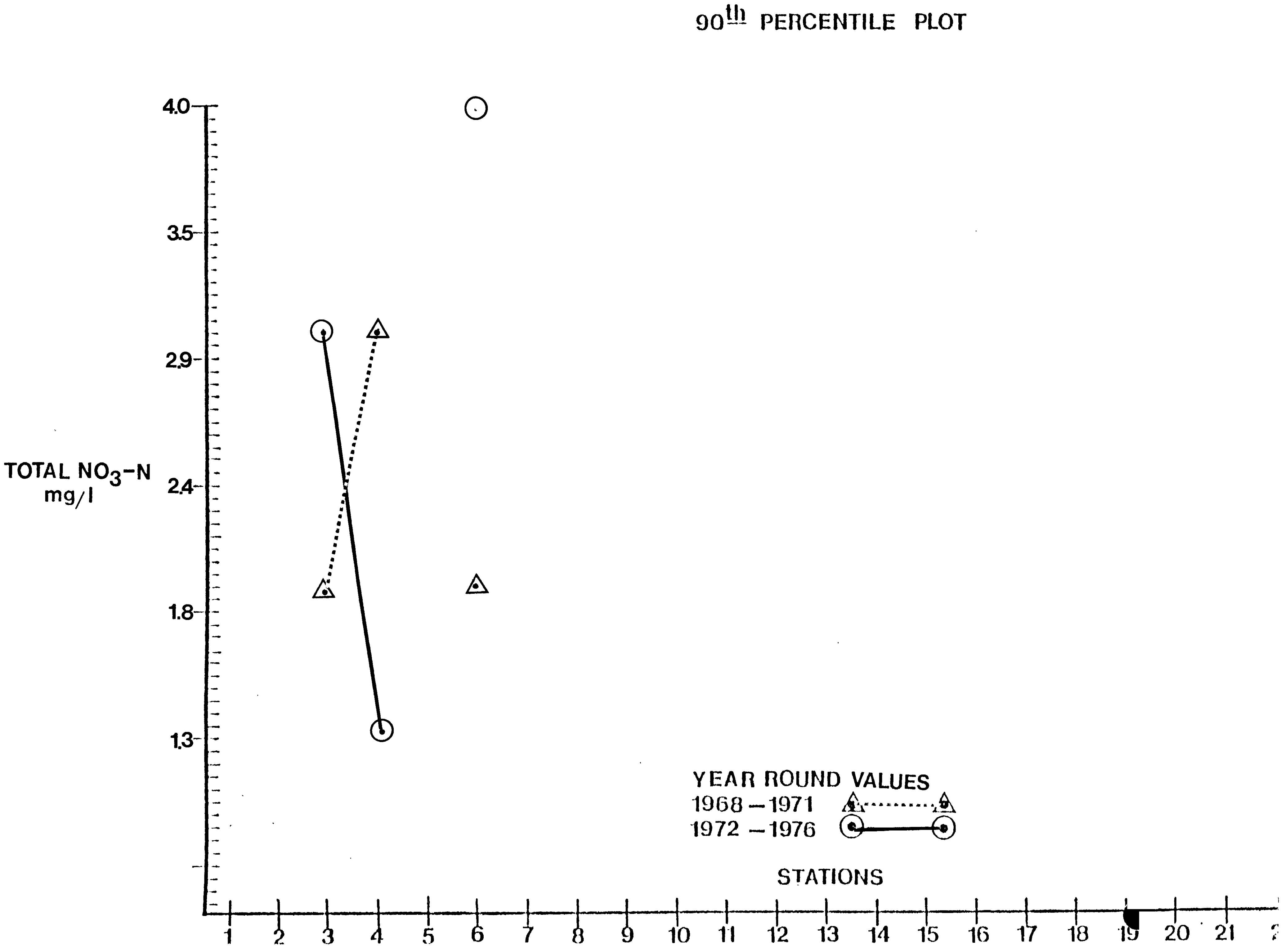

90th PERCENTILE PLOT
TOTAL NO3-N mg/l
4.0
3.5
2.9
2.4
1.8
1.3
YEAR ROUND VALUES
1968 — 1971
1972 — 1976
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21

Figure VI.A.7

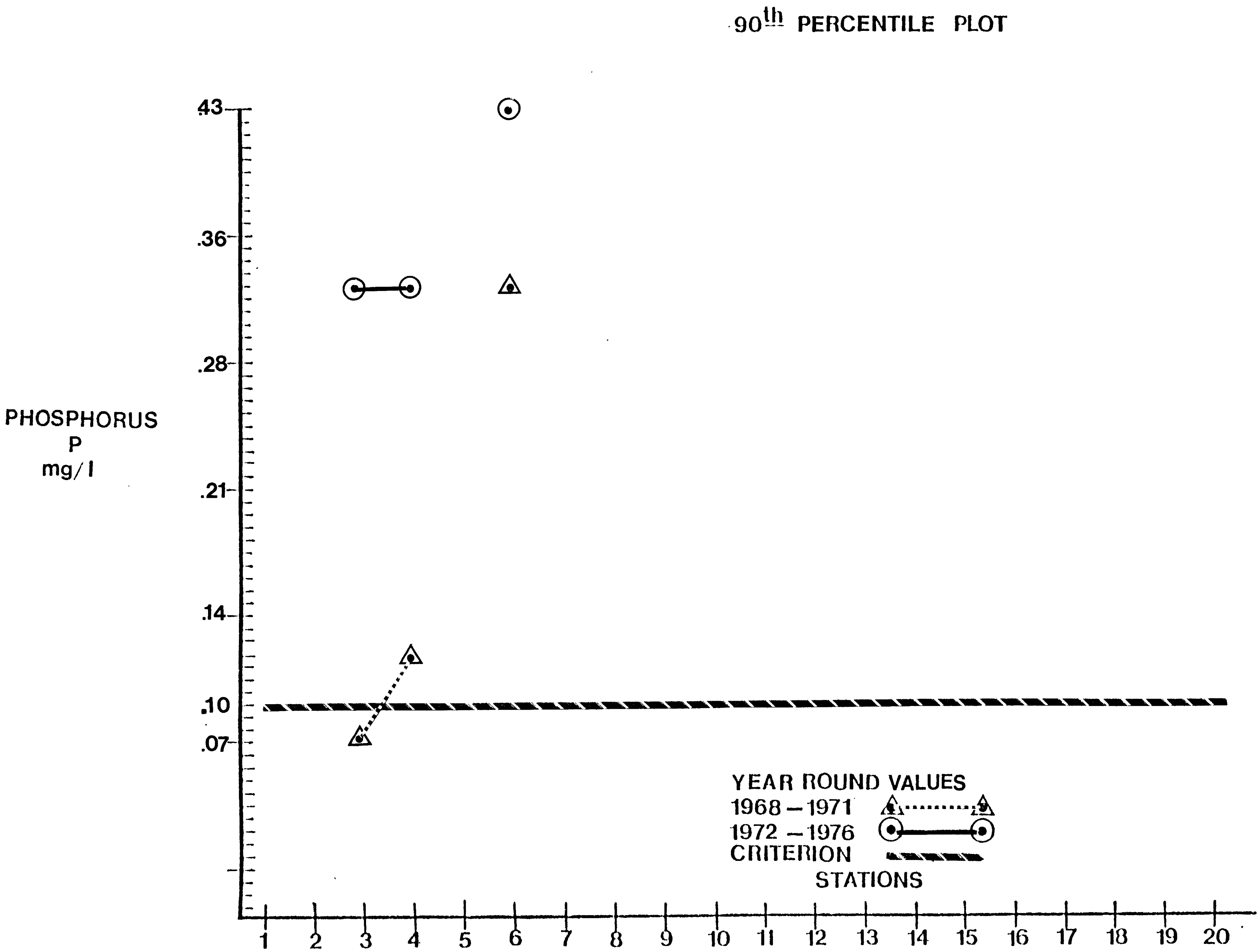
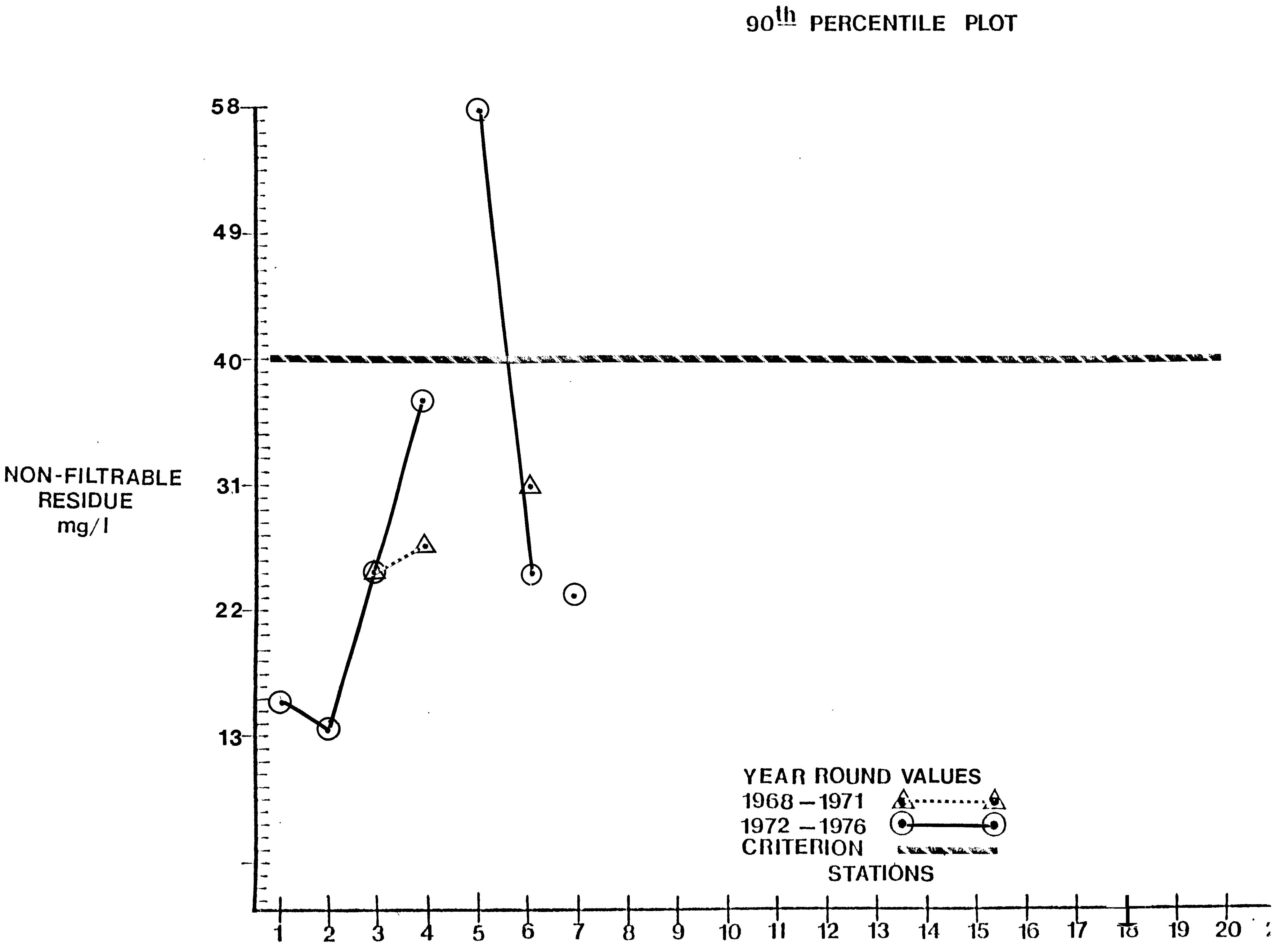

90th PERCENTILE PLOT
PHOSPHORUS
P
mg/l
.43
.36
.28
.21
.14
.10
.07
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Figure VI.A.8



90th PERCENTILE PLOT
NON-FILTRABLE RESIDUE mg/l
58
49
40
31
22
13
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
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11
12
13
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15
16
17
18
19
20

Figure VI.A.10

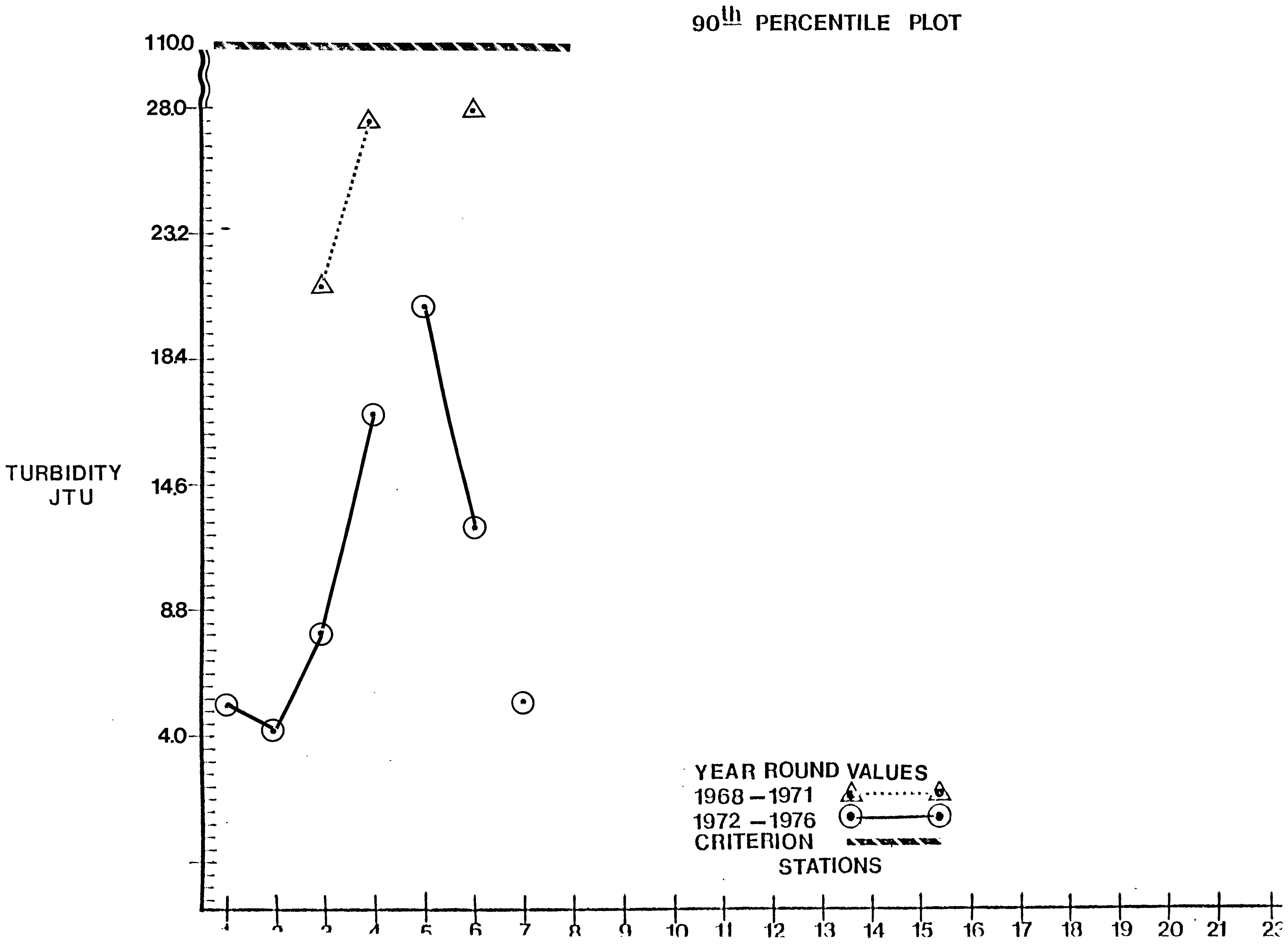
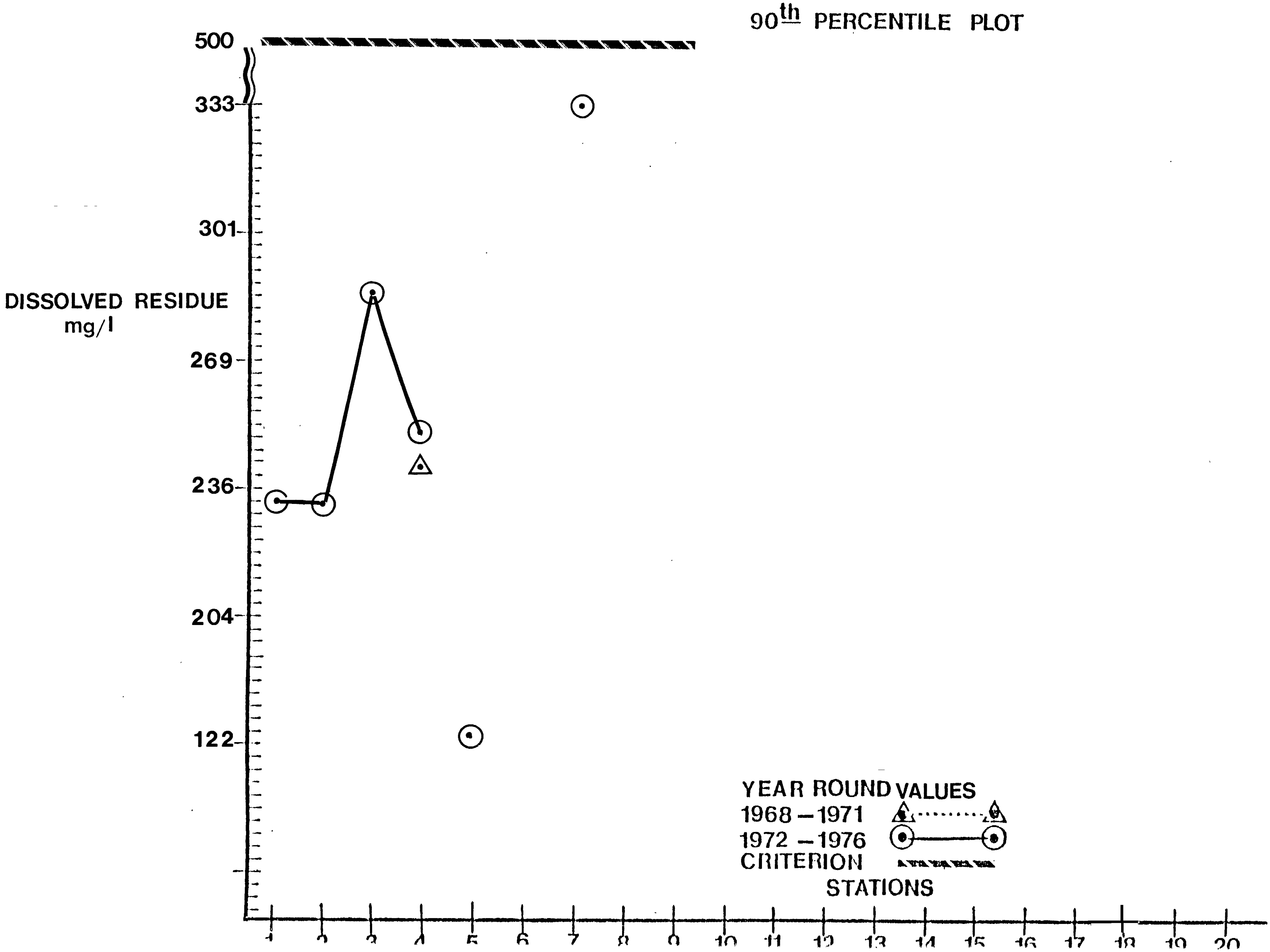


Figure VI.A.9



90th PERCENTILE PLOT
500
333
301
269
236
204
122
DISSOLVED RESIDUE
mg/l
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS

# Table VI.A.1

DISCHARGER INVENTORY

Wallkill Basin

| MAP CODE | MUNICIPALITY | PLANT NAME | DEGREE OF TREATMENT | RECEIVING STREAM | AVG. (MDG) DAILY FLOW 1973 | 1974 | 1975 | 1976 | COMPLIANCE WITH 1977 REQUIREMENTS OF SECONDARY/BEST PRACTICABLE TREATMENT LIMITATIONS |
|---|---|---|---|---|---|---|---|---|---|
| A | Vernon Township | Great Gorge Resort Hotel | Ter. | Wallkill River | 0.15 | 0.250 | 0.240 | .30 | Yes |
| B | Franklin Borough | Franklin Borough Hemlock Junction | Pri. | Wallkill River | 0.18 | 0.18 | 0.18 | .18 | No |
| | Franklin Township | Franklin Shop. Center | Sec. | Wallkill River | 0.0005 | 0.0005 | 0.0005 | .0003 | Yes |
| | Hardyston Township | Carlton Village | Sec. | Wallkill River | 0.010 | .010 | 0.012 | .018 | Yes |
| | Sparta Township | Alpine School | Ter. | Wallkill River | 0.003 | 0.003 | 0.003 | .003 | Yes |
| | Sparta Township | Plaza Sewage Plant | Sec. | Wallkill River | 0.015 | 0.015 | 0.015 | .014 | No |
| | Sparta Township | Pope John XXIII | Sec. | Wallkill River | 0.008 | 0.006 | 0.006 | .006 | Yes |
| | Sparta Township | Sparta Public H.S. | Sec. | Wallkill River | 0.008 | 0.008 | 0.006 | .008 | Yes |
| | Sparta Township | Sussex Co. Vocational HS | Sec. | Wallkill River | 0.0014 | 0.0018 | 0.0025 | .002 | Yes |
| | Vernon Township | Great Gorge Corp., Ski Area | Sec. | Wallkill River | 0.01 | 0.008 | 0.008 | .005 | No |
| | Vernon Township | High School | Sec. | Ground Recharge | - | - | 0.003 | .004 | No |
| | Vernon Township | Lawnsberry Hollow M.S. | Ter. | Wallkill River | 0.0075 | 0.014 | 0.014 | .006 | Yes |
| | Vernon Township | Vernon Valley Rec. Assoc., Inc. | Ter. | Wallkill River | 0.014 | 0.004 | 0.004 | .007 | No |
| | Wantage Township | 4-H Camp | Sec. | Spray Irrigation | - | - | 0.003 | .003 | Yes |
| | Wantage Township | High Point Reg. H.S. | Sec. | Wallkill River | 0.008 | 0.007 | 0.007 | .007 | Yes |
| | Wantage Township | Wantage Develop. Corp. | Ter. | Wallkill River | new Cons. | 0.025 | 0.030 | .030 | Yes |

## Table VI.A.1

DISCHARGER INVENTORY

Wallkill Basin (Cont'd)

| MAP CODE | MUNICIPALITY | PLANT NAME | DEGREE OF TREATMENT | RECEIVING STREAM | AVG. (MDG) DAILY FLOW 1973 | 1974 | 1975 | 1976 | COMPLIANCE WITH 1977 REQUIREMENTS OF SECONDARY/BEST PRACTICABLE TREATMENT LIMITATIONS |
|---|---|---|---|---|---|---|---|---|---|
| | Hamburg Borough | Ames Rubber Corp. | Sec. | Wallkill River | 0.006 | 0.006 | 0.005 | .005 | Yes |
| | Hamburg Borough | Plastoid Corp. | Sec. | Wallkill River | 0.003 | 0.003 | 0.003 | .003 | Yes |
| | Hamburg Borough | Accurate Forming Corp. (C.B.M. Realty Co.) | Sec. | Wallkill River | 0.005 | 0.005 | 0.005 | .005 | Yes |
| | Hamburg Borough | Accurate Forming Corp. (C.B.M. Realty Co.) | Ind. | Wallkill River | 0.025 | 0.025 | 0.015 | .025 | Yes |
| | Ogdensburg Borough | New Jersey Zinc Co. | Pri. | Wallkill River | 0.004 | 0.004 | 0.004 | | No |
| | Sussex Borough | Sussex Boro Municipal | Sec. | Clove Brook to Wallkill | 0.17 | 0.17 | 0.250 | .18 | No |

FLAT BROOK AND PAULINS KILL

## BASIN DESCRIPTION

The Flat Brook is formed by the confluence of Little Flat Brook and Big Flat Brook in northwest Sussex County. As such, it flows in a southwesterly direction for approximately 8 miles to its confluence with the Delaware River. The watershed covers 33 square miles and is primarily undeveloped mountainous forest; the prime use being recreational. The Flat Brook receives no major point discharges. Nearly all of the stream is classified as either FW-2 trout production or trout maintenance waters. As one of the premiere trout streams in New Jersey, it is a valuable recreational resource.

The Paulins Kill originates in a swampy area outside of Newton in central Sussex County. The watercourse meanders north and then flows southwest for 38 miles through Sussex and Warren counties to its confluence with the Delaware River south of Columbia. The watershed encompasses 175 square miles of predominantly agricultural drainage with the town of Newton being the largest population center in the watershed. Its municipal sewage treatment plant (approximately 1.0 MGD) is the largest of the 9 point source discharges in the watershed.

Paulinskill Lake is the major impoundment on the Paulins Kill. The lake is approximately 3 miles long with a surface area of 0.4 square miles. The Paulins Kill and Paulinskill Lake are both popular recreational waters, with two major segments of the Paulins Kill designated as trout maintenance waters. Several major highways offer easy access to the basin and future residential development could be expected if the present agricultural lands are not preserved.

## WATER QUALITY ASSESSMENT

The Flat Brook is considered to be one of New Jersey's highest quality waters. However, excessively high fecal coliform bacteria data from the Storet data bank indicates that there could be considerable contamination in the waterway. Other limited Division data with values ranging from less than 20 to 230 MPN/ 100 ml would indicate generally uncontaminated waters. The fact that all other parameters are also at natural levels would tend to confirm the absence of any major contamination. Dissolved oxygen levels are excellent, with summer values approaching 92% saturation, although five day biochemical oxygen demand data is insufficient to assess water quality using that parameter. The pH is alkaline with values as high as 8.6 being recorded due to the natural geology of the area.

Phosphorus and nitrate levels are both low and reflect the uncontaminated nature of the watershed, with phosphorus values being well below the criterion level. The non-filtrable residue (suspended solids) and dissolved residue (total dissolved solids) values are similarly at low natural levels, well below the criteria for those parameters. In addition, biological sampling has confirmed that the Flat Brook is in excellent biological condition.

The overall water quality in the Paulins Kill is considered to be good, although data is lacking for several parameters. The fecal coliform bacteria values, however, do exceed the criterion level at the one station for which there is data. The dissolved oxygen levels appear to be satisfactory with summer saturation values of over 84% being recorded. However the lack of biological oxygen demand and phosphorus and nitrate data makes it impossible to assess the potential oxygen demands on the lower reach of the stream. Limited non-storet nutrient data is, however, available for Paulinskill Lake. Phosphorus concentrations greater than 0.1 mg/l have been recorded in both the inlet and outlet. Although nitrate values in the range of .5-1.5 mg/l have been measured, the super abundance of available phosphorus has caused the lake to be nitrogen limited. As would be expected, the potential for primary productivity is high and the lake is classified as eutrophic. Turbidity, non-filtrable residue and dissolved residue values reflect natural levels and are below the criteria for those parameters.

PROBLEM ASSESSMENT

As one of the more pristene waterways in the state the Flat Brook has no major water quality problems. The major area of the watershed is forested and, unlike much of Sussex County, there is no major agricultural land use, residential development, or major point source discharge to affect water quality.

In contrast, the Paulins Kill watershed has major agricultural uses and has the potential for increased residential development. At the present there are 9 point source discharges the majority of which, including the Newton STP, discharge into the upper reach of the stream. The Newton STP has a major impact on the water quality of the upper Paulins Kill and Paulinskill Lake. This one discharge accounts for 45% of the total phosphorus load while non-point sources contributed 52% of the phosphorous load reaching Paulinskill Lake.

Non-point sources would be expected to contribute almost the total nutrient loading to the river downstream of Paulinskill Lake.

GOAL ASSESSMENT AND RECOMMENDATIONS

The Flat Brook, classified as a trout production and maintenance stream, currently meets the goal as being suitable for fishing. Excessive fecal coliform counts intimate that the water may not be satisfactory for contact uses and a thorough sampling program should be conducted to resolve the bacterial quality of the water and identify the cause of any contamination.

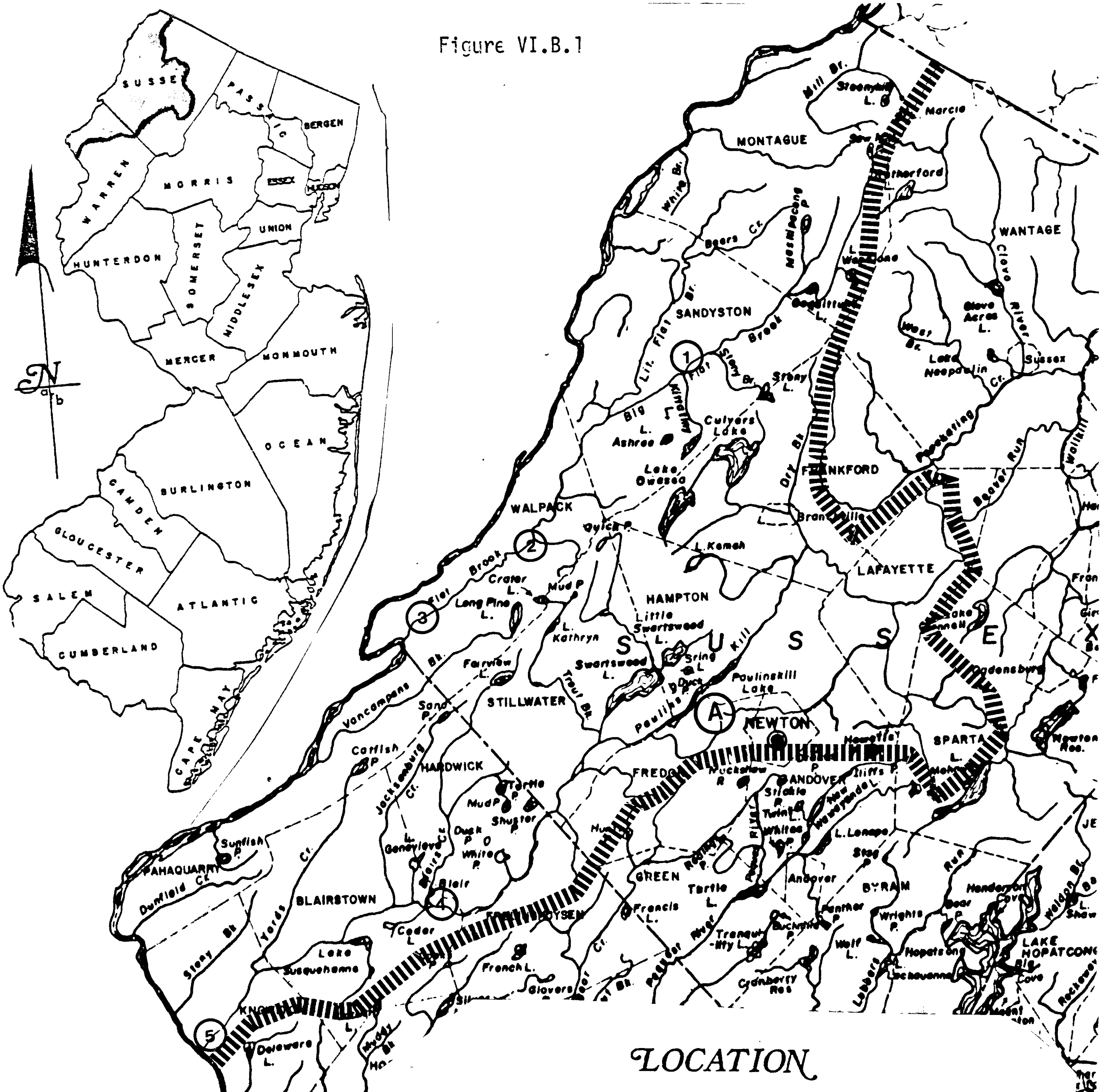
The Paulins Kill also currently satisfies the goal of a fishable water and has two segments classified as suitable for trout maintenance. However the fecal coliform values indicate that the stream does not yet meet the swimmable goals. Non-point pollution sources account for a large proportion of the contamination at the downstream stations where samples have been collected. Improved agricultural and drainage practices could possibly alleviate some portion of this contamination. However, in the upstream segment of Paulinskill Lake, point sources account for approximately 50% of the phosphorus loading reaching the lake. Therefore phosphorus removal especially at the Newton STP is recommended and, if implemented, should result in a persistant state of phosphorus limitation and slow the rate of eutrophication of Paulinskill Lake.

The fact that the major point source discharge is in the headwaters area, a sampling station should be instituted upstream of Paulinskill Lake to monitor nutrient flows and the concentration of other parameters into this rapidly eutrophicating lake. Nutrient and biological oxygen demand sampling should also be instituted at all other stations on both the Paulins Kill and the Flat Brook.

## STATION LIST

| Station No. | Location |
|---|---|
| 1 | Big Flatbrook |
| 2 | Flatbrook Creek at Wallpack Center |
| 3 | Flatbrook Creek near Flatbrookville |
| 4 | Paulins Kill at Blairstown |
| 5 | Paulins Kill at Columbia |

Figure VI.B.1

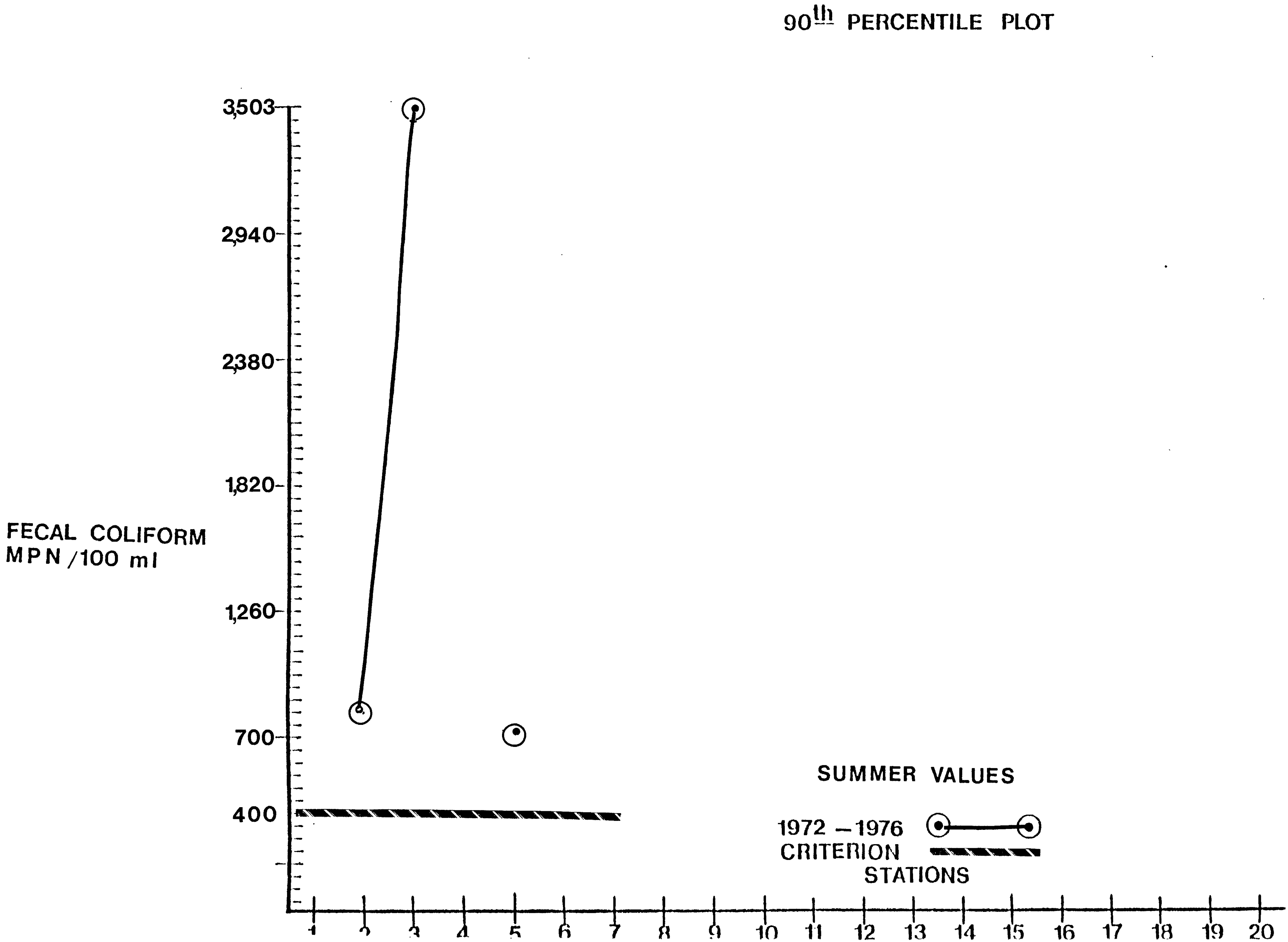



# LOCATION
# FLAT BROOK & PAULINS KILL RIVER

## LEGEND

| | |
|---|---|
| Point Source | (A) (B) (C) (D) (E) |
| Monitoring Site | (1) (2) (3) (4) (5) |
| Drainage Basin Boundaries | |
| County Bounderies | |
| Municipal Bounderies | |

Figure VI.B.2



90th PERCENTILE PLOT
FECAL COLIFORM
MPN /100 ml
3,503
2,940
2,380
1,820
1,260
700
400
SUMMER VALUES
1972 – 1976
CRITERION
STATIONS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Figure VI.B.3

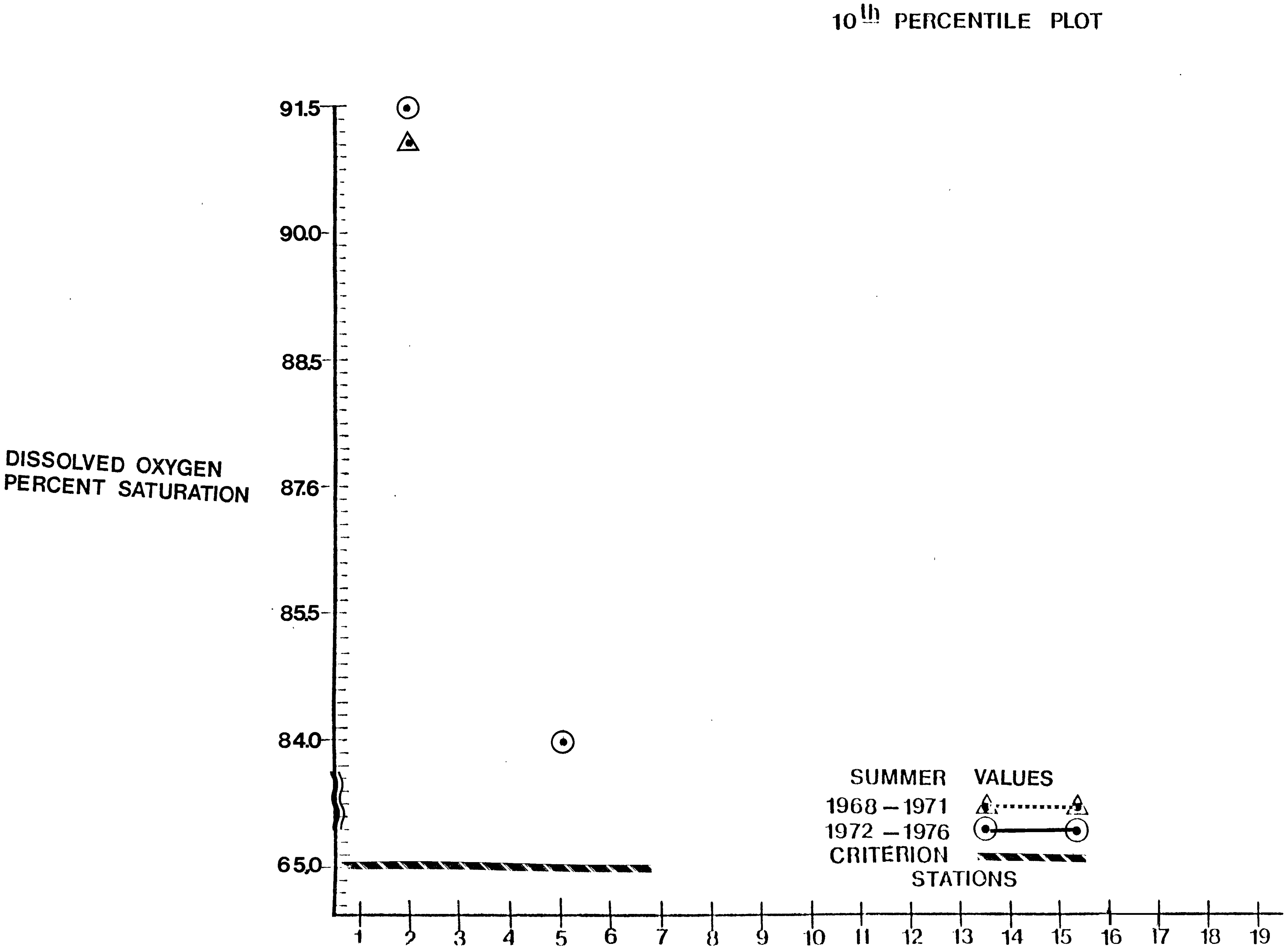
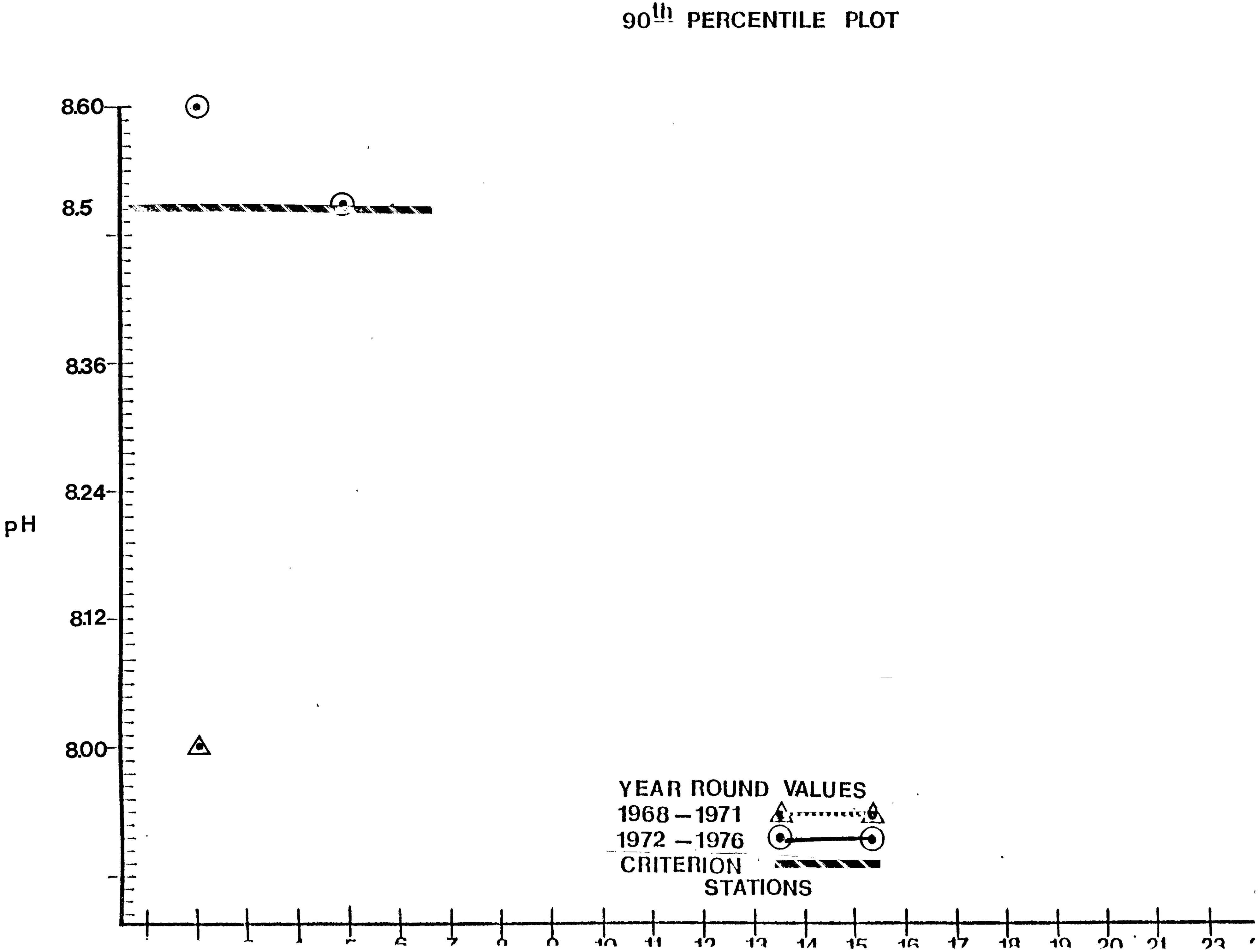

10th PERCENTILE PLOT
DISSOLVED OXYGEN PERCENT SATURATION
91.5
90.0
88.5
87.6
85.5
84.0
65.0
SUMMER VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19

Figure VI.B.4



90th PERCENTILE PLOT
pH
8.60
8.5
8.36
8.24
8.12
8.00
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS

Figure VI.B.5

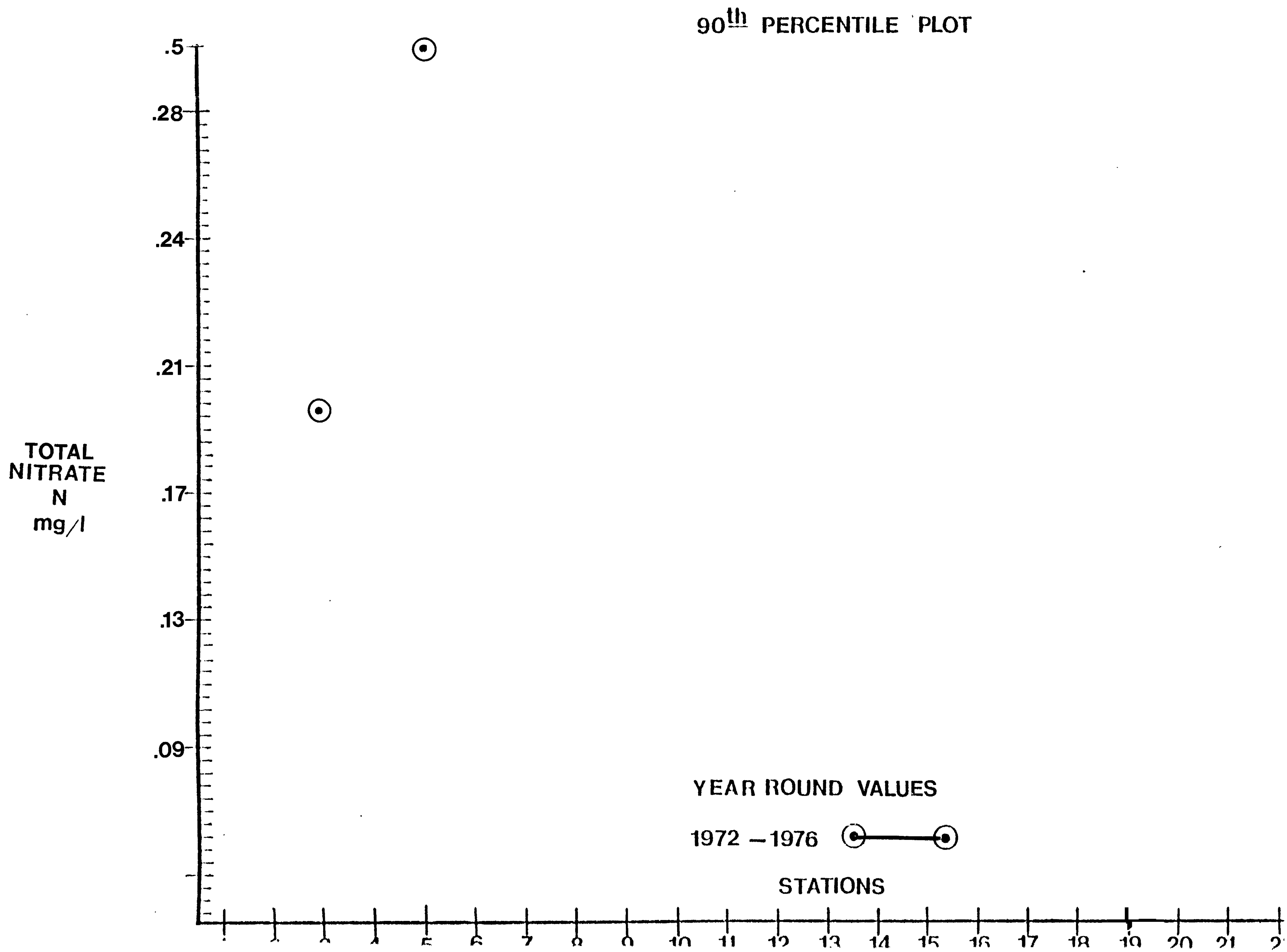

90th PERCENTILE PLOT
TOTAL NITRATE N mg/l
.5
.28
.24
.21
.17
.13
.09
YEAR ROUND VALUES
1972 – 1976
STATIONS
5
6
7
8
10
11
12
13
14
15
16
17
18
19
20
21

Figure VI.B.6

90$^{th}$ PERCENTILE PLOT

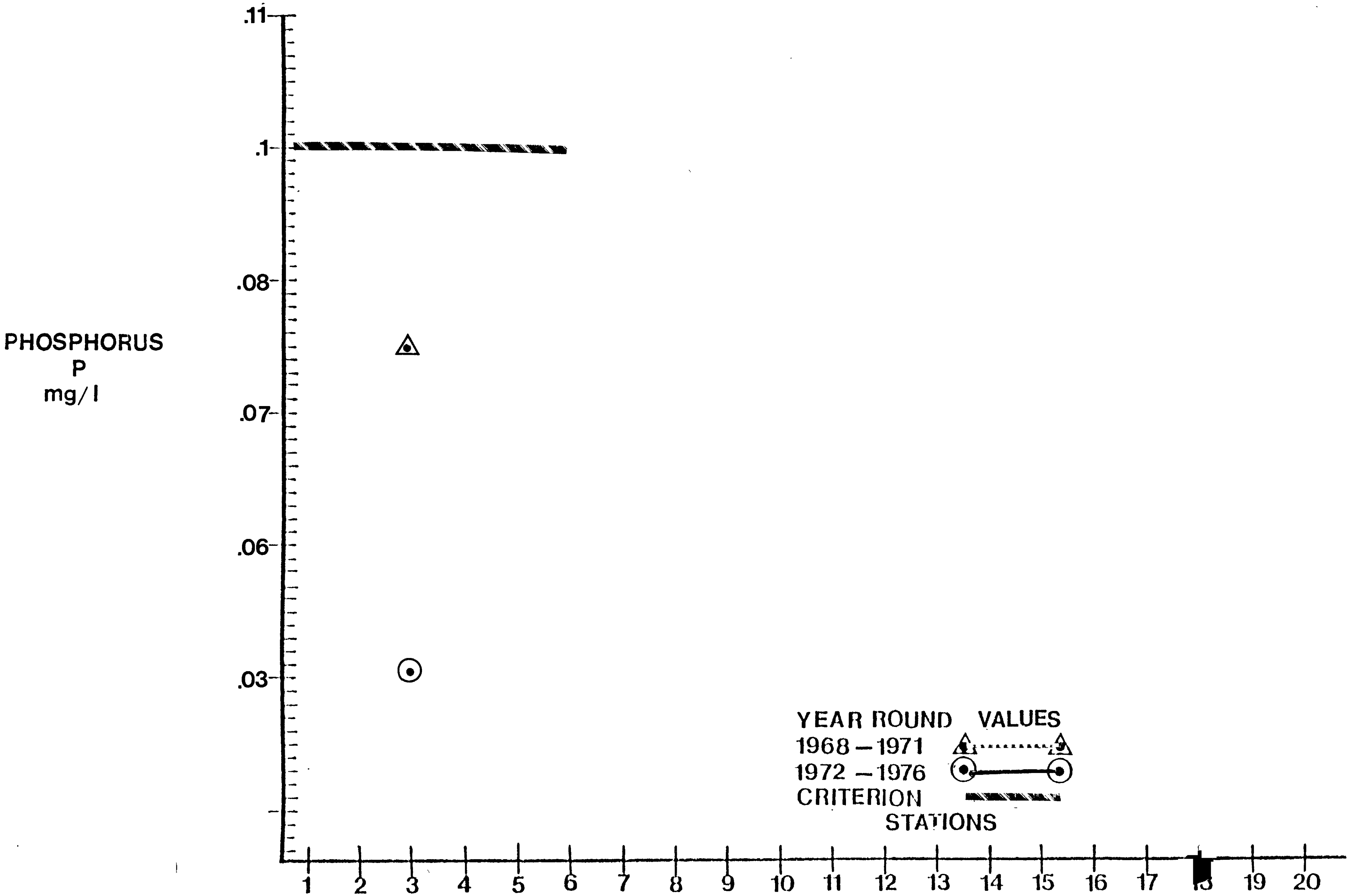


Figure VI.B.7

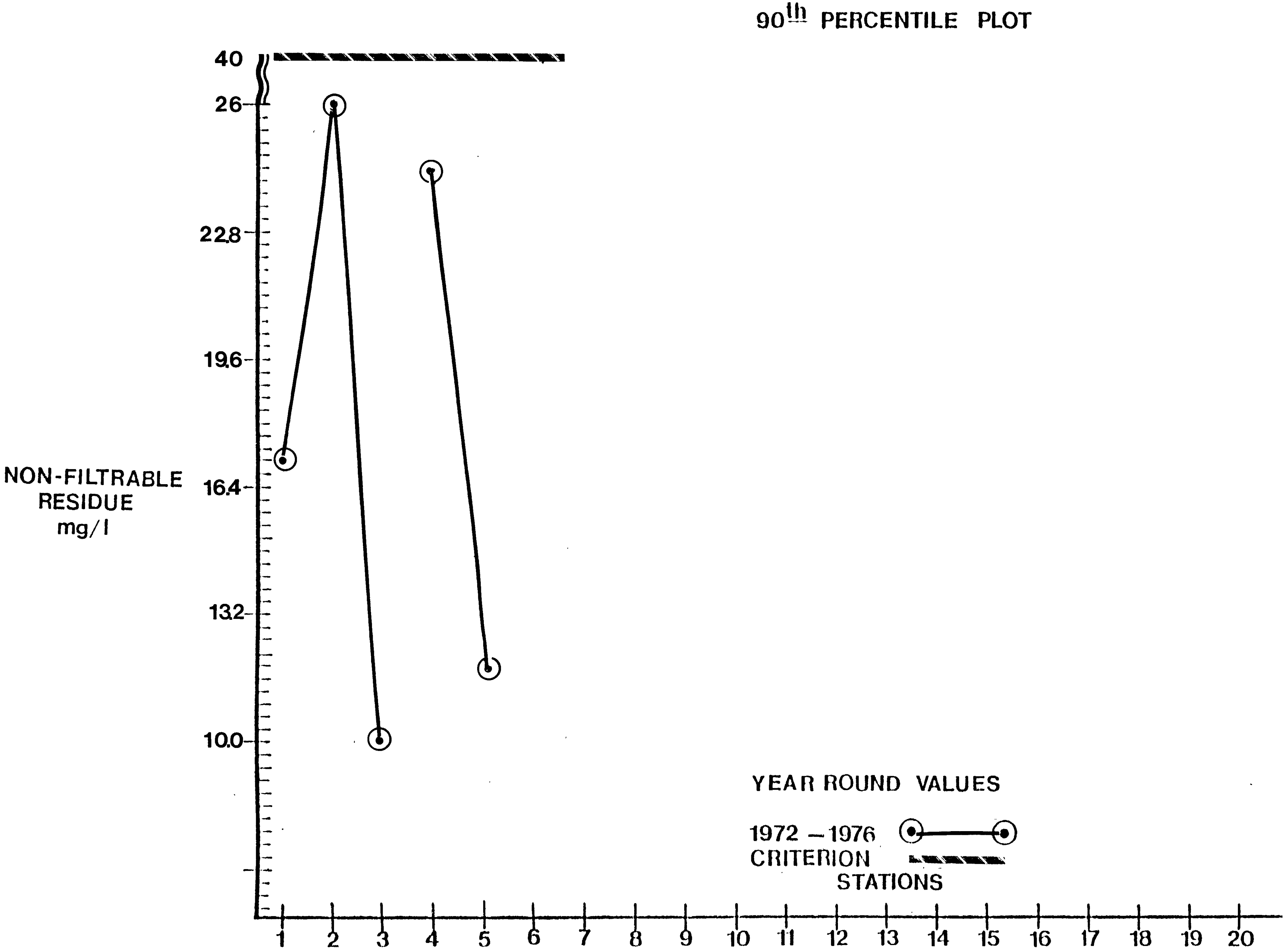
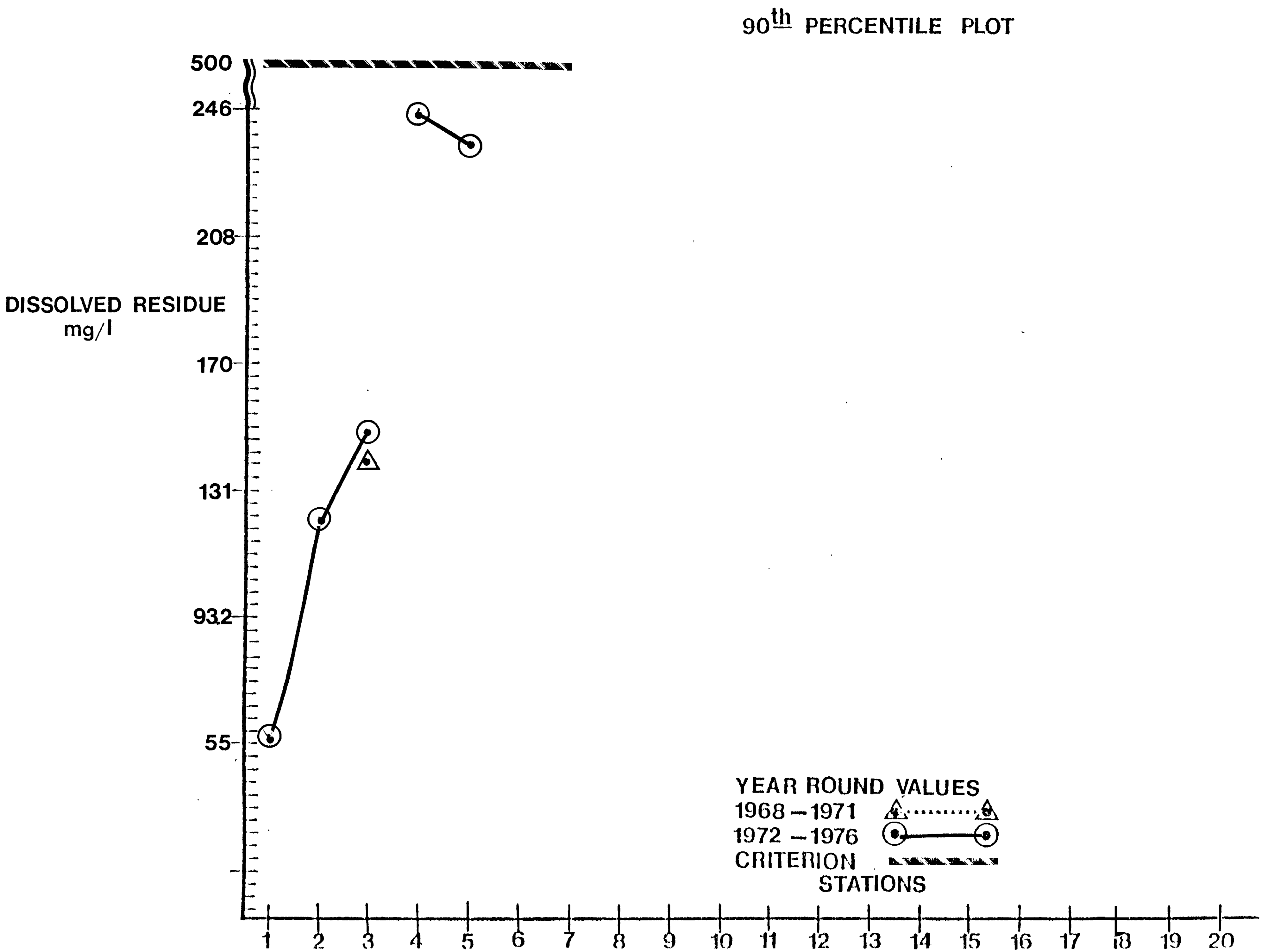
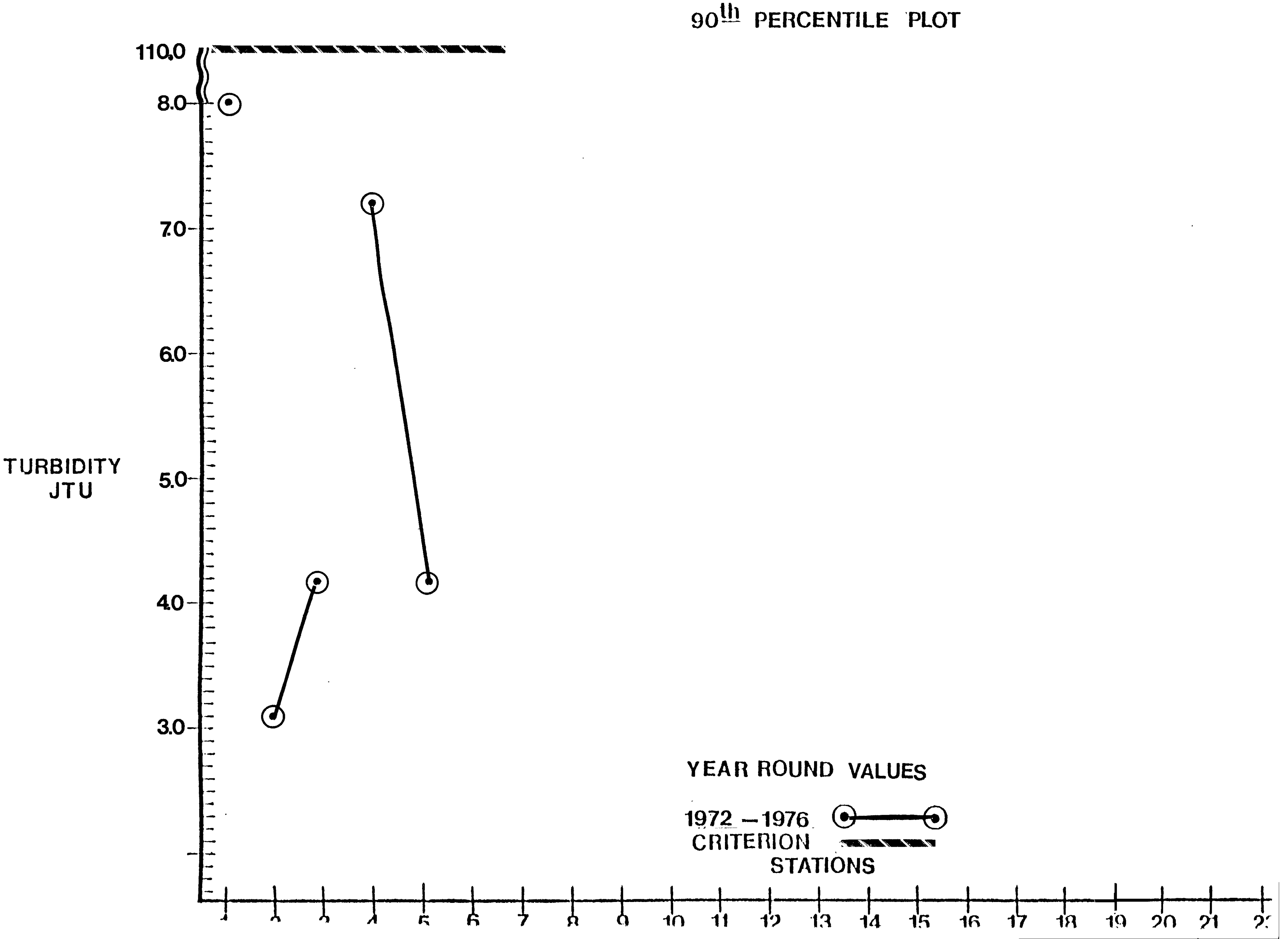

90th PERCENTILE PLOT
NON-FILTRABLE RESIDUE mg/l
40
26
22.8
19.6
16.4
13.2
10.0
YEAR ROUND VALUES
1972 – 1976
CRITERION
STATIONS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Figure VI.B.8



90th PERCENTILE PLOT
DISSOLVED RESIDUE
mg/l
500
246
208
170
131
93.2
55
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Figure VI.B.9


90th PERCENTILE PLOT
TURBIDITY JTU
110.0
8.0
7.0
6.0
5.0
4.0
3.0
YEAR ROUND VALUES
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22

## Table VI.B.1

DISCHARGER INVENTORY

Flatbrook River and Paulins Kill Segment

| MAP CODE | MUNICIPALITY | PLANT NAME | DEGREE OF TREATMENT | RECEIVING STREAM | AVG. (MDG) DAILY FLOW 1973 | 1974 | 1975 | 1976 | COMPLIANCE WITH 1977 REQUIREMENTS OF SECONDARY/BEST PRACTICABLE TREATMENT LIMITATIONS |
|---|---|---|---|---|---|---|---|---|---|
| A | Newton | Newton Municipal | Sec. | Paulins Kill | 1.0 | 1.00 | 1.400 | .90 | No |
| | Andover Township | Andover Nursing Home | Ter. | Trib. to Paulins Kill | 0.011 | 0.018 | .023 | .026 | Yes |
| | Blairstown | Blair Academy | Pri. | Blairs Creek to Paulins Kill | 0.03 | 0.02 | .013 | .015 | No |
| | Blairstown | N. Warren Reg. H.S. | Sec. | Paulins Kill | 0.003 | 0.04 | .0035 | .0035 | Yes |
| | [a]Stillwater Township | Northern Conference of Methodist Church | Sec. | Trib. to Swartswood Lake | .003 | .001 | - | - | - |
| | Hampton Township | Big N Plaza | Sec. | Trib. to Paulins Kill | 0.007 | 0.0075 | 0.007 | .008 | No |
| | Hampton Township | Regional High School | | Paulins Kill | - | - | 0.007 | .006 | Yes |
| | Hampton Township | Sussex Co. Civil Defense Unit | Sec. | Paulins Kill | 0.0004 | 0.0005 | 0.001 | .0006 | Yes |
| | Frankford Township | Sussex Co. Service Area | Sec. | Paulins Kill | 0.015 | 0.015 | 0.015 | 0.014 | Yes |
| | Lafayette | Schearing Corp. | Ter. | Paulins Kill | 0.014 | 0.015 | 0.016 | .016 | Yes |
| | Montague | Annandale Work Camp | Sec. | Flat Brook | 0.008 | 0.007 | 0.002 | .0015 | No |

## PEQUEST & MUSCONETCONG RIVERS

### BASIN DESCRIPTION

The Pequest & Musconetcong Rivers are major watersheds for Sussex, Warren and Hunterdon Counties. The counties are largely rural and support much recreational and agricultural activity; however, they are prime areas for future development.

The Pequest River is 32 miles long and has a watershed of 158 square miles. Orginating at Stickle Pond in Andover Township, the Pequest River is classified as FW-2 trout maintenance waters from its source to Tranquility Bridge and again from the Townsbury Bridge to the confluence with the Delaware River. The stream reach between the Tranquility and Townsbury Bridges is classified as FW-2 non-trout waters and receives point source discharges before flowing through Bear Swamp. The Primary area of development is along lower reaches with Belvidere being the most developed area within the watershed.

The Musconetcong River originates at Lake Hopatcong and flows 43 miles to its confluence with the Delaware River at Riegelsville. The River, which forms the boundary between the counties of Warren, Hunterdon, and Morris, is classified as FW-2 trout maintenance water for its entire length. Water supply, recreation, and scenic value make the Musconetcong one of the more important tributaries to the Delaware River.

The upper watershed is rugged mountainous terrain with shallow, fast flowing surface waters. As the Delaware River is approached, the land smoothes out somewhat, the water depth increases slightly and the velocity decreases. The major population centers in the watershed are Stanhope-Netcong and Hackettstown. Extensive industrial and residential growth is projected in the headwater areas, including Lakes Hopatcong and Musconetcong, the two major lakes within the watershed. These lakes presently are heavily developed residentially and offer a significant and highly utilized recreational areas. There are industrial and domestic point source discharges into the Musconetcong River watershed. The two major municipal dischargers are the Musconetcong Sewage Authority, which discharges into Wills Brook, and the Hackettstown MUA discharging directly into the Musconetcong River.

The primary industrial discharger is the Reigal Paper Company, which has three plants discharging into the Musconetcong River.

### WATER QUALITY ASSESSMENT

The surface waters within the Pequest and Musconetcong watersheds are of overall good quality and in conformance with the New Jersey Surface Water Quality Standards and the Fishable goals of the Act. Bacteriological sampling at the Pequest River at Pequest and the Musconetcong River at Bloomsbury yielded exceptionally high fecal coliform bacterial levels. Other, limited sampling programs have found elevated fecal coliform levels at nearly all stations on the Pequest and Musconetcong Rivers; however, the levels, even though exceeding standards, were much lower than those in the storet file. Dissolved oxygen levels are generally high and in compliance with the standards for trout waters. Low percent saturation is observed at several stations on Lake Hopatcong. The only five day biochemical oxygen demand data available from storet is for the Musconetcong River at Bloomsbury. This data indicates a low $BOD_5$, well within the criterion. Other limited $BOD_5$ sampling indicate that the $BOD_5$ are at natural favorable levels throughout the Pequest and Musconetcong watersheds. No storet data is available for pH within the Pequest watershed; however, the Pequest watershed appears to have natural, alkaline pH of about 8 due to the geology of the area. The pH within the Musconetcong watershed is also naturally alkaline ranging from approximately 7.8 to slightly over 8.5, the upper range of the criteria. Limited nutrient sampling indicates phosphorus levels to be well within the criterion with nitrate nitrogen present at natural concentrations. Phosphorus levels within the Musconetcong watershed are within or marginally exceed the criterion. Excessive concentrations may be locally encountered downstream of the point source discharges. Phosphorus standards however have been exceeded in Waterloo and Saxton Lakes. Nitrate nitrogen levels are low at all stations except at the Musconetcong River near Bloomsbury, and slightly elevated levels presisting downstream to the confluence with the Delaware River. Turbidity, dissolved residue (total dissolved solids), and non-filterable residue (suspended solids) conformed with the criteria at all stations within the segment, with the exception of non-filtrable residue at the Pequest River at Pequest.

PROBLEM ASSESSMENT

Water pollution problems in this segment are derived primarily from non-point sources due to the heavy agricultural activity throughout the watersheds. The excessive fecal coliform levels are attributed mainly to agricultural runoff, with some contribution from malfunctioning septic systems, such as in Oxford Township. Surface waters within the Pequest watershed traverse organic soils, swamps, farmland and forests, plus receive point source discharges; all of which contribute organic loading. Rooted aquatic plants are present along several reaches of the Pequest River. Industrial discharges may periodically contribute to elevated oxygen demands; however, these demands should be fulfilled without jeopardizing the aquatic biota due to stream flow characteristics and excellent assimilative capacity of both rivers. Excessive nutrient concentrations, particularly of phosphorus, in point source discharges above Waterloo and Saxton Lakes are responsible for the widespread undesirable aquatic weed growth in the lakes.

The Riegal paper plant industrial discharges, approximately 3.3 miles from the mouth of the Musconetcong River, at times cause water discoloration and a heavy deposition of fiberous paper particles on the stream substrate; thus greatly altering and reducing the natural aquatic biota in this reach.

Lakes Musconetcong and Hopatcong are heavily impacted by septic systems and storm water runoff. This has caused excessive bacteria levels, siltation, and undesirable aquatic plant growth.

## GOAL ASSESSMENT AND RECOMMENDATIONS

Major pollutional impact will continue to be from non-point sources. Fecal coliform levels contributed by agricultural runoff may be reduced through future land use planning and improved agricultural practices. However, water quality will not meet the swimmable goals by 1983 throughout most of the segment, but does presently conform with the trout water classification standards and the fishable goals of the Act. Since future population growth is anticipated in already sensitive areas, further consideration should be given to developing a regional wastewater management plan. Upgrading of existing sewage treatment plants should include phosphorus removal for those plants discharging upstream of lakes. This would curb undesirable aquatic plant activity and decrease the rate of eutrophication. Effluent limitation for discharges into waters classified for trout or potable water supplies should include provisions to restrict the amount of total residual chlorine in the wastewater. Instream water quality criterion will be proposed for inclusion in the state standards for residual chlorine in water designated as suitable for potable supply or trout production or maintenance.

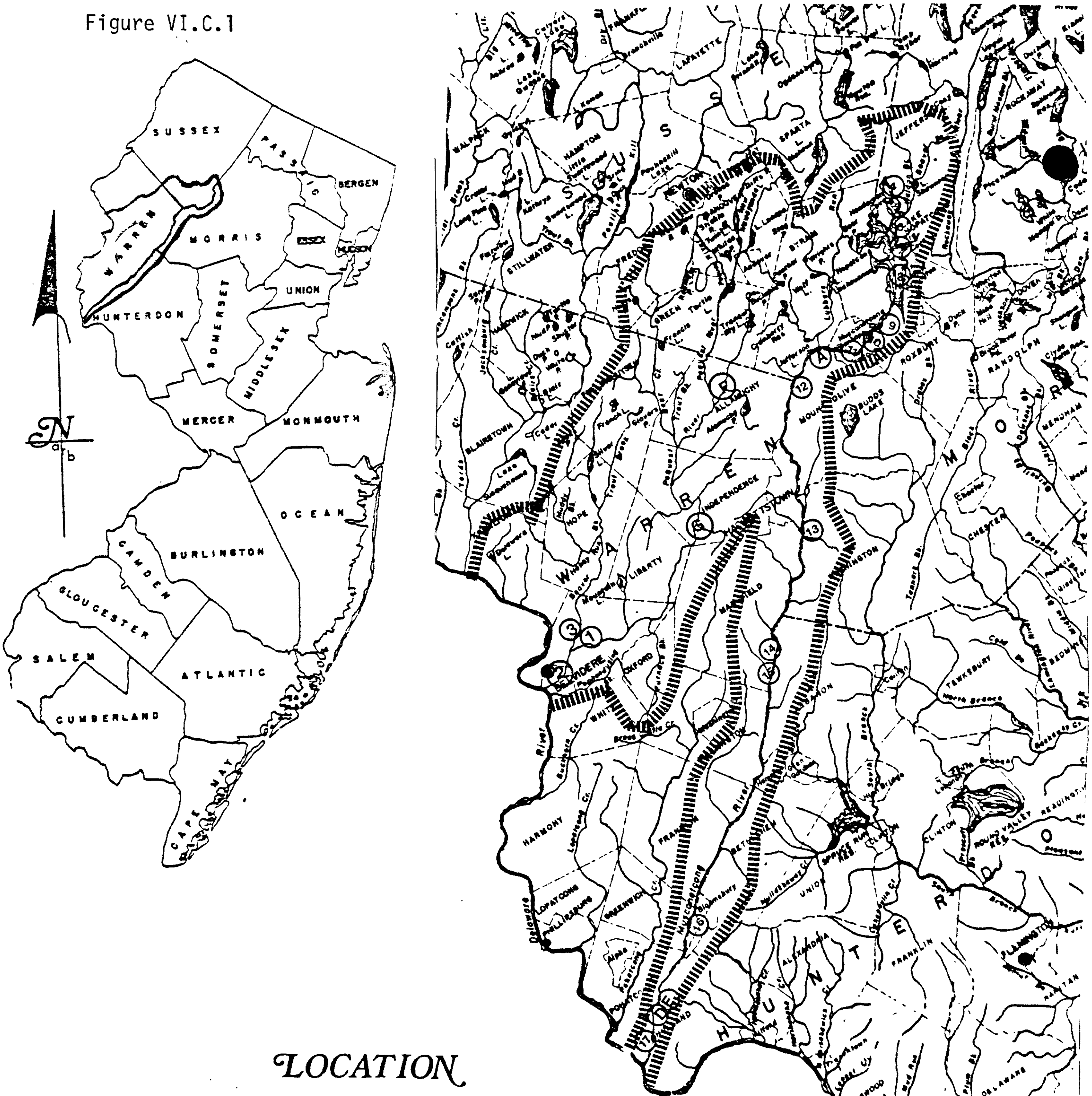
Due to the lack of data within the Pequest watershed, a monitoring program for chemical, bacteriological, and biological parameters should be instituted.

Sanitary surveys should be conducted in areas on septic systems with corrective action mandated for malfunctioning systems. Use of sediment traps or other forms of stormwater runoff diversion should be investigated in the Hopatcong-Musconetcong Lakes areas. These actions should improve water quality and result in compliance with swimmable goals within the lakes.

# STATION LIST

| Station No. | Location |
|---|---|
| 1 | Pequest River at Pequest |
| 2 | Pequest River at Belvidere |
| 3 | Beaver Brook near Belvidere |
| 4 | Lake Hopatcong, Henderson Cove |
| 5 | Lake Hopatcong, Waldon Brook |
| 6 | Lake Hopatcong, East Shore approximately mid Lake |
| 7 | Lake Hopatcong, Big Cove |
| 8 | Lake Hopatcong, Mount Arlington |
| 9 | Lake Musconetcong, near Inlet |
| 10 | Lake Musconetcong, at outlet |
| 11 | Lake Musconetcong, Netcong |
| 12 | Musconetcong River, downstream of confluence with Lubbers Run |
| 13 | Musconetcong River at Lockwood |
| 14 | Musconetcong River at Stephens |
| 15 | Musconetcong River at Beatyestown |
| 16 | Musconetcong River at Hampton |
| 17 | Musconetcong River at Bloomsbury |
| 18 | Musconetcong River at Riegelsville |

Figure VI.C.1

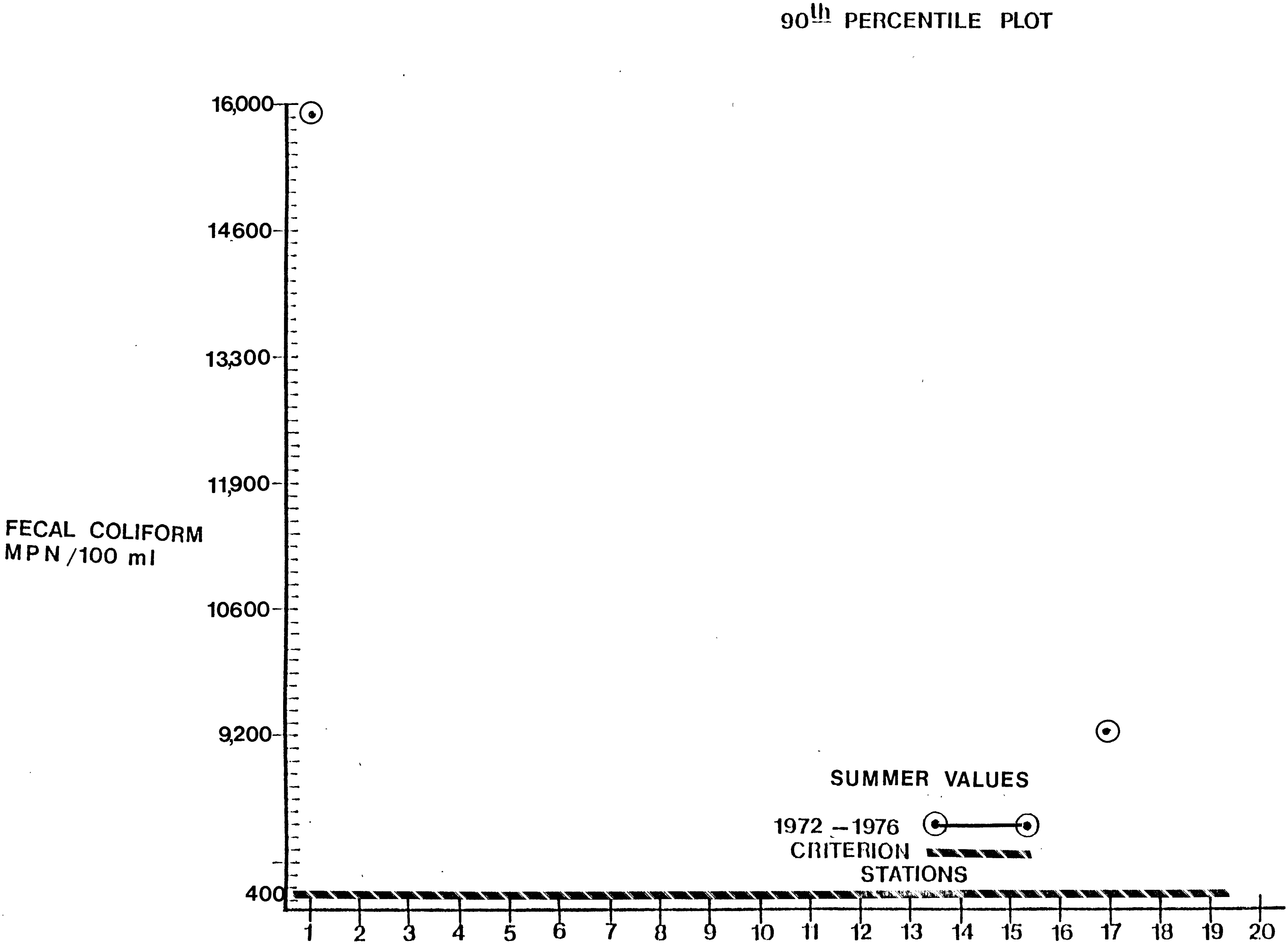



# LOCATION
# MUSCONETCONG & PEQUEST RIVERS

## LEGEND

| | |
|---|---|
| Point Source | (A) (B) (C) (D) (E) |
| Monitoring Site | (1) (2) (3) (4) (5) |
| Drainage Basin Boundaries | IIIIIIIIIIIIIIIIIIIIIIIIIIII |
| County Bounderies | ▪ ▬▬ ▬ ▬▬ ▬ ▬ |
| Municipal Bounderies | ▬▬▬▬▬▬▬▬▬▬ |

Figure VI.C.2



90th PERCENTILE PLOT
FECAL COLIFORM
MPN /100 ml
16,000
14600
13,300
11,900
10600
9,200
400
SUMMER VALUES
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Figure VI.C.3

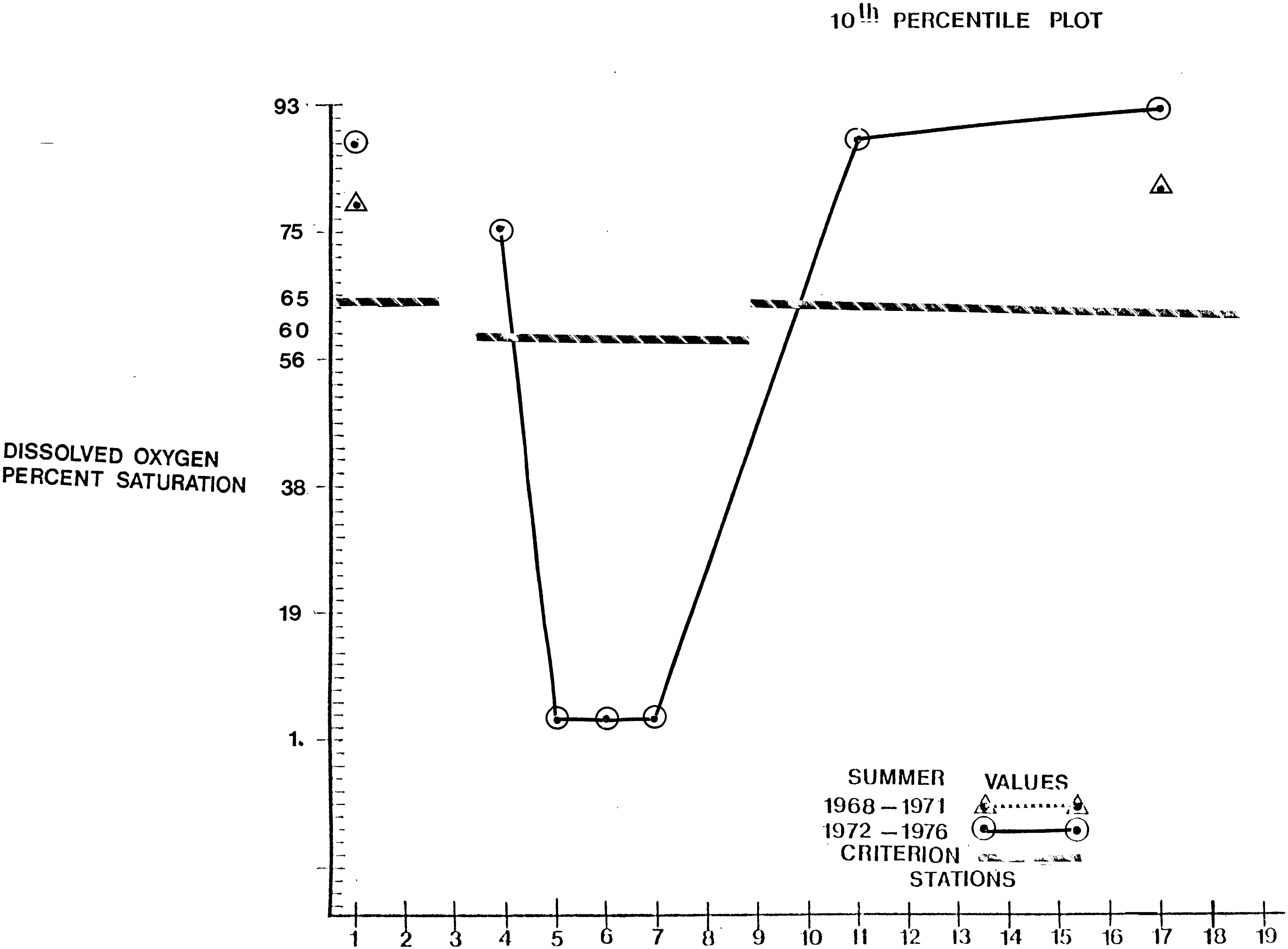

10th PERCENTILE PLOT
DISSOLVED OXYGEN
PERCENT SATURATION
93
75
65
60
56
38
19
1.
SUMMER VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19

Figure VI.C.4

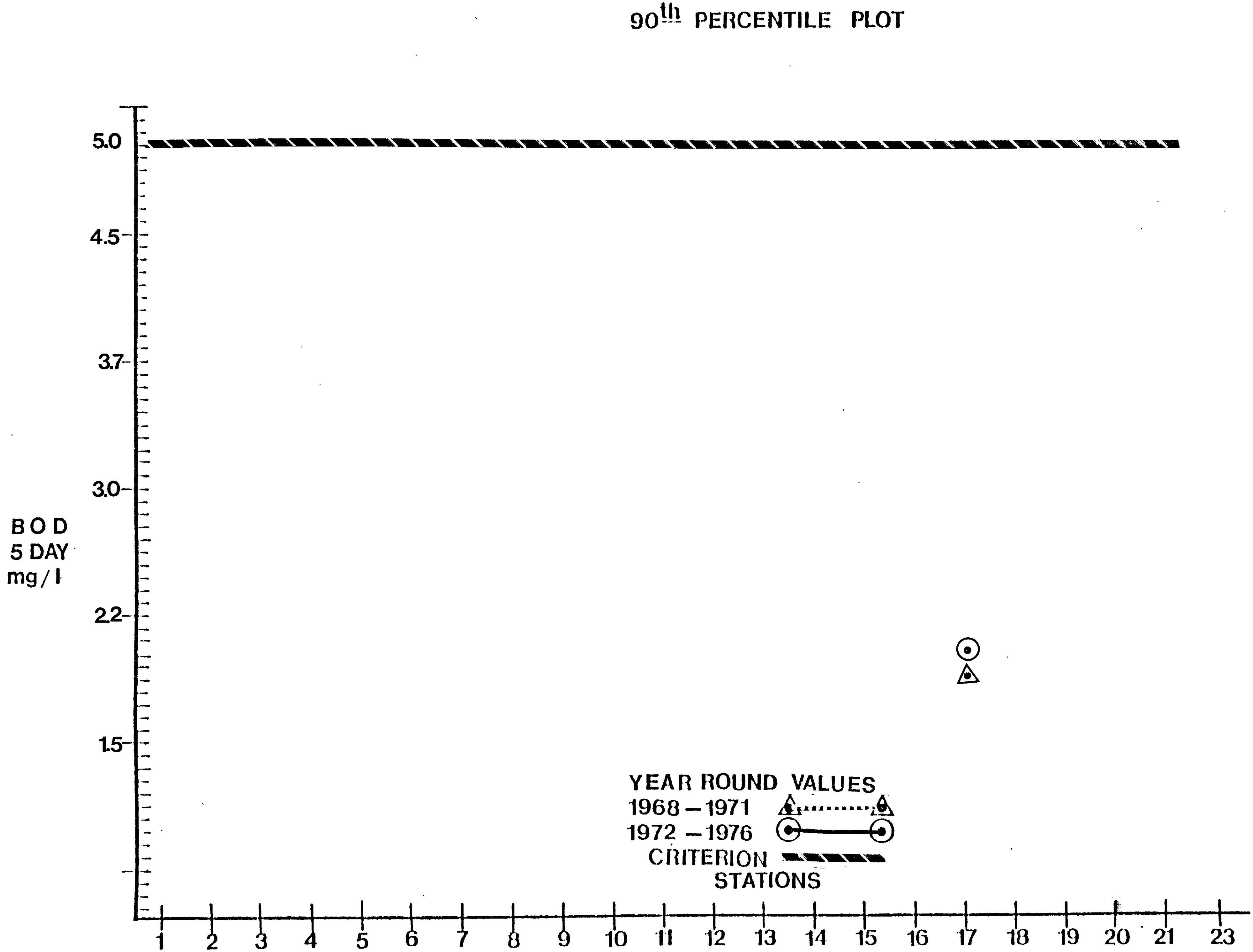

90th PERCENTILE PLOT
5.0
4.5
3.7
3.0
2.2
1.5
BOD
5 DAY
mg/l
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
23

Figure VI.C.5

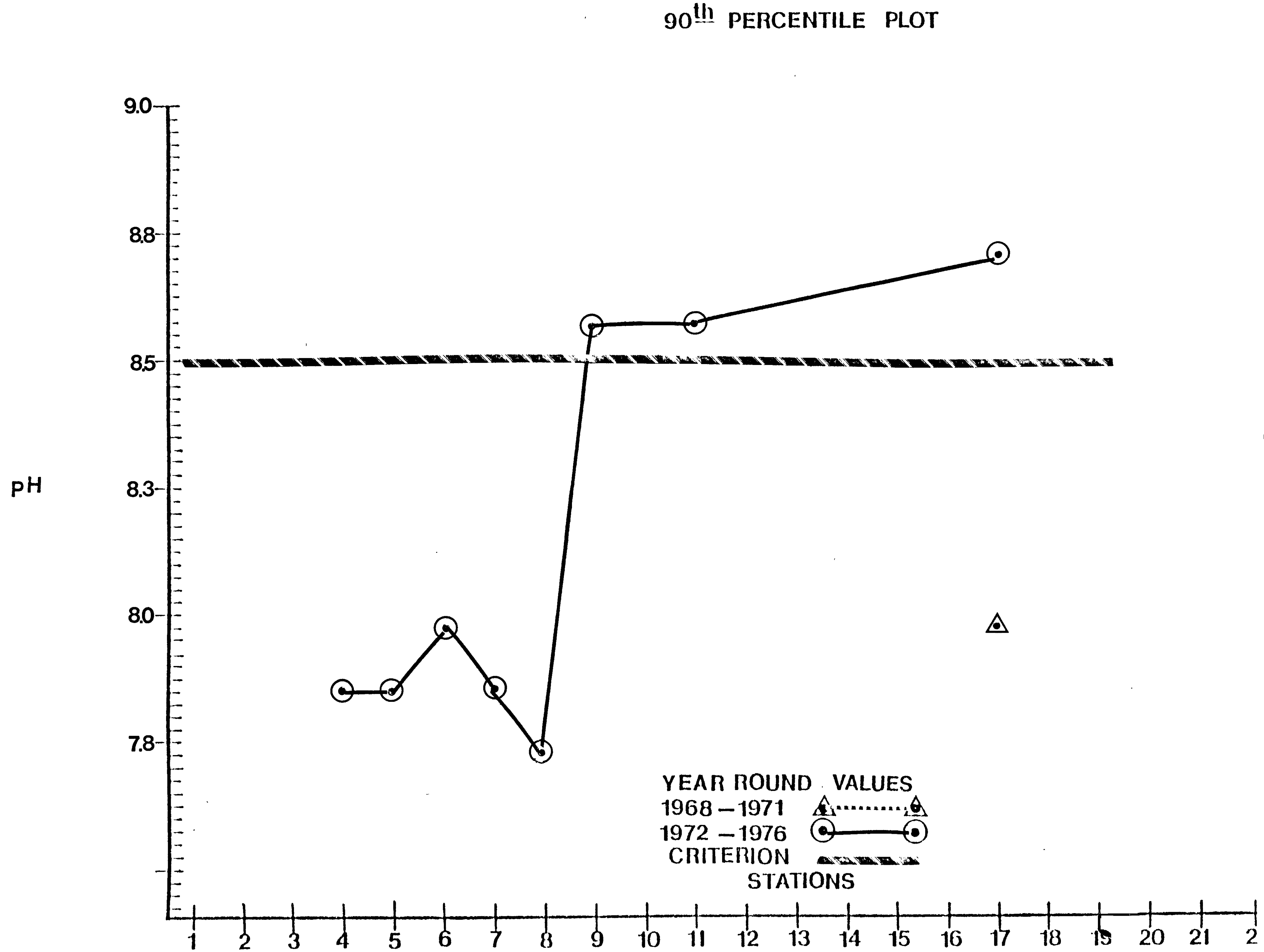
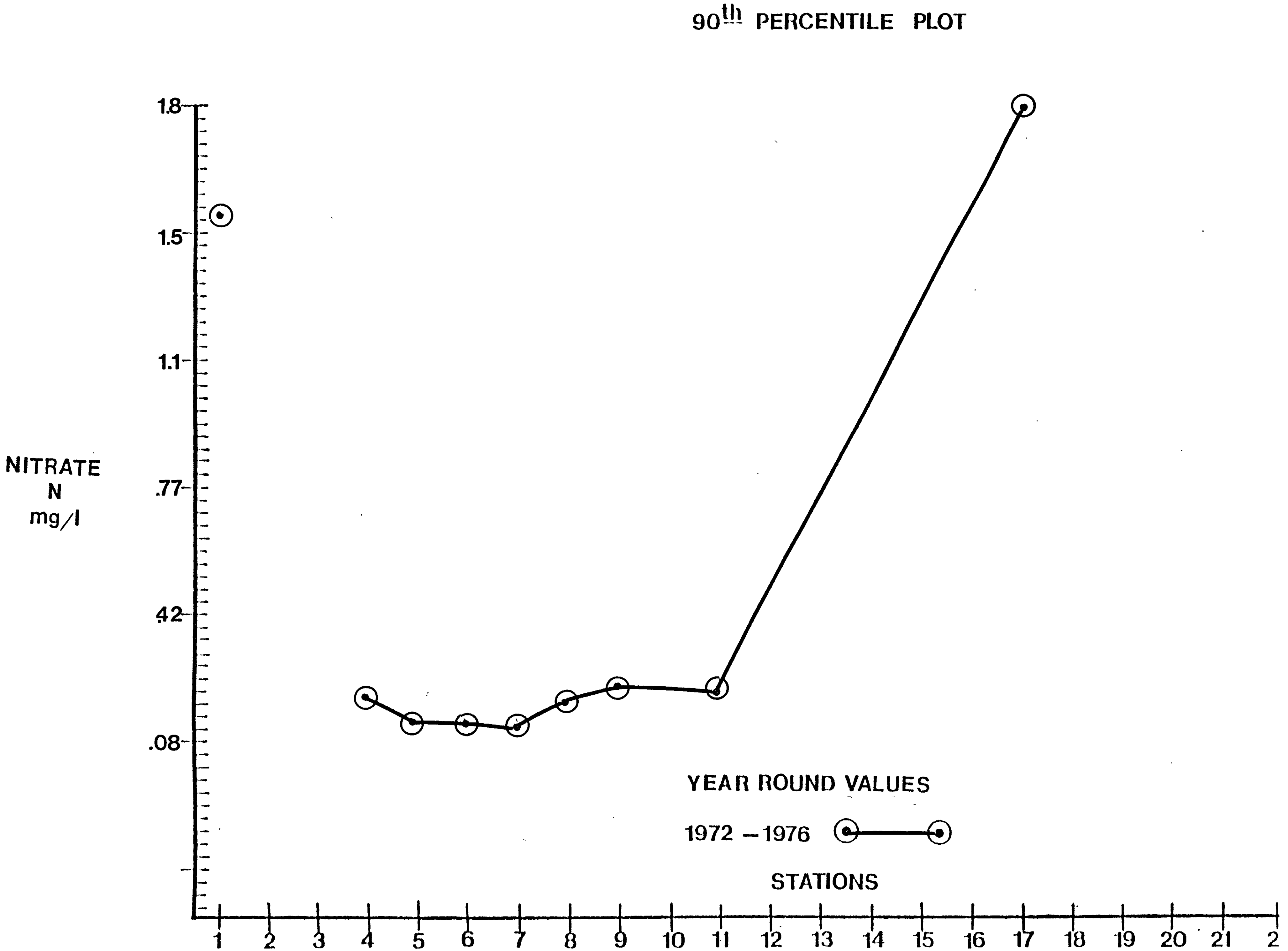
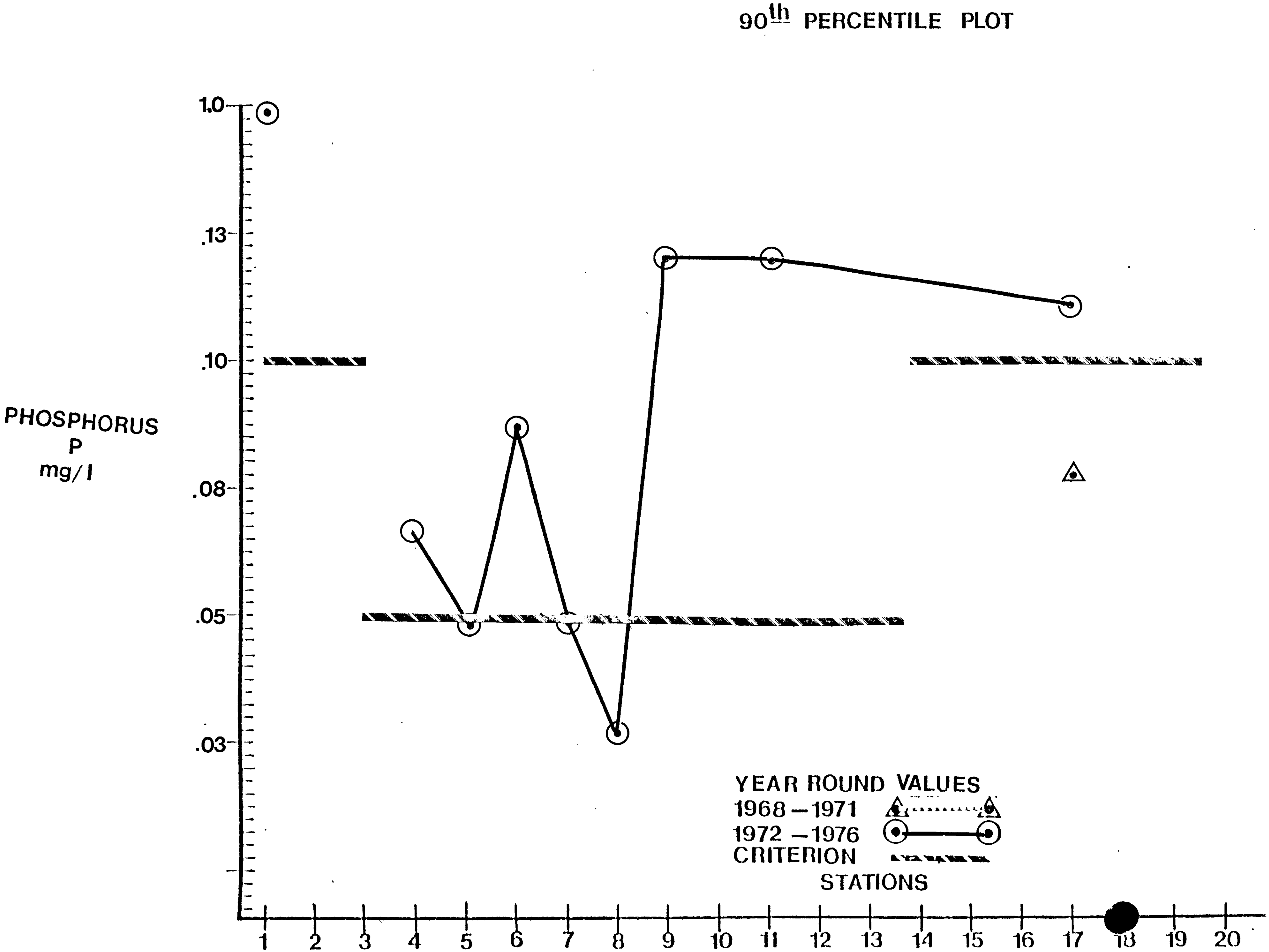

90th PERCENTILE PLOT
pH
9.0
8.8
8.5
8.3
8.0
7.8
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21

Figure VI.C.6



90th PERCENTILE PLOT
NITRATE
N
mg/l
1.8
1.5
1.1
.77
.42
.08
YEAR ROUND VALUES
1972 – 1976
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
2

Figure VI.C.7



90th PERCENTILE PLOT
PHOSPHORUS
P
mg/l
1.0
.13
.10
.08
.05
.03
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Figure VI.C.8

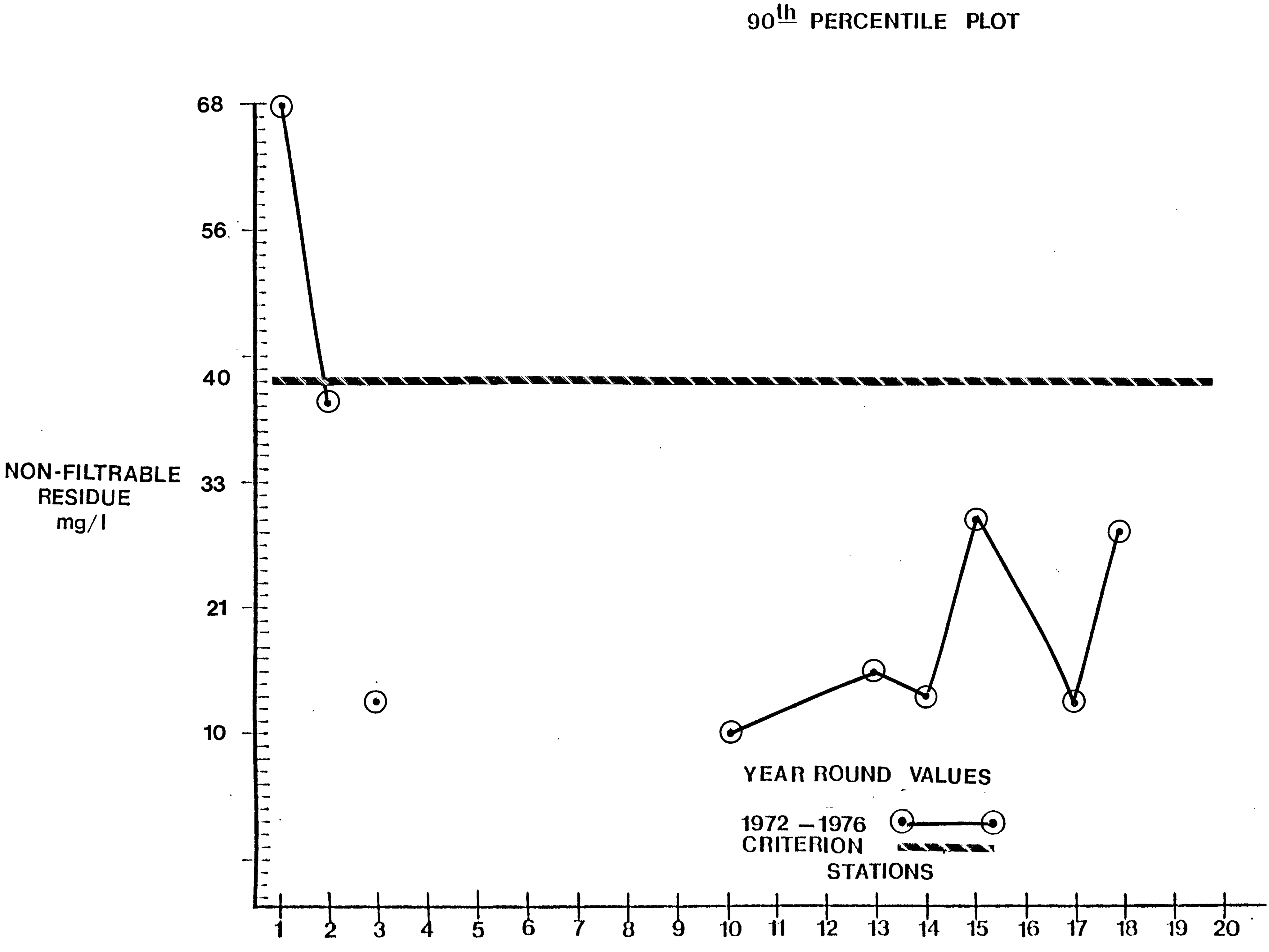

90th PERCENTILE PLOT
68
56
40
33
21
10
NON-FILTRABLE
RESIDUE
mg/l
YEAR ROUND VALUES
1972 –1976
CRITERION
STATIONS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Figure VI.C.9

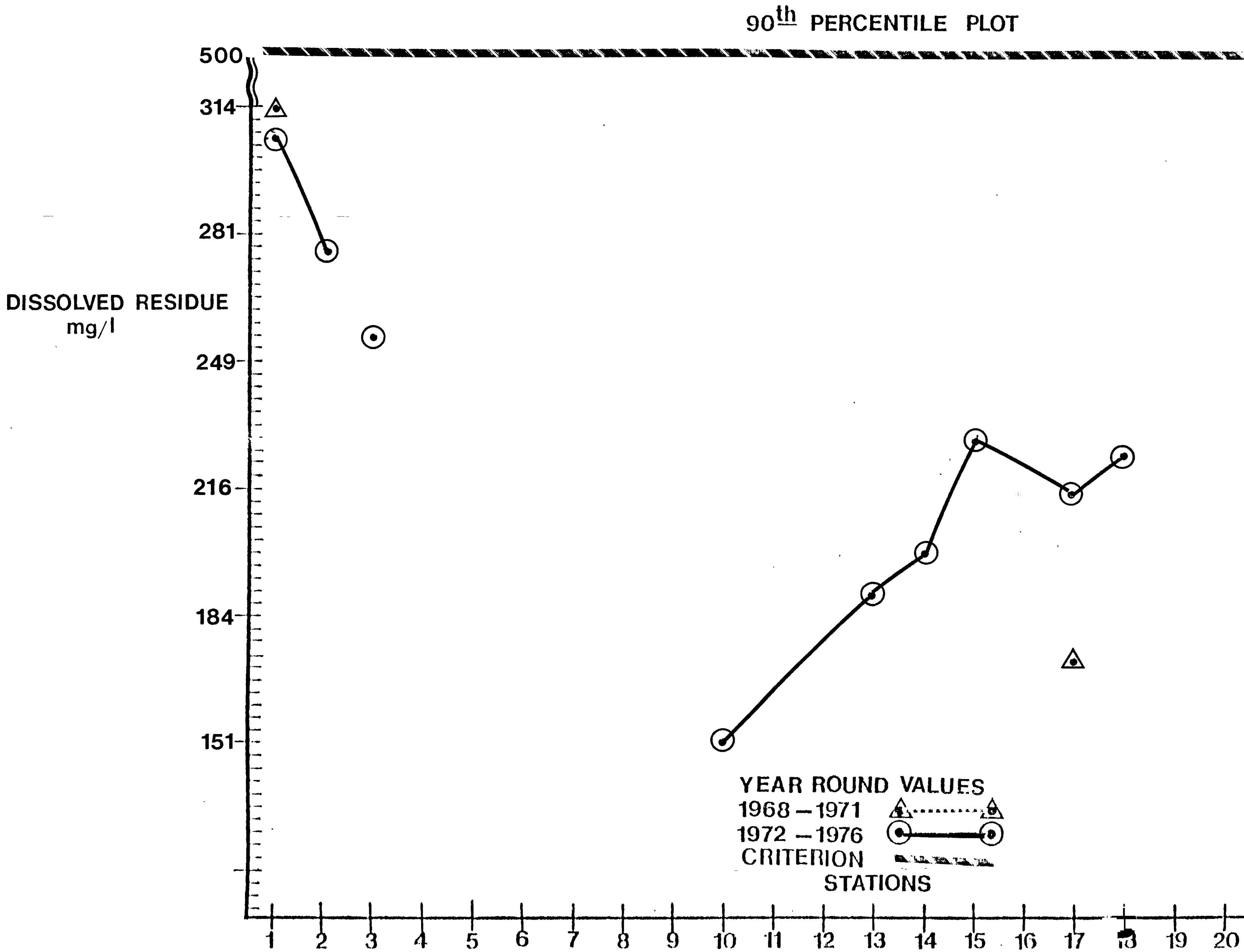
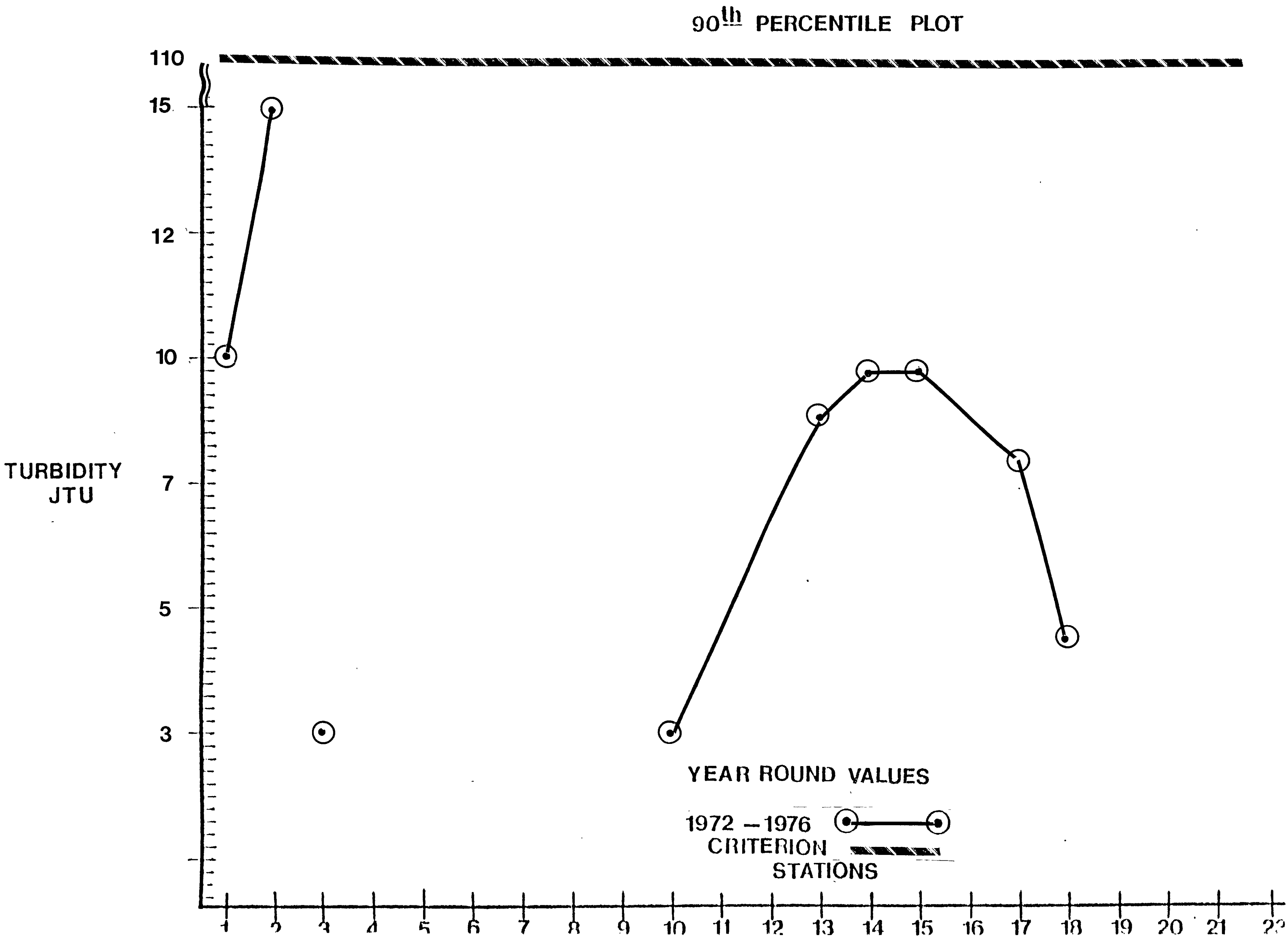

90th PERCENTILE PLOT
500
314
281
249
216
184
151
DISSOLVED RESIDUE
mg/l
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Figure VI.C.10



## Table VI.C.1

DISCHARGER INVENTORY

Pequest and Musconetcong Rivers Segment

| MAP CODE | MUNICIPALITY | PLANT NAME | DEGREE OF TREATMENT | RECEIVING STREAM | AVG. (MGD) DAILY FLOW 1973 | 1974 | 1975 | 1976 | COMPLIANCE WITH 1977 REQUIREMENTS OF SECONDARY/BEST PRACTICABLE TREATMENT LIMITATIONS |
|---|---|---|---|---|---|---|---|---|---|
| A | Mt. Olive Township | Musconetcong S.A. | Sec. | Musconetcong River | 0.45 | 0.50 | 0.680 | .70 | Yes |
| B | Washington Township | Hackettstown MUA | Ter. | Musconetcong River | 0.43 | 0.75 | 1.000 | .90 | Yes |
| C | Washington Borough | Washington Boro Mun. | Ter. | Musconetcong River | 0.67 | 0.70 | 0.800 | .75 | Yes |
| D | Holland Township | Riegel Paper Co. Warren Glen | Ind. | Musconetcong River | 2.10 | 2.20 | 2.50 | 2.0 | Yes |
| E | Holland Township | Riegel Paper Co. Hugesville | Ind. | Musconetcong River | 0.350 | 0.350 | 0.350 | .35 | Yes |
| F | Allamuchy Township | Pequest Sewer Co. | Ter. | Pequest River | 0.1 | 0.1 | 0.140 | .160 | Yes |
| G | Independence Twp. | Ashland Chemical Corp. | Ind. | Trib. to Pequest River | 0.14 | 0.14 | 0.140 | .20 | No |
| H | Oxford | Oxford Textile Co. | Sec. & In. | Furnace Brook | 0.800 | 0.800 | 0.700 | 0.7 | No |
| I | Phillipsburg | Phillipsburg Municipal | Sec. | Lopatcong | 2.3 | 2.3 | 2.300 | 2.3 | No |

## Table VI.C.1

DISCHARGER INVENTORY
Delaware River Tributaries Zone 1
Pequest and Musconetcong Rivers Segment (Cont'd)

| MAP CODE | MUNICIPALITY | PLANT NAME | DEGREE OF TREATMENT | RECEIVING STREAM | AVG. (MGD) DAILY FLOW 1973 | 1974 | 1975 | 1976 | COMPLIANCE WITH 1977 REQUIREMENTS OF SECONDARY/BEST PRACTICABLE TREATMENT LIMITATIONS |
|---|---|---|---|---|---|---|---|---|---|
| | Andover Township | St. Paul's Abbey | Ter. | Trib. Pequest River | 0.003 | 0.002 | .003 | .002 | Yes |
| | Belvidere | Warren Co. Court House | Sec. | Pequest River | 0.0015 | 0.0015 | .0015 | .0015 | Yes |
| | Andover Township | Board of Education | Ter. | Trib. to Musconetcong River | 0.002 | 0.003 | .003 | .003 | Yes |
| | Bloomsbury Township | 76 Auto & Truck Stop | Ter. | Musconetcong River | .010 | .015 | .017 | .015 | Yes |
| | Byram Township | Byran Twp. Board of Ed. Intermediate School | Sec. | Trib. to Musconetcong River | 0.004 | 0.004 | .004 | .003 | Yes |
| | Jefferson Township | Arthur Stanlick School | Sec. | Trib. to Lake Hopatcong | 0.014 | 0.014 | 0.005 | .005 | Yes |
| | Jefferson Township | Consolidated School | Sec. | Trib. to Lake Hopatcong | 0.002 | 0.002 | 0.002 | .005 | Yes |
| | Mansfield Township | Diamond Hill Estates | Ter. | Trib. to Musconetcong River | 0.065 | 0.065 | 0.090 | .100 | Yes |
| | Mt. Arlington | Our Lady of the Lake School | Ter. | Lake Hopatcong | 0.001 | 0.001 | 0.001 | .001 | Yes |
| | Mt. Arlington | Mt. Arlington Knolls | Ter. | Trib. to Lake Hopatcong | 0.02 | 0.02 | 0.023 | .020 | Yes |
| | Oxford | Oxwall Products | Sec. & In. | Furnace Brook | 0.002 | 0.011 | 0.011 | .007 | No |

# POHATCONG AND LOPATCONG CREEKS

## BASIN DESCRIPTION

The Pohatcong and Lopatcong Creeks are located entirely within Warren County and flow in a southwesterly direction to the Delaware River.

The Pohatcong Creek has a length of 28 miles with a watershed encompassing 56 square miles, while the Lopatcong Creek is 10 miles long with a drainage area of 14.2 square miles. The major urban centers in the segment are Phillipsburg and Alpha, near the mouth of the Lopatcong Creek and Washington Borough on the Pohatcong Creek.

Originating in the Pohatcong mountain range, the Pohatcong Creek flows through the heavily farmed Pohatcong Valley. The largest wastewater discharge in the watershed is the Washington Borough Sewage Treatment Plant on the Shabbaconk Creek. Several lesser discharges are also located within the watershed. The Lopatcong Creek watershed consists primarily of rural, agricultural land, with the exception of the urban development from U.S. Route 22 to the Delaware River. The Phillipsburg Sewage Treatment Plant discharges into the Lopatcong Creek near its confluence with the Delaware River. The entire length of the Pohatcong Creek and the Lopatcong Creek, from its source downstream to Route 22, are designated as FW-2 trout production or maintenance waters.

## WATER QUALITY ASSESSMENT

Water quality data is not available from STORET for the surface waters within this segment. However, an indication of the water quality of the Pohatcong and Lopatcong Creeks is available from the Delaware River Basin Water Quality Study cooperatively conducted during the Summer of 1974 by the Pennsylvania Department of Environment Resources, the New Jersey Department of Environmental Protection and the U.S. Environmental Protection Agency.

Overall, the water quality in both the Pohatcong and Lopatcong Creeks is high and meets the fishable goals set forth in the Act (P.L. 92-500); but precludes the swimmable goals due to excessive fecal coliform levels. Apparent contravention of the fecal coliform standard occurred at all stations on both waterways with the exception of the two most upstream stations on the Pohatcong Creek. Moderate to high fecal contamination from human sources was indicated at the Pohatcong Creek downstream stations. Extremely high bacterial levels were observed near the mouth of the Lopatcong Creek downstream of the Phillipsburg Sewage Treatment Plant discharge. Dissolved oxygen concentrations were high and favorable at all stations within the segment. Five day biochemical oxygen demand met the criterion at all stations, however, elevated levels as compared to background levels were recorded locally downstream of the Phillipsburg and Washington Borough sewage treatment plants. The criterion for pH was met at all stations. Phosphorus levels exceeded the criterion only at the stations immediately downstream of the above mentioned sewage treatment plant discharges. Elevated nitrate-nitrogen concentrations were also present downstream of the Phillipsburg STP and the Washington Borough STP. The levels remained elevated on the Pohatcong Creek to its confluence with the Delaware River. The criteria for turbidity, dissolved residue (total dissolved solids) and non-filterable residue (suspended solids) was met at all stations with the exception of the Lopatcong Creek downstream of the Phillipsburg STP discharge where the criteria for all three parameters were excessively exceeded.

## PROBLEM ASSESSMENT

Based on the cooperative study, the segment exhibited generally good water quality with some organic enrichment of Pohatcong Creek occurring primarily from agricultural activities. The elevated fecal coliform levels are attributed to non-point source agricultural runoff.

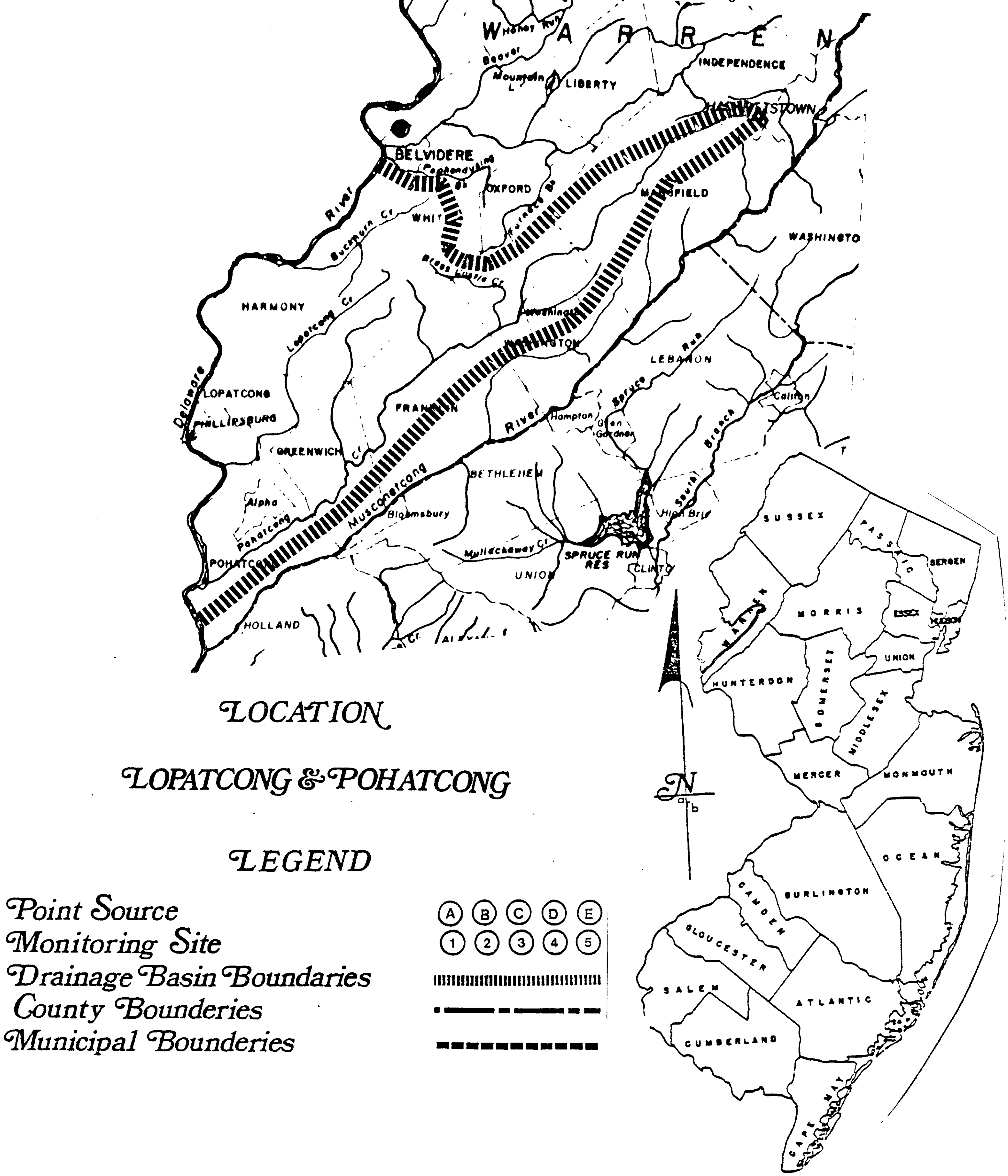
Slight degradation caused by the Washington Borough STP discharge is evident on the Pohatcong Creek. The Phillipsburg STP discharge severely impacts the downstream - most reaches of the Lopatcong Creek. Water quality is significantly degraded, with the aquatic biota deleteriously altered as compared to upstream stations.

## GOAL ASSESSMENT & RECOMMENDATIONS

The surface waters in this segment conform with fishable goals, however swimmable goals will not be met until feasible control technologies are developed for agricultural runoff. Conscientious land use planning and management for future development and improved agricultural practices can maintain or improve the existing water quality. Due to the paucity of data available for this segment, a continuing intensive chemical and biological monitoring program should be initiated. Upgrading of the Washington Borough STP to include dechlorination and possibly some degree of phosphorus removal would be desirable.

The Phillipsburg STP should be upgraded and the possibility of relocating the discharge into the Delaware River should be explored in order to alleviate the undesirable water quality situation and restore natural aquatic community structure in the lower reaches of the Lopatcong Creek.

Figure VI.D.1


W A R R E N
INDEPENDENCE
LIBERTY
HACKETTSTOWN
BELVIDERE
OXFORD
MANSFIELD
WASHINGTON
HARMONY
LOPATCONG
PHILLIPSBURG
GREENWICH
FRANKLIN
LEBANON
BETHLEHEM
Bloomsbury
Alpha
POHATCONG
HOLLAND
UNION
Hampton
Glen Gardner
Califon
SPRUCE RUN RES
Delaware River
Musconetcong River
Lopatcong Cr
Pohatcong
Mulhockaway Cr
Spruce Run
Beaver
SUSSEX
PASSAIC
BERGEN
MORRIS
ESSEX
HUDSON
WARREN
UNION
HUNTERDON
SOMERSET
MIDDLESEX
MERCER
MONMOUTH
OCEAN
BURLINGTON
CAMDEN
GLOUCESTER
SALEM
ATLANTIC
CUMBERLAND
CAPE MAY
N
LOCATION
LOPATCONG & POHATCONG
LEGEND
Point Source
Monitoring Site
Drainage Basin Boundaries
County Bounderies
Municipal Bounderies
A B C D E
1 2 3 4 5

DELAWARE TRIBUTARIES - HUNTERDON COUNTY

## BASIN DESCRIPTION

The tributaries to the Delaware River all originate in western Hunterdon County and flow in a southwesterly direction through a predominately rural and agricultural region that is an attractive area for future residential development. These are small watersheds with maximum stream reaches less than fifteen miles. The Wickecheoke Creek, although considered a tributary of the Delaware River, actually discharges into the D&R Canal.

## WATER QUALITY ASSESSMENT

Although the general water quality is good, fecal coliform bacteria values indicate possible major problems in three of the watersheds: the Wickecheoke, Swan and Moore Creeks. Average summer dissolved oxygen levels are generally good, although the values recorded for the Wickecheoke and Alexauken Creeks indicate dissolved oxygen levels below the criterion. Five day biochemical oxygen demand levels are also generally satisfactory with the exception of Wickecheoke Creek which contained an excessive biochemical oxygen demand. All streams have highly alkaline pH valves with the Locatong and Wickecheoke having values well above the criterion level. Turbidity, dissolved residue (total dissolved solids) and non-filtrable residue (suspended solids) values are generally all below criteria levels with only Nishisakawick Creek having dissolved residue and non-filtrable residue values above the criteria.

## PROBLEM ASSESSMENT

All these streams flow through a rural region and receive non-point source pollutants primarily from agricultural runoff and septic systems. With continued agricultural land use and only minor residential developments, the major pollution impact will continue to be from agricultural land uses.

The Wickecheoke Creek appears to be the most affected having fecal coliform and biochemical oxygen demand values above the criteria and dissolved oxygen values below the criterion.

## GOAL ASSESSMENT AND RECOMMENDATIONS

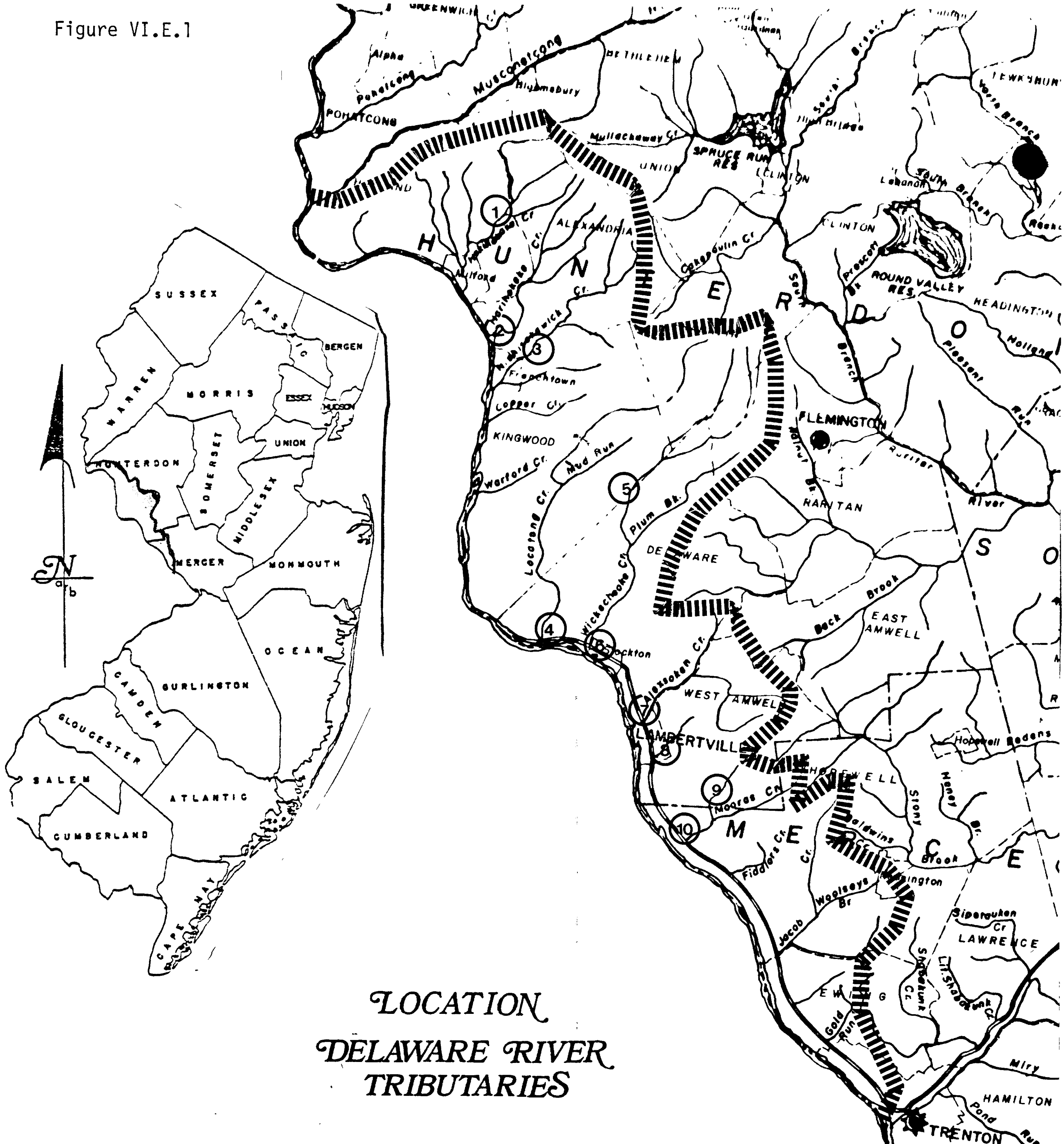
General water quality currently meets the goal of fishable waters with several streams classified as trout maintenance waters. However, fecal coliform values preclude contact uses in all but Hakihokake Creek and Alexauken Creek.

Continued water quality monitoring, with the inclusion of phosphorus and nitrogen is recommended especially since several parameters, most notably biochemical oxygen are approaching the criteria in several streams. Nutrient sampling would aid in delineating those areas most impacting water quality. Given the non-point agricultural source of the pollutants it is unlikely that the problem can be entirely corrected in the near future. Although improved agricultural practices may help to alleviate the condition.

## STATION LIST

1. Hakihokake Creek at Milford
2. Harihokake Creek near Frenchtown
3. Nishisakawick Creek at Frenchtown
4. Lockatong Creek near Raven Rock
5. Wickecheoke Creek at Locktown
6. Wickecheoke Creek at Stockton
7. Alexauken Creek near Lambertville
8. Swan Creek at Lambertville
9, Moores Creek near Lambertville
10. Moores Creek near Titusville

Figure VI.E.1




# LOCATION
# DELAWARE RIVER TRIBUTARIES

## LEGEND

- Point Source — (A) (B) (C) (D) (E)
- Monitoring Site — (1) (2) (3) (4) (5)
- Drainage Basin Boundaries
- County Bounderies
- Municipal Bounderies

Figure VI.E.2

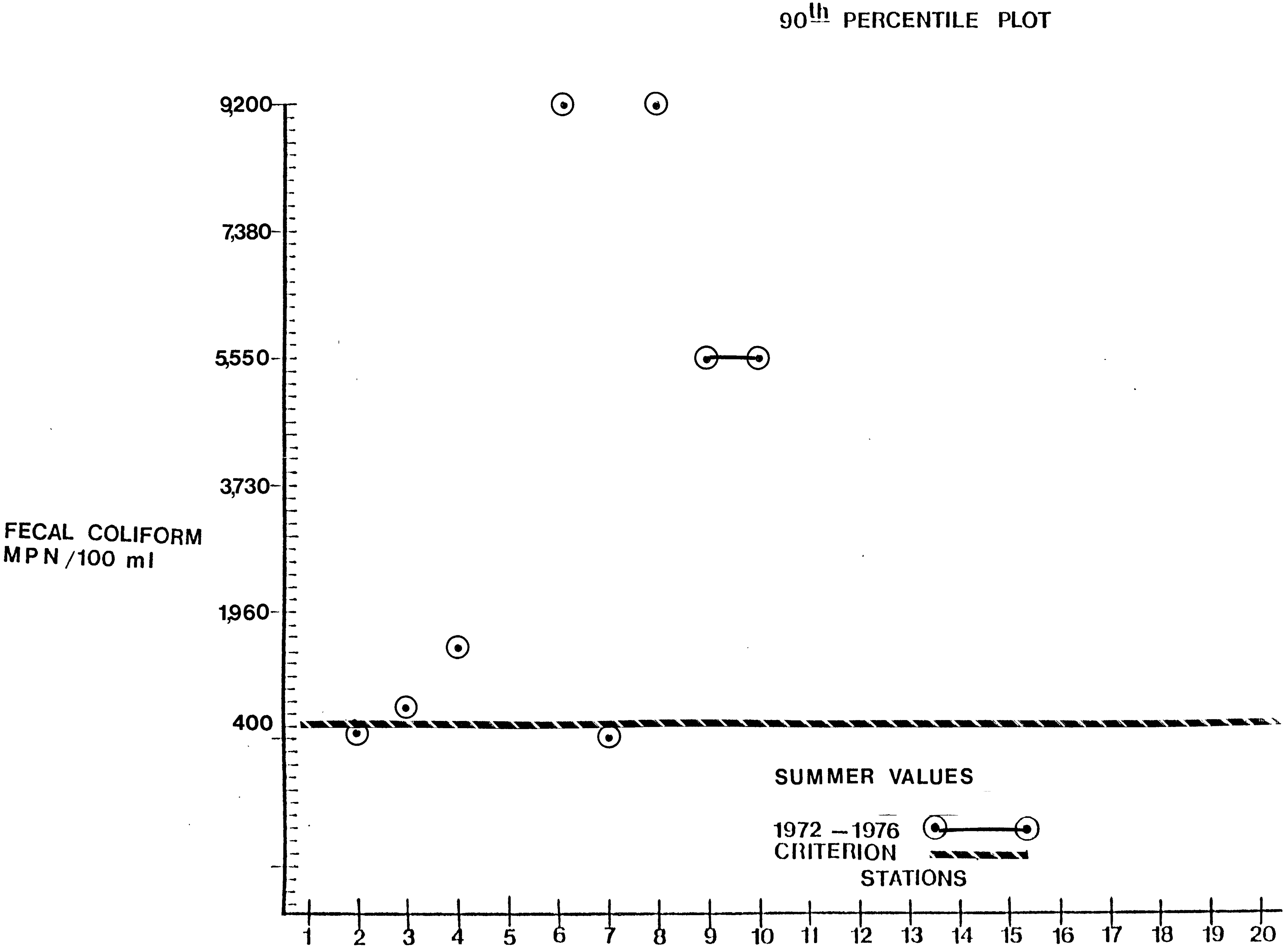

90th PERCENTILE PLOT
FECAL COLIFORM
MPN/100 ml
9,200
7,380
5,550
3,730
1,960
400
SUMMER VALUES
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Figure VI.E.3

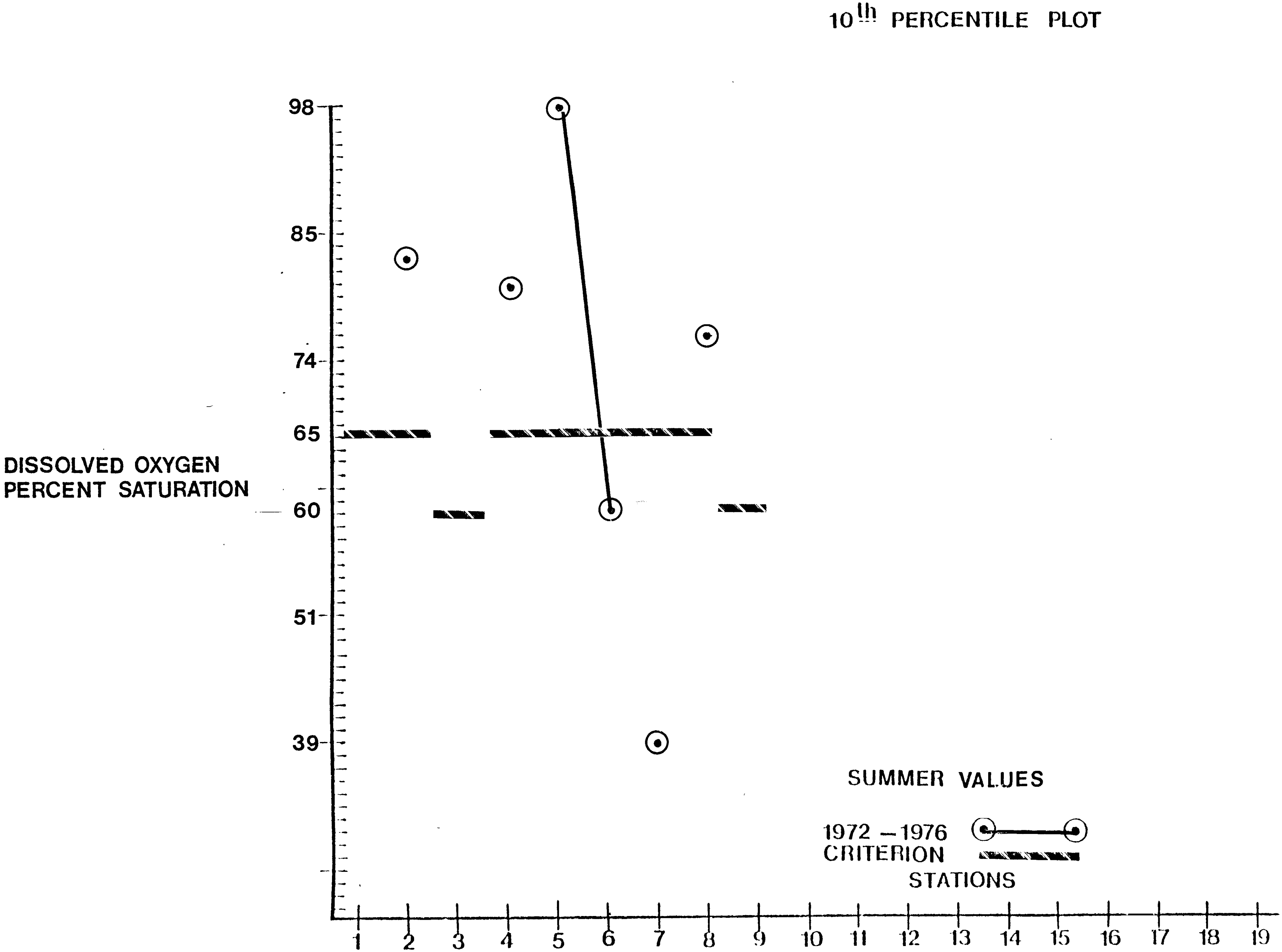
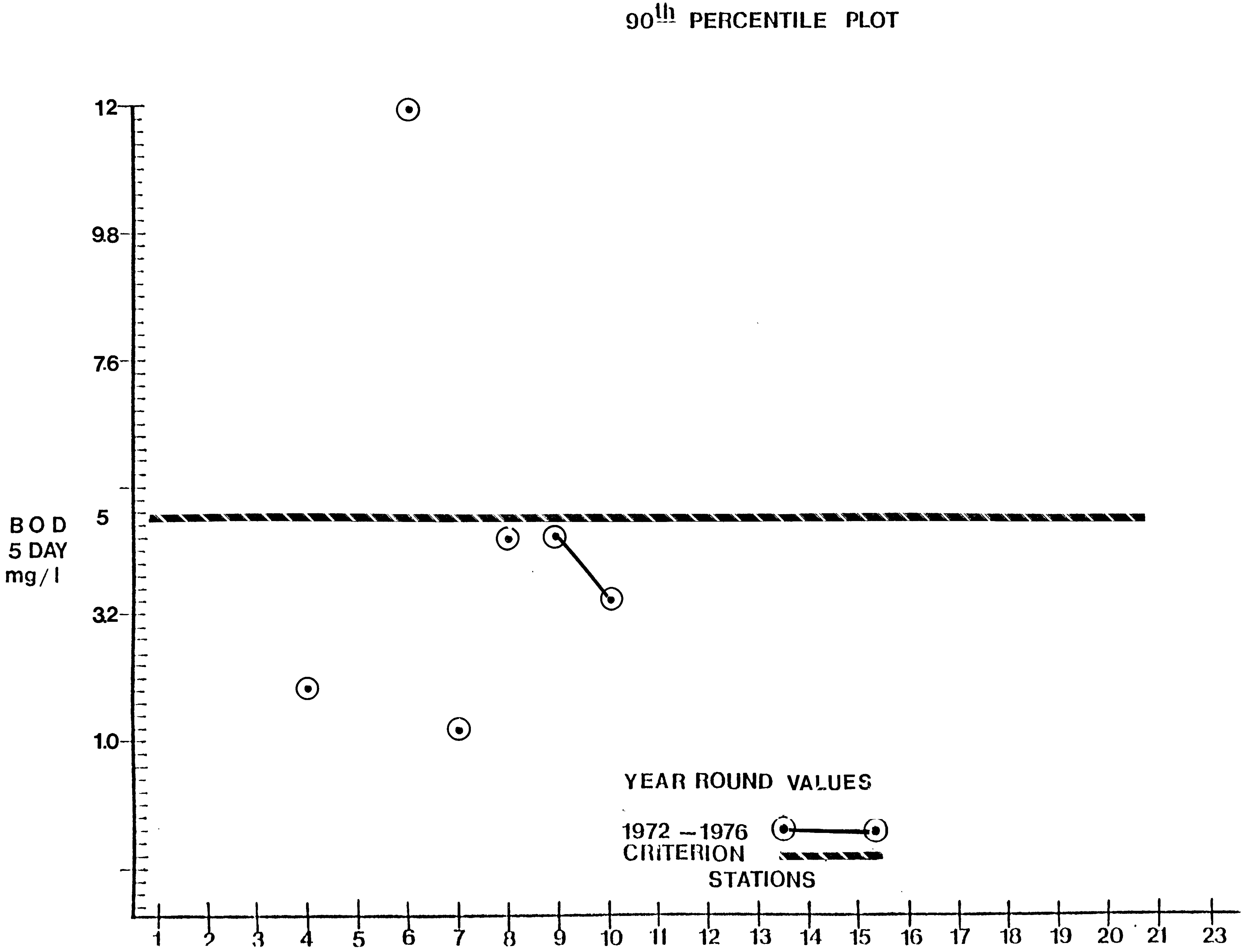

10th PERCENTILE PLOT
DISSOLVED OXYGEN
PERCENT SATURATION
98
85
74
65
60
51
39
SUMMER VALUES
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19

Figure VI.E.4



90th PERCENTILE PLOT
12
9.8
7.6
5
3.2
1.0
B O D
5 DAY
mg/l
YEAR ROUND VALUES
1972 — 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
23

Figure VI.E.5

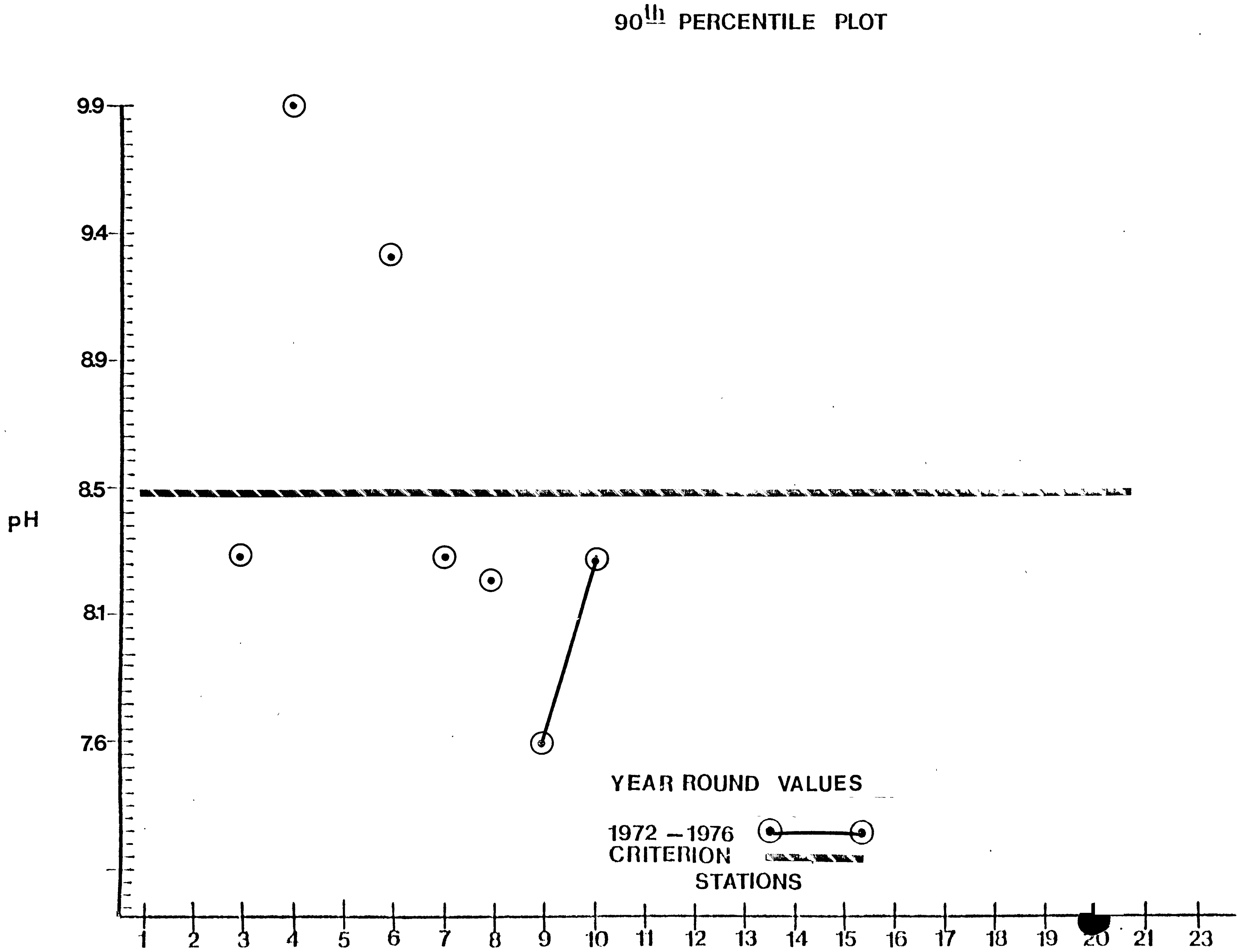

90th PERCENTILE PLOT
pH
9.9
9.4
8.9
8.5
8.1
7.6
YEAR ROUND VALUES
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
23

Figure VI.E.6

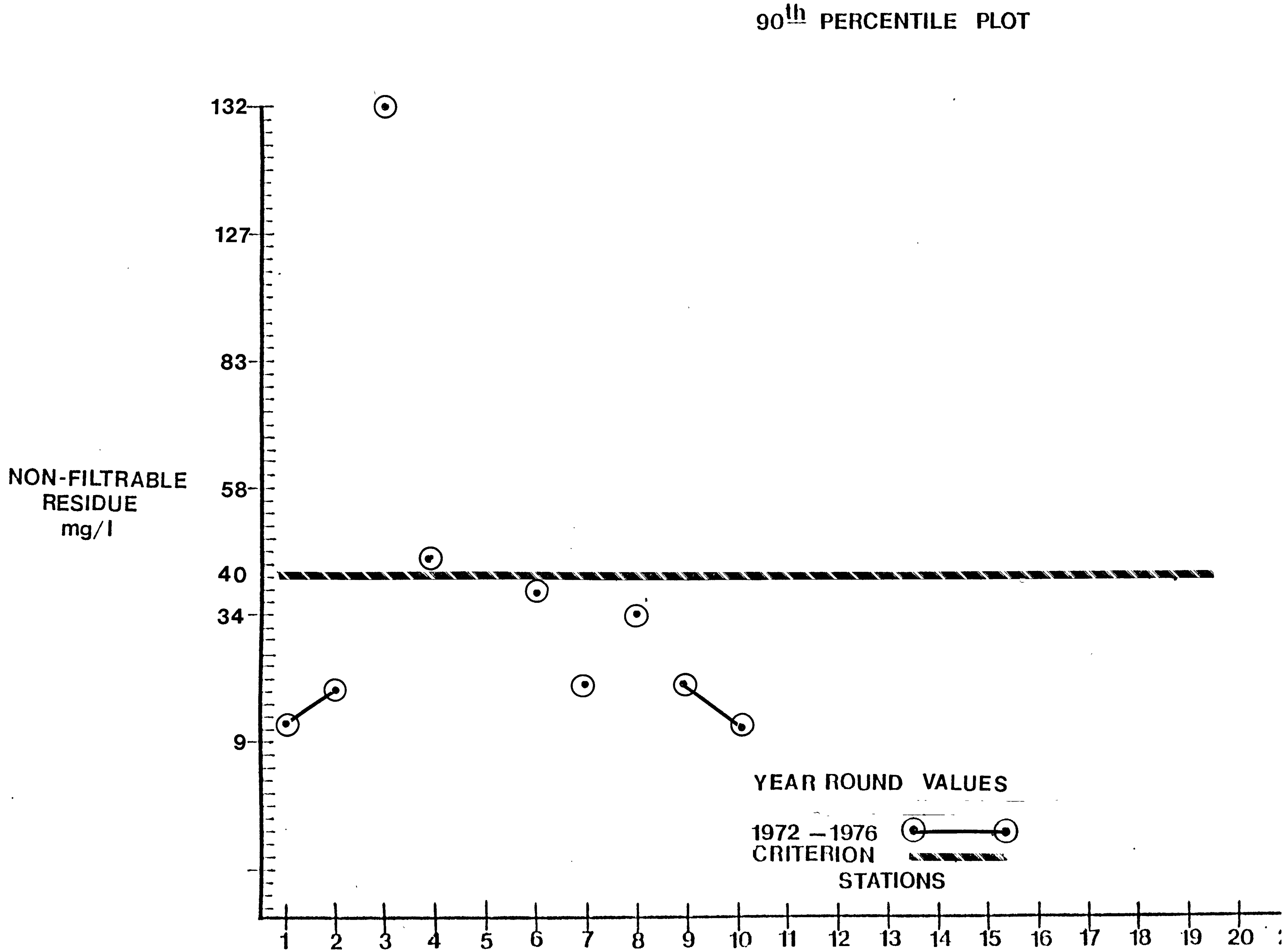
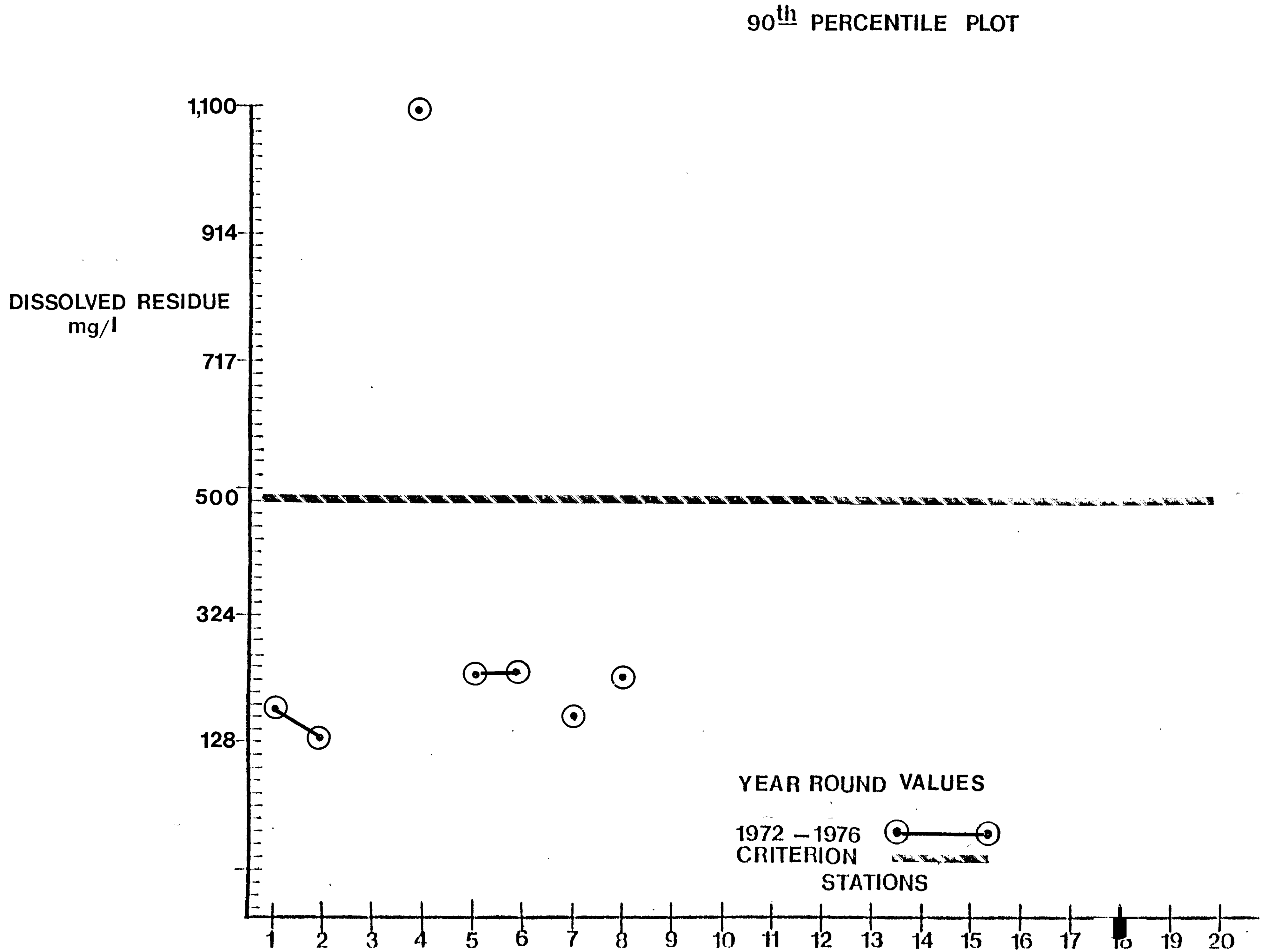
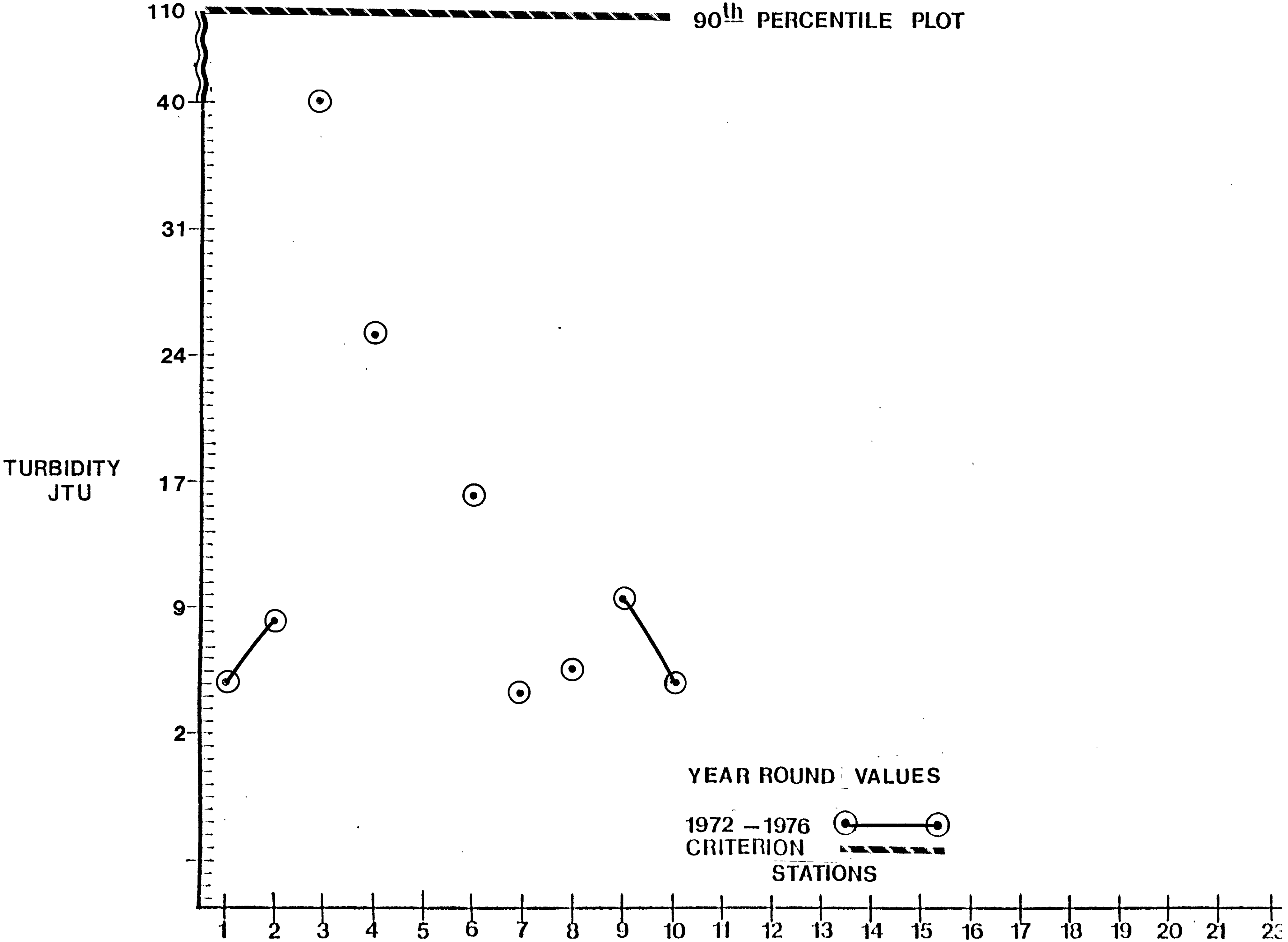

90th PERCENTILE PLOT
NON-FILTRABLE
RESIDUE
mg/l
132
127
83
58
40
34
9
YEAR ROUND VALUES
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Figure VI.E.7



90th PERCENTILE PLOT
DISSOLVED RESIDUE mg/l
1,100
914
717
500
324
128
YEAR ROUND VALUES
1972 – 1976
CRITERION
STATIONS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Figure VI. E.8


90th PERCENTILE PLOT
TURBIDITY
JTU
110
40
31
24
17
9
2
YEAR ROUND VALUES
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21

## ASSUNPINK CREEK

### BASIN DESCRIPTION

The Assunpink Creek originates in Millstone Township, Monmouth County and flows 25 miles in a westerly direction, traversing Mercer County, to its confluence with the Delaware River at Trenton. Several flood control-recreation impoundments have been constructed along the main stem and tributaries. Whitehead Pond is the last impoundment before the creek enters the Delaware River. The watershed has a drainage area of 91 square miles consisting primarily of agricultural, recreational, and undeveloped land uses. Urbanization is heaviest along the lower reach as the Assunpink Creek flows through the City of Trenton and surrounding townships. The watershed has high potential for future development. There are five discharges into the Assunpink or its tributaries. Ewing-Lawrence Sewerage Authority is the largest with an average daily flow of approximately 7 million gallons per day below Whitehead Pond; whereas the other discharges are less than 0.25 MGD.

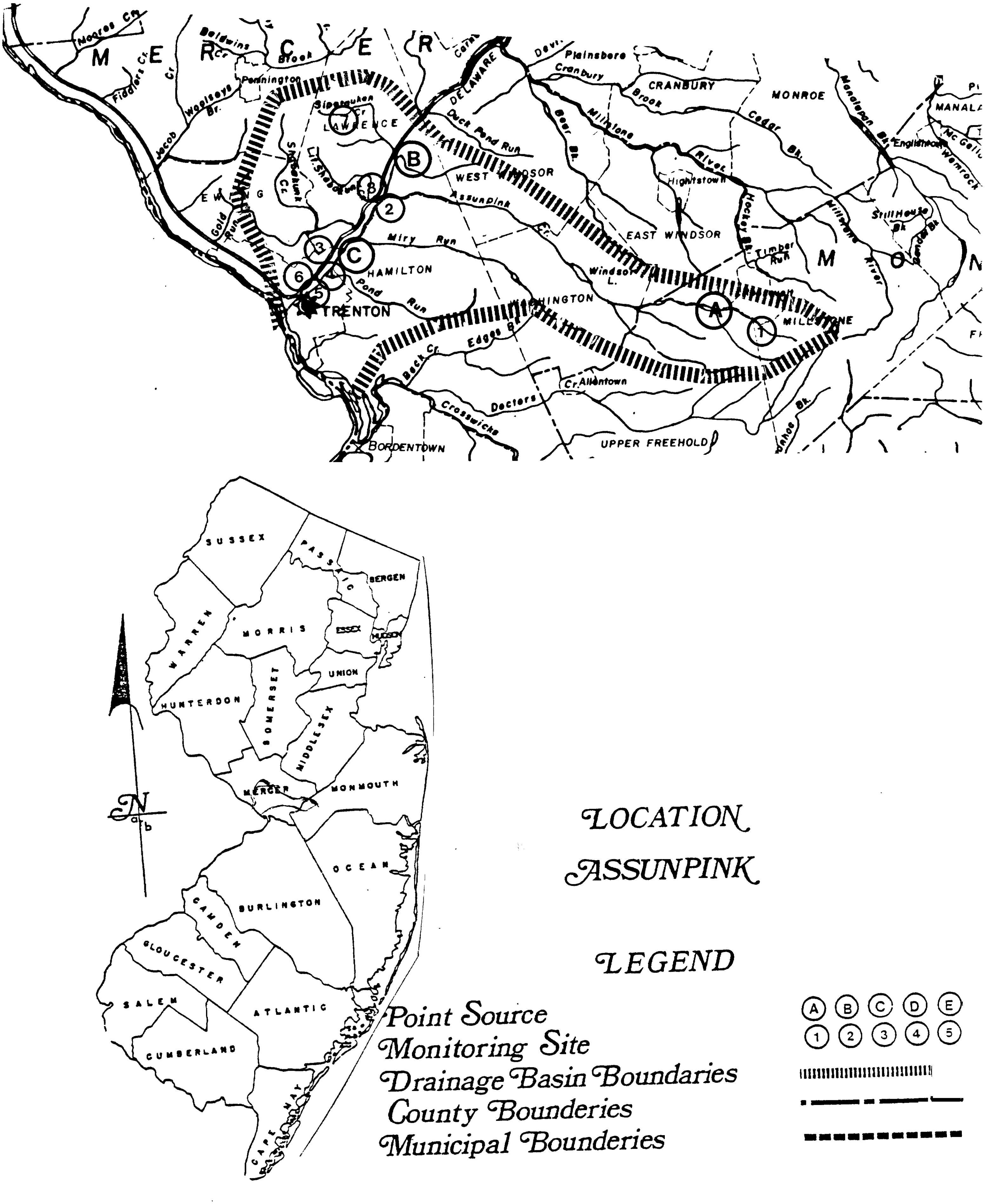
### WATER QUALITY ASSESSMENT

Fecal coliform levels are excessive and contravene the standard throughout the segment. Exceptionally high levels appear at the urban stations. Dissolved oxygen levels are marginally below the criterion at the Assunpink Creek stations while in compliance at the tributary stations. The five day biochemical oxygen demand exceeds the criterion at all but one upstream station on the Assunpink Creek and, as with dissolved oxygen, is within the criterion at the tributary stations. No pH data is available from STORET for this segment. Nutrient levels are excessive throughout the segment. Phosphorus concentrations range from nearly twice the criterion at the upstream and tributary stations to exceptionally high levels, up to 50 times greater than the criterion, at the urban stations. Nitrate-nitrogen levels are generally elevated throughout the watershed. Turbidity, although somewhat elevated at the urban stations, and dissolved residue (total dissolved solids) conform with the criteria for these parameters. The upstream and tributary stations exhibit very low non-filtrable residue (suspended solids) levels, with increasing levels occuring at the urban stations; although only one station exceeded the criterion based on data collected from 1972 through 1976.

### PROBLEM ASSESSMENT

The Assunpink Creek receives heavy non-point sources of pollution from agricultural runoff along its upper reaches and urban runoff along the lower portion of the watershed. These non-point sources cause the excessive fecal coliform and nutrient levels throughout the segment.

Figure VI .F.1


M E R C E R
Moores Cr.
Baldwins Cr.
Brook
Pennington
Fiddlers Cr.
Woolseys Br.
Jacob
Shipetaukin Cr.
LAWRENCE
Lit. Shabakunk
Shabakunk Cr.
EWING
Gold Run
DELAWARE
Duck Pond Run
Plainsboro
Cranbury
CRANBURY
Brook
MONROE
Cedar Bk.
Bear Bk.
Millstone River
Hightstown
WEST WINDSOR
Assunpink
EAST WINDSOR
Miry Run
HAMILTON
Pond Run
TRENTON
Windsor L.
WASHINGTON
Timber Run
M O N
Back Cr.
Edges Bk.
Allentown
Doctors Cr.
Crosswicks
BORDENTOWN
UPPER FREEHOLD
Manalapan Bk.
Englishtown
Wemrock
StillHouse Bk.
SUSSEX
PASSAIC
BERGEN
WARREN
MORRIS
ESSEX
HUDSON
UNION
HUNTERDON
SOMERSET
MIDDLESEX
MERCER
MONMOUTH
OCEAN
CAMDEN
BURLINGTON
GLOUCESTER
SALEM
ATLANTIC
CUMBERLAND
CAPE MAY
N
LOCATION
ASSUNPINK
LEGEND
Point Source
Monitoring Site
Drainage Basin Boundaries
County Bounderies
Municipal Bounderies
A B C D E
1 2 3 4 5

Considerable organic and nutrient loads are also imposed on the Assunpink Creek by the Ewing-Lawrence Sewerage Authority discharge; thus increasing the biochemical oxygen demand and depleting dissolved oxygen. Further dissolved oxygen depletion may be attributable to the DeLaval Turbine Co. cooling water discharge. DeLaval utilizes approximately 19 million gallons per day, nearly the entire Assunpink Creek stream low flow, for non-contact cooling water which is then discharged back into the Assunpink Creek. The cooling water causes a significant increase in the water temperature in the Assunpink Creek, thus decreasing the saturation level for dissolved oxygen.

Whitehead Pond experiences undesirable algal and emergent aquatic weed growths due to siltation and excessive nutrient levels. Dissolved oxygen levels sometimes reach critical levels in this impoundment. One fish kill occurred in Whitehead Pond due to a toxic chemical spill washed in through storm drains and low dissolved oxygen concentrations.

GOAL ASSESSMENT AND RECOMMENDATIONS

The Assunpink Creek segment does not meet the swimmable and fishable goals of the Act (P.L. 92-500) due to excessive fecal coliform and nutrient levels and generally depressed dissolved oxygen levels.

The upstream impact from non-point sources may be reduced through improved agricultural and drainage practices; however this is not anticipated in the near future.

Loading attributed to the Ewing-Lawrence Sewerage Authority discharge will be decreased significantly in the next few years due to the upgrading of this plant to achieve advanced treatment levels. All five discharges in the segment, are in compliance with the 1977 requirements of secondary/best practicable treatment limitations. The watershed has a high growth potential. Sewerage for projected future growth has been committed to other service areas outside the watershed.

Methods to reduce the rate of the eutrophication in Whitehead Pond should be explored. This could involve the construction of sedimentation traps along the inlet tributaries, stormwater diversion, dredging, nutrient inactivation, in-lake aeration, and undesirable aquatic plant control.

The monitoring program on this segment should be modified to an intensive chemical, biological, and thermal monitoring program with emphasis placed on the urban areas.

## STATION LIST

| Station No. | Location |
|---|---|
| 1. | Assunpink Creek at Carsons Mills |
| 2. | Assunpink Creek at Bakersville |
| 3. | Assunpink Creek at Whitehead Pond, Trenton |
| 4. | Assunpink Creek at Chambers Street, Trenton |
| 5. | Assunpink Creek at Peace Street, Trenton |
| 6. | Assunpink Creek at John Fitchway Bridge, Trenton |
| 7. | Shabakunk Creek at Lawrence Township |
| 8. | Shipetauken Creek at Bakersville |

Figure VI.F.2

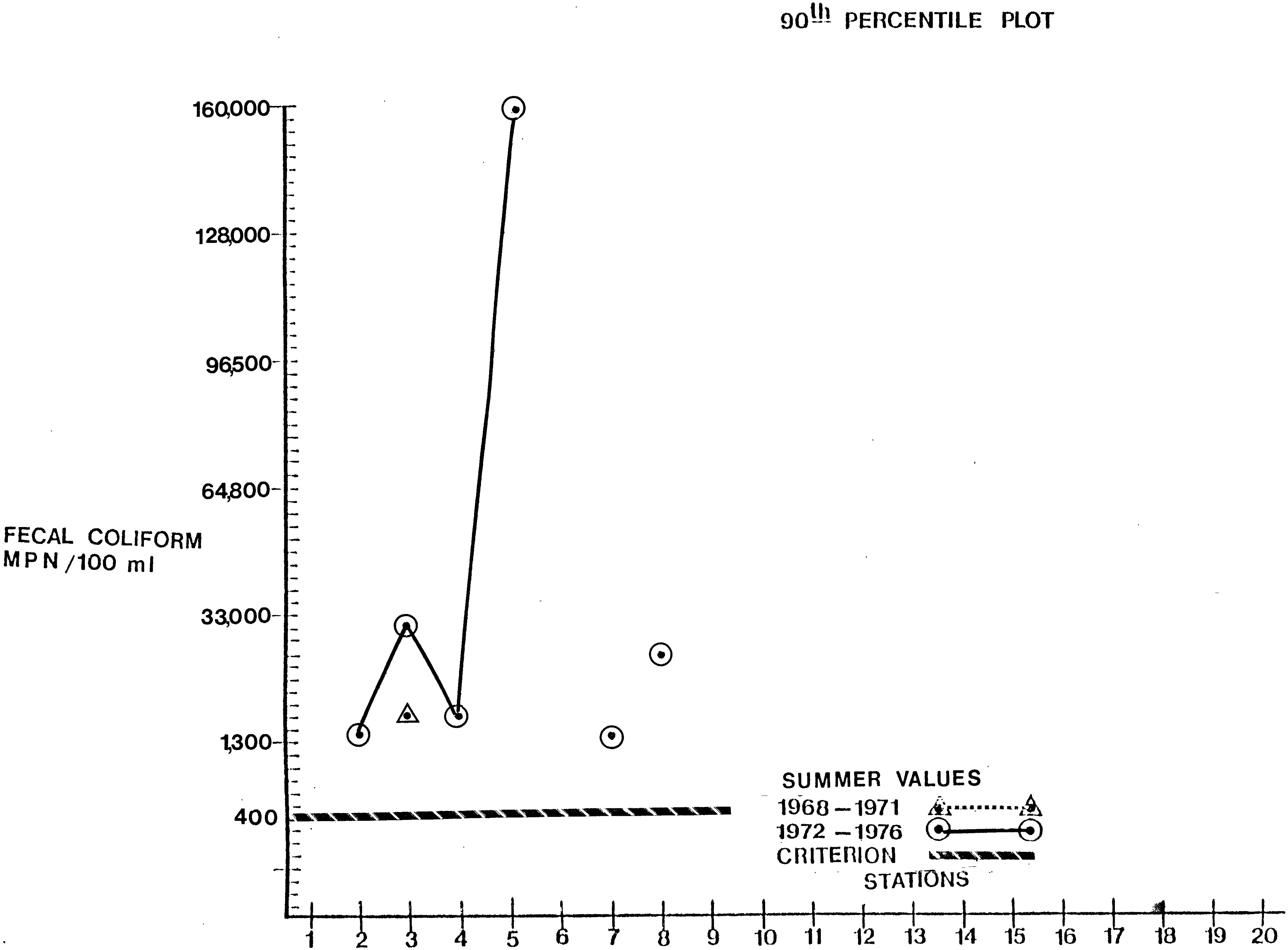

90th PERCENTILE PLOT
FECAL COLIFORM
MPN/100 ml
160,000
128,000
96,500
64,800
33,000
1,300
400
SUMMER VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Figure VI.F.3

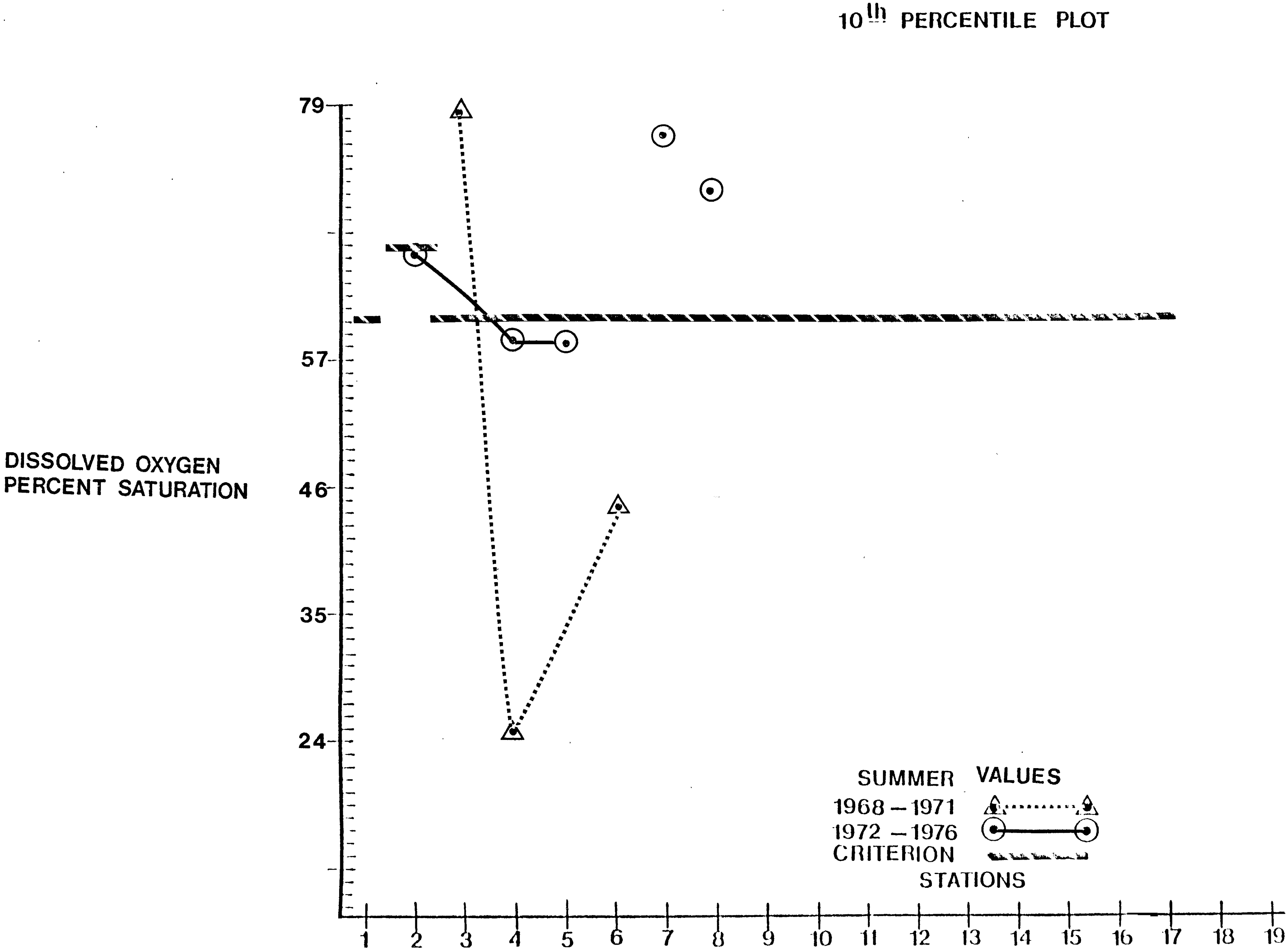
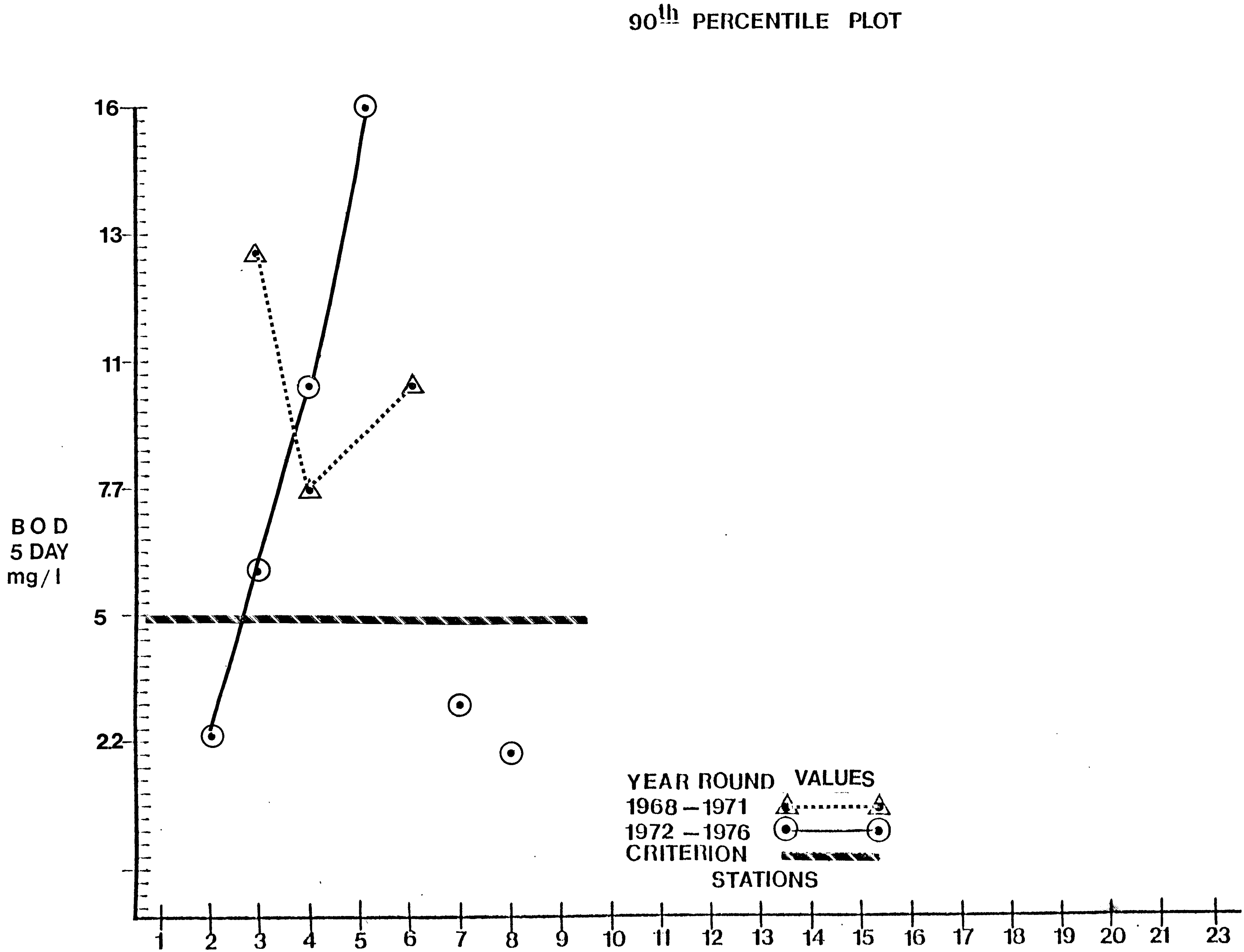

10th PERCENTILE PLOT
79
57
46
35
24
DISSOLVED OXYGEN
PERCENT SATURATION
SUMMER VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19

Figure VI.F.4



90th PERCENTILE PLOT
16
13
11
7.7
5
2.2
B O D
5 DAY
mg / l
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
23

Figure VI.F.5

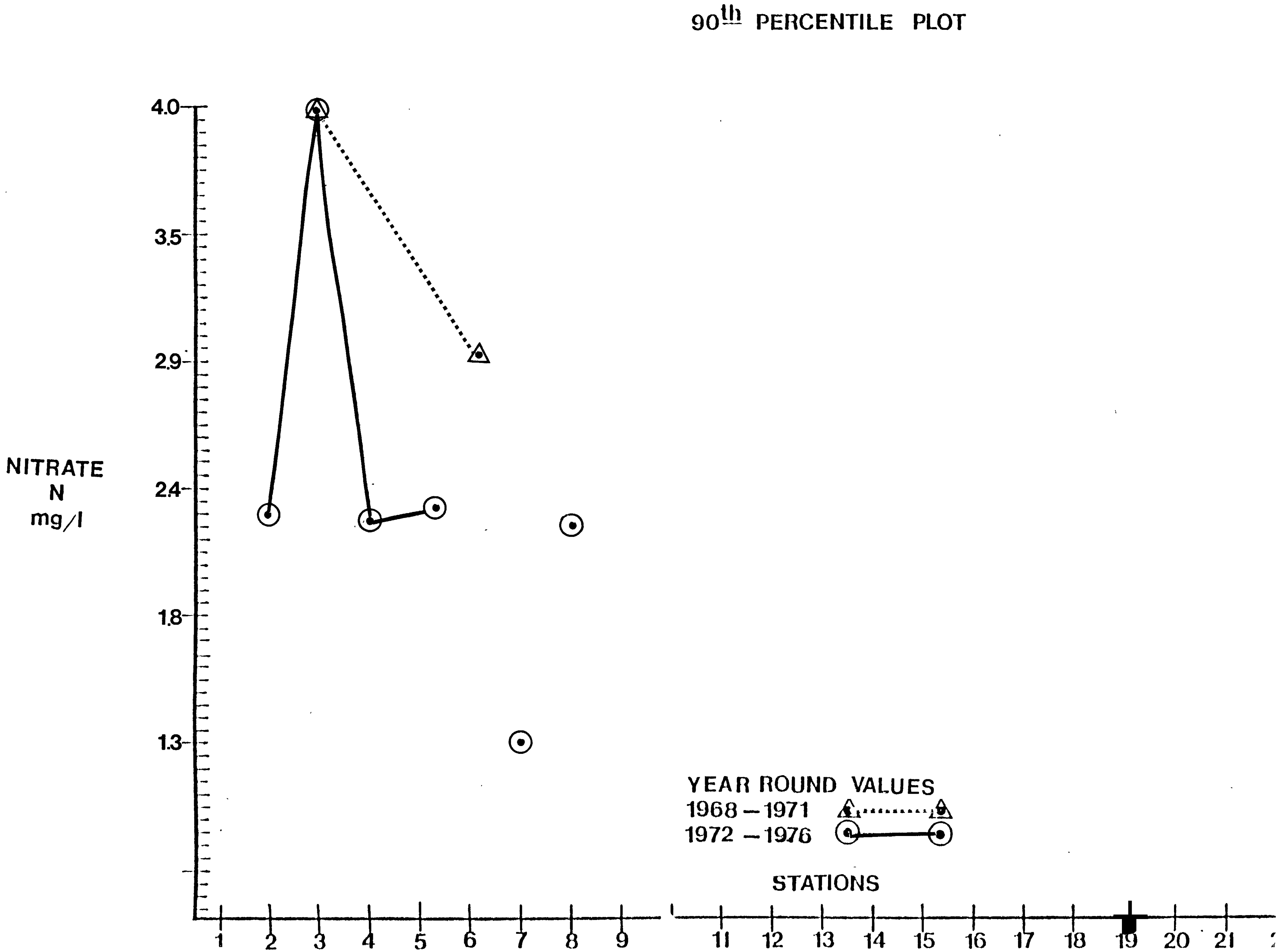

90th PERCENTILE PLOT
NITRATE N mg/l
4.0
3.5
2.9
2.4
1.8
1.3
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
STATIONS
1 2 3 4 5 6 7 8 9 11 12 13 14 15 16 17 18 19 20 21

Figure VI.F.6

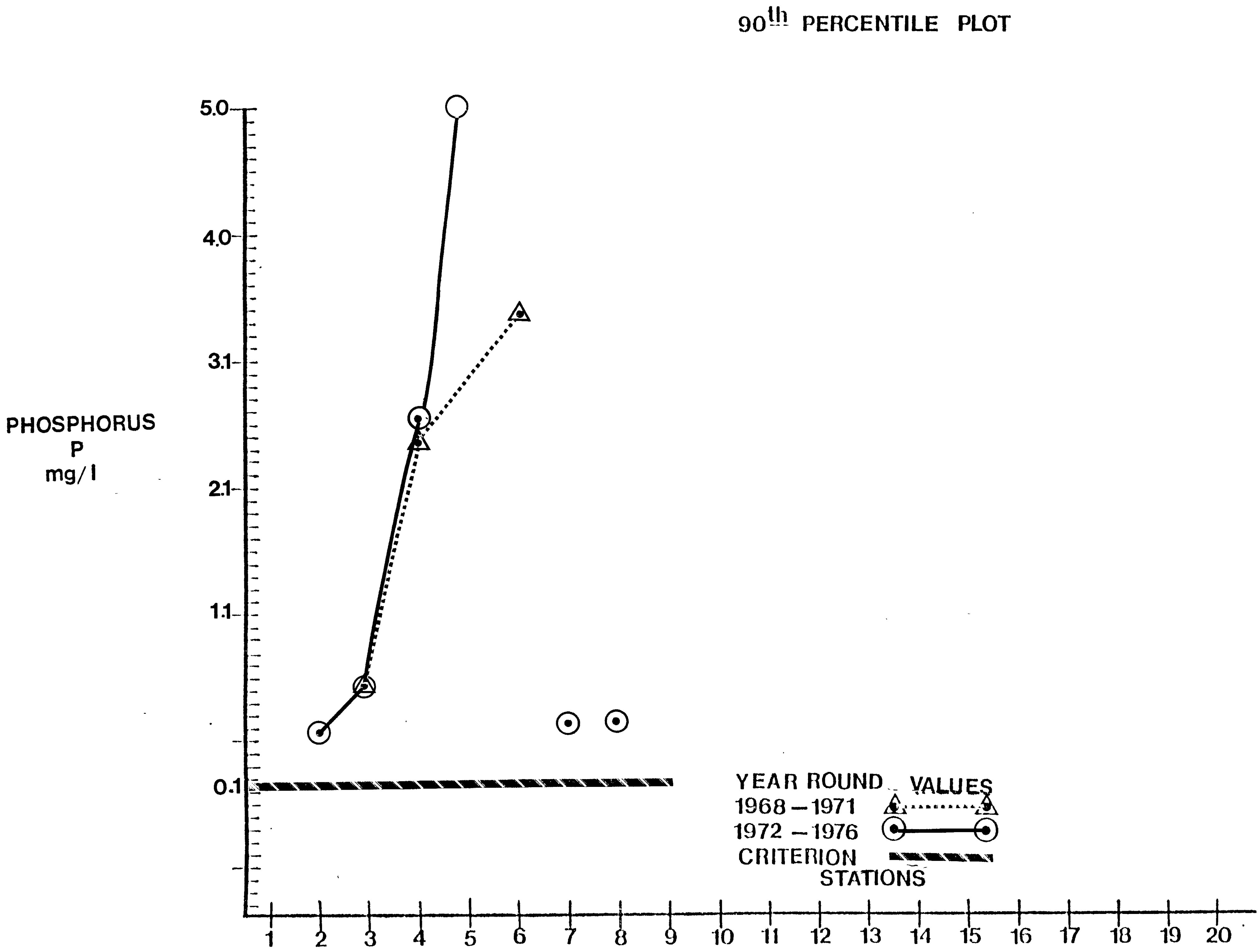

90th PERCENTILE PLOT
5.0
4.0
3.1
2.1
1.1
0.1
PHOSPHORUS
P
mg/l
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Figure VI.F.7

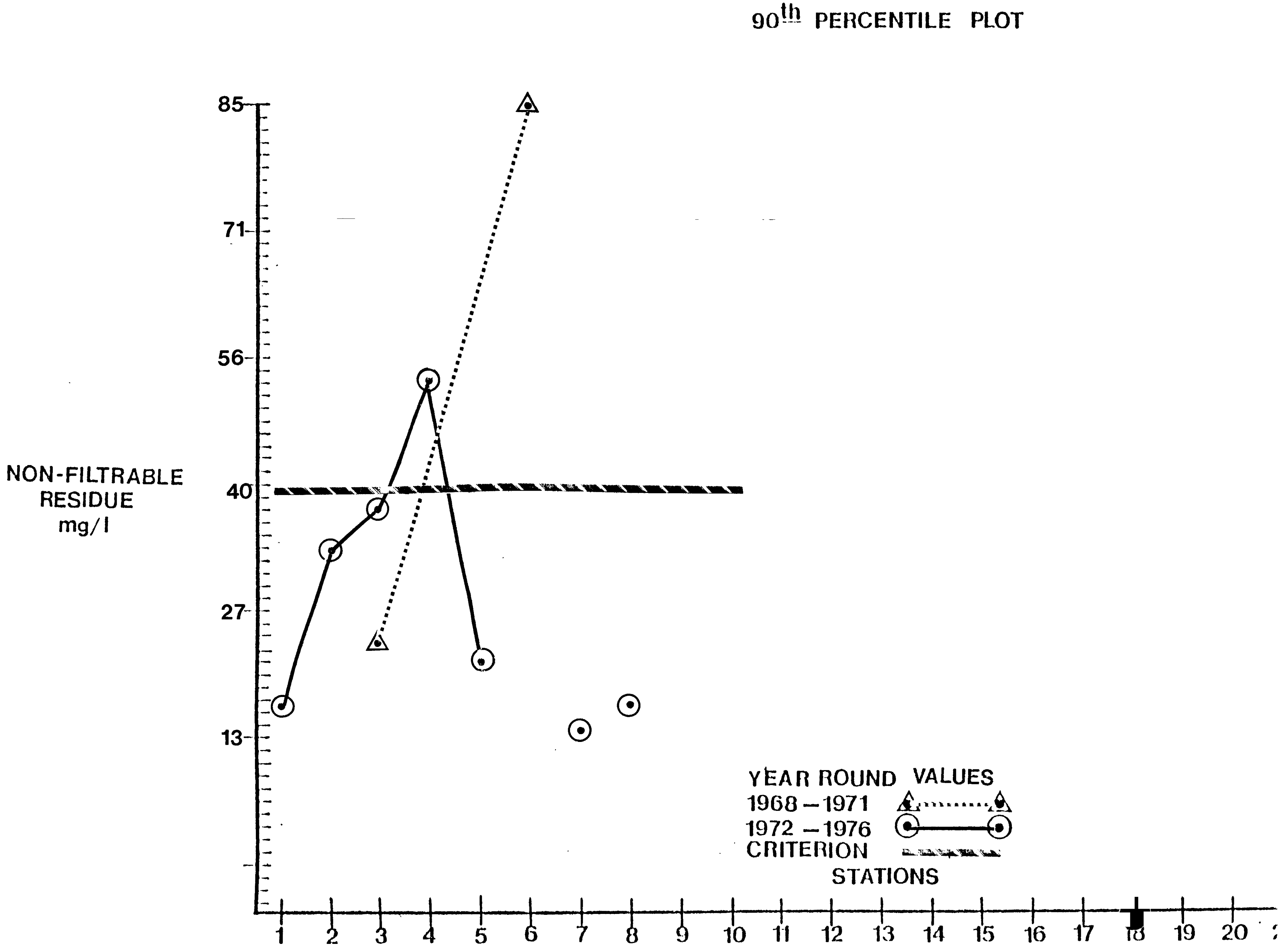
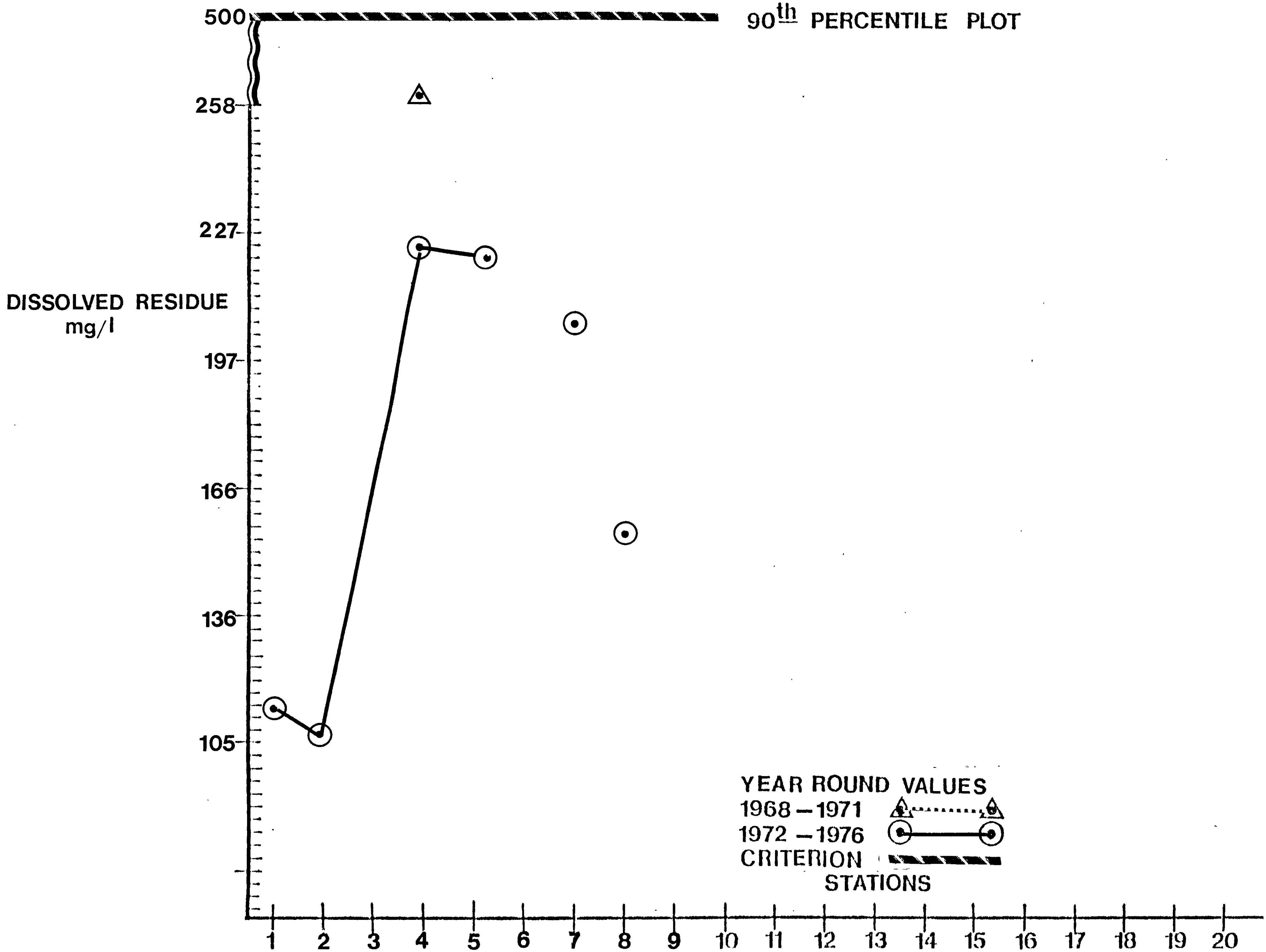
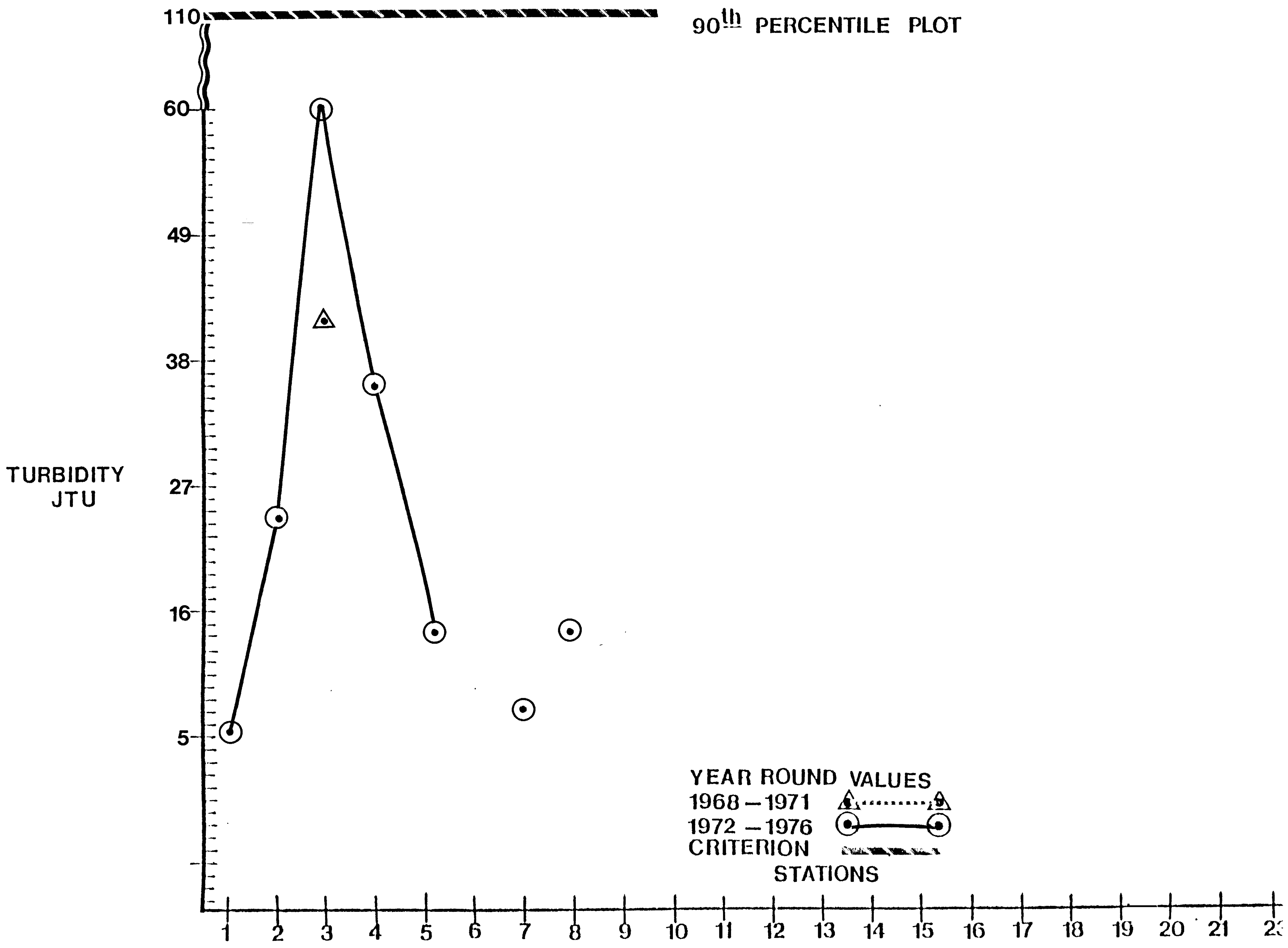

90th PERCENTILE PLOT
NON-FILTRABLE RESIDUE mg/l
85
71
56
40
27
13
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Figure VI.F.8



90th PERCENTILE PLOT
DISSOLVED RESIDUE mg/l
500
258
227
197
166
136
105
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Figure VI.F.9



90th PERCENTILE PLOT
TURBIDITY JTU
110
60
49
38
27
16
5
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21

## Table VI.F.1

DISCHARGER INVENTORY

Assunpink Creek Segment

| MAP CODE | MUNICIPALITY | PLANT NAME | DEGREE OF TREATMENT | RECEIVING STREAM | AVG. (MGD) DAILY FLOW 1973 | 1974 | 1975 | 1976 | COMPLIANCE WITH 1977 REQUIREMENTS OF SECONDARY/BEST PRACTICABLE TREATMENT LIMITATIONS |
|---|---|---|---|---|---|---|---|---|---|
| A | Lawrence Township | Ewing-Lawrence S.A. | Sec. | Assunpink Creek | 6.9 | 8.5 | 9.0 | 6.7 | Yes |
| B | West Windsor | American Cyanamid | Sec. | Assunpink Creek | 0.047 | 0.040 | 0.045 | .075 | Yes |
| C | Roosevelt | Roosevelt Municipal | Sec. | Assunpink Creek | 0.20 | 0.120 | 0.300 | .25 | Yes |
| | West Windsor | West Windsor Municipal Jefferson Park | Sec. | Trib. to Assunpink Creek | 0.029 | 0.020 | 0.030 | .03 | No |
| | Washington Twp. | Vernon Fabricating Co. Sharon Arms | Ter. | Trib. to Assunpink Creek | 0.014 | 0.014 | 0.025 | .025 | Yes |

CROSSWICKS CREEK AND ASSISCUNK CREEK

## BASIN DESCRIPTION

Crosswicks Creek originates in northwest Monmouth at the Oakford Lake outfall and meanders northwest through Monmouth and Mercer Counties before forming the Mercer-Burlington County line and flowing northwesterly to the Delaware River. The watershed encompasses an area of 146 square miles. The more rapidly flowing upstream segment gives way to a slow moving meandering tidal stream carrying a large sediment load. The agricultural and rural area about the town of Crosswicks is experiencing commercial and residential development and the tidal segment is traversed by major highways and supports considerable manufacturing industry as well as residential development. In addition, 10 point source discharges are located on the stream or tributary, the major being the 11.0 MGD Hamilton Township main Sewage Treatment Plant.

Doctors Creek is a major tributary to Crosswicks Creek originating as a minor stream at Imlaystown Lake. It flows westerly for approximately 4 miles to Allentown Lake and then flows approximately 4 more miles to its confluence with Crosswicks Creek, the last half mile being tidal. The watershed encompasses 26 square miles and land use is predominatly agricultural with a small population center at Allentown. The Allentown STP (0.1 MGD) and 0.5 MGD Hamilton Township Yardville-Groveville Municipal Sewage Treatment Plant discharge into this tributary.

The Assiscunk Creek originates in northeast Burlington County and flows in a westerly direction for approximately 6 miles to its confluence with the Delaware River. While the headwaters are undeveloped the downstream area is experiencing rapid commercial growth. The Assiscunk has 2 point source discharges, the most significant being the 0.25 MGD Burlington Township LaGorce Square Municipal Treatment Plant.

## WATER QUALITY ASSESSMENT

Fecal coliform bacteria values exceeded the criterion in all streams with the exception of Doctors Creek and the upstream (Cookstown) station on Crosswicks Creek. Dissolved oxygen concentrations on some streams are significantly below the criterion. These segments include the upstream segment of Crosswicks Creek from Cookstown downstream to Extonville and Blacks Creek at Bordentown. In addition, data collected between 1966-1971 indicates that a portion of lower Doctor's Creek may also be oxygen deficient. Several of the segments are also experiencing high biochemical oxygen demands most notably the upstream segment of Crosswicks Creek, the Assiscunk Creek at Columbus and Doctor's Creek.

The pH in all segments is below the criterion with the Assiscunk Creek values being naturally slightly acidic.

Phosphorus concentrations exceeded the criterion in all stream segments (1967-1971) for which there is data (Crosswicks Creek, Doctor's

Creek, and Assiscunk Creek). Nitrate concentrations are also elevated on segments of all the streams in this zone. Dissolved residue, non-filtrable residue and turbidity show similar distribution throughout the zone. All stations show compliance with non-filtrable residue and turbidity except at the Crosswicks Creek station at Crosswicks.

Dissolved residue data are also elevated at this station but remain below the criterion level. Dissolved residue values from all other streams are also well below the criterion.

PROBLEM ASSESSMENT

The upstream portion of Crosswicks Creek is severely impacted by an excessive BOD load with a subsequent reduction in dissolved oxygen saturation. Elevated nitrate and phosphorus concentrations are also evident and the combined effect of these pollutants could have a serious detrimental effect on Oakford Lake. The discharges from the Wrightstown MUA, Fort Dix and McGuire Air Force Base treatment plants and drainage from McGuire Air Force Base and associated residential areas all contribute to the pollutant loading. Although the flow characteristics of Crosswicks Creek are not conducive to extensive reaeration downstream, dissolved oxygen concentrations are açceptable. Data however is lacking for the tidal estuarine segment, an area with extensive industrial and residential development. This is also the area of the 11 MGD Hamilton Main Municipal Plant, and the 0.47 MGD Bordentown Township Mile Hollow facility which are not in compliance with the 1977 best practicable treatment requirements.

Excessive turbidity, non-filtrable residue and nitrate at Crosswicks are caused by the extensive agriculture runoff in this portion of the basin.

Although Doctor's Creek drains a predominantly rural area, the Allentown Municipal and Hamilton Township Yardville-Groveville Municipal discharges have significant impacts on water quality as measured by elevated biological oxygen demand and nitrate.

The upstream segment is affected by agricultural drainage and Allentown Lake is experiencing severe weed growth.

Similarly, the watersheds draining into Black Creek, Crafts Creek and the Assiscunk Creek are predominantly rural and agricultural. Although no data is available, the 0.625 MGD Bordentown City treatment plant and the 0.10 MGD Bordentown Township Laurel Run plant could be expected to severely affect Blacks Creek, especially dissolved oxygen concentrations. The Assiscunk Creek is similarly affected, receiving discharges from both Burlington Township

LaGorce Square wastewater treatment plant and agricultural drainage which contributes the largest proportion of pollutant load, especially as measured by the upstream biological oxygen demand values.

GOAL ASSESSMENT AND RECOMMENDATIONS

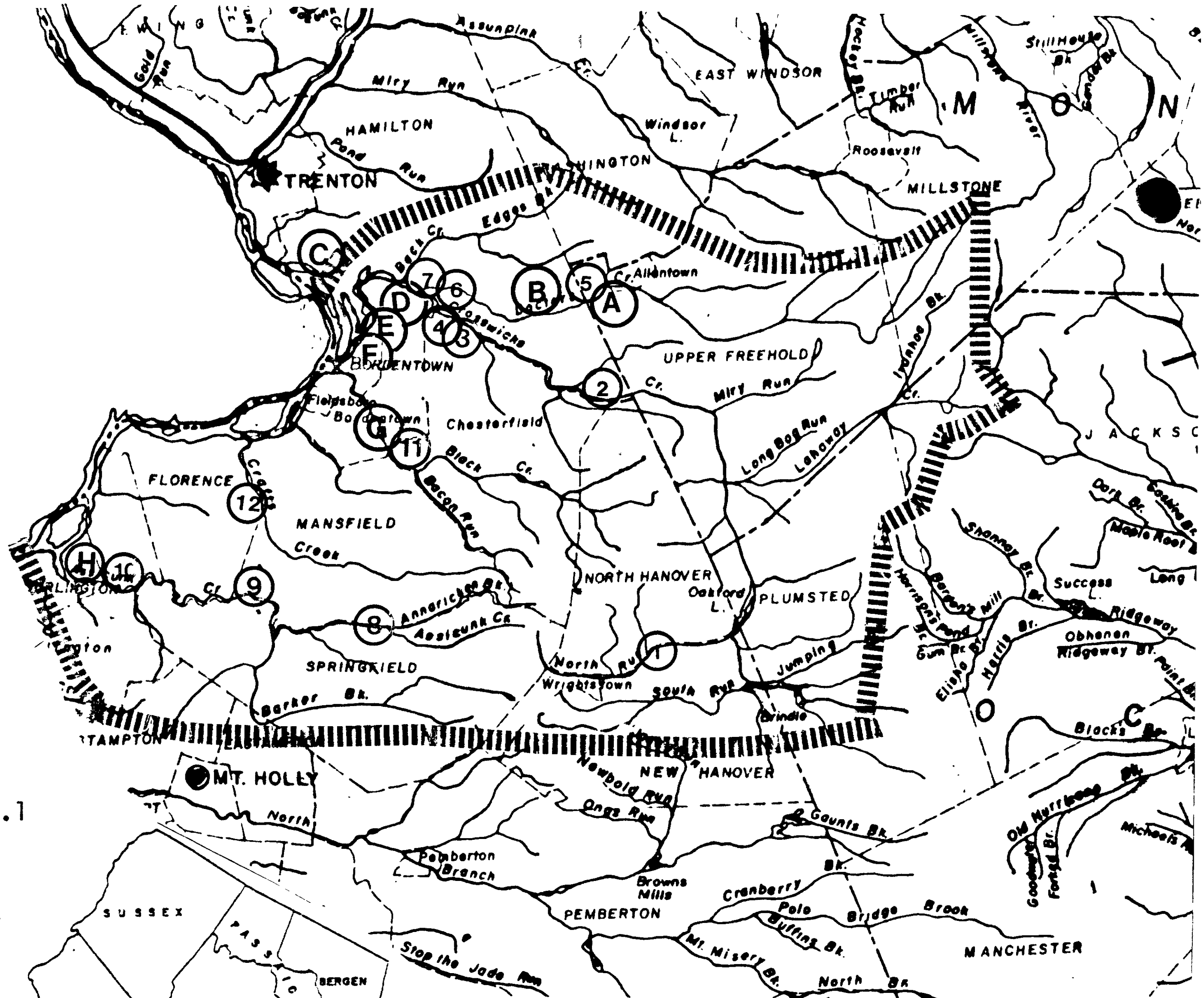
All waters in this zone are currently suitable as fishable waters. However dissolved oxygen data from the upstream segment of Crosswicks Creek intimates that it may be but marginally acceptable. Excessive fecal coliform concentrations preclude contact recreation in all waters with the exception of Doctor's Creek.

At this time there is little possibility of alleviating the variable impacts of agricultural drainage on these waterways. However, Crosswicks, Blacks and Doctor's Creeks have significant major domestic waste discharge, most of which currently do not meet the 1977 secondary/best practical treatment requirements. Compliance with these requirements would result in a reduction of the biological oxygen demand and have a subsequent beneficial effect on dissolved oxygen concentrations. Sampling stations should be established below these major wastewater discharges to gain a clearer perspective of their impact on the estuarine areas.

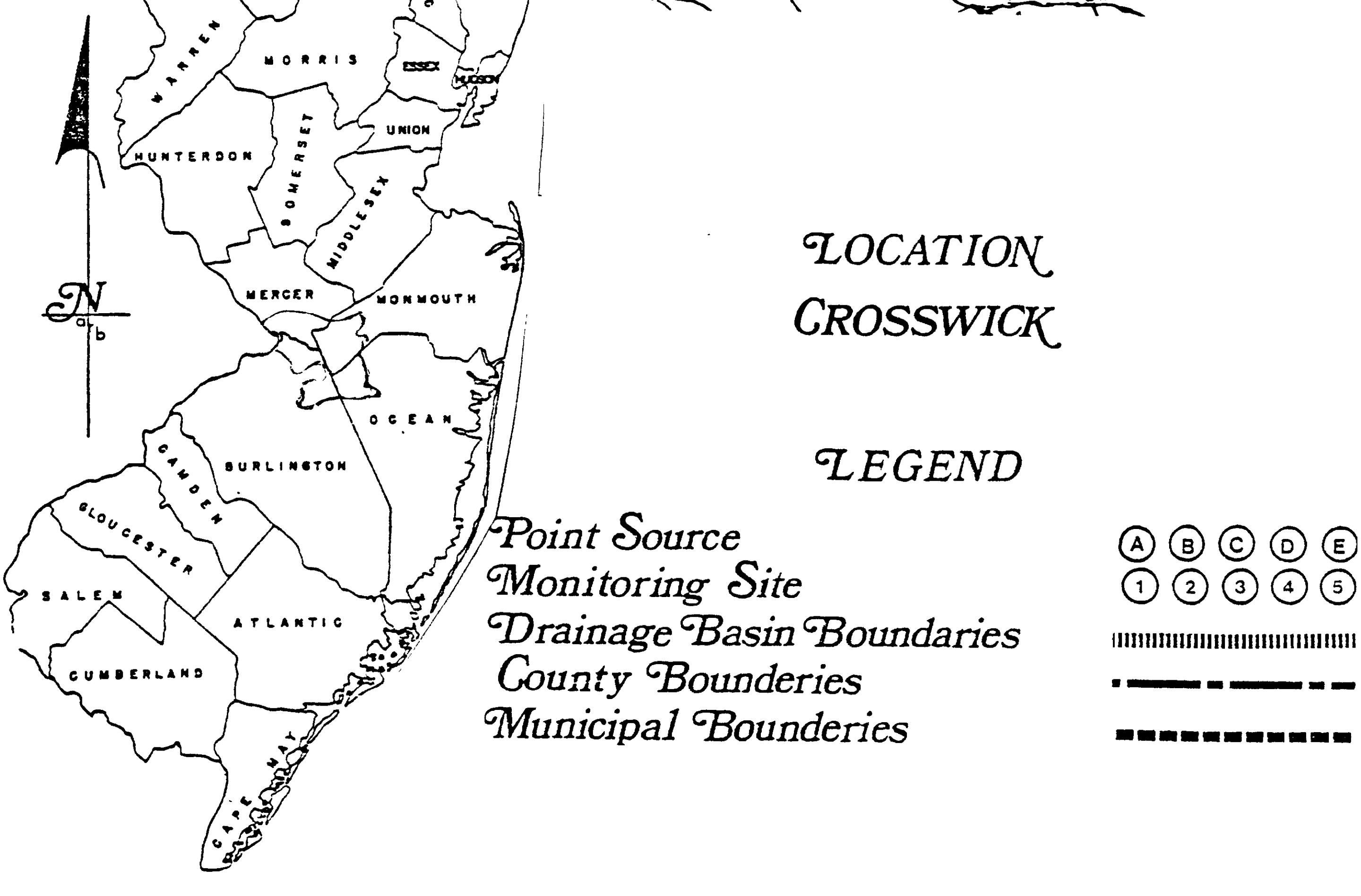
STATION LIST

| Station No. | Location |
|---|---|
| 1. | Crosswicks Creek near Cookstown |
| 2. | Crosswicks Creek near Extonville |
| 3. | Crosswicks Creek near Groveville |
| 4. | Crosswicks Creek near Yardville |
| 5. | Doctors Creek at Allentown |
| 6. | Doctors Creek near Groveville |
| 7. | Doctors Creek at Rt. 130, Yardville |
| 8. | Assiscuhk Creek At Columbus |
| 9. | Assiscunk Creek at Florence Township |
| 10. | Assiscunk Creek near Burlington |
| 11. | Blacks Creek at Bordentown |
| 12. | Crafts Creek at Hedding |

Figure VI.G.1



Assunpink
Gold Run
Miry Run
EAST WINDSOR
HAMILTON
Pond Run
TRENTON
WASHINGTON
Windsor L.
Roosevelt
MILLSTONE
Edges Bk.
Back Cr.
Allentown
Crosswicks
BORDENTOWN
UPPER FREEHOLD
Miry Run
Fieldsboro
Bordentown
Chesterfield
Long Bog Run
Lahaway
FLORENCE
Crafts
MANSFIELD
Black Cr.
Bacon Run
Creek
NORTH HANOVER
Oakford L.
PLUMSTED
Annaricken Bk.
Assiscunk Cr.
SPRINGFIELD
North Run
Wrightstown
South Run
Jumping
Barker Bk.
Brindle
Shannoc Bk.
Success L.
Ridgeway
Obhenen
Ridgeway Br.
Blacks Br.
NEW HANOVER
Newbold Run
Ongs Run
MT. HOLLY
North
Pemberton Branch
Browns Mills
Cranberry Bk.
PEMBERTON
Pole Bridge Brook
Mt. Misery Bk.
North Br.
Stop the Jade Run
MANCHESTER
Old Hurricane Bk.

SUSSEX
PASSAIC
BERGEN
WARREN
MORRIS
ESSEX
HUDSON
UNION
HUNTERDON
SOMERSET
MIDDLESEX
MERCER
MONMOUTH
OCEAN
BURLINGTON
CAMDEN
GLOUCESTER
SALEM
ATLANTIC
CUMBERLAND
CAPE MAY
N
LOCATION
CROSSWICK
LEGEND
Point Source
Monitoring Site
Drainage Basin Boundaries
County Bounderies
Municipal Bounderies

Figure VI.G.2

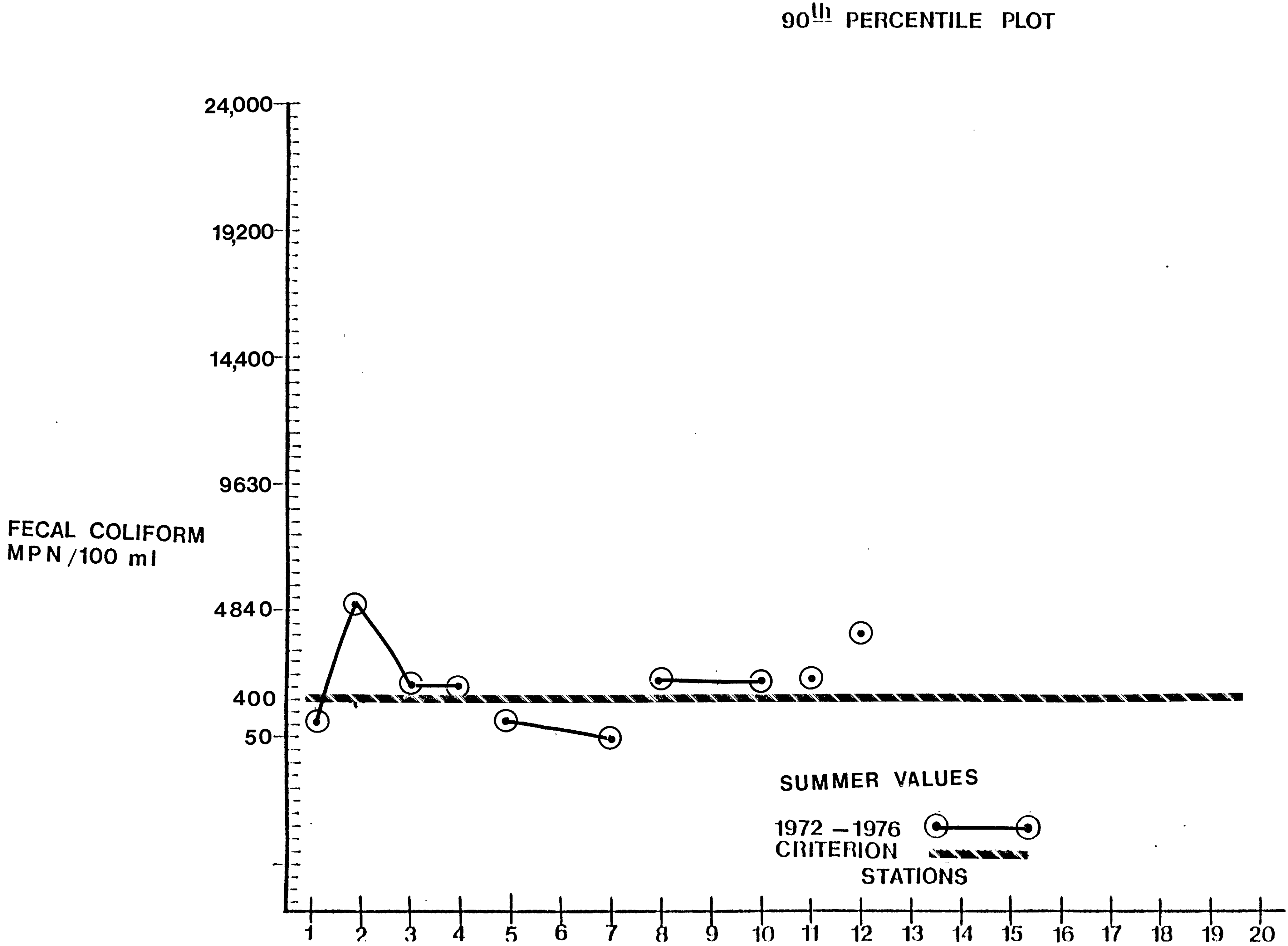

90th PERCENTILE PLOT
24,000
19,200
14,400
9630
FECAL COLIFORM
MPN/100 ml
4840
400
50
SUMMER VALUES
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Figure VI.G.3

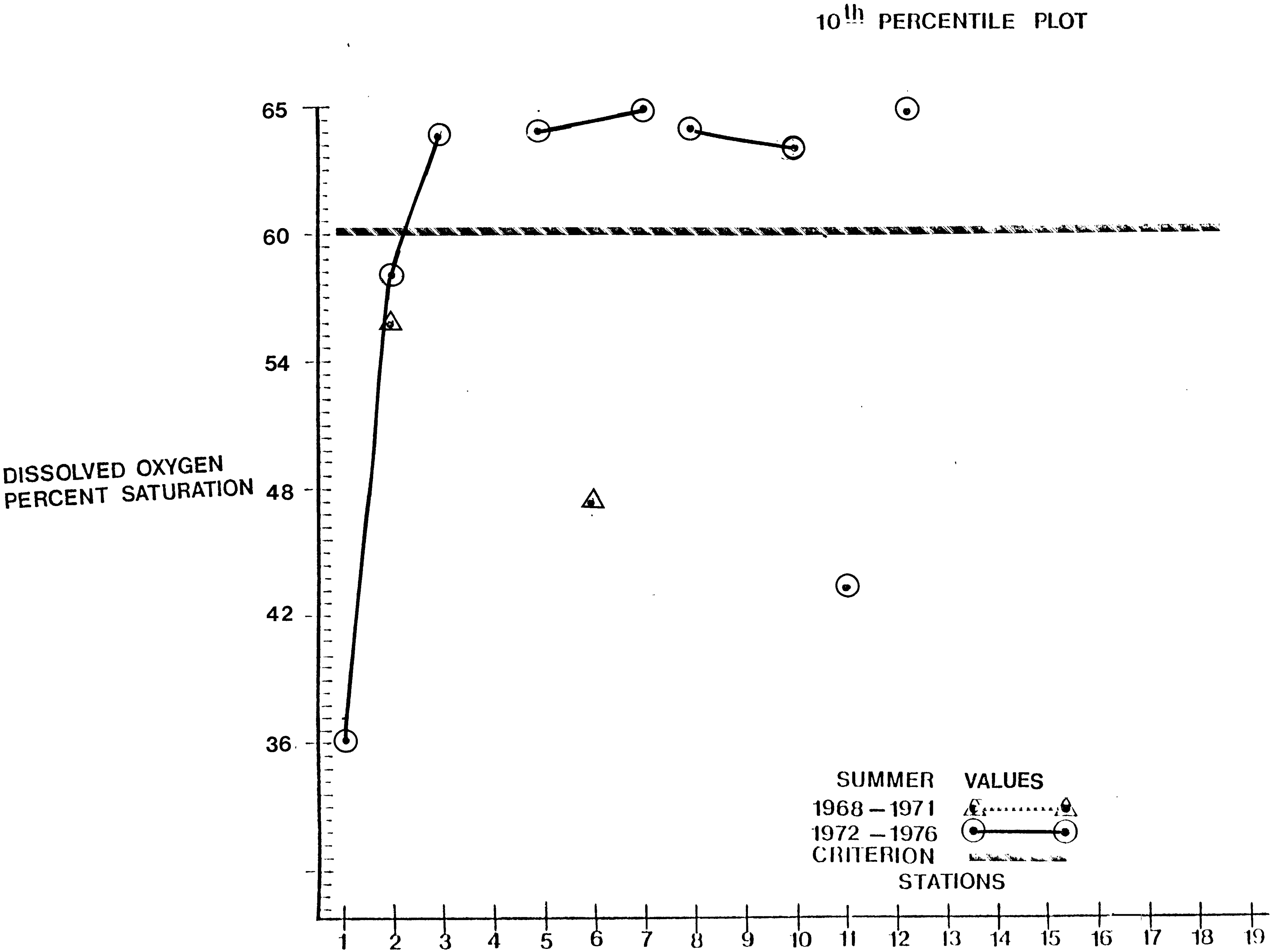
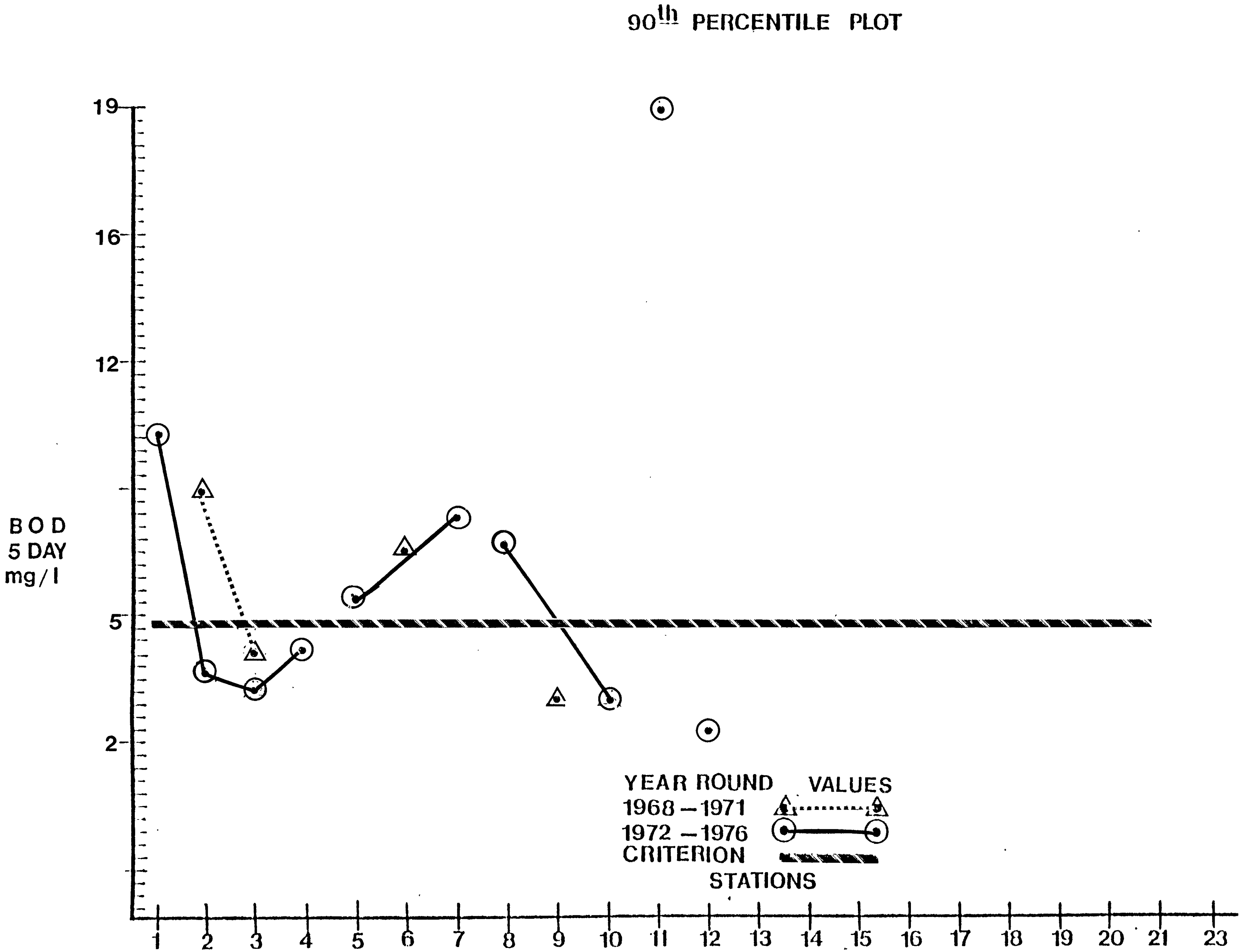

10th PERCENTILE PLOT
DISSOLVED OXYGEN PERCENT SATURATION
65
60
54
48
42
36
SUMMER VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

Figure VI.G.4



90th PERCENTILE PLOT
19
16
12
5
2
B O D
5 DAY
mg/l
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
23

Figure VI.G.5

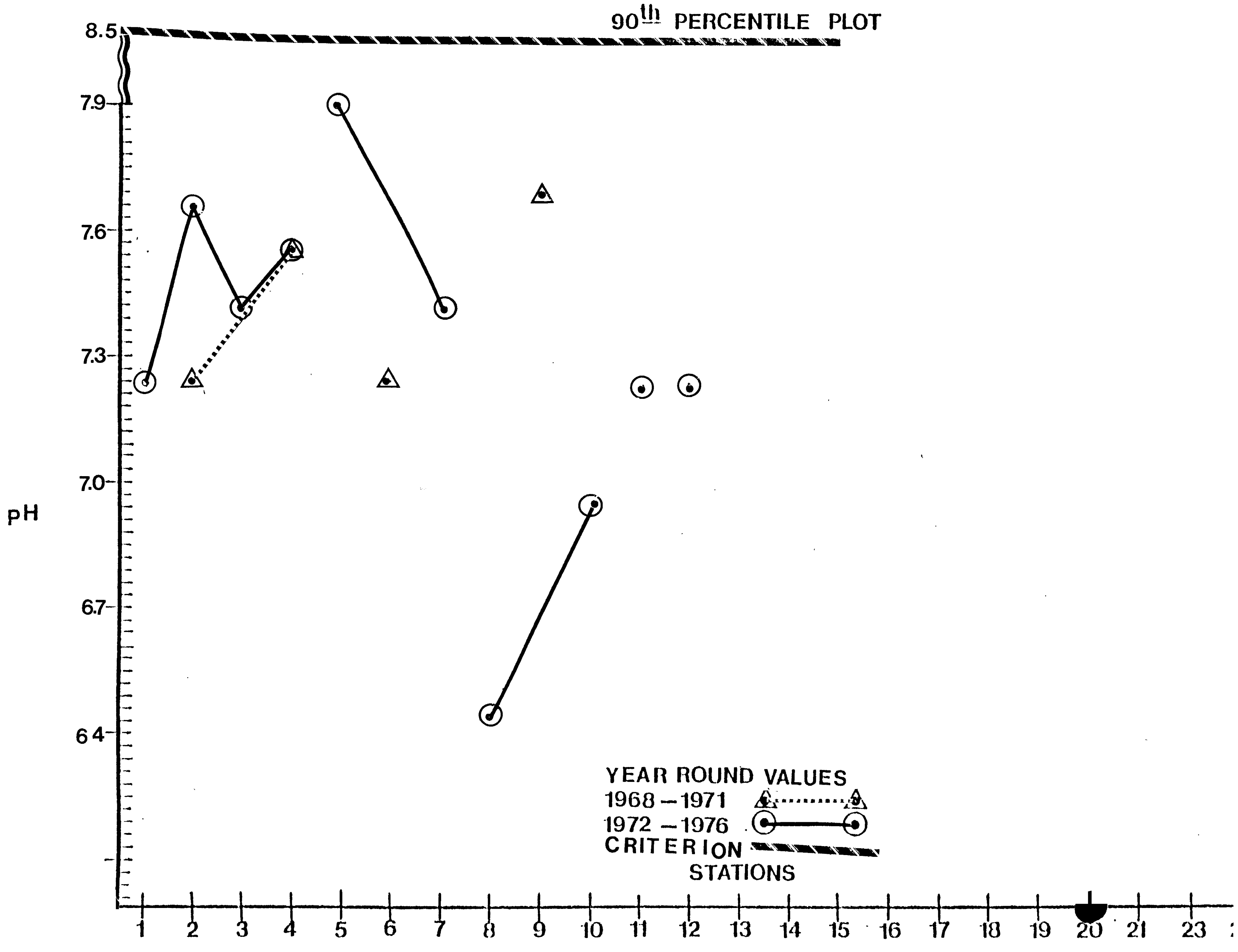

90th PERCENTILE PLOT
8.5
7.9
7.6
7.3
7.0
6.7
6 4
pH
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
23

Figure VI.G.6

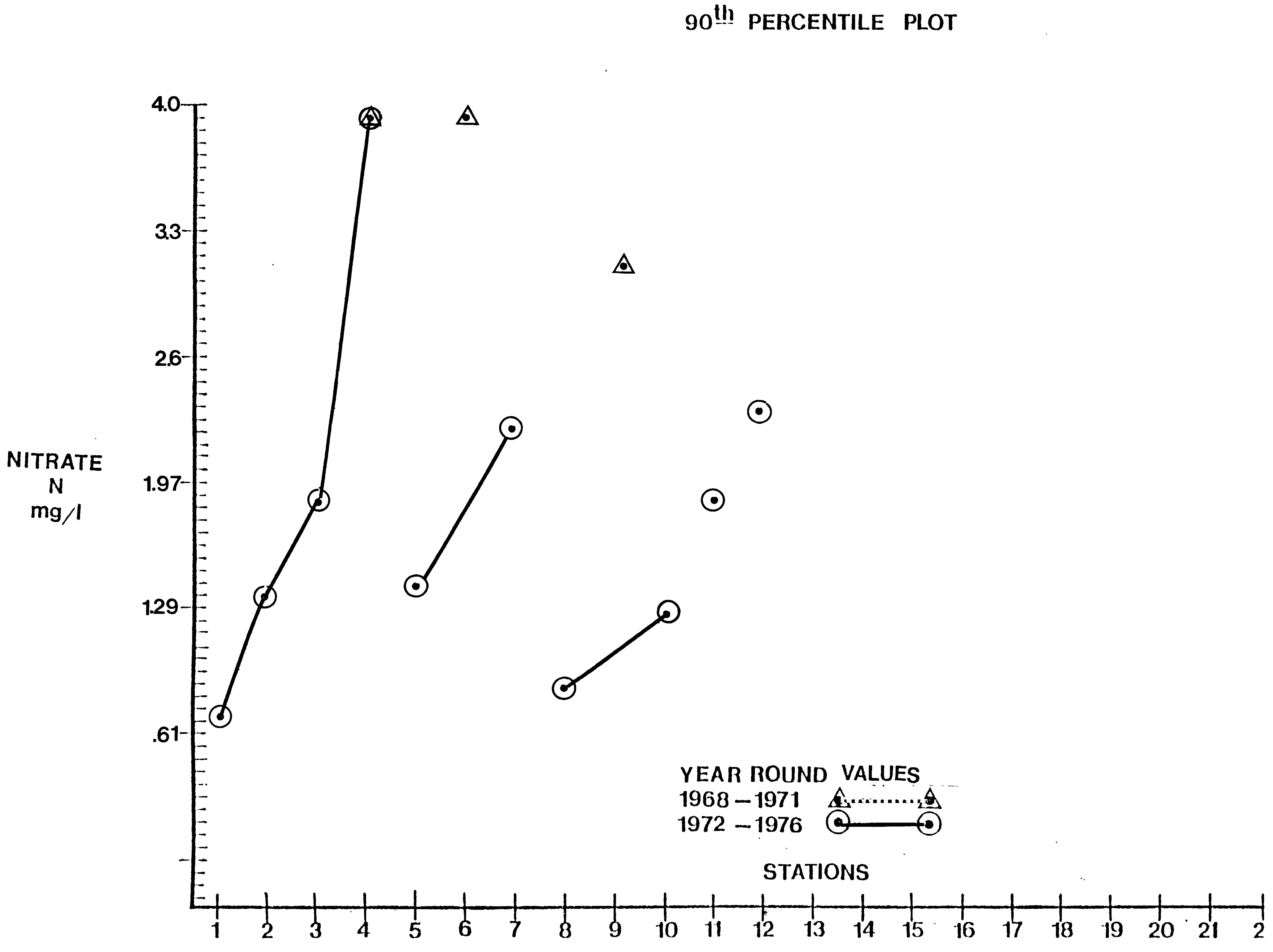
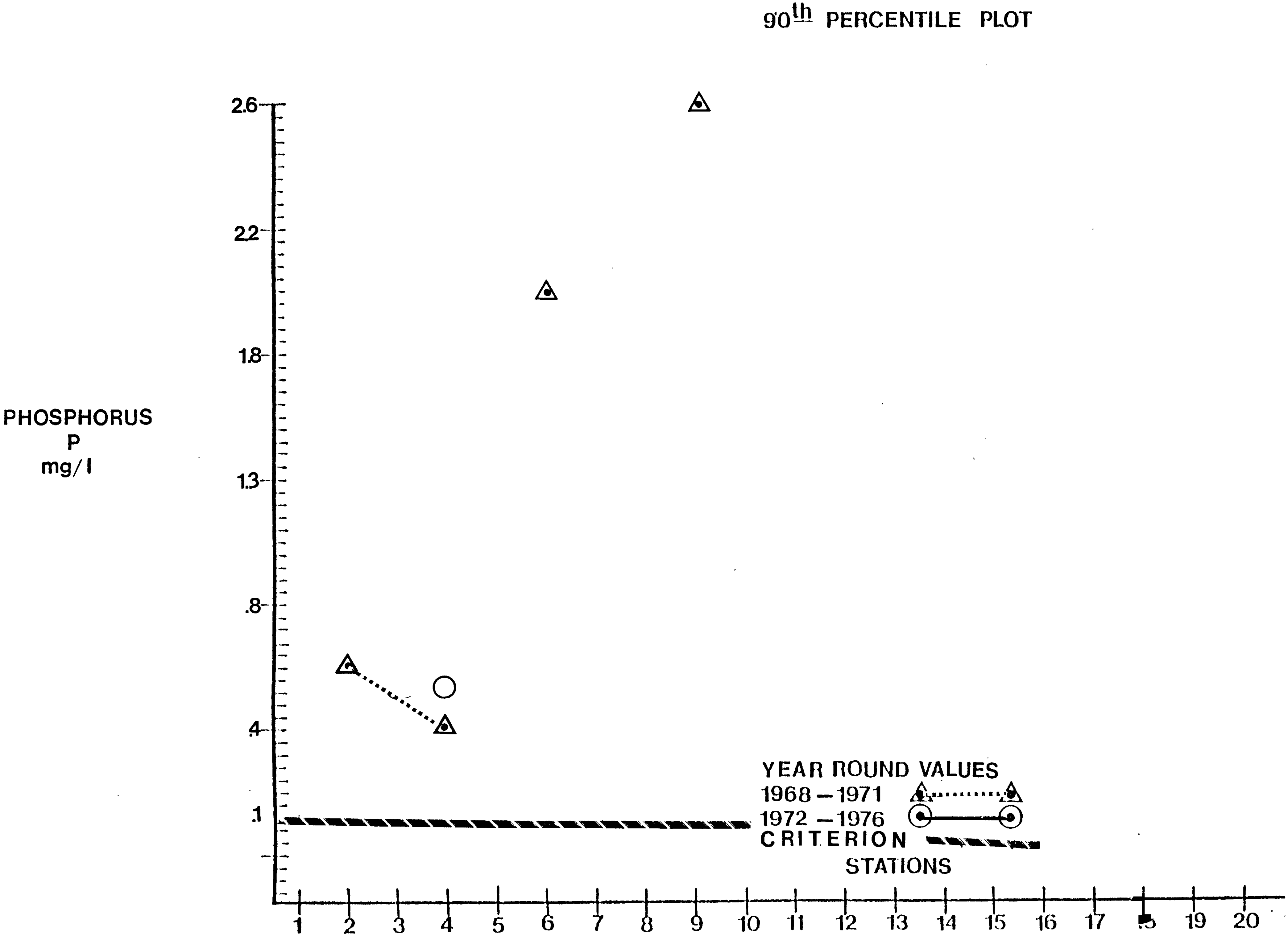

90th PERCENTILE PLOT
NITRATE
N
mg/l
4.0
3.3
2.6
1.97
1.29
.61
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21

Figure VI. G.7



90th PERCENTILE PLOT
PHOSPHORUS
P
mg/l
2.6
2.2
1.8
1.3
.8
.4
.1
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Figure VI.G.8

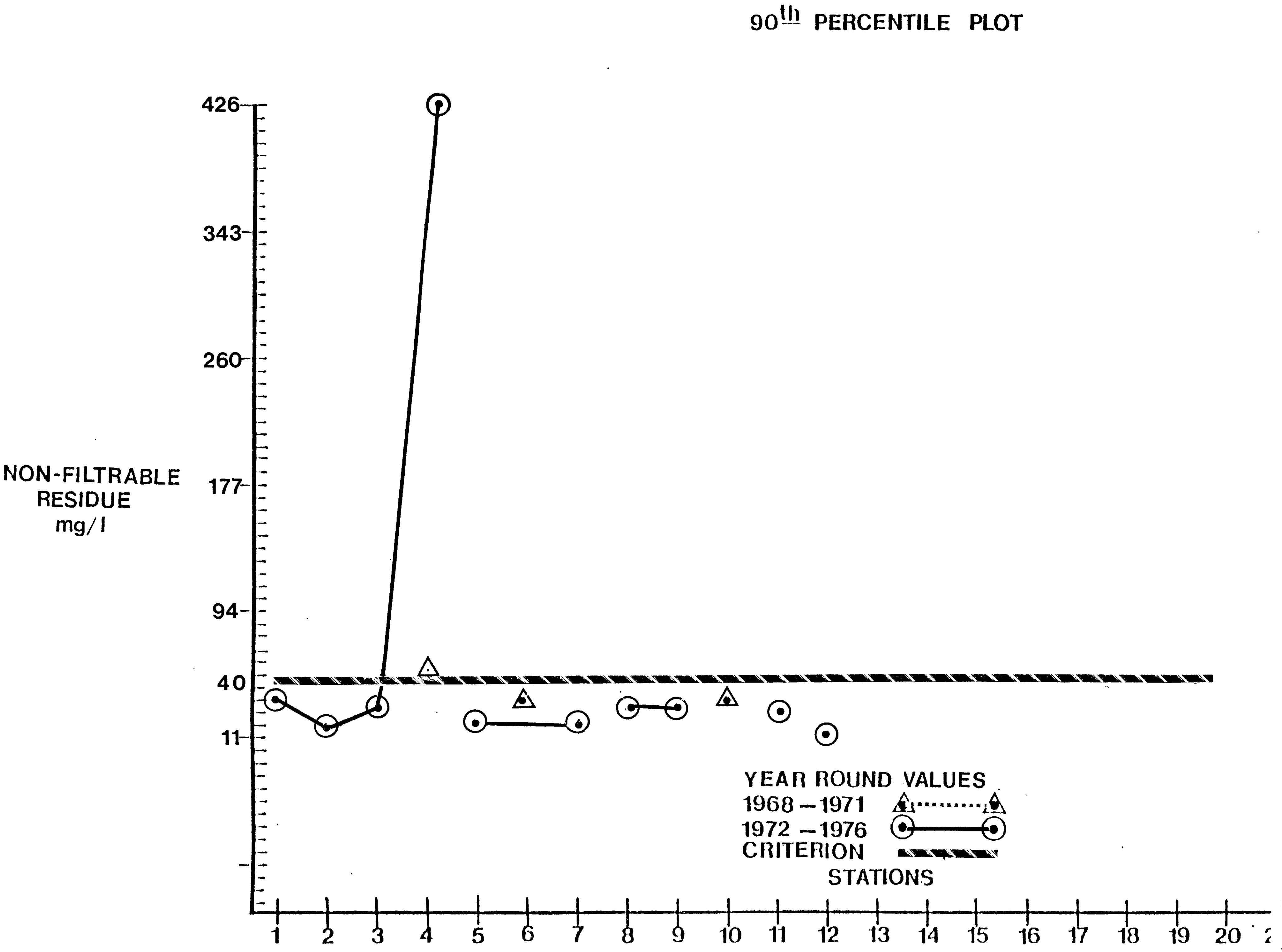

90th PERCENTILE PLOT
NON-FILTRABLE RESIDUE mg/l
426
343
260
177
94
40
11
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Figure VI.G.9

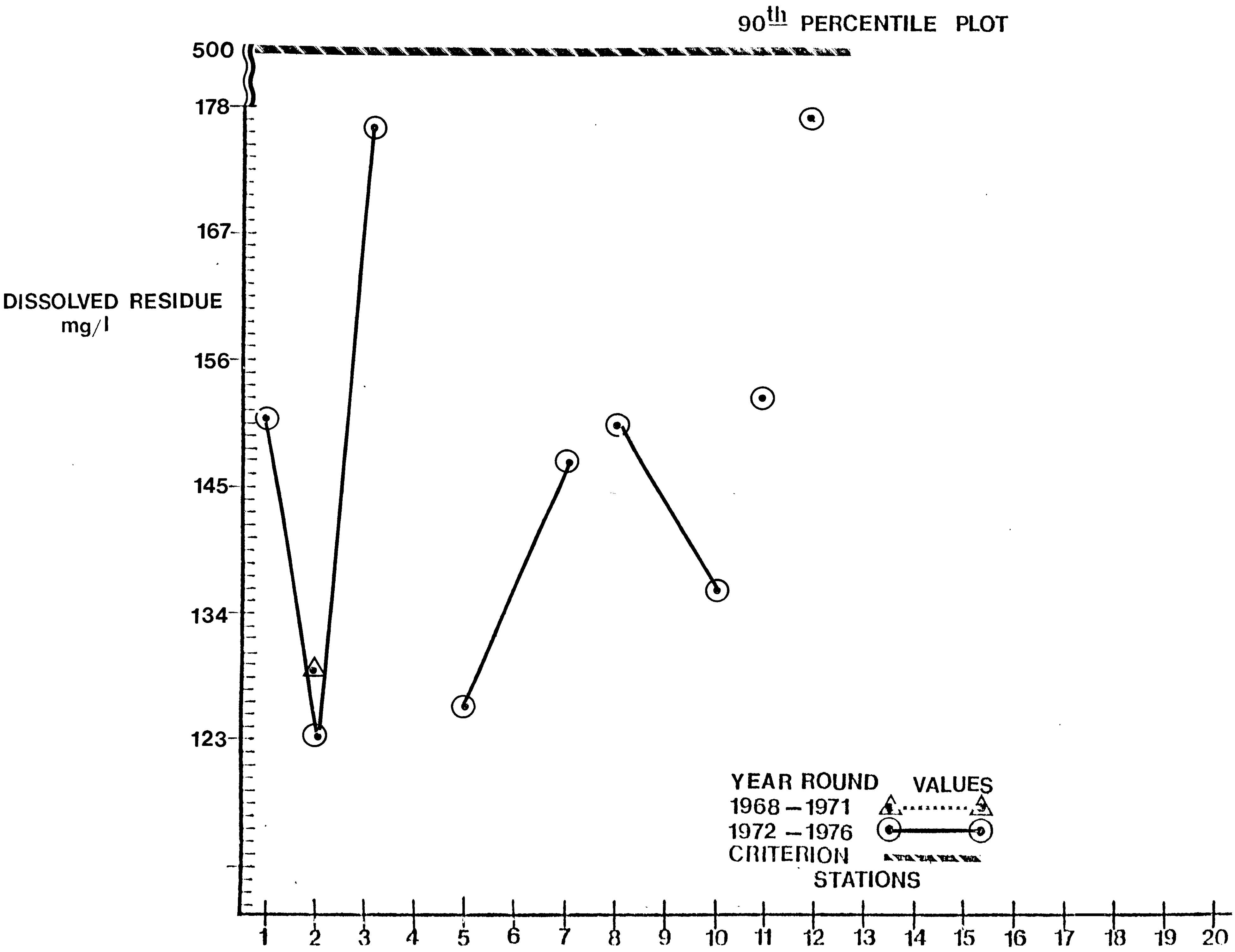
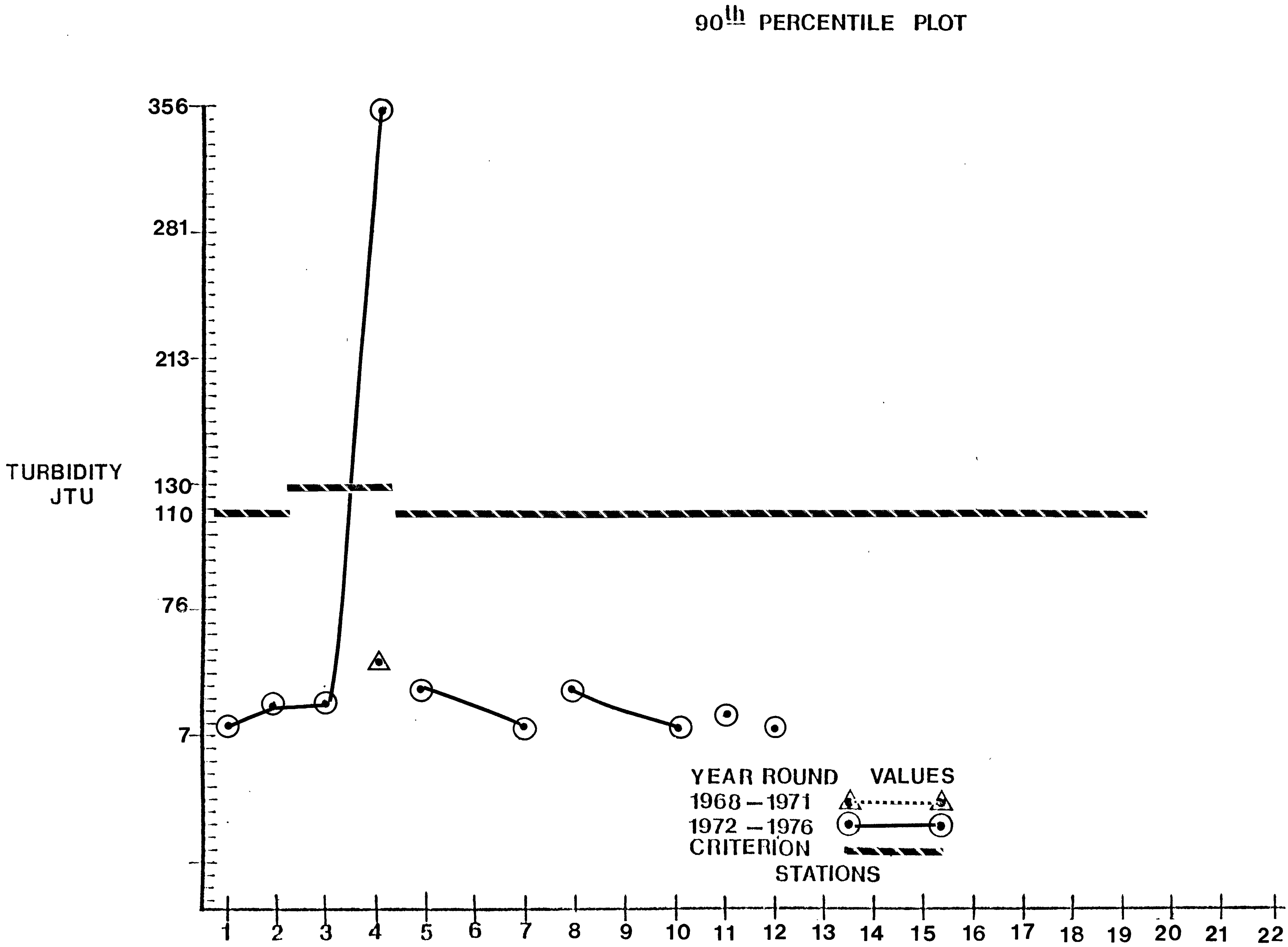

90th PERCENTILE PLOT
500
178
167
156
145
134
123
DISSOLVED RESIDUE
mg/l
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Figure VI.G.10



## Table VI.G.1

DISCHARGER INVENTORY

Crosswicks, Doctors, and Assiscunk Creek Segments

| MAP CODE | MUNICIPALITY | PLANT NAME | DEGREE OF TREATMENT | RECEIVING STREAM | AVG. (MGD) DAILY FLOW 1973 | 1974 | 1975 | 1976 | COMPLIANCE WITH 1977 REQUIREMENTS OF SECONDARY/BEST PRAC-TICABLE TREATMENT LIMITATIONS |
|---|---|---|---|---|---|---|---|---|---|
| A | Allentown | Allentown Municipal | Sec. | Trib. to Crosswicks Cr. | 0.15 | 0.16 | 0.195 | .17 | No |
| B | Hamilton Township | Yardville Groveville Mun. | Sec. | Doctors Creek | 0.534 | 0.630 | 0.430 | .37 | No |
| C | Hamilton Township | Main Municipal Plant | Sec. | Crosswicks Creek | 11.0 | 11.0 | 9.500 | 8.3 | No |
| D | Chesterfield Twp. | Youth Correctional Inst. | Sec. | Crosswicks Creek | 0.37 | 0.275 | 0.270 | .26 | Yes |
| E | Bordentown Twp. | Yates Industries | Ind. | Trib. to Delaware River | 0.250 | 0.250 | 0.350 | .4 | No |
| F | Bordentown Twp. | Bordentown Twp. Mun. | Sec. | Crosswicks Creek | 0.500 | 0.480 | 0.480 | .4 | No |
| G | Bordentown City | Bordentown City | Sec. | Blacks Creek | 18.516 | 19.134 | 17.511 | .80 | No |
| H | Burlington Township | LaGorce Square (Mun.) | Sec. | Assiscunk Creek | 0.150 | 0.530 | 0.220 | .20 | No |
| I | Burlington City | Burlington City Mun. | Sec. | Delaware River | 2.0 | 1.50 | 1.660 | 1.3 | No |
| | Hamilton Township | N.J. Turnpike 6S & 6N | Sec. | Trib. to Crosswicks Creek | .05 | .05 | 0.045 | .05 | Yes |
| | North Hanover Twp. | California Villa | Sec. | Trib. to Crosswicks Creek | 0.025 | 0.020 | 0.020 | .019 | Yes |

# Table VI.G.1

DISCHARGER INVENTORY
Delaware Tributaries Zone 2
Crosswicks, Doctors, and Assiscunk Creek Segments
(Continued)

| MAP CODE | MUNICIPALITY | PLANT NAME | DEGREE OF TREATMENT | RECEIVING STREAM | AVG. (MGD) DAILY FLOW 1973 | 1974 | 1975 | 1976 | COMPLIANCE WITH 1977 REQUIREMENTS OF SECONDARY/BEST PRACTICABLE TREATMENT LIMITATIONS |
|---|---|---|---|---|---|---|---|---|---|
| | North Hanover Twp. | Spartan Village | Sec. | Trib. to Crosswicks Creek | 0.014 | 0.020 | 0.018 | .02 | No |
| | North Hanover Twp. | Hanover Mobile Home | Sec. | Trib. to Crosswicks Creek | 0.009 | 0.0085 | 0.008 | .008 | Yes |
| | Plumsted Township | New Egypt School | Sec. | Trib. to Crosswicks Creek | 0.002 | 0.002 | 0.002 | .002 | No |
| | Washington Township | Mercer Mobile Home Park | Sec. | Trib. to Crosswicks Creek | 0.02 | 0.02 | 0.02 | .014 | Yes |
| | Burlington Township | Burlington Twp. Mun. | Sec. | Delaware River | 0.41 | 0.60 | 0.650 | .78 | Yes |
| | Springfield Twp. | Springfield Twp. School | Sec. | Trib. to Assiscunk Creek | 0.003 | 0.015 | 0.001 | .001 | Yes |

RANCOCAS CREEK

BASIN DESCRIPTION

The Rancocas Creek watershed, draining 346 square miles entirely within Burlington County, consists primarily of two major branches, the North and South Branches, which originate from many small tributary creeks in the rural eastern and central portions of the county. The North Branch has a length of 25 miles and a drainage area of 167 square miles, whereas the slightly smaller South Branch is 23 miles long and drains an area of 144 square miles. The two branches meet at Hainsport and West Hampton Townships just upstream of the New Jersey Turnpike bridge. The mainstem, which drains 35 square miles, flows 8 miles, to its confluence with the Delaware River at Hank Island. Tidal influence extends the entire length of the mainstem to the dam at Mount Holly on the North Branch, Vincentown on the South Branch, and Kirby Mills on the Southwest Branch.

The watershed is characterized by a flat topography with sandy soils of the Cohansey and Kirkwood formations in the eastern headwaters portion with finer grained soils in the western watershed. The surface waters slowly meander through the watershed in a northwesterly direction, passing through many lakes, particularly in the upstream areas. Land use is primarily rural and agricultural along the South Branch while the North Branch supports a corridor of scattered moderate localized suburban development along the river and the more dense populated centers at Mount Holly and Pemberton. Portions of Mount Holly and surrounding areas experience occassional flooding. The outer North Branch watershed is primarily undeveloped or agricultural, as is the upstream reach and its tributaries. The mainstem Rancocas watershed consists of heavy suburban development in its northern section with a combination of moderate to heavy development and rural areas in the southern portion.

Twenty sewage treatment plants are scattered throughout the watershed; most of which are small package plants providing secondary treatment. The largest dischargers are the municipal plants in Willingboro, Mount Holly, Riverside, Evesham and Medford Townships and the Ionac Chemical Company in Birmingham which discharges to unlined lagoons adjacent to the river.

## WATER QUALITY ASSESSMENT

Water quality throughout the Rancocas watershed is generally unacceptable based on chemical and bacteriological parameters. Fecal coliform levels exceed the standard at all stations sampled except two upstream stations, one on the North and one on the South Branch. These two stations, however, exhibit levels on the borderline of unacceptability. Exceptionally high fecal coliform values occur on the Southwest Branch of the Rancocas downstream of the Evesham Township, Medford Lakes Borough, and the Medford Township Municipal Sewage Treatment Plants; and on the South Branch just downstream of its confluence with the Southwest Branch. Dissolved oxygen levels at all stations on the North Branch were in compliance with the criterion; however, based on the total data base, the percent saturation generally decreases in the downstream direction to a level just within the criterion at Mount Holly. The South Branch experiences dissolved oxygen levels contravening the criterion at all stations, with percent saturation decreasing as the waterway progresses downstream. The dissolved oxygen at the mainstem's only station, located at Willingboro approximately mid-way between the confluence of the North and South Branches and the confluence with the Delaware, contravenes the criterion by a considerable margin. The five day biochemical oxygen demand meets the criterion throughout the segment except at the South Branch at Hainesport, which only marginally exceeds the criterion. There exists an expected correlation between the decreases in the percent saturation levels of dissolved oxygen and the increases in $BOD_5$ on both the North and South Branches. The pH values are consistent and nearly neutral at all stations except at the most upstream stations on the North and South Branches. These stations exhibit naturally low acidic pH values common to the Pine barrens of central Burlington and Ocean Counties. Phosphorus levels exceed the criterion at all stations throughout the segment. As with fecal coliform, the highest phosphorus levels, 25 to 32 times the criterion, occur on the Southwest Branch and the South Branch downstream of the above mentioned sewage treatment plant discharges. Nitrate-nitrogen concentrations are generally acceptable. However, the South Branch just downstream of its confluence with the Southwest Branch exhibits higher nitrate-nitrogen levels. Turbidity levels at all stations, although elevated beyond background at the Southwest Branch station, pose no water quality problem and are in compliance with the criterion for the maximum allowable occurrence. Dissolved residue (total dissolved solids) levels are well within the criterion throughout the watershed. Concentrations of non-filtrable residue (suspended solids) comply with the criterion at all stations on the North Branch, although increasing to somewhat elevated levels in the downstream direction. The stations on the South Branch and mainstem (1 station) exceed the criterion with the exception of the Southwest Branch station which is just below the criterion. A significant increase is observed on the South Branch downstream of its confluence with the Southwest Branch.

PROBLEM ASSESSMENT

The Rancocas Creek surface waters receive significant pollutional loading from both point and non-point sources.

Excessive bacteria and phosphorus levels in the upstream non-tidal reaches of the North Branch are attributed to agricultural runoff and malfunctioning septic systems, two sewage treatment plants and occassional discharges from the Fort Dix Pumping Station. Urban runoff and the two Mount Holly S.A. Sewage Treatment Plants provide additional nutrient and $BOD_5$ loading to the North Branch along its lower reaches. The two plants, neither of which are in compliance with the requirements of secondary/best practicable treatment limitations, have a combined flow of approximately 2.4 million gallons per day. The runoff and point source loadings have not been determined and differentiated due to the lack of downstream data on the North Branch. The other domestic/municipal point sources on the North Branch discharge a cumulative total of approximately 1.15 MGD. The North Branch indirectly and directly receives the industrial wastewater discharge from Ionac Chemical Corporation located in Pemberton Township. The wastewater effluent is discharged to unlined lagoons which readily leach into the adjacent North Branch. Although the available data do not indicate significant degradation to the North Branch based on sampled parameters, the discharge consists of organic and toxic wastes which may have a chronic effect on the aquatic biota.

The South Branch experiences non-point source loading from agricultural runoff and malfunctioning septic systems (especially around Ewanville); however, the primary impact on this watershed is caused by point source discharges. The major dischargers within the Southwest Branch watershed are the Evesham Township MUA, Medford Township, and Medford Lakes Borough Sewage Treatment Plants, discharging approximately 2.5 MGD into upstream areas. Of these three dischargers, the Medford Township Municipal STP and the Evesham Township MUA are in compliance with the requirements of secondary/best practicable treatment limitations. The Medford Lakes Borough

STP discharges approximately 0.4 MGD immediately upstream of the Birchwood-Oakwood Lakes system. Extensive surveys by the New Jersey Department of Environmental Protection, Division of Water Resources implicate the discharge as being responsible for the excessive algal problems experienced in these recreational lakes due to the excessive phosphorus content. Other point sources account for approximately 0.19 MGD discharged into the South Branch and its tributaries.

The mainstem Rancocas receives approximately 4.6 MGD from four sewage treatment plants, the largest being the Willingboro Municipal Utilities Authority at 3.6 MGD and the Riverside Sewage Authority at 0.9 MGD. The Delran Township Sewage Authority (0.9 MGD), although not discharging into the Rancocas, impacts the mainstem through tidal action. Besides point sources, the mainstem also receives considerable suburban runoff and is heavily influenced by tidal effects. Based on one sampling station on the mainstem, it is impossible to accurately determine and differentiate the impact attributable to the various contributors.

Only six of the twenty wastewater discharges in the Rancocas Segment, presently meet the requirements of secondary/best practicable treatment limitations.

GOAL ASSESSMENT AND RECOMMENDATIONS

Overall, water quality within the Rancocas Creek watershed does not meet the Fishable goal as presented in the Act (P.L. 92-500). The swimmable goal is not met throughout the watershed due to excessive fecal coliform levels.

The North Branch exhibits the best water quality within the segment, with Fishable goals presently met. Since the excessive fecal coliform levels in the non-tidal reach is attributed to agricultural runoff, and malfunctioning septic systems, an intensified bacteriological sampling program is recommended to differentiate animal and human contamination. Sanitary surveys with mandated corrective action in areas presently served by septic systems will improve water quality, however, it is doubtful that swimmable goals will be achieved everywhere within the watershed until improved agricultural runoff controls are implemented. An expanded monitoring program on the downstream reach of the North Branch is needed to determine the impact from urban runoff and the Mount Holly Sewage Authority discharges. These plants, presently organically overloaded, are to be upgraded in 1978.

Intensive biological and toxics monitoring is recommended for the North Branch in the vicinity of Ionac Chemical Corporation to ascertain any water quality degradation or acute or chronic deleterious effects on the aquatic biota. A regional plant at Pemberton will incorporate 0.25 MGD of the discharges from several treatment plants throughout the segment. Abandonment of these facilities has proceeded slowly because of problems in getting the service agreements between the Authority and owners of the facilities signed.

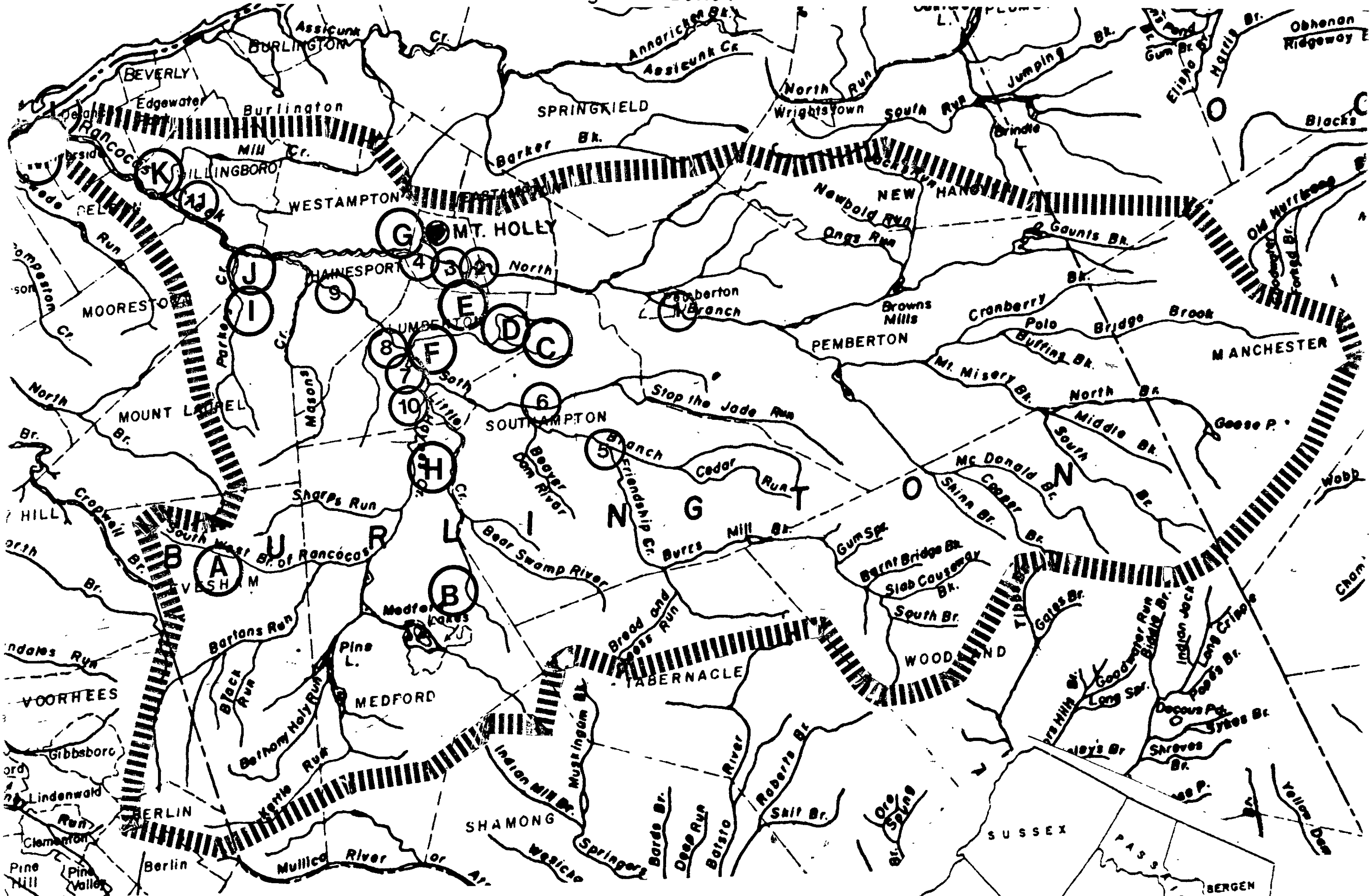
Fishable and swimmable goals are not met in the South Branch watershed due to point and non-point sources. Upgrading of the major treatment plants in this watershed will result in compliance with the Fishable goals; however, this may not be accomplished by 1983. As with the North Branch, the swimmable goal will not be achieved on the South Branch by 1983. Elimination of malfunctioning septic systems will reduce the level of bacterial pollution, but not to swimmable levels. The goal may be achievable in the distant future through implementation of agricultural runoff controls and, in regard to future development, careful land use planning and management. The specific problem of excessive phosphorus in the Medford Lakes Borough Sewage Treatment Plant discharge which results in excessive algal growth in the Birchwood-Oakwood Lakes System, should be alleviated in the near future. The Borough after legal intervention by the Division of Water Resources, is in the process of implementing nutrient control ponds for the removal of excessive phosphorus from the effluent. Conventional removal of phosphorus by chemical precipitation will be sought if acceptable removal is not achieved by the nutrient control ponds. Redredging of Birchwood Lake and initial dredging of Oakwood Lake to remove bottom nutrients and sediment accumulation is recommended.

Intensive and thorough biological and chemical monitoring should be conducted on the mainstem to determine the impact of point sources (particularly that of Willingboro MUA) and non-point sources to determine whether fishable goal can be achieved. Since the swimmable goal is not achievable by 1983 on the North and South Branches, it also will not be met on the mainstem of the Rancocas Creek.

## STATION LIST

| Station Number | Location |
|---|---|
| 1 | North Branch Rancocas Creek at Pemberton |
| 2 | North Branch Rancocas Creek at Mount Holly |
| 3 | North Branch Rancocas Creek at Pine Street, Mount Holly |
| 4 | North Branch Rancocas Creek at Mount Holly |
| 5 | South Branch Rancocas Creek at Retreat |
| 6 | South Branch Rancocas Creek at Vincentown |
| 7 | South Branch Rancocas Creek at Eayrestown |
| 8 | South Branch Rancocas Creek at Lumberton |
| 9 | South Branch Rancocas Creek at Hainsport |
| 10 | Southwest Branch Rancocas Creek at Eayrestown |
| 11 | Rancocas Creek at Willingboro |

Figure VI.H.1




LOCATION

RANCOCAS

LEGEND

Point Source

Monitoring Site

Drainage Basin Boundaries

County Bounderies

Municipal Bounderies

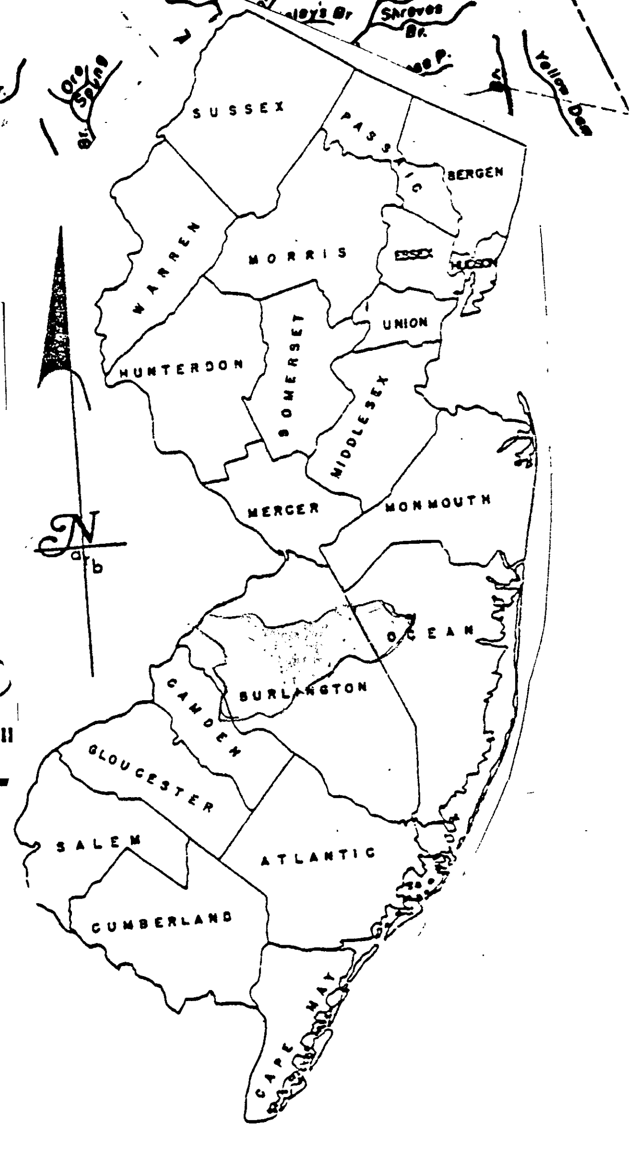


Figure VI.H.2

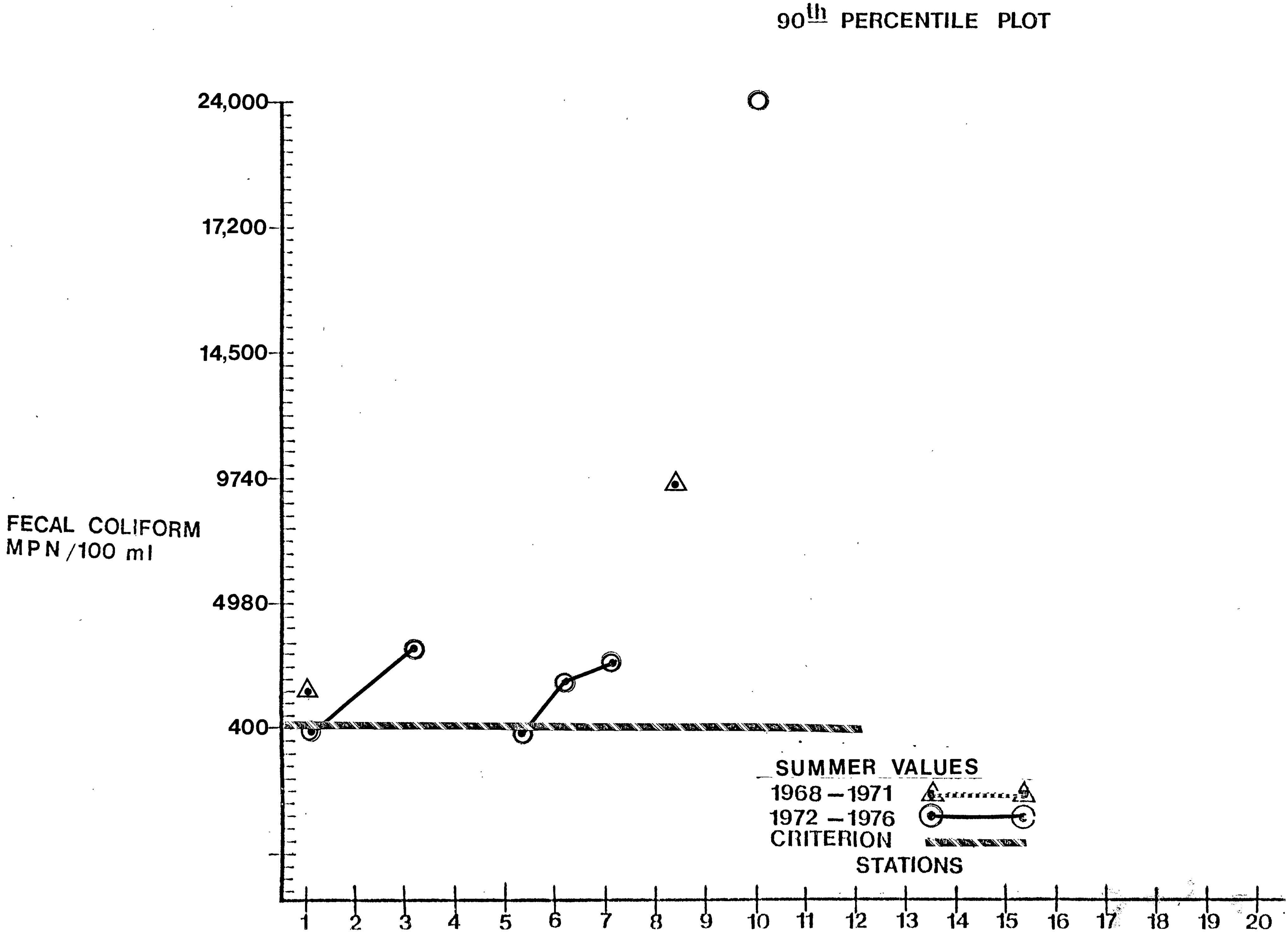

90th PERCENTILE PLOT
24,000
17,200
14,500
9740
4980
400
FECAL COLIFORM
MPN/100 ml
SUMMER VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Figure VI.H.3

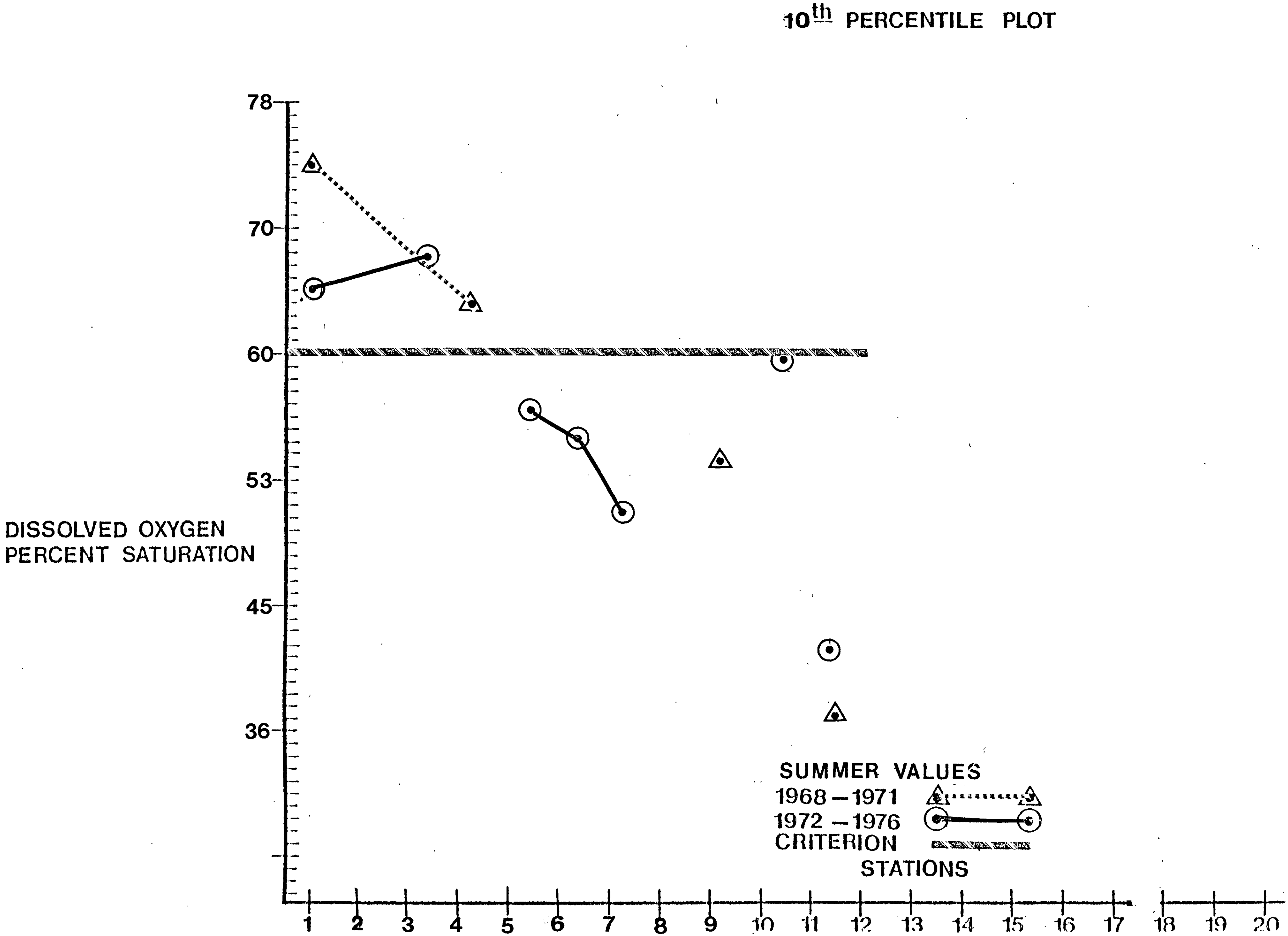
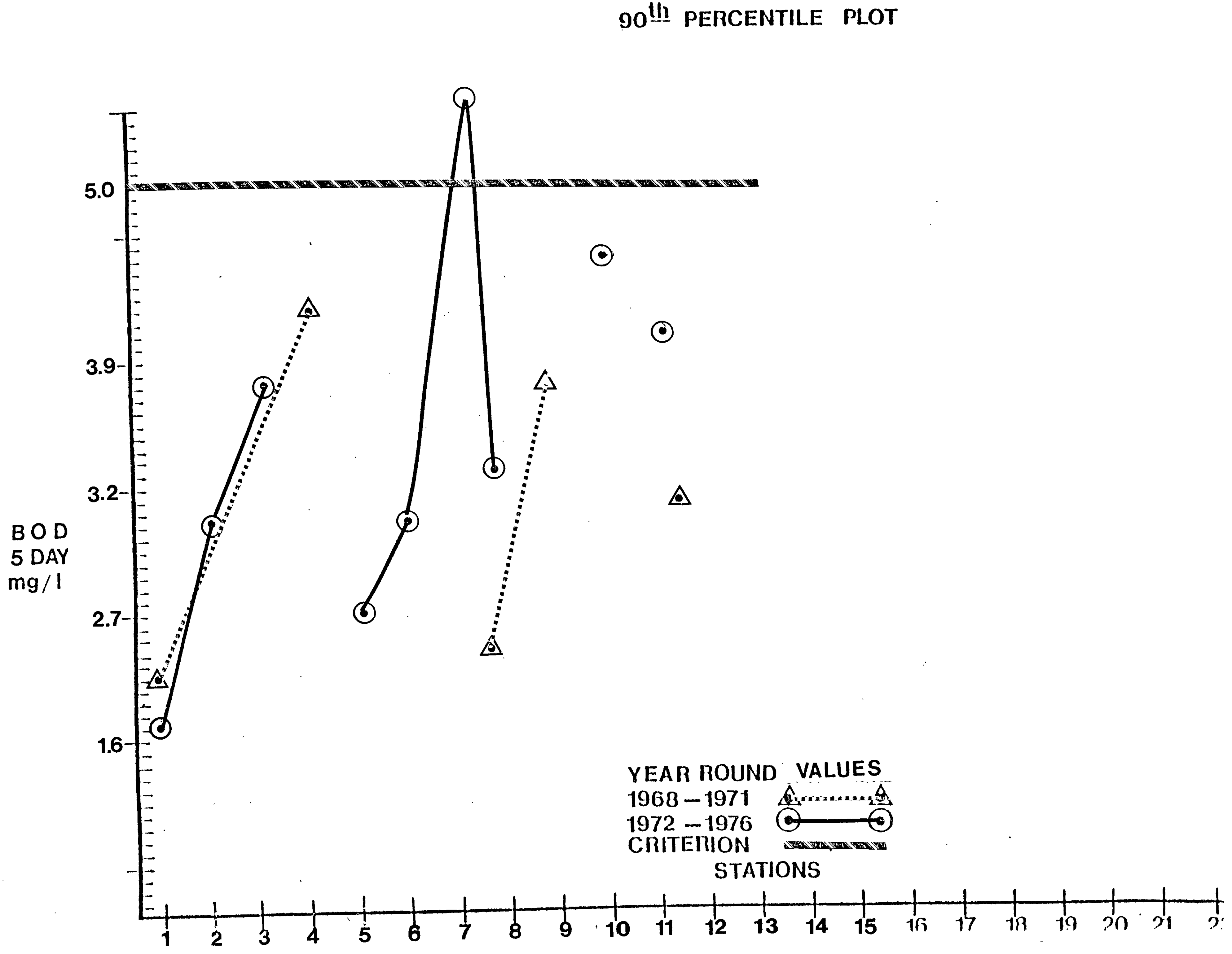
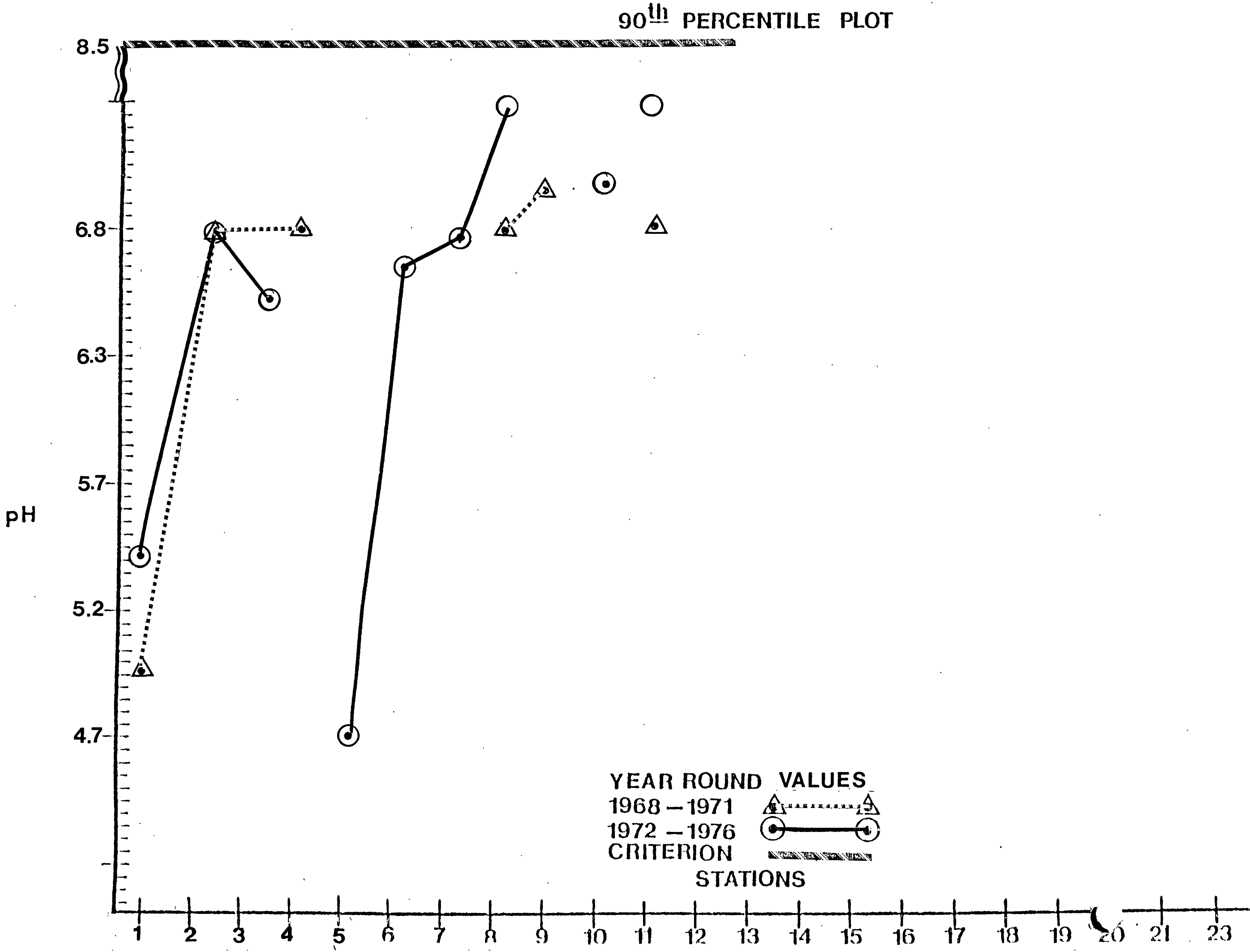

10th PERCENTILE PLOT
DISSOLVED OXYGEN PERCENT SATURATION
78
70
60
53
45
36
SUMMER VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Figure VI.H.4



90th PERCENTILE PLOT
5.0
3.9
3.2
2.7
1.6
BOD
5 DAY
mg/l
YEAR ROUND VALUES
1968 — 1971
1972 — 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21

Figure VI.H.5



90th PERCENTILE PLOT
8.5
6.8
6.3
5.7
5.2
4.7
pH
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
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10
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14
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16
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19
20
21
23

Figure VI.H.10

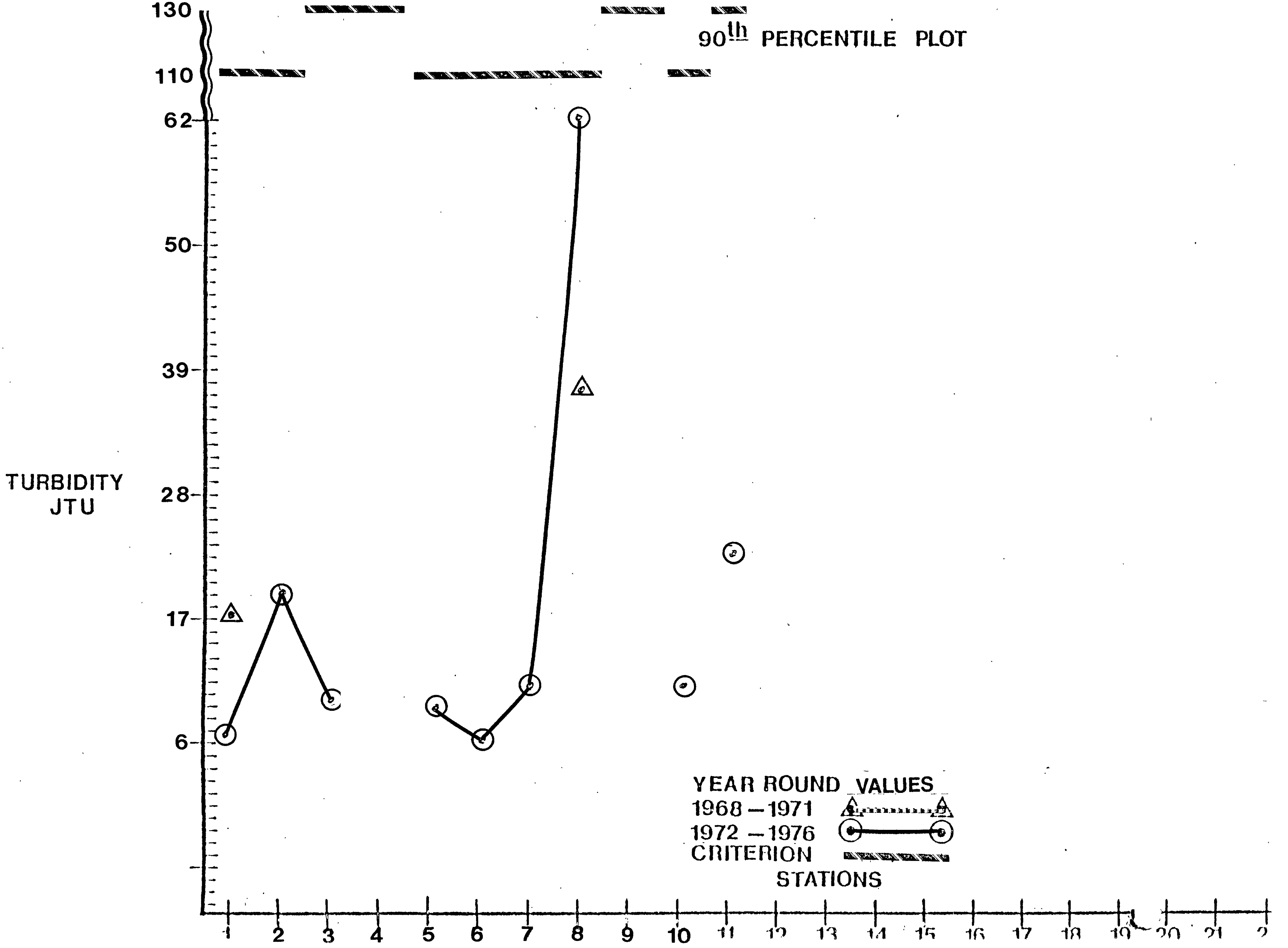
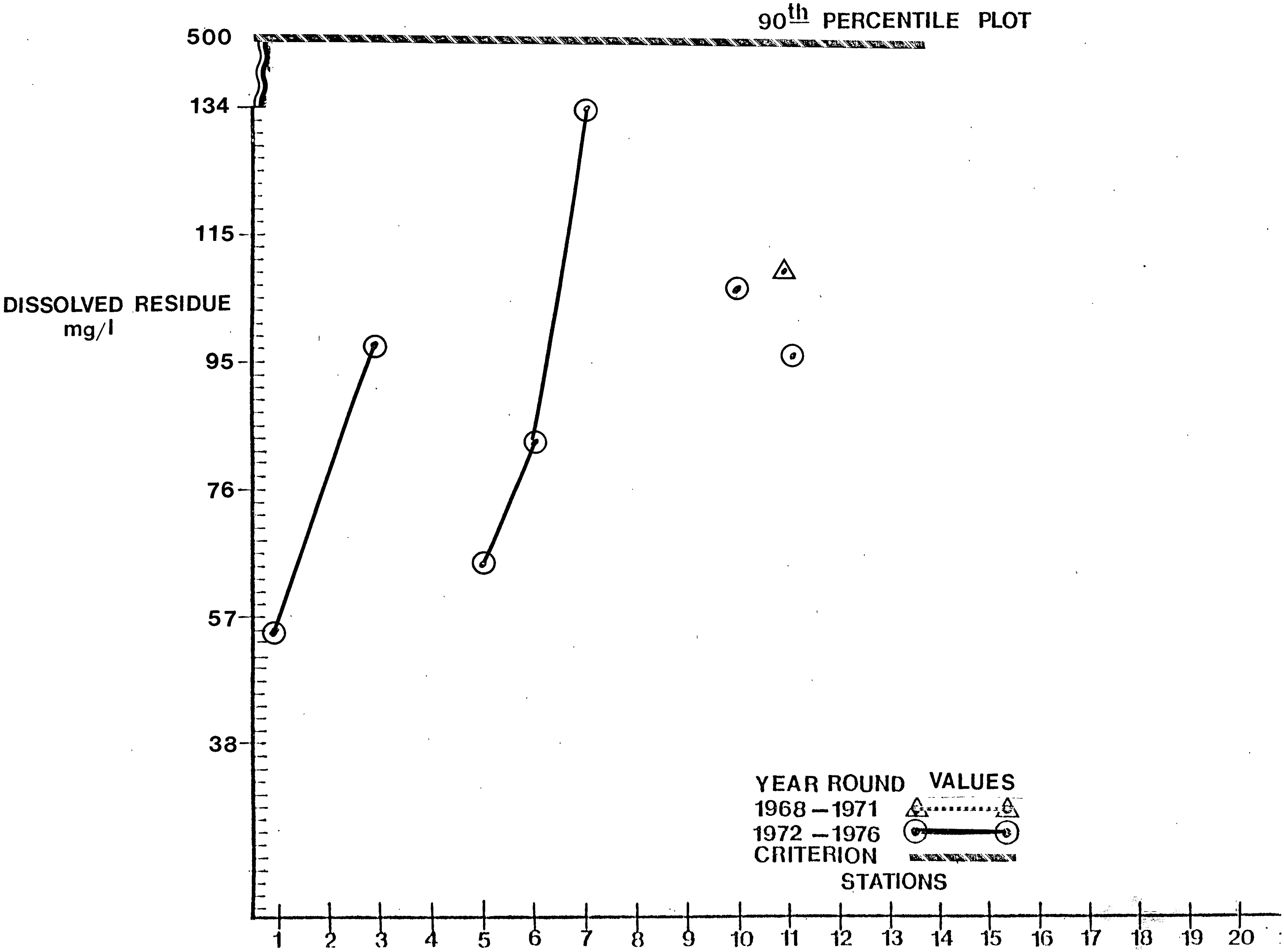
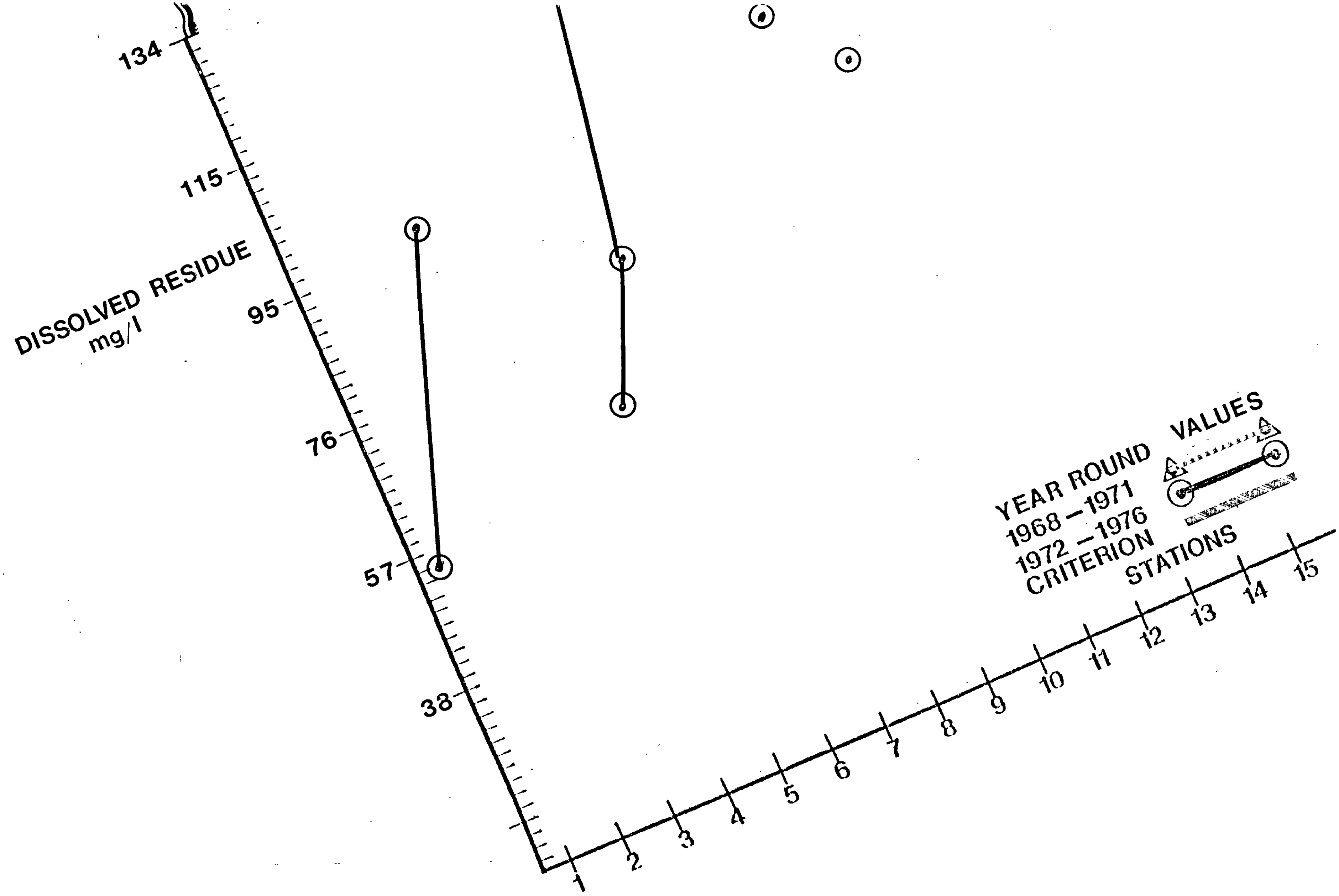


Figure VI.H.9

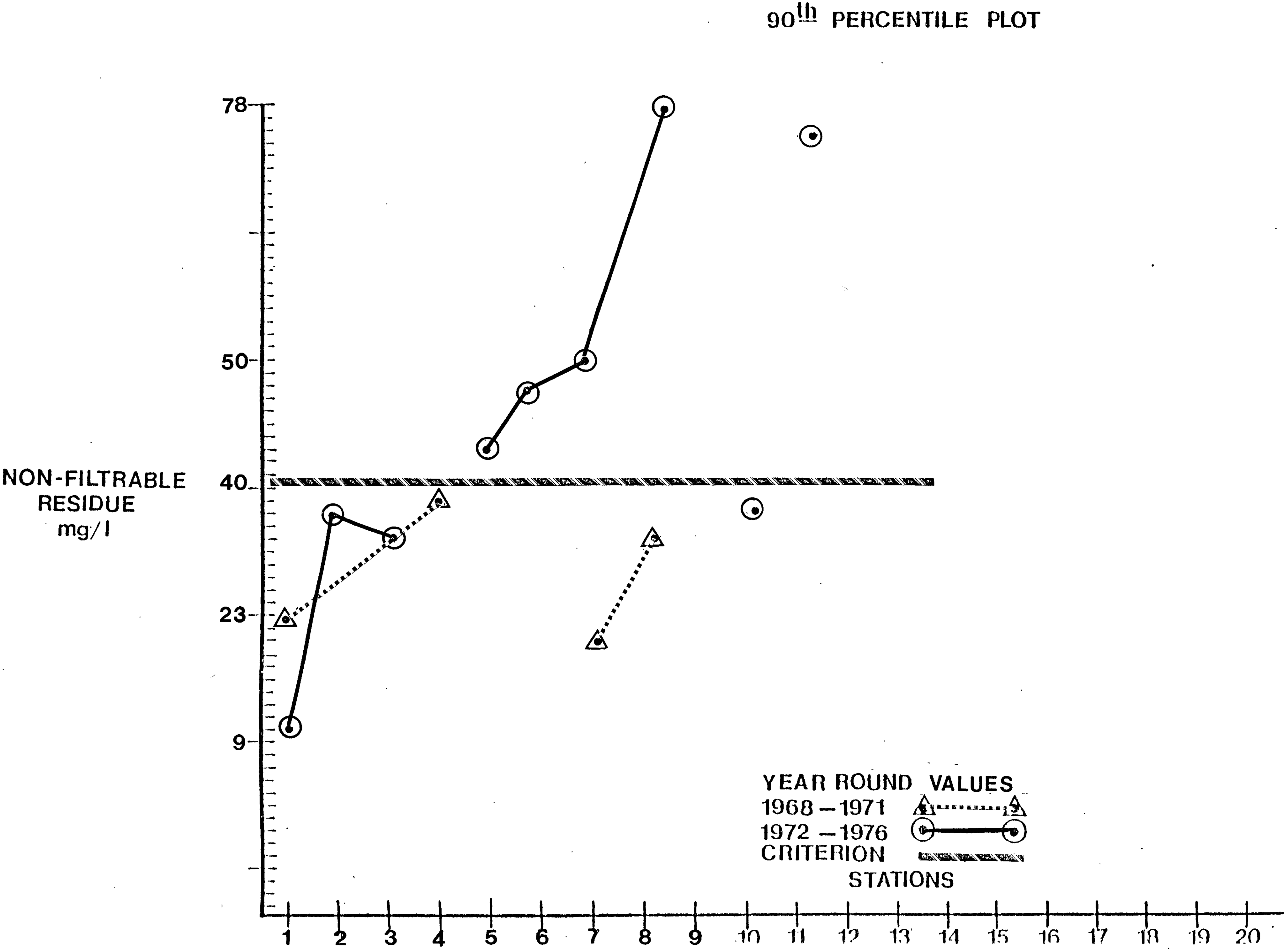


90th PERCENTILE PLOT
500
134
115
95
76
57
38
DISSOLVED RESIDUE
mg/l
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20



DISSOLVED RESIDUE
mg/l
134
115
95
76
57
38
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15

Figure VI.H.8



90th PERCENTILE PLOT
NON-FILTRABLE RESIDUE mg/l
78
50
40
23
9
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
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11
12
13
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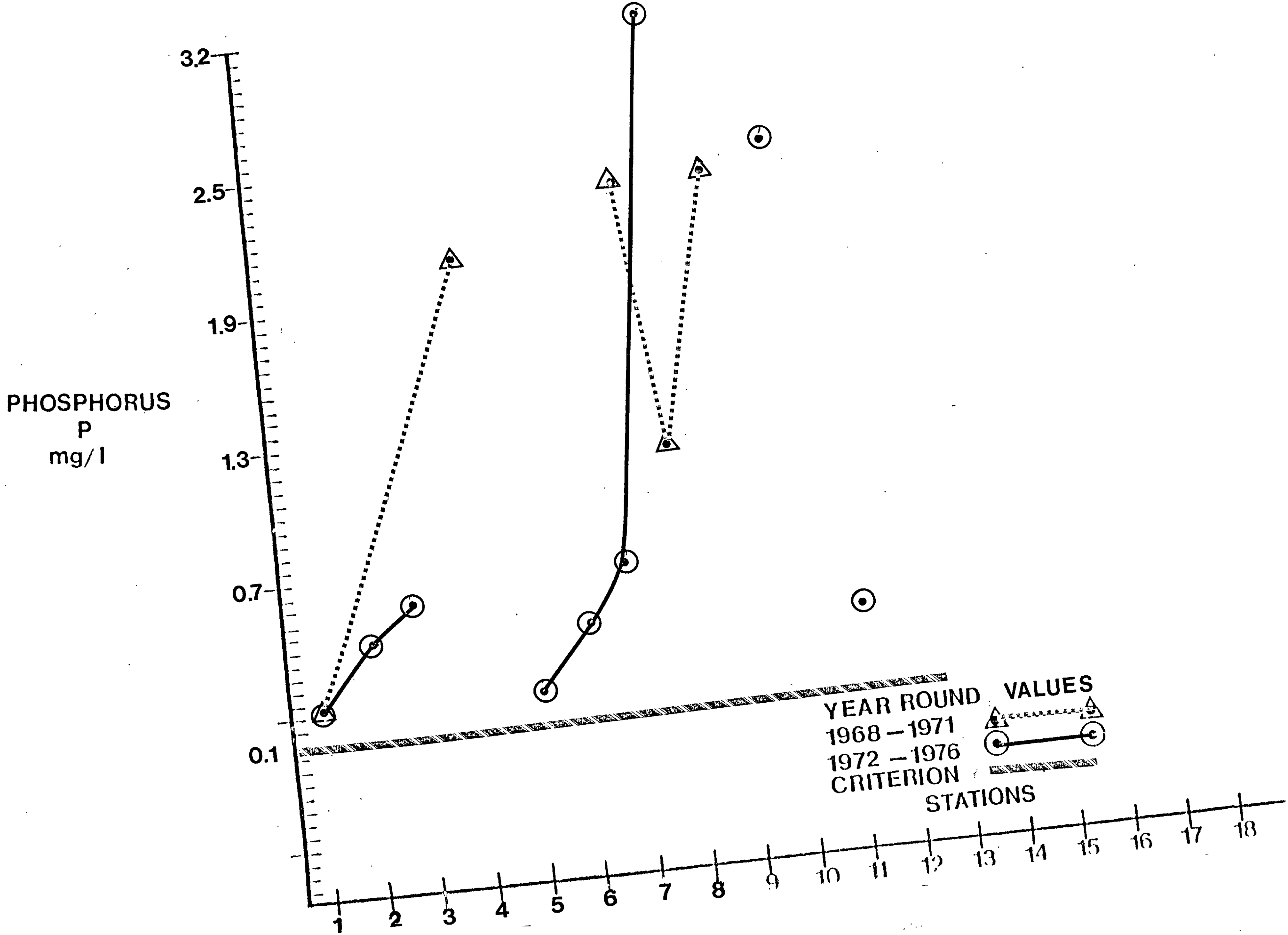
19
20


PHOSPHORUS
P
mg/l
3.2
2.5
1.9
1.3
0.7
0.1
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
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14
15
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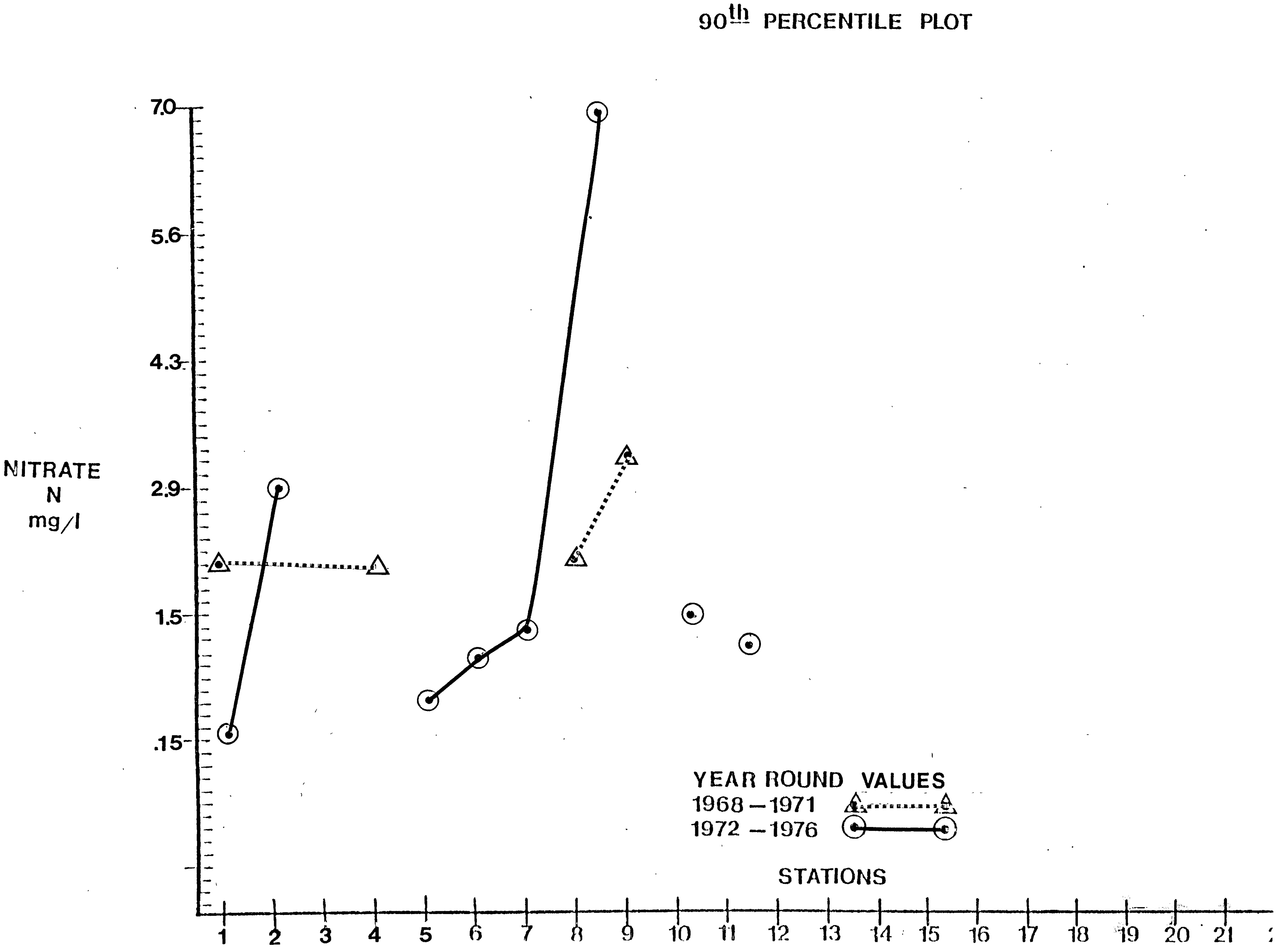
17
18

Figure VI.H.6


90th PERCENTILE PLOT
NITRATE
N
mg/l
7.0
5.6
4.3
2.9
1.5
.15
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
STATIONS
1
2
3
4
5
6
7
8
9
10
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14
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16
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18
19
20
21

## Table VI.H.1

DISCHARGER INVENTORY

Rancocas Creek Segment

| MAP CODE | MUNICIPALITY | PLANT NAME | DEGREE OF TREATMENT | RECEIVING STREAM | AVG. (MGD) DAILY FLOW 1973 | 1974 | 1975 | 1976 | COMPLIANCE WITH 1977 REQUIREMENTS OF SECONDARY/BEST PRACTICABLE TREATMENT LIMITATIONS |
|---|---|---|---|---|---|---|---|---|---|
| A | Evesham Township | Elmwood | Sec. | Southwest Br. of Rancocas Creek | 0.78 | 0.85 | 0.930 | 1.0 | Yes |
| B | Medford Lakes | Medford Lakes Mun. | Sec. & Ter. | Rancocas Creek | 0.35 | 0.40 | 0.425 | .41 | No |
| C | Pemberton Borough | Pemberton Boro Mun. | Sec. | North Br. Rancocas Creek | 0.13 | 0.13 | 0.175 | .14 | No |
| D | Pemberton Borough | Pemberton Twp. M.U.A. | Under Construction | | | | | .4 | No |
| E | Pemberton Township | Ionac Chemical | Ind. | No. Branch Rancocas Creek | | | | 1.74 | No |
| F | Southampton Twp. | Southampton Sewer Co. | Ter. | So. Br. Rancocas Creek | 0.120 | 0.170 | 0.120 | .15 | Yes |
| G | Mount Holly Twp. | Mount Holly Sew. Auth. #1 | Sec. | North Br. Rancocas Creek | 0.8 | 0.80 | 0.925 | .92 | No |
| | Mount Holly Twp. | Mount Holly Sew. Auth. #2 | Sec. | North Br. Rancocas Creek | 1.3 | 1.3 | 1.500 | 1.4 | No |
| H | Medford Township | Medford Twp. Mun. | Sec. | Southwest Branch of Rancocas Cr. | 0.55 | 0.80 | 0.90 | .88 | Yes |
| I | Mount Laurel Twp. | New Plant (MUA) Hartford | Sec. | Rancocas Creek | .234 | 0.350 | 0.350 | .45 | Yes |
| J | Mount Laurel Twp. | Rancocas Woods M.U.A. | Sec. | South Branch Rancocas | .120 | .120 | 0.055 | .05 | No |
| K | Willingboro Twp. | Willingboro MUA | Sec. | Rancocas Creek | 3.500 | 3.500 | 3.900 | 3.6 | No |
| L | Riverside Township | Riverside Sewerage Auth. | Sec. | Trib. to Rancocas Creek | 0.09 | 0.90 | 0.900 | .9 | No |

## Table VI.H.1

DISCHARGER INVENTORY

Rancocas Creek Segment (Cont'd)

| MAP CODE | MUNICIPALITY | PLANT NAME | DEGREE OF TREATMENT | RECEIVING STREAM | AVG. (MGD) DAILY FLOW 1973 | 1974 | 1975 | 1976 | COMPLIANCE WITH 1977 REQUIREMENTS OF SECONDARY/BEST PRAC-TICABLE TREATMENT LIMITATIONS |
|---|---|---|---|---|---|---|---|---|---|
| M | Delran Township | Delran S.A. | Sec. | Delaware River | 1.0 | 1.0 | 0.900 | .9 | Yes |
| | Mount Laurel Twp. | N.J. Turnpike Authority | Sec. | Rancocas Creek | .035 | .035 | 0.035 | .03 | Yes |
| | Pemberton Township | Delaire Trailer Park A | Sec. | No. Branch Rancocas | - | - | 0.07 | .055 | No |
| | Pemberton Township | Delaire Trailer Park B | Sec. | No. Branch Rancocas | - | - | 0.06 | .055 | No |
| | Pemberton Township | Board of Ed. #1 | Ter. | Trib. to Rancocas Creek | 0.015 | 0.025 | 0.025 | .02 | No |
| | Pemberton Township | Board of Ed. #2 | Ter. | Trib. to Rancocas Creek | | | | .03 | No |
| | Pemberton Township | Hilltop Trailer Court | Sec. | Trib. to Rancocas Creek | 0.009 | 0.009 | 0.009 | .009 | No |
| | Pemberton Township | Sunbury Village Sewer Co. | Sec. | Trib. to No. Br. Rancocas | 0.07 | 0.07 | 0.075 | .08 | No |
| | Southampton Twp. | Vincentown Ele. School | Sec. | So. Br. Rancocas Creek | 0.003 | 0.003 | 0.007 | .006 | No |
| | Southampton Twp. | Mobile Estates Inc. | Sec. | Trib. to Rancocas Creek | 0.03 | 0.03 | 0.03 | .03 | No |

# PENNSAUKEN CREEK AND COOPER RIVER

## BASIN DESCRIPTION

Both the Pennsauken Creek and Cooper River originate in rural areas of Burlington and Camden Counties. The Cooper River watershed is entirely within Camden County. The drainage area of the Pennsauken Creek is primarily in Burlington County; however, the South Branch Pennsauken Creek, which forms the boundary between Burlington and Camden Counties, receives some drainage from Camden County. Both waterways consist of North and South Branches beginning as small fast moving streams which flow into lakes and finally become sluggish tidal rivers, before entering the Delaware River opposite Philadelphia.

The Cooper River drains 42 square miles which consists of rural upstream areas, expanding suburban development along the mid-segment and a dense urban downstream watershed, including the City of Camden, in its lower sector. The upstream watershed is composed of small tributaries converging upstream of Kirkwood Lake with several lakes in the Gibbsboro-Lindenwold area. Other on-stream lakes downstream of Kirkwood Lake are Evans Pond and Cooper River Lake. The North Branch flows through a predominently suburban area scattered with farms, and joins the mainstem between Erlton, Wallworth Park, and West Haddonfield. The mouth of the Cooper River is characterized by extensive Tidal Flats. Fifteen municipal sewage treatment plants discharge into the Cooper River or its tributaries. Water quality in the tidal portion of the Cooper River, below Cooper River Lake, is affected by tidal inflow from the Delaware River. Significant local discharges to the Delaware River include the two Camden County M.U.A. treatment plants in Camden City, the Pennsauken Sewage Authority treatment plant, and discharges on the Philadelphia side of the river.

The Pennsauken Creek watershed, located just north of the Cooper River watershed, consists of 30 square miles of predominently suburban land with some agricultural activity. Farming exists mainly in the upstream areas, particularly in the north branch watershed. The upstream reaches of the South Branch support moderate localized suburban development mixed with agricultural activities. The lower reaches of both the North and South Branches flow through heavy suburban areas consisting of large housing developments and recently constructed shopping centers. The two branches converge between Cinnaminson and Maple Shade, with the mainstem meandering just over 3 miles to its confluence with the Delaware River. The mouth, like that of the Cooper River, is characterized by extensive tidal flats. Two significant industrial and eight municipal treatment plants discharge into the Pennsauken Creek watershed. The tidal reaches also are affected by the local water quality of the Delaware River.

Overall, the Cooper River and Pennsauken Creek segment, which has a total drainage area of 72 square miles, receives the discharges of 25 wastewater treatment plants plus considerable suburban and urban runoff. Sewer connection bans are common throughout the segment because many of the existing municipal treatment plants are hydraulically and/or organically overloaded.

## WATER QUALITY ASSESSMENT

Water quality within the Pennsauken and Cooper River segment is unacceptable based on existing bacteriological and chemical data. The surface waters of both the Pennsauken Creek and Cooper River watersheds experience excessive fecal coliform, five-day biochemical oxygen demand, phosphorus, and non-filterable residue (suspended solids) levels and depressed dissolved oxygen levels which contravene the criteria for these parameters. Exceptionally high fecal coliform levels, greater then 100,000 MPN/100 ml, were recorded during 1968-1971 on the South Branch Pennsauken Creek near Moorestown and on the Cooper River at Camden upstream of the tidal gates. Bacterial samples were not collected at these stations during the 1972-1976 data period. Dissolved oxygen levels contravene the percent saturation criterion at all stations except on the Cooper River at the outlet of Linden Lake, an upstream station free from point source impact. An exceptionally low saturation level was recorded on the Cooper River at Lawnside. The five day biochemical oxygen demand values also exceed the criterion at all stations except at the outlet of Linden Lake. The Cooper River at the outlet to Kirkwood Lake is the only station to exceed the pH criterion. Phosphorus levels are elevated throughout the Pennsauken Creek and Cooper River watersheds, resulting in noncompliance with the criterion. Data from the 1972-1976 period indicate insignificant improvement when compared to the 1968-1971 data. Nitrate nitrogen levels are elevated on three of four Pennsauken Creek stations and three of five Cooper River stations. As with dissolved oxygen and $BOD_5$, non-filterable residue (suspended solids) meets the criterion only at the outlet of Linden Lake. Overall, non-filterable residue levels recorded over the 1972-1976 data period remained constant with those recorded from 1968-1971. Turbidity and dissolved residue (total dissolved solids) comply with the criteria for these parameters.

## PROBLEM ASSESSMENT

A major cause of the poor water quality in the segment is the large number of point source discharges throughout the relatively small watershed. These discharges are responsible for the high levels of fecal coliform, phosphorus and $BOD_5$ with the accompanying low dissolved oxygen concentrations. During summer low flow conditions, a large percentage of the Pennsauken Creek and Cooper River waters consists of sewage treatment plant effluents. Of the 23 municipal/domestic sewage plants discharging into the segment, only 3 on the Pennsauken Creek and 6 on the Cooper River meet the requirements of secondary/best practicable treatment limitations. Only the Evesham MUA Woodstown Plant and the small New Jersey Turnpike Authority package plant achieve advanced (tertiary) treatment. All others are secondary plants. Additional impact is attributed to tidal action which holds back discharged waste-waters on the incoming tide and washes in discharges to the Delaware near the mouths of the Pennsauken Creek and Cooper River. Non-point sources also impact the Pennsauken Creek and the Cooper River through storm water runoff from suburban and urban areas. Agricultural runoff has a minor impact on the overall water quality, but may adversely effect the most up-stream regions of the watershed.

The elevated pH level recorded at the outlet of Kirkwood Lake is attributed to excessive algal productivity in the lake during the summer months. The heavy phosphorus loading is caused primarily by the Lindenwold MUA discharge. The plant achieves some degree of phosphorus removal, however the approximately 2 MGD discharge into this limited waterway results in an excessive nutrient loading to Kirkwood Lake.

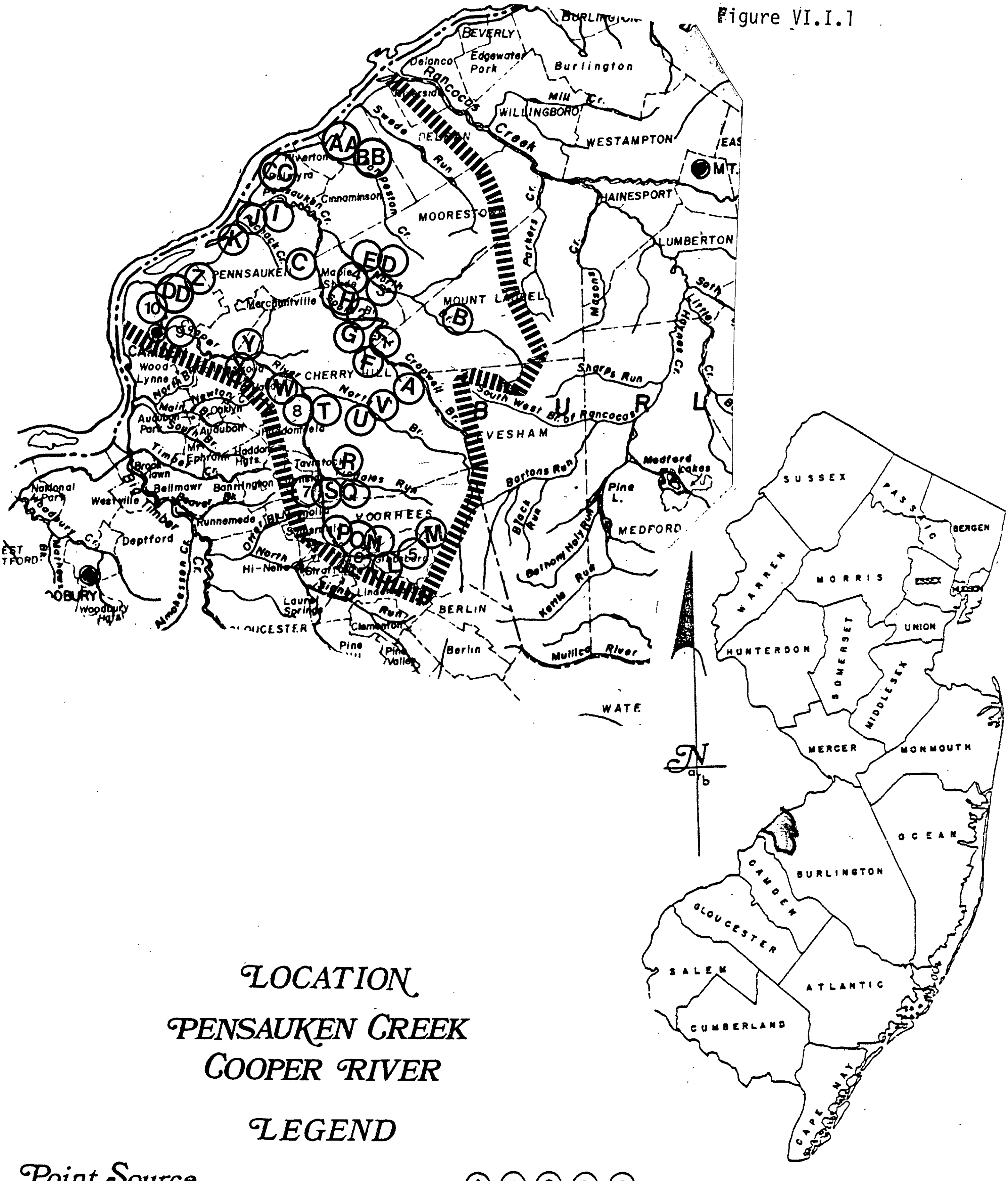
## GOAL ASSESSMENT AND RECOMMENDATIONS

The water quality in both the Pennsauken Creek and Cooper River watersheds does not presently meet the Fishable or swimmable goals presented in the Act (P.L. 92-500) and will not meet the goals by 1983. A comprehensive, restructured chemical monitoring program throughout the segment should be established to determine the extent of degradation to water quality and in what areas, and by what means, rehabilitation is feasible. All fifteen municipal treatment plants in the Cooper River watershed and three plants on the South Branch of the Pennsauken Creek eventually will be abandoned. These plants will be replaced by the regional facilities of the Camden County MUA, with discharges to the Delaware River. Monitoring for heavy metals in the vicinity of the U.S. Steel Delair plant is recommended due to the character of the discharge and the lack of heavy metals data downstream of this discharge. This plant has been up-graded this year. Storm water runoff controls also should be explored in future planning studies.

## STATION LIST

| Station Number | Location |
|---|---|
| 1 | South Branch Pennsauken Creek at Moorestown |
| 2 | South Branch Pennsauken Creek near Maple Shade |
| 3 | North Branch Pennsauken Creek near Moorestown |
| 4 | North Branch Pennsauken Creek at Maple Shade |
| 5 | Cooper River at Linden Lake outlet |
| 6 | Cooper River at Kirkwood Lake outlet |
| 7 | Cooper River at Lawnside |
| 8 | Cooper River at Haddonfield |
| 9 | Cooper River at Rt. 130 Bridge, Camden |
| 10 | Cooper River at Camden, upstream of tide gates |

Figure VI.I.1




LOCATION
PENSAUKEN CREEK
COOPER RIVER

LEGEND

Point Source — (A) (B) (C) (D) (E)
Monitoring Site — (1) (2) (3) (4) (5)
Drainage Basin Boundaries
County Bounderies
Municipal Bounderies

Figure VI.I.2

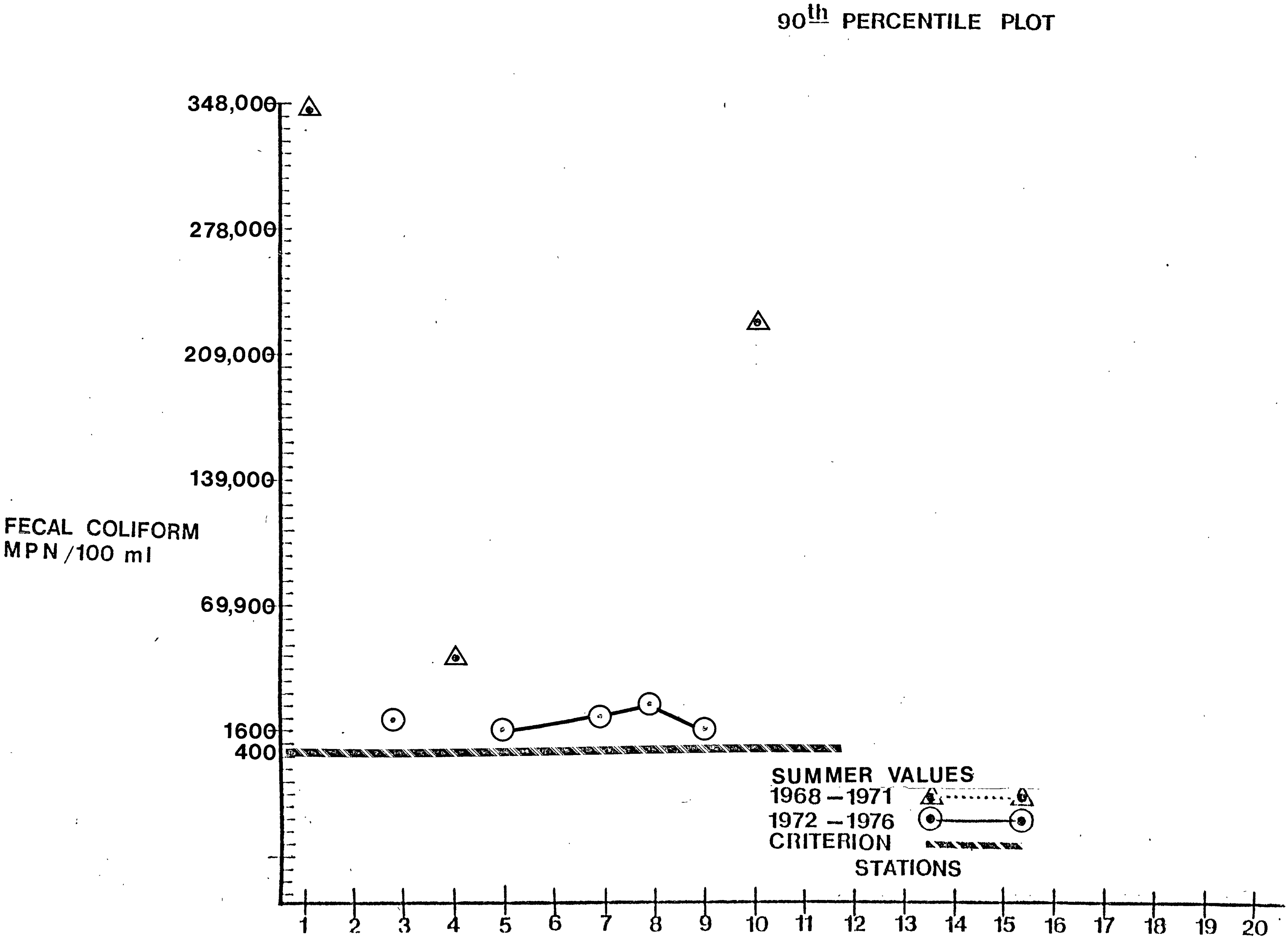

90th PERCENTILE PLOT
348,000
278,000
209,000
139,000
69,900
1600
400
FECAL COLIFORM
MPN /100 ml
SUMMER VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
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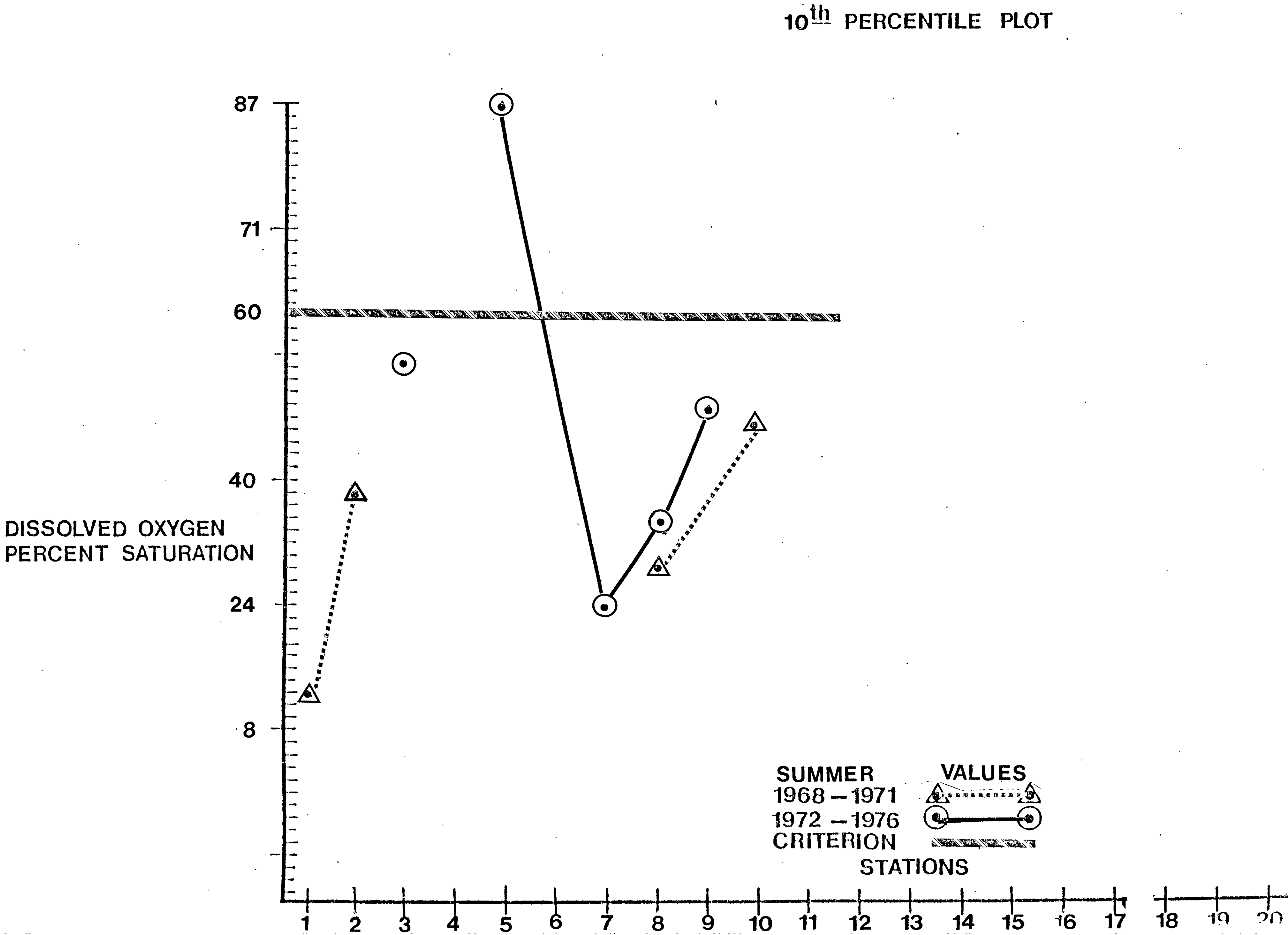
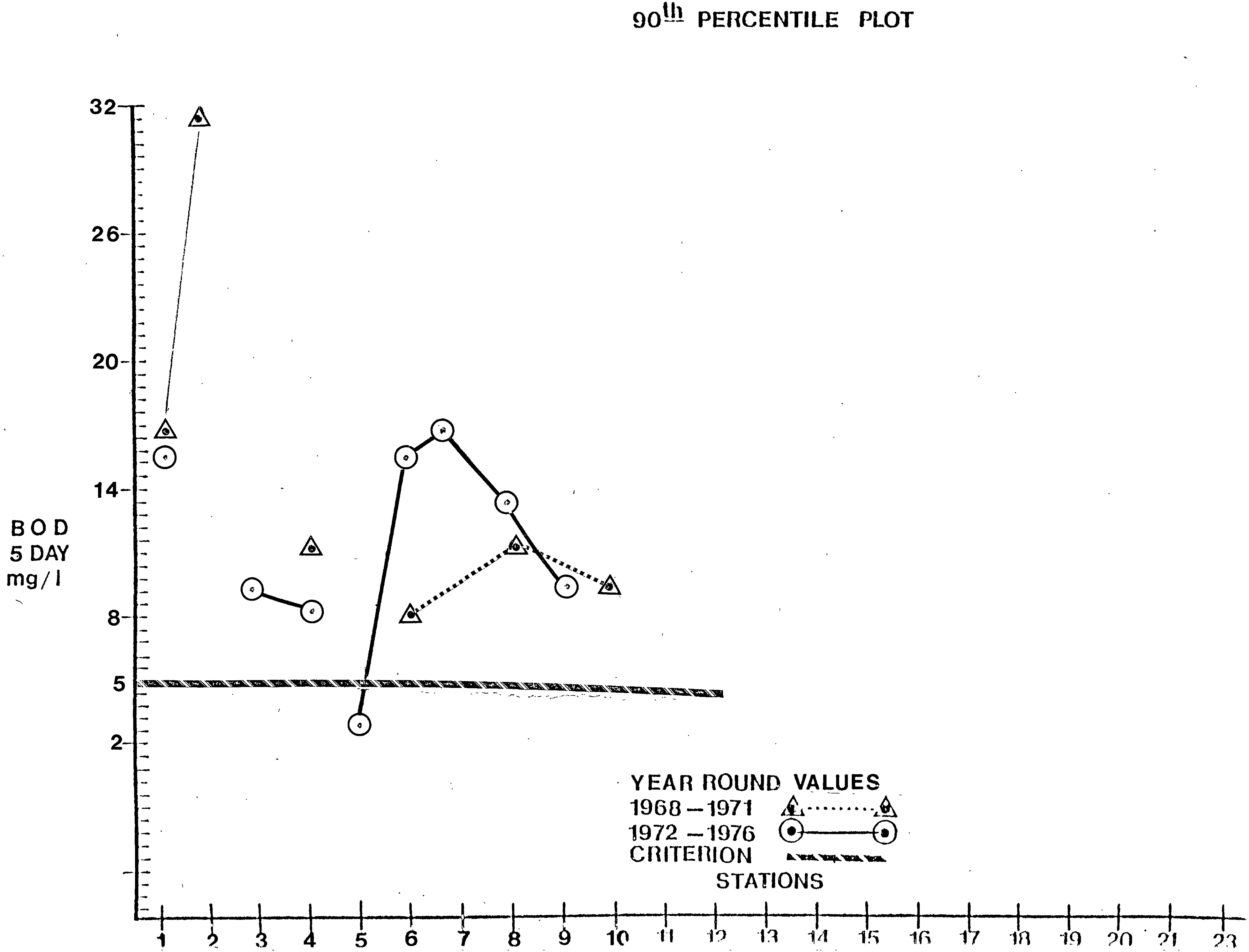
Figure VI.I.3



10th PERCENTILE PLOT
87
71
60
40
24
8
DISSOLVED OXYGEN
PERCENT SATURATION
SUMMER VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Figure VI.I.4


90th PERCENTILE PLOT
32
26
20
14
8
5
2
BOD
5 DAY
mg/l
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
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21
23

Figure VI.I.5

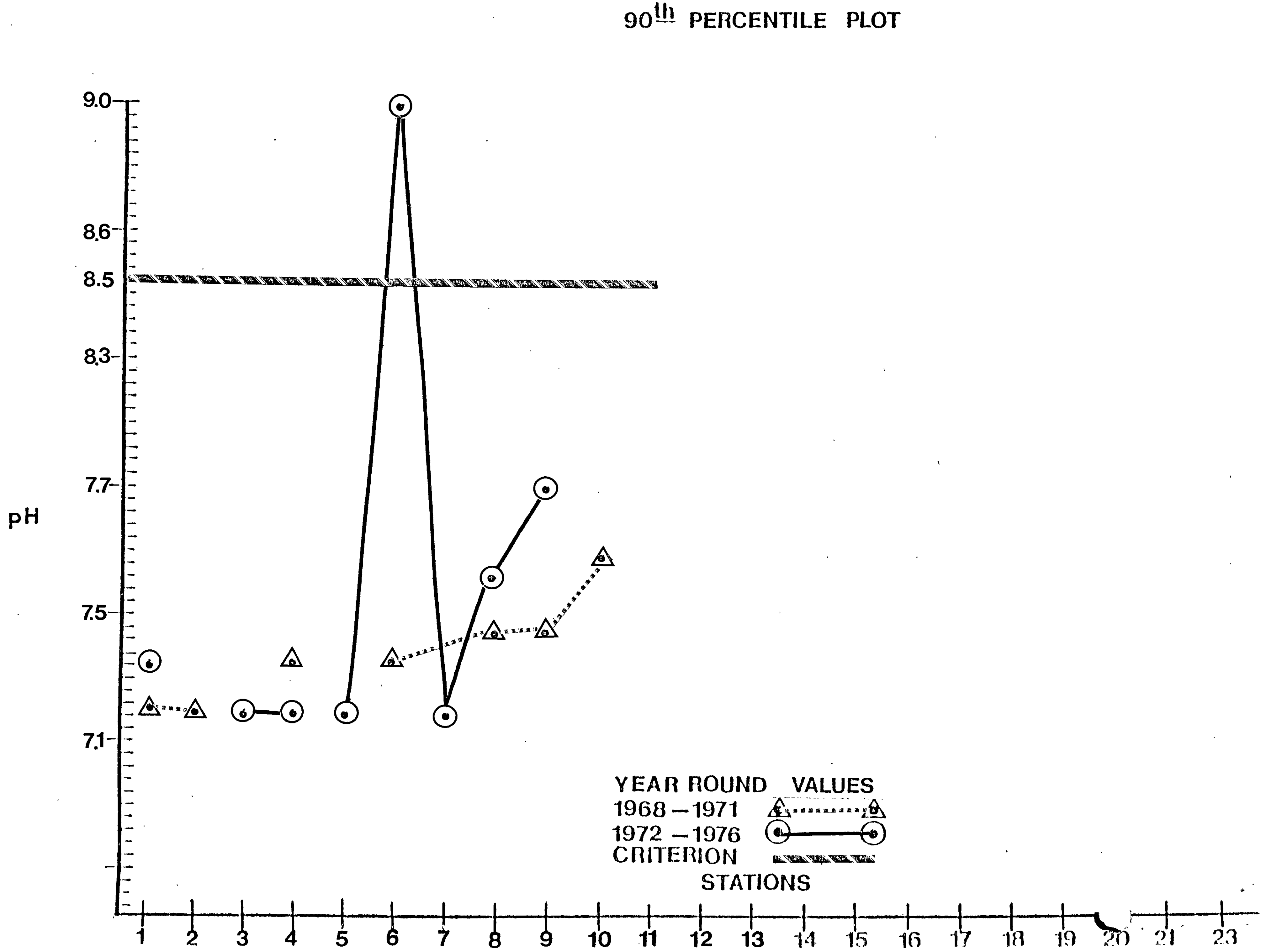
90th PERCENTILE PLOT
9.0
8.6
8.5
8.3
7.7
7.5
7.1
pH
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
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Figure VI.I.6

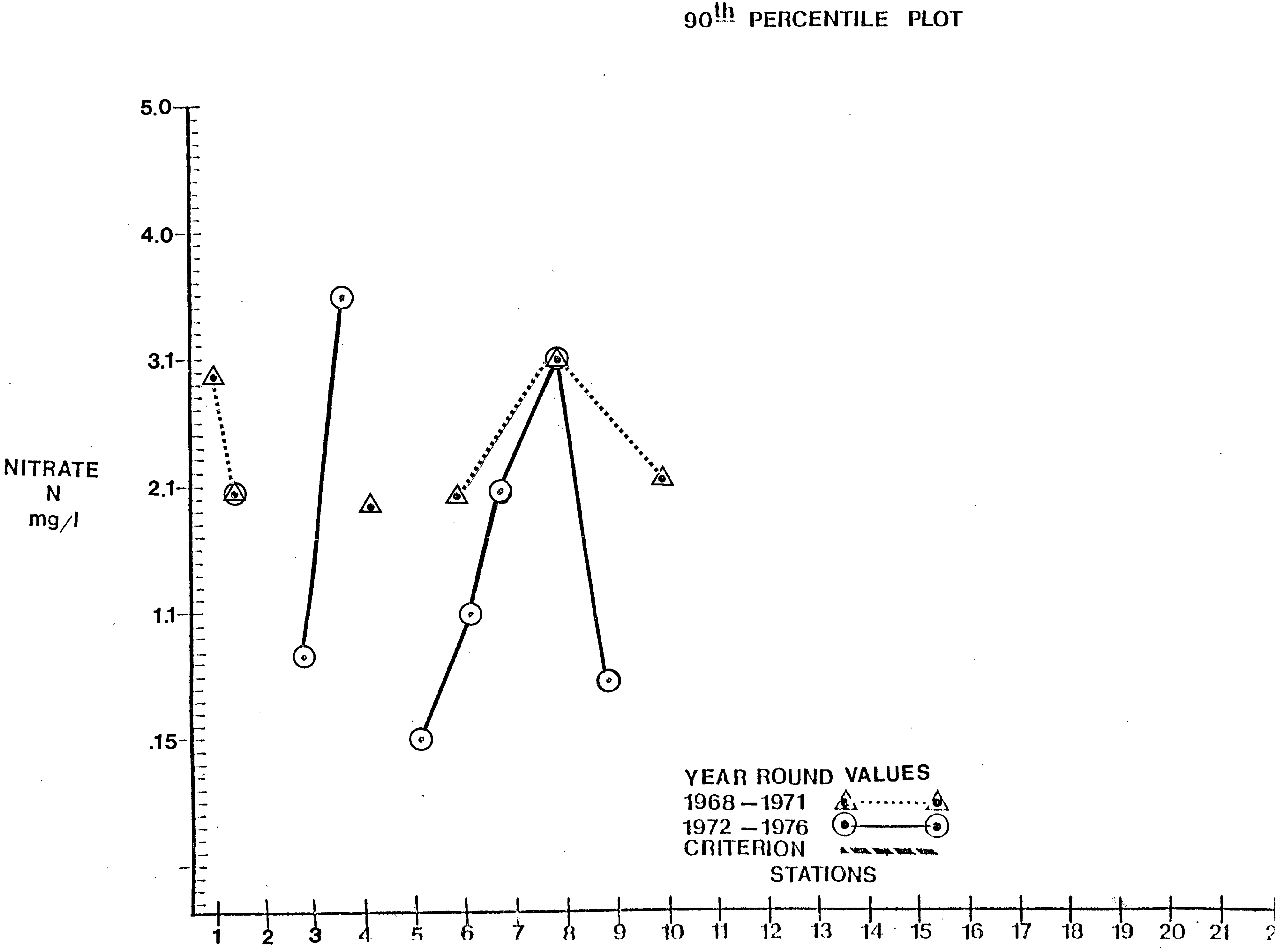
90th PERCENTILE PLOT
5.0
4.0
3.1
2.1
1.1
.15
NITRATE
N
mg/l
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
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Figure VI.I.7

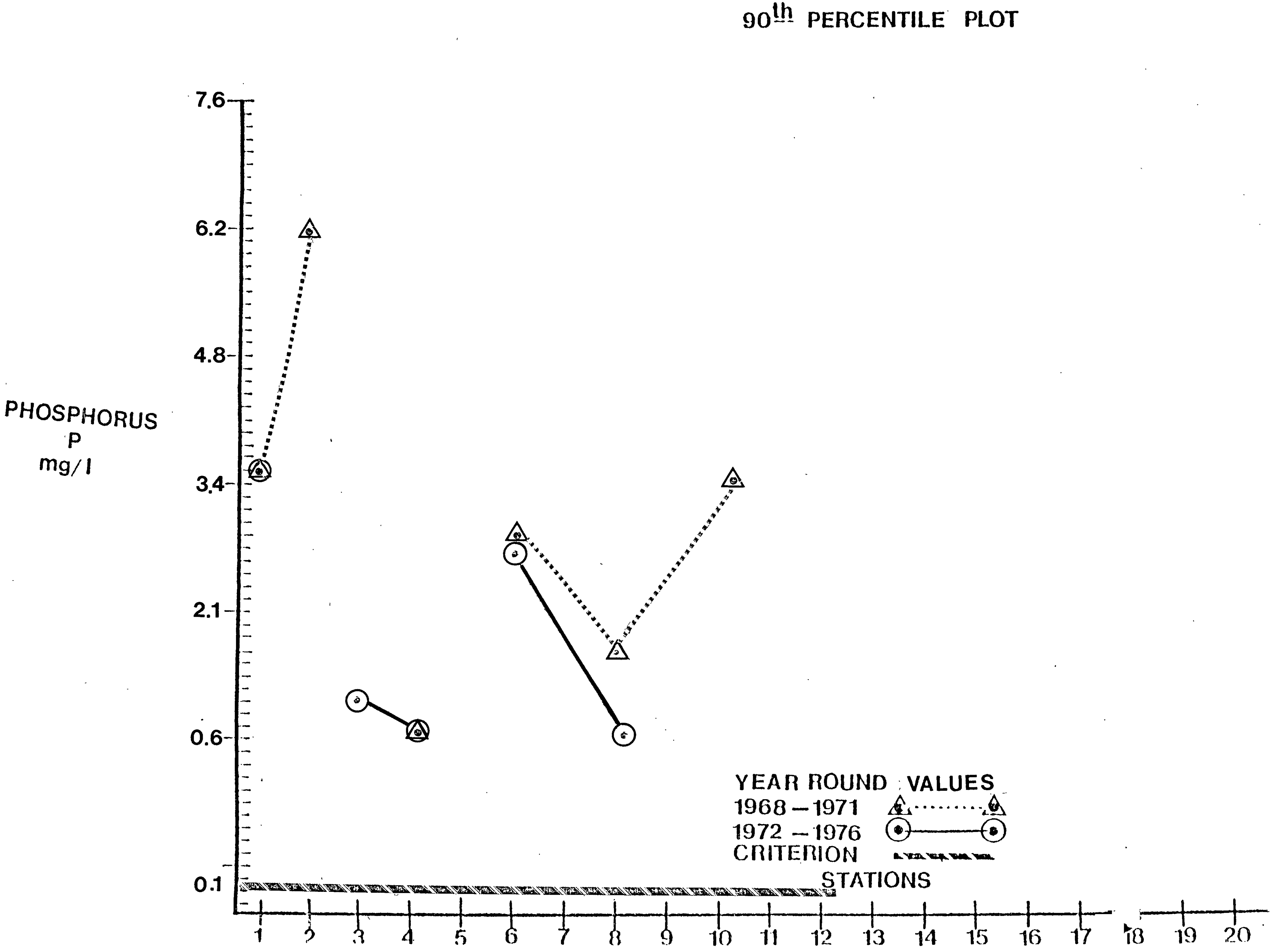
90th PERCENTILE PLOT
PHOSPHORUS
P
mg/l
7.6
6.2
4.8
3.4
2.1
0.6
0.1
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
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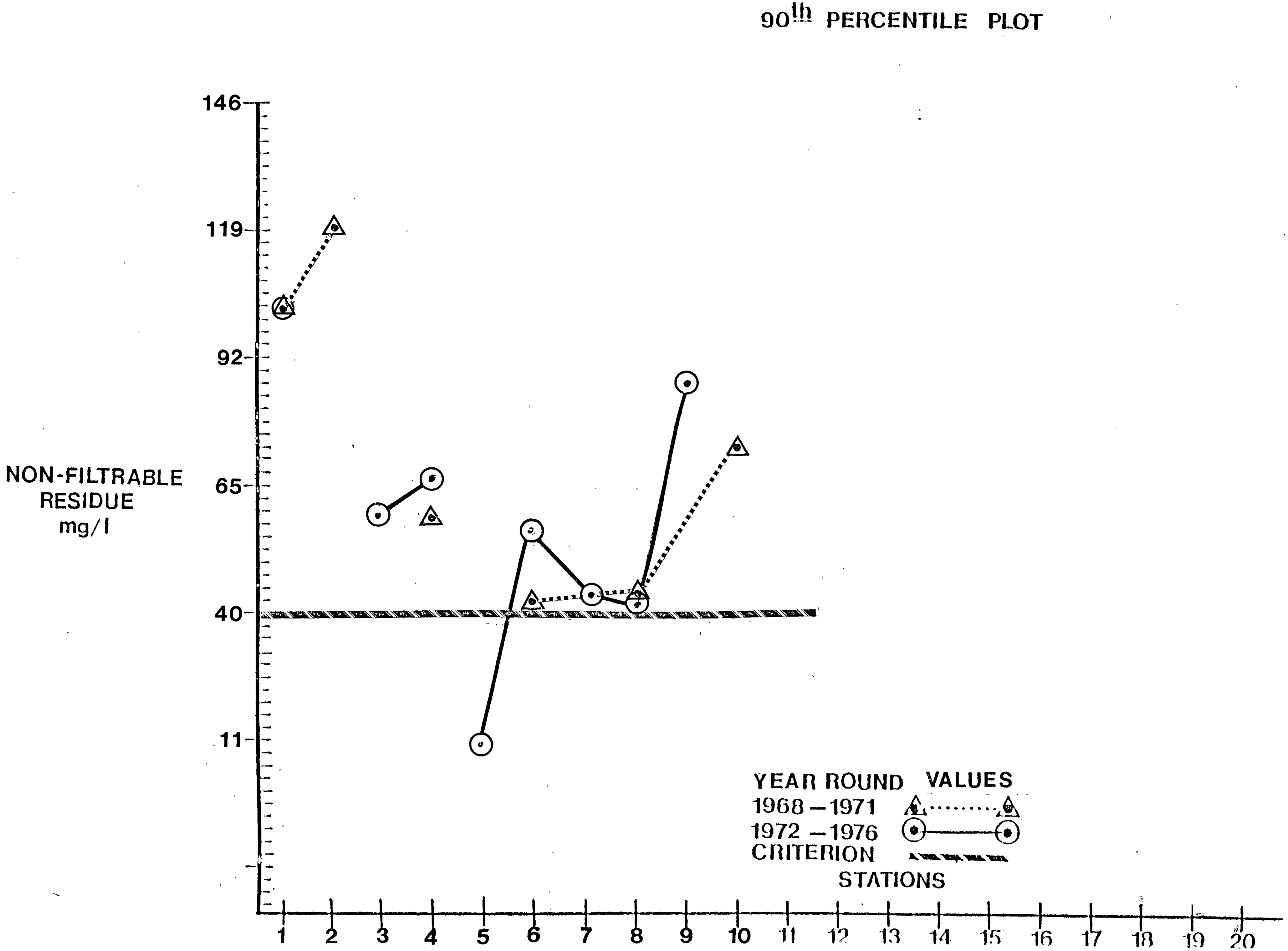
Figure VI.I.8


90th PERCENTILE PLOT
NON-FILTRABLE RESIDUE mg/l
146
119
92
65
40
11
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
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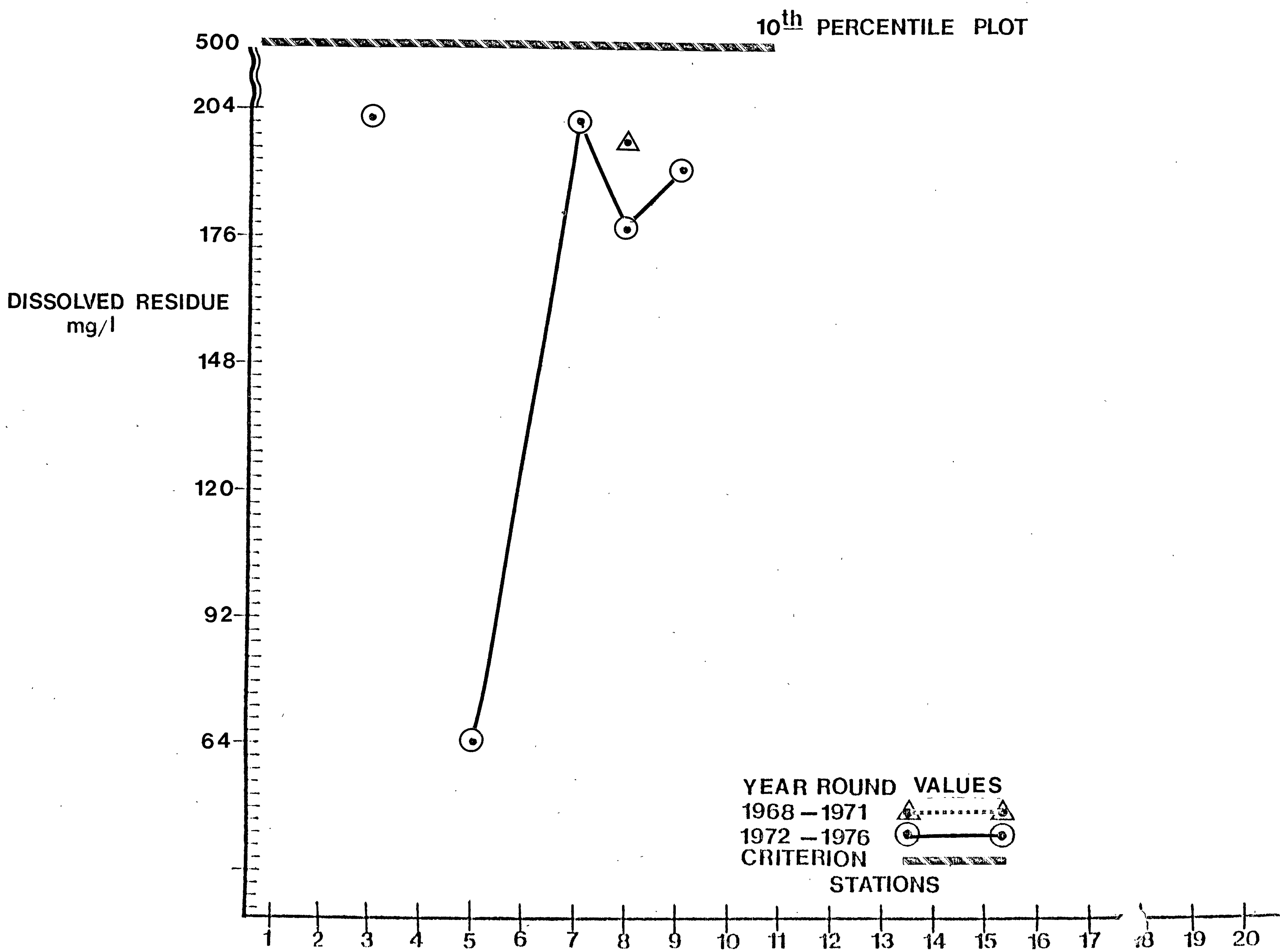
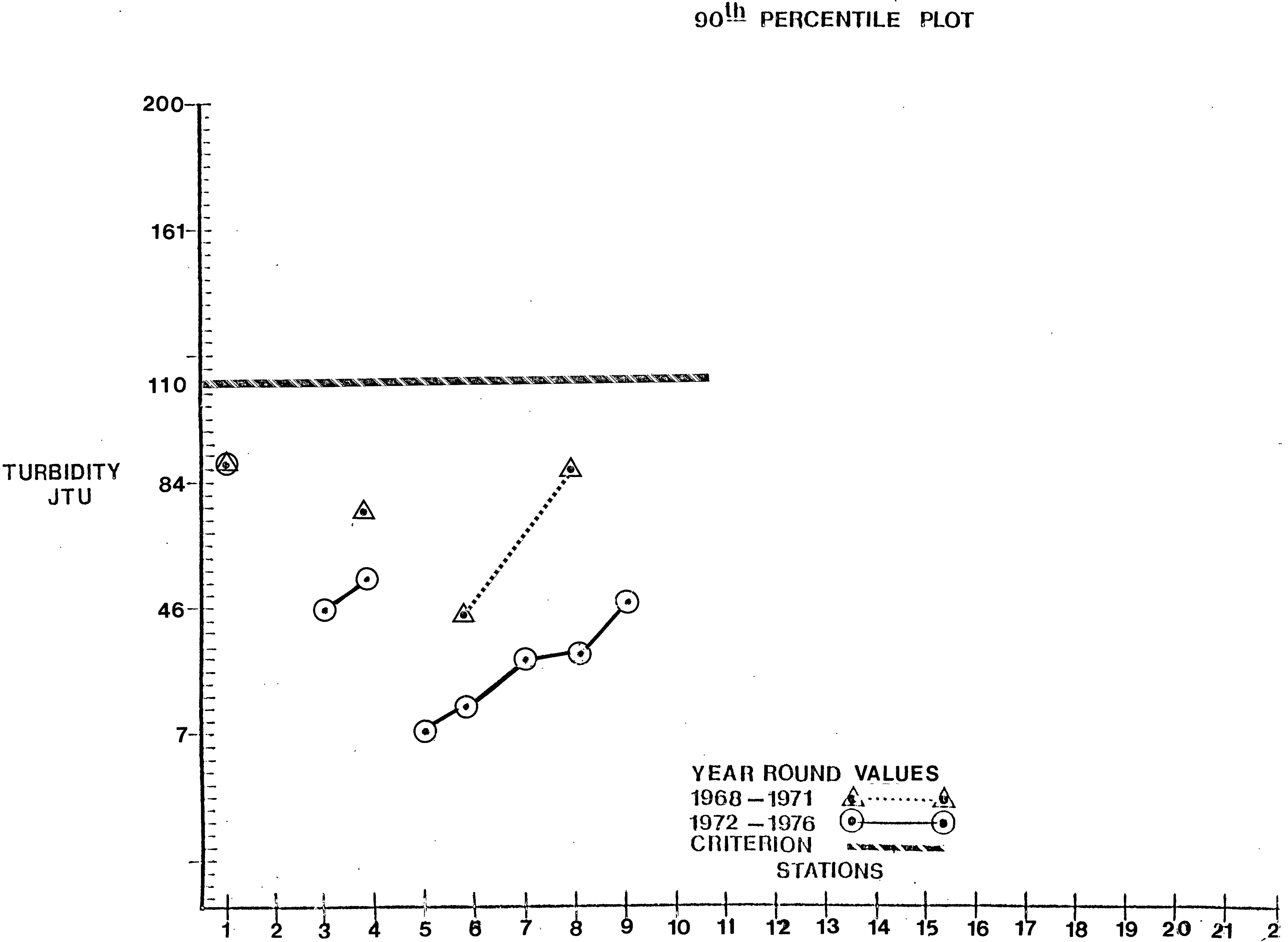
18
19
20

Figure VI.I.9



10th PERCENTILE PLOT
500
204
176
148
120
92
64
DISSOLVED RESIDUE
mg/l
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Figure VI.I.10



# Table VI.I.1

## DISCHARGER INVENTORY

### Pennsauken Creek and Cooper River Segment

| MAP CODE | MUNICIPALITY | PLANT NAME | DEGREE OF TREATMENT | RECEIVING STREAM | AVG. (MDG) DAILY FLOW 1973 | 1974 | 1975 | 1976 | COMPLIANCE WITH 1977 REQUIREMENTS OF SECONDARY/BEST PRACTICABLE TREATMENT LIMITATIONS |
|---|---|---|---|---|---|---|---|---|---|
| A | Evesham Township | Woodstream Plant (MUA) | Sec. | Pennsauken Creek | 0.24 | 0.34 | 0.475 | .45 | No |
| B | Mt. Laurel Township | Ramblewood (M.U.A.) | Sec. | Trib. to No. Branch Timber Creek | 0.6 | 0.40 | 0.450 | .3 | No |
| C | Maple Shade Township | Maple Shade #1 Mun. | Sec. | Pennsauken Creek | 0.68 | 0.68 | 1.100 | .9 | No |
| D | Maple Shade Township | Maple Shade #2 Mun. | Sec. | Pennsauken Creek | 0.7 | 1.00 | 1.400 | 1.5 | No |
| E | Moorestown Township | Moorestown Municipal | Sec. | Pennsauken Creek | 2.5 | 2.2 | 2.200 | 2.0 | No |
| F | Cherry Hill Township | Kingston Municipal | Sec. | Pennsauken Creek | 0.8 | 0.85 | 1.000 | 1.0 | Yes |
| G | Cherry Hill Township | Cherry Hill Plants 1, 2, 3, 4 & 5 | Sec. | Pennsauken Creek | 3.0 | 3.0 | 3.500 | 2.5 | Yes |
| H | Cherry Hill Township | Colwick Municipal | Sec. | Pennsauken Creek | 0.1 | 0.1 | 0.100 | 0.1 | No |
| I | US Steel Belair | Pennsauken Twp. | Ind. | Pennsauken Creek | | | | .135 | |
| J | Pennsauken Township | Georgia-Pacific | Ind. | Delaware River | 1.3 | 1.3 | 1.300 | 0.9 | No |
| K | Pennsauken Township | Pennsauken Township S.A. | Sec. | Delaware River | 3.5 | 3.3 | 3.500 | 3.1 | No |
| L | Lindenwold Borough | Lindenwold M.U.A. | Sec. | Cooper River | 1.50 | 2.0 | 2.000 | 2.0 | Yes |

## Table VI.I.1

### DISCHARGER INVENTORY

Delaware River Tributaries Zones 3 and 4
Pennsauken Creek and Cooper River Segment (Cont'd)

| MAP CODE | MUNICIPALITY | PLANT NAME | DEGREE OF TREATMENT | RECEIVING STREAM | AVG. (MDG) DAILY FLOW 1973 | 1974 | 1975 | 1976 | COMPLIANCE WITH 1977 REQUIREMENTS OF SECONDARY/BEST PRACTICABLE TREATMENT LIMITATIONS |
|---|---|---|---|---|---|---|---|---|---|
| M | Gibbsboro Borough | Gibbsboro Sewerage Corp. | Sec. | Cooper River | 0.22 | 0.24 | 0.200 | .08 | No |
| N | Voorhees Township | Osage Plant | Sec. | Cooper River | 0.25 | 0.30 | 0.320 | .29 | Yes |
| O | Voorhees Township | Ashland Section | Sec. | Cooper River | 0.37 | 0.36 | 0.340 | .31 | No |
| P | Somerdale Borough | Somerdale Municipal | Sec. | Cooper River | 0.77 | 0.70 | 0.780 | .6 | No |
| Q | Cherry Hill Township | Ashland Municipal | Sec. | Cooper River | 0.29 | 0.250 | 0.240 | .29 | Yes |
| R | Cherry Hill Township | Woodcrest 1 & 2 Mun. | Sec. | Copper River | 0.21 | 0.34 | 0.340 | .32 | No |
| S | Lawnside | Lawnside | Sec. | Cooper River | 0.20 | 0.20 | 0.200 | .23 | No |
| T | Cherry Hill Township | Stafford Municipal | Sec. | Cooper River | 0.4 | 0.5 | 0.250 | .17 | Yes |
| U | Cherry Hill Township | Barclary Farms Mun. | Sec. | Cooper River | 0.85 | 0.900 | 0.900 | .9 | Yes |
| V | Cherry Hill Township | Old Orchard Municipal | Sec. | Cooper River | 0.55 | 0.80 | 0.800 | .88 | No |
| W | Haddonfield Borough | Haddonfield Municipal | Sec. | Cooper River | 0.72 | 1.2 | 0.900 | 1.0 | No |

# Table VI.I.1

## DISCHARGER INVENTORY

Delaware River Tributaries Zones 3 and 4
Pennsauken Creek and Cooper River Segment (Cont'd)

| MAP CODE | MUNICIPALITY | PLANT NAME | DEGREE OF TREATMENT | RECEIVING STREAM | AVG. (MDG) DAILY FLOW 1973 | 1974 | 1975 | 1976 | COMPLIANCE WITH 1977 REQUIREMENTS OF SECONDARY/BEST PRACTICABLE TREATMENT LIMITATIONS |
|---|---|---|---|---|---|---|---|---|---|
| X | Haddon Township | Westmont Municipal | Sec. | Cooper River | 1.5 | 1.7 | 1.850 | 1.7 | No |
| Y | Cherry Hill Township | Cooper River Municipal | Sec. | Cooper River | 1.2 | 1.3 | 1.500 | 1.0 | No |
| Z | Camden City | Baldwin Run Municipal | Sec. | Delaware | 3.5 | 3.7 | 3.600 | 4.0 | No |
| AA | Riverton Township | Riverton SA | Sec. | Delaware | | | | .305 | |
| BB | Cinnaminson Township | Cinnaminson S.A. | Sec. | Delaware River | 1.3 | 1.60 | 1.700 | 2.0 | No |
| CC | Palmyra Borough | Palmyra Municipal | Sec. | Delaware River | 0.33 | 0.47 | 0.300 | .35 | No |
| DD | Camden City | Main Municipal Plant | Pri. | Delaware River | 30.00 | 33.0 | 24.000 | 26. | No |
| | Cherry Hill Township | N.J. Turnpike Authority | Ter. | Cooper River | 0.032 | 0.03 | 0.020 | .02 | Yes |

# Newton Creek and Big Timber Creek

Newton Creek and Big Timber Creek originate in Northern Gloucester and Southwestern Camden counties and flow westward to the Delaware River. The watersheds are located in highly developed residential, urban and industrial areas. Portions of headwater streams are set aside for public recreational usage and both creeks are characterized by slow flow through wide meanderings in tidal areas. Wide tidal flats are present near the confluence with the Delaware River.

## Water Quality Assessment

Fecal coliform bacteria counts are above the criterion level in the South Branch Big Timber Creek and below the criterion in the North Branch Big Timber Creek. Lack of data prior to 1972 precludes any temporal comparisons. Fecal coliform concentrations have decreased on the North and South branches of Newton Creek, but still exceed the criterion. Dissolved oxygen and biochemical oxygen demand concentrations are approaching or near the criteria. Nutrient concentrations of nitrates and phosphorus remain excessive in both creeks, with exceptionally high concentrations of phosphorus. Non-filtrable solids have increased at all stations on both creeks during the past five year and most stations have levels exceeding the criterion. Turbidity levels in the North Brandh of Newton Creek have increased to exceed the criterion during the past five years.

## Problem Assessment

The large number of dischargers per unit distance, rather than individual effluent volume, creates distinct point-source pollution problems in these creeks. Additionally, only one of the major dischargers on Newton Creek and few of dischargers on Big Timber Creek meet 1977 secondary/best practicable treatment standards. The highly developed urban and industrial watershed areas also contribute substantial non-point source pollution through urban surface and storm drain runoff. Landfill leachate and groundwater seepage from industrial and chemical facilities also contribute to degradation of Big Timber Creek Water quality.

## Goal Assessments and Recommendations

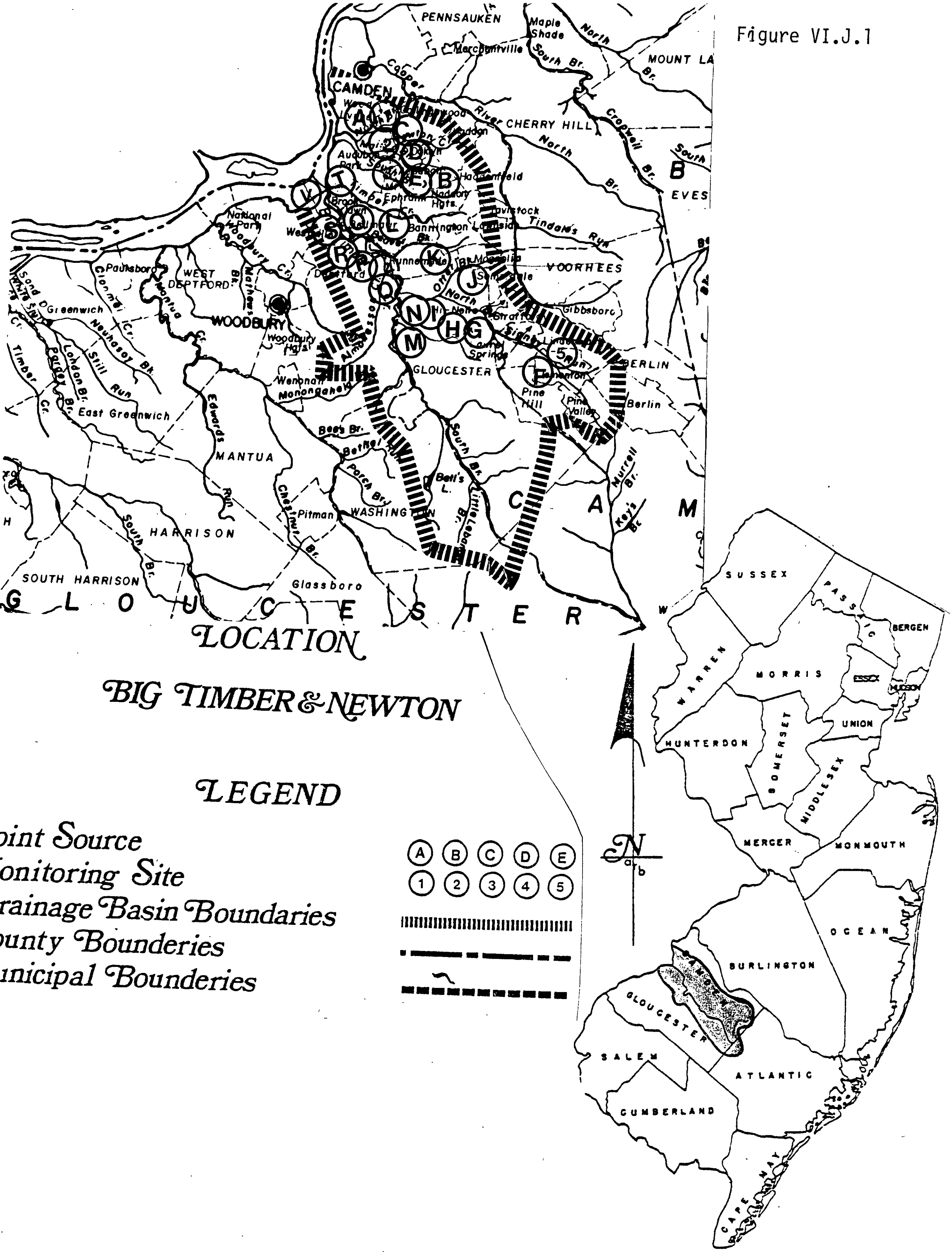
Although most dischargers provide point source secondary treatment, a number of plants are hydraulically and/or organically overloaded. This is evidenced by a number of sewer bans currently in effect in these watersheds. Priority attention should be given to abandoning existing facilities in favor of regional treatment plants, or else upgrading these facilities to best practicable technology standards, depending on the conclusions of the "201" studies presently being conducted for these watersheds. All six municipal treatment plants in the Newton Creek watershed, all three municipal plants on Little Timber Creek, and ten municipal plants in the Big Timber Creek watershed are scheduled to be abandoned when the Camden County MUA facilities become available. The Camden County MUA discharge will probably be directly to the Delaware River. Intensive surveys are warranted in those areas where groundwater seepage is indicated as a non-point source of pollution. Appropriate enforcement actions should be taken to halt leachate migration from adjacent landfill activities. Due to the intensive urban and industrial activities in these watersheds, it is unlikely that 1983 goals in water quality will be achieved in these waters. The overall quality may be significantly improved when regionalization occurs.

## Newton Creek and Big Timber Creek

## STATION LIST

1. Newton Creek at Audubon
2. Newton Creek, North Branch
3. Newton Creek, South Branch
4. South Branch Big Timber Creek
5. North Branch Big Timber Creek

Figure VI.J.1




# LOCATION

## BIG TIMBER & NEWTON

## LEGEND

- Point Source — (A) (B) (C) (D) (E)
- Monitoring Site — (1) (2) (3) (4) (5)
- Drainage Basin Boundaries
- County Bounderies
- Municipal Bounderies

Figure VI.J.2

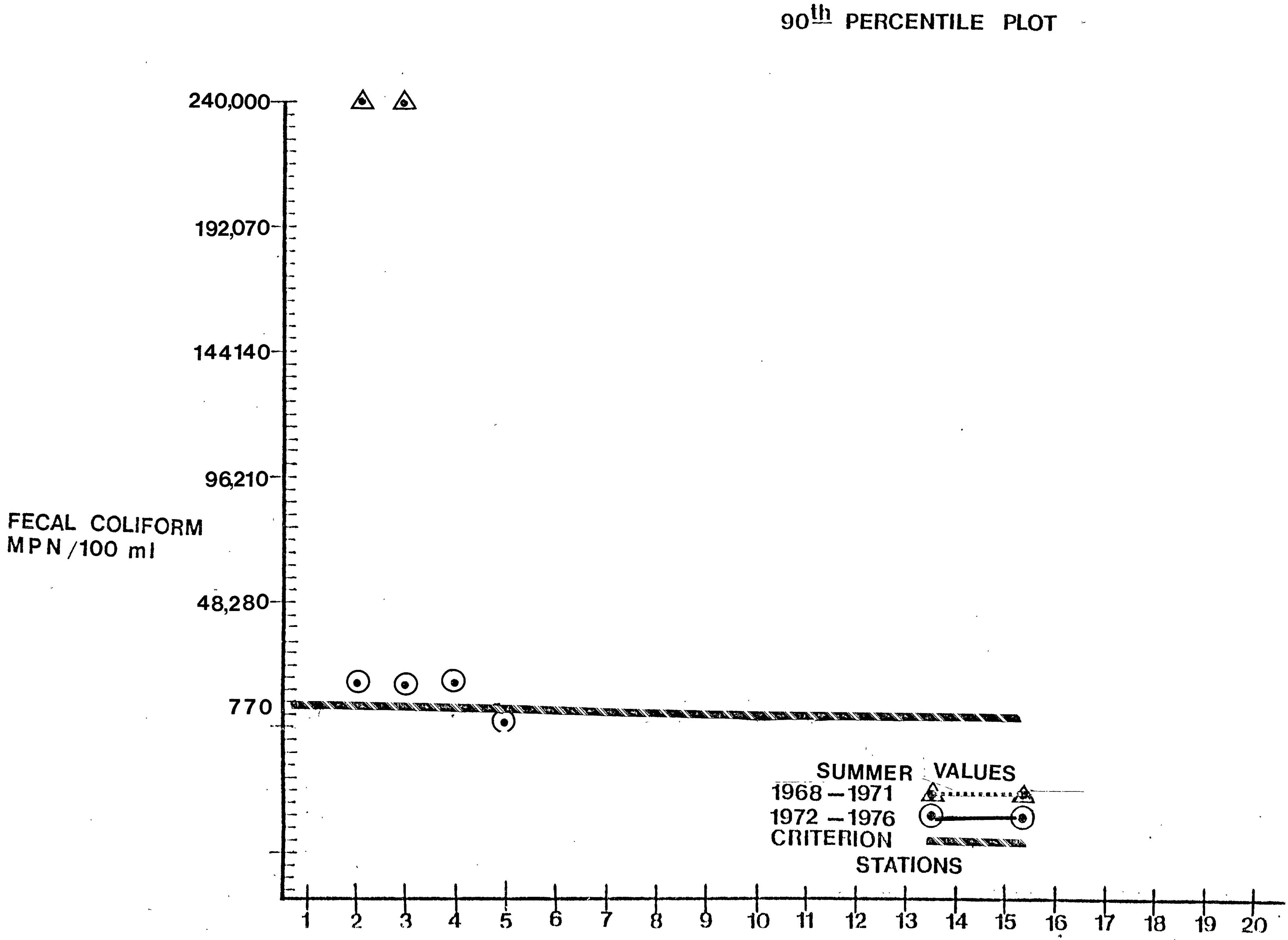

90th PERCENTILE PLOT
240,000
192,070
144140
96,210
48,280
770
FECAL COLIFORM
MPN/100 ml
SUMMER VALUES
1968 — 1971
1972 — 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Figure VI.J.3

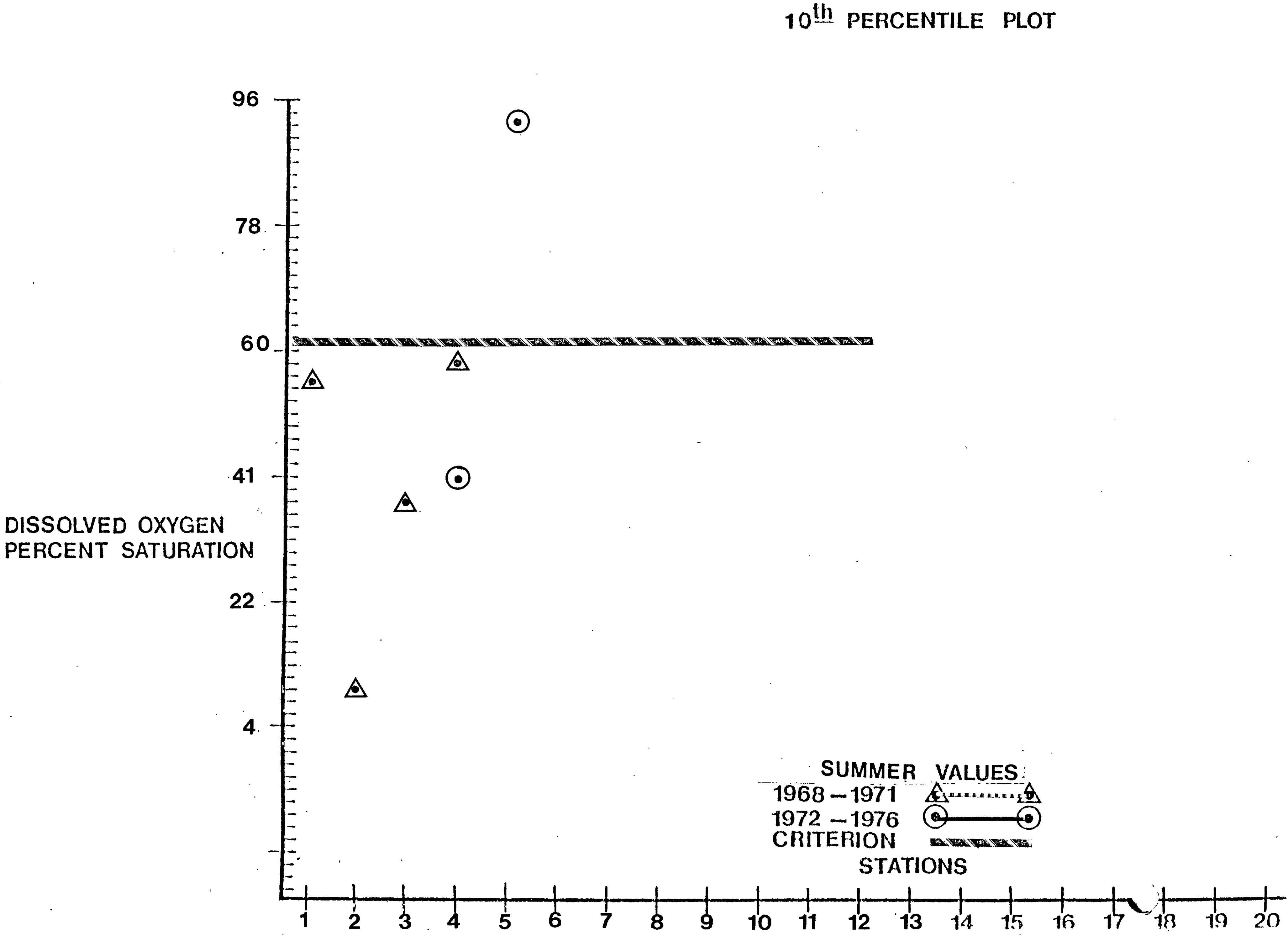

10th PERCENTILE PLOT
96
78
60
41
22
4
DISSOLVED OXYGEN
PERCENT SATURATION
SUMMER VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Figure VI.J.4

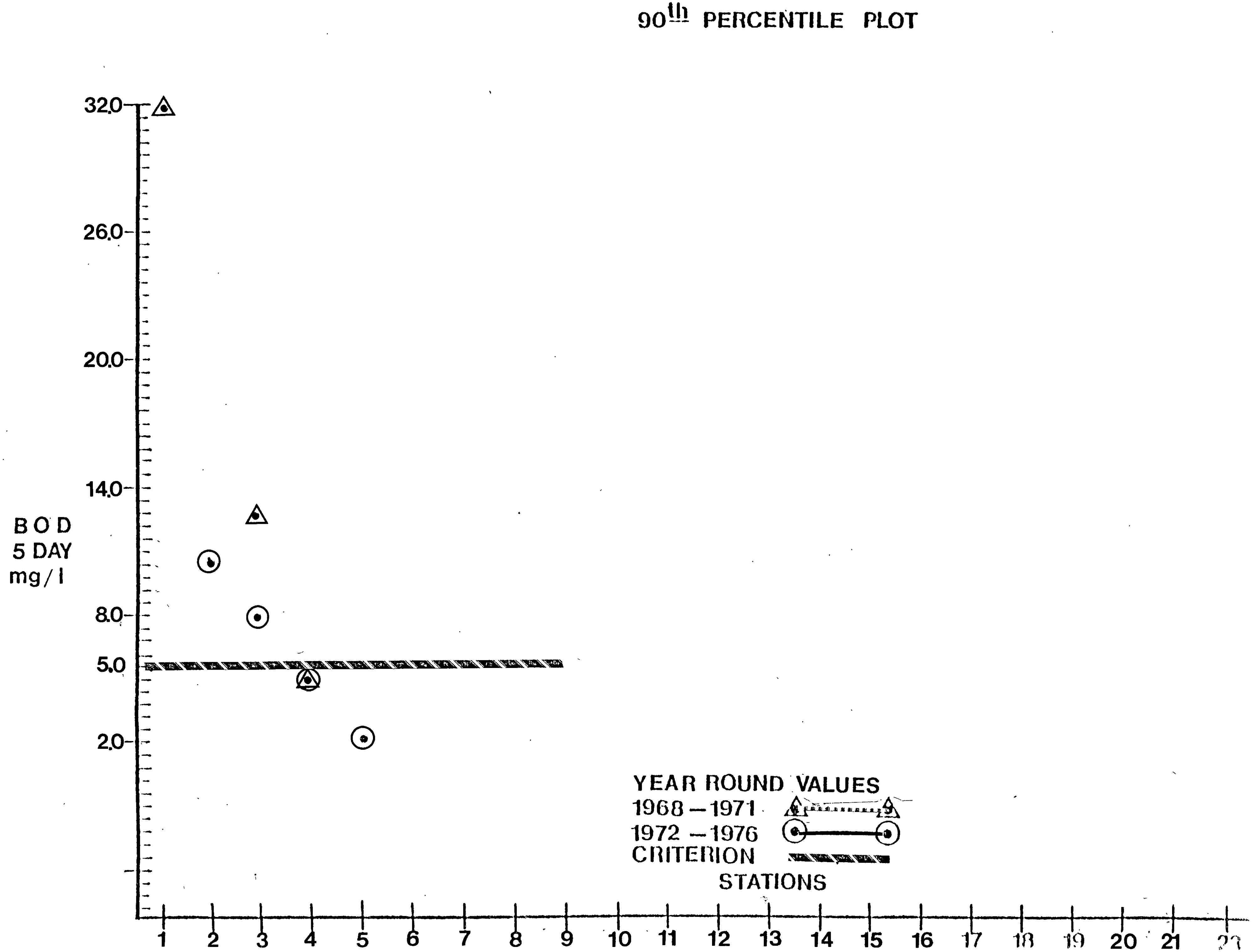

90th PERCENTILE PLOT
32.0
26.0
20.0
14.0
8.0
5.0
2.0
BOD
5 DAY
mg/l
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22

Figure VI.J.5

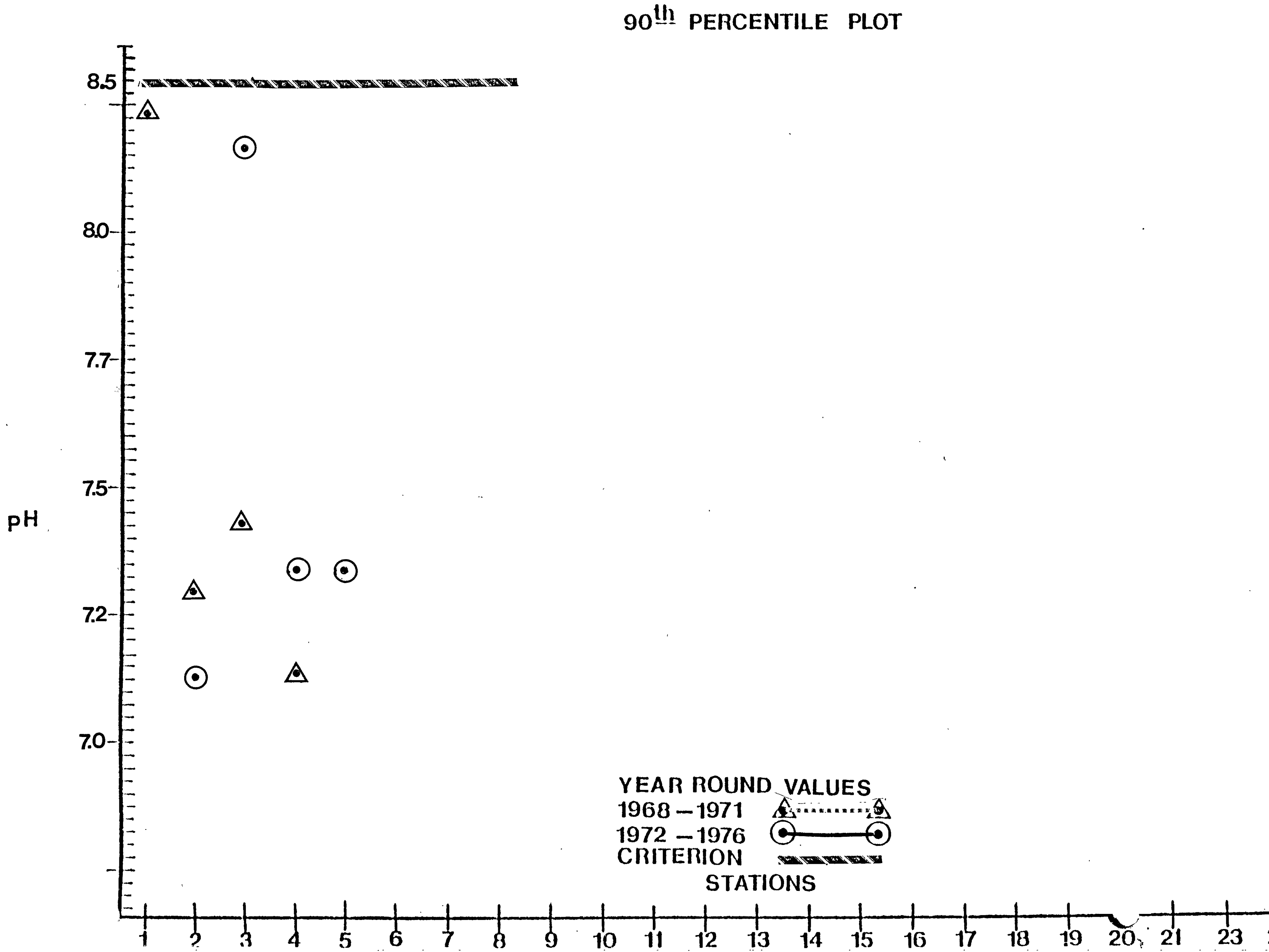

90th PERCENTILE PLOT
8.5
8.0
7.7
7.5
7.2
7.0
pH
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
23

Figure VI.J.6

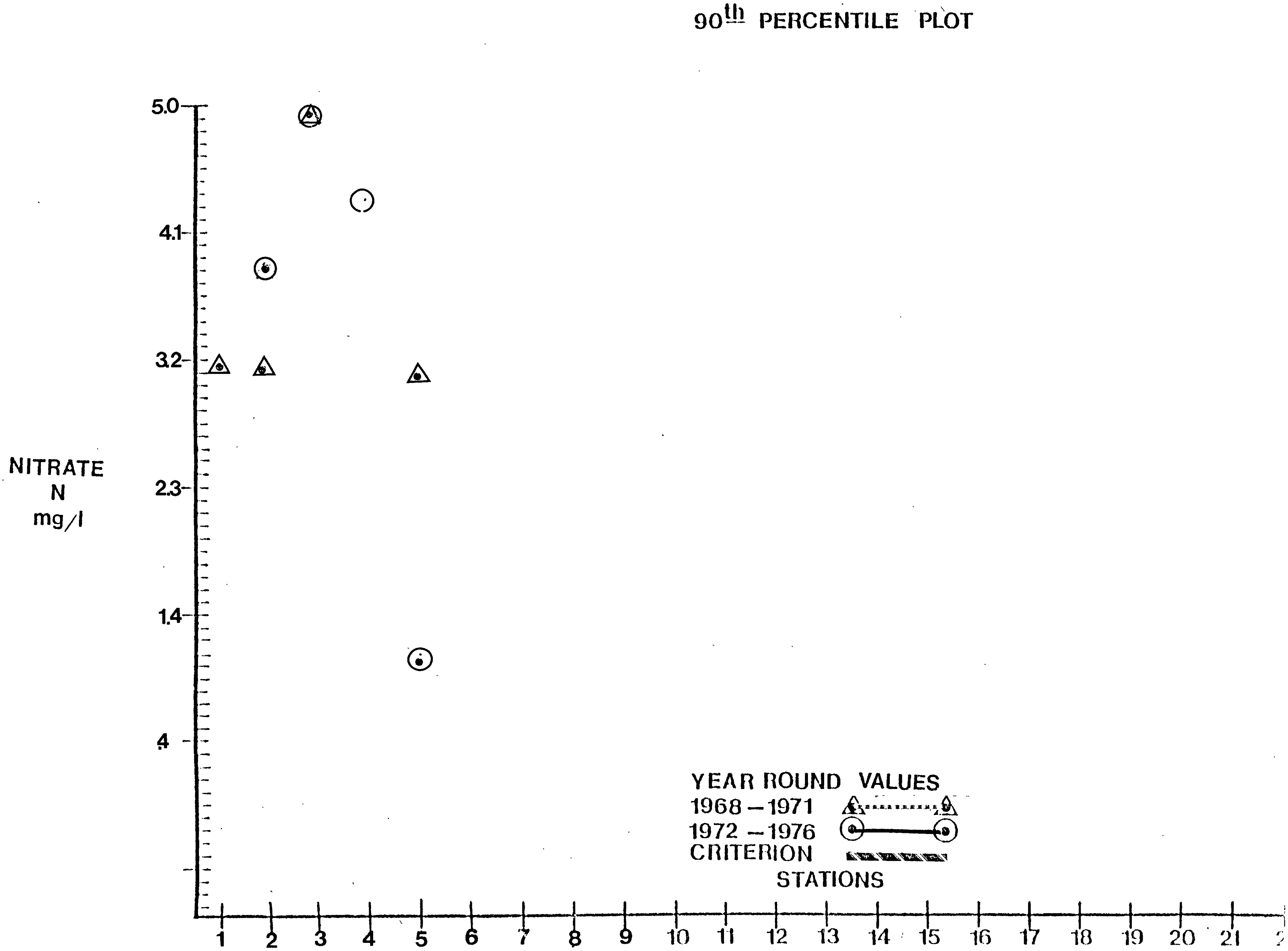

90th PERCENTILE PLOT
NITRATE
N
mg/l
5.0
4.1
3.2
2.3
1.4
.4
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21

Figure VI.J.7

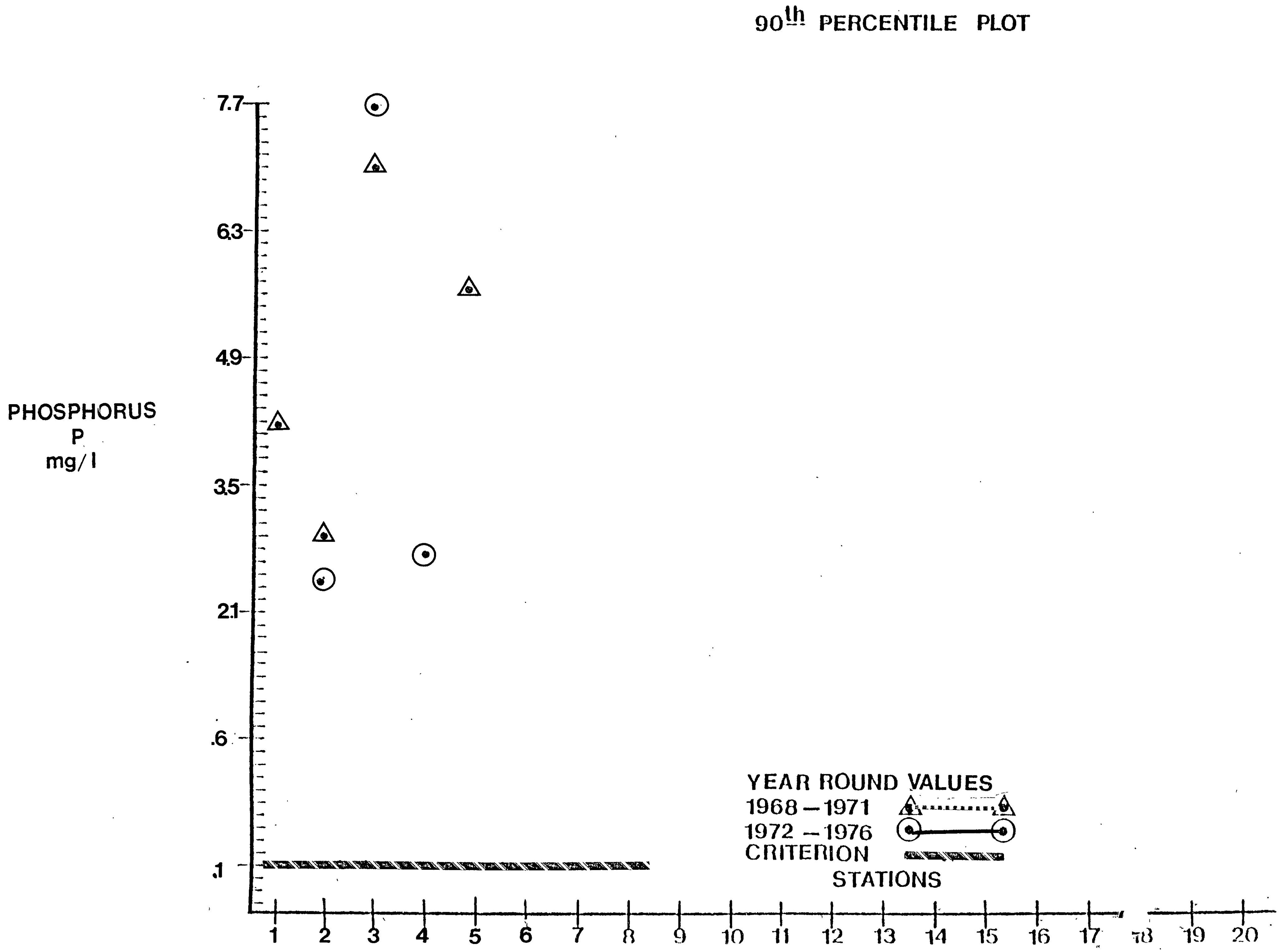

90th PERCENTILE PLOT
7.7
6.3
4.9
3.5
2.1
.6
.1
PHOSPHORUS
P
mg/l
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Figure VI.J.8

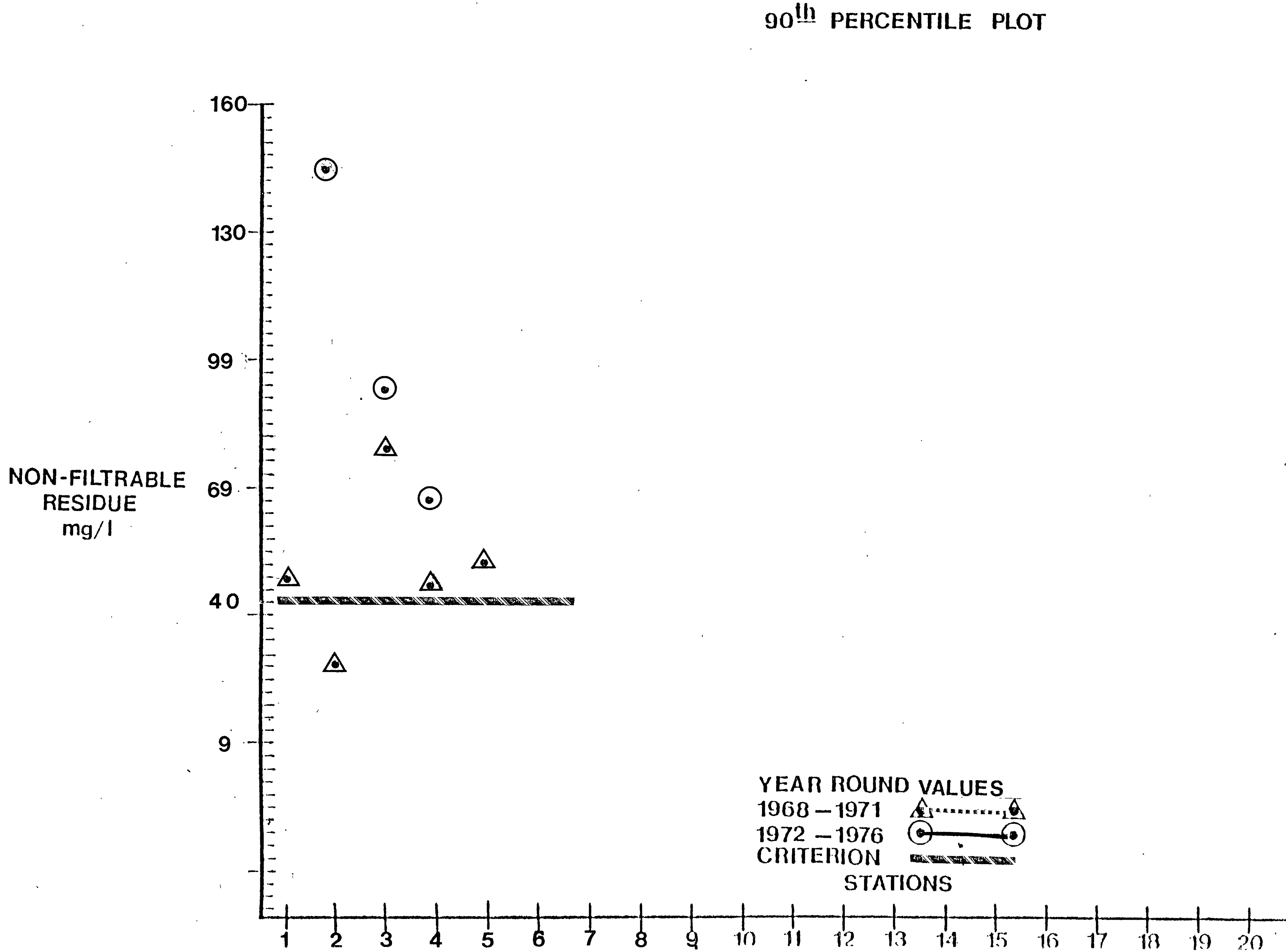
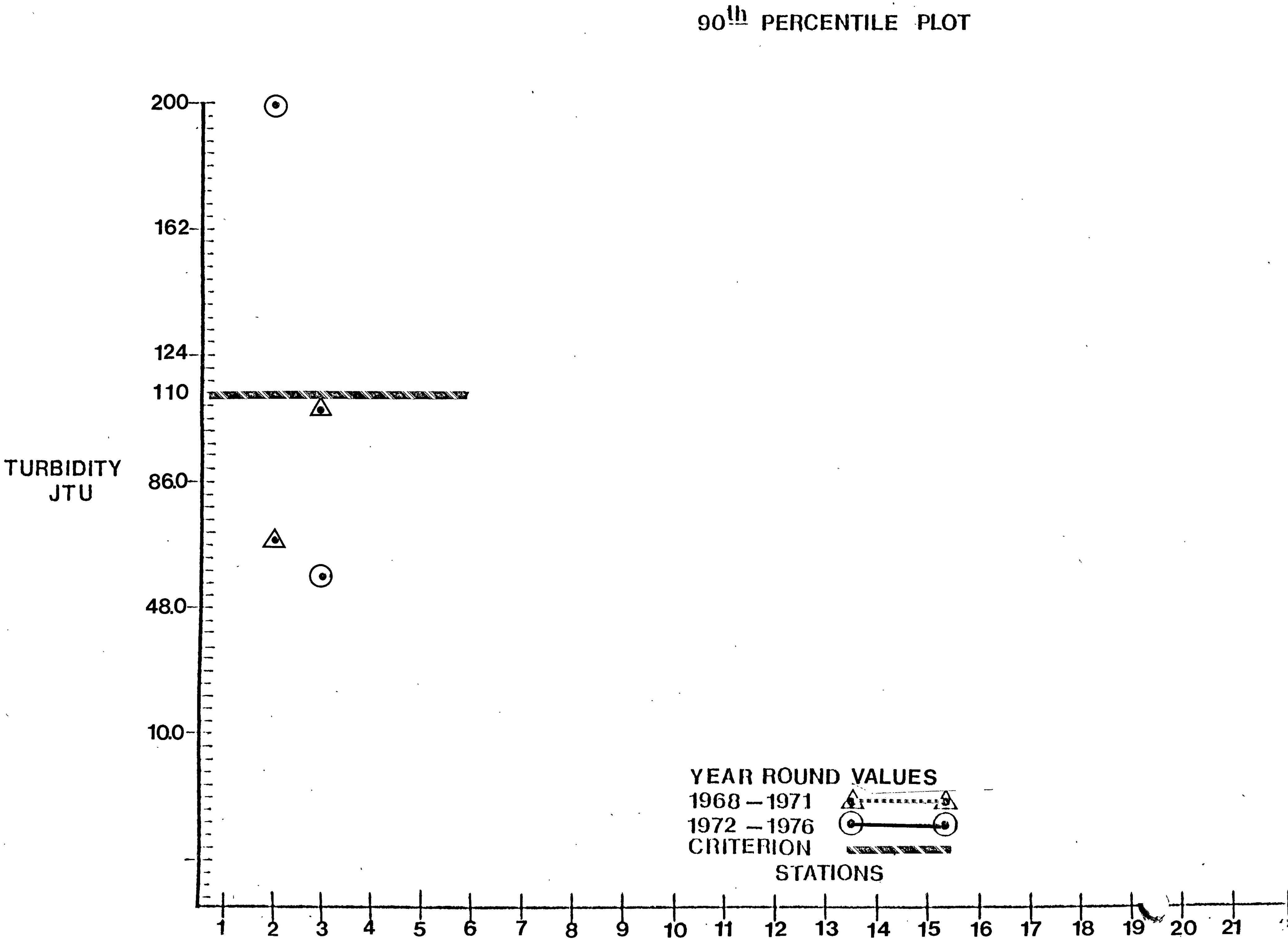

90th PERCENTILE PLOT
NON-FILTRABLE RESIDUE mg/l
160
130
99
69
40
9
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Figure VI.J.9



90th PERCENTILE PLOT
TURBIDITY JTU
200
162
124
110
86.0
48.0
10.0
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21

# Table VI.J.1

DISCHARGER INVENTORY

Big Timber - Newton Creeks Segment

| MAP CODE | MUNICIPALITY | PLANT NAME | DEGREE OF TREATMENT | RECEIVING STREAM | AVG. (MDG) DAILY FLOW 1973 | 1974 | 1975 | 1976 | COMPLIANCE WITH 1977 REQUIREMENTS OF SECONDARY/BEST PRACTICABLE TREATMENT LIMITATIONS |
|---|---|---|---|---|---|---|---|---|---|
| A | Woodlynne Borough | Woodlynne Borough | Pri. | Newton Creek | 0.150 | 0.150 | 0.220 | .19 | No |
| B | Haddon Heights Borough | Haddon Heights Municipal | Sec. | Trib. to Newton Creek | 0.73 | 0.45 | 0.540 | .48 | No |
| C | Collingswood Borough | Collingswood Municipal | Sec. | Newton Creek | 2.500 | 1.900 | 2.200 | 1.9 | No |
| D | Oaklyn Borough | Oaklyn Municipal | Sec. | Newton Creek | 0.35 | 0.35 | 0.360 | .34 | No |
| E | Audubon Borough | Audubon Municipal | Sec. | S. Br. Newton Creek | 1.9 | 0.700 | 0.950 | 0.9 | No |
| F | Clementon Borough | Clementon S.A. | Sec. | No. Br. of Timber Cr. | 0.8 | 0.95 | 1.050 | 1.0 | Yes |
| G | Stratford Borough | Stratford S.A. | Sec. | No. Branch Timber Creek | 0.8 | 0.60 | 1.000 | .9 | Yes |
| H | Gloucester Township | Mar Dale (M.U.A.) | Sec. | No. Br. of Timber Cr. | 0.16 | 0.16 | 0.150 | .14 | No |
| I | Gloucester Township | Catalina Hills (M.U.A.) | Sec. | No. Br. of Timber Cr. | 0.11 | 0.11 | 0.110 | .11 | No |
| J | Magnolia Borough | Magnolia S.A. | Sec. | Trib. to No. Branch Timber Creek | 0.44 | 0.375 | 0.400 | .41 | No |
| K | Barrington | Barrington Municipal | Sec. | Beaver Brook | 1.20 | 1.10 | 1.100 | .9 | No |

# Table VI.J.1 (cont'd)

## DISCHARGER INVENTORY

### Big Timber and Newton Creeks Segment

| MAP CODE | MUNICIPALITY | PLANT NAME | DEGREE OF TREATMENT | RECEIVING STREAM | AVG. (MDG) DAILY FLOW 1973 | 1974 | 1975 | 1976 | COMPLIANCE WITH 1977 REQUIREMENTS OF SECONDARY/BEST PRACTICABLE TREATMENT LIMITATIONS |
|---|---|---|---|---|---|---|---|---|---|
| M | Mt. Ephraim Borough | Mr. Ephraim Municipal | Sec. | Little Timber Creek | 0.9 | 0.9 | 0.700 | .75 | No |
| N | Gloucester Township | Blackwood (M.U.A.) | Sec. | No. Br. of Timber Cr. | 0.76 | 0.76 | 0.750 | .7 | No |
| O | Gloucester Township | Chews Landing (M.U.A.) Plants 1 & 2 | Sec. | No. Br. of Timber Cr. | 1.5 | 1.5 | 1.600 | 1.5 | No |
| | Gloucester Township | Chews Landing (M.U.A.) Plant 3 | Sec. | No. Br. of Timber Cr. | - | - | 0.330 | .44 | Yes |
| P | Runnemede Borough | Runnemede Sewer. Auth. | Sec. | Trib. to Big Timber Creek | 0.90 | 1.1 | 0.940 | .8 | No |
| Q | Bellmawr Borough | Bellmawr S.A. | Sec. | Big Timber Creek | 1.400 | 1.400 | 1.800 | 1.4 | No |
| R | Gloucester City | Gloucester City S.A. | Sec. | Little Timber Creek | 2.500 | 2.500 | 1.700 | 1.7 | No |
| S | Brooklawn Borough | Brooklawn Municipal | Pri. | Little Timber Creek | 0.260 | 0.270 | 0.230 | .25 | No |
| T | Gloucester City | Harshaw Chemical | Sec. | Delaware River | 0.006 | 0.006 | 0.006 | .006 | Yes |
| V | Gloucester City | NJ Zinc | Ind. | Maurice River | | | | 10.5 | |
| | Gloucester Township | Lakeland Inst. | Sec. | No. Br. of Timber Cr. | 0.16 | 0.17 | 0.140 | .12 | Yes |
| | Haddon Township | W. Collingswood (Mun.) | Sec. | Newton Creek | 0.15 | 0.15 | 0.150 | .15 | |

## WOODBURY, MANTUA, AND RACCOON CREEKS

### BASIN DESCRIPTION

Woodbury Creek watershed is located entirely within Gloucester County. The Woodbury Creek originates in Deptford Township and flows in a northwesterly direction approximately 4.5 miles to its confluence with the Delaware River at National Park. A major portion of this waterway is influenced by tidal action. The watershed is primarily suburban with the major population center at Woodbury.

The Mantua watershed is also entirely within Gloucester County. Originating east of Glassboro, the Mantua Creek flows approximately 16.5 miles in a northwesterly direction emptying into the Delaware River just upstream of Paulsboro. The upstream basin is primarily a rural, undeveloped area and becomes increasingly suburban as the river flows through the Township of Mantua. The downstream reach is characterized by extensive mud and tidal flats. Major population centers are Mantua, Paulsboro and Pitman. There are three industrial discharges within the watershed. A large number of oil storage tank farms are present adjacent to the mouth of the Mantua Creek and the Delaware River just downstream of Mantua Creek and also upstream in West Deptford Township. The Lipari, Kramer and Kinsley landfills are also located within the watershed.

The Raccoon Creek watershed, the largest in this segment, is located in Gloucester County. Raccoon Creek and South Branch Raccoon Creek both originate in rural southeastern Gloucester County and flow northwest forming the mainstem at Harrison. There are several small impoundments along the upstream reach of Raccoon Creek. The mainstem flows through a rural area to Swedesboro, the largest population center within the watershed, and then meanders through extensive tidal marshlands to its confluence with the Delaware River. Raccoon Creek receives point source discharges from the Mullica Hill Municipal Sewage Treatment Plant, from the Swedesboro Municipal STP, and from Rollins Environmental Services, Inc. in Logan Township.

### WATER QUALITY ASSESSMENT

Fecal coliform levels are marginally acceptable at most stations during the 1972-1976 time period. Present dissolved oxygen levels are acceptable and above the criterion throughout the segment. However, the two downstream stations on Raccoon Creek show dissolved oxygen levels to exceed criterion during the 1968-1971 period. The downstream station at Swedesboro contravenes the criterion by a considerable margin with less than 5% saturation having been recorded. Portions of each waterway within the segment experience five day biochemical oxygen demands exceeding the criterion. Excessive levels occur at the Woodbury Creek station, Mantua Creek above Chestnut Branch, and Raccoon Creek at Swedesboro. All waterways have pH values within the criteria range; although there is considerable fluctuation in the values recorded from the Raccoon Creek stations. Phosphorus levels exceed the criterion throughout the segment with maximum values recorded at Mantua Creek above Chestnut Branch and Raccoon Creek at Swedesboro. While still above acceptable limits, there appears to have been some reduction in this parameter since the 1968-1972 data collection period at Woodbury and Mantua Creeks. Nitrate-nitrogen values are also excessive at all stations. A rapid increase in nitrate-N concentrations is noted at the Swedesboro stations. The distribution of turbidity and non-filterable residue (suspended solids) values follow similar trends. Maximum values for both parameters occur at Woodbury Creek, Mantua Creek above Chestnut Branch, and Raccoon Creek near Swedesboro with the nonfilterable residue values exceeding the criterion. Although elevated, the turbidity levels at these stations are within the criterion. Dissolved residue (total dissolved solids) levels are within the criterion at all stations sampled.

## PROBLEM ASSESSMENT

Since Woodbury Creek receives only one non-contact cooling water discharge, the source of any water quality degradation is attributed to a possible variety of nonpoint sources including urban and suburban runoff. Although five day biochemical oxygen demand was somewhat elevated, the excessive nutrient concentrations implicate major nonpoint source contributions. Insufficient data precludes determination of contributions from the various possible sources.

Unlike Woodbury Creek, the Mantua Creek is affected by both industrial and non-point sources. Major dischargers include CB5 Records, Struthers-Dunn, Inversand and Essex Chemical. Present available nutrient data from the upstream stations also indicate that rural and agricultural runoff are a source of nonpoint source pollution. Several landfills are located adjacent to downstream tributaries, but they have not been effectively monitored to determine their impact on water quality and the aquatic biota. Suburban runoff does not appear to constitute a significant portion of the nutrient load. Major improvements in the water quality of Mantua Creek have been recorded since the completion in 1973 of the Gloucester County Sewage Authority and its discharge into the Delaware River. Twenty individual treatment facilities which fomerly discharged into Mantua, Woodbury, and Big Timber Creeks have thus been removed from these watersheds.

In contrast to the Woodbury and Mantua Creeks, Raccoon Creek receives major and significant point source discharges. Rollins Environmental Services, Inc. receives large quantities of diverse industrial waste, and discharges the treated wastes into the tidal reach approximately 2 miles downstream of Swedesboro. Additionally, the Swedesboro Municipal Sewage Treatment Plant discharges into Raccoon Creek within a tenth of a mile downstream of the Swedesboro station. The upstream segment is impacted primarily by agricultural runoff with high nutrient concentrations evident at all upstream rural stations. Excessive nutrient levels, elevated $BOD_5$ and the exceptionally low percent dissolved oxygen saturation level are evident downstream at Swedesboro.

Although these major dischargers are located downstream of the last sampling station, tidal action does have a considerable impact on the upstream water quality. Agricultural wastes from the Del Monte Corporation Food Processing Plant contribute significantly to the high $BOD_5$ concentration in the Swedesboro STP final effluent. As a result the plant does not meet the secondary/best practicable treatment requirements. The effect of toxic materials emanating from the Rollins Environmental Services effluent is being investigated. An accumulation of toxics in the bottom mud is also possible. The observed exceptionally low dissolved oxygen levels and only moderately elevated $BOD_5$ may be partially explained by the toxic effects of this discharge.

GOAL ASSESSMENT AND RECOMMENDATIONS

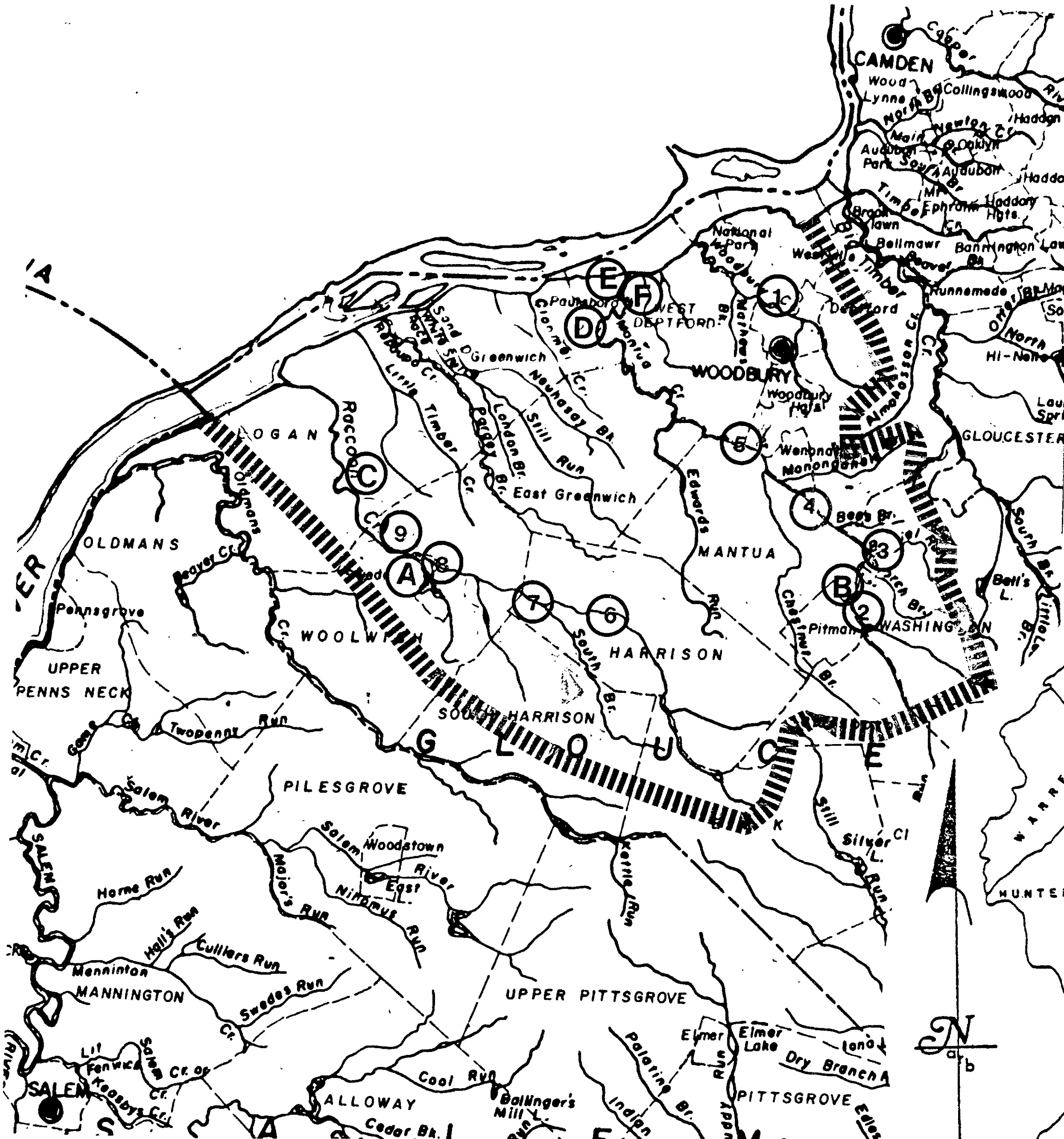
Although fecal coliform levels would indicate that the surface waters marginally meet the swimmable goal, the presence of toxic substances throughout the segment may cause reduced bacterial counts. Dissolved oxygen concentrations are sufficient in the upstream reaches to meet the fishable goal. A complete and accurate assessment concerning attainment of the swimmable/fishable goals is not possible due to the lack of a thorough investigation of all possible contaminants throughout this segment. Sources of contamination not adequately monitored include landfill leachate in upstream areas and the movement of wastewater effluent from major dischargers on the Delaware upstream by tidal action.

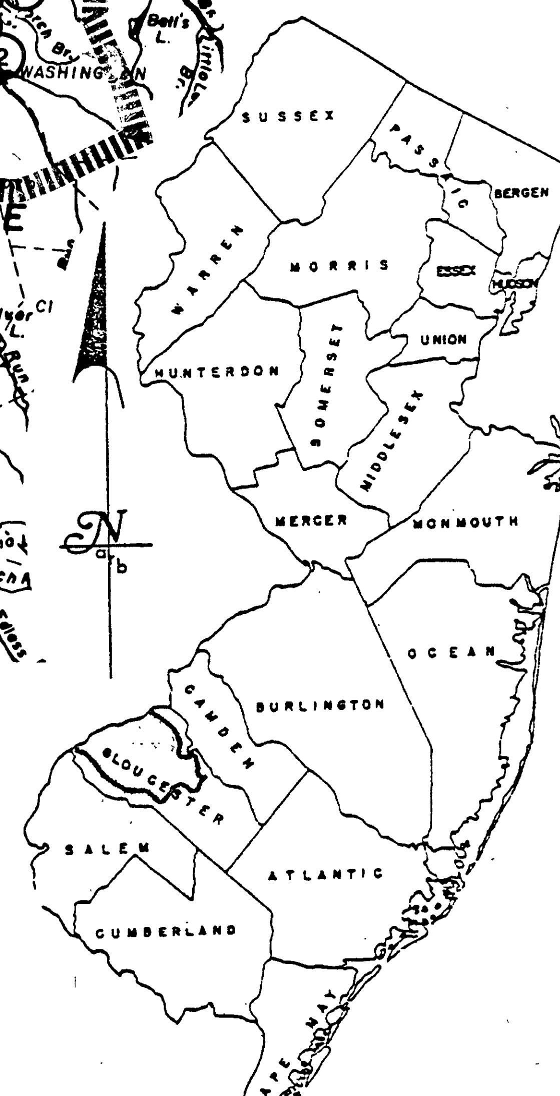
The upstream watershed appears to be adequately monitored, but stations for monitoring chemical and biological parameters downstream of major discharges are necessary and should be implemented immediately. The monitoring of toxic materials, especially in Raccoon Creek, should also be expanded and include examination of bottom muds for any accumulation of toxic substances. The monitoring of landfill leachate and direct discharge of landfill wastes into surface waters is also inadequate and should be accompanied by a thorough groundwater monitoring network. Finally, the upgrading of Gloucester County S.A. and Swedesboro Municipal treatment plants could aid in the reduction of the oxygen demand in the tidal zones of Mantua and Raccoon Creeks.

## STATION LIST

| Station Number | Location |
|---|---|
| 1 | Woodbury Creek, Rt. 45, Woodbury |
| 2 | Mantua Creek at Pitman |
| 3 | Mantua Creek at Sewell |
| 4 | Mantua Creek above Chestnut Branch |
| 5 | Mantua Creek at Mantua |
| 6 | Raccoon Creek near Mullica Hill |
| 7 | Raccoon Creek at Harrison Township |
| 8 | Raccoon Creek above Swedesboro |
| 9 | Raccoon Creek, Rt. 551, Swedesboro |

Figure VI.K.1




# LOCATION
# WOODBURY, MANTUA, & RACCOON CREEKS

## LEGEND

| | |
|---|---|
| Point Source | Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ |
| Monitoring Site | ① ② ③ ④ ⑤ |
| Drainage Basin Boundaries | ‖‖‖‖‖‖‖‖ |
| County Bounderies | ▬ ▬ ▬ |
| Municipal Bounderies | ■■■■■ |

Figure VI.K.2

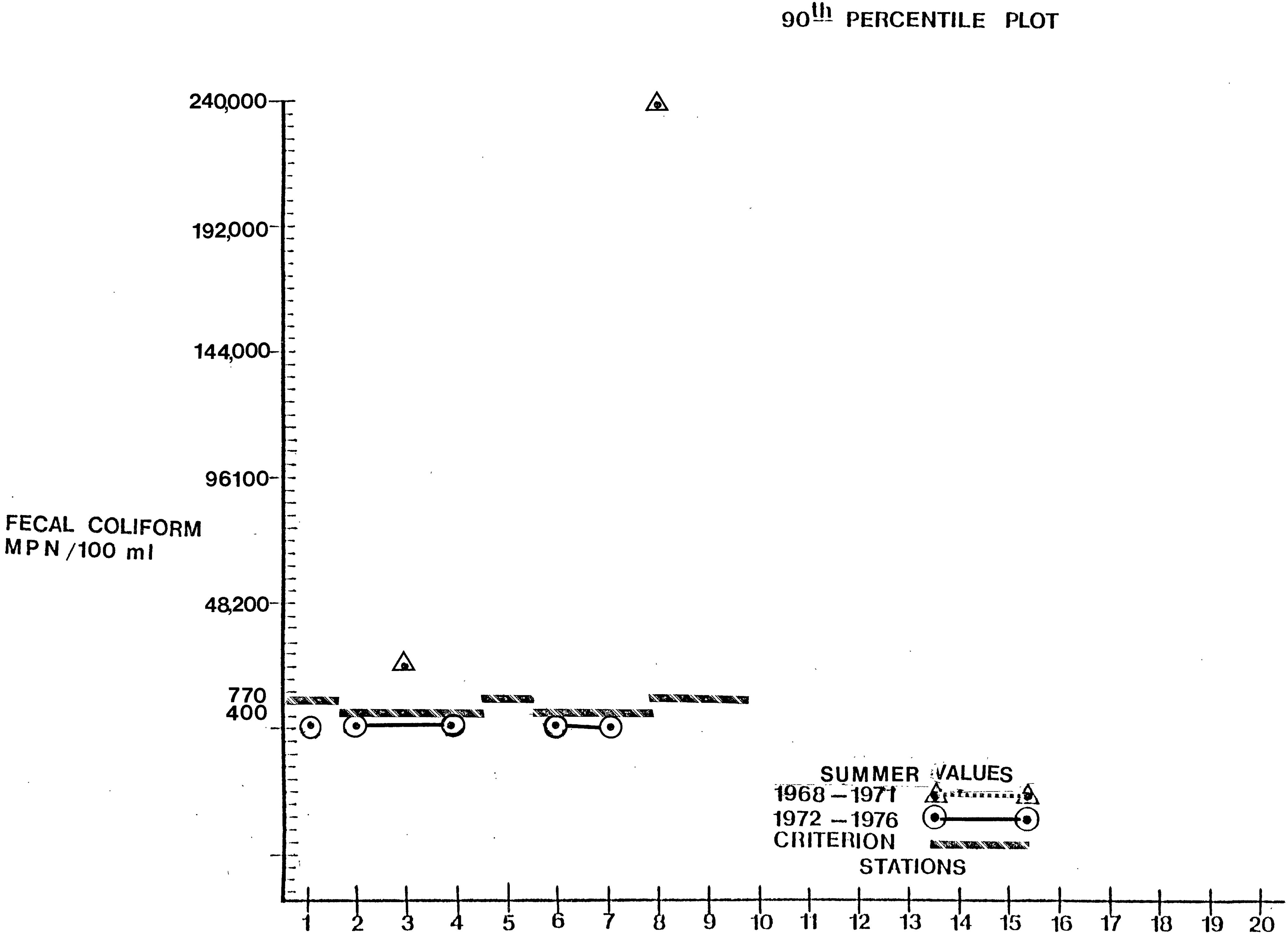

90th PERCENTILE PLOT
FECAL COLIFORM
MPN/100 ml
240,000
192,000
144,000
96100
48,200
770
400
SUMMER VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Figure VI.K.3

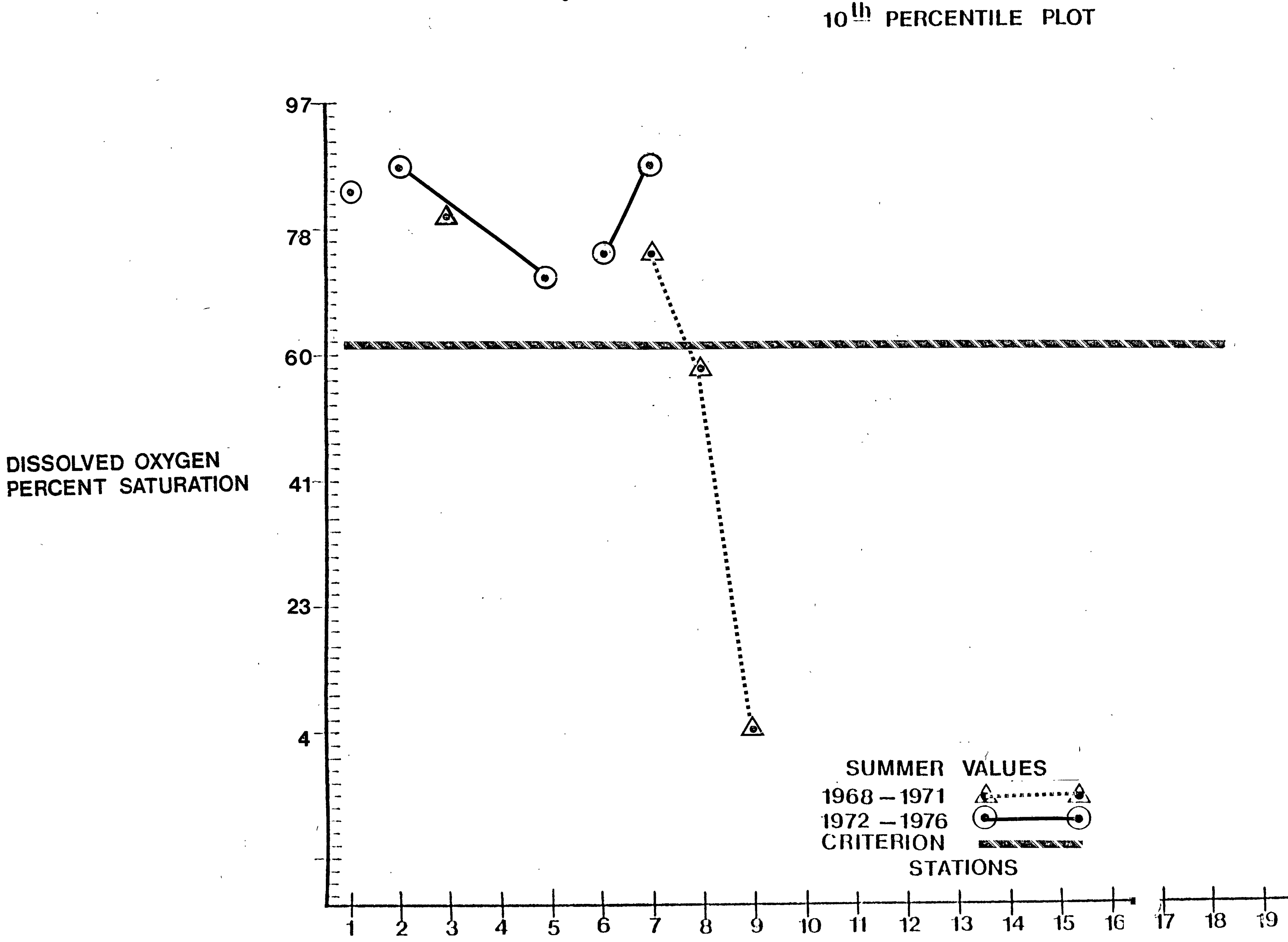
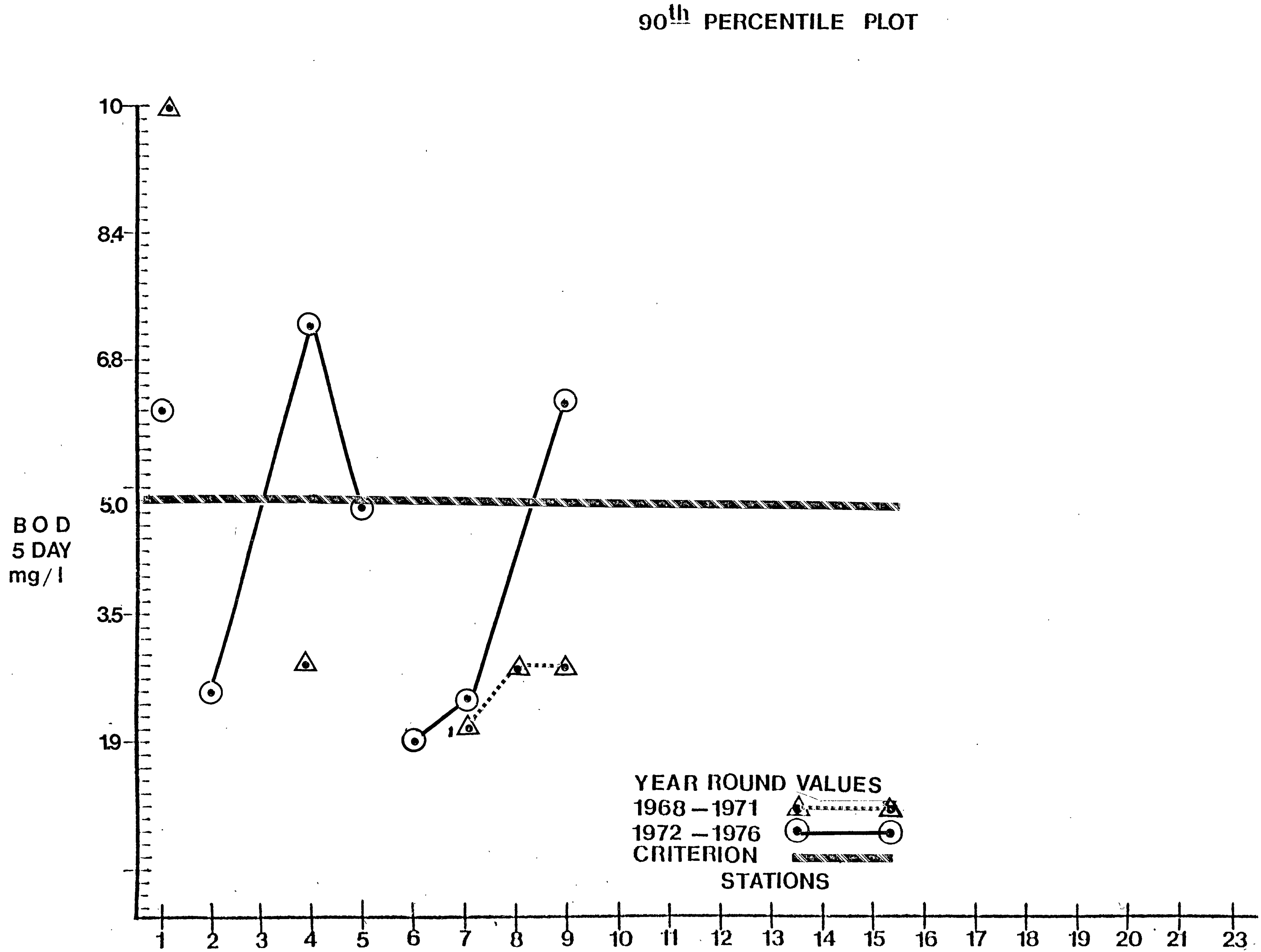

10th PERCENTILE PLOT
97
78
60
41
23
4
DISSOLVED OXYGEN
PERCENT SATURATION
SUMMER VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19

Figure VI.K.4



90th PERCENTILE PLOT
10
8.4
6.8
5.0
3.5
1.9
BOD
5 DAY
mg/l
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
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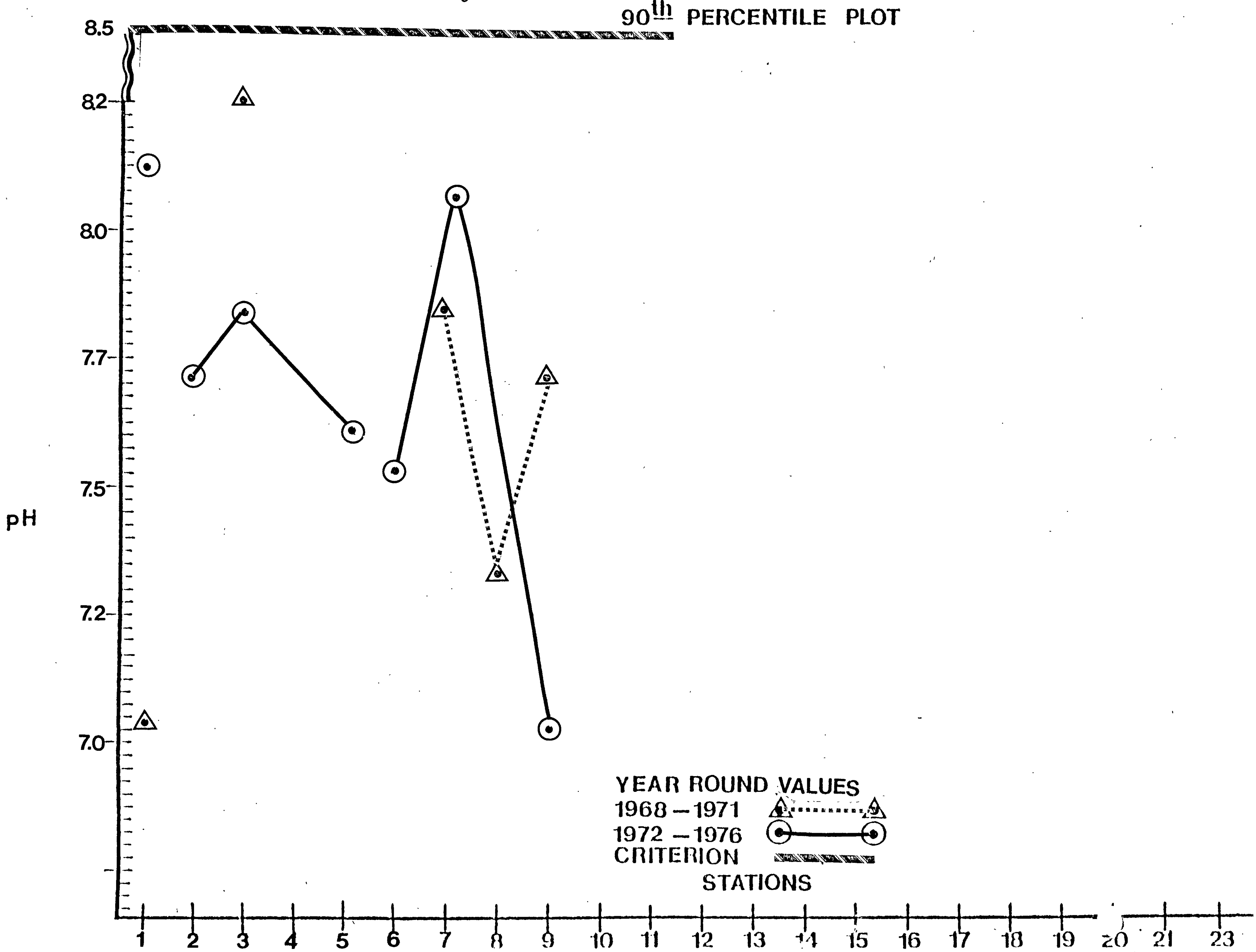
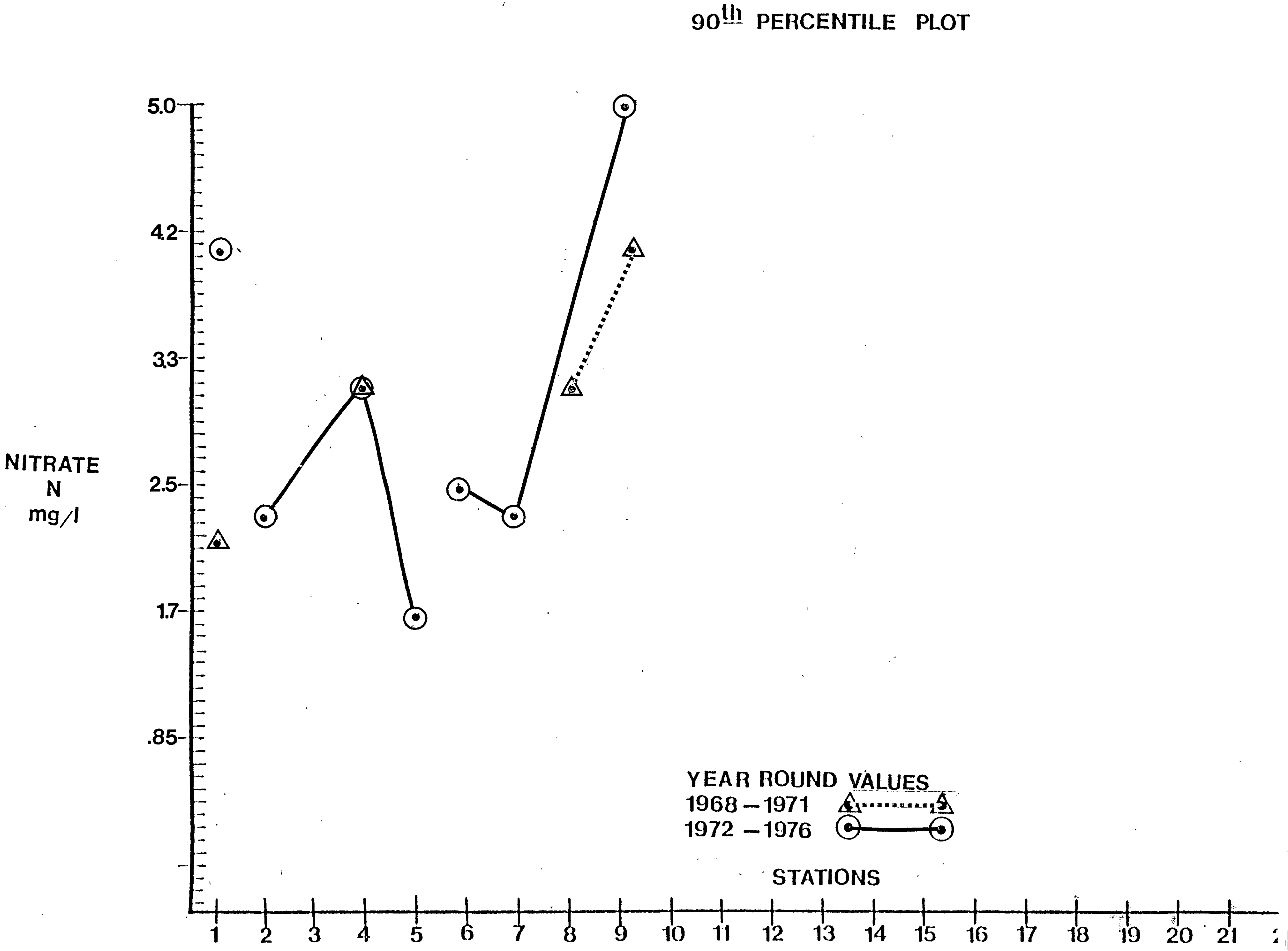
18
19
20
21
23

Figure VI.K.5



90th PERCENTILE PLOT
8.5
8.2
8.0
7.7
7.5
7.2
7.0
pH
YEAR ROUND VALUES
1968 — 1971
1972 — 1976
CRITERION
STATIONS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 23

Figure VI.K.6



90th PERCENTILE PLOT
NITRATE N mg/l
5.0
4.2
3.3
2.5
1.7
.85
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
STATIONS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21

Figure VI.K.7

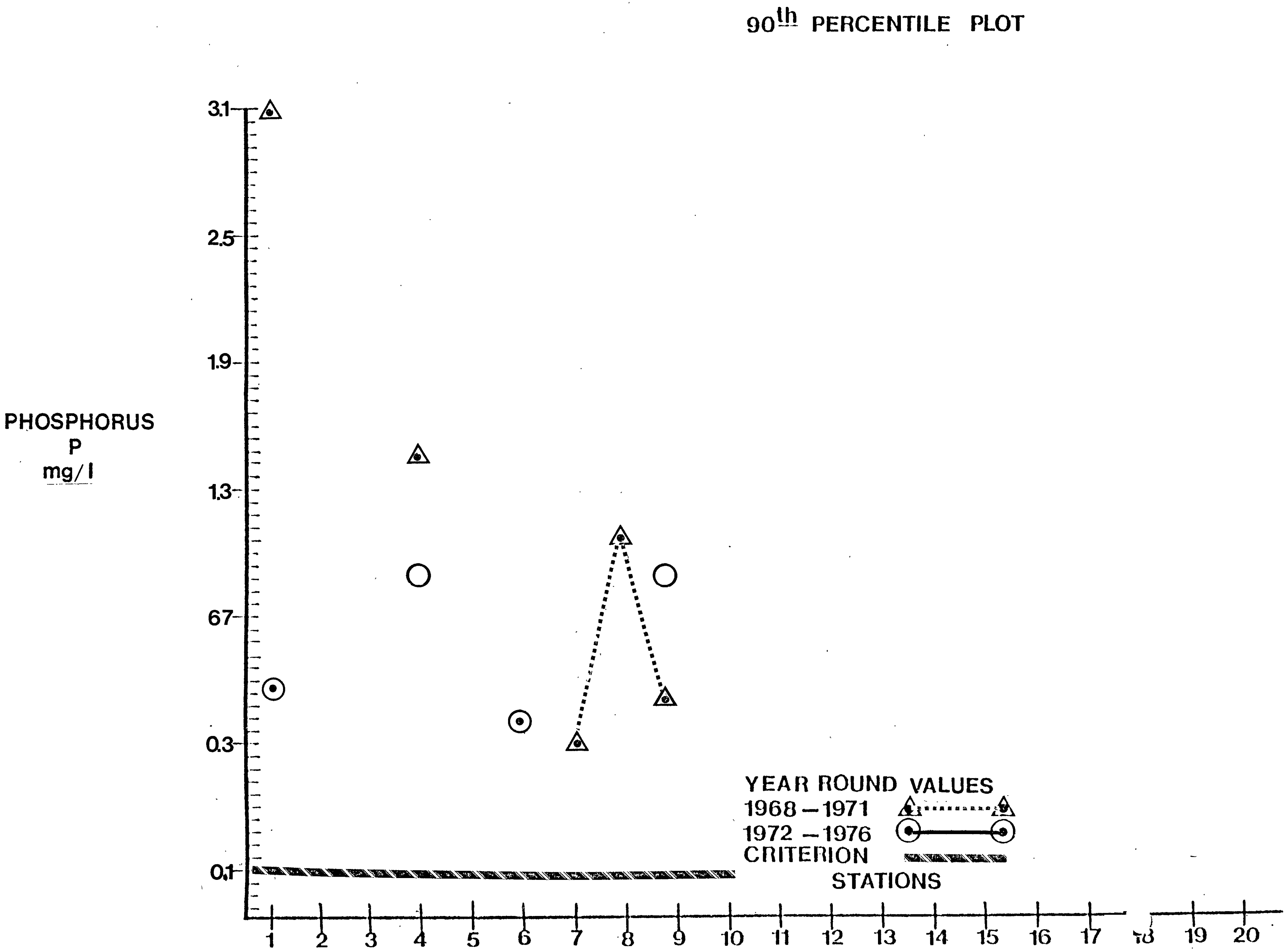

90th PERCENTILE PLOT
PHOSPHORUS
P
mg/l
3.1
2.5
1.9
1.3
67
0.3
0.1
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
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Figure VI.K.8

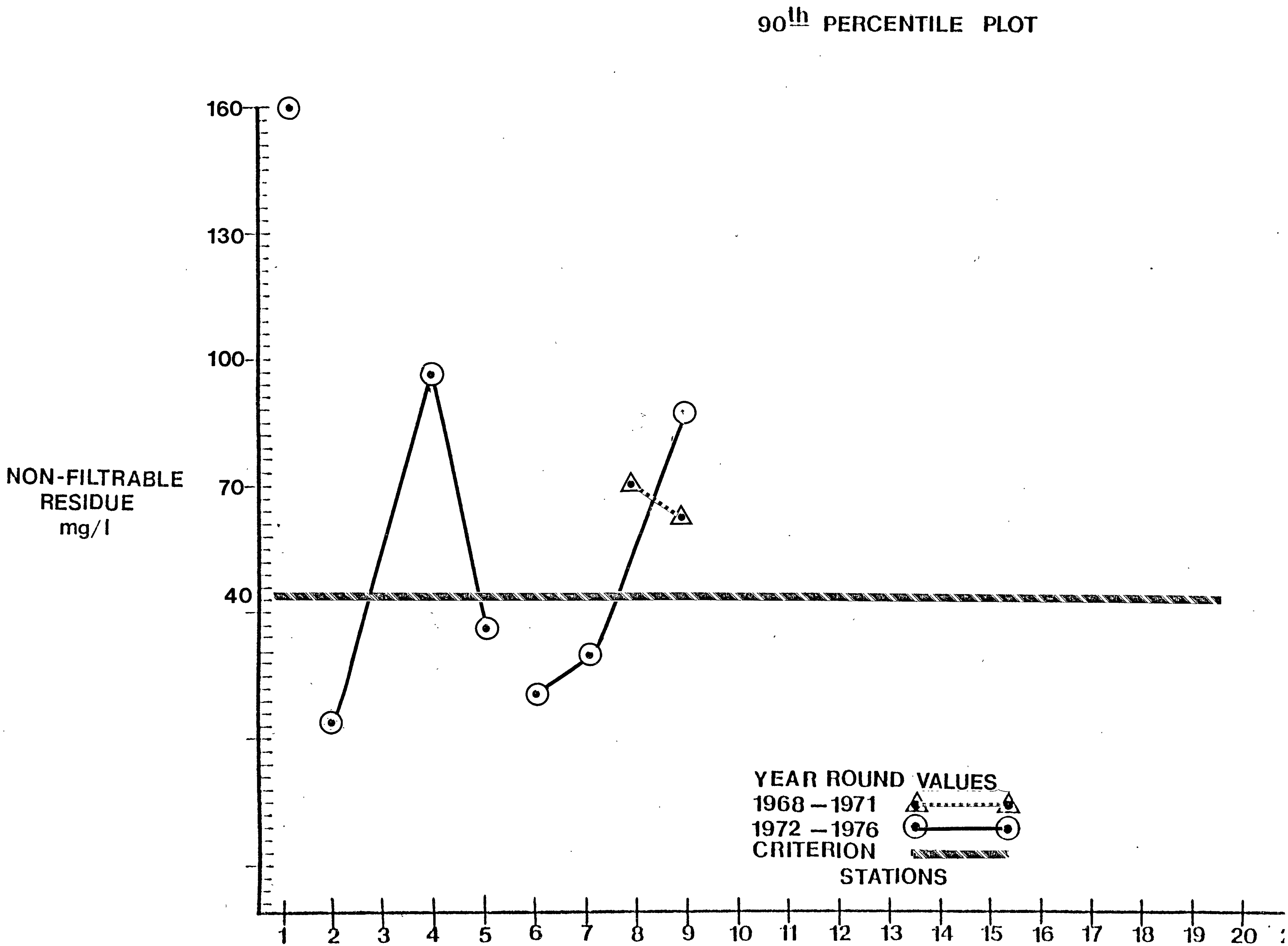
90th PERCENTILE PLOT
NON-FILTRABLE RESIDUE mg/l
160
130
100
70
40
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
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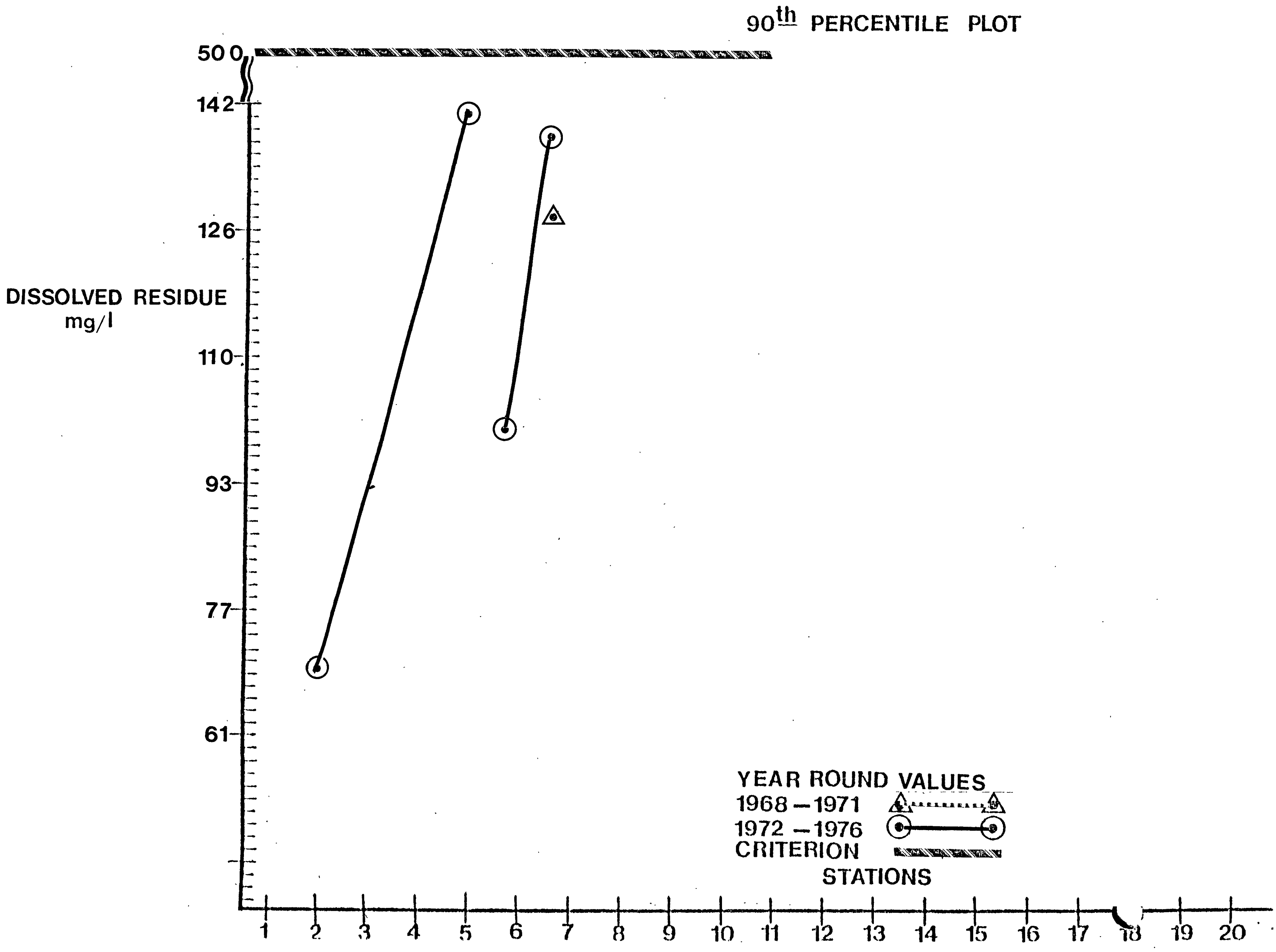
Figure VI.K.9



90th PERCENTILE PLOT
DISSOLVED RESIDUE
mg/l
500
142
126
110
93
77
61
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
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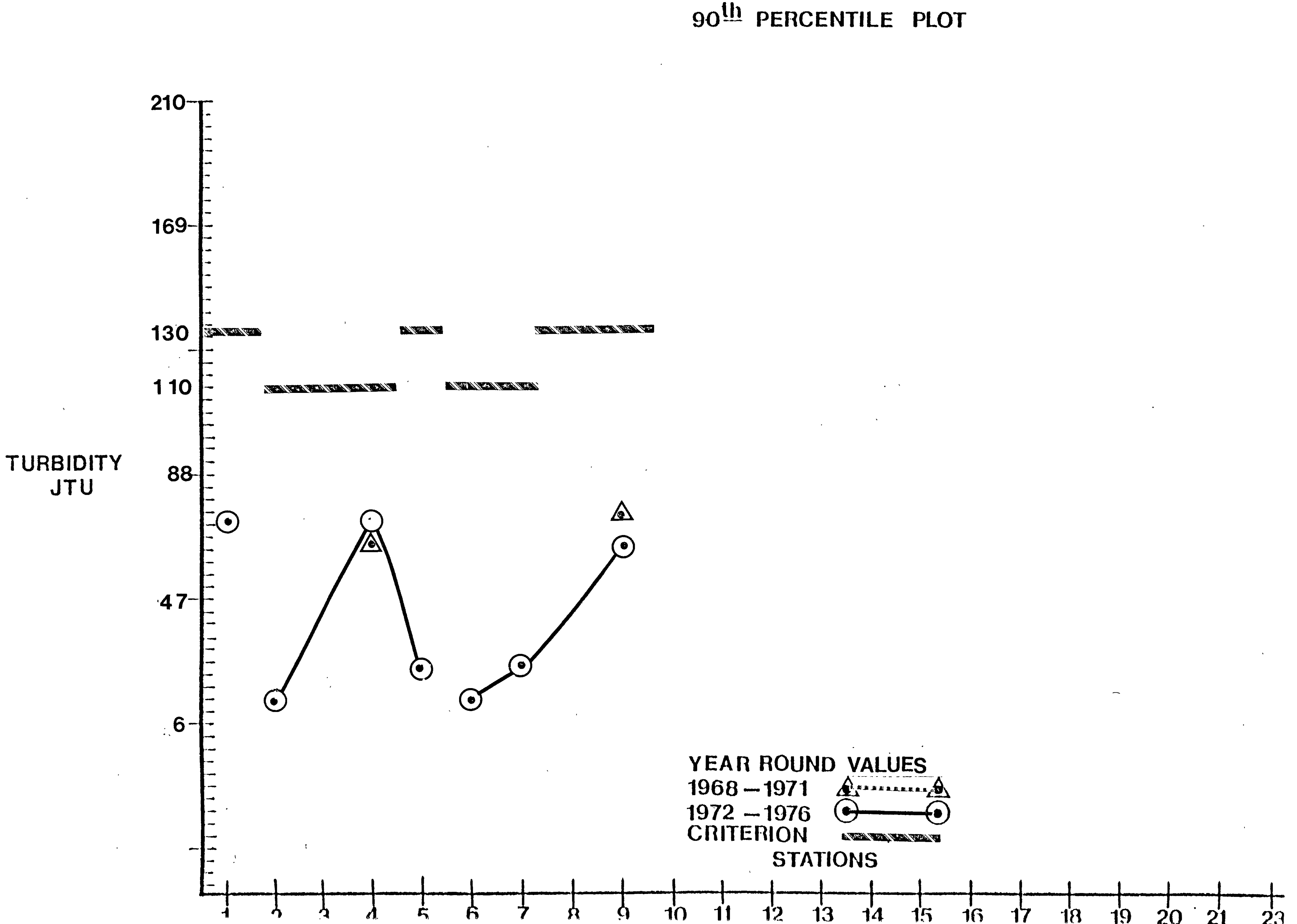
Figure VI.K. 10



# Table VI.K.1

## DISCHARGER INVENTORY

### Mantua and Raccoon Creeks Segment

| MAP CODE | MUNICIPALITY | PLANT NAME | DEGREE OF TREATMENT | RECEIVING STREAM | AVG. (MGD) DAILY FLOW 1973 | 1974 | 1975 | 1976 | COMPLIANCE WITH 1977 REQUIREMENTS OF SECONDARY/ BEST PRACTICABLE TREAT-MENT LIMITATIONS |
|---|---|---|---|---|---|---|---|---|---|
| A | Swedesboro Borough | Swedesboro Municipal | Sec. | Raccoon Cr. | 0.17 | 0.160 | 0.200 | .18 | No |
| B | Pitman Borough | Columbia Broadcast, Sys. | Ind. | Trih to Mantua Creek | 0.280 | 0.280 | 0.380 | | Yes |
| C | Logan Twp. | Rollins Environmental | Ind. | Raccoon Cr. | | | | .6 | - |
| D | Greenwich Township | Mobile Oil Corp. | Ind. | Delaware R. | 18.0 | 18.0 | 18.000 | | Yes |
| E | Paulsboro | Essex Chemical Co. | Ind. | Delaware R. | | | | 3.4 | - |
| F | Deptford Twp. | Gloucester County S.A. | Sec. | Delaware R. | 7.0 | 11.0 | 12.000 | 11.0 | No |
| | Mantua Township | Struthers Dunn | Ind. | Trib. to Mantua Creek | 0.007 | 0.007 | 0.003 | | No |
| | Harrison Township | Mullica Hill Mun. | Sec. | Raccoon Cr. | 0.06 | 0.05 | 0.050 | .065 | Yes |
| | Woodbury | Polyrez | | Trib. to Woodbury Creek | | | | | - |
| | Mantua | Inversand Co. | Sec. | Trib. to Mantua Creek | | | | | No |

## OLDMANS, SALEM, AND ALLOWAYS CREEKS

### BASIN DESCRIPTION

These waters slowly meander through a relatively flat area which is extensively covered by salt marshes along the lower reaches. These wetlands are important spawning areas for shrimp and other estuarine invertebrates which are important food items for the estuarine and anadromous sport fish. This area is sparsely populated and supports a number of dairy, poultry and pig farms. Oldmans Creek and Alloways Creek do not receive any significant direct discharges. The Salem River receives a number of direct discharges, however, most wastewater treatment is performed by septic tanks. Alloways Creek and Salem River are utilized as water supplies for municipalties and industry.

### WATER QUALITY ASSESSMENT

Water quality is generally poor in all three waterways. Fecal coliform levels are above the criterion at all stations in this segment. Summer dissolved oxygen are marginally unacceptable at most stations. Biochemical oxygen demand levels are below the criterion in all stations, except those on Salem River. pH values are generally acceptable in all surface waters. Nutrient levels are high throughout this segment. Turbidity values are below the criterion in all surface waters in this segment, however, nonfiltrable residue (suspended solids) are generally above the criterion. Dissolved residue (total dissolved solids-TDS) are below the criterion in all fresh surface waters.

### PROBLEM ASSESSMENT

Water quality appears to be largely influenced by non-point sources in Alloways and Oldmans Creeks and a combination of point and non-point sources in Salem River. Since no major point source discharges are located on Alloways and Oldmans Creeks upstream of the monitoring stations, the elevated fecal coliform and nutrient levels may be attributed to on-site wastewater disposal systems and agricultural runoff. It is important to control these substances to prevent undesirable conditions for swimming and aquatic weed growths.

Three point source discharges are located upstream of the monitoring stations on Salem River. Fecal coliform, BOD, dissolved oxygen, nutrients, and suspended solids contravene the criteria downstream of these discharges. However, since discharges are relatively small, water quality must also be affected by non-point sources attributed to agricultural runoff.

### GOAL ASSESSMENT AND RECOMMENDATIONS

It is expected that the biological integrity of these surface waters will be maintained. The impact of large water diversions on the assimilative capacity of surface waters must be examined. There is not a sufficient inventory of non-point source impacts on water quality to determine if these waters will be swimmable in 1983. Advanced treatment of domestic wastewaters should improve water quality in the Salem River. In addition, substantial reduction in BOD loads and fecal coliform levels should occur upon completion of the treatment facility at Richman Ice Cream Company. Approximately 90% of the population use on-site wastewater disposal systems. Therefore, sanitary surveys must be coordinated with in-stream and ground water monitoring to determine the impact of these systems on water quality and achievability of water-related beneficial uses in the entire segment.

## SALEM, OLDMANS, ALLOWAYS CREEKS
## STATION LIST

1 Oldmans Creek at Harrisonville

2 Oldmans Creek at Paches Mill

3 Oldmans Creek at Auburn

4 Salem River at Woodstown NJ

5 Salem Creek at Sharptown

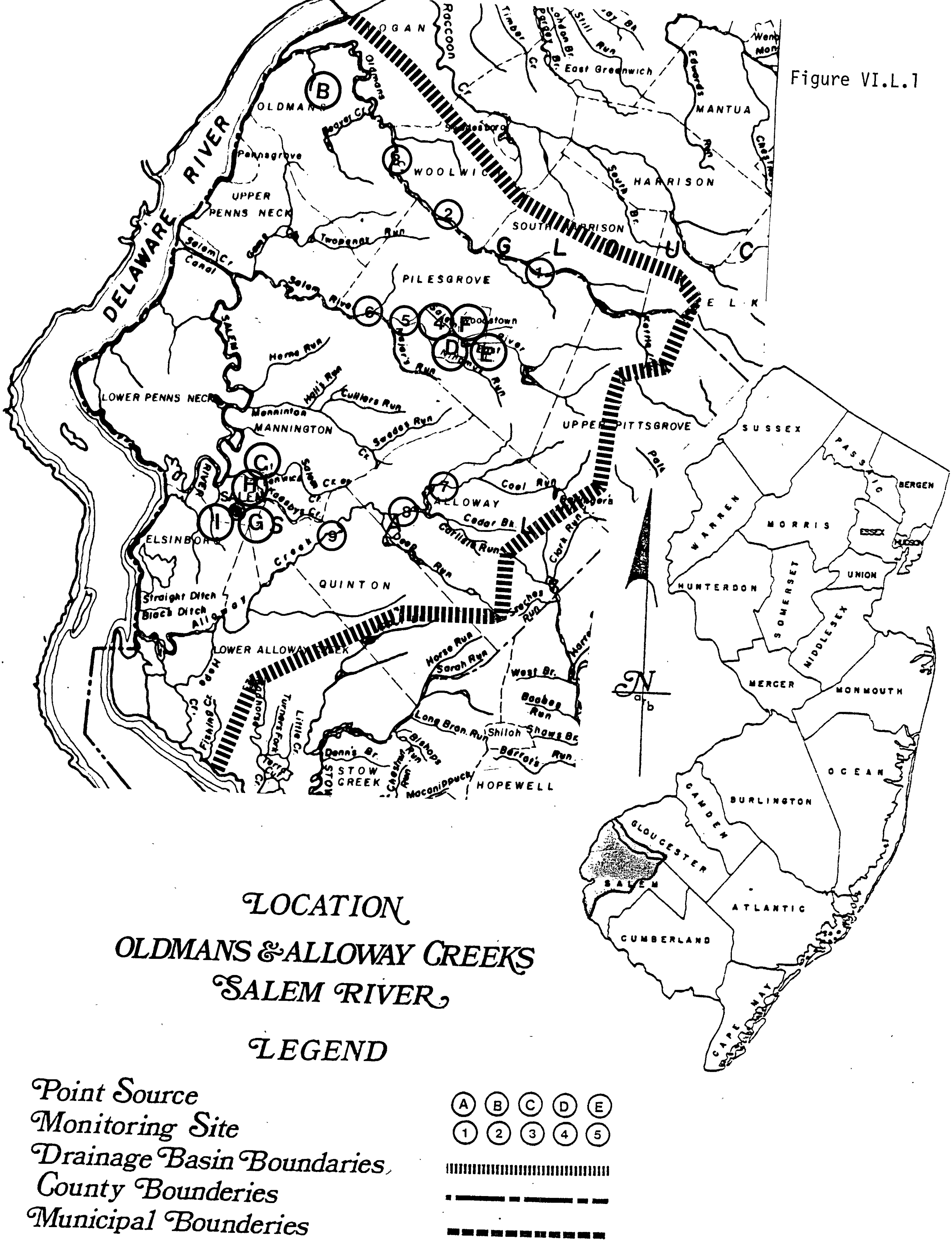
6 Salem River at Courses Landing

7 Alloway at inlet of Alloway Lake

8 Alloway at Alloway

9 Alloway at Quinton

Figure VI.L.1



LOCATION
OLDMANS & ALLOWAY CREEKS
SALEM RIVER
LEGEND
Point Source
Monitoring Site
Drainage Basin Boundaries
County Bounderies
Municipal Bounderies
A B C D E
1 2 3 4 5
DELAWARE RIVER
OLDMANS
UPPER PENNS NECK
LOWER PENNS NECK
PILESGROVE
WOOLWICH
SOUTH HARRISON
HARRISON
MANTUA
EAST GREENWICH
UPPER PITTSGROVE
MANNINGTON
ALLOWAY
QUINTON
ELSINBORO
LOWER ALLOWAY CREEK
STOW CREEK
HOPEWELL
GLOUCESTER
SALEM
SUSSEX
PASSAIC
BERGEN
WARREN
MORRIS
ESSEX
HUDSON
UNION
HUNTERDON
SOMERSET
MIDDLESEX
MERCER
MONMOUTH
OCEAN
BURLINGTON
CAMDEN
ATLANTIC
CUMBERLAND
CAPE MAY

Figure VI.L.2

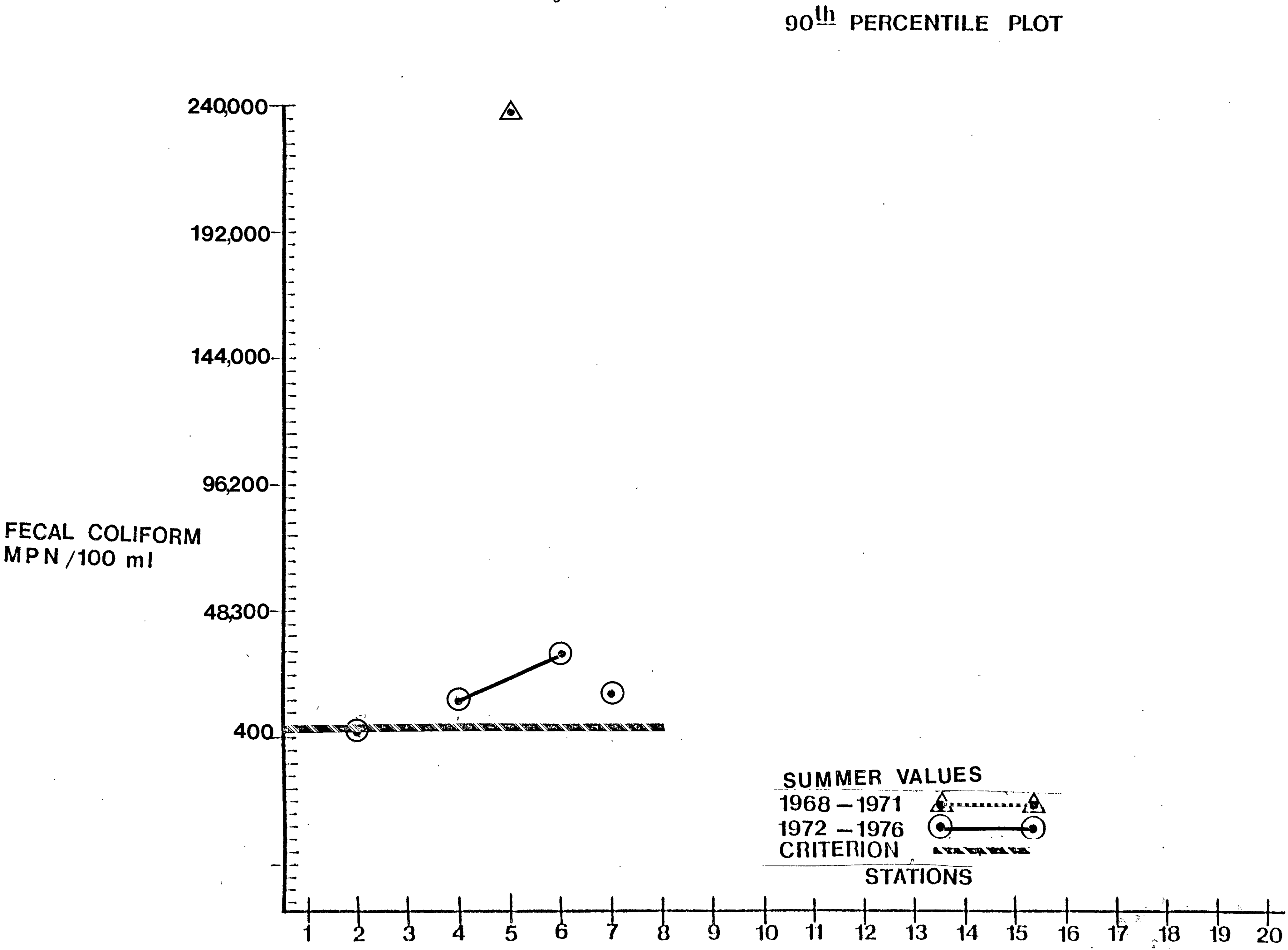

90th PERCENTILE PLOT
240,000
192,000
144,000
96,200
48,300
400
FECAL COLIFORM
MPN /100 ml
SUMMER VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Figure VI.L.3

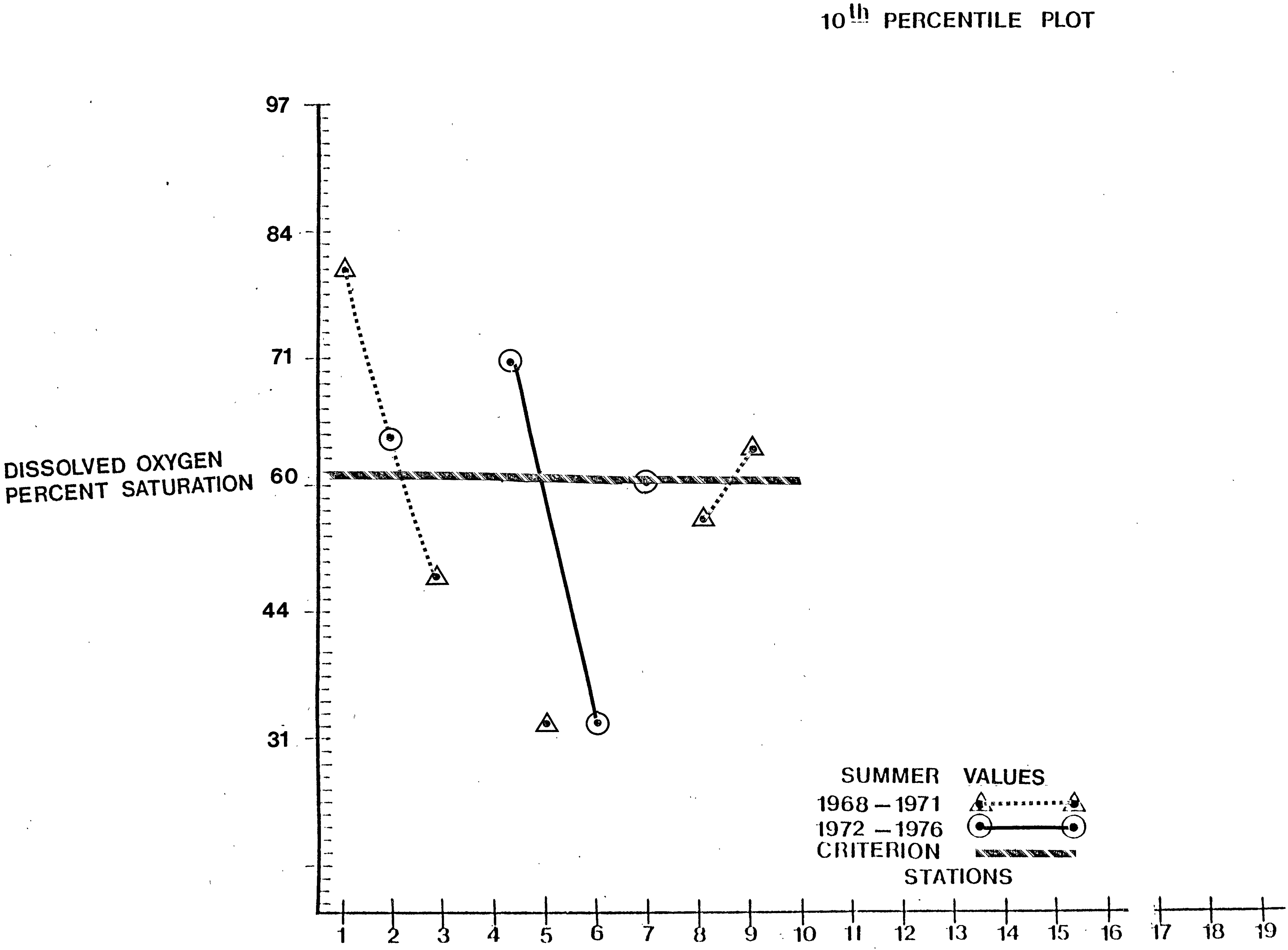
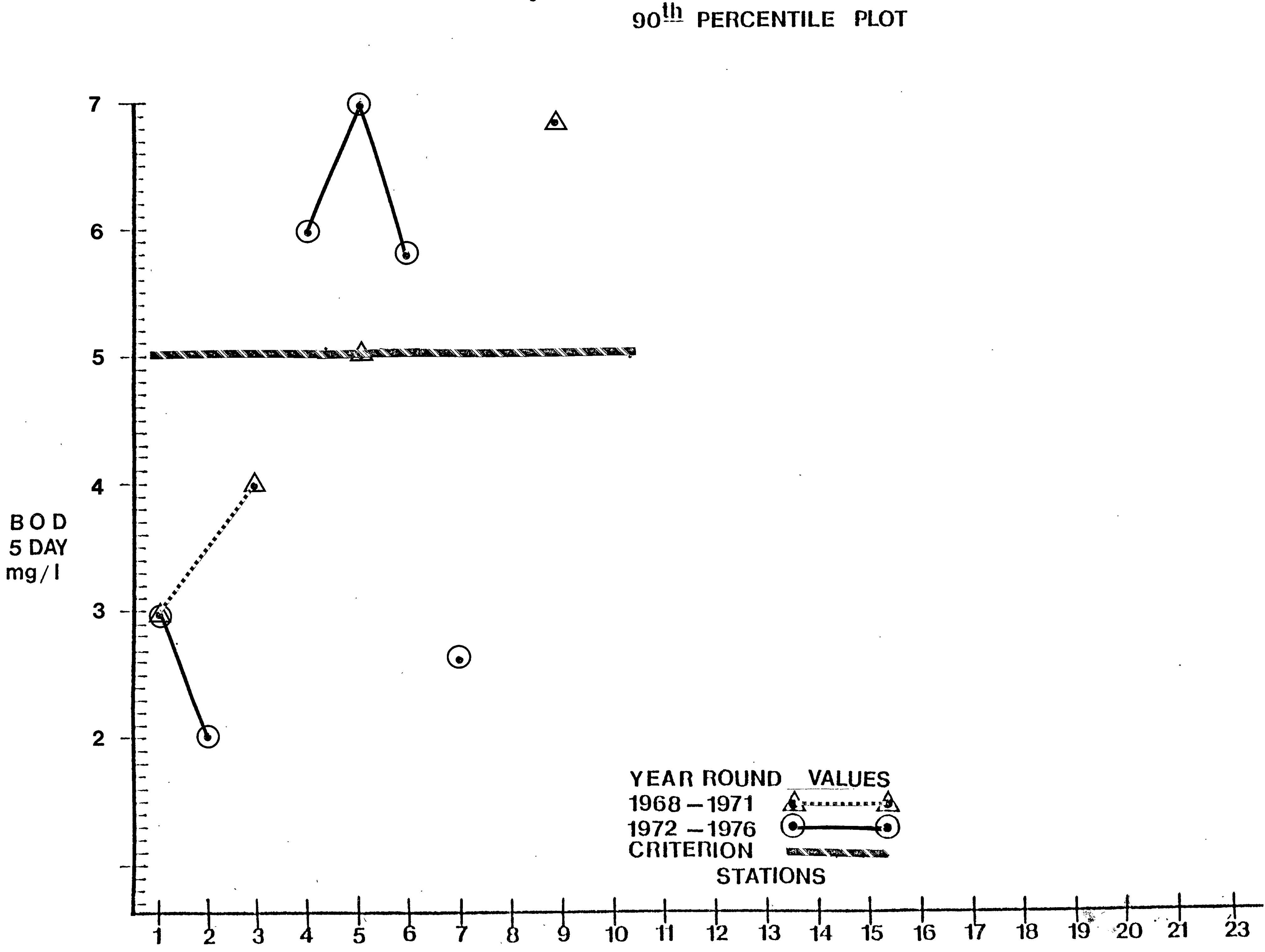

10th PERCENTILE PLOT
DISSOLVED OXYGEN PERCENT SATURATION
97
84
71
60
44
31
SUMMER VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19

Figure VI.L.4


90th PERCENTILE PLOT
7
6
5
4
3
2
BOD
5 DAY
mg/l
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
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14
15
16
17
18
19
20
21
23

Figure VI.L.5

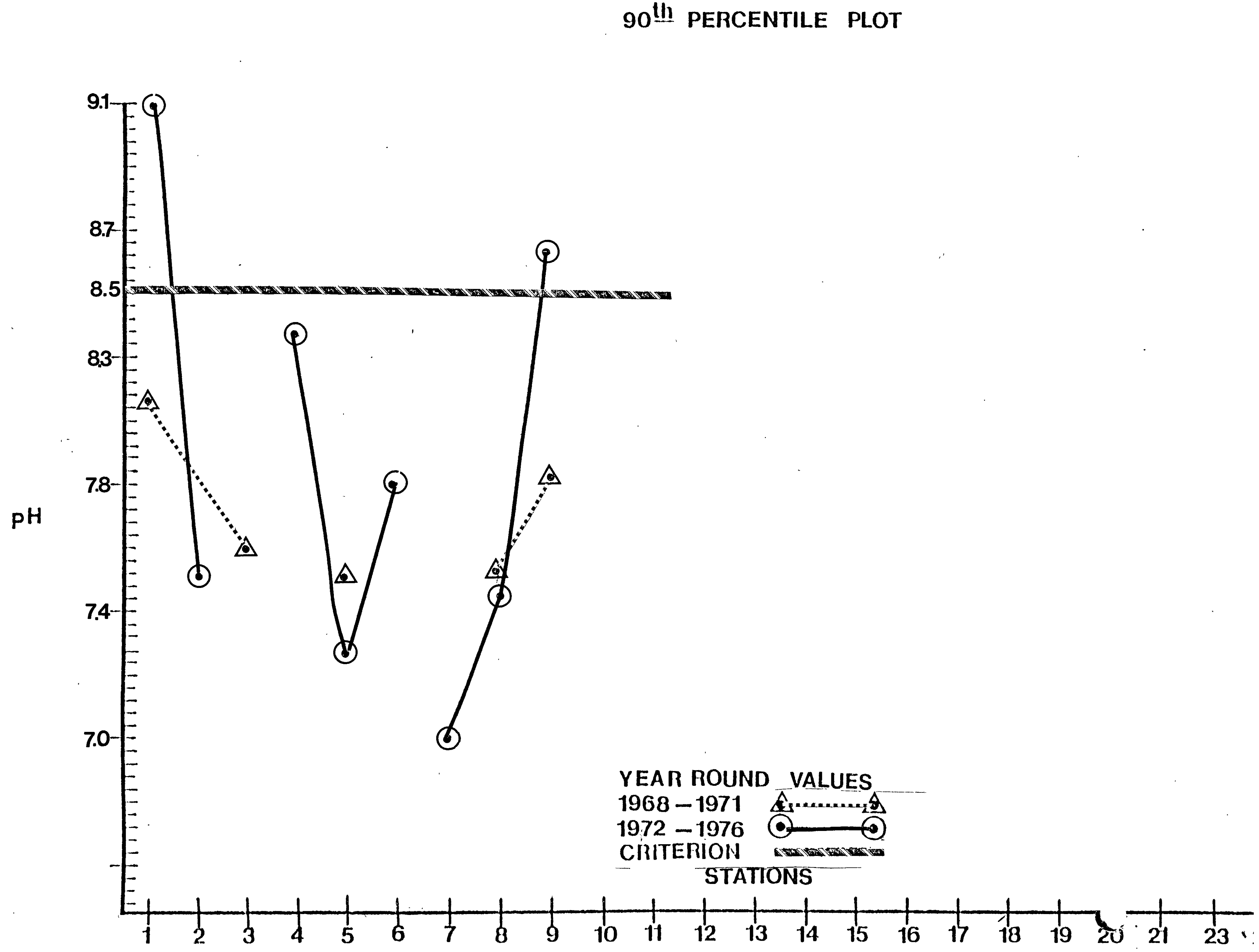
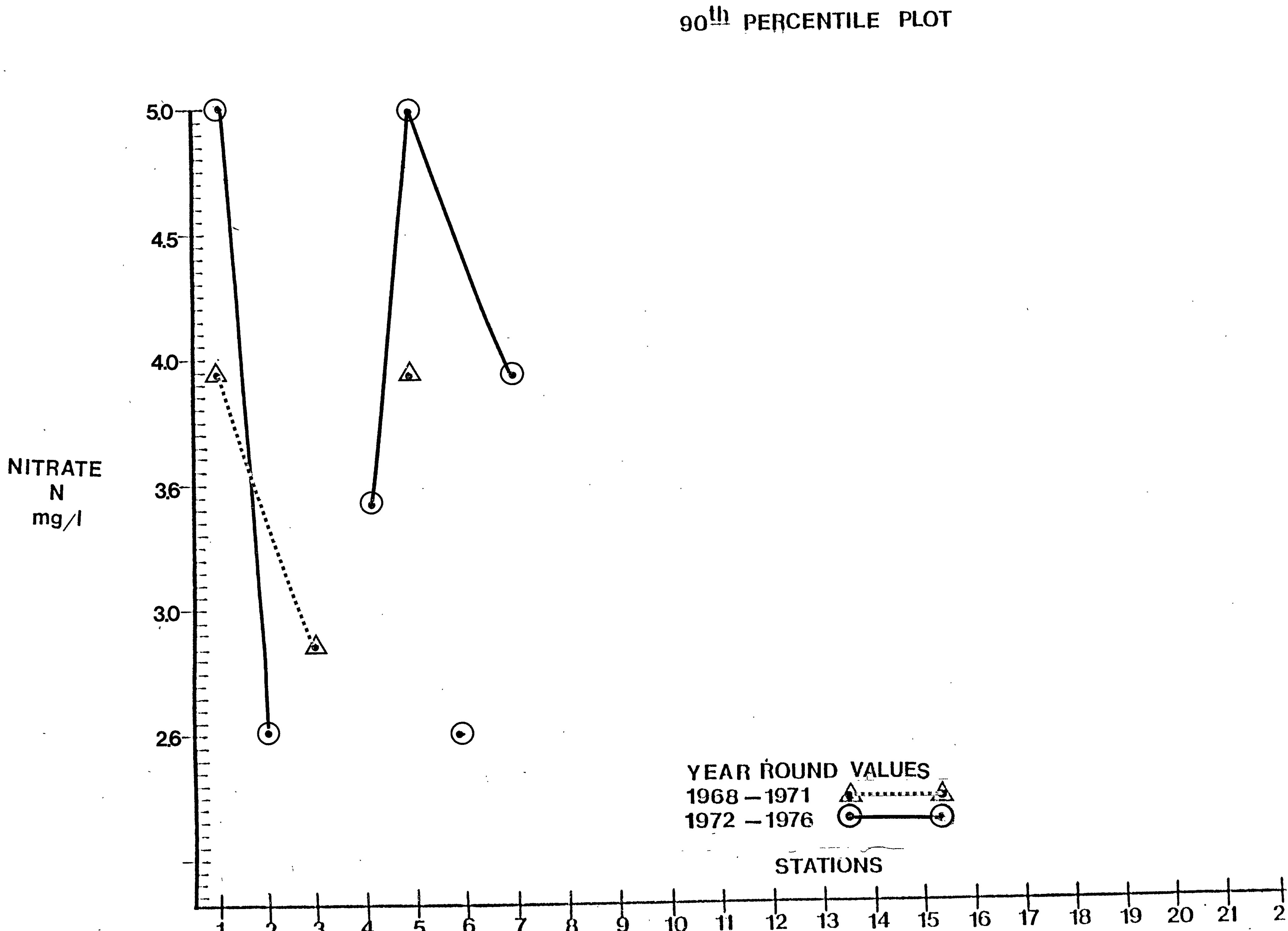

90th PERCENTILE PLOT
9.1
8.7
8.5
8.3
7.8
7.4
7.0
pH
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 23

Figure VI.L.6



90th PERCENTILE PLOT
NITRATE
N
mg/l
5.0
4.5
4.0
3.6
3.0
2.6
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
STATIONS
1
2
3
4
5
6
7
8
9
10
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14
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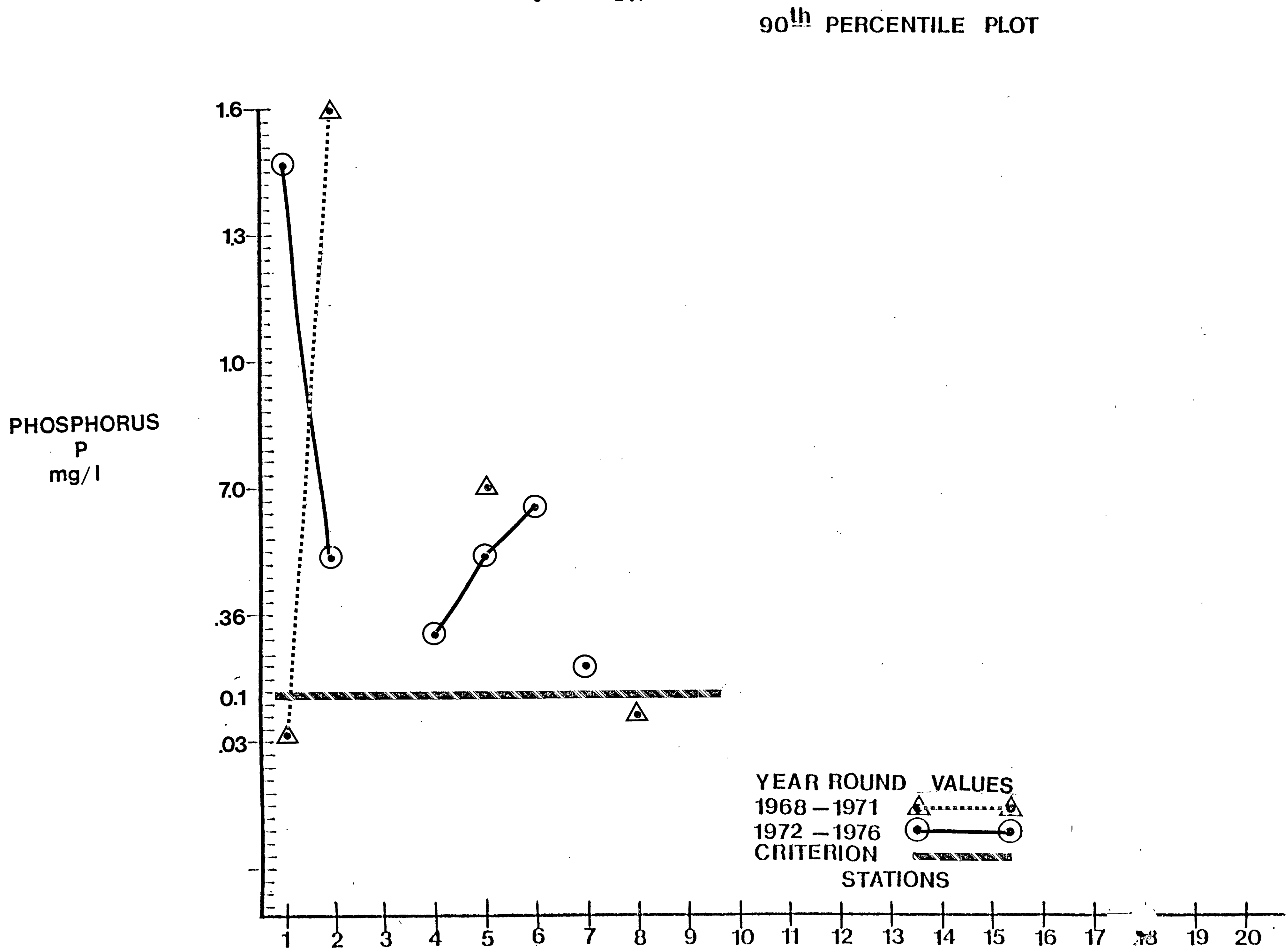
16
17
18
19
20
21

Figure VI.L.7


90th PERCENTILE PLOT
PHOSPHORUS
P
mg/l
1.6
1.3
1.0
7.0
.36
0.1
.03
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
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16
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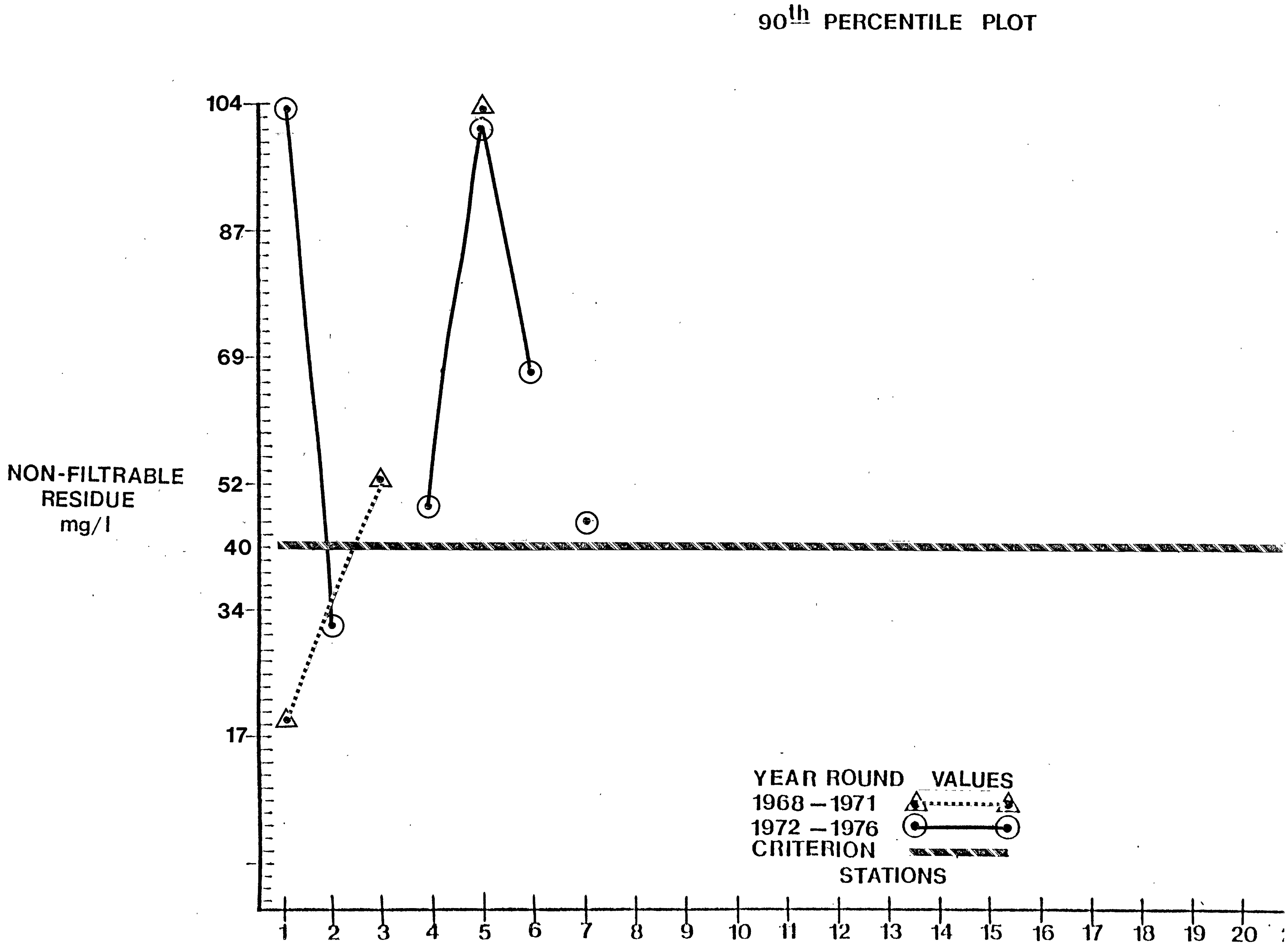
19
20

Figure VI.L8


90th PERCENTILE PLOT
104
87
69
52
40
34
17
NON-FILTRABLE
RESIDUE
mg/l
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
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19
20

Figure VI.L.9

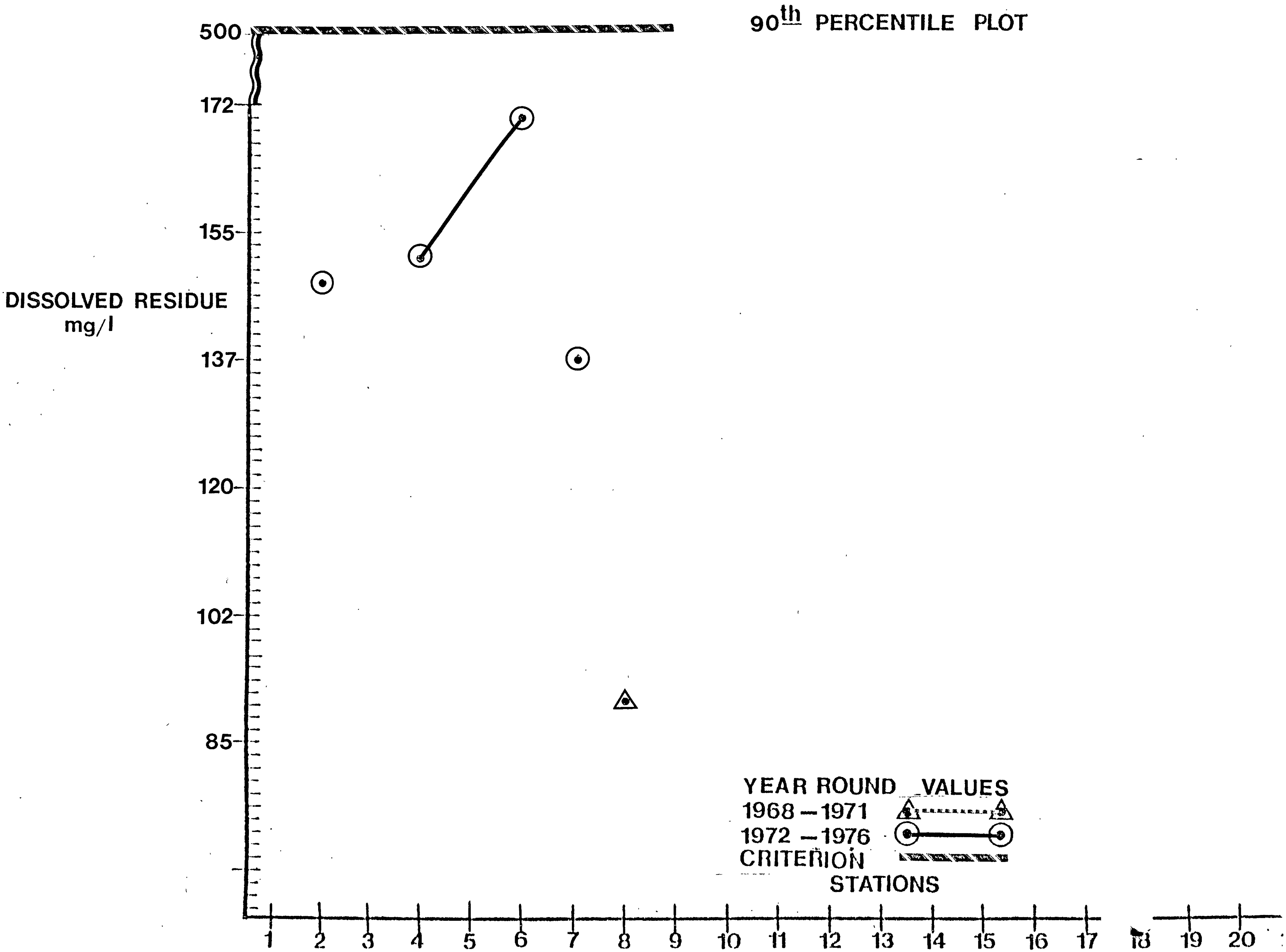
90th PERCENTILE PLOT
DISSOLVED RESIDUE mg/l
500
172
155
137
120
102
85
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
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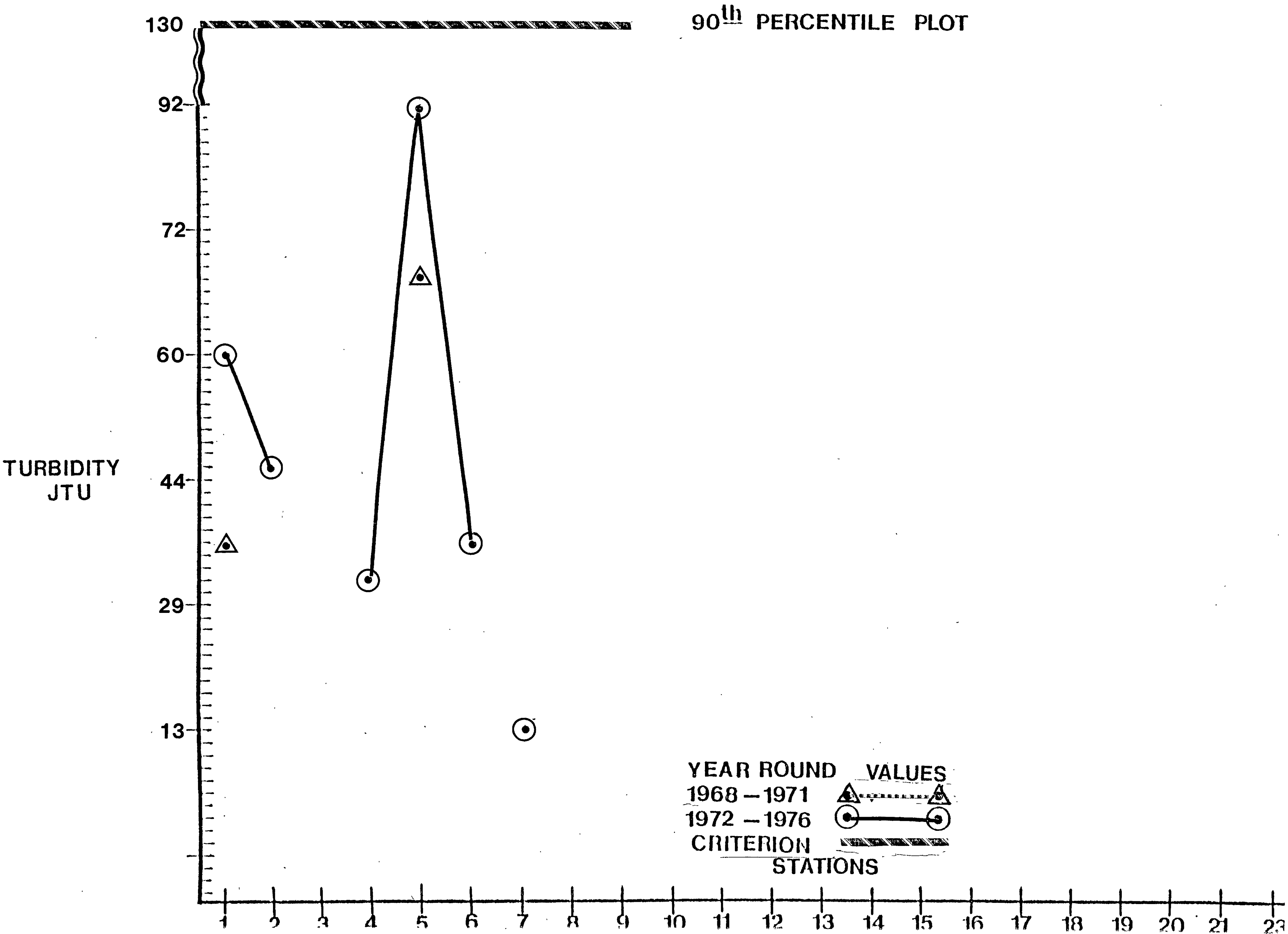
Figure VI.L.10



DISCHARGER INVENTORY

Salem River, Oldmans Creek, Alloway Creek Segment

| MAP CODE | MUNICIPALITY | PLANT NAME | DEGREE OF TREATMENT | RECEIVING STREAM | AVG. (MGD) DAILY FLOW 1973 | 1974 | 1975 | 1976 | COMPLIANCE WITH 1977 REQUIREMENTS OF SECONDARY/BEST PRACTICABLE TREATMENT LIMITATIONS |
|---|---|---|---|---|---|---|---|---|---|
| A | Oldmans Twp. | B.F. Goodrich Co. | | Delaware River | | | | .43 | |
| B | Oldmans Twp. | NL Industry | | Groundwater | | | | - | |
| C | Mannington Twp. | Mannington Mills | Pri. | Pledger Creek | | | | | |
| D | Mannington Twp. | Salem Co. Voc. School | Sec. | Major Run Creek | | | | .0075 | |
| E | Woodstown Borough | Woodstown S.A. | Sec. | Salem River | 0.33 | 0.29 | 0.300 | .3 | No |
| F | Pilesgrove Twp. | Richmond Ice Cream Co. | Ind. | Salem River | | | 0.003 | | |
| G | Salem City | Heinz USA | | Salem River | | | | | |
| H | Salem City | National Bottle Corp. | - | Salem River | | | 0.064 | | |
| I | Salem City | Salem Municipal | Pri. | Salem River | 1.400 | 1.100 | 1.200 | .9 | No |
| | Oldmans Twp. | N.J. Turnpike Auth. | Sec. | Oldmans Creek | 0.065 | 0.055 | 0.050 | .05 | Yes |

# COHANSEY RIVER

## BASIN DESCRIPTION

The Cohansey River originates in eastern Salem County and is wholly within the Atlantic Coastal Plain. It flows southerly through Cumberland County and into Fairfield Township, from there meandering west and then southwest before finally emptying into Delaware Bay. Approximately 20% of the basin is wetlands and tidal marsh and in general the region is sparsely populated. The area is extensively cultivated with the City of Bridgeton being the major population center. However, development of the area is proceeding at a rate higher than the rest of the state. Inasmuch as the basin is sparsely populated, there are only 2 significant point source discharges, both from treatment plants owned by the Cumberland County Sewerage Authority. The 3.0 MGD Bridgeton treatment plant is located on the Cohansey River, at Bridgeton City. The 0.25 MGD Seabrook Farms facility is on Foster Run, a tributary to the Cohansey River, in Upper Deerfield Township.

## WATER QUALITY ASSESSMENT

Fecal coliform values exceed the criterion at all three stations, with the highest levels occurring at Bridgeton. Dissolved oxygen values at stations 1 and 2 indicate compliance with that criterion. Data from the Bridgeton station however indicates non-compliance. The biological oxygen demand data also presents a similar distribution, with excessive values recorded downstream of Bridgeton. Values slightly higher than usual were also recorded at the upstream station and are possibly due to natural sources and algal growth in Sunset Lake. The pH data also reflects the presence of Sunset Lake since that station's alkaline pH is above the criterion, probably the result of high algal productivity. The remaining stations reveal lower alkaline pH values and are well within the criteria.

Elevated phosphorus concentrations, which are evident at all stations, increase in the downstream direction and all exceed the 0.1 mg/l criterion. Elevated nitrate concentrations appear at the Sunset Lake station.

Dissolved residue data are available only in the area of Sunset Lake and are apparently within the criterion. Non-filterable residue and turbidity at both Sunset Lake and Bridgeton are excessive and above the criteria. Maximum values for both parameters occur at Sunset Lake, again reflecting the probability of high algal production.

## PROBLEM ASSESSMENT

The major problem in the upper watershed is the apparent accelerated eutrophication rate of Sunset Lake. The lake is absorbing high concentrations of nutrients and its high rate of productivity is evidenced by super-saturation of dissolved oxygen, high suspended solids and extremely high pH. While agriculture is the primary land use, the relative impact of all possible pollution sources is unknown but includes septic tank leachate, agricultural run-off and wastewater discharged from the Seabrook Farms treatment plant. Although nutrient levels are high in the downstream reach, this river segment is impacted primarily by an excessive biological oxygen demand. As a result, dissolved oxygen levels have fallen below the criterion and present a possible detrimental effect on marine life.

## GOAL ASSESSMENT AND RECOMMENDATIONS

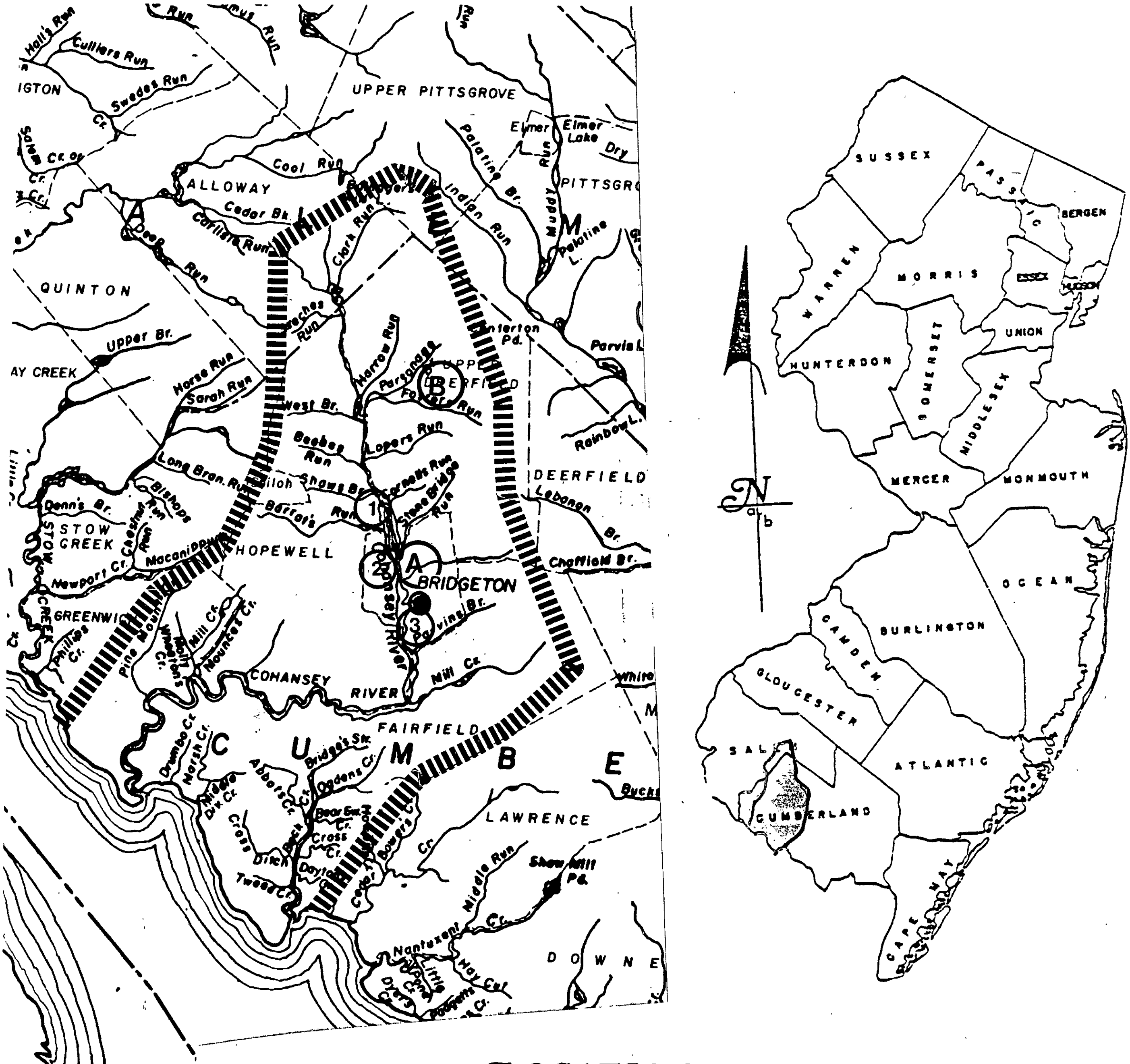
Fecal coliform bacteria values in excess of the criterion apparently preclude the use of these waters for contact recreation. Although the river does meet the goal of a fishable resource, reduced dissolve oxygen levels at Bridgeton present a possible obstacle to a healthy marine ecosytem.

The Seabrook Farms facility is in compliance with the 1977 secondary/best practicable treatment requirements. However, if it is found to contribute a large portion of the nutrient loading into Sunset Lake either nutrient removal capability should be added, or else the facility should be tied into the regional treatment plant in Bridgeton. Improved septic tank management and agricultural methods may also be necessary to reduce the lake eutrophication rate if major non-point sources are implicated.

The river downstream of Sunset Lake is impacted primarily by an excessive biological oxygen demand which causes a reduction in the dissolved oxygen level. A significant contributing factor in this problem may be the Bridgeton municipal wastewater treatment plant discharge. The 3.0 MGD wastewater flow to this plant is receiving primary treatment at present. The plant is being expanded and upgraded to comply with secondary/best practicable treatment requirements by 1979. Subsequent reduction of the oxygen demand in the discharge should improve the dissolved oxygen concentrations and be beneficial to marine life.

## STATION LIST

1. Cohansey River at Seeley Road
2. Cohansey River at Sunset Lake
3. Cohansey River at Bridgeton



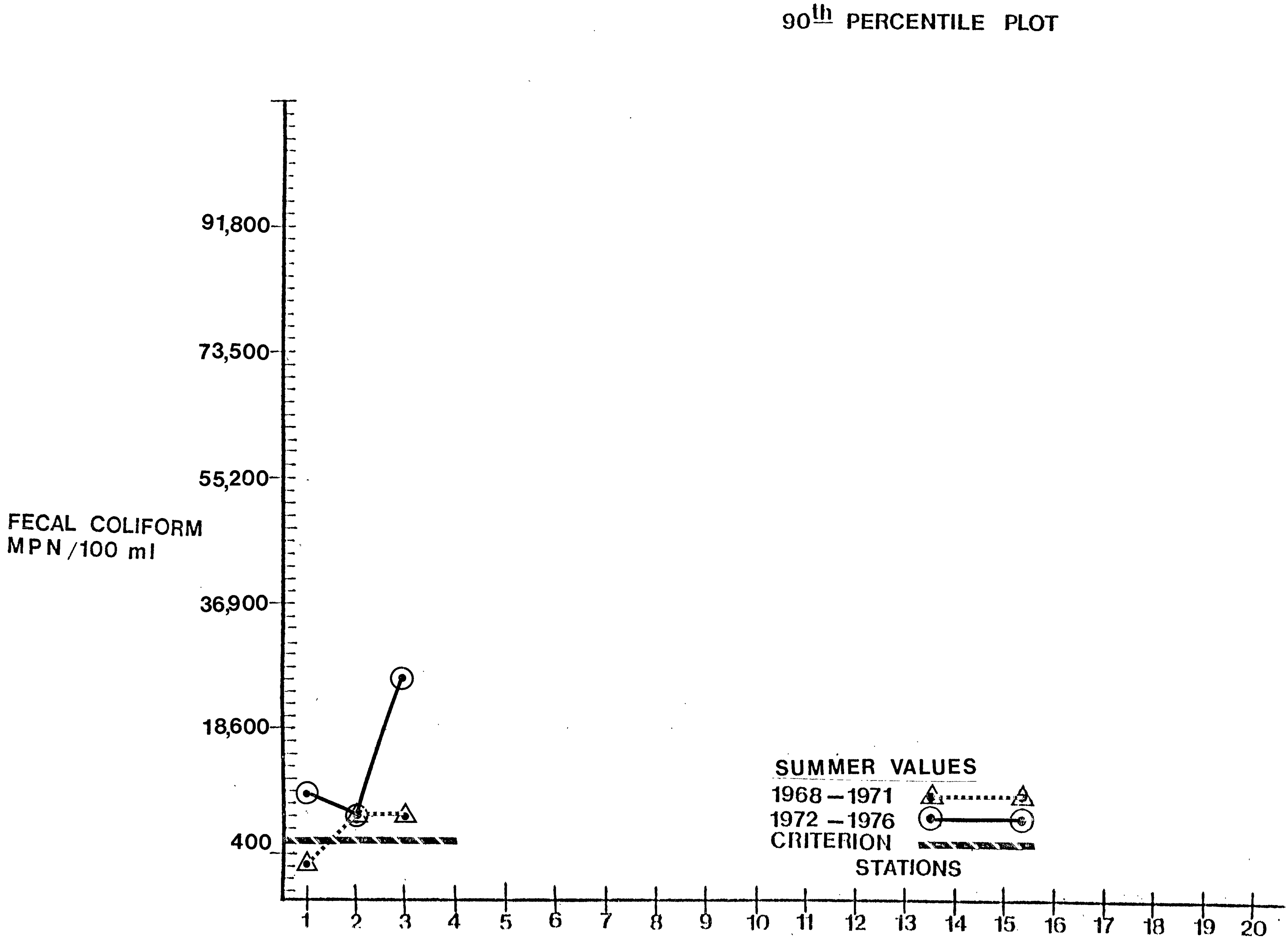

# LOCATION

# COHANSEY RIVER

## LEGEND

| | |
|---|---|
| Point Source | (A) (B) (C) (D) (E) |
| Monitoring Site | (1) (2) (3) (4) (5) |
| Drainage Basin Boundaries | IIIIIIIIIIIIIIIIIIIIIIIIIIIIII |
| County Bounderies | ▪ ▬▬ ▪ ▬▬ ▪ ▬▬ |
| Municipal Bounderies | ▬ ▬ ▬ ▬ ▬ ▬ ▬ |

Figure VI.M.2



90th PERCENTILE PLOT
91,800
73,500
55,200
36,900
18,600
400
FECAL COLIFORM
MPN /100 ml
SUMMER VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
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15
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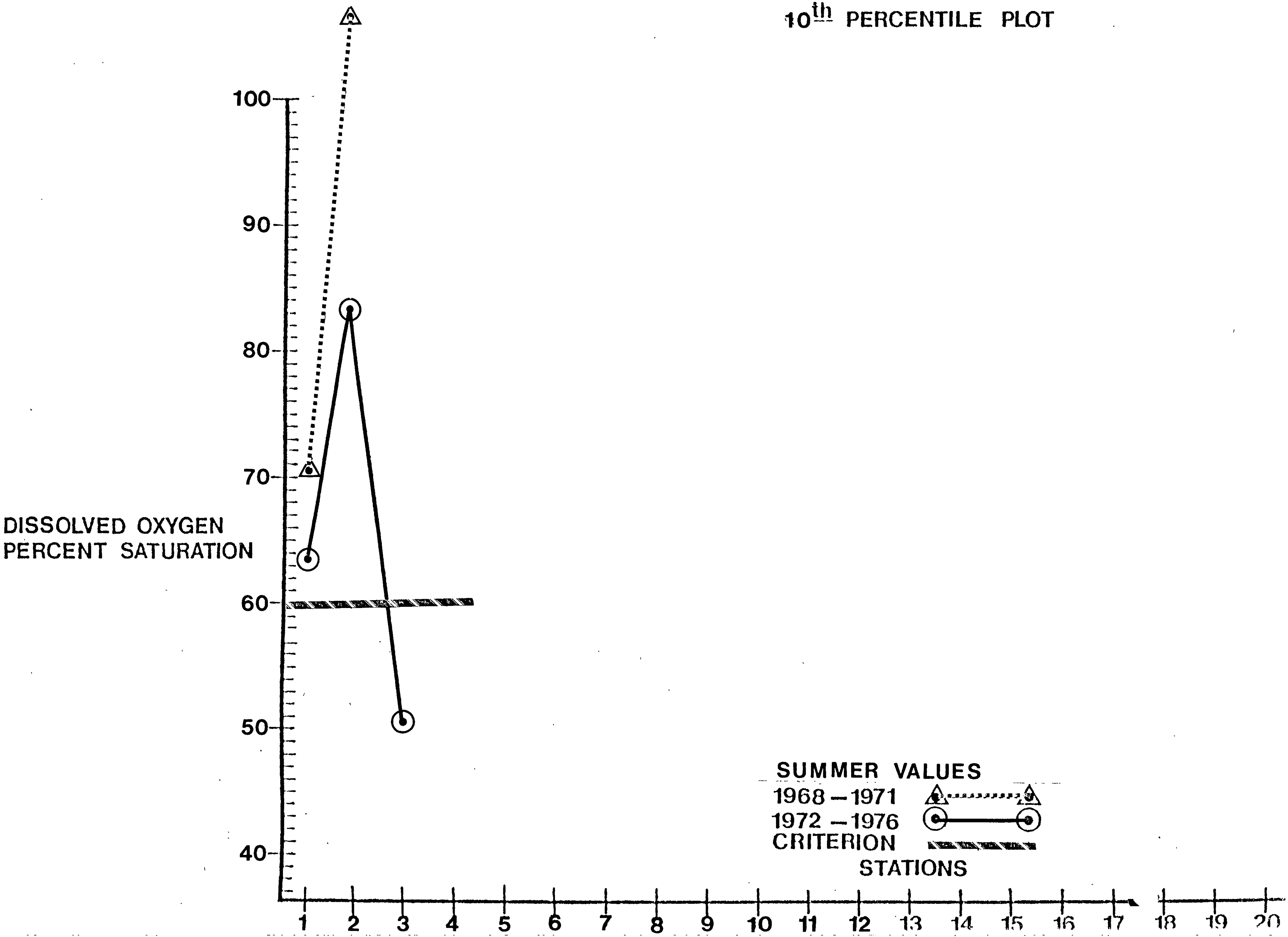
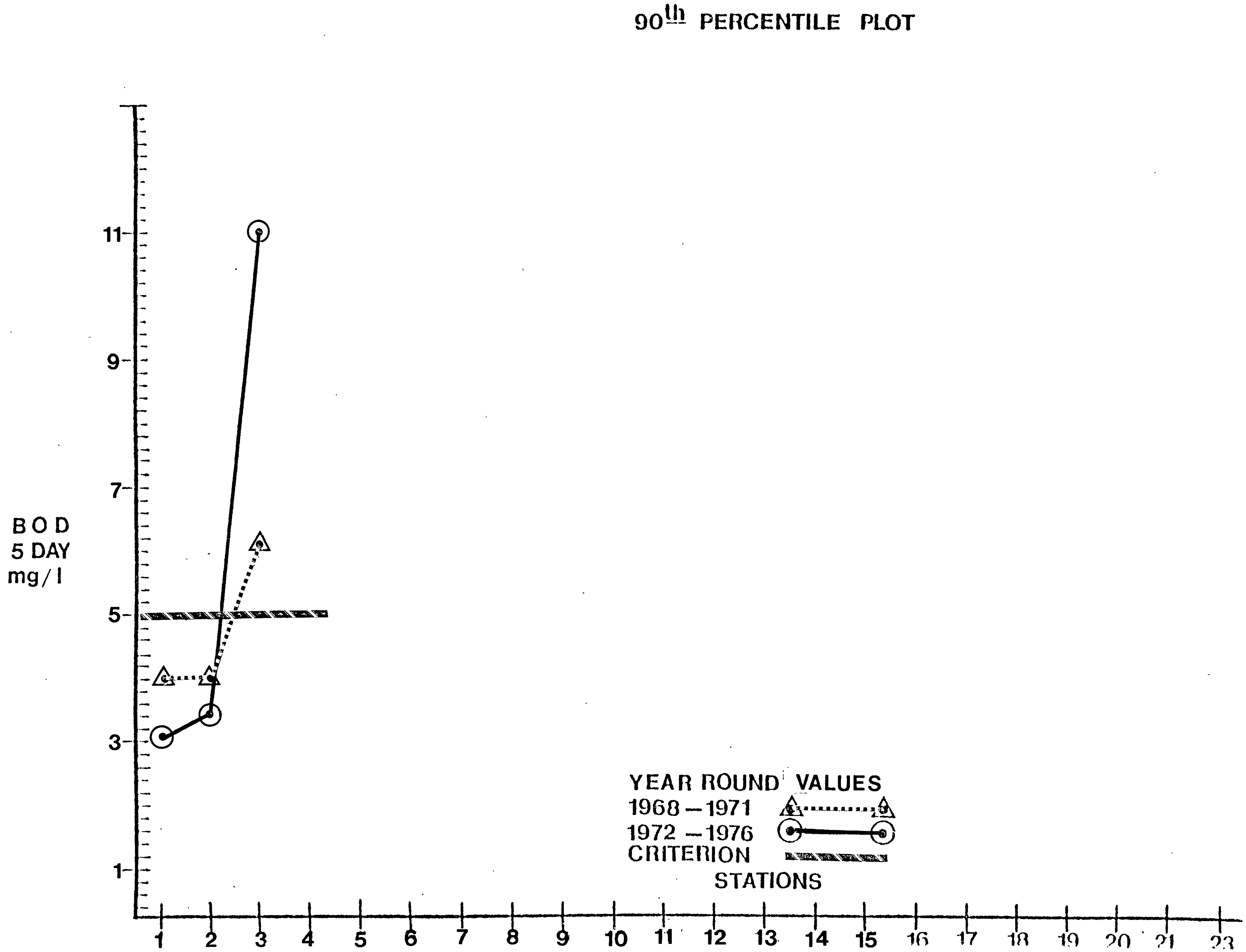
19
20



10th PERCENTILE PLOT
DISSOLVED OXYGEN PERCENT SATURATION
100
90
80
70
60
50
40
SUMMER VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Figure VI.M.4



90th PERCENTILE PLOT
BOD
5 DAY
mg/l
11
9
7
5
3
1
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
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19
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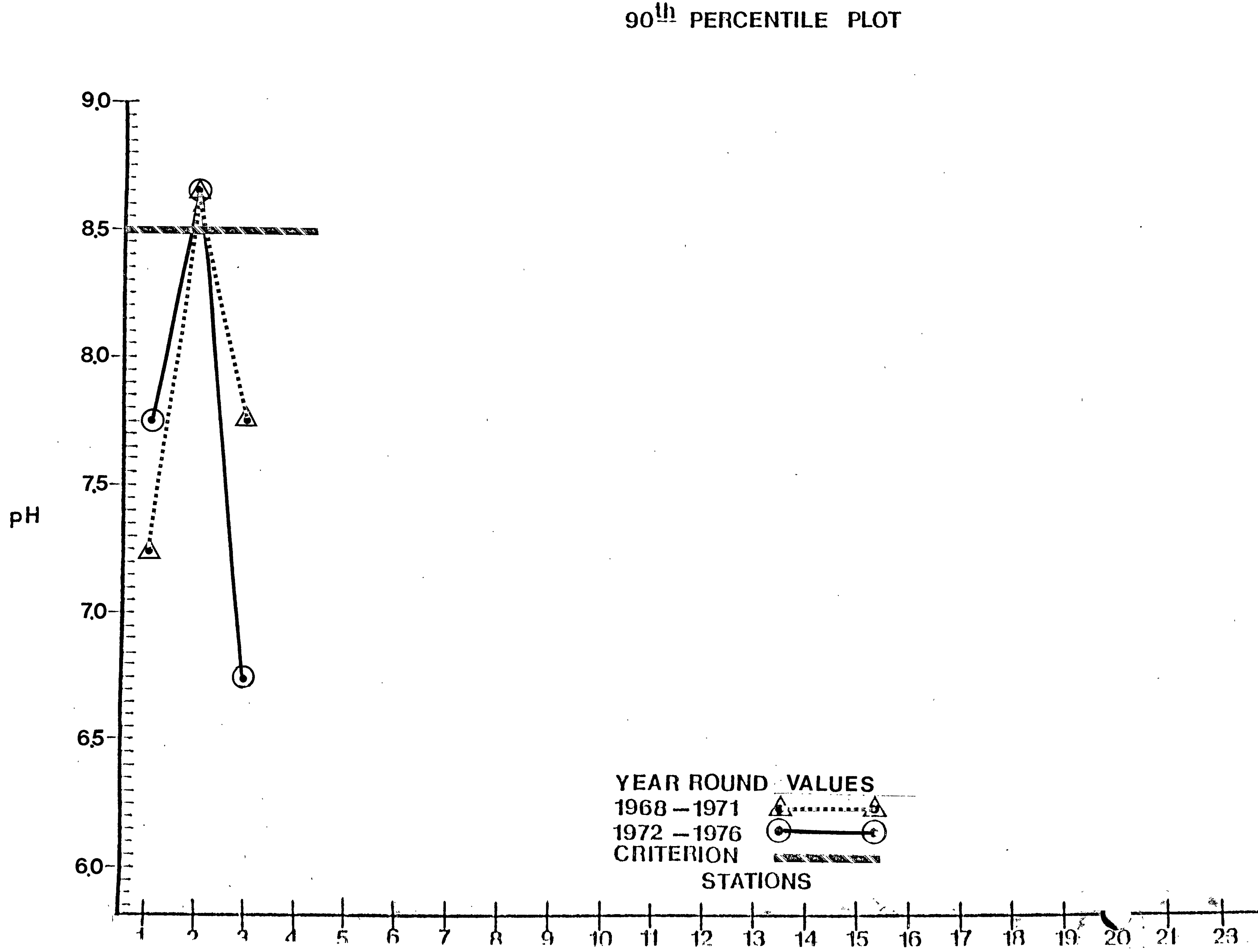
Figure VI.M.5


90th PERCENTILE PLOT
9.0
8.5
8.0
7.5
7.0
6.5
6.0
pH
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
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19
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21
23

Figure VI . M.6

90th PERCENTILE PLOT

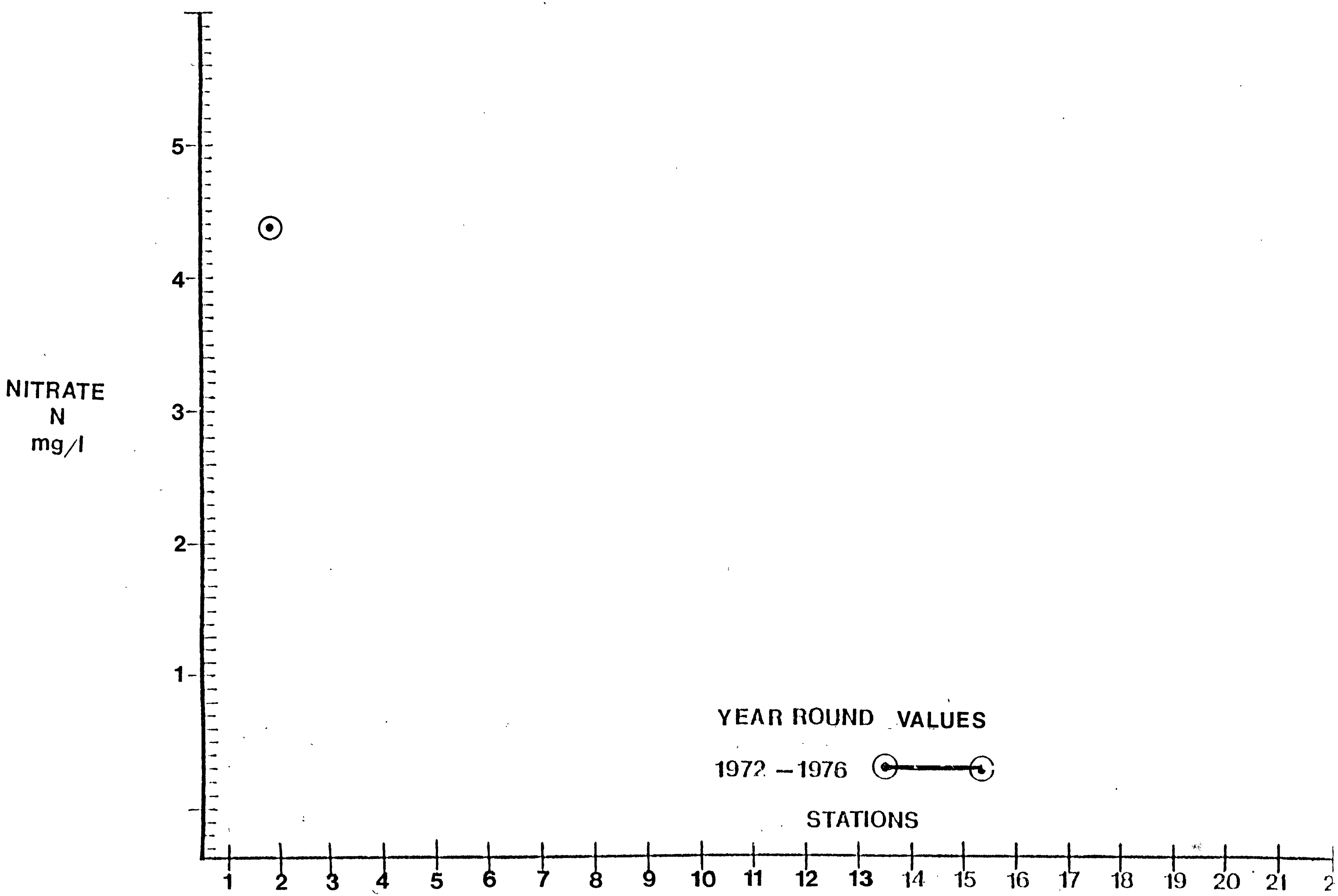
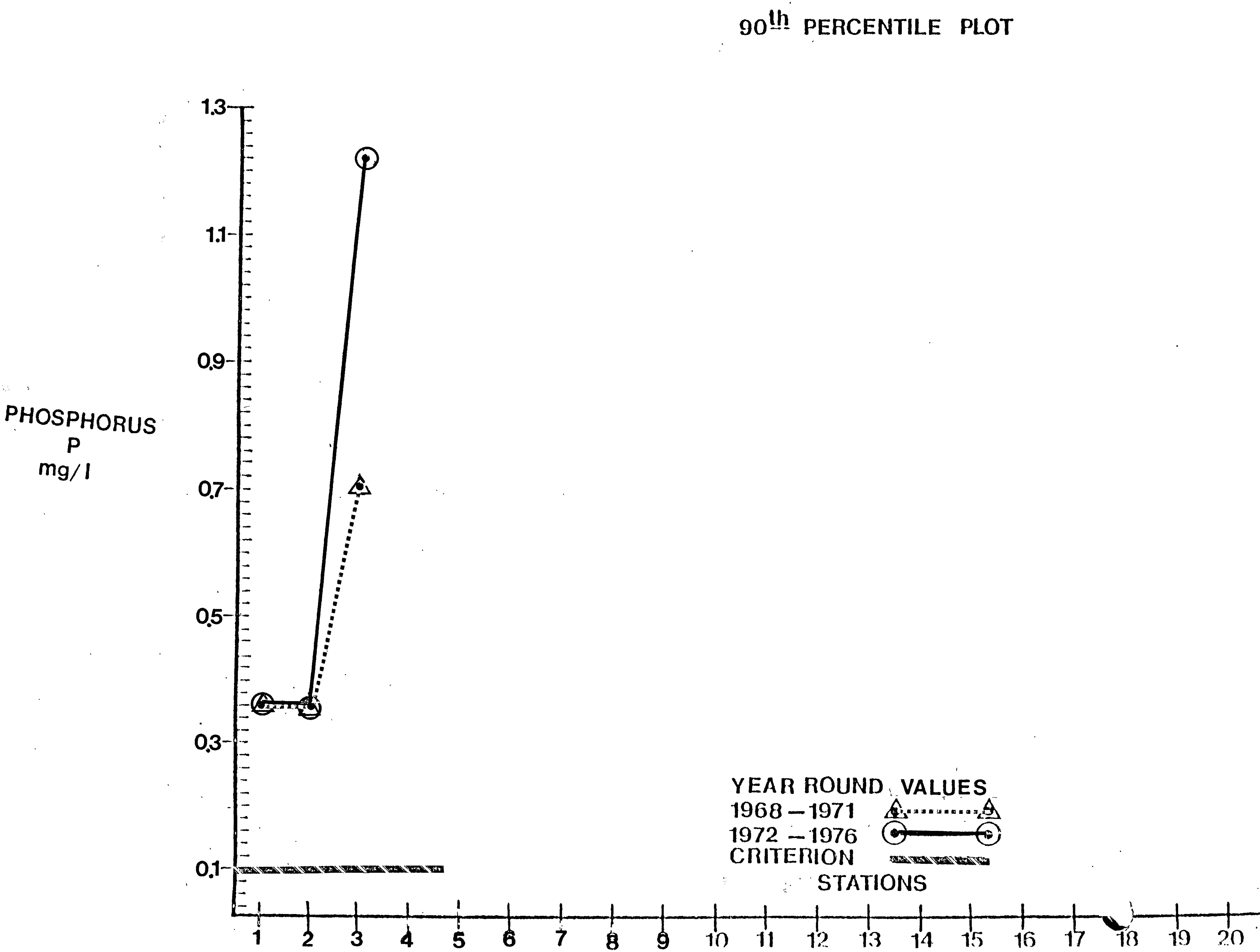


Figure VI. M.7


90th PERCENTILE PLOT
PHOSPHORUS
P
mg/l
1.3
1.1
0.9
0.7
0.5
0.3
0.1
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
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19
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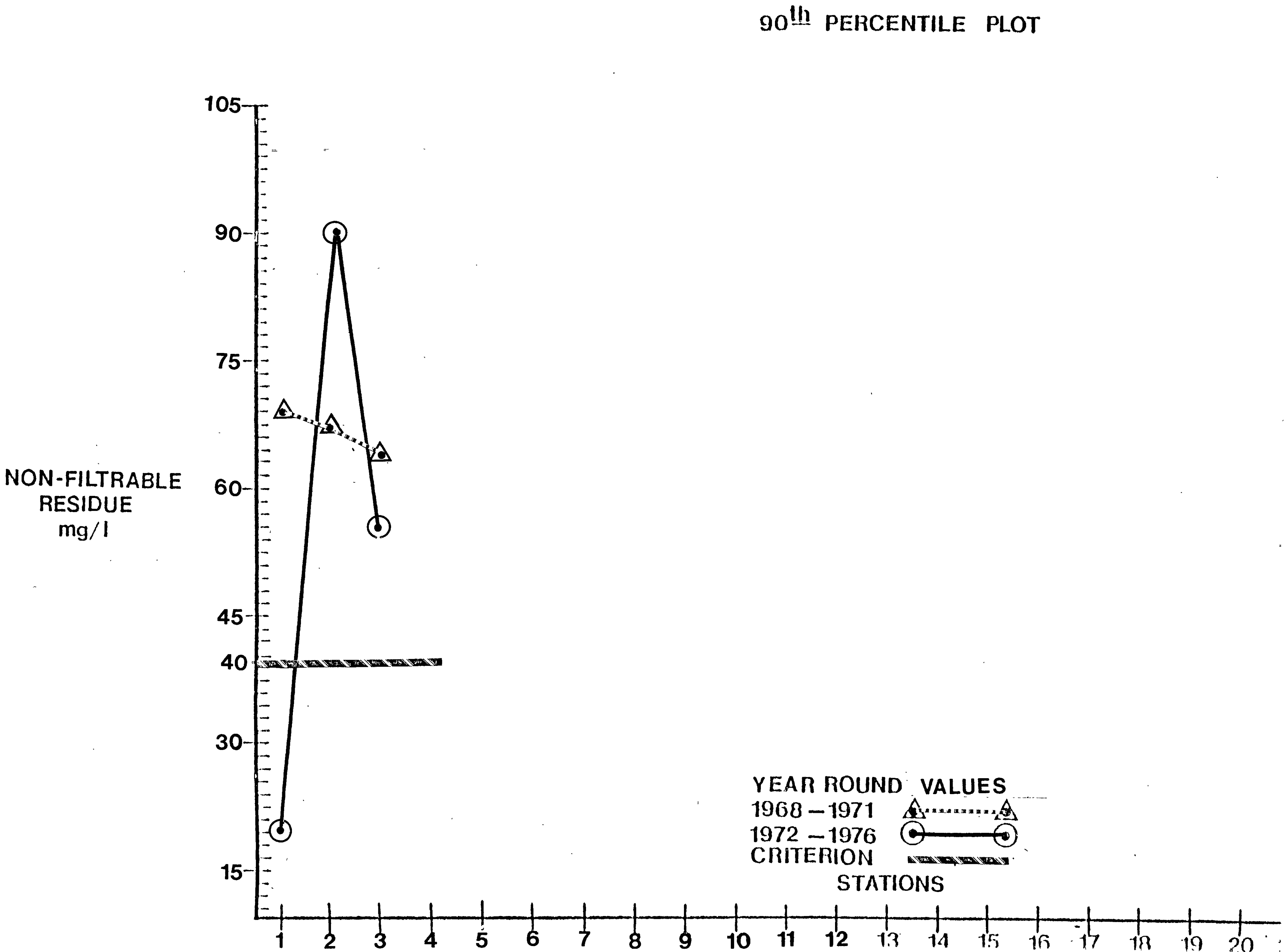
Figure VI.M.8


90th PERCENTILE PLOT
NON-FILTRABLE RESIDUE mg/l
105
90
75
60
45
40
30
15
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
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11
12
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14
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16
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Figure VI.M.9

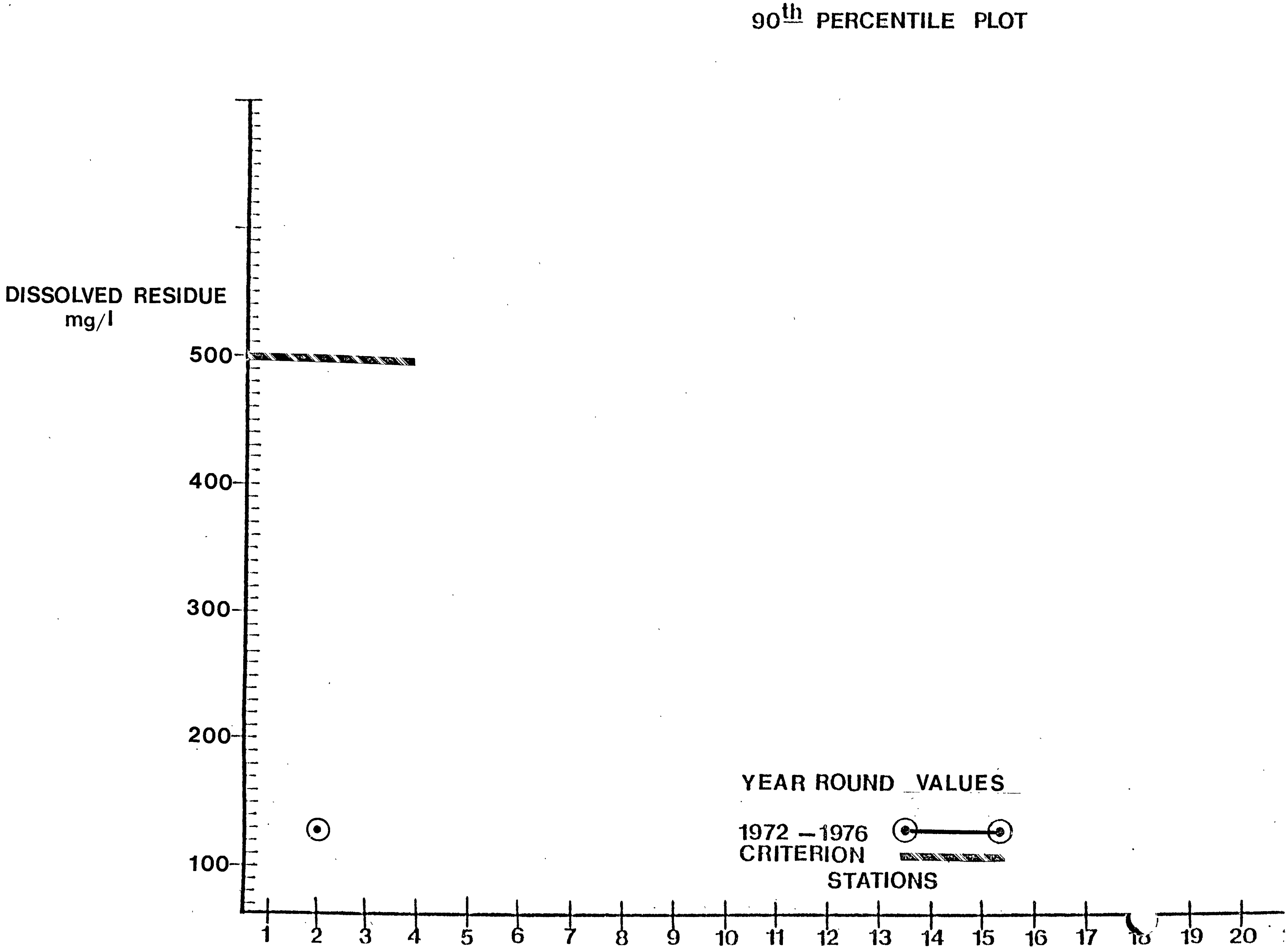
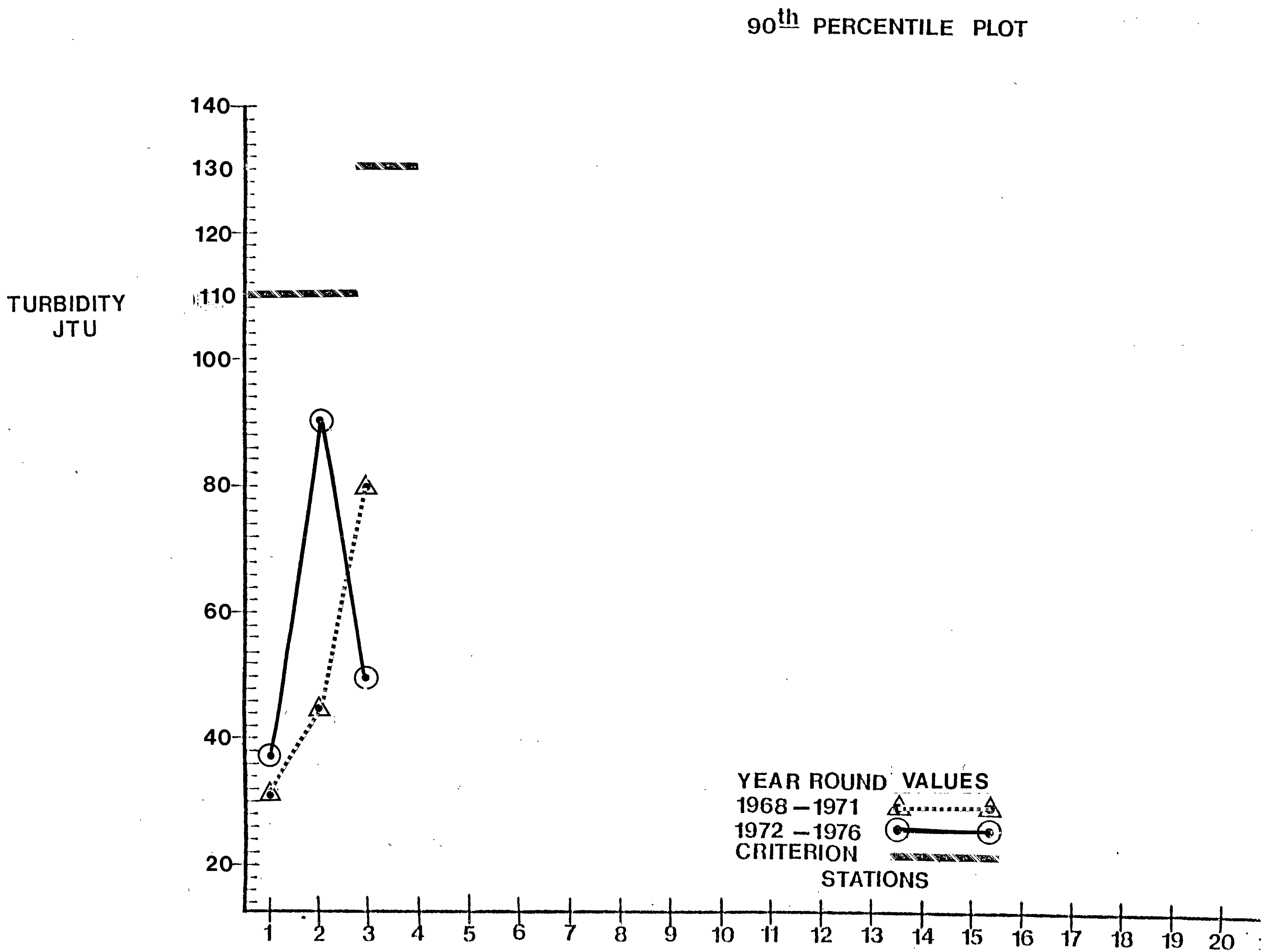

90th PERCENTILE PLOT
DISSOLVED RESIDUE mg/l
500
400
300
200
100
YEAR ROUND VALUES
1972 –1976
CRITERION
STATIONS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Figure VI.M.10



# Table VI.M.1

## DISCHARGER INVENTORY

### Cohansey River Segment

| MAP CODE | MUNICIPALITY | PLANT NAME | DEGREE OF TREATMENT | RECEIVING STREAM | AVG. (MDG) DAILY FLOW 1973 | 1974 | 1975 | 1976 | COMPLIANCE WITH 1977 REQUIREMENTS OF SECONDARY/BEST PRACTICABLE TREATMENT LIMITATIONS |
|---|---|---|---|---|---|---|---|---|---|
| A | Bridgeton City | Bridgeton Mun. (Cumberland County S.A.) | Sec. | Cohansey | 3.2 | 3.4 | 3.400 | 3.0 | No |
| B | Upper Deerfield | Seabrook Farms C., Inc. (Now owned by Cumberland Co.,S.A.) | Sec. | Cohansey River | 0.5 | 0.250 | 0.290 | .29 | Yes |

MAURICE RIVER

## BASIN DESCRIPTION

The headwaters of the Maurice River originate in southeast Gloucester County. It flows swiftly south through Cumberland County before being impounded at Union Lake. The Lake covers approximately 1.5 square miles and is the largest, deepest lake in southern New Jersey. The river is tidal from the outfall of Union Lake as it meanders to its confluence with the Delaware Bay.

Land use within the basin is predominantly rural but there are several major wastewater treatment facilities in the watershed. These include the 3.5 MGD Landis plant at Vineland, the 0.75 MGD Vineland Municipal plant and the 2.2 MGD Millville Municipal facility. Both Vineland facilities are primary treatment plants which utilize subsurface disposal and are located between the Maurice River and the Tarkiln Branch, upstream of Union Lake. The major industrial treatment plant is the 3.0 MGD Wheaton Glass Company oil separator which discharges into Petticoat Creek. In addition, Vineland Chemical Company's liquid waste which contains arsenic compounds is also known to enter the ground and surface waters from a percolation lagoon.

## WATER QUALITY ASSESSMENT

Fecal coliform values increase in the downstream direction, and the majority of stations are not in compliance with the criterion.

The biological oxygen demand also increases in the downstream direction reaching excessive maximum values at Millville with apparent decrease in oxygen demand in the tidal reach. Dissolved oxygen values in Scotland Run and at the Maurice River at Norma are below the criterion values, although dissolved oxygen levels are satisfactory in the other stream segments. The pH of Scotland Run and that portion of the Maurice upstream of Union Lake is naturally acidic although the stream segment in the vicinity of the Vineland-Landis wastewater treatment plant shows some pH elevation. The outflow from Union Lake is markedly alkaline with water quality probably being influenced by algal growths. Phosphorus levels at all stations exceed the criterion for tributaries to a lake. In addition, nitrate concentrations in the river are also evaluated above the natural conditions as measured at Scotland Run. Total non-filterable residue and dissolved residue are generally within acceptable limits and below criteria. However, the stream segment just upstream of Union Lake, while displaying a slight increase in dissolved residue, has non-filterable residue (suspended solids) concentrations in excess of the criterion. All stream segments are in compliance with the turbidity criterion, although there is some increase in turbidity at the Union Lake outlet.

## PROBLEM ASSESSMENT

Nutrient concentrations are excessive in the entire reach upstream of Union Lake. It is possible that rural and agriculture land use contribute some portion of the load in the upstream areas. However, more than 4.0 MGD of only primary treated wastes are being discharged into the ground water adjacent to the Maurice. It is difficult to accurately determine the water quality in the vicinity of treatment or estimate gallons or nutrient loading entering the river from this source. An increase in complaints concerning odors in the upstream end of Union Lake has been registered in the last year. The other major problem in the upstream region is the presence of arsenic in the Blackwater Branch and the Maurice River from the Vineland Chemical Company. Concentrations potentially harmful to aquatic life have been measured in the Maurice River and the Blackwater Branch. The river downstream of Union Lake is impacted by excessive oxygen demand, a primary source being the Millville treatment plant effluent. Although serious reductions in dissolved oxygen are not apparent, there is a potential hazard to marine life.

In the lower portion of the Maurice River, in the Port Norris area, are ten clam and oyster shucking industries. Effluent flows vary from less than 1,000 GPD to 50,000 GPD per facility. The discharges are characterized by high levels of suspended solids, and several also have high biochemical oxygen demand. The Department has issued NPDES permit certifications requiring 90% removal of suspended solids. The certifications have been challenged, and the impact of these discharges on water quality is being disputed.

## GOALS ASSESSMENT AND RECOMMENDATIONS

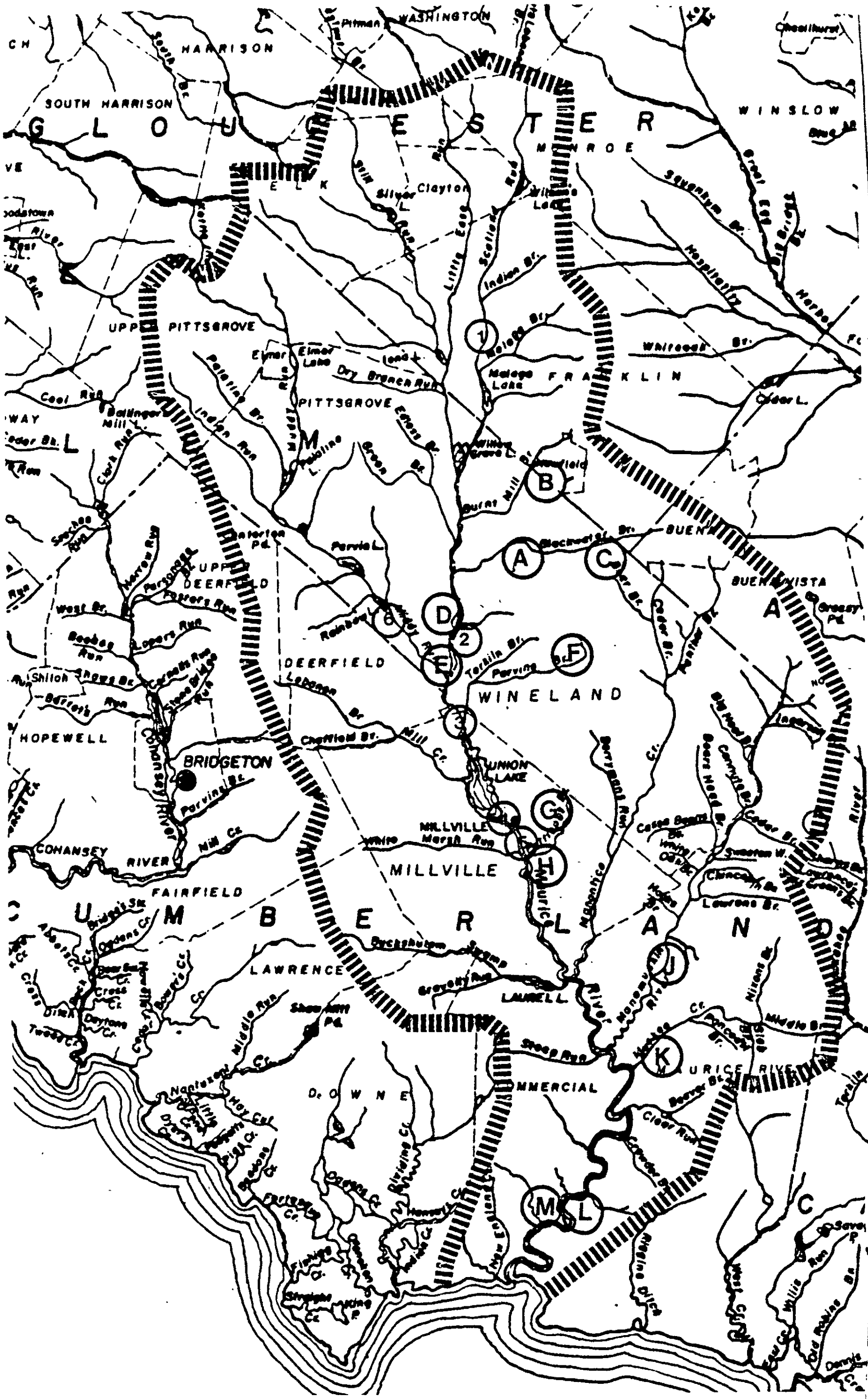
Fecal coliform counts indicate that the waterway is not in continuous compliance as being suitable for primary contact recreation. It is however suitable for fishing and other non-contact uses.

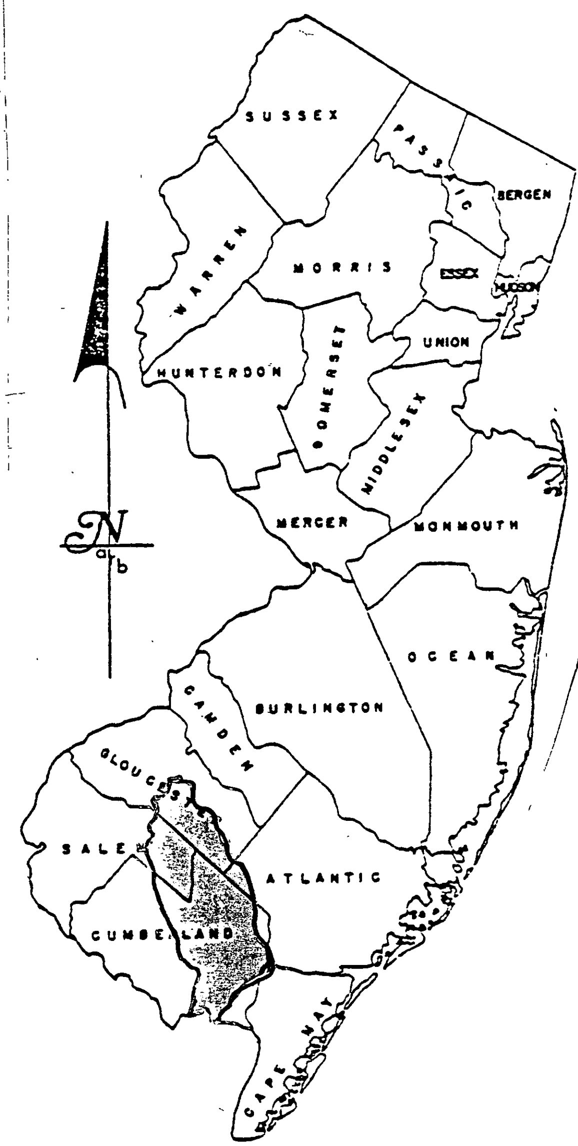
Both major Vineland City treatment plants utilize only primary treatment and as such do not meet the 1977 requirement of secondary/best practicable treatment. Major construction and plant alterations are being planned at the Landis plant, including nitrate removal. An investigation into the effects of this ground discharge is being funded by EPA. There is a potential for serious degradation of the groundwater and for large quantities of contaminants to also enter surface waters. A study of the relative impact of the treatment plant effluents upon Union Lake also should be undertaken. The Lake is the most significant standing body of water in southern New Jersey and protecting its water quality should merit a high priority.

## STATION LIST

1. Scotland Run near Franklinville
2. Maurice River at Norma
3. Maurice River near Millville
4. Maurice River at Millville - Union Lake Outlet
5. Maurice River at Millville
6. Muddy Run near Norma

Figure VI.N.1




LOCATION
MAURICE RIVER

LEGEND

Point Source
Monitoring Site
Drainage Basin Boundaries
County Bounderies
Municipal Bounderies

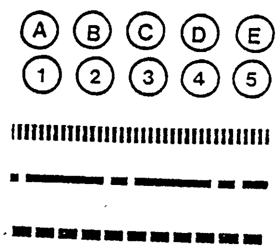


Figure VI.N.2

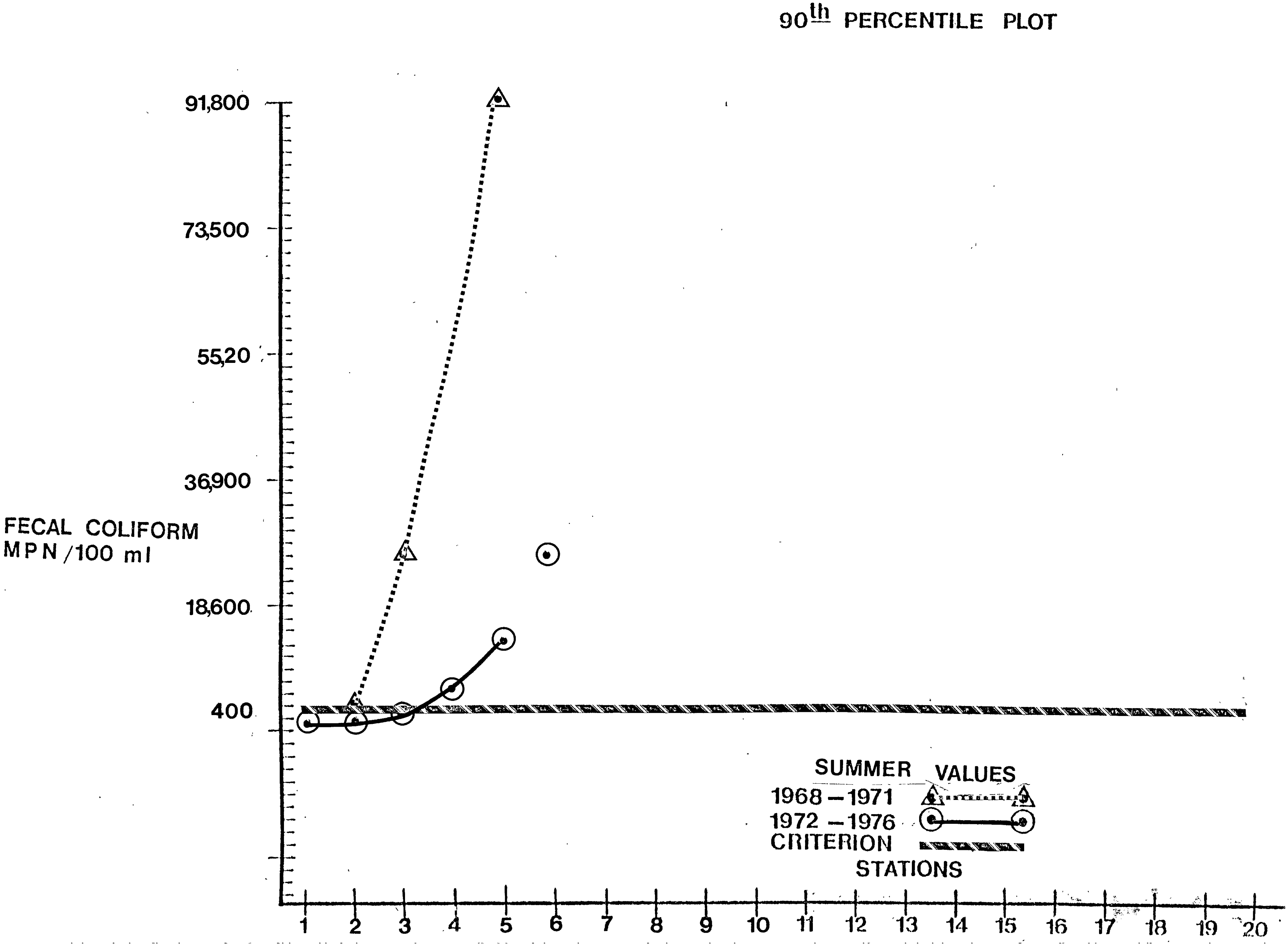
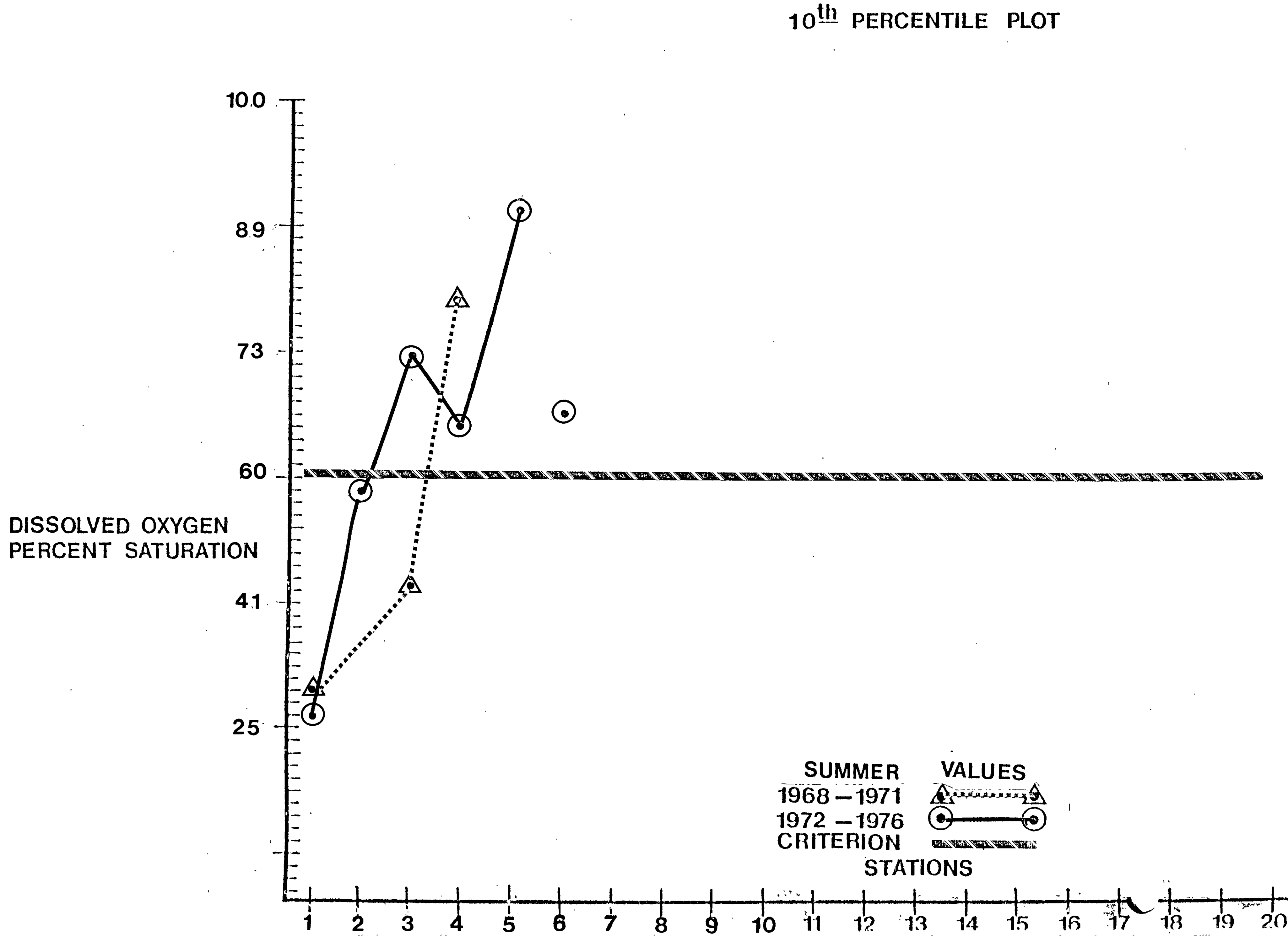

90th PERCENTILE PLOT
91,800
73,500
55,20
36,900
18,600
400
FECAL COLIFORM
MPN/100 ml
SUMMER VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Figure VI.N.3


10th PERCENTILE PLOT
10.0
8.9
73
60
41
25
DISSOLVED OXYGEN
PERCENT SATURATION
SUMMER VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
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9
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18
19
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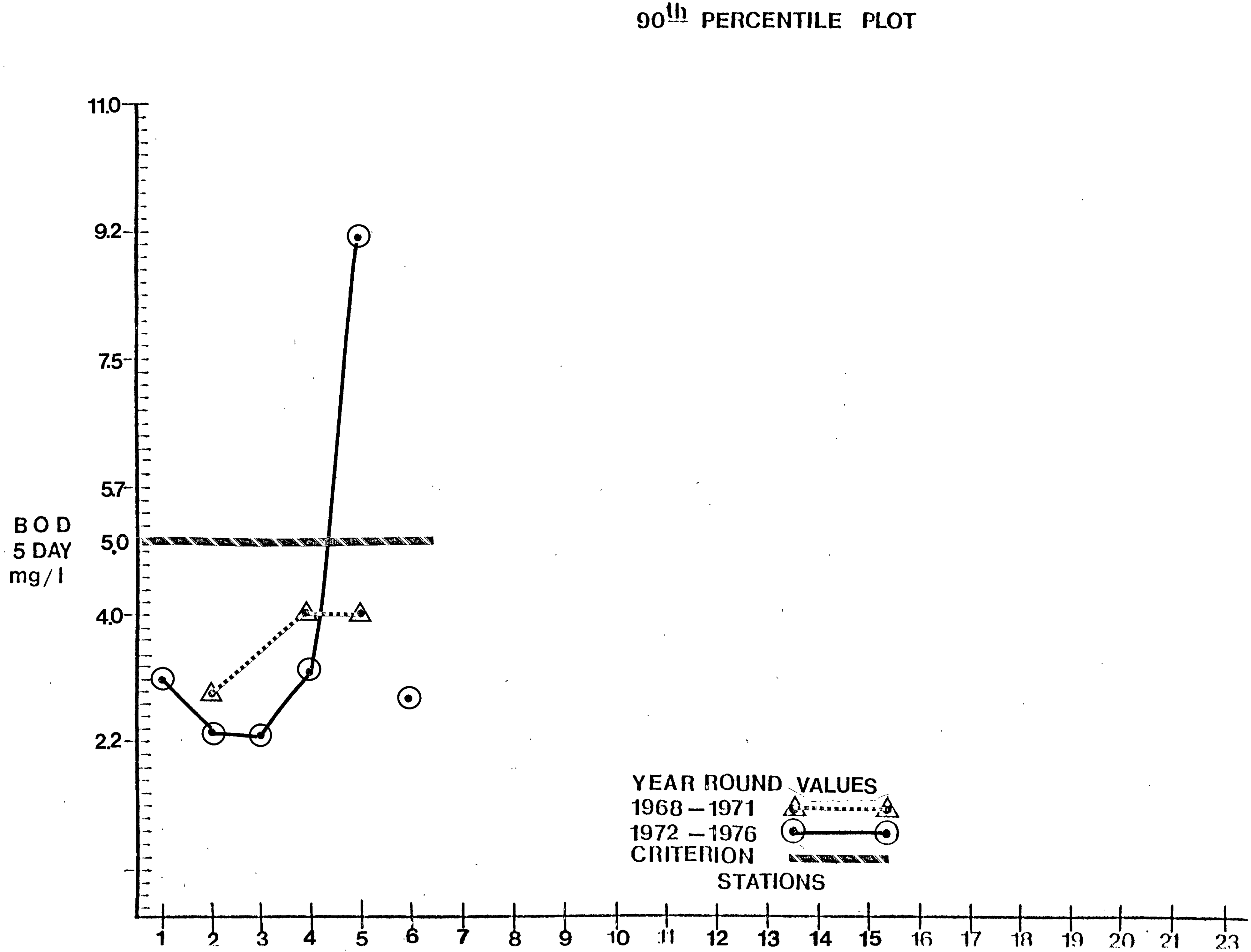
Figure VI.N.4


90th PERCENTILE PLOT
11.0
9.2
7.5
5.7
5.0
4.0
2.2
BOD
5 DAY
mg/l
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
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8
9
10
11
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16
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19
20
21
23

Figure VI.N.5

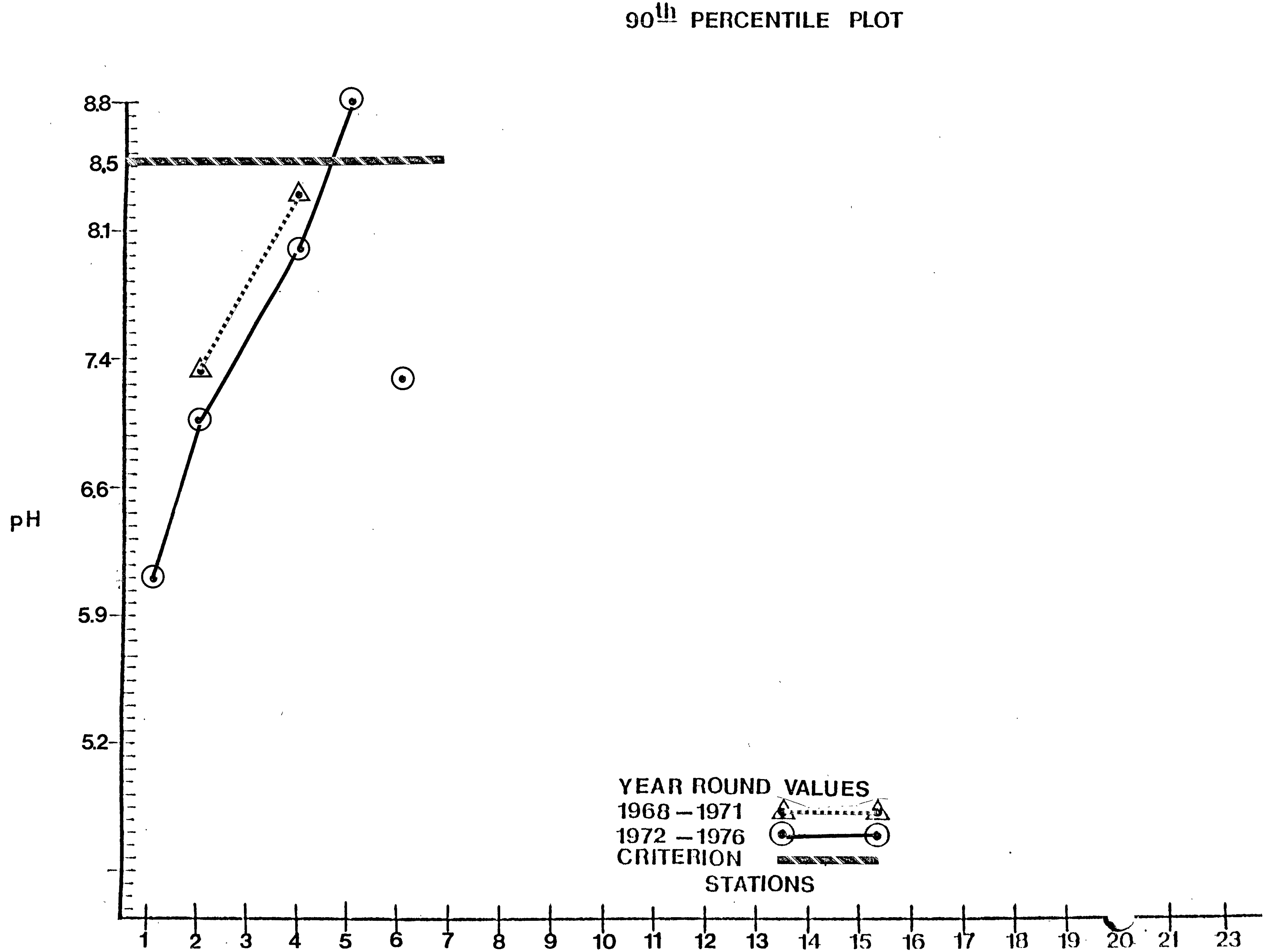
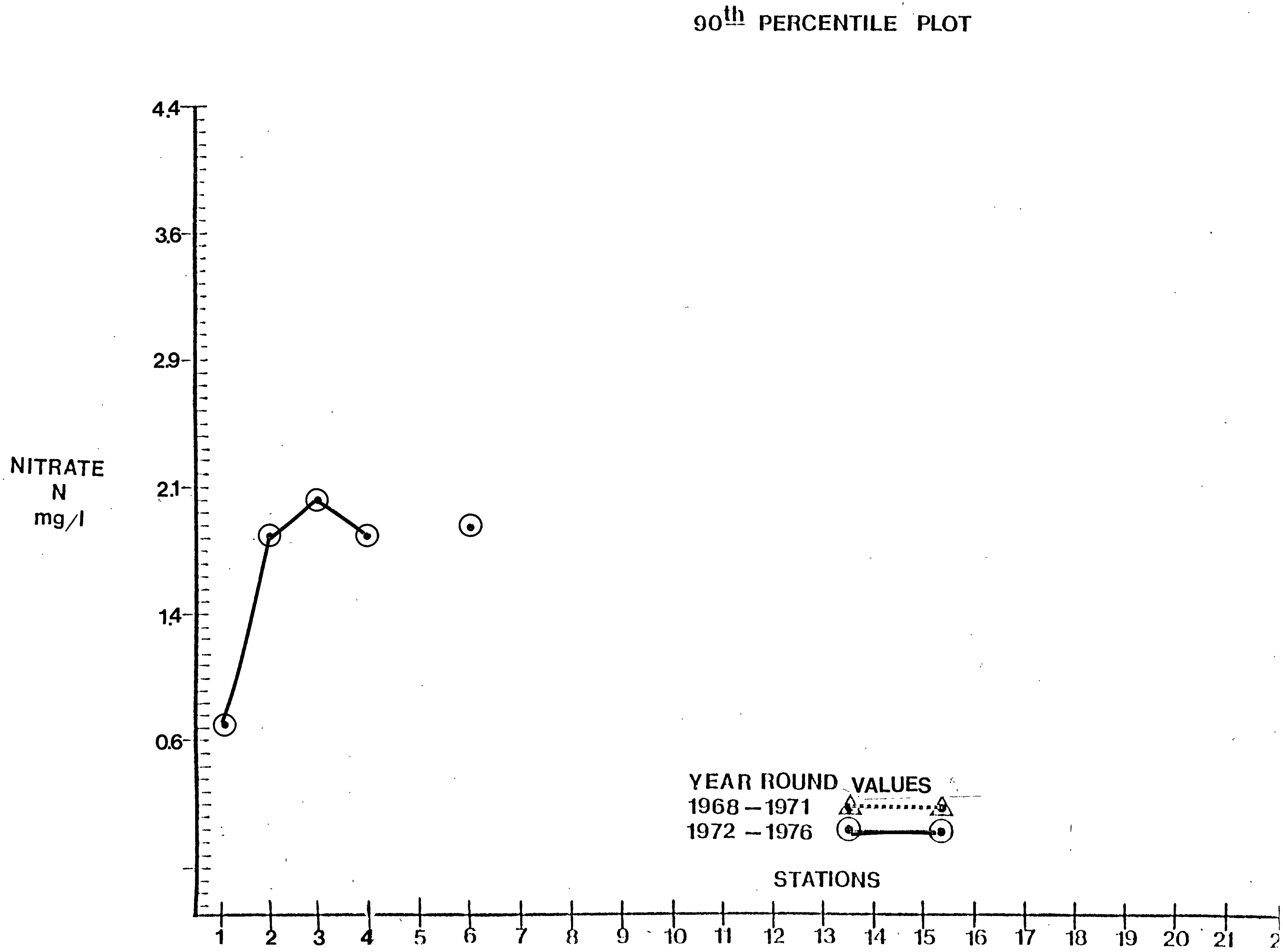

90th PERCENTILE PLOT
pH
8.8
8.5
8.1
7.4
6.6
5.9
5.2
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 23

Figure VI.N.6



90th PERCENTILE PLOT
4.4
3.6
2.9
2.1
1.4
0.6
NITRATE
N
mg/l
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
STATIONS
1
2
3
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Figure VI.N.7

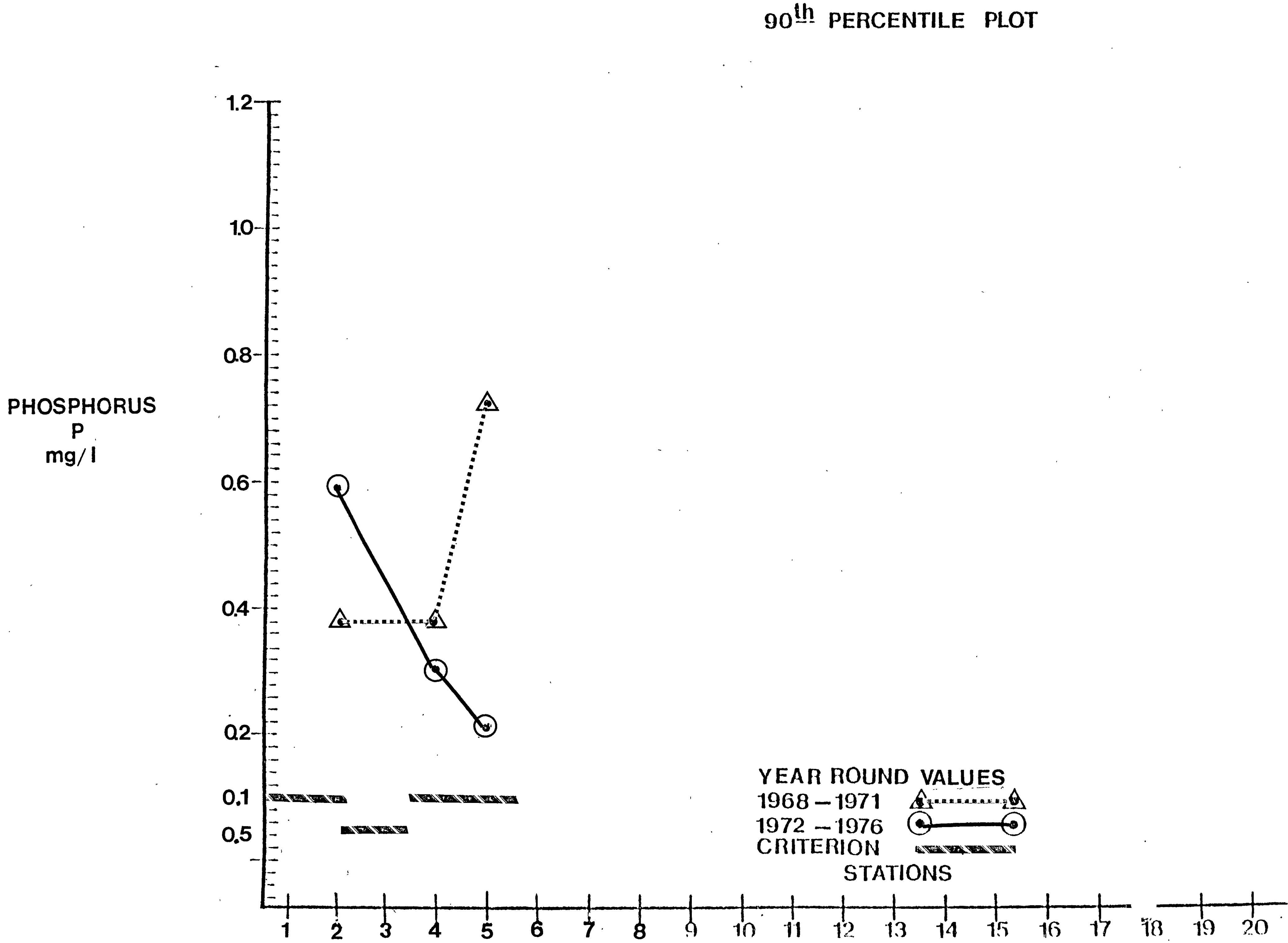
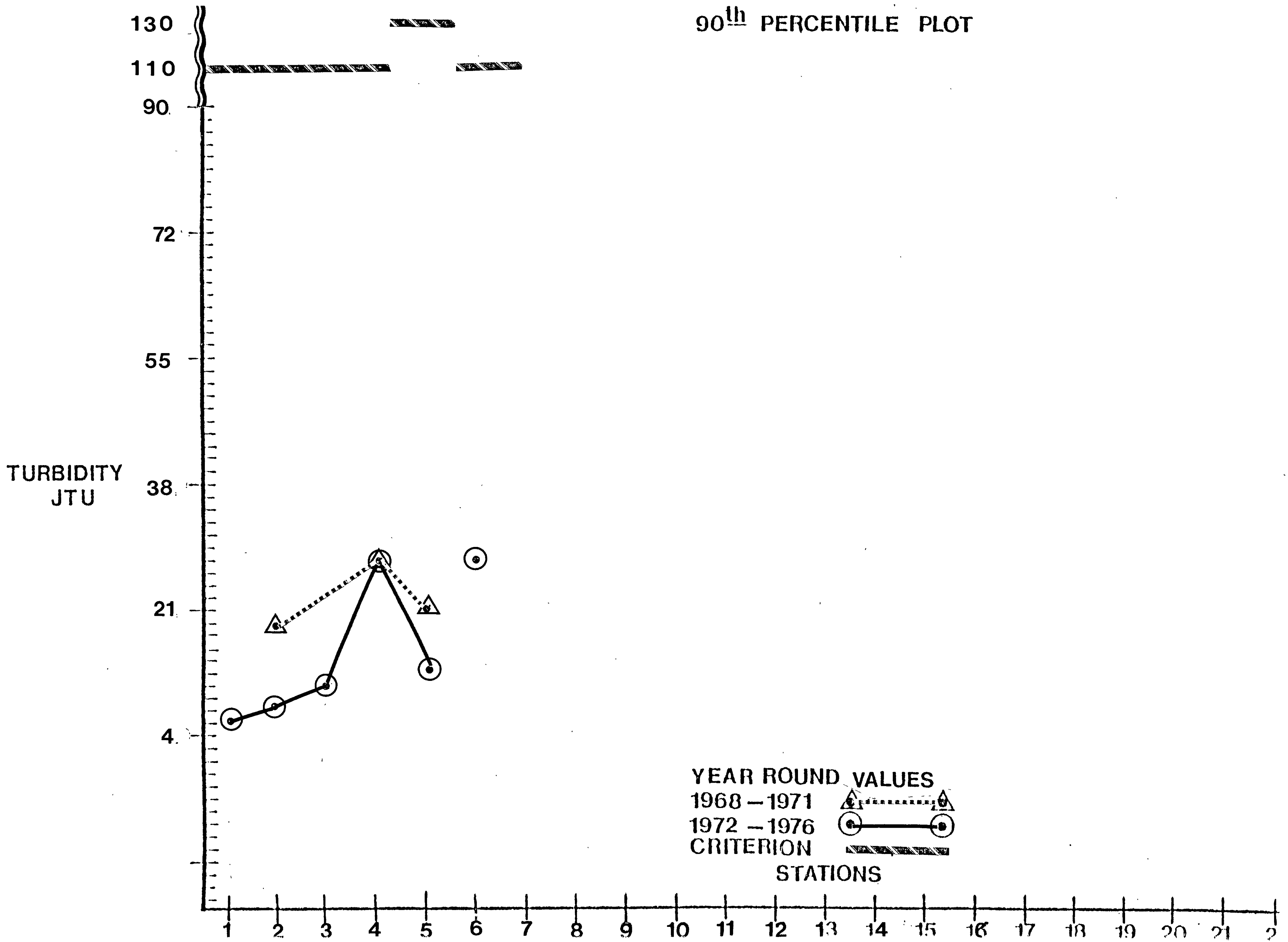

90th PERCENTILE PLOT
PHOSPHORUS
P
mg/l
1.2
1.0
0.8
0.6
0.4
0.2
0.1
0.5
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Figure VI.N.8



90th PERCENTILE PLOT
TURBIDITY JTU
130
110
90
72
55
38
21
4
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21

## Table VI.N.1

DISCHARGER INVENTORY

Maurice River Segment

| MAP CODE | MUNICIPALITY | PLANT NAME | DEGREE OF TREATMENT | RECEIVING STREAM | AVG. (MDG) DAILY FLOW 1973 | 1974 | 1975 | 1976 | COMPLIANCE WITH 1977 REQUIREMENTS OF SEC-ONDARY/BEST PRACTICABLE TREATMENT LIMITATIONS |
|---|---|---|---|---|---|---|---|---|---|
| A | Newfield Boro | Shield Alloy Corp. | Physical-Chemical | Hudsons Branch | | | 0.326 | | - |
| B | Vineland City | Vineland Chemical | | Groundwater | | | | - | |
| C | Vineland City | Owen Illinois Inc. | Ind. | Parvins Branch | | | 0.020 | | - |
| D | Vineland City | Vineland Mun. | Pri. | Ground Recharge | - | 0.9 | 0.600 | .75 | No |
| E | Vineland City | Landis S.A. | Pri. | Ground Recharge | - | 4.5 | 3.900 | 3.5 | No |
| F | Vineland City | Progress Foods Corp. | Ind. | Parvins Branch | | | 0.3 | | - |
| G | Millville City | Wheaton Glass Co., | Oil Separation | Petticoat Creek | | | 1.58 | | - |
| H | Millville City | Kerr Glass Mfg. Corp. | Sec. | Maurice River | 0.002 | 0.002 | 0.002 | .002 | Yes |
| I | Millville City | Millville Municipal | Sec. | Maurice River | 2.1 | 2.8 | 2.200 | 2.2 | No |
| J | Maurice River Twp. | Unisyl | Ind. | Manamuskin | | | | .05 | - |
| K | Maurice River Twp. | Owens-Illinois Inc. | - | Muskie Creek | | | 1.86 | | - |
| L | Commercial Twp. | Port Norris Oyster Co. Inc. | Ind. | Maurice River | | | 0.0074 | | - |
| M | Maurice River | Clamco Corp. | Ind. | Maurice River | | | 0.05 | | - |

# SOUTHERN ATLANTIC COASTAL SEGMENT

## BASIN DESCRIPTION

The Southern Atlantic Coastal Segment comprises the coastal, estuarine, and inland fresh waters of eastern Ocean, Atlantic and Cape May Counties. The fresh water streams originate in the sparsely populated interior and slowly meander through the topographically flat coastal plain. Cedar swamps are also characteristic of this area. Stream flows are typically slow through wide meanders downstream to salt marshes and entrance into estuarine bays in the coastal area. These bays are connected to the Atlantic Ocean through the barrier beach islands via several inlets. Fresh waters are utilized for recreational activities; swimming, canoeing, and fishing. The estuarine and coastal waters comprise the major recreational resource in New Jersey, supporting a multi-million dollar tourist industry. Extensive recreational and commercial fishing and shellfishing activities are conducted in these waters. Although inland areas are sparsely developed, the barrier islands and localized areas along Route 9 are highly developed.

## WATER QUALITY ASSESSMENT

Water quality varies with the differing environments encountered in this basin. Inland tributaries originating in State forests or sparsely developed lands are of excellent quality. As these waters flow through more developed areas downstream, the levels of fecal coliform bacteria, nutrients, solids, and biochemical oxygen demand increase. The estuarine areas have very low flows, and the distance between inlets through the barrier beaches precludes adequate tidal flushing of the back bays. Fecal coliform bacteria counts equal or exceed criterion levels at all stations throughout the basin, with major increases over time noted in the Forked River. Dissolved oxygen concentrations remain above the criterion at all stations except Forked River. The decrease in dissolved oxygen noted at this station parallels a doubling of the biochemical oxygen demand within the most recent five year period in the Forked River. Biochemical oxygem demand levels are also excessive in Tuckerton Creek. The acidic rivers and streams of this area exhibit increasing pH values as they flow downstream into the more developed estuarine areas. Moderate nitrate concentrations have remained relatively constant with time whereas phosphorus levels have increased throughout this segment. Despite excessive nutrient levels within waters of this basin, nuisance algal blooms have presented minimal problems due to the predominantly acidic, soft waters of this area. Non-filtrable residue and turbidity have increased in the Forked River.

## PROBLEM ASSESSMENT

The diversity of aquatic environments in this segment pose a variety of problems in meeting water quality goals. Inland areas are experiencing intensive development westward from the Route 9 corridor. Septic seepage, surface runoff, and increased storm water flows will continue to degrade existing ground and surface water quality. Overloaded sewage treatment plants, some performing only primary treatment, discharge from the mainland and barrier beach islands into the bays and estuarine areas. These point sources raise biochemical oxygen demand, solids, and fecal coliform levels. Cape May City's combined storm & sanitary sewer system and antiquated, overloaded treatment plant result in the bypassing of raw sewage following any significant rainfall. Urban runoff from densely populated cities on barrier beach islands (i.e. Atlantic City, Ocean City, Wildwood) contribute major non-point source pollution to the bay areas. Channel dredging and heavy boat traffic raise turbidity and suspended solids levels.

## GOAL ASSESSMENT AND RECOMMENDATIONS

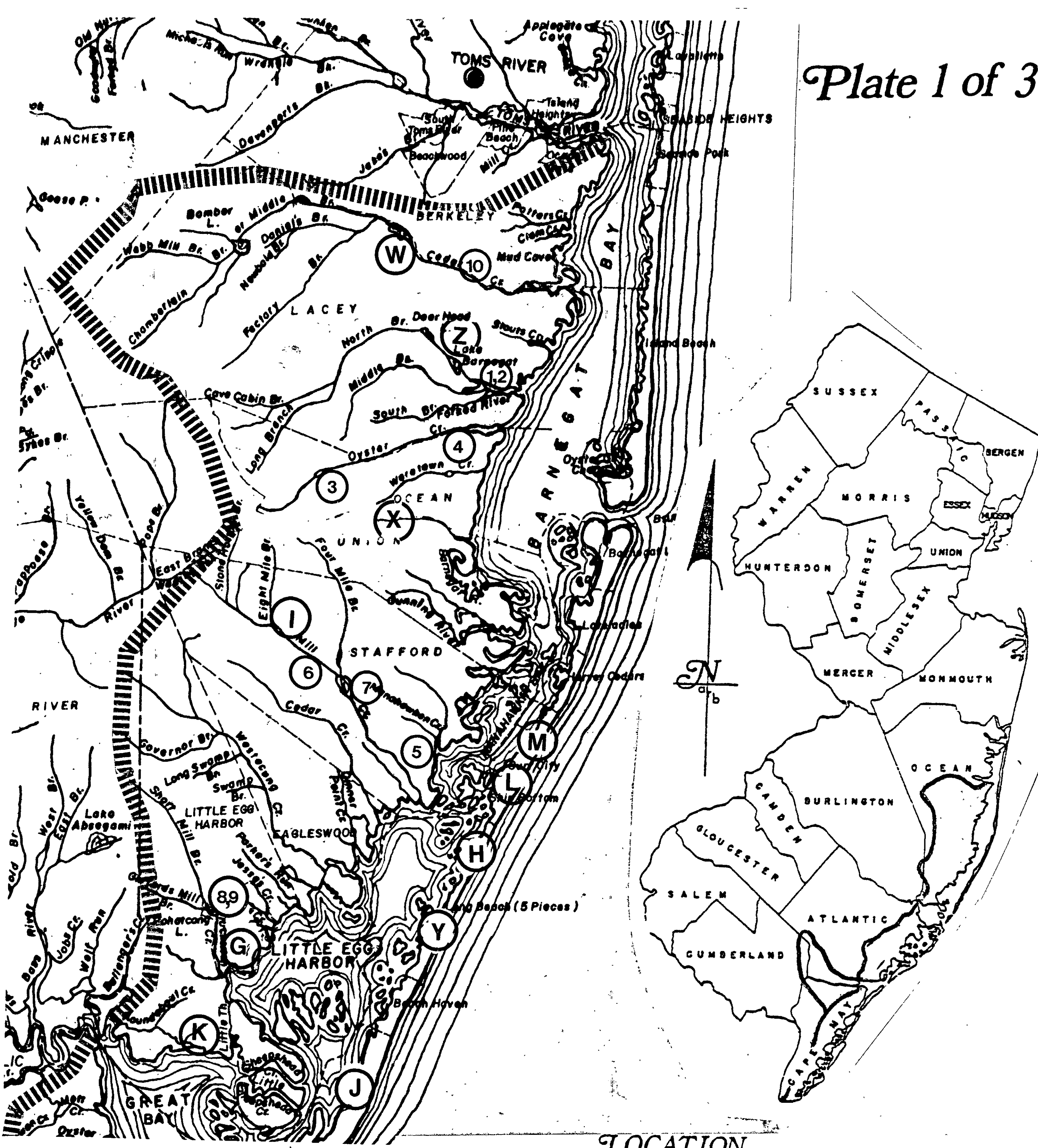
The waters of the Southern Atlantic Coastal Segment represent an invaluable recreational and commercial resource to the State of New Jersey. Current problems associated with the point source discharges from inadequate or overloaded treatment plants will be eliminated or reduced as funding levels permit completion of regionalized facilities. Cape May and Atlantic City should be a priority project in this program. Regionalization and sewering of areas served by septic systems will maintain existing fishable quality in these waters, and could result in the reopening of many currently condemned shellfishing areas by 1983. Additional monitoring and extensive surveys on ground and surface waters are necessary to establish baseline water quality in some areas and to establish causative relationships for degradation in quality, i.e. Forked River. Adequate surface and ground water standards are urgently needed in this segment to assist in aggressively pursuing proper planning activities for development of currently unpopulated areas.

## SOUTHERN ATLANTIC COASTAL SEGMENT

## STATION LIST

1. Forked River
2. North Branch Forked River at Forked River
3. Oyster Creek near Brookville
4. Oyster Creek
5. Manahawkin Creek
6. Mill Creek near Manahawkin
7. Mill Creek at Manahawkin
8. Tuckerton Creek at Tuckerton
9. Tuckerton Creek at Tuckerton
10. Cedar Creek at Lanoka Harbor
11. Tuckahoe River near Estelle Manor
12. Tuckahoe River at Head of River
13. Absecon Creek at Absecon

# Plate 1 of 3




## LOCATION

South Atlantic Coastal

Figure VI.0.1

## LEGEND

| | |
|---|---|
| Point Source | Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ |
| Monitoring Site | ① ② ③ ④ ⑤ |
| Drainage Basin Boundaries | ▮▮▮▮▮▮▮ |
| County Bounderies | ▬ ▬▬ ▬ ▬▬ |
| Municipal Bounderies | ▬ ▬ ▬ ▬ ▬ |

# Plate 2 of 3

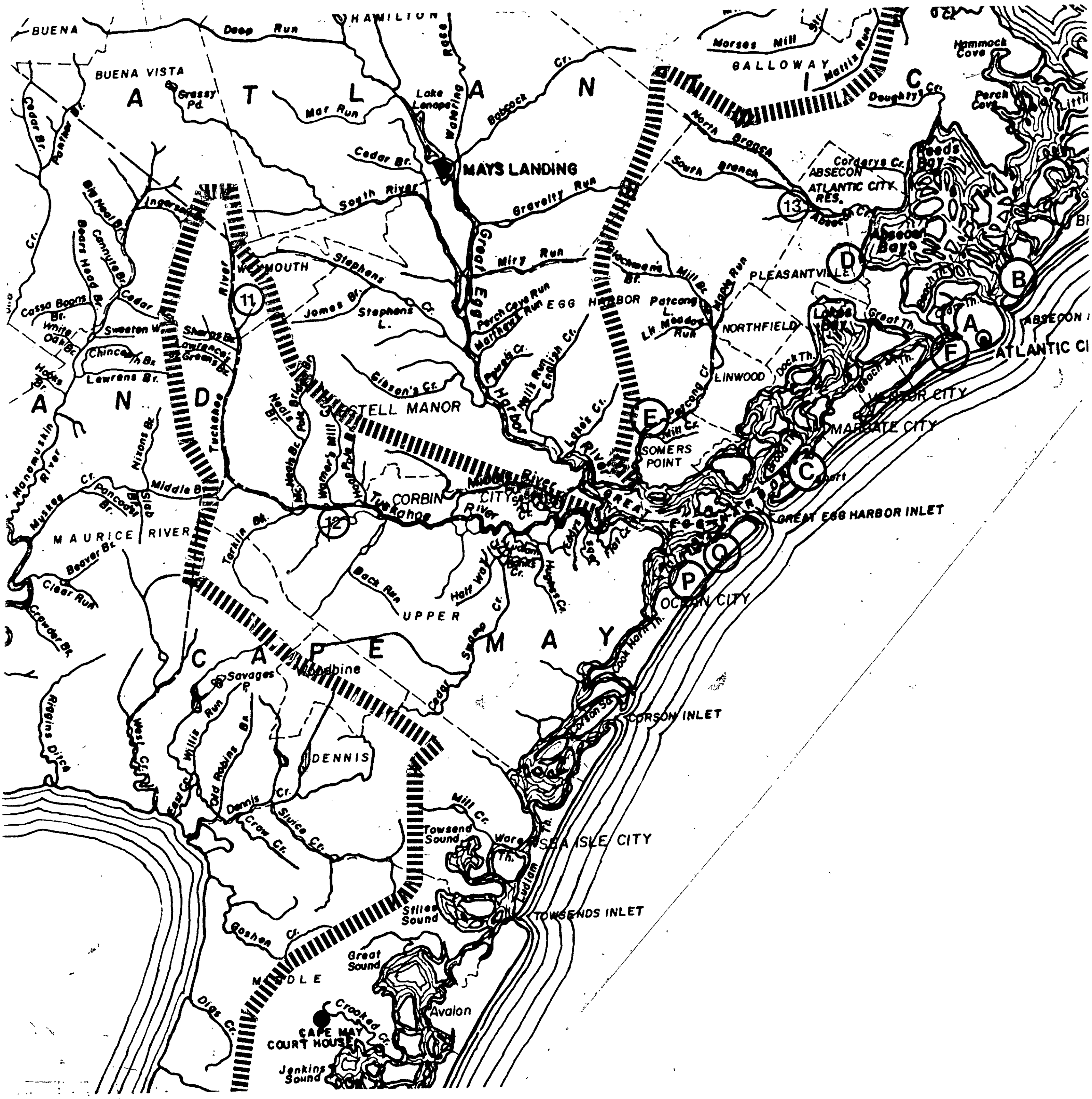



Figure VI.0.1
(cont'd)

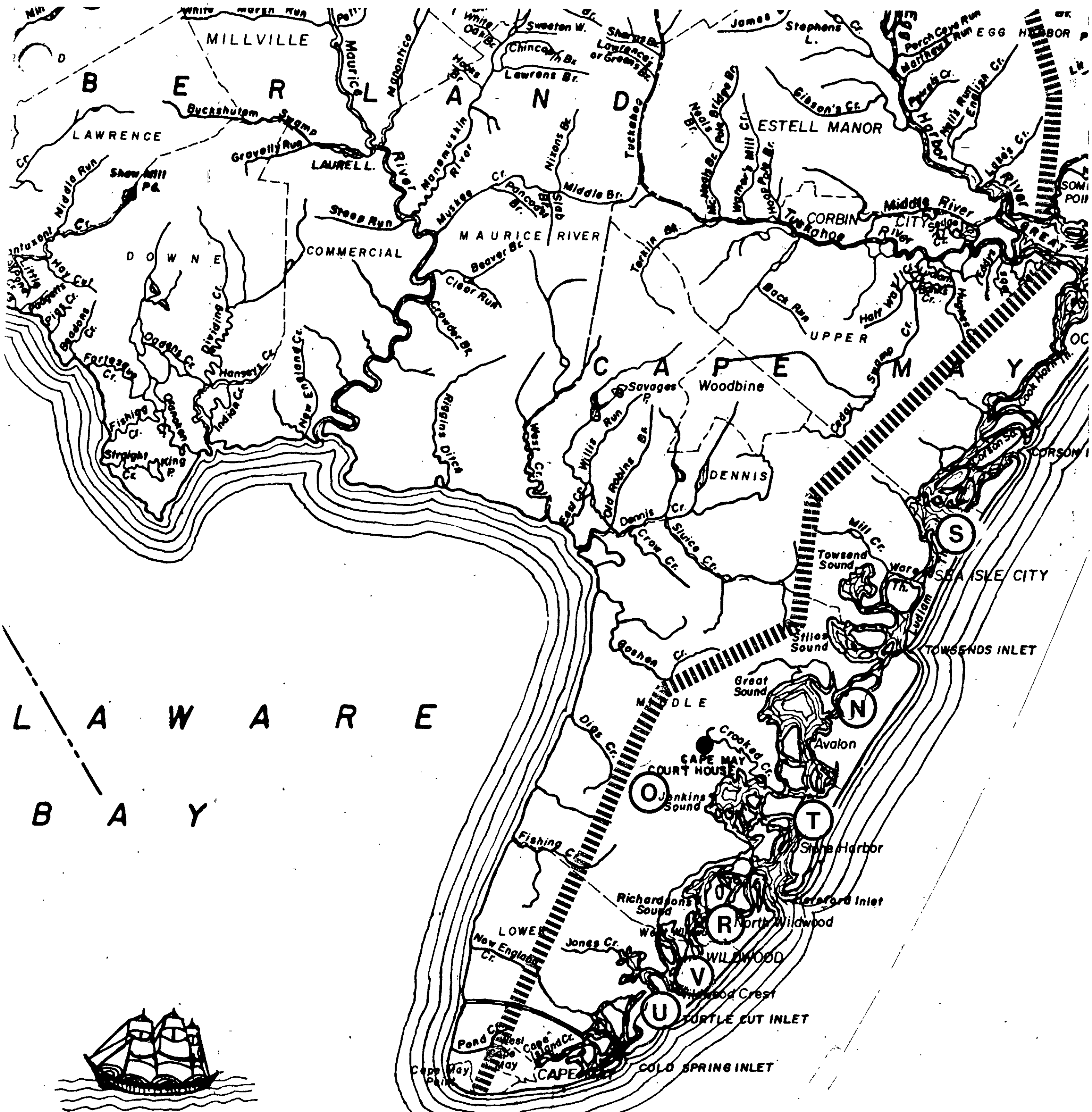



Figure VI.0.1
(cont'd)

Figure VI.0.2

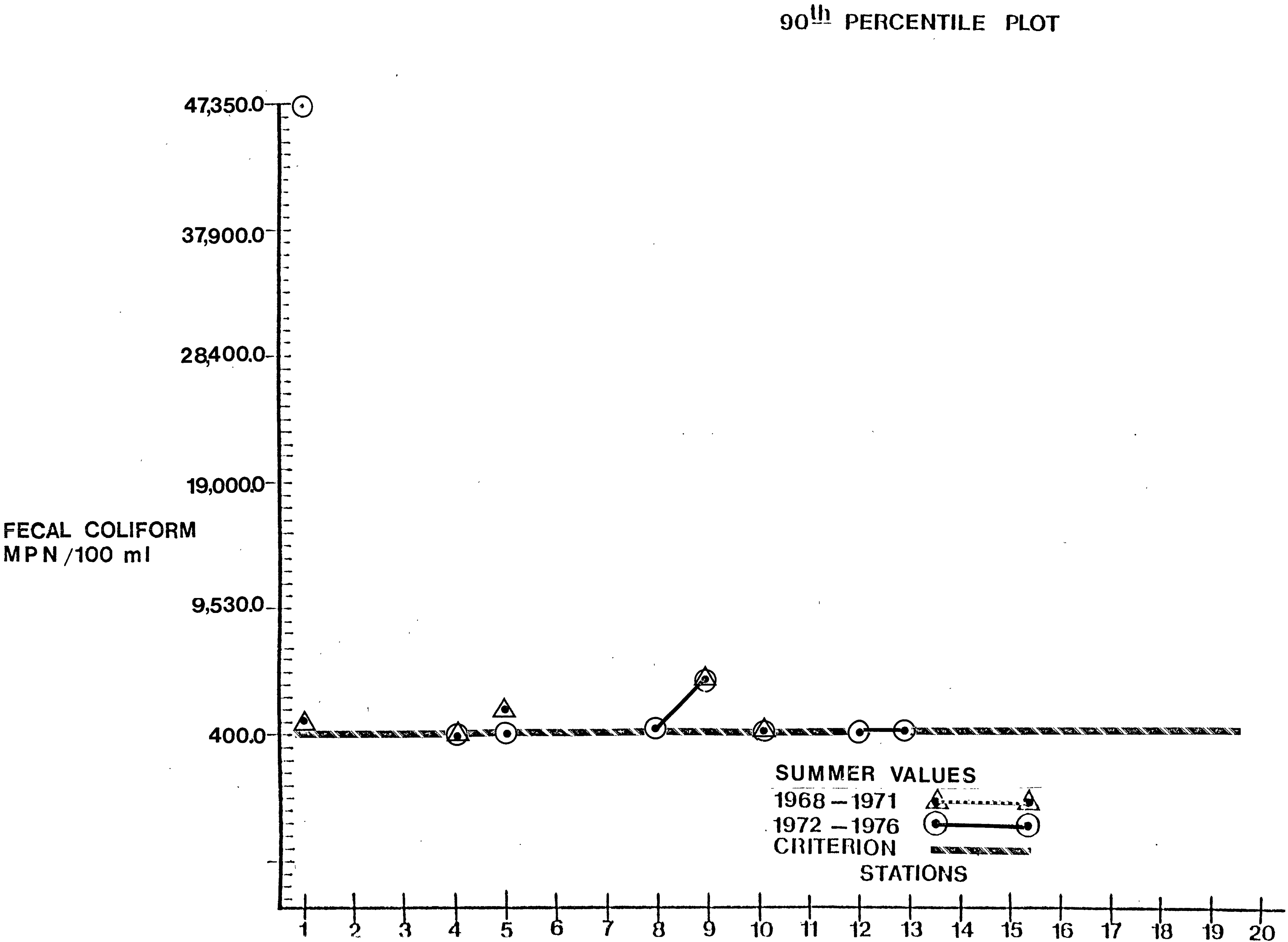

90th PERCENTILE PLOT
FECAL COLIFORM
MPN/100 ml
47,350.0
37,900.0
28,400.0
19,000.0
9,530.0
400.0
SUMMER VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Figure VI.0.3

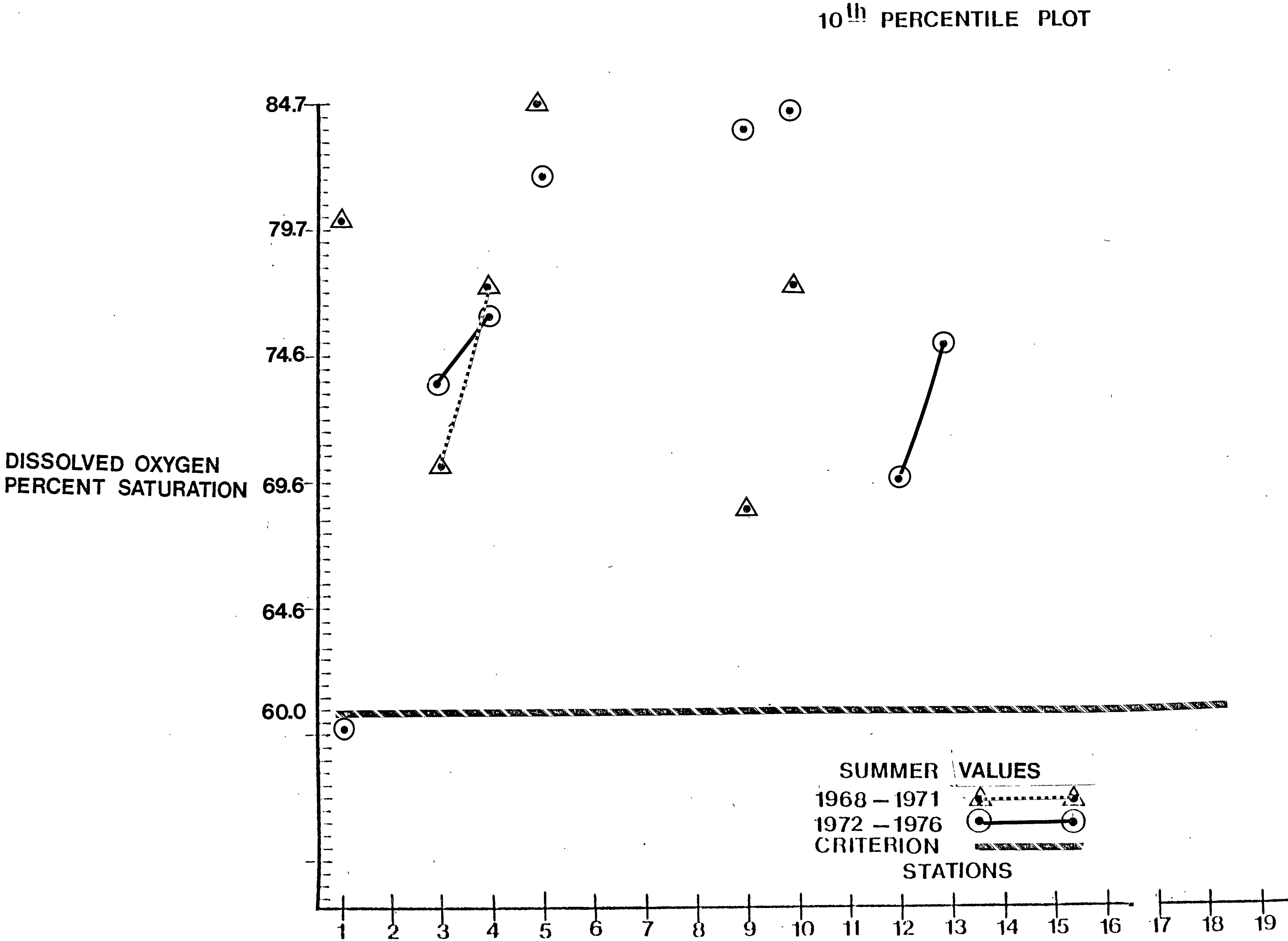
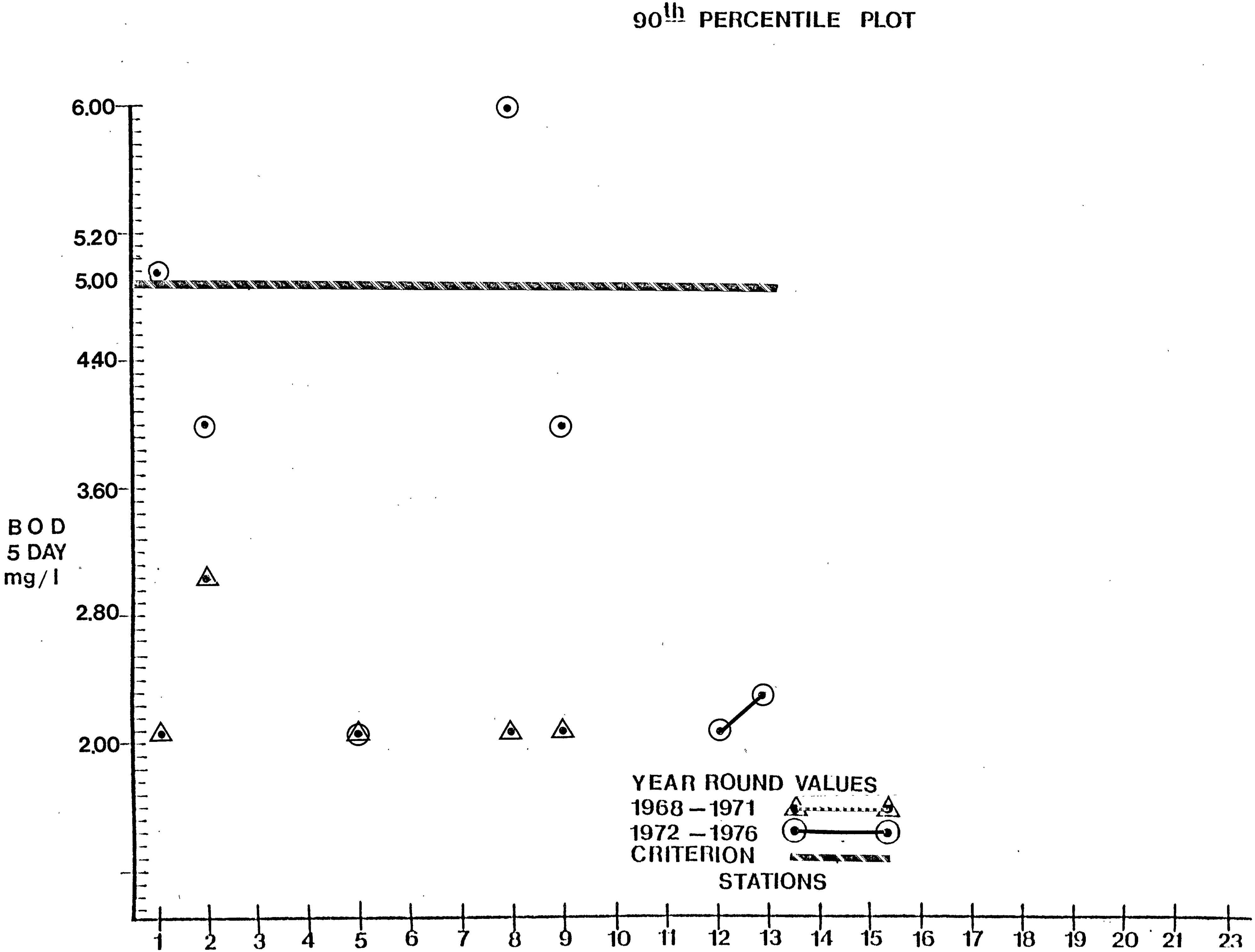

10th PERCENTILE PLOT
DISSOLVED OXYGEN PERCENT SATURATION
84.7
79.7
74.6
69.6
64.6
60.0
SUMMER VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

Figure VI.O. 4



90th PERCENTILE PLOT
6.00
5.20
5.00
4.40
3.60
2.80
2.00
BOD
5 DAY
mg/l
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
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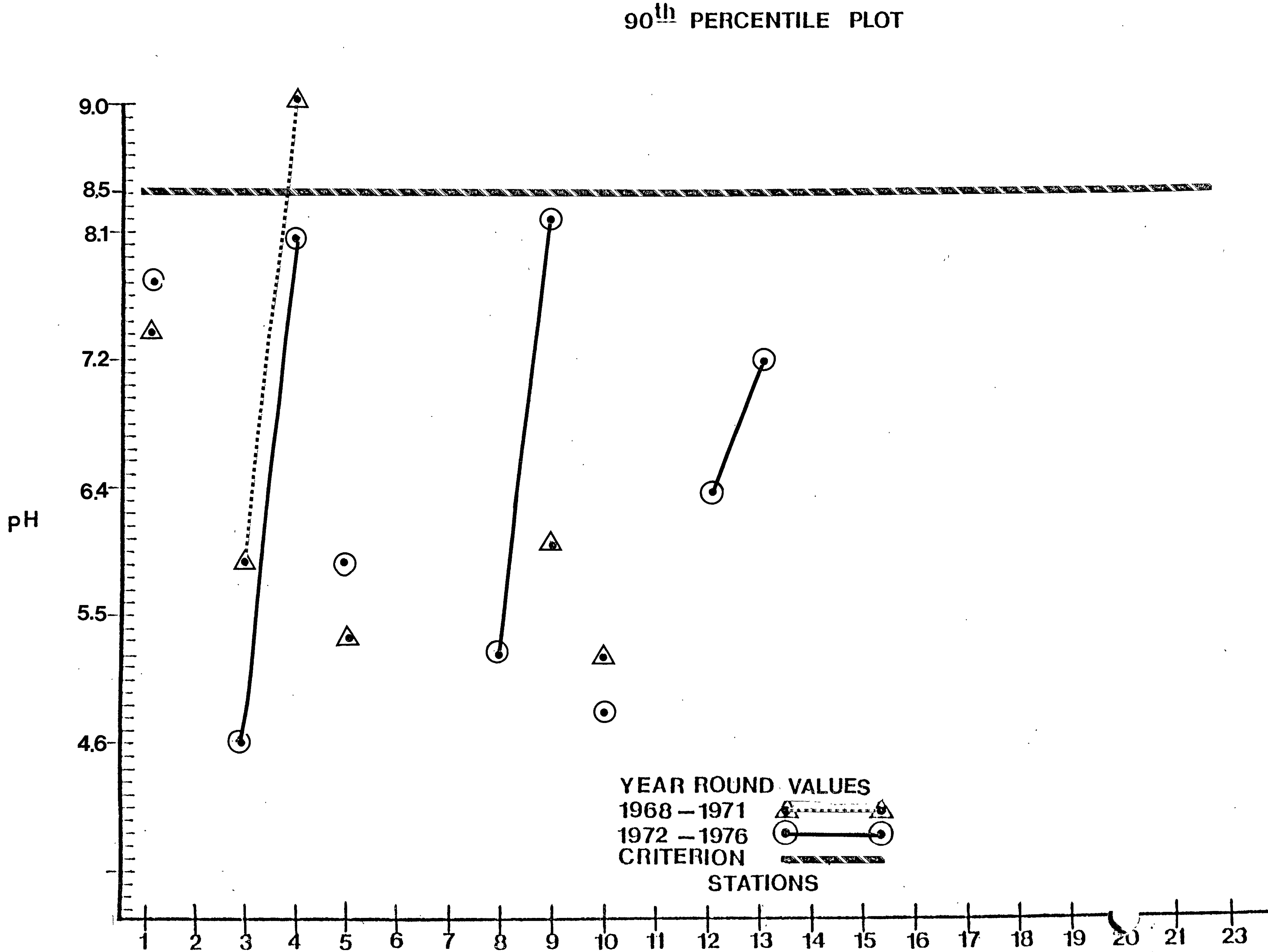
Figure VI.0.5



90th PERCENTILE PLOT
9.0
8.5
8.1
7.2
6.4
5.5
4.6
pH
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
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21
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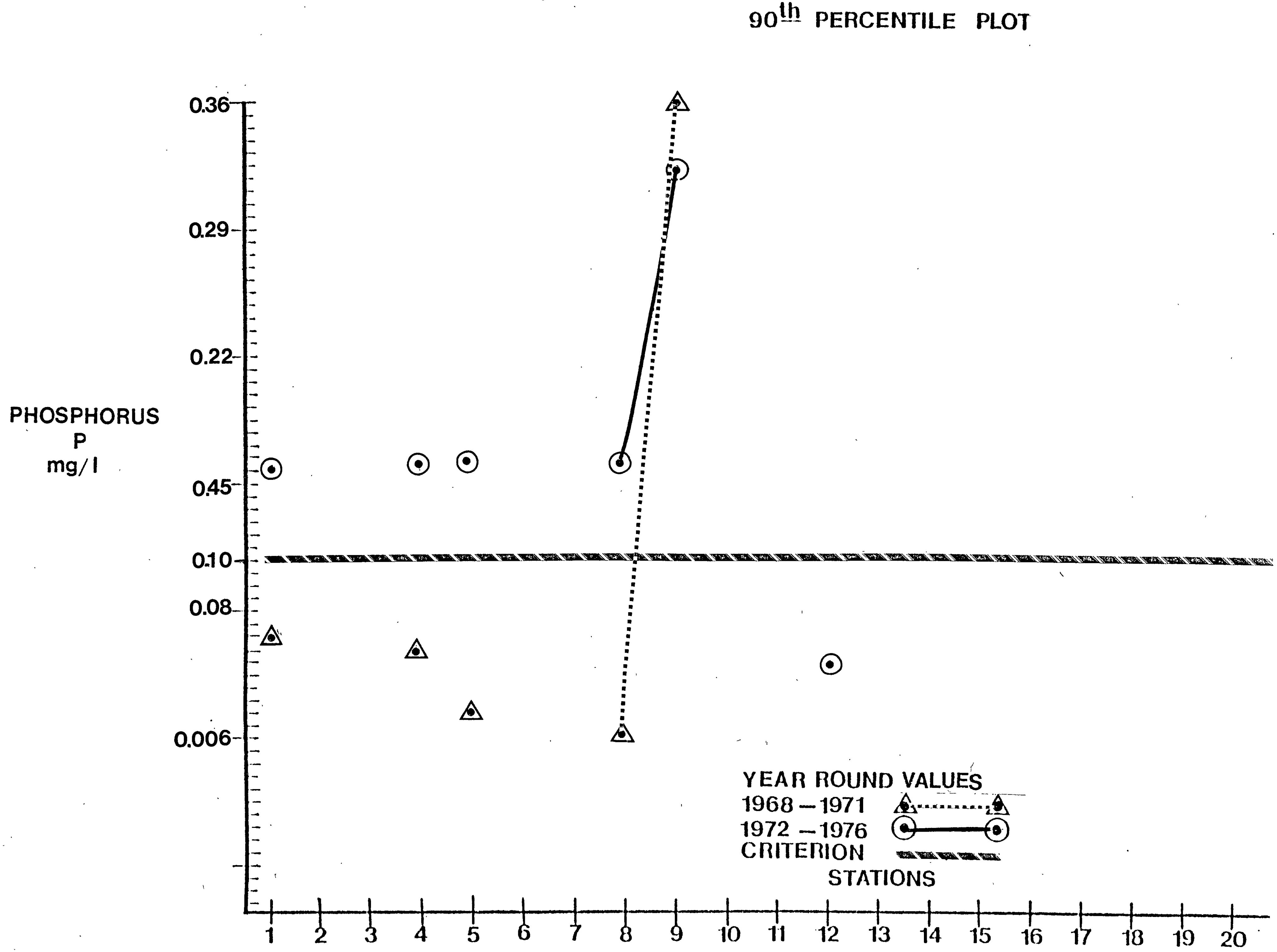
Figure VI.O. 6



90th PERCENTILE PLOT
PHOSPHORUS
P
mg/l
0.36
0.29
0.22
0.45
0.10
0.08
0.006
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
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13
14
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16
17
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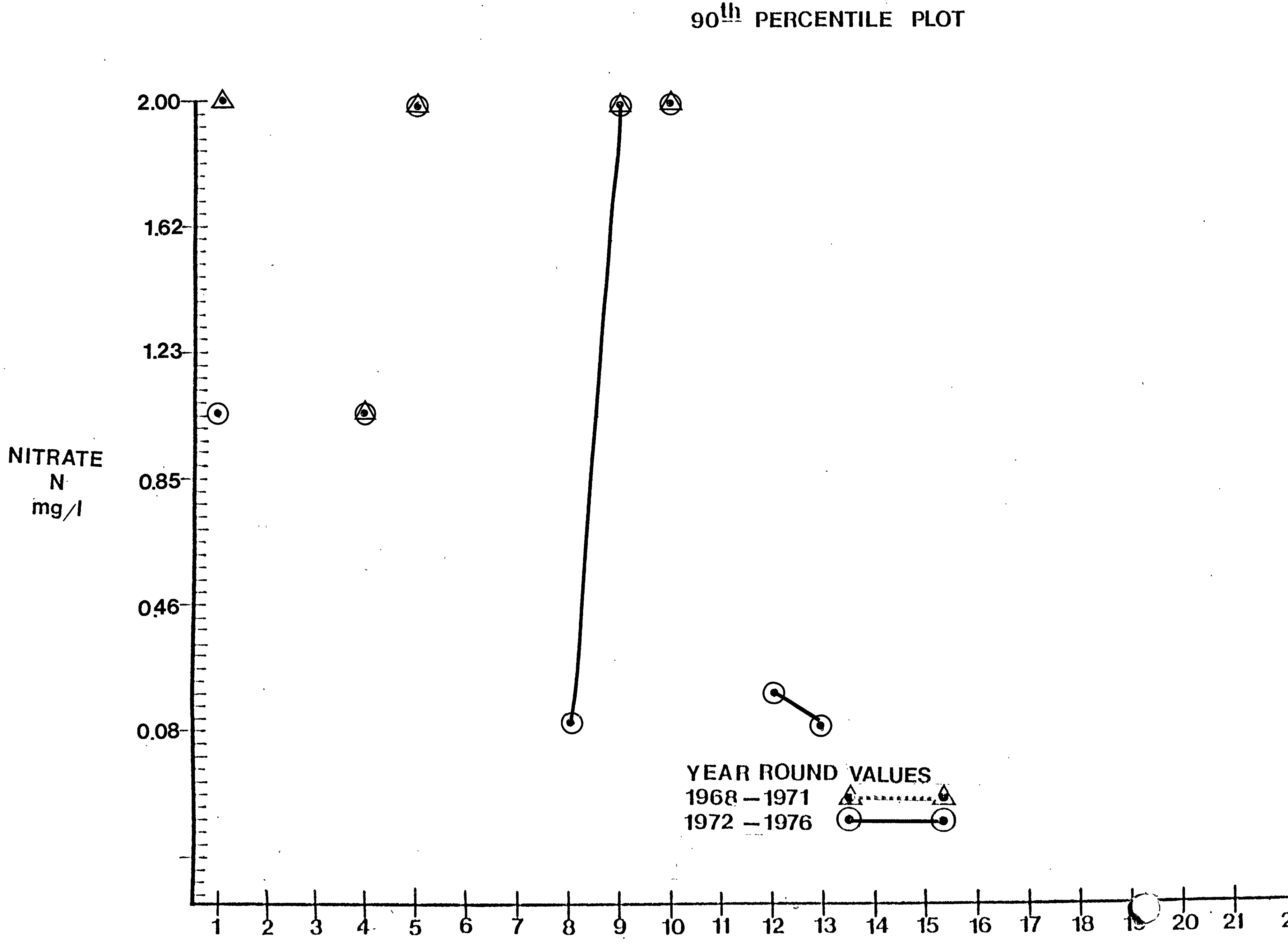
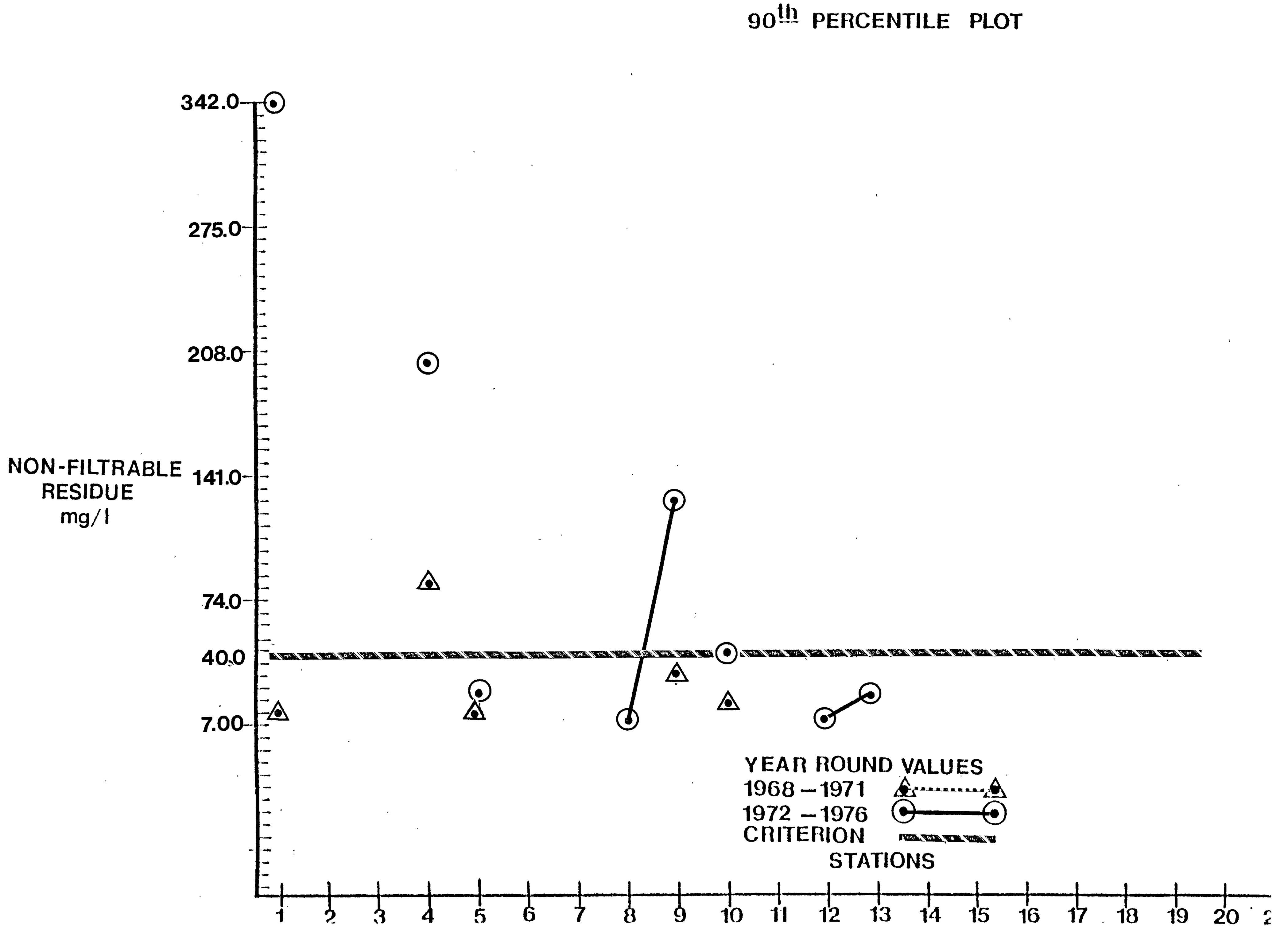
19
20

Figure VI.0.7



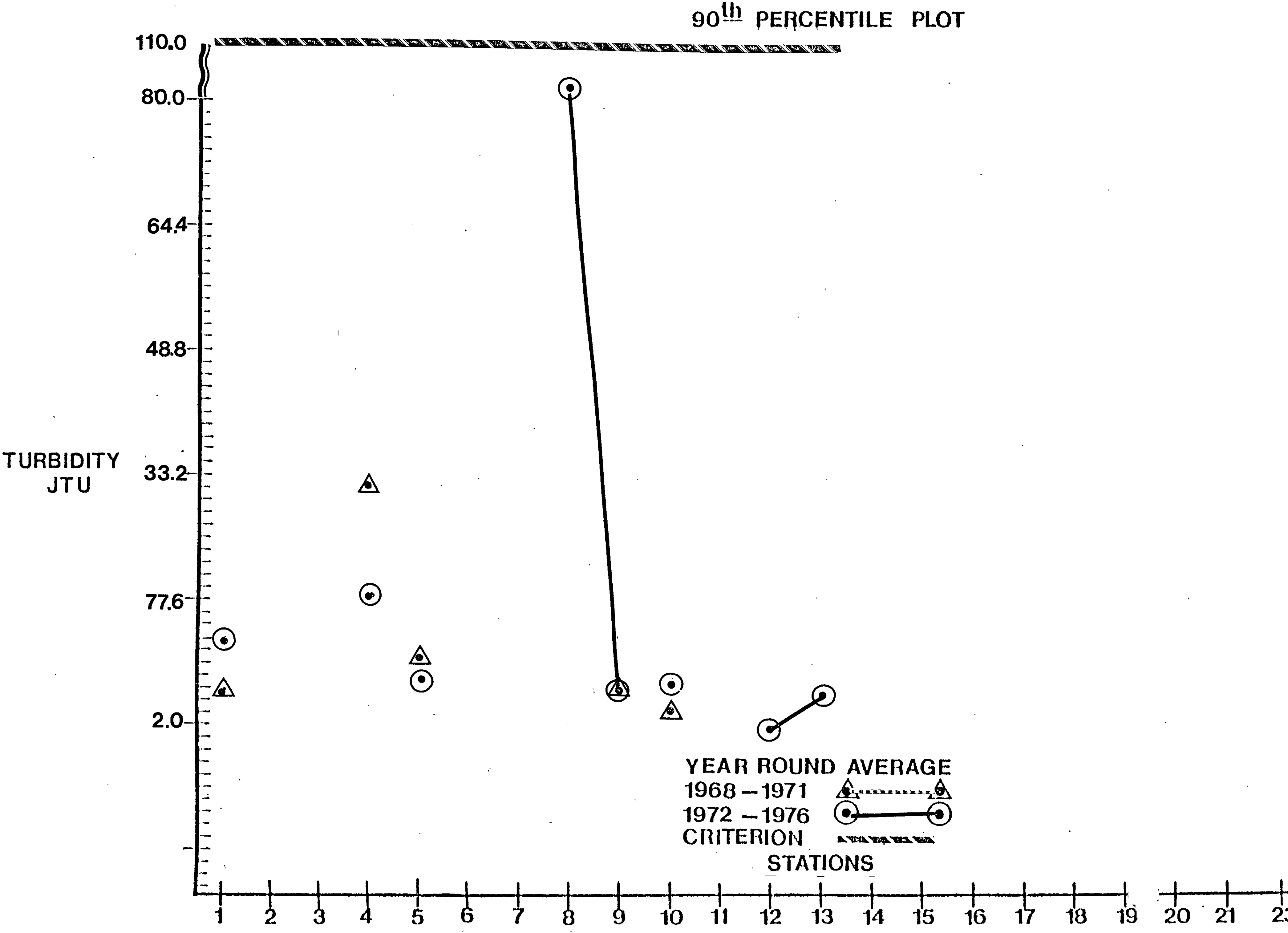
90th PERCENTILE PLOT
NITRATE
N
mg/l
2.00
1.62
1.23
0.85
0.46
0.08
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
20
21
YEAR ROUND VALUES
1968 – 1971
1972 – 1976

Figure VI.0.8



90th PERCENTILE PLOT
NON-FILTRABLE RESIDUE mg/l
342.0
275.0
208.0
141.0
74.0
40.0
7.00
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Figure VI.0.9



90th PERCENTILE PLOT
110.0
80.0
64.4
48.8
33.2
77.6
2.0
TURBIDITY
JTU
YEAR ROUND AVERAGE
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21

## Table VI.0.1 MUNICIPAL AND INSTITUTIONAL DISCHARGER INVENTORY

### S. Atlantic Coastal Basin

| Map Number | Compliance with 1977 Secondary/ Best Practicable Treatment Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Flow (mgd) 1975 Avg. | Flow (mgd) 1975 Max. | Average Daily Effluent Quality (1975) $BOD_5$ mg/l | $BOD_5$ #/Day | $NH_3$-N mg/l | $NH_3$-N #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | No | Atlantic City | Atlantic City | Beach Thorofare | 0024988 | Primary | 18.2 | 10.7 | 13.8 | 94 | 8388 | 13.1 | 1169 | SS 45 mg/l |
| | | Atlantic Cty. S.A.- Coastal | Atlantic City | Atlantic Ocean | 0024473 | Active Sludge | 40 | | | | | | | |
| B | No | Brigantine City | Brigantine City | St. George's Thorofare | 0021725 | Contact Stabiliz. | .6 | 1.13 | 1.52 | 77 | 728 | 14.6 | 137 | SS 59.5 mg/l |
| C | No | Longport | Longport | Beach Thorofare | 0027502 | Primary | .5 | .35 | .39 | 88 | 254 | 13.5 | 4.7 | SS 57 mg/l |
| D | No | Pleasantville Water Poll. Control Fac. | Pleasantville | Johnathan Thorofare | 0024945 | High Rate Trickling Filter | 2.05 | 2.37 | 2.8 | 35.6 | 704 | 24.2 | 478 | SS 44 mg/l |
| E | No | Somers Point City | Somers Point City | Patcong Creek | 0023116 | High Rate Trickling | 1.05 | .83 | .93 | 35 | 244 | 18.4 | 127 | SS 39 mg/l |
| F | No | Ventnor-Margate Joint Treatment Plant | Ventnor | Beach Thorofare | 0024805 | Primary | 3.5 | 3.94 | 5.29 | 87 | 2859 | 19.1 | 627 | SS 69 mg/l |

Table VI.0.1 MUNICIPAL AND INSTITUTIONAL DISCHARGERS
(cont'd)

South Atlantic Coastal Basin
Lower Coastal Segment

| Map Number | Compliance with 1977 Requirements of Secondary/Best Practicable Treatment Limitations | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Avg. | Max. | Average Daily Effluent Quality BOD$_5$ mg/l | #/Day | $NH_3$-N mg/l | #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| G | Yes | Tuckerton Boro MUA | Tuckerton | Tuckerton Creek | 0021032 | Contact Stabil-ization | 0.5 | 0.28 | 0.48 | 9.2 | 21 | 12.9 | 29.8 | SS 23 mg/l |
| H | No | Long Beach S.A. - Crest Plant | Long Beach | Atlantic Ocean | 0023272 | Primary | 2.0 | 1.22 | 2.0 | 43 | 436 | 14.3 | 145.2 | SS 36 mg/l |
| I | Yes | Stafford MUA | Stafford | Mill Creek | 0026221 | High Rate Trickling Filter | 0.58 | 0.34 | 0.57 | 11 | 37 | 15.6 | 44.0 | SS 9 mg/l |
| J | | Beach Haven S.A. | Beach Haven | Atlantic Ocean | 0020567 | Contact Stabil-ization | 1.5 | 0.94 | 1.58 | 43 | 336 | 11.3 | 88.3 | SS 40 mg/l |
| | | Ocean County S.A. -Southern | Stafford | Atlantic Ocean | 0026018 | Secondary | 20.0 | (Plant not yet in operation) | | | | | | |
| K | Yes | Mystic Isles Sewer Co. | Little Egg Harbor | Roses Creek | 0021466 | Secondary | .50 | .51* | | | 44.2* | | | |
| L | No | Ship Bottom S.A. | Ship Bottom | Atlantic Ocean | 0021237 | Primary | .75 | .48* | | | | | | |
| | | Borough of Beach Haven Water Dept. | Beach Haven | | | | | | | | | | | |
| M | No | Surf City Sewer Dept. | Surf City | Atlantic Ocean | 0021563 | Primary | .75 | .88* | | | | | | |

Note: An asterisk (*) denotes that this is not an average value for the year, but the value for the month with maximum monthly flow.

Table VI.0.1 MUNICIPAL AND INSTITUTIONAL DISCHARGER INVENTORY
(cont'd)

S. Atlantic Coastal Basin

| Map Number | Compliance with 1977 Secondary/ Best Practicable Treatment Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Avg. | Max. | Average Daily Effluent Quality (1975) $BOD_5$ mg/l | $BOD_5$ #/Day | $NH_3$-N mg/l | $NH_3$-N #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N | | Avalon Boro | Avalon | Gravens Thorofare | 0021385 | Contact Stabliz. | 1.6 | .98 | 1.67 | 39 | 317 | 7.7 | 62.9 | SS 56 mg/l |
| | | Bay Motel Corp. | Upper Twp. | Ben Elders Creek | 0024597 | Sand Filter | .025 | | | | | | | |
| | No | Cape May Cty. Bd. of Free-holders - Crest Haven | Middle Twp. | Holmes Creek | 0026786 | Contact Stabiliz. | .05 | .026 | .034 | 67 | 15 | 9.1 | 2 | SS 179 mg/l |
| | Yes | Florida Motor Court | Middle Twp. | Gar Creek | 0027499 | Extended Aeration | .06 | .02 | .03 | 26 | | 9.1 | 1.5 | SS 37 mg/l |
| O | No | Middle Twp. Sew. Dist. #1 - Court House | Middle Twp. | Crooked Creek | 0028037 | Primary | .1 | .25 | | 144 | 300 | 22.6 | 47.1 | SS 113 mg/l |
| P | No | New Jersey Water Co. - 46th St. | Ocean City | Crook Horn | 0027286 | Contact Stabiliz. | 1.0 | .98 | 1.6 | 31 | 257 | 16.8 | 137 | SS 43 mg/l |
| Q | No | New Jersey Water Co. Third St. | Ocean City | Great Egg Harbor Bay | 0023281 | Primary | 5.82 | 3.1 | 4.7 | 132 | 3412 | 24 | 620 | SS 65 mg/l |
| R | No | North Wild-wood | N. Wildwood | Hereford Inlet | 0023515 | Primary | 2.1 | .90 | 1.82 | 113 | 853 | 28.2 | 211.6 | SS 76 mg/l |

Table VI.0.1 MUNICIPAL AND INSTITUTIONAL DISHCARGER INVENTORY
(cont'd) S. Atlantic Coastal Basin

| Map Number | Compliance with 1977 Secondary/ Best Practicable Treatment Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Avg. | Max. | Average Daily Effluent Quality (1975) $BOD_5$ mg/l | #/Day | $NH_3$-N mg/l | #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S | No | Sea Isle City | Sea Isle City | Scraggy Creek | 0023680 | Primary | .84 | .76 | 2.0 | 78 | 493 | 17.1 | 108 | SS 68 mg/l |
| | Yes | Seaville Serv. Area -G.S. Pkwy | Dennis | Ludlam's Brook | 0021121 | Trickling Filter | .03 | .012 | .035 | | | | | |
| | No | Shawcrest Mobile Home Park | Lower Twp. | Three Reach Creek | 0024538 | Extended Aeration | .1 | .03 | .053 | 6 | 2 | 1.5 | .37 | SS 17 mg/l |
| T | No | Stone Harbor | Stone Harbor | Great Channel | 0026581 | Primary | 1.2 | .46 | .915 | 115 | 443 | 13.3 | 51 | SS 48 mg/l |
| | | U.S. Coast Guard Training Center (Two outfalls) | Cape May City | Cape May Harbor | 0020524 | Industrial | | | | | | | | |
| U | No | Wildwood City | Wildwood City | Post Creek | 0022811 | Primary | 3.5 | 1.98 | 3.57 | 122 | 2009 | 16.6 | 274 | SS 43 mg/l |
| V | No | Wildwood Crest | Wildwood Crest | Richardson Channel | 0027171 | Primary | 1.3 | .9 | 2.0 | 152 | 1141 | 25.3 | 190 | SS 77 mg/l |
| | | Cape May City | Cape May City | Delaware Bay | | Primary | 3.0 | .614 | .926 | 101 | 519 | 20.4 | 104 | SS 84 mg/l |

## Table VI.0.1 (cont'd) INDUSTRIAL DISCHARGER
### S. Atlantic Coastal Basin

| Map Number | Compliance with 1977 Secondary/ Best Practicable Treatment Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Avg. | Max. | Average Daily Effluent Quality (1975) $BOD_5$ mg/l | $BOD_5$ #/Day | $NH_3$-N mg/l | $NH_3$-N #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Federal Oil Co. | Middle Twp. | Storm Sewer | 0026123 | | | | | | | | | |
| | | Garden Lake Corp. | Middle Twp. | Cresse Creek | 0027197 | Sand Filter | .056 | .007 | .009 | 27 | 1.6 | 10.4 | .60 | SS 56 mg/l |
| | | Snow Food Products | Cape May City | Upper Thorofare | 0004961 | Industrial | | | | | | | | |
| | | Wildwood Clam Co., Inc. | Wildwood | Otten's Harbor | 0004022 | Industrial | | | | | | | | |
| W | Yes | Jersey Central Power & Light Co. | Lacey | Oyster Creek | | Secondary (batch) | 528 | * | | 553 | | | | |
| | | Seacoast Products | Tuckerton | | | | | | | | | | | |
| | | Stafford Water Co. | Stafford | | | | | | | | | | | |

Table VI.0.1 MUNICIPAL AND INSTITUTIONAL DISCHARGERS
(cont'd)

S. Atlantic Coastal Basin

| Map Number | Compliance with 1977 Secondary/ Best Practicable Treatment Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Avg. | Max. | Average Daily Effluent Quality (1975) BOD$_5$ mg/l | #/Day | NH$_3$-N mg/l | #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| X | | Indianola Sewer Co. | Union | Lochiel Creek | 0021423 | Secondary | .40 | .27* | | | | 9.0* | 20.3* | |
| | | Tuckerton Water Co. | Tuckerton | | 0025828 | | | | | | | | | |
| | | Borough of Harvey Cedars Water Dept. | Harvey Cedars | | 0025488 | | | | | | | | | |
| | | Long Beach S.A. | Surf City | | 0023264 | | | | | | | | | |
| Y | No | Long Beach S.A. | Long Beach Twp. | Atlantic Ocean | 0023256 | Primary | | | 1.25 | | | | | |
| | | Harvey Cedars Water Dept | Harvey Cedars | Kinsey Cove | 0025488 | | | | (seas.) 0.036 | | | | | |
| | | Ocean Twp. MUA | Ocean Twp. | Waretown Creek | | | .085 | | | | | | | |

Note: An asterisk (*) denotes that this is not an average value for the year, but the value for the month with maximum monthly flow.

Table VI.0.1 MUNICIPAL AND INSTITUTIONAL DISCHARGE INVENTORY
(cont'd)

South Atlantic Coastal Basin

| Map Number | Compliance with 1977 Secondary/ Best Practicable Treatment Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Avg. | Max. | Average Daily Effluent Quality (1975) BOD5 mg/l | #/Day | NH3-N mg/l | #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Z | | Berkeley Twp. S.A. | Berkeley | Atlantic Ocean | 0022917 | Secondary | .50 | .30* | | | 88.3* | 8.3* | 69.4* | |
| | | Lacey MUA | Lacey | | 0024112 | | | | | | | | | |
| | | Berkeley Twp. S.A. | Berkeley | Clamming Creek | 0022969 | Secondary | .25 | .09 * | | | 10.8* | | | |
| | Yes | N.J. Bureau of Parks (Forked River Marina) | Lacey | Forked River | 0026808 | Secondary | | | | | | | | |

Note: An asterisk (*) denotes that this is not an average value for the year, but the value for the month with maximum monthly flow.

# CENTRAL PINE BARRENS

## BASIN DESCRIPTION

The Central Pine Barrens includes:

- Mullica River
- Hammonton Creek
- Batsto River
- Oswego River
- Wading River
- Oyster Creek
- Jakes Branch (tributary to Toms River)
- McDonalds Branch
- South Branch Rancocas Creek

The Central Pine Barrens is a portion of a much larger wilderness tract that covers approximately 2000 square miles. This area is sparsely populated and contains minimal industrial development. The upland areas drain Pine-Oak and Pine-Blackjack Forests. Agricultural crops such as apples, peaches, and tomatoes dominate this upland area. The lowlands are dominated by cedar swamp, hardwood swamp, and pitch pine forests. Cranberry and blueberry production is the dominant agricultural crop in this area.

This region is underlain by the Cohansey and Kirkwood Formations. These formations generally consist of medium to course sand which ranges from 20 to over 200 feet thick.

The Central Pine Barrens Region is an area of naturally acid soils and waters which are low in calcium, magnesium, alkalinity, buffering capacity, nitrogen, and phosphorus and high in iron. The cranberry industry, which ranked third nationally in 1975, is dependent on these acid waters.

The shallow, slow moving streams are naturally tea-colored from precipitation which has leached the forest litter and entered the ground water system. The stream flows are relatively constant year round because of the large groundwater contribution.

## WATER QUALITY ASSESSMENT

In general the water quality of surface waters in this portion of the Pine Barrens is excellent. Percent saturation of dissolved oxygen is usually near the criterion in all stations except those stations in Hammonton Creek and McDonald's Branch. Five-day biochemical oxygen demand are all below the criterion and show little change with time. The waters in the Central Pine Barrens region are naturally acidic. The variation from norm at station six on Batsto River is atypical for surface waters in the Central Pine Barrens. The phosphorus levels generally hover around the criterion. Nitrate nitrogen levels are relatively low throughout the Central Pine Barrens region. Raw data show elevated nitrate nitrogen levels do appear in Hammonton Creek. Elevated nitrate nitrogen levels also appeared in Batsto, Oswego, and Wading River during the 1972-1976 period. However, the values during the 1968-1971 period are more reflective of the entire data base for nitrate nitrogen concentrations in these three rivers. Non-filterable residue (*suspended solids) and dissolved residue (total dissolved solids) are within the criteria. Dissolved residue is higher in the Mullica River than in other surface waters in the Central Pine Barrens Region. Turbidity is generally low throughout the surface waters in this region. However, turbidity values appear to be higher in Hammonton Creek than in other waters in the Central Pine Barrens Region.

PROBLEM ASSESSMENT

The Central Pine Barrens Region is sparsely populated, but these population centers do have a significant impact on water quality in this region. Because of the exceptional water quality in this area, changes due to point and nonpoint sources of pollution are noticed immediately. This is clearly evident in Hammonton Creek. Hammonton Creek receives nutrient loadings contributed by agricultural activities, urban runofff from Hammonton, and treated sewage discharged from the Hammonton Sewage Treatment Plant. In addition, because of the low buffering capacity, pH will change almost instantaneously when inflow pH is different from the surface water. This has also occurred in Hammonton Creek and resulted in elevated pH values in this surface water. Biochemical oxygen demand loadings from point and nonpoint sources caused a fishkill in 1976 in the Nescohague Lake. Hammonton Creek is an example of how easily water quality in the Central Pine Barrens Region is changed by nonpoint and point source discharges of contaminants and pollutants.

The discharge from Ancora State Hospital is causing similar problems in Blue Anchor Brook, near the headwaters of the Mullica River. Landing Creek has also experienced these problems downstream of the Egg Harbor City Sewage Treatment Plant. The low dissolved oxygen concentration in McDonald's Branch is typical of monitoring locations that are near groundwater discharge areas or springs.

There are several small lakes in this region. The Birchwood-Oakwood Lakes chain is influenced by point and non-point sources of nutrients from Medford Lakes Borough. The combination of shallow depth and nutrient inputs have caused nuisance algal and aquatic weed growth in this lake chain.

GOAL ASSESSMENT AND RECOMMENDATIONS

It is expected that all surface waters in this region will meet the fishable/swimmable goals of P.L. 92-500. However, P.L. 92-500 also has an objective of restoring and maintaining the chemical, physical, and biological integrity of surface waters. Implementation of pretreatment requirements for industry and the transfer of municipal and institutional discharges from surface waters to the land may improve water quality in the surface waters. In addition, best management practices for agricultural operations should also aid in restoring surface water quality to typical levels in this region. However, it is unclear whether such controls of point and non-point sources are sufficient to completely restore Hammonton Creek to "Pine Barrens" character.

Another important factor that will affect the objective of maintaining the physical, chemical, and biological integrity of surface waters is the fate of effluent contaminants for individual on-site wastewater disposal systems. The sandy soils are highly permeable and chemically-resistant. Thus these soils have reduced capability to quickly and effectively filter out or immobilize wastes by oxidation, sorption, biochemical, and ion exchange action. As a result of these factors, contaminants and pollutants can readily enter and travel long distances in the aquifer, and perhaps enter the surface waters at levels that may degrade water quality. Such degradation would lead to changes in the natural aquatic biota.

Because of the intimate relationship between ground and surface water quality, the fate of contaminants through the soils and into the groundwater must be identified. Thus basic research is necessary to make this determination. However, the process in which the fate of contaminants and pollutants in the groundwater is determined must readily be useable by regulatory agencies. The DEP is presently funding such a project by Rutgers University.

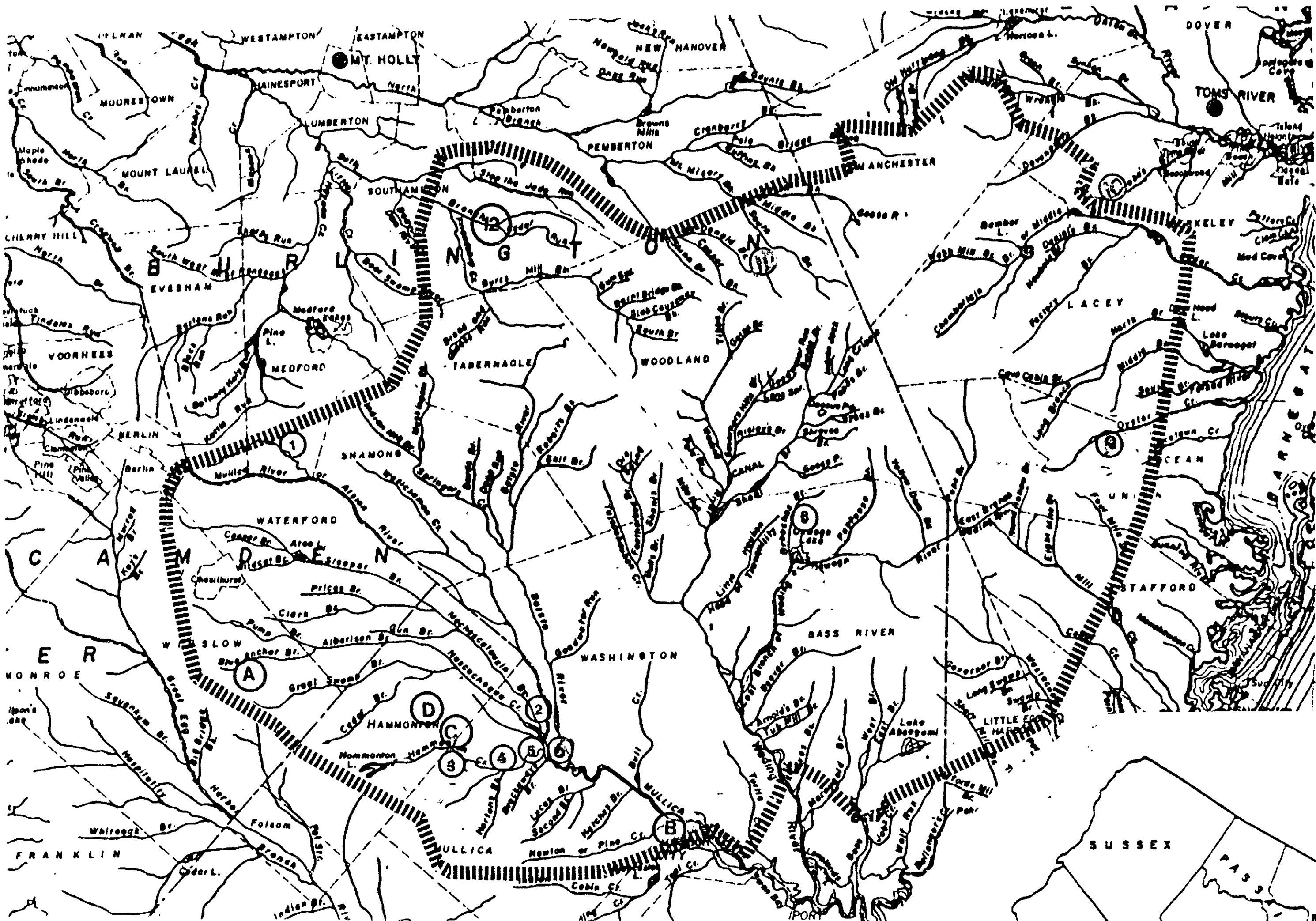
Chemical and physical monitoring should be augmented with biological monitoring. An indigenous species survey should be conducted in this region. The results would be utilized when reviewing NPDES permits to incorporate bioassay requirements where necessary. The results would also be utilized to determine what changes in the indigenous aquatic biota have occurred in atypical streams (e.g. Hammonton Creek).

Although the preceding assessment summarizes all water quality data available to the Division of Water Resources, the following graphs do not present all Central Pine Barrens Area water quality data available to the Division.

Neither the scope of this report nor its generalized format for displaying data allow presentation of all available water quality data for the many small streams of the Central Pine Barrens Area. However, the Division will prepare a comprehensive inventory of the water quality data for this segment in 1978.

STATION LIST

1. Mullica River at Atsion Lake Outlet
2. Mullica River at Pleasant Mills
3. Hammonton Creek at Hammonton
4. Hammonton Creek at Nortonbrook
5. Hammonton Creek at Nescochague Lake
6. Batsto River at Batsto
7. Oswego River at Harrisville
8. Wading River near Harrisville
9. Oyster Creek near Brookville
10. Jakes Branch at South Toms River
11. McDonalds Branch in Lebanon State Forest
12. South Branch Rancocas Creek at Retreat




# LOCATION

# CENTRAL PINE BARRENS

## LEGEND

Point Source — (A) (B) (C) (D) (E)

Monitoring Site — (1) (2) (3) (4) (5)

Drainage Basin Boundaries

County Bounderies

Municipal Bounderies

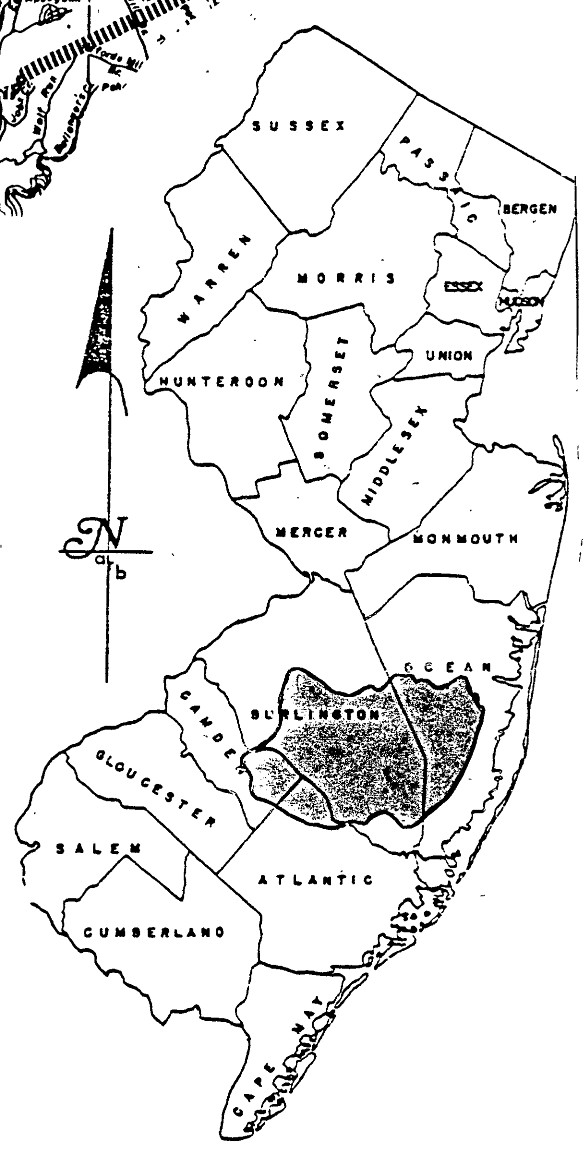
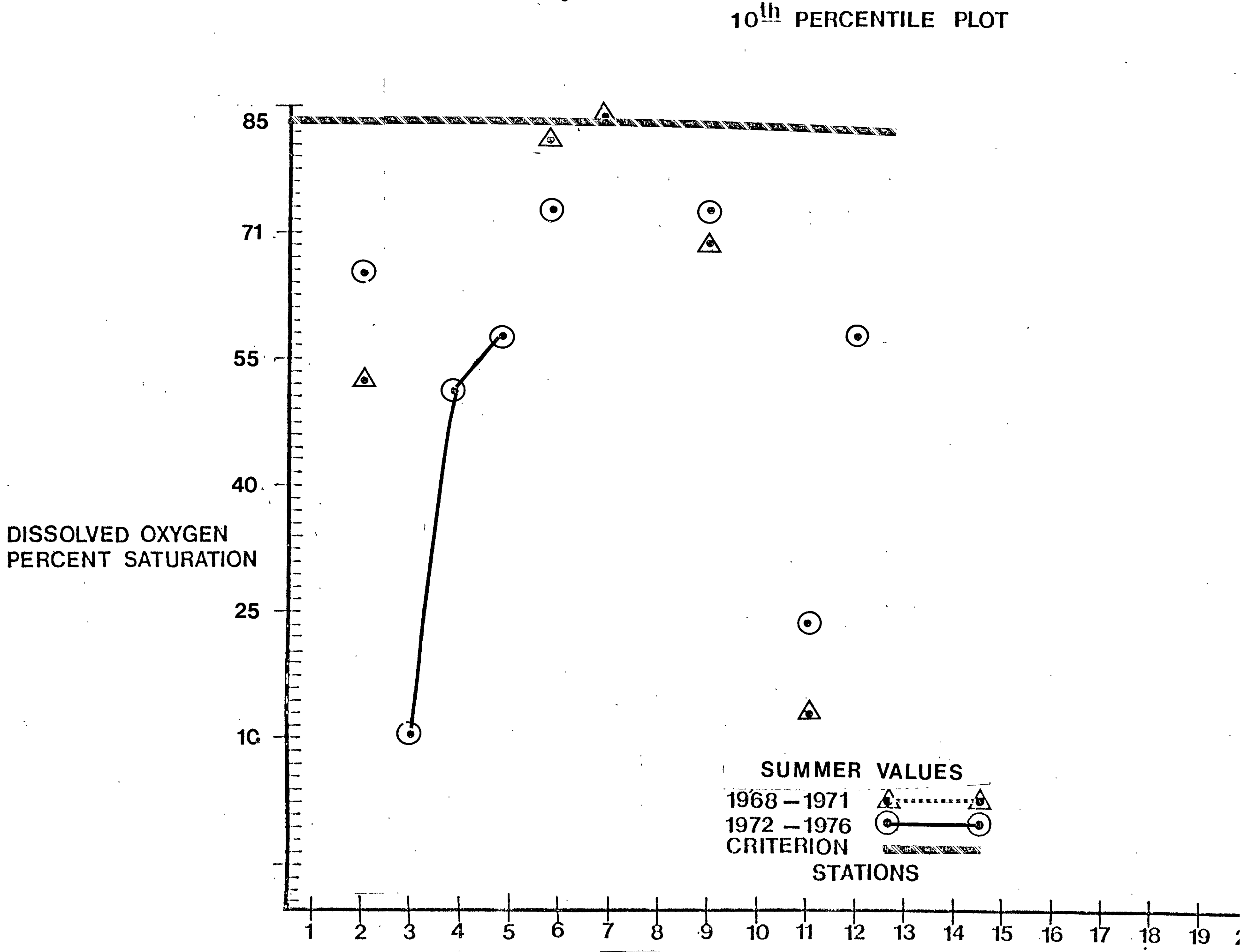
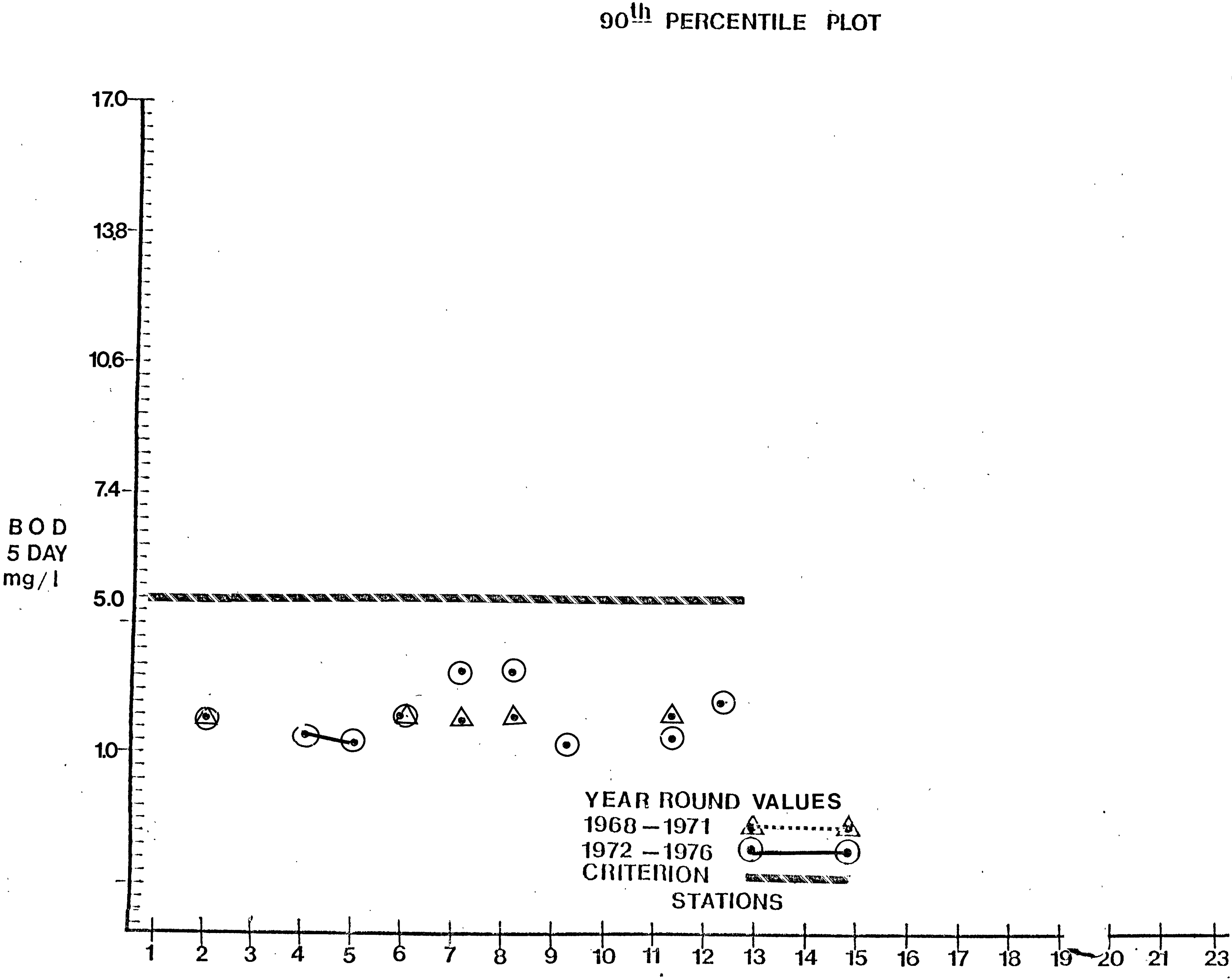



Figure VI.P.1

Figure VI.P.2


10th PERCENTILE PLOT
85
71
55
40
25
10
DISSOLVED OXYGEN
PERCENT SATURATION
SUMMER VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19


90th PERCENTILE PLOT
17.0
13.8
10.6
7.4
BOD
5 DAY
mg/l
5.0
1.0
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
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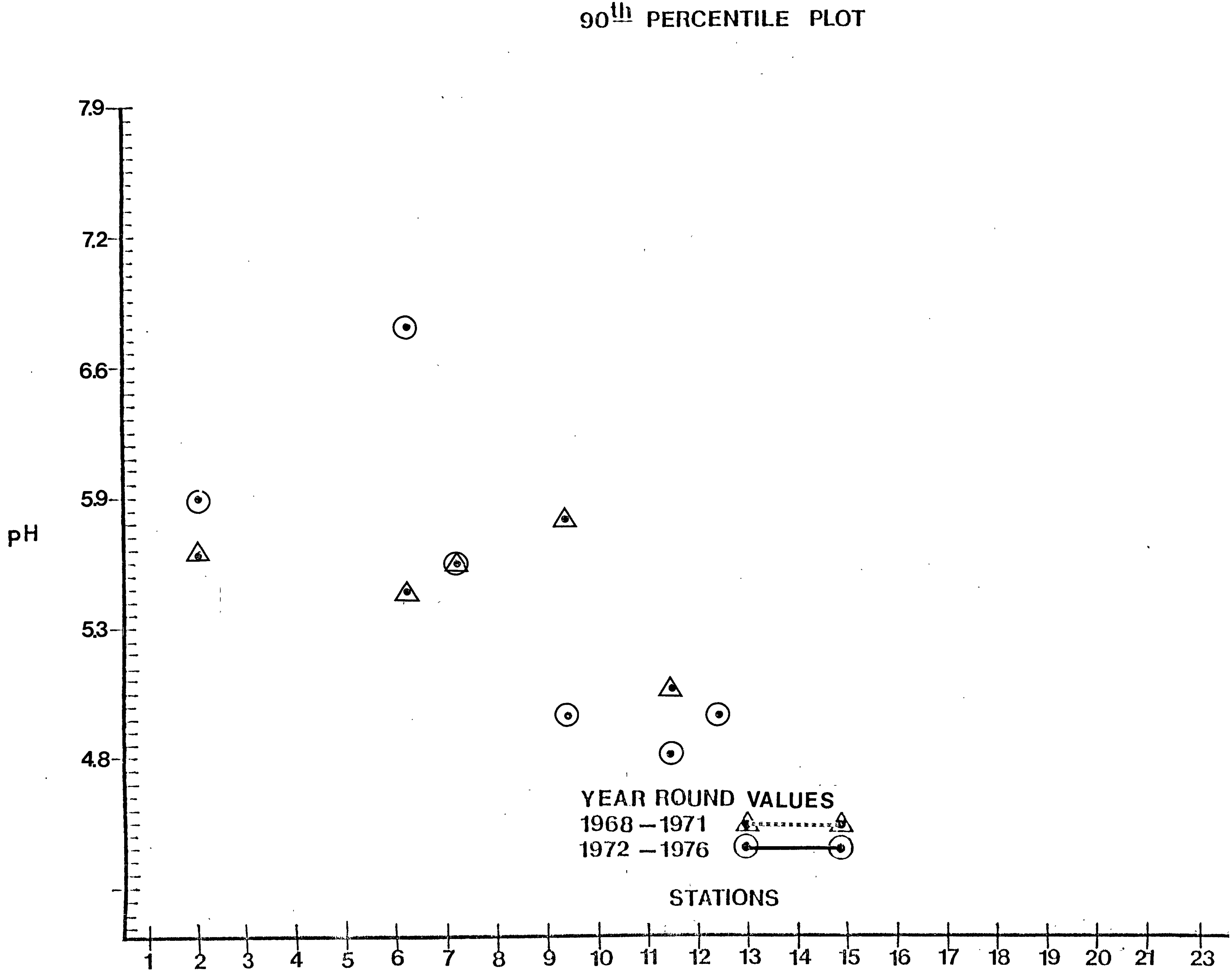
21
23

Figure VI.P.4


90th PERCENTILE PLOT
7.9
7.2
6.6
5.9
5.3
4.8
pH
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
STATIONS
1
2
3
4
5
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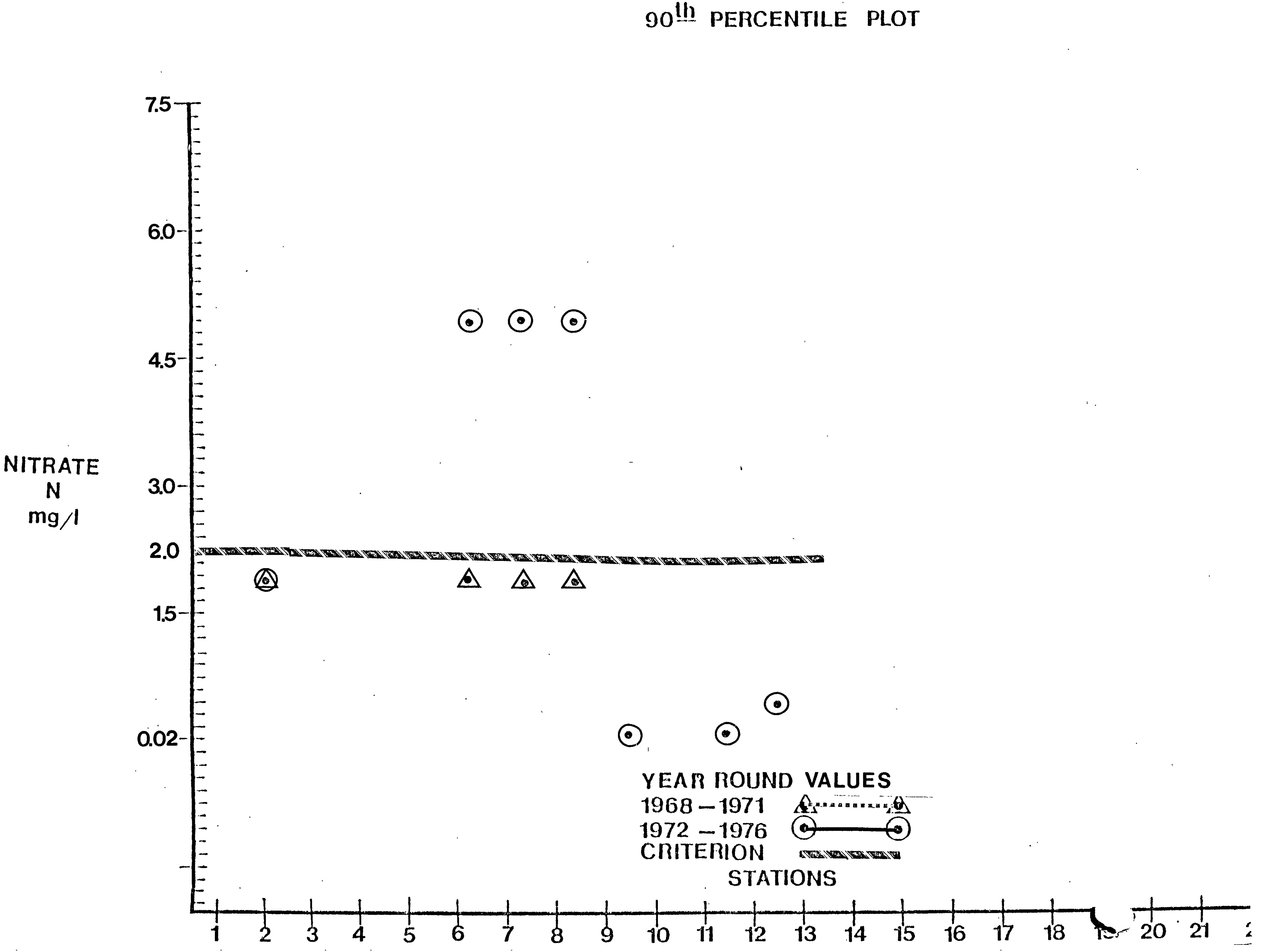
21
23

Figure VI.P.5


90th PERCENTILE PLOT
NITRATE
N
mg/l
7.5
6.0
4.5
3.0
2.0
1.5
0.02
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
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21

Figure VI.P.6

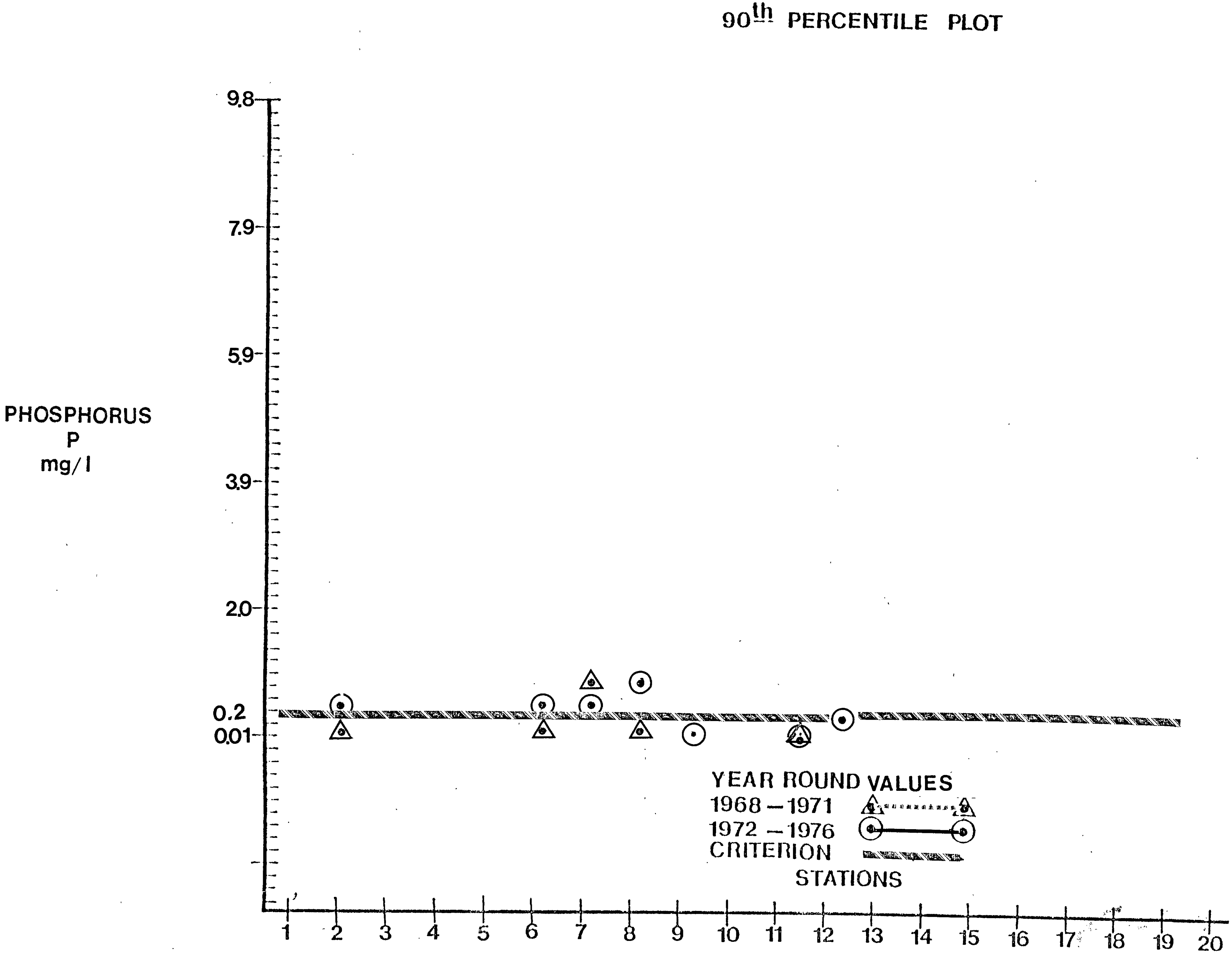
90th PERCENTILE PLOT
PHOSPHORUS
P
mg/l
9.8
7.9
5.9
3.9
2.0
0.2
0.01
YEAR ROUND VALUES
1968 — 1971
1972 — 1976
CRITERION
STATIONS
1
2
3
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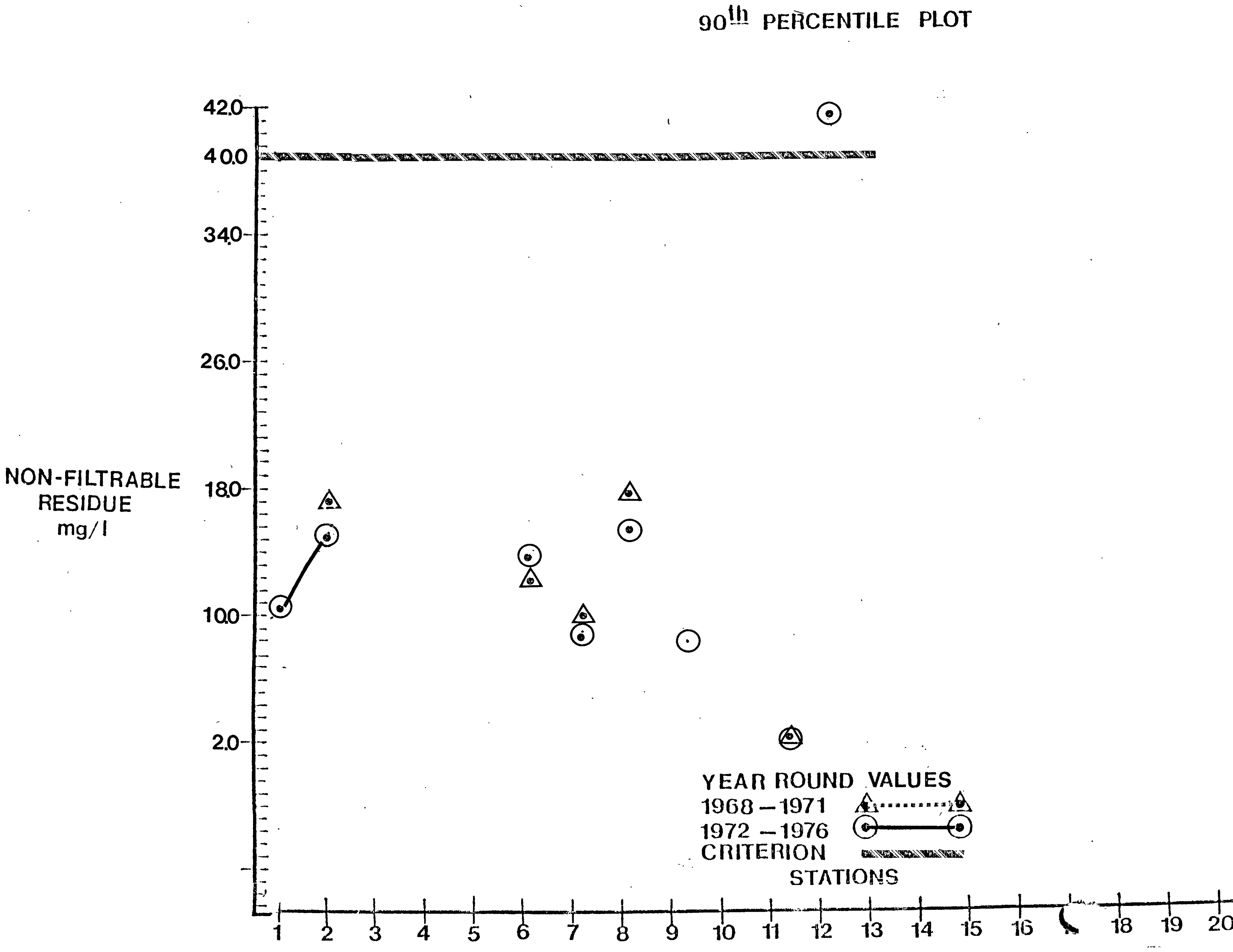
Figure VI.P.7



90th PERCENTILE PLOT
NON-FILTRABLE RESIDUE mg/l
42.0
40.0
34.0
26.0
18.0
10.0
2.0
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
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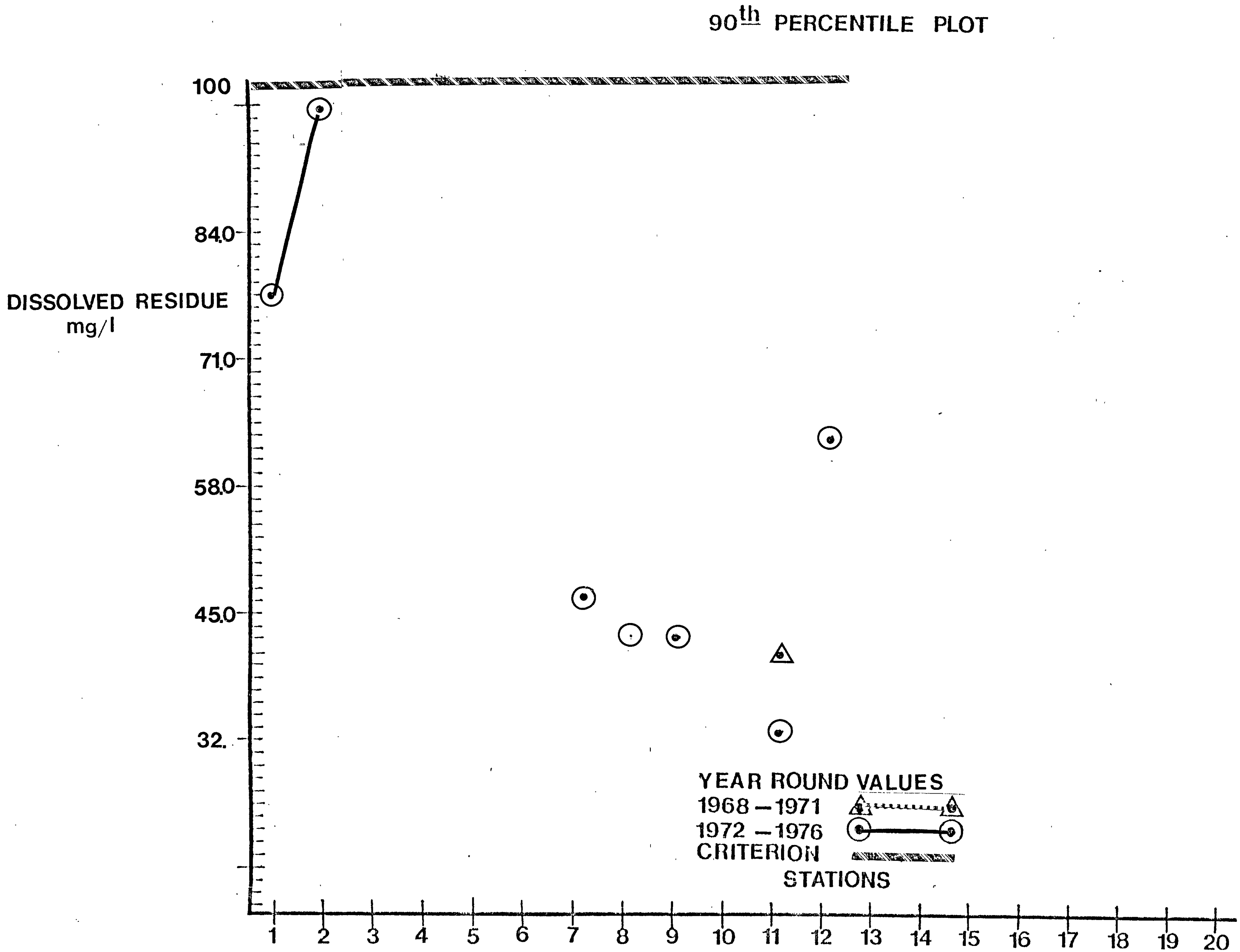
Figure VI.P.8



90th PERCENTILE PLOT
100
84.0
71.0
58.0
45.0
32.
DISSOLVED RESIDUE
mg/l
YEAR ROUND VALUES
1968 — 1971
1972 — 1976
CRITERION
STATIONS
1
2
3
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Figure VI.P.9

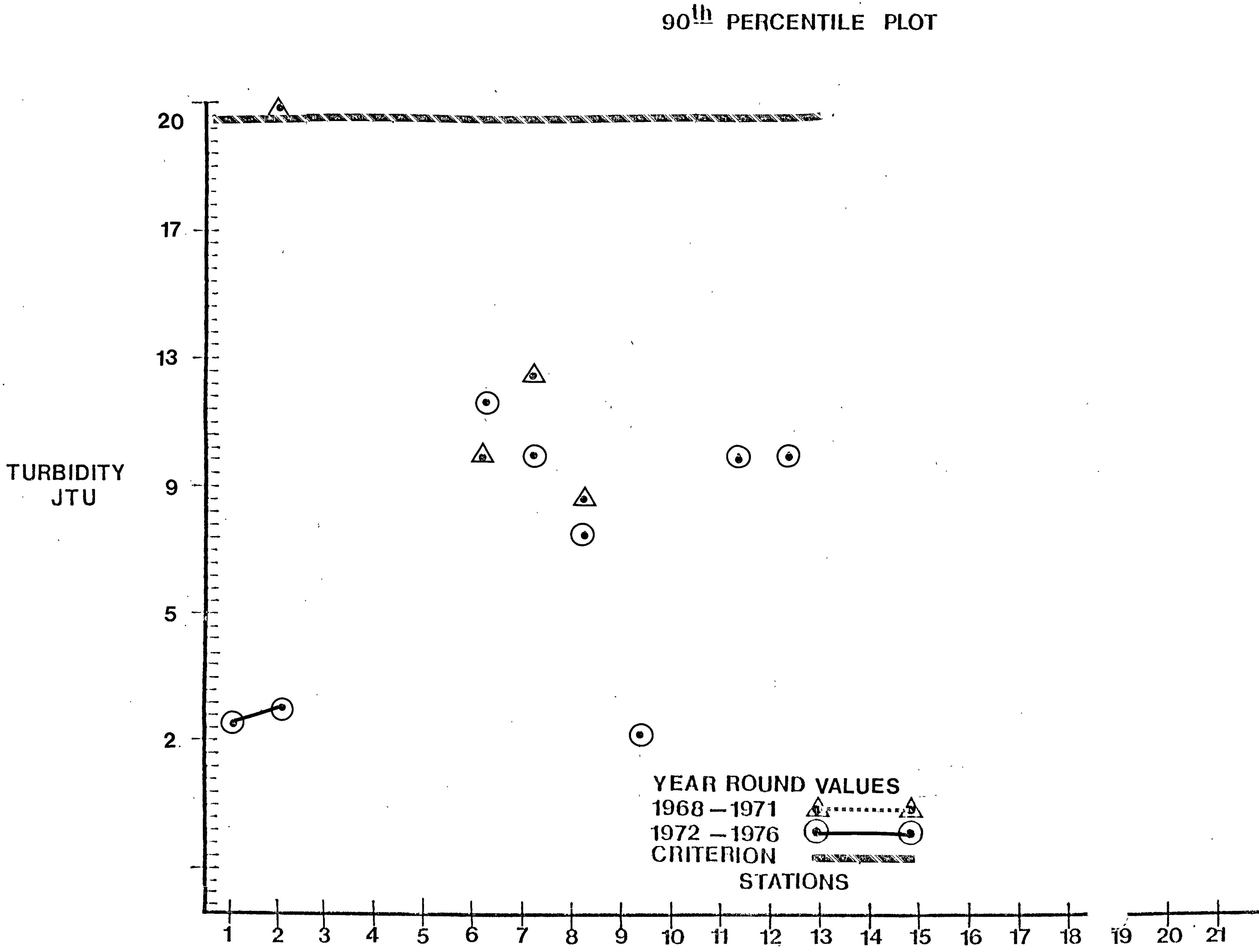
90th PERCENTILE PLOT
TURBIDITY JTU
20
17
13
9
5
2
YEAR ROUND VALUES
1968 — 1971
1972 — 1976
CRITERION
STATIONS
1
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Table VI.P.1 INDUSTRIAL DISCHARGERS
(cont'd) S. Atlantic Coastal Basin
Pine Barrens

| Map Number | Compliance with 1977 Secondary / Best Practicable treatment Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Avg. | Max. | Average Daily Effluent Quality (1975) $BOD_5$ mg/l | #/Day | $NH_3$-N mg/l | #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Braddock Frosted Foods | Winslow | Mullica River Trib. | 0004081 | Cooling Water | | .2 | | | | | | |
| | | Eastern Brewing Co. | Hammonton | Cedar Branch | 0028223 | Cooling Water | | | | | | | | |
| | | L.N. Renault and Sons, Inc. | Galloway | Elliots Creek | 0005126 | | | | | | | | | |
| | Yes | Pacemaker Corp. (Discharge 001 of 003) | Washington | Mullica | 005428 | Extended Aeration | .01 | .006 | .012 | 22 | 1.0 | 6.8 | .34 | SS 80 mg/l |
| | | Discharge 002 | | | | Extended Aeration | .01 | .006 | .012 | 22 | 1.0 | 6.8 | .34 | SS 80 mg/l |
| | | Discharge 003 | | | | Extended Aeration | .01 | .006 | .012 | 22 | 1.0 | 6.8 | .34 | SS 80 mg/l |
| | | Whitehall Labs | Hammonton | Pond | 00024210 | Cooling Water | | .57 | | | | | | |

## Table VI.P.1 MUNICIPAL AND INSTITUTIONAL DISCHARGERS

### Pine Barrens

| Number | Compliance with 1977 Secondary / Best Practicable treatment Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 | | | Average Daily Effluent Quality (1975) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Des. Cap. | Avg. | Max. | $BOD_5$ mg/l | $BOD_5$ #/Day | $NH_3$-N mg/l | $NH_3$-N #/Day | Other |
| A | Yes | Ancora Psychiatric Hosp. | Winslow | Blue Anchor Brook | 0021962 | Standard Rate Trickling Filter | .40 | .24 | .3 | 17 | 34 | 5.1 | 10.2 | SS 24 mg/l |
| | | Atlantic City Service Area G.S. Pkwy | Galloway | Mattix Run | 0027189 | Sand Filter | .035 | .03 | .04 | 3 | .65 | 1.5 | .37 | SS 4.4 mg/l |
| B | No | Egg Harbor City | Egg Harbor City | Landing Creek | 0024589 | Standard Rate Trickling Filter | .34 | .416 | .417 | 22 | 76 | 18 | 62.4 | SS 38 mg/l |
| C | No | Hammonton | Hammonton | Hammonton Creek | 0025160 | High Rate Trickling Filter - Standard Rate Trick. Filter | 1.6 | .73 | .79 | 102 | 623 | 12.3 | 74.8 | SS 48.5 mg/l |

# STATION LIST

## GREAT EGG HARBOR RIVER SEGMENT

1. Great Egg Harbor River at Berlin
2. Great Egg Harbor River near Sicklerville
3. Great Egg Harbor River at Winslow
4. Great Egg Harbor River near Blue Anchor
5. Great Egg Harbor River at Folsom
6. Great Egg Harbor River at Penny Pot
7. Great Egg Harbor River at Weymouth
8. Great Egg Harbor River at Mays Landing
9. Great Egg Harbor River tributary at Sicklerville
10. Great Egg Harbor River tributary at Winslow
11. Fourmile Brook at Winslow Crossing
12. Fourmile Brook at New Brooklyn
13. Squankum Brook near Winslow
14. Deep Run at Weymouth

## GREAT EGG HARBOR RIVER

### BASIN DESCRIPTION

The Great Egg Harbor River originates in the rural, agricultrual areas of eastern Gloucester and Camden counties. It flows southeastward through suburban, light industrial, and commercial developments in Atlantic County to its entrance, through tidal salt marshes, into Great Egg Harbor. Most development in the drainage basin is localized in the vicinity of Berlin, Winslow and Mays Landing, and along the entire length of the riverbank. Water is utilized for agricultrual purposes, and as a high quality fresh water contributions in support of significant recreational fishing and commercial shellfishing in Great Egg Harbor.

### WATER QUALITY ASSESSMENT

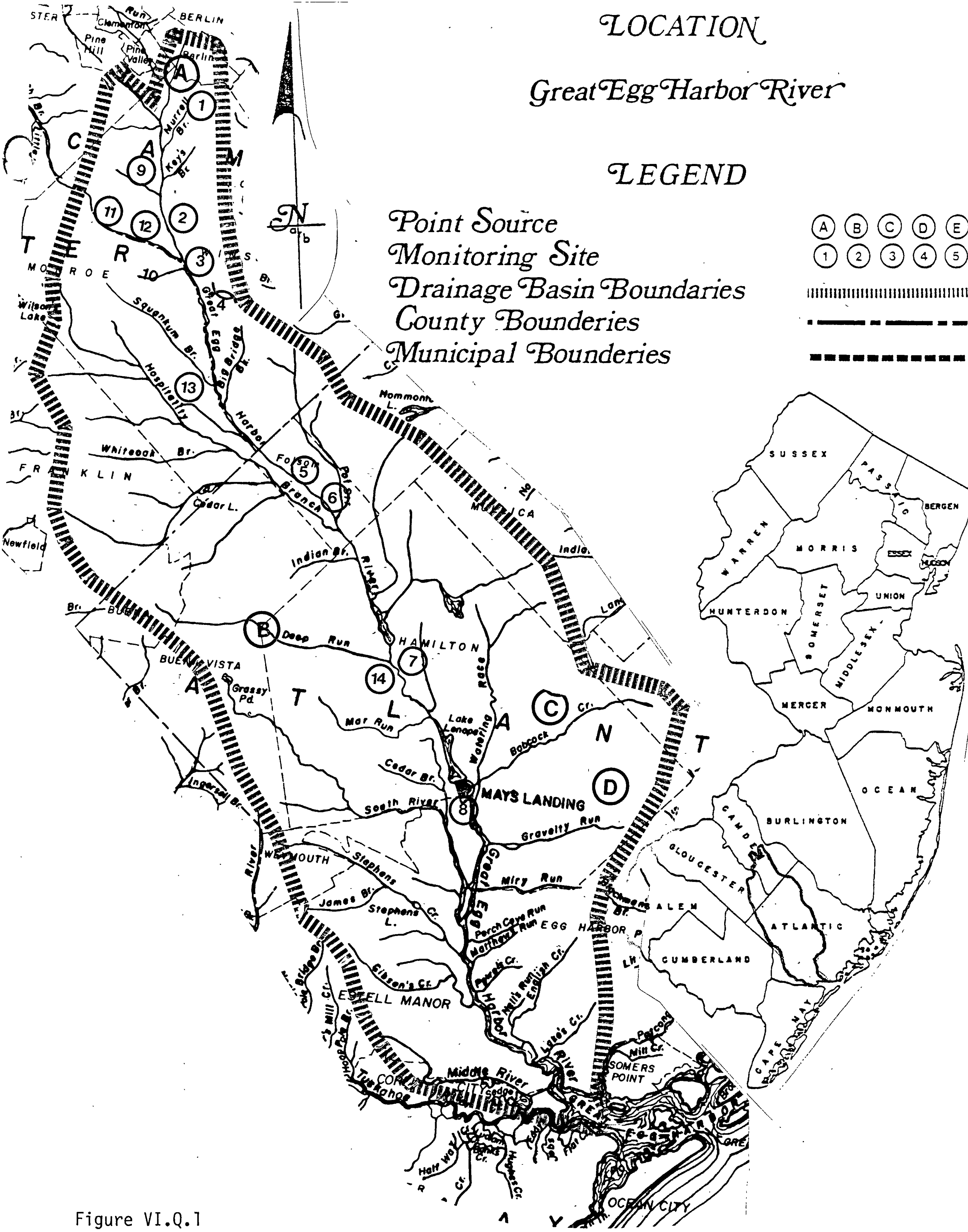
Water quality of the Great Egg Harbor River drainage area is generally very good. Fecal coliform bacteria counts are above the criterion at most stations in this basin and are extremely high in the Squankum Brook tributary in Monroe Township, Gloucester County. Dissolved oxygen levels are depressed in tributaries upstream of Blue Anchor, particularly in Quankum Brook. The low dissolved oxygen values at this station are correlated with excessive biochemical oxygen demand. Biochemical oxygen demand levels are generally within the criterion at the remainder of the stations. The higher pH of upstream tributaries decreases as the Egg Harbor River flows downstream into Atlantic County. The pH levels increase below the confluence with Deep Run but return to decrease levels downstream. Nutrient levels are higher in upstream tributaries, and tend to decrease on the downstream main stem. Squankum Brook levels of phosphorous are extremely high.

### PROBLEM ASSESSMENT

Great Egg Harbor River receives point source pollution from the Berlin sewage treatment plant. The Squankum Brook and Deep Run tributaries have been significantly degraded by Monroe Township M.U.A. and Buena Boro treatment plant discharges, respectively. Major contributors of pollutants are non-point sources of agricultural and residential storm water runoff and septic system seepage from riverside development.

### GOAL ASSESSMENT AND RECOMMENDATIONS

Waters are suitable for fishing and meet swimmable criteria in some segments. The goal of fishable/swimmable waters by 1983 is feasible if adequate surface and ground water quality standards, basin planning, and areawide planning practices are utilized in future development to minimize non-point source contributions. Additionally, point source pollution by Berlin and Hamilton Township M.U.A. sewage treatment plants must be eliminated or reduced by upgrading to minimal 1977 best practicable technology standards.



LOCATION
Great Egg Harbor River
LEGEND
Point Source
Monitoring Site
Drainage Basin Boundaries
County Bounderies
Municipal Bounderies
BERLIN
Clementon
Pine Hill
Pine Valley
Berlin
Murrell Br.
Keys Br.
MONROE
Wilson Lake
Squankum Br.
Great Egg
Big Bridge Br.
Hospitality
Harbor
Nommonock L.
Whiteoak Br.
FRANKLIN
Folsom
Cedar L.
Branch
Newfield
Indian Br.
River
Deep Run
HAMILTON
BUENA VISTA
Grassy Pd.
Mar Run
Lake Lenape
Watering Race
Babcock Cr.
Cedar Br.
MAYS LANDING
South River
Gravelly Run
WEYMOUTH
Stephens
James Br.
Stephens Cr.
Stephens L.
Miry Run
Great Egg
Perch Cove Run
Matthews Run
EGG HARBOR
Gibson's Cr.
ESTELL MANOR
Patcong
Mill Cr.
SOMERS POINT
Middle River
Tuckahoe
OCEAN CITY
SUSSEX
PASSAIC
BERGEN
WARREN
MORRIS
ESSEX
HUDSON
UNION
HUNTERDON
SOMERSET
MIDDLESEX
MERCER
MONMOUTH
OCEAN
BURLINGTON
CAMDEN
GLOUCESTER
SALEM
ATLANTIC
CUMBERLAND
CAPE MAY


Figure VI.Q.1

Figure VI.Q.2

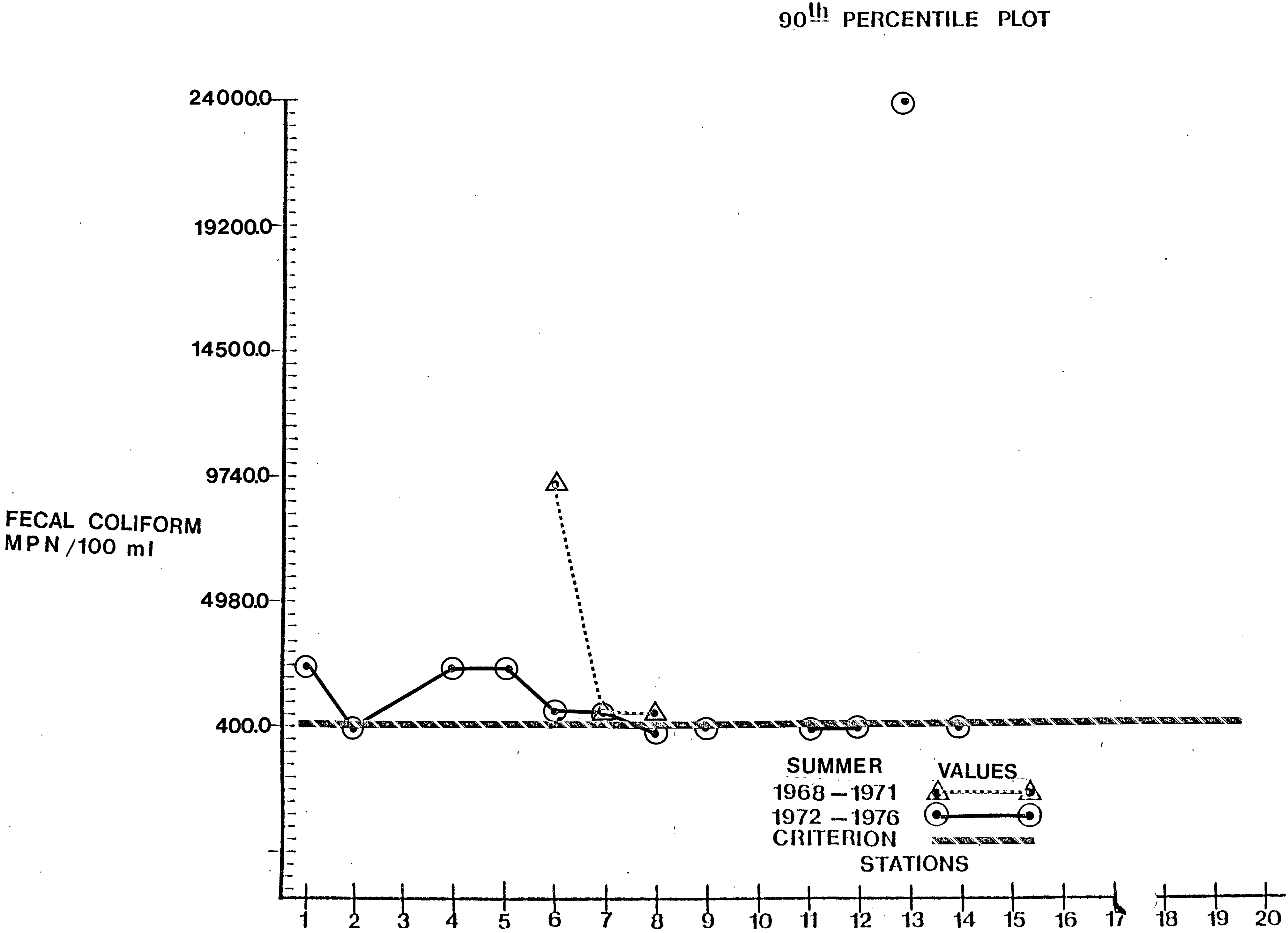
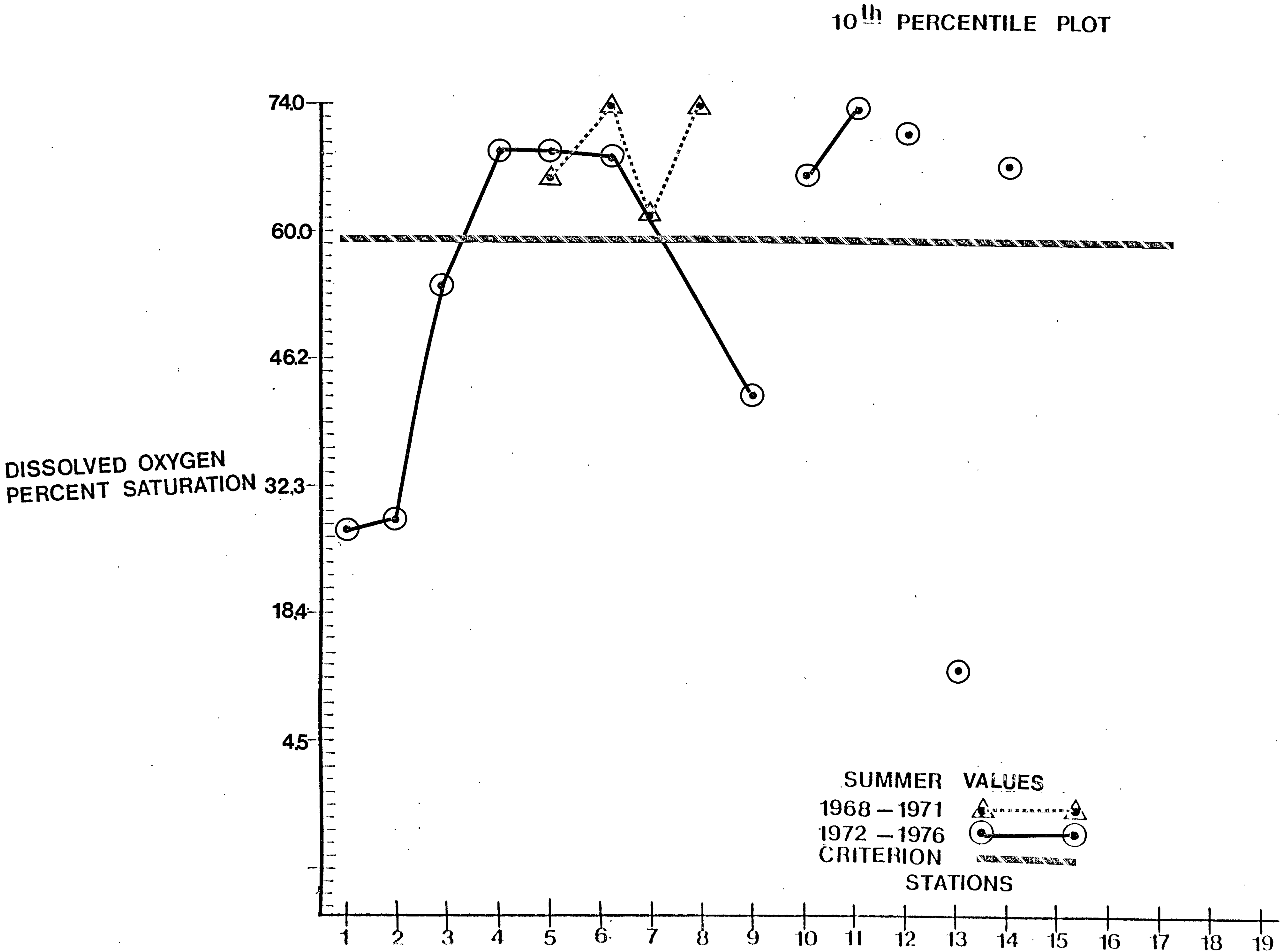
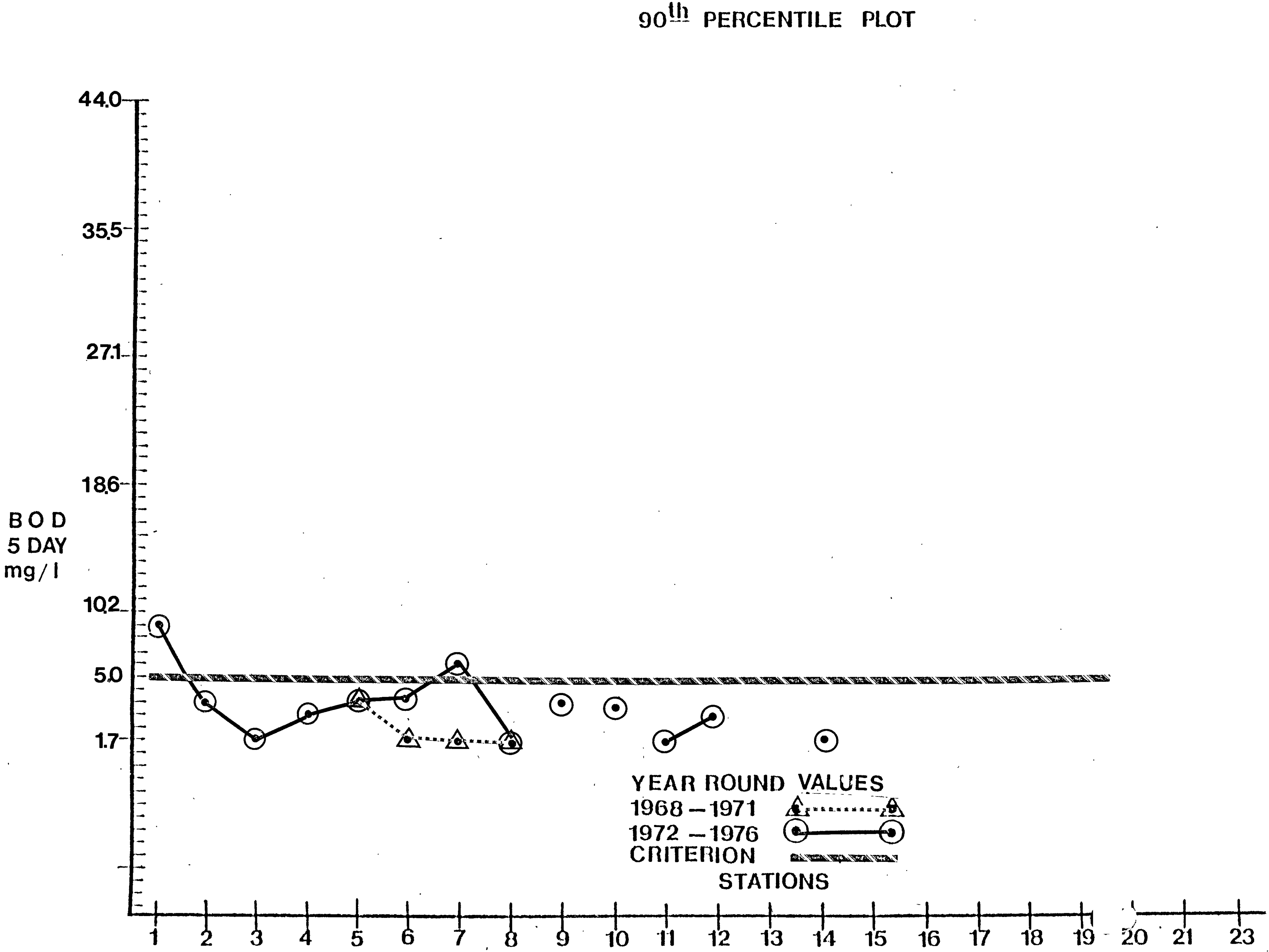

90th PERCENTILE PLOT
24000.0
19200.0
14500.0
9740.0
4980.0
400.0
FECAL COLIFORM
MPN/100 ml
SUMMER
VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Figure VI.Q.3



10th PERCENTILE PLOT
DISSOLVED OXYGEN PERCENT SATURATION
74.0
60.0
46.2
32.3
18.4
4.5
SUMMER VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19

Figure VI.Q.4



90th PERCENTILE PLOT
44.0
35.5
27.1
18.6
BOD
5 DAY
mg/l
10.2
5.0
1.7
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
23

Figure VI.Q.5

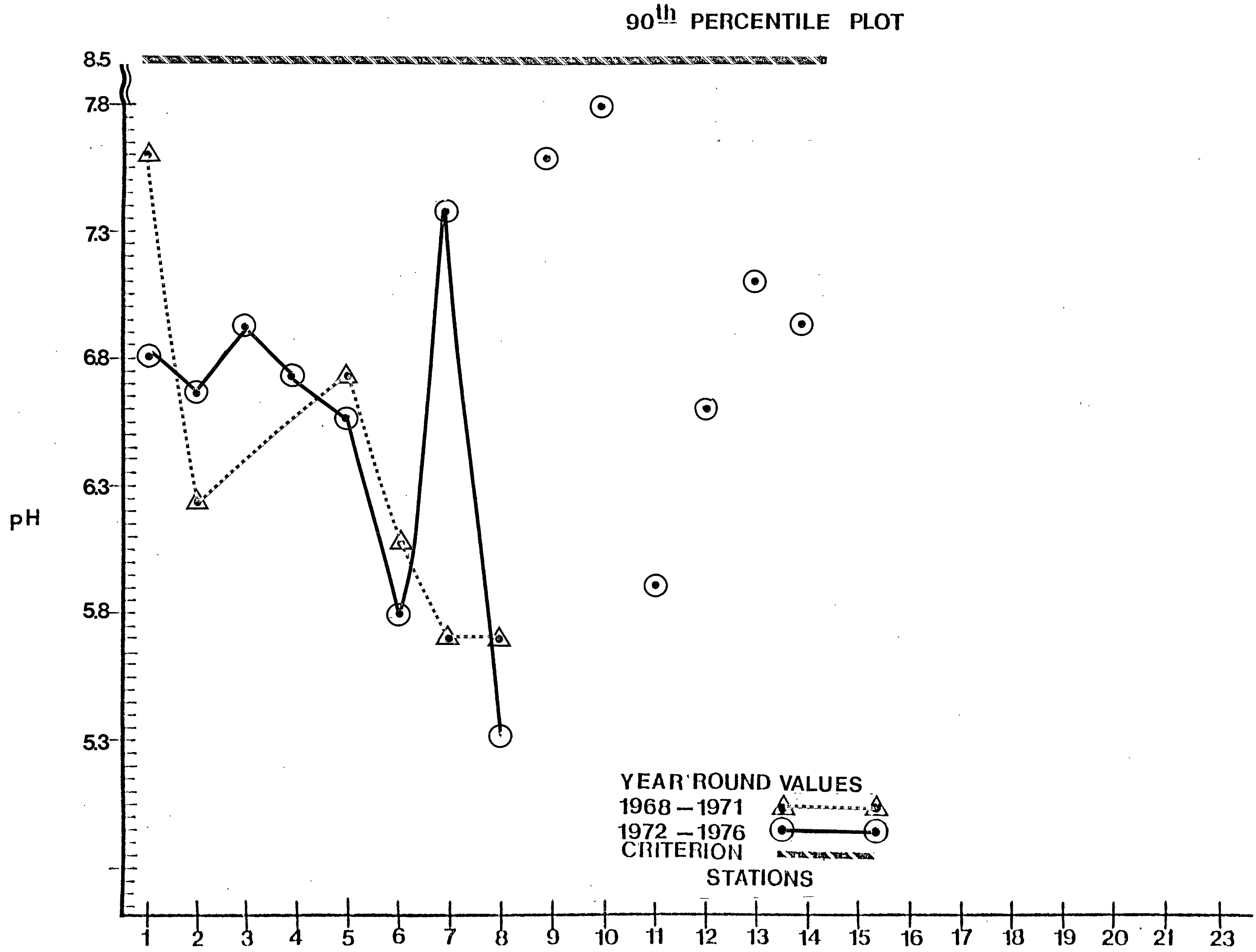

90th PERCENTILE PLOT
8.5
7.8
7.3
6.8
6.3
5.8
5.3
pH
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
23

Figure VI.Q.6

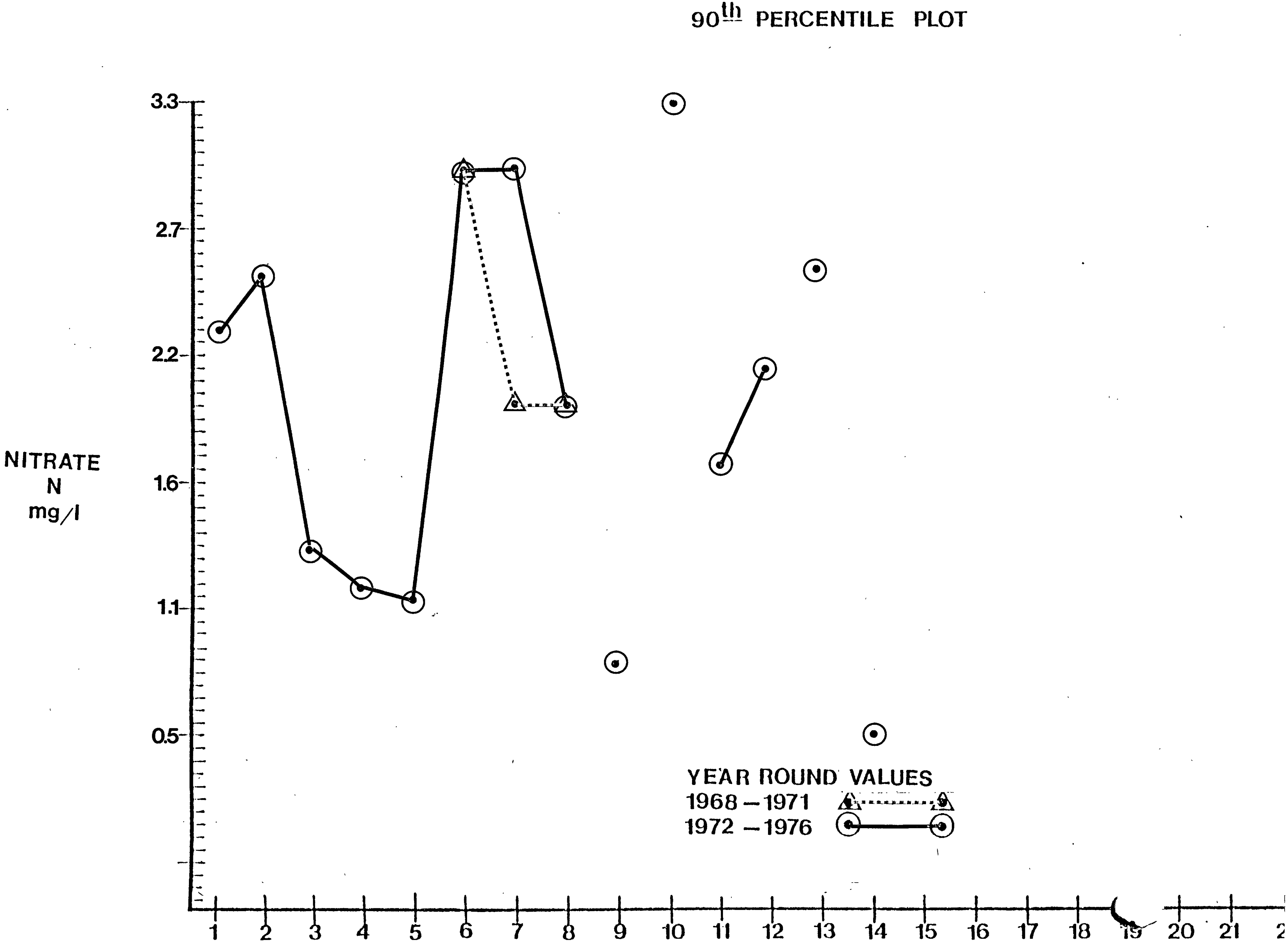

90th PERCENTILE PLOT
NITRATE
N
mg/l
3.3
2.7
2.2
1.6
1.1
0.5
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
YEAR ROUND VALUES
1968 – 1971
1972 – 1976

Figure VI.Q.7

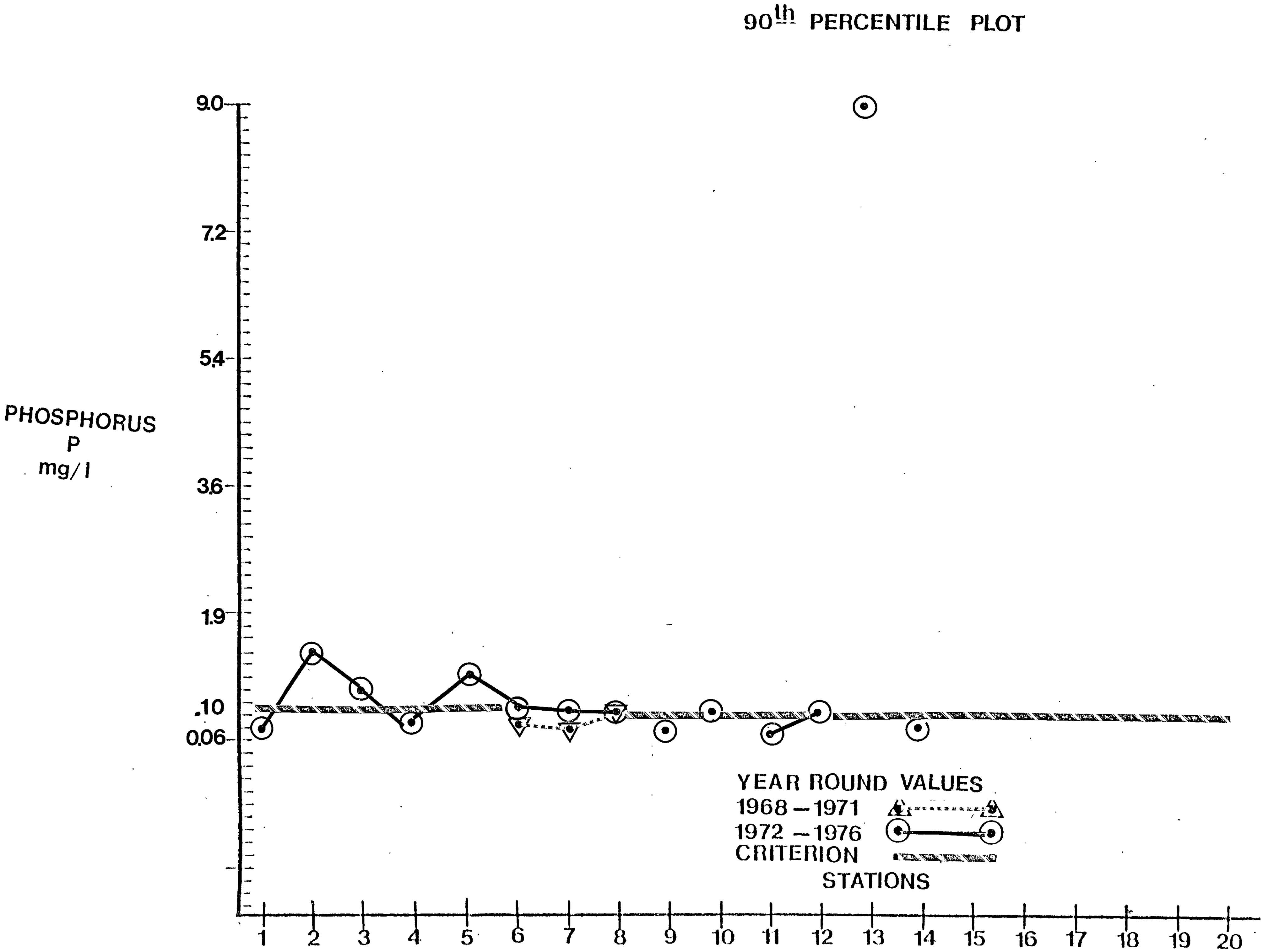

90th PERCENTILE PLOT
PHOSPHORUS
P
mg/l
9.0
7.2
5.4
3.6
1.9
.10
0.06
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Figure VI.Q.8

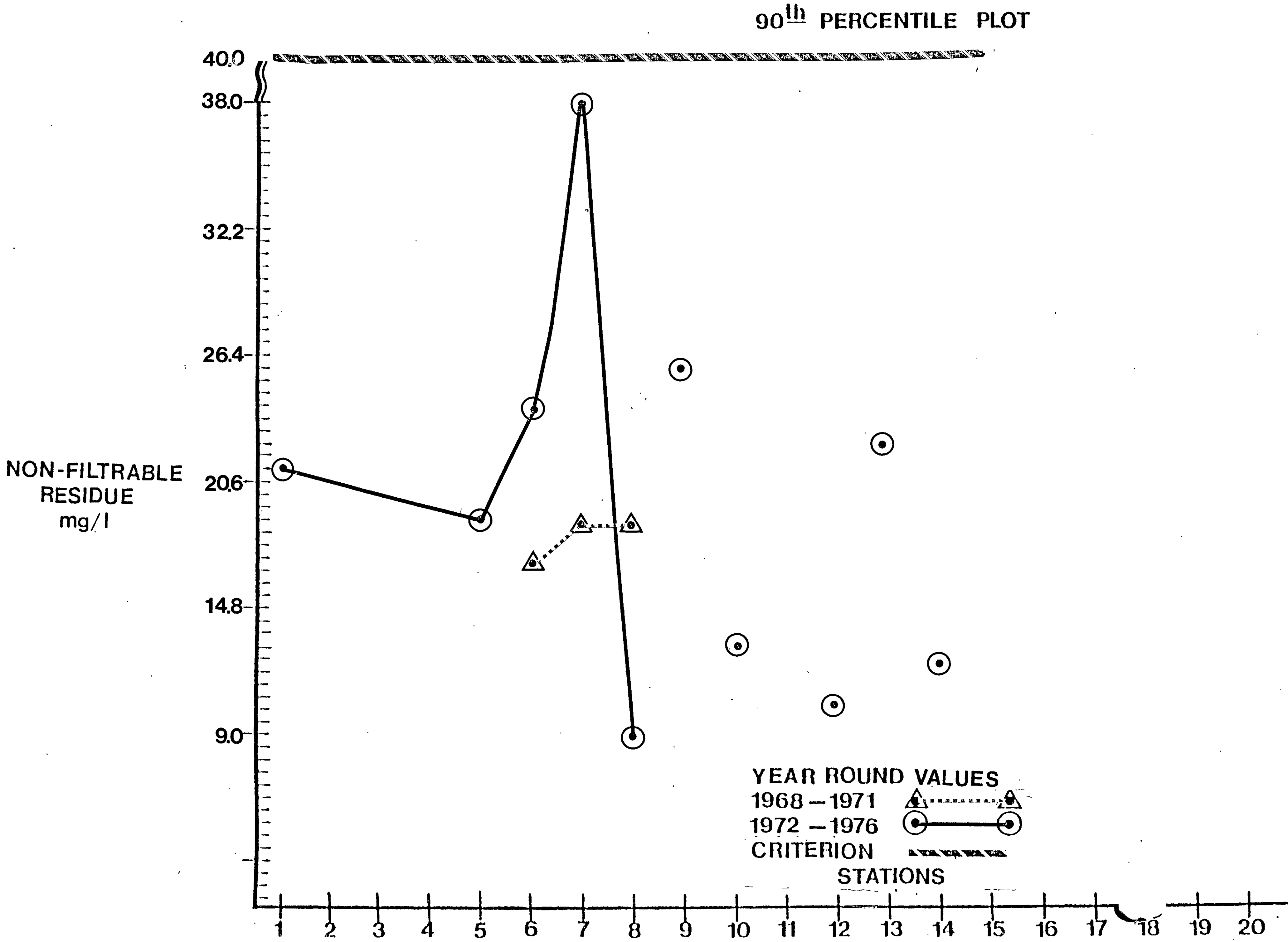

90th PERCENTILE PLOT
40.0
38.0
32.2
26.4
20.6
14.8
9.0
NON-FILTRABLE
RESIDUE
mg/l
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Figure VI.Q.9

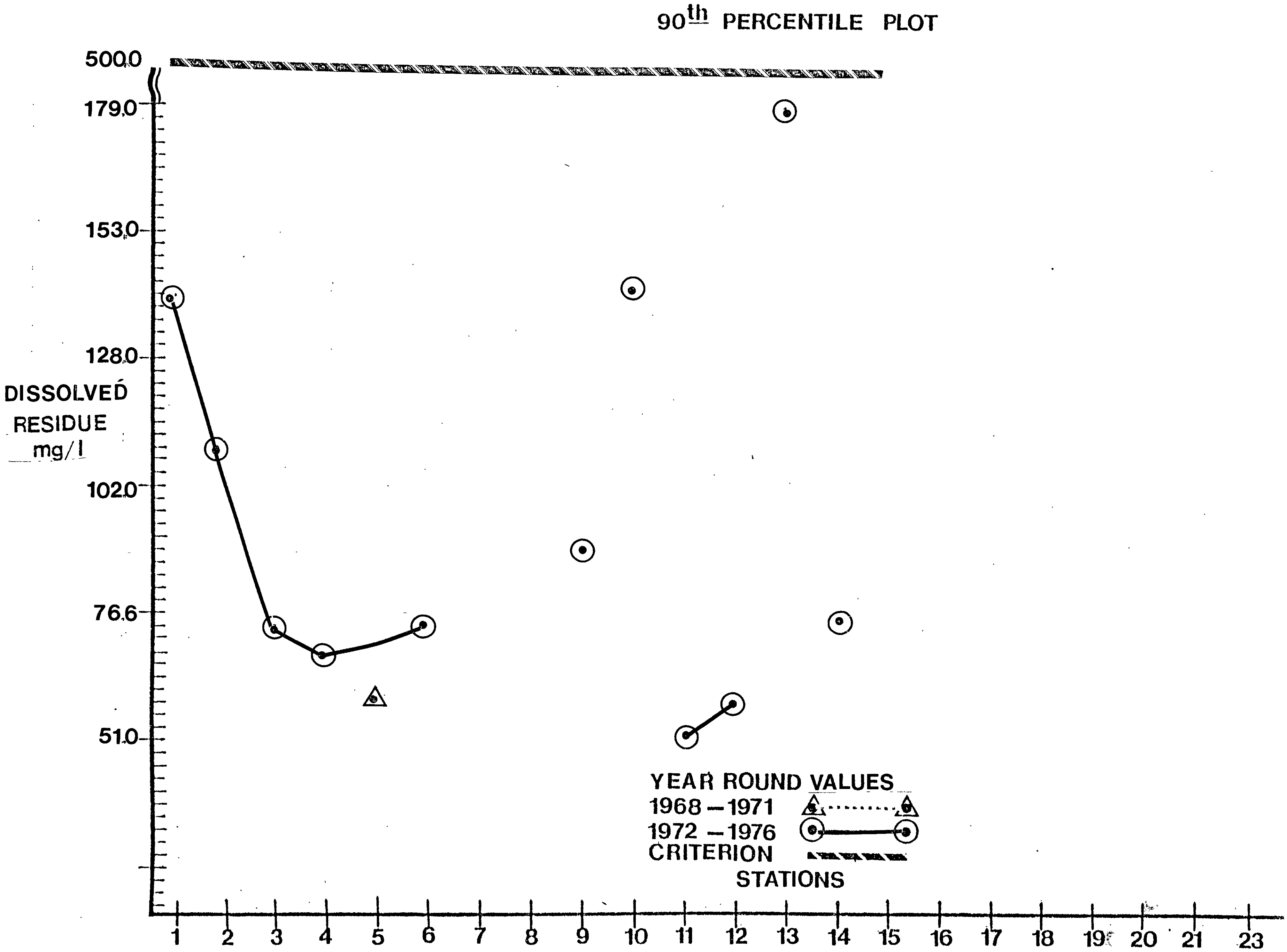
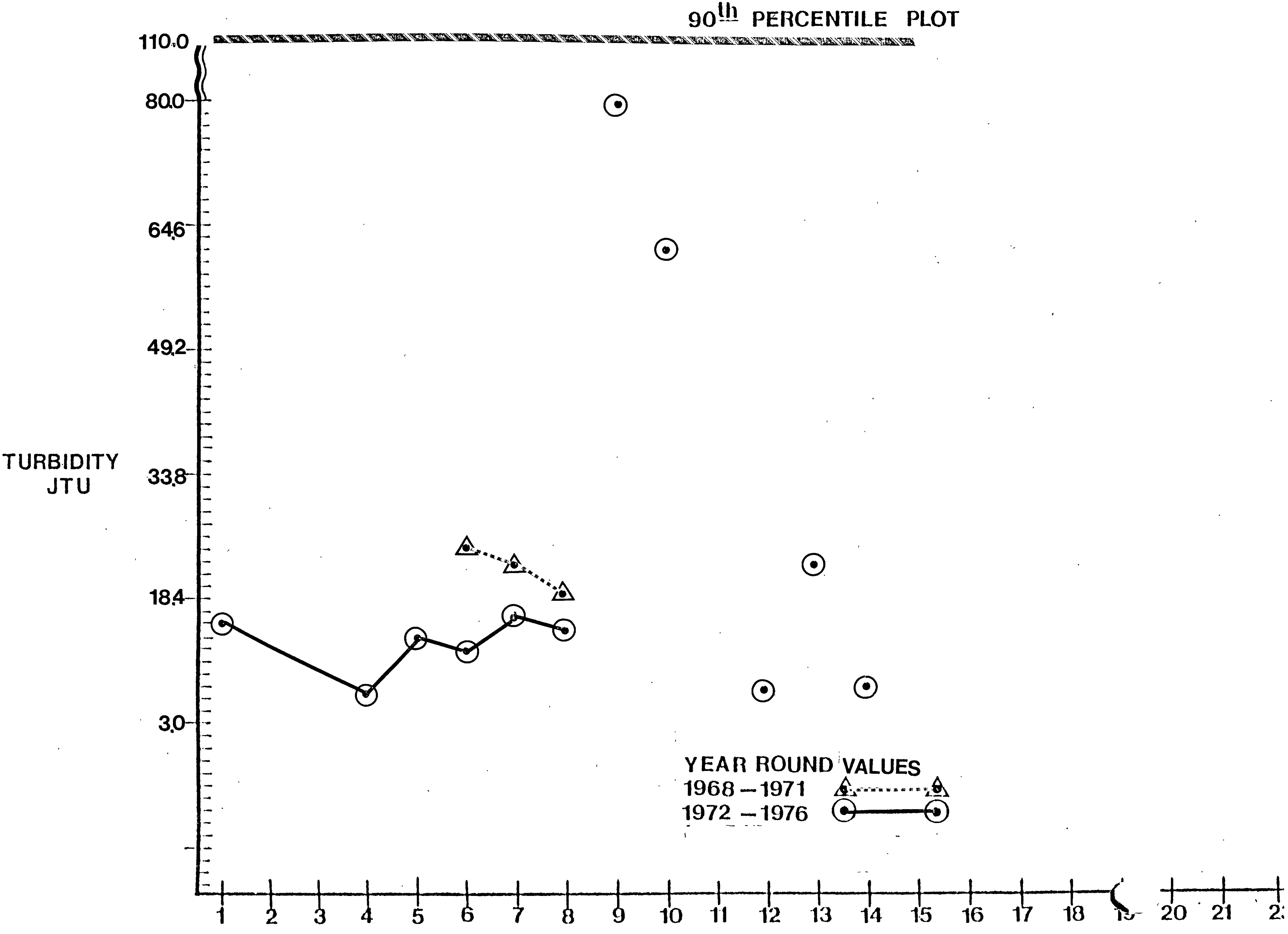

90th PERCENTILE PLOT
500.0
179.0
153.0
128.0
102.0
76.6
51.0
DISSOLVED RESIDUE mg/l
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
23

Figure VI.Q.10



## Table VI.Q.1 MUNICIPAL AND INSTITUTIONAL DISCHARGER INVENTORY

S. Atlantic Coastal Basin
Great Egg Harbor River Region Segment

| Map Number | Compliance with 1977 Secondary/ Best Practicable treatment Requirements | Discharger | Municipality | Receiving Stream | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Flow (mgd) 1975 Avg. | Flow (mgd) 1975 Max. | Average Daily Effluent Quality (1975) $BOD_5$ mg/l | $BOD_5$ #/Day | $NH_3$-N mg/l | $NH_3$-N #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Yes | Atlantic City Expressway-Hammonton | Hammonton | Makepeace Stream | Extended Aeration | .004 | .001 | | 21 | .02 | 18 | .15 | SS 54 mg/l |
| | Yes | Atlantic City Racing Assoc. | Hamilton | Babcock Creek | Primary | .33 | .02 | .025 | 15 | 2 | 2.4 | .40 | SS 6.7 mg/l |
| A | No | Berlin Dept. | Berlin | Egg Harbor River | Activ. Sludge | .6 | .72 | .75 | 57 | 342 | 16.2 | 97.2 | SS 52 mg/l |
| B | Yes | Buena Boro. MUA | Buena Boro. | Deep Run Brook | Contact Stabiliz. | .4 | .28 | .32 | 15 | 35 | 16.6 | 38.7 | SS 31 mg/l |
| C | No | Hamilton Twp. MUA | Hamilton | Bobcock Stream | High Rate Trickling Filter | .625 | .47 | .53 | 40 | 157 | 17.3 | 67.8 | SS 48 mg/l |
| D | Yes | N.A.F.E.C. | Egg Harbor Twp. | Gravelly Run | Standard Rate Trickling Filter | .22 | .22 | .265 | 17 | 31 | 5.3 | 9.72 | SS 23 mg/l |

Table VI.Q.1 INDUSTRIAL DISCHARGERS
(cont'd)
S. Atlantic Coastal Basin
Great Egg Harbor River Region Segment

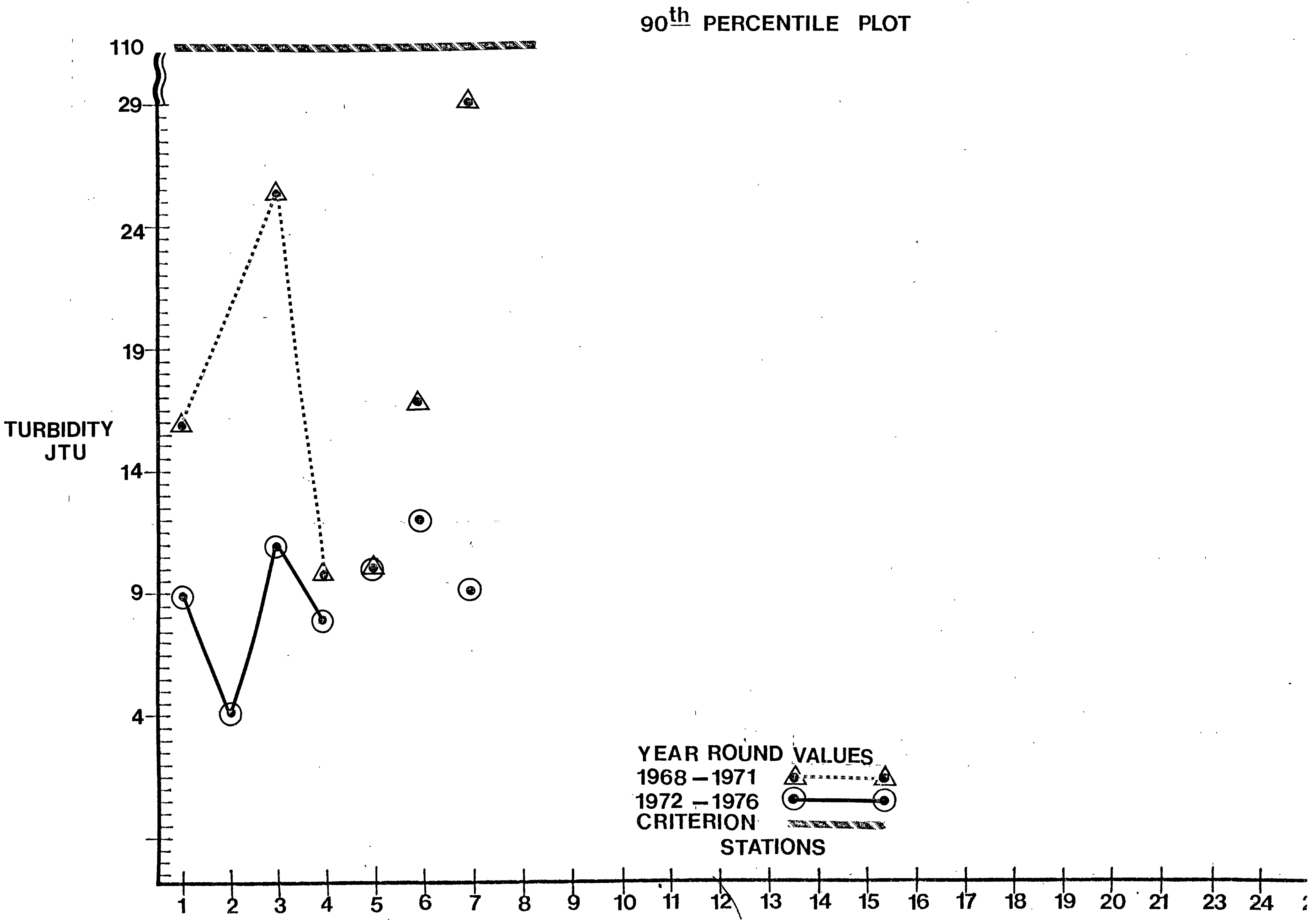
| Map Number | Compliance with 1977 Secondary/ Best Practicable Treatment Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Avg. | Max. | Average Daily Effluent Quality (1975) $BOD_5$ mg/l | #/Day | $NH_3$-N mg/l | #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | B.L. England Generating Station - Unit 3 (Discharge 012) | Upper Twp. | Great Egg Harbor Bay | | Industrial | | | | | | | | |
| | | Discharge 013 | Upper Twp. | Great Egg Harbor Bay | | Industrial | | | | | | | | |
| | Yes | Lenox China, Inc. | Galloway | Babcock Creek | | Intermittent Sand Filter | .035 | .022 | .029 | 12 | 2.2 | 11 | 2 | SS 16 mg/l |
| | | Scott Paper Co. | Buena Boro | Deep Run Trib. | | | | .01 | | | | | | |

## Table VI.Q.5 INDUSTRIAL DISCHARGERS

S. Atlantic Coastal Basin
Great Egg Harbor River Region Segment

| Map Number | Compliance with 1977 Secondary/Best Practicable Treatment Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Avg. | Max. | Average Daily Effluent Quality (1975) $BOD_5$ mg/l | #/Day | $NH_3$-N mg/l | #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | B.L. England Generating Station - Unit 1 and 2 (Discharge 001) | Upper Twp. | Great Egg Harbor Bay | | Industrial | | | | | | | | |
| | | Discharge 002 | | | | Industrial | | | | | | | | |
| | | Discharge 003 | | | | Industrial | | | | | | | | |
| | | Discharge 006 | | | | Industrial | | | | | | | | |
| | | Discharge 007 | | | | Industrial | | | | | | | | |
| | | Discharge 008 | | | | Industrial | | | | | | | | |
| | | Discharge 009 | | | | Cooling Water | | | | | | | | |
| | | Discharge 010 | | | | Cooling Water | | | | | | | | |
| | | Discharge 011 | | | | Industrial | | | | | | | | |

Figure VI.R.9


90th PERCENTILE PLOT
110
29
24
19
14
9
4
TURBIDITY
JTU
YEAR ROUND VALUES
1968 — 1971
1972 — 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
23
24

## Table VI.R.1 MUNICIPAL AND INSTITUTIONAL DISCHARGER INVENTORY

N. Atlantic Coastal Basin

Toms River Segment

| Map Number | Compliance with 1977 Secondary/ Best Practicable Treatment Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Flow (mgd) 1975 Avg. | Flow (mgd) 1975 Max. | Average Daily Effluent Quality $BOD_5$ mg/l | Average Daily Effluent Quality $BOD_5$ #/Day | Average Daily Effluent Quality $NH_3$-N mg/l | Average Daily Effluent Quality $NH_3$-N #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | (yr.avg) | (Seas.) | | | | | |
| | No | Island Heights Boro | Island Hts. | Dillons Creek | 0055896 | Trickling Filter | 0.40 | 0.19 | 0.2 | 39 | 63 | 9 | 14.4 | SS 29 mg/l |
| A | No | Maxim Sewerage Corp. | Howell | Haystack Bk. | 0020311 | Contact Stabilization | .45 | .37 | .46 | 70 | 213 | 32 | 97 | SS 77 mg/l |
| B | No | Lavalette Boro | Lavalette | Atlantic Ocean | 0026924 | Primary | 0.87 | 0.62 | 1.02 | 77 | 400 | 13 | 67 | SS 60 mg/l |
| | No | Harmony Sewer Co. | Jackson | S. Branch Metedeconk River | 00205803 | Contact Stabilization | 0.14 | 0.07 | 0.08 | 40 | 29 | 23 | 13 | SS 39 mg/l |
| | Yes | Marc Village | Howell | Ground Hog Brook | 0026646 | Intermittant sand filter polishing lagoon | .05 | 0 | 0 | | | | | |
| C | No | Jackson Twp. MUA Brookwood #1 | Jacksor | S. Branch Metedeconk River | 0024058 | Contact Stabilization | 0.20 | .20 | .[illegible] | 44 | 75 | 24 | 40.8 | SS 51 mg/l |
| D | No | Jackson Twp. MUA Brookwood #2 | Jacksor | S. Branch Metedeconk River | 0024066 | Contact Stabilization | 0.5 | .25 | .27 | 22 | 46 | 12 | 24.9 | SS 37 mg/l |

Note: An asterisk (*) denotes that this is not an average value for the year, but the value for the month with maximum monthly flow.

Table VI.R.1 (cont'd) MUNICIPAL AND INSTITUTIONAL DISCHARGER INVENTORY

N. Atlantic Coastal Basin

Toms River Segment

| Map Number | Compliance with 1977 Secondary/ Best Practicable Treatment Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Flow (mgd) 1975 Avg. | Flow (mgd) 1975 Max. | Average Daily Effluent Quality (1975) $BOD_5$ mg/l | $BOD_5$ #/Day | $NH_3$-N mg/l | $NH_3$-N #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E | No | Jackson Twp. MUA Brook-wood #3 | Jackson | N. Branch Metedeconk River off Brewers Lane | 0024074 | Contact Stabiliza-tion | 0.3 | .23 | .26 | 48 | 91 | 26.2 | 49.9 | SS 72 mg/l |
| | Yes | Cricket Restaurant | Howell | N. Branch Metedeconk | 0023167 | Secondary | .006 | .003 | .003 | 10 | .23 | 2 | .05 | SS 15.6 mg/l |
| F | | Berkeley Twp. S.A. (Berkeley Shores) | Berkeley | Trib. of Barnegat Bay | 0022942 | Secondary | .50 | .46* | | | 111.9* | .16* | 61* | |
| | Yes | Brick Plaza Inc. | Brick | Cedar Bridge Creek | 0021067 | Secondary | .05 | | | 3.36* | | .3* | | |

Table VI.R.1 (cont'd) MUNICIPAL AND INSTITUTIONAL DISCHARGER INVENTORY

N. Atlantic Coastal Basin

Toms River Segment

| Compliance with 1977 Secondary/ Best Practicable Treatment er Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Avg. | Max. | Average Daily Effluent Quality (1975) $BOD_5$ mg/l | #/Day | $NH_3$-N mg/l | #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No | Jackson Twp. MUA Brook-wood #3 | Jackson | N. Branch Metedeconk River off Brewers Lane | 0024074 | Contact Stabiliza-tion | 0.3 | .23 | .26 | 48 | 91 | 26.2 | 49.9 | SS 72 mg/l |
| Yes | Cricket Restaurant | Howell | N. Branch Metedeconk | 0023167 | Secondary | .006 | .003 | .003 | 10 | .23 | 2 | .05 | SS 15.6 mg/l |
| | Berkeley Twp. S.A. (Berkeley Shores) | Berkeley | Trib. of Barnegat Bgy | 0022942 | Secondary | .50 | .46* | | | 111.9* | 16* | 61* | |
| Yes | Brick Plaza Inc. | Brick | Cedar Bridge Creek | 0021067 | Secondary | .05 | | | 3.36* | | .3* | | |

Table VI.R.1 MUNICIPAL AND INSTITUTIONAL DISCHARGER INVENTORY

(cont'd) Atlantic Coastal Basin

Toms River Segment

| Map Number | Compliance with 1977 Secondary/ Best Practicable Treatment Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Avg. | Max. | Average Daily Effluent Quality (1975) $BOD_5$ mg/l | $BOD_5$ #/Day | $NH_3$-N mg/l | $NH_3$-N #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| G | | Dover Twp. S.A. | Dover | Atlantic Ocean | 0024775 | Primary Upgrading to Secondary | 12.0 | | | | | | | |
| | | Marc Village | Howell | Ground Hog Brook | 0026643 | Advanced-biological | .05 | | | | | | | |
| | | Winding Brook Mobile Home Park | Howell | | 0026956 | | | | | | | | | |
| | | Borough of Lakehurst | Lakehurst | Manapaqua Brook | 0027952 | Advanced | .30 | | | | | | | |
| H | | Borough of Seaside Hts. | Seaside Heights | Atlantic Ocean | 0023370 | Primary | 2.20 | 1.[illegible] | | | 111.8* | 6* | 97* | |

Note: An asterisk (*) denotes that this is not an average value of the year, but the value for the month with maximum monthly flow.

Table VI.R.1 (cont'd) MUNICIPAL AND INSTITUTIONAL DISCHARGER INVENTORY

N. Atlantic Coastal Basin

Toms River Segment

| Map Number | Compliance with 1977 Secondary/ Best Practicable Treatment Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Avg. | Max. | Average Daily Effluent Quality (1975) $BOD_5$ mg/l | $BOD_5$ #/Day | $NH_3$-N mg/l | $NH_3$-N #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E | No | Jackson Twp. MUA Brook-wood #3 | Jackson | N. Branch Metedeconk River off Brewers Lane | 0024074 | Contact Stabiliza-tion | 0.3 | .23 | .26 | 48 | 91 | 26.2 | 49.9 | SS 72 mg/l |
| | Yes | Cricket Restaurant | Howell | N. Branch Metedeconk | 0023167 | Secondary | .006 | .003 | .003 | 10 | .23 | 2 | .05 | SS 15.6 mg/l |
| F | | Berkeley Twp. S.A. (Berkeley Shores) | Berkeley | Trib. of Barnegat Bay | 0022942 | Secondary | .50 | .46* | | | 111.9* | .16* | 61* | |
| | Yes | Brick Plaza Inc. | Brick | Cedar Bridge Creek | 0021067 | Secondary | .05 | | | 3.36* | | .3* | | |

Table VI.R.1 (cont'd) MUNICIPAL AND INSTITUTIONAL DISCHARGE

N. Atlantic Coastal Basin
Toms River Segment

| Map Number | Compliance with 1977 Secondary/ Best Practicable Treatment Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Avg. | Max. | Average Daily Effluent Quality (1975) $BOD_5$ mg/l | #/Day | $NH_3$-N mg/l | #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Toms River Water Co.- Holly | Dover | | 0025649 | | | | | | | | | |
| | | Toms River Water Co- Brooks | Dover | | 0025659 | | | | | | | | | |
| | | Atlantic Water Care Service | Dover | | 0025151 | | | | | | | | | |
| I | | Lakehurst Naval Air Station | Manchester | Manapaqua Brook | | | | .27 | | | 101 | | | |
| J | No | Borough of Seaside P~rk | Seaside Park | Atlantic Ocean | | Primary | .95 | 1.11* | | | | | | |
| K | | Ocean County S.A. | Brick | Atlantic Ocean | 0028142 | Secondary | 28.0 | | Plant not yet in operation | | | | | |
| | | First Jersey National Bank | Brick | | 0022896 | | | | | | | | | |
| L | No | Borough of Island Hts. | Island Hts. | Dillons Creek | 0027791 | Secondary | .40 | | | | | | | |
| | Yes | Ocean Twp. M'A | Ocean Twp. | | | | .085 | | | | | | | |

Table VI.R.1 INDUSTRIAL DISCHARGER

(cont'd) N. Atlantic Coastal Basin

Toms River Segment

| Map Number | Compliance with 1977 Secondary/ Best Practicable Treatment Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Avg. | Max. | Average Daily Effluent Quality (1975) $BOD_5$ mg/l | $BOD_5$ #/Day | $NH_3$-N mg/l | $NH_3$-N #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Lakehurst Naval Air Station | Manchester | | | | | | | | | | | |
| | | Lakehurst Naval Air Station | Manchester | | | | | | | | | | | |
| | | Lakehurst Naval Air Station | Manchester | | | | | | | | | | | |
| | | Lakehurst Naval Air Station | Manchester | | | | | | | | | | | |
| | | Lakehurst Naval Air Station | Manchester | | | | | | | | | | | |
| | | Lakehurst Naval Air Station | Manchester | | | | | | | | | | | |
| | | Lakehurst Naval Air Station | Manchester | | | | | | | | | | | |
| | | Lakehurst Naval Air Station | Manchester | Manapaqua Brook | | | .27 | | | | 101 | | | |
| | | Toms River Chem Co. | Dover | Toms River, Atl. Ocean | | Secondary (batch) | | | | | | | | |

Table VI.R.1 (cont'd) MUNICIPAL AND INSTITUTIONAL DISCHARGER INVENTORY

N. Atlantic Coastal Basin

Toms River Segment

| Map Number | Compliance with 1977 Secondary/ Best Practicable Treatment Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Avg. | Max. | Average Daily Effluent Quality (1975) $BOD_5$ mg/l | $BOD_5$ #/Day | $NH_3$-N mg/l | $NH_3$-N #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M | | Berkeley Twp. S.A. | Berkeley | Atlantic Ocean | 0022951 | Secondary | .50 | .30 | | | 88.3* | 8.3* | 69.4* | |
| | | Borough of Seaside Park | Seaside Park | Atlantic Ocean | 0027316 | Primary | .95 | 1.11* | | | | | | |
| | | Berkeley Twp. S.A. | Berkeley | Clamming Creek | 0022969 | Secondary | .25 | .09 * | | | 10.8* | | | |

Note: An asterisk (*) denotes that this is not an average value for the year, but the value for the month with maximum monthly flow.

Table VI.R.1 INDUSTRIAL DISCHARGER
(cont'd)
N. Atlantic Coastal Basin
Toms River Segment

| Map Number | Compliance with 1977 Secondary/ Best Practicable Treatment Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Avg. | Max. | Average Daily Effluent Quality (1975) $BOD_5$ mg/l | $BOD_5$ #/Day | $NH_3$-N mg/l | $NH_3$-N #/day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | N.Y. and Long Branch Rail-road | Bay Head | | 0022373 | Oil Separater | | | | | | | | |
| | | Borden Inc. Snow Food Products | Pt. Pleasant Beach | Wills Hole Thorough-fare | 0004979 | | | | | | | | | |
| | | Asarco Manchester Unit | Manchester | Green Branch of Wrangle Brook | 0020681 | Settling Ponds | | | | | | | | |
| | | SCM Corp. Jackson Mine | Jackson | | 0025169 | Settling Ponds | | | | | | | | |
| | | EXXON Corp | Lakewood | | 0026107 | | | | | | | | | |
| | | Toms River Chem Co. | Dover | Toms River, Atl. Ocean | 0024120 | Secondary (batch) | | | | | | | | |

# MANASQUAN RIVER AND SHARK RIVER

## BASIN DESCRIPTION

The Manasquan River and Shark River originate in Monmouth County and flow eastward to enter the Atlantic Ocean through inlets located 26 and 20 miles south of Sandy Hook. The Manasquan River is connected in its lower tidal reach to northern Barnegat Bay through the Point Pleasant Canal. Both rivers support intensive boating and fishing in the downstream tidal areas. The Manasquan Inlet has developed into one of the major sportfishing and commercial clamming and fishing centers on the eastern seaboard. The two rivers flow downstream through agricultural, residential, public lands and light industrial development to the densely populated areas of the Jersey Shore.

## WATER QUALITY ASSESSMENT

Overall water quality on both rivers is good, with Shark River Watershed utilized as a potable water source through the Jumping Brook and Glendola reservoirs. The Manasquan River is classified as trout maintenance water in its fresh water areas. However, existing data for two stations indicate excessive fecal coliform bacteria levels in both rivers. Tidal portions of both rivers are closed to the harvest of oysters, clams or mussels. Dissolved oxygen levels are low in these slow flowing drainage basins, and are depressed by the excessive biochemical oxygen demand exerted from antiquated, overloaded sewage treatment plants and a large landfill. Pollutant levels decrease as dilution increases with down-stream flow. Phosphorous levels exceed the criterion at Squankum on the Manasquan. Nitrate levels are highest in those low flow tributaries subject to agricultural runoff and treatment plant discharges on the upper Manasquan. The Marsh Bog Creek tributary to the Manasquan originates in an acidic bog environment, resulting in pH levels remaining low downstream to the confluence with the Manasquan.

## PROBLEM ASSESSMENT

The Manasquan and Shark Rivers are subject to non-point source degradation from agricultural runoff, landfill leachate, septic tank seepage, and storm water runoff in densely populated developed areas. Excessive biochemical oxygen demand levels are attributed to waste loading from inadequate and overloaded industrial, private, and municipal waste treatment plants. Dubois Creek is a prime example of a low flow stream polluted by an overloaded municipal sewage treatment plant (Freehold Boro) which receives industrial wastes.

## GOAL ASSESSMENT AND RECOMMENDATIONS

Fishable quality waters currently exist on the Manasquan and Shark Rivers, with some segments classified as trout maintenance waters. Shark River drainage currently feeds two potable water reservoirs, and an additional reservoir is planned on the Manasquan. Excessive fecal coliform levels preclude swimming in all areas of both rivers except in extreme downstream tidal areas adjacent to the Atlantic Ocean. Achievement of swimmable goals by 1983 will be extremely difficult due to the non-point sources of the coliform bacteria. Efforts should be directed toward expanded monitoring efforts to improve the data base on water quality in these rivers. More intensive surveys, enforcement activities, and planning activities must be directed toward preserving or improving the quality of tributary streams in western and northwestern areas of the county as development expands into these regions. The densely populated areas of these drainage basins contain several eutrophic, under-utilized lakes which could be greatly enhanced for fishing, swimming, and boating by lake restoration projects. Efforts should be directed toward obtaining federal funding for restoration of Lake Como, Deal Lake, Wreck Pond, and others.

## STATIONS
## MANASQUAN RIVER

1. Manasquan River at Elton
2. Manasquan River near Georgia
3. Manasquan River at Wyckoff Mills
4. Manasquan River at Fairfield
5. Manasquan River at Farmingdale
6. Manasquan River at Squankum
7. Manasquan River at Allenwood
8. Manasquan River Tributary near Adelphia

9. Mingamahone Brook near Earle
10. Mingamahone Brook at Asbury
11. Mingamahone Brook at Birdsall
12. Mingamahone Brook at Squankum

13. Marsh Bog Brook near Shacks Corner
14. Marsh Bog Brook at Farmingdale
15. Marsh Bog Brook at Squankum

16. Debois Creek near Freehold
17. Debois Creek at Adelphia
18. Debois Creek at Wyckoff Mills

19. Shark River near Neptune City

20. Jumping Brook near Neptune City

Figure VI.S.1

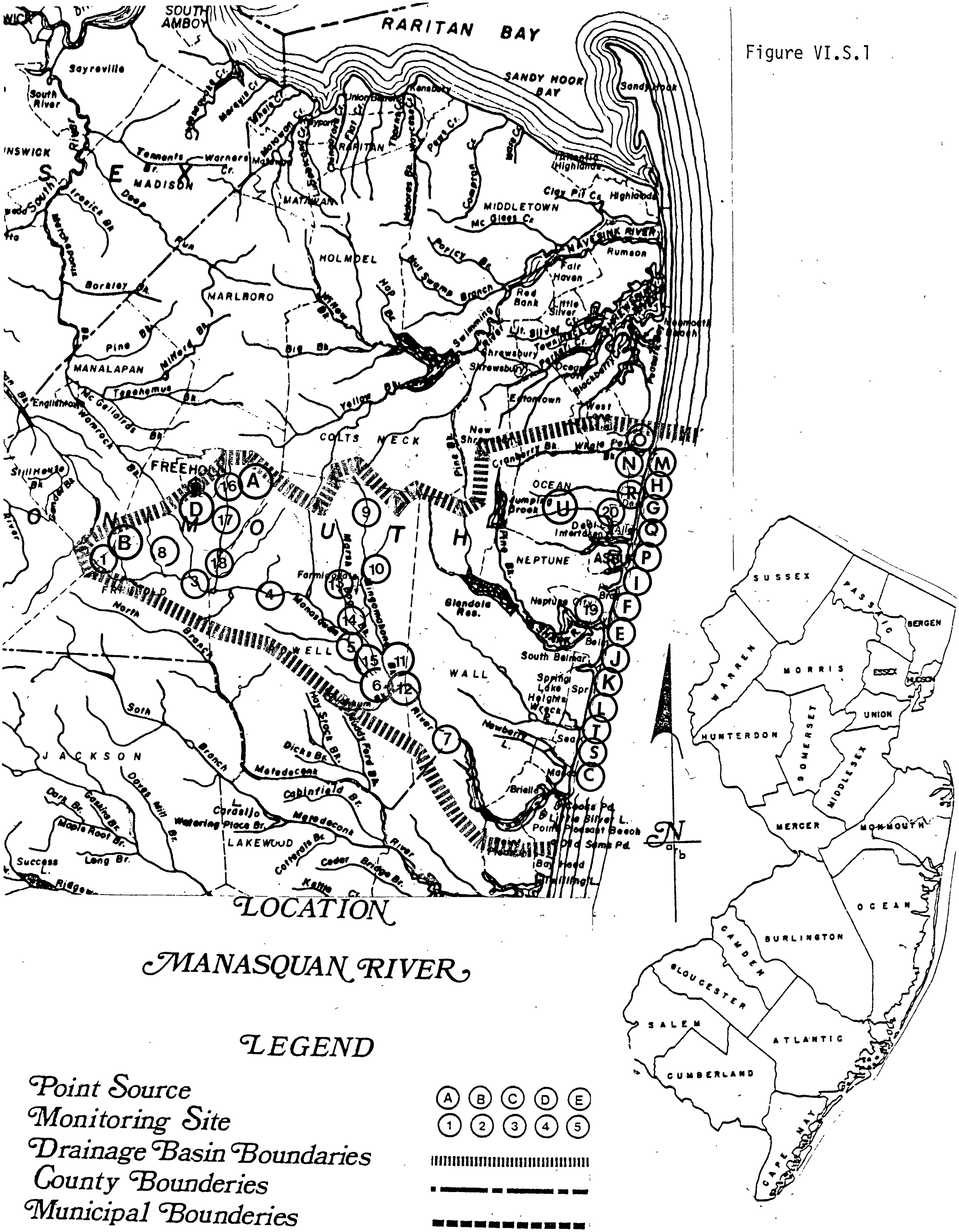
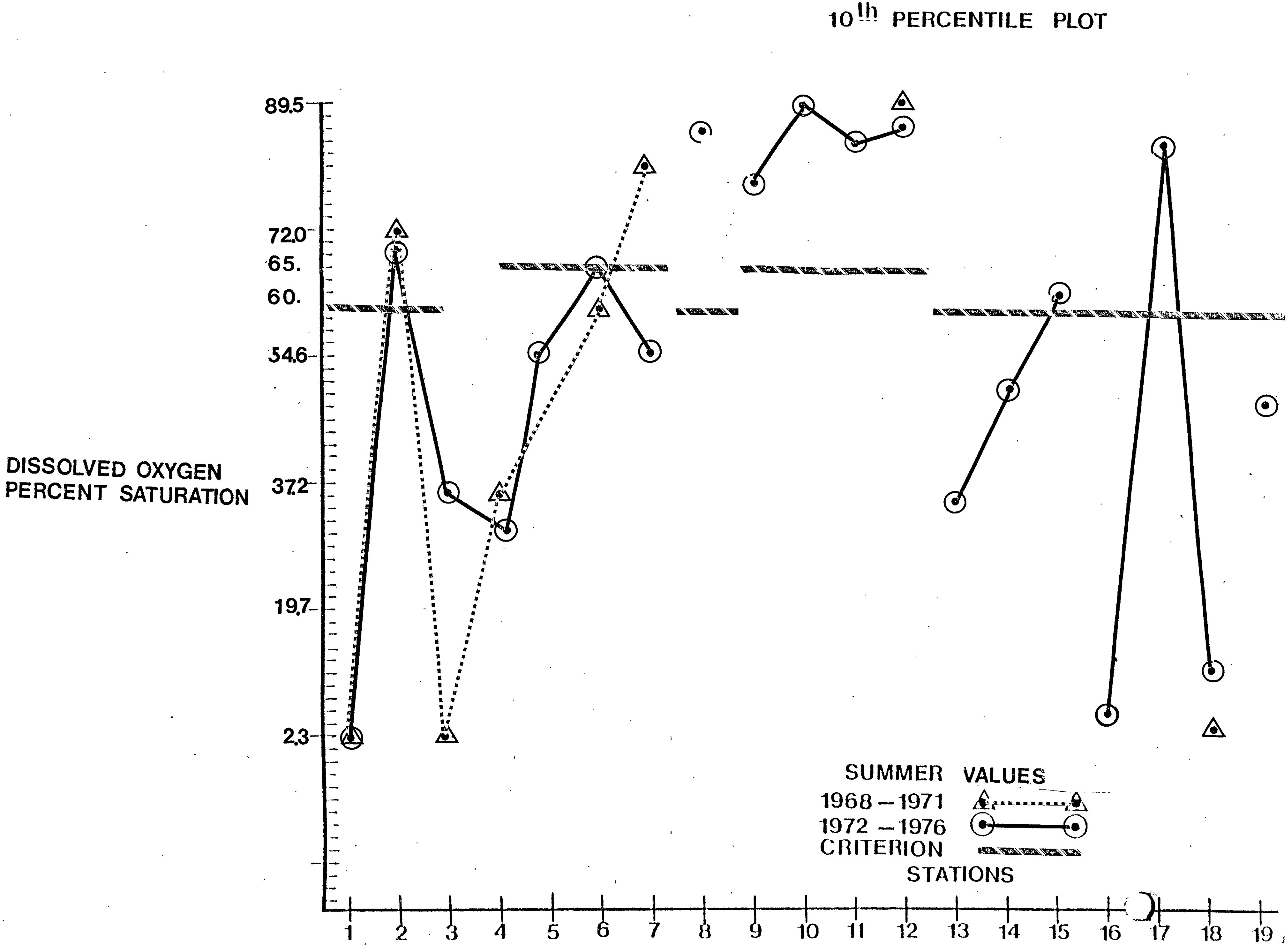
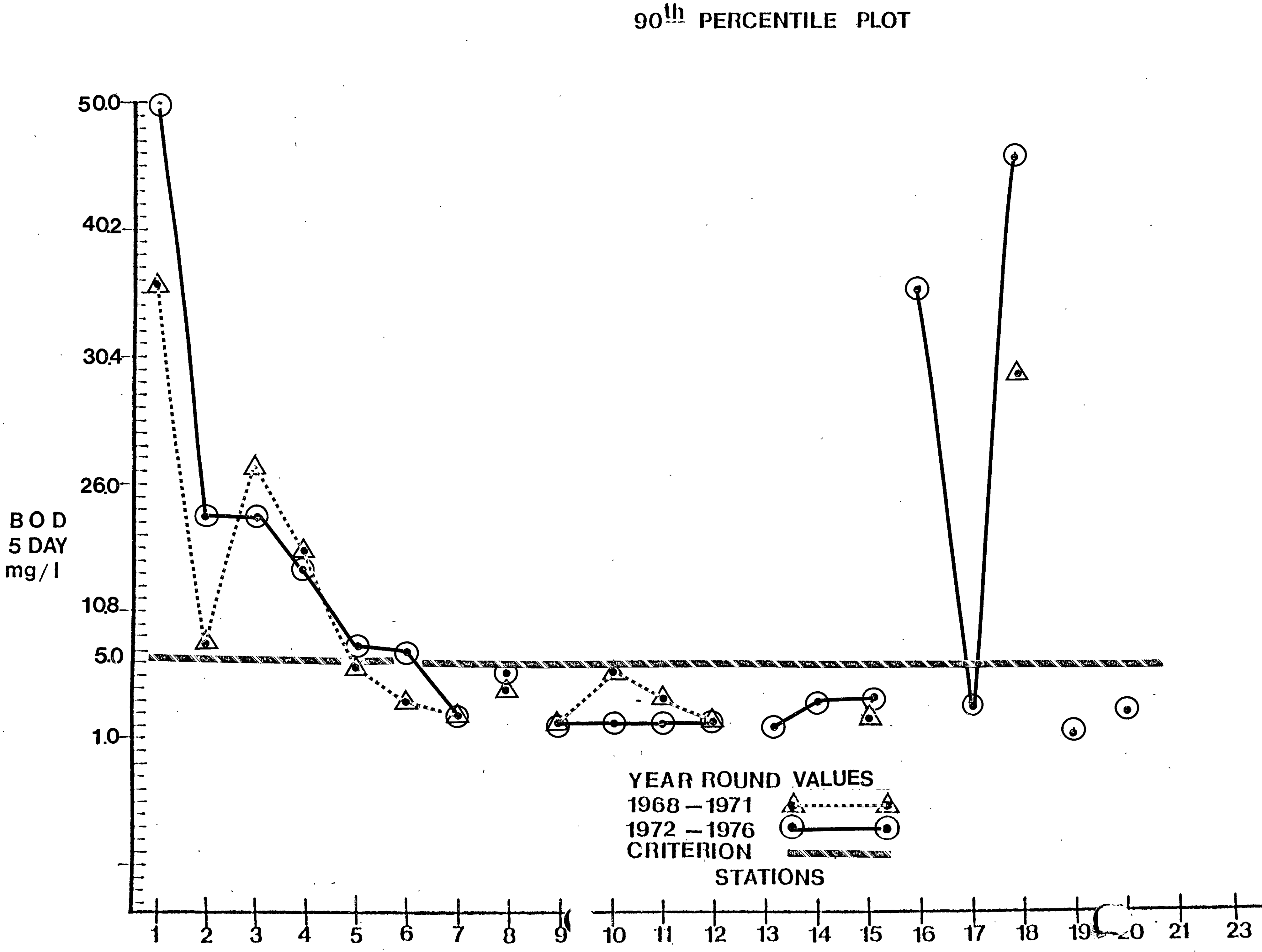

RARITAN BAY
SANDY HOOK BAY
Sandy Hook
SOUTH AMBOY
Sayreville
MADISON
MATAWAN
HOLMDEL
MIDDLETOWN
MARLBORO
MANALAPAN
FREEHOLD
COLTS NECK
OCEAN
NEPTUNE
WALL
JACKSON
LAKEWOOD
Red Bank
Rumson
Fair Haven
Shrewsbury
Eatontown
Highlands
Neptune City
South Belmar
Spring Lake Heights
Brielle
Point Pleasant Beach
Bay Head
Glendola Res.
Farmingdale
Manasquan
Navesink River
Shrewsbury River
Swimming River
Yellow Bk.
Big Bk.
Pine Bk.
Metedeconk
River
SUSSEX
PASSAIC
BERGEN
WARREN
MORRIS
ESSEX
HUDSON
UNION
HUNTERDON
SOMERSET
MIDDLESEX
MERCER
MONMOUTH
OCEAN
BURLINGTON
CAMDEN
GLOUCESTER
SALEM
ATLANTIC
CUMBERLAND
CAPE MAY
LOCATION
MANASQUAN RIVER
LEGEND
Point Source
Monitoring Site
Drainage Basin Boundaries
County Bounderies
Municipal Bounderies

Figure VI.S.2



10th PERCENTILE PLOT
DISSOLVED OXYGEN PERCENT SATURATION
89.5
72.0
65.
60.
54.6
37.2
19.7
2.3
SUMMER VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19

Figure VI.S.3


90th PERCENTILE PLOT
50.0
40.2
30.4
26.0
10.8
5.0
1.0
B O D
5 DAY
mg / l
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
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14
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20
21
23

## TOMS RIVER AND METEDECONK RIVER

### BASIN DESCRIPTION

The headwaters of the Toms River lie in the relatively underdeveloped western sections of Ocean County. The river flows eastward into Barnegat Bay, entering the bay eleven miles North of Barnegat Inlet. The drainage area comprises 265 square miles. Upstream areas have relatively flat topography with wide swampy flood plains. The downstream areas are densely populated with almost complete commercial and residential development. Surface waters are utilized for agricultural, industrial, and recreational shellfishing, fishing, and swimming purposes. The river is tidal upstream to the dam at the town of Toms River.

The Metedeconk River has its headwaters on the border of Middlesex and Monmouth counties. The topography of the drainage basin is flat, with upstream agricultural and residential areas encompassing several lakes fed by slow moving tributary streams. The Metedeconk River flows through heavy residential development in downstream areas as it enters northern Barnegat Bay.

### WATER QUALITY ASSESSMENT

The overall quality of the Toms River and Metedeconk River is good. On the Toms River and the Metedeconk, fecal coliform bacteria counts have decreased though numbers remain above the criterion level. Dissolved oxygen levels have increased on the main stem of Toms River and are above the criterion. However, dissolved oxygen concentrations on the Jake's Branch tributary have decreased, and are currently below the criterion. On the Metedeconk North Branch dissolved oxygen levels have decreased, but remain well above the criterion. Five day biochemical oxygen demand has increased at all stations in both drainage basins except on the North Branch of the Metedeconk, and all levels are below the criterion. The pH values of Toms River remain lower than those of the Metedeconk, which is typical of the acidic streams and rivers of the pine forests of southern New Jersey. However, the Jake's Brook tributary to Toms River has markedly increased pH levels over those of the previous five year period. All pH values for the Metedeconk and Toms River are within criterion limits. Nutrient concentrations of nitrate in Toms River are high, with Jake's Branch tributary increasing to excessive levels. Metedeconk concentrations of nitrate remain very high. Phosphorous concentrations in Toms River are above criterion limits at all stations, although they have decreased at the Jake's Brook and Toms River stations. Metedeconk phosphorous concentrations have decreased markedly, however, levels continue to be above the criterion. Non-filtrable residue concentrations in Toms River remain below criterion levels, as in the Metedeconk North Branch. The Metedeconk South Branch contains excessive solids. Turbidity levels have decreased throughout Toms River and the Metedeconk with time, and all values are below the criterion.

## PROBLEM ASSESSMENT

Major problems in Toms River and Metedeconk River water quality can be attributed to the extremely rapid population growth and development experienced throughout their drainage basins. Inadequate septic systems in a predominantly sand environment; overloaded, antiquated waste treatment plants; and substantial storm water runoff contributions in downstream areas have combined with the natural slow flowing character of these rivers to degrade water quality with excessive solids, nutrient loadings, fecal coliforms and biochemical oxygen demand. Heavy powerboat utilization of downstream portions has also contributed to degraded water quality through discharges of sewage, oil and gasoline, and litter. Noxious algal blooms and excessive aquatic vegetation growth hinder recreational usage of lakes in the Metedeconk drainage and the main stem of the Metedeconk River.

## GOAL ASSESSMENT AND RECOMMENDATIONS

The elimination of several sewage treatment plant discharges has resulted in water quality improvement in these waters during recent years. With continued federal funding to construct additional regionalized collection and treatment facilities for heavily populated areas currently served by septic systems, water quality should continue to improve. The current fishable quality can be maintained, and may improve, in these rivers, but swimmable quality will be more difficult to achieve due to the large storm water runoff to downstream waters from heavily developed areas. Emphasis should be placed on federal lake restoration funding in this area. Additional monitoring activities must be initiated to expand the existing data on water quality. Intensive surveys on problem segments such as Jake's Brook should be conducted to ascertain causative pollutant sources.

## STATION LIST

1. Toms River near Cassville
2. Toms River near Toms River
3. Toms River at Toms River
4. Toms River at Toms River
5. Toms River - Jakes Branch
6. South Branch Metedeconk River
7. North Branch Metedeconk River

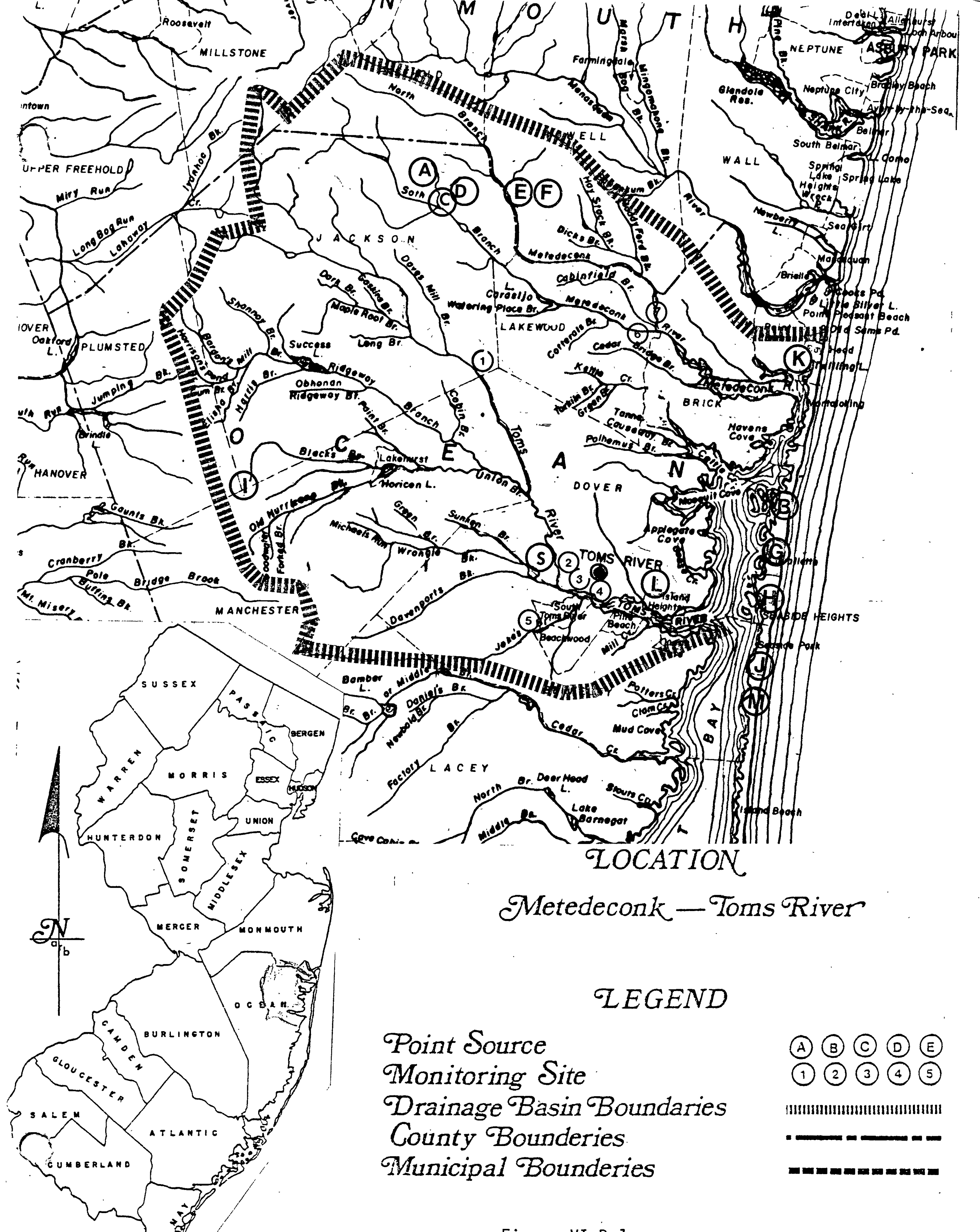

LOCATION
Metedeconk — Toms River
LEGEND
Point Source
Monitoring Site
Drainage Basin Boundaries
County Bounderies
Municipal Bounderies
JACKSON
LAKEWOOD
BRICK
DOVER
MANCHESTER
LACEY
PLUMSTED
HOWELL
WALL
NEPTUNE
ASBURY PARK
TOMS RIVER
SEASIDE HEIGHTS
SUSSEX
PASSAIC
BERGEN
WARREN
MORRIS
ESSEX
HUDSON
UNION
HUNTERDON
SOMERSET
MIDDLESEX
MERCER
MONMOUTH
OCEAN
BURLINGTON
CAMDEN
GLOUCESTER
SALEM
ATLANTIC
CUMBERLAND
CAPE MAY

Figure VI.R.1

Figure VI.R.2

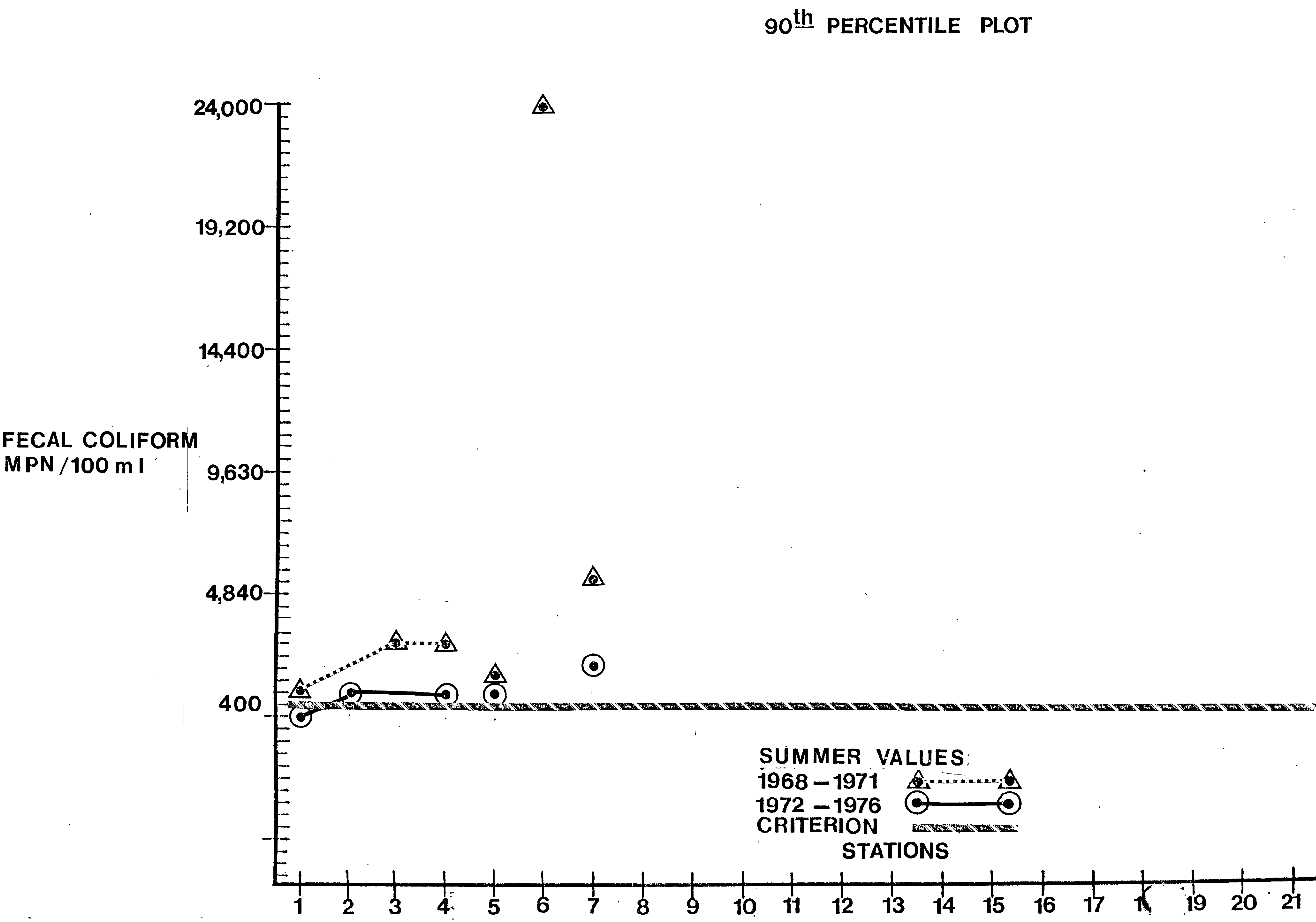

90th PERCENTILE PLOT
24,000
19,200
14,400
9,630
4,840
400
FECAL COLIFORM
MPN/100 ml
SUMMER VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
19
20
21

Figure VI.R.3

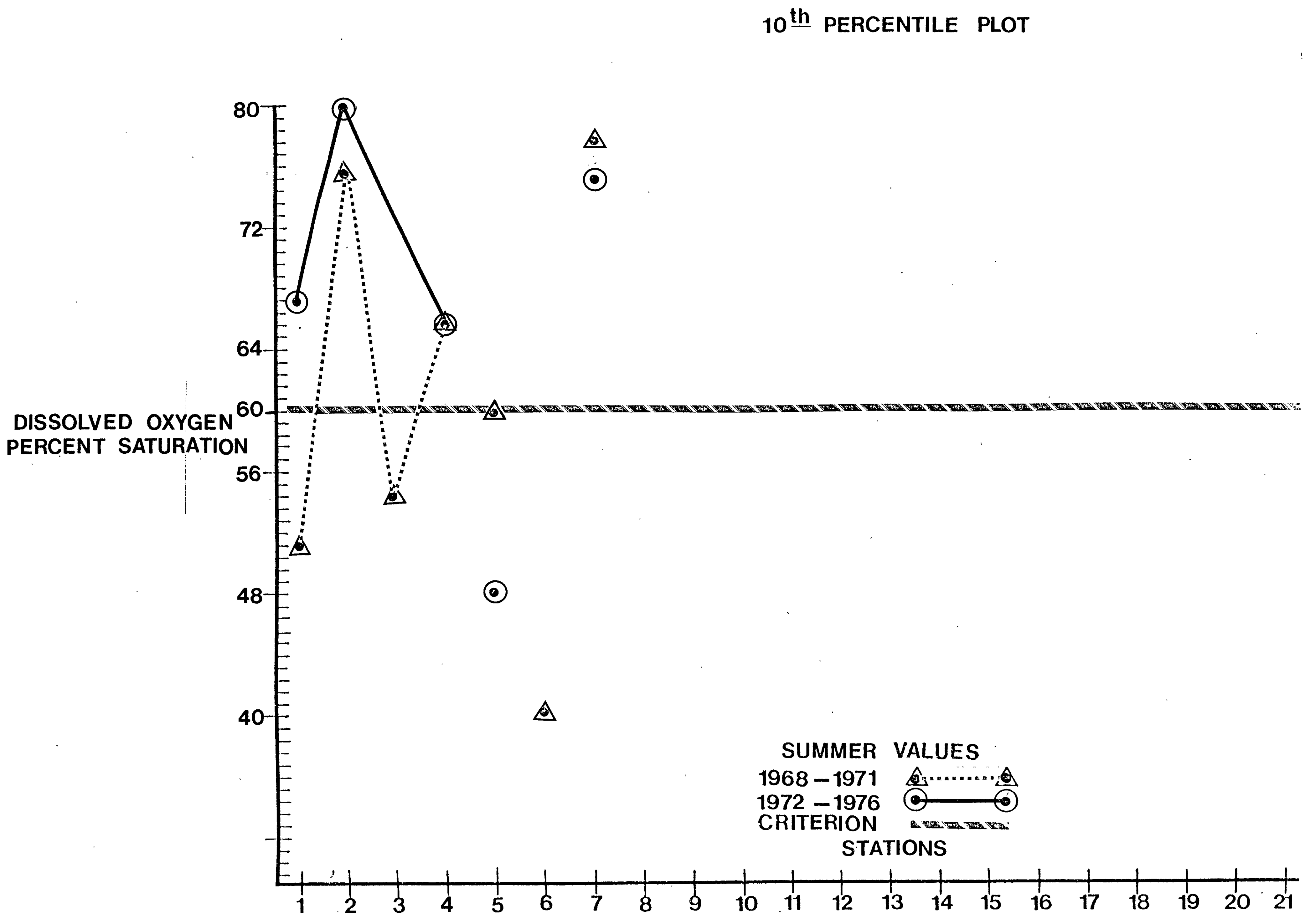
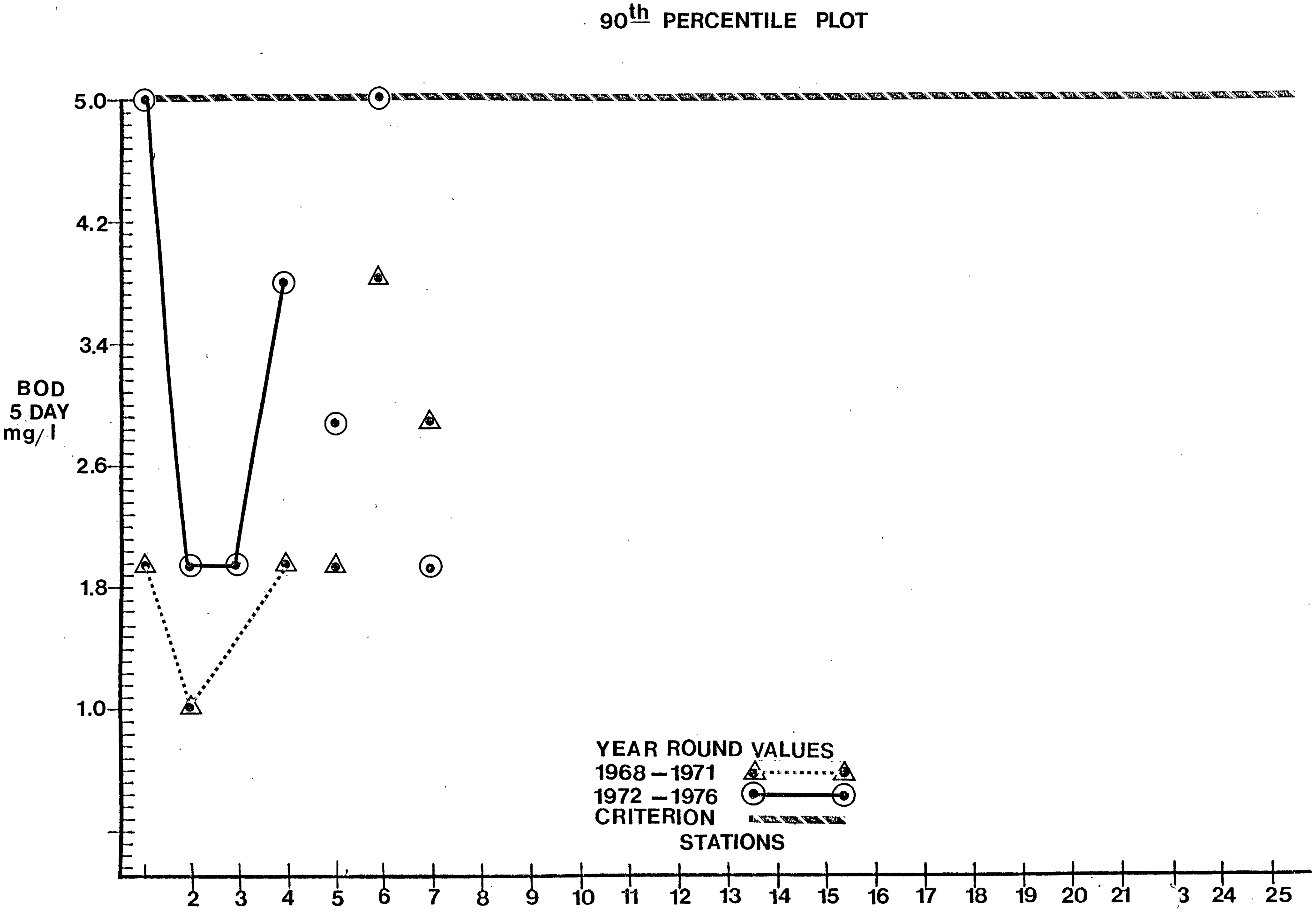
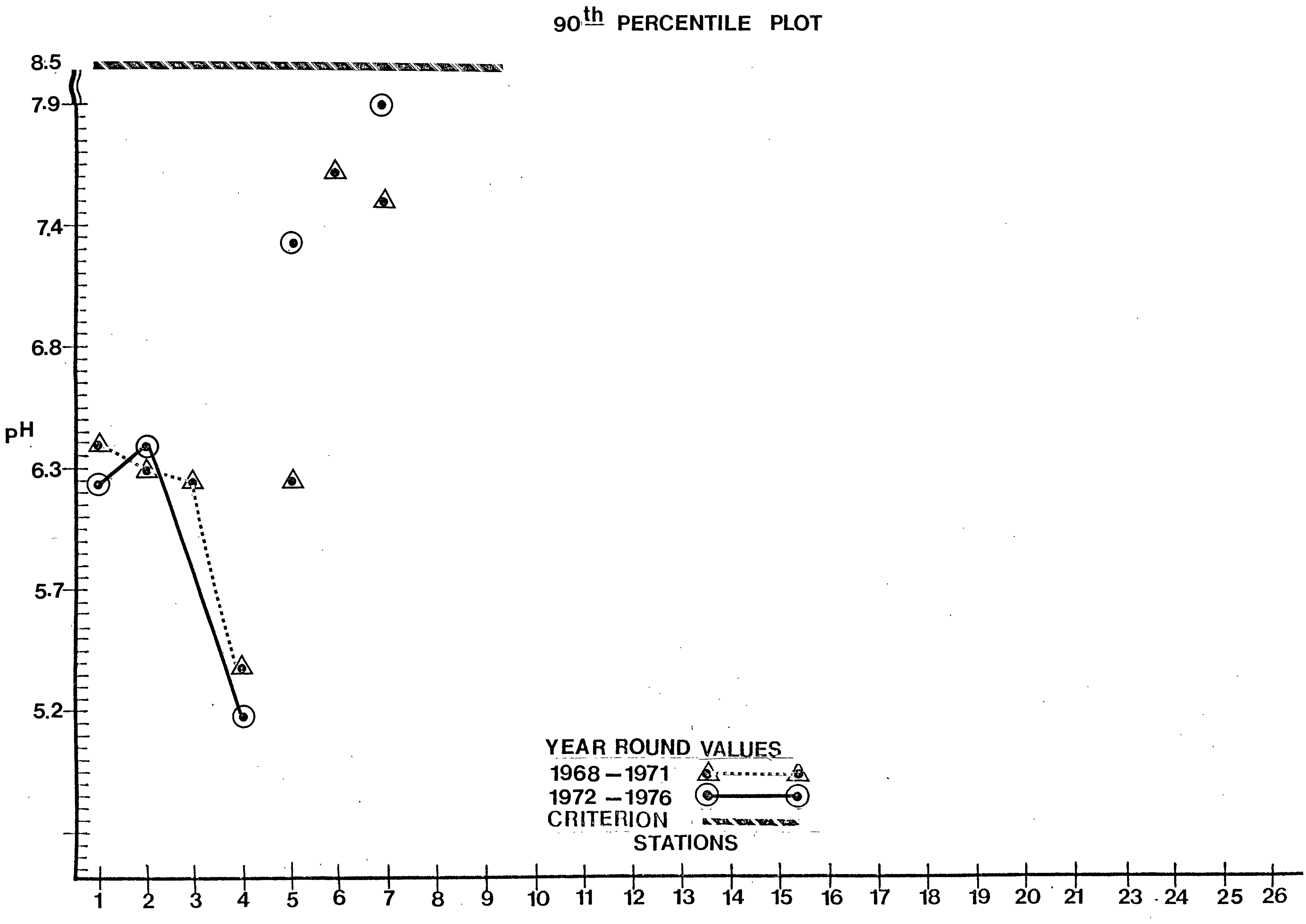

10th PERCENTILE PLOT
DISSOLVED OXYGEN
PERCENT SATURATION
80
72
64
60
56
48
40
SUMMER VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21

Figure VI.R.4



90th PERCENTILE PLOT
5.0
4.2
3.4
2.6
1.8
1.0
BOD
5 DAY
mg/l
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
3
24
25

Figure VI.R.5


90th PERCENTILE PLOT
8.5
7.9
7.4
6.8
pH
6.3
5.7
5.2
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
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16
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23
24
25
26

Figure VI.R.6

90th PERCENTILE PLOT

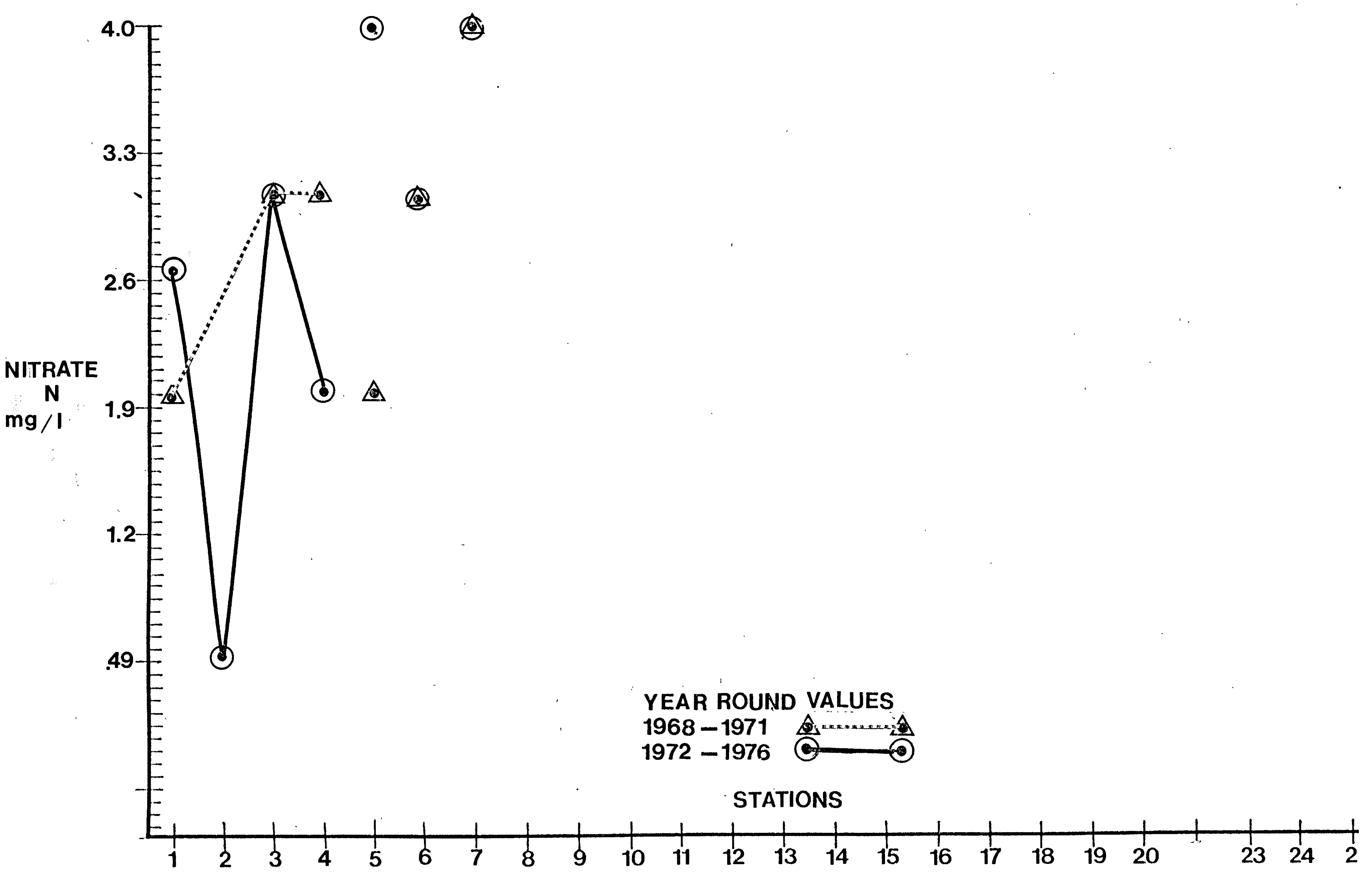
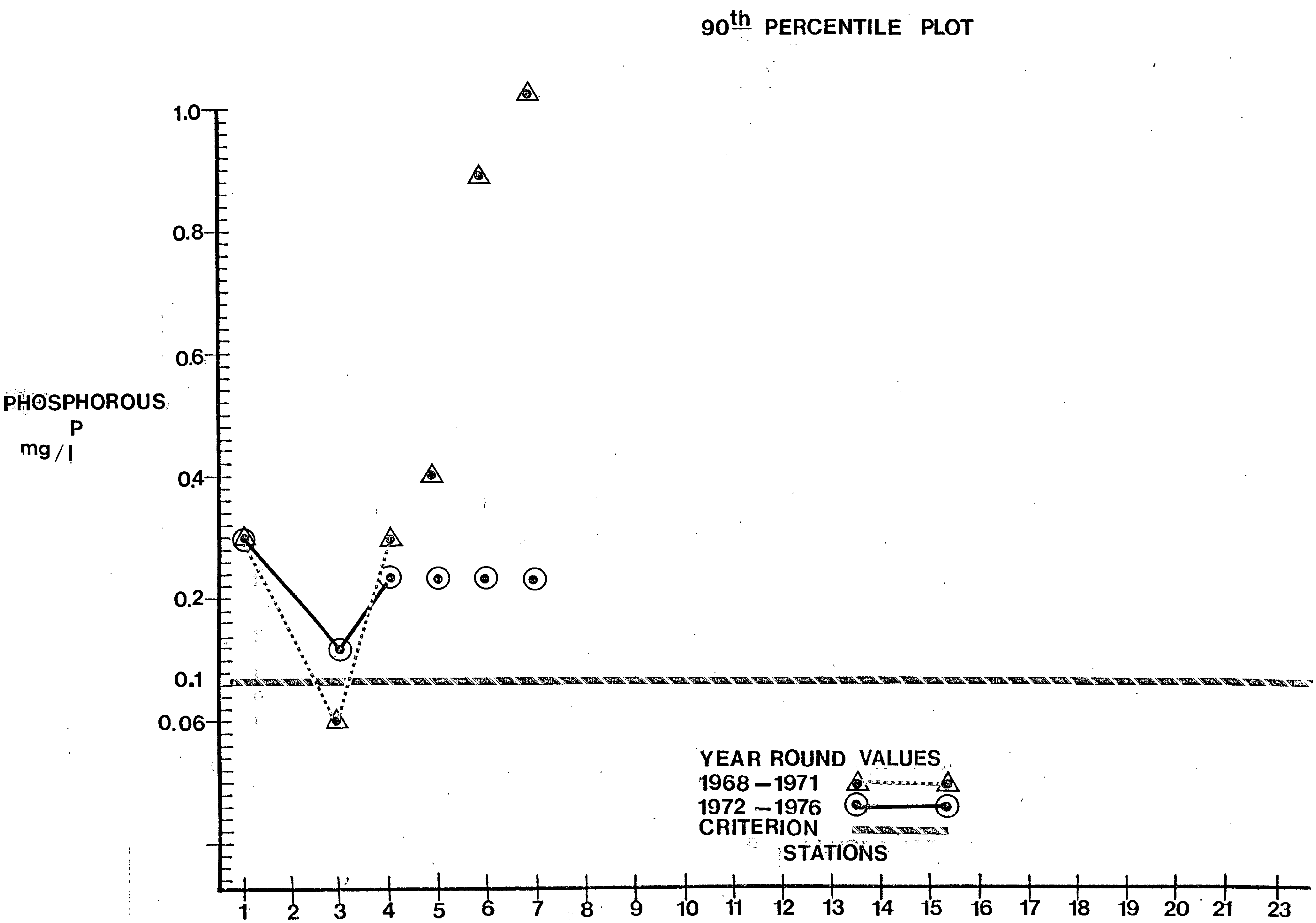


Figure VI.R.7



90th PERCENTILE PLOT
PHOSPHOROUS
P
mg / l
1.0
0.8
0.6
0.4
0.2
0.1
0.06
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
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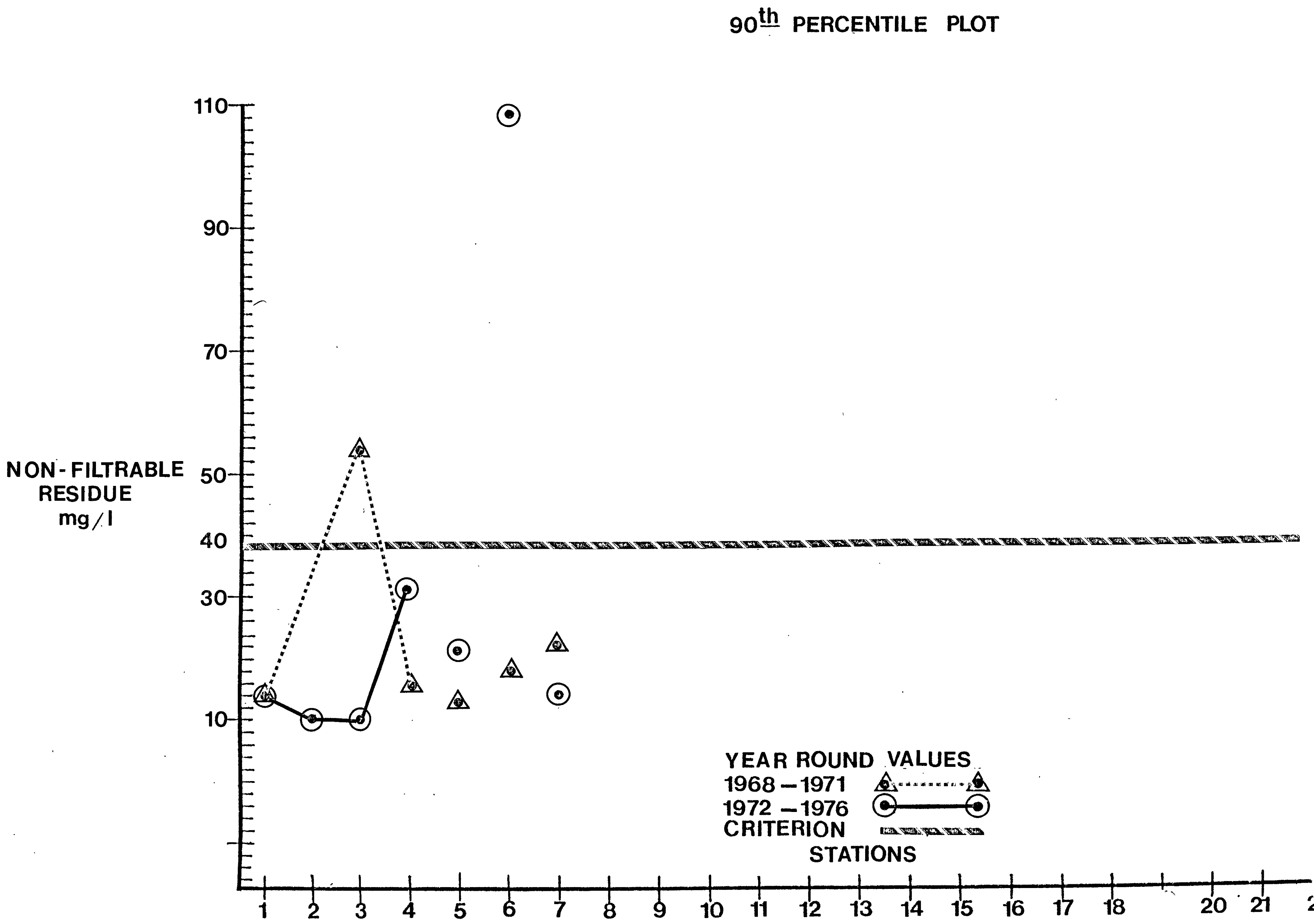
23

Figure VI. R.8


90th PERCENTILE PLOT
NON-FILTRABLE RESIDUE mg/l
110
90
70
50
40
30
10
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
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11
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18
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21

Figure VI.S.4

90th PERCENTILE PLOT

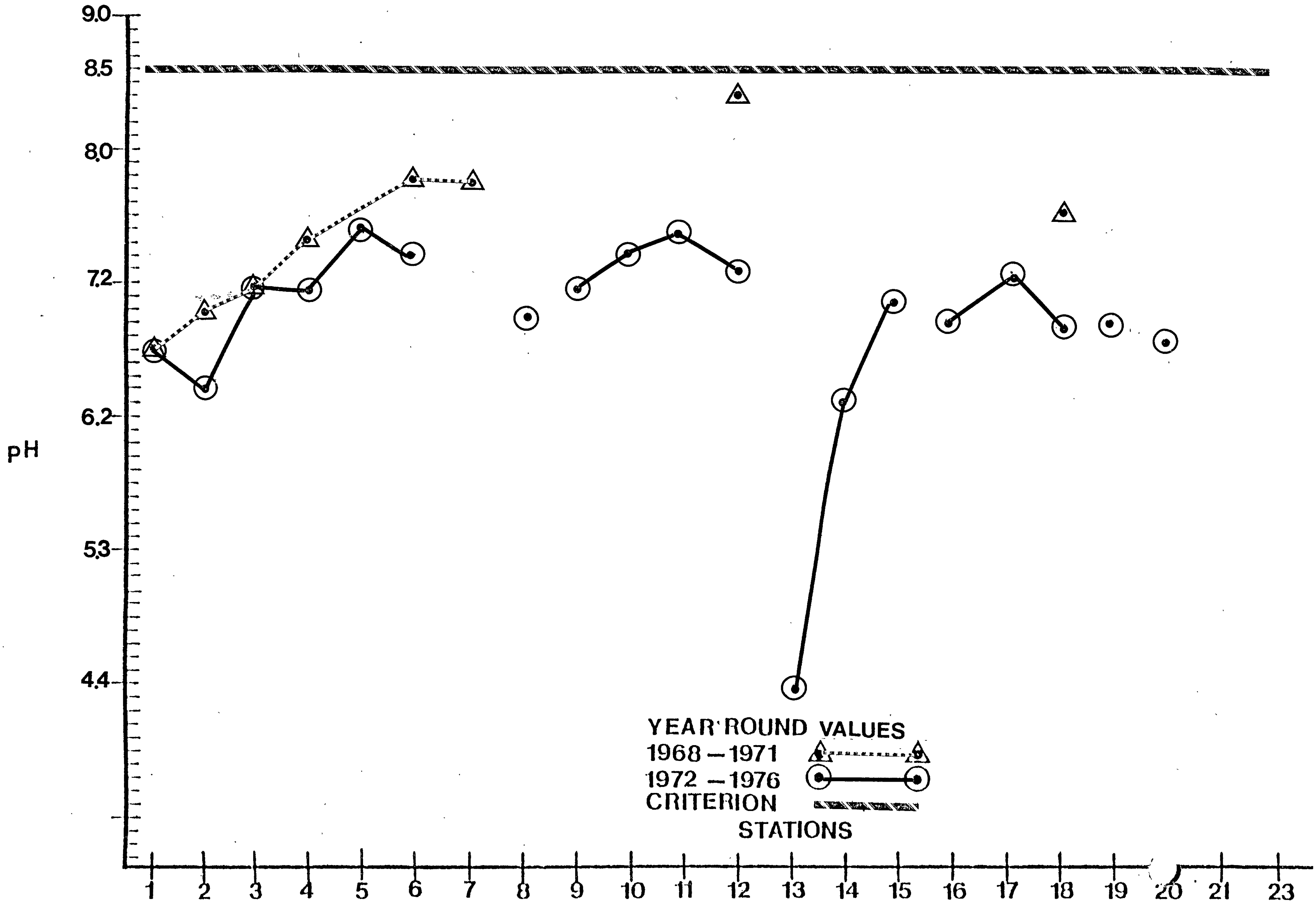


Figure VI.S.5

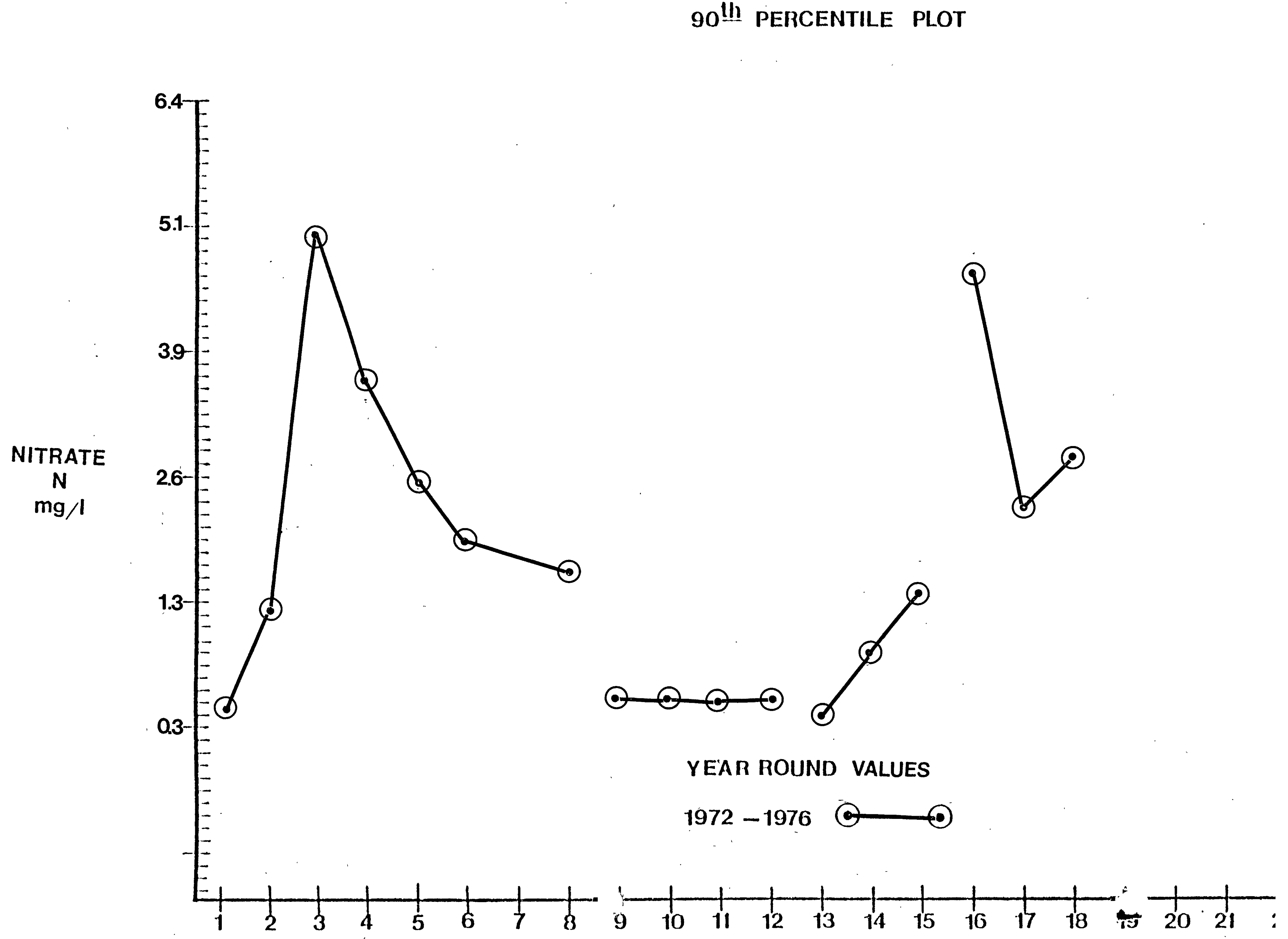

90th PERCENTILE PLOT
NITRATE
N
mg/l
6.4
5.1
3.9
2.6
1.3
0.3
YEAR ROUND VALUES
1972 – 1976
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
20
21

Figure VI.S.6

90th PERCENTILE PLOT

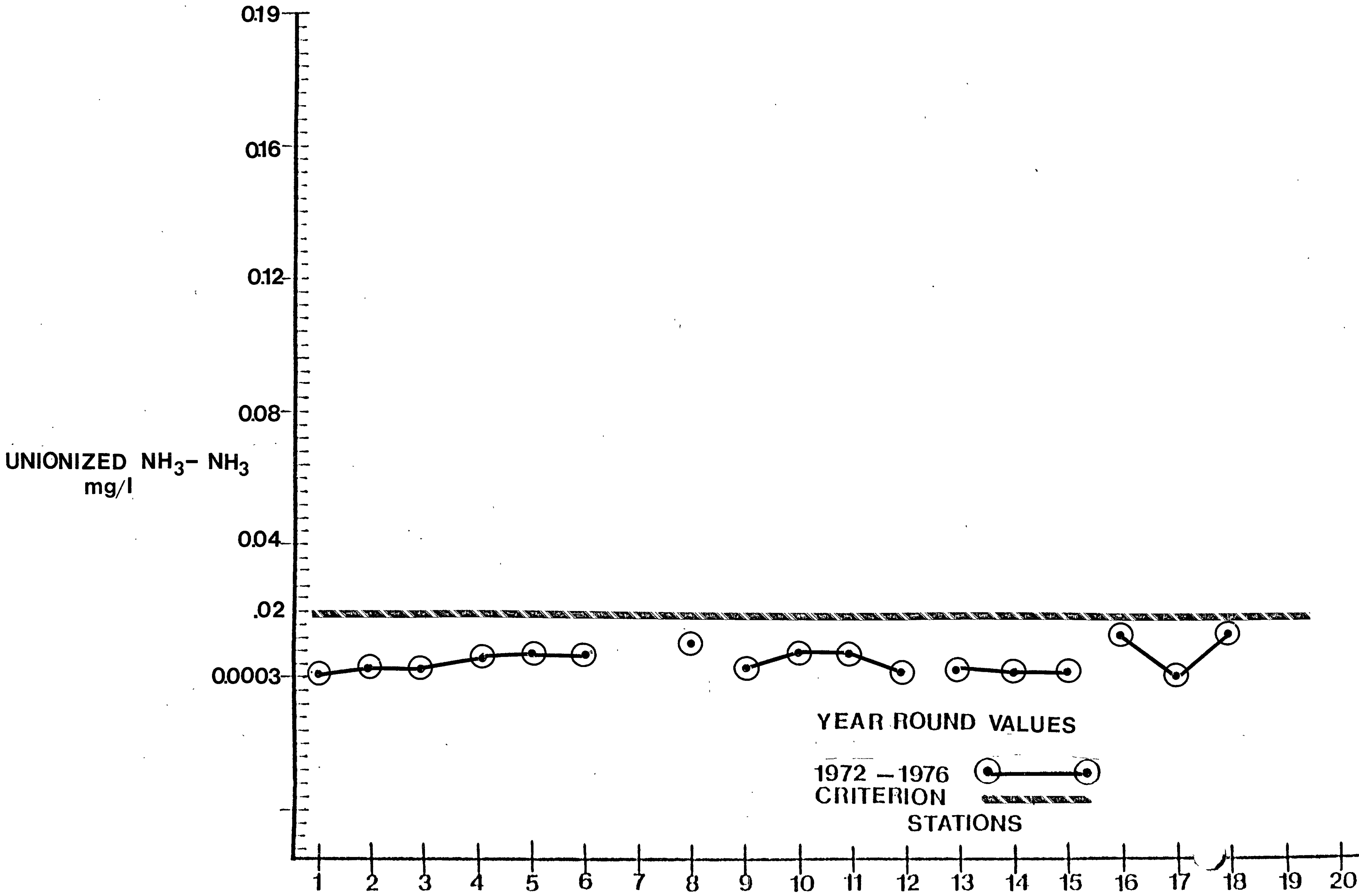


Table VI.S.1 MUNICIPAL AND INSTITUTIONAL DISCHARGERS INVENTORY

N. Atlantic Coastal Basin
Manasquan River Segment

| Map Number | Compliance with 1977 Secondary / Best Practicable Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Avg. | Max. | Average Daily Effluent Quality BOD$_5$ mg/l | BOD$_5$ #/Day | $NH_3$-N mg/l | $NH_3$-N #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Yes | Adelphia Sewer Co. | Howell | Manasquan | 0020133 | Intermittent Sand Filter | 0.13 | 0.08 | 0.1 | 7.2 | 4.9 | 3.6 | 2.4 | SS:4.2 mg/l |
| A | No | Freehold Boro. | Freehold Boro. | DuBois Creek | 002665 | High Rate Trickling Filter Standard Rate Trickling Filter | 1.5 | 1.47 | 1.55 | 59 | 722 | 19.1 | 234 | SS:48 mg/l |
| B | No | Wynnewood Sewerage Utility Co. | Freehold Twp. | Pasamaconaway Stream | 0021008 | Extended Aeration | 0.38 | 0.23 | 0.35 | 71 | 138 | 18.2 | 35.4 | SS:66.5 mg/l |
| C | No | Manasquan | Manasquan | Atlantic Ocean | 0022454 | Primary | 0.56 | 0.48 | 0.6 | 130 | 520 | 24.4 | 97.9 | SS:55 mg/l |
| | | Freehold Twp. (Woodgate Farms Sect. 3) | Freehold Twp. | Manasquan River | 0027120 | Physical Chemical | 0.05 | 0.03 | 0.03 | 20.5 | 4.6 | 24.7 | 5.6 | SS:13 mg/l |
| | Yes | Silvermead Adult Mobile Home Community | Freehold Twp. | Pasaquanacqua Brook | 0020494 | Extended Aeration | 0.03 | 0.02 | 0.02 | 28 | 4.4 | 16.9 | 2.7 | SS:24 mg/l |

Note: An asterisk (*) denotes that this is not an average value for the year, but the value for the month with maximum monthly flow.

Table VI.S.1 (cont'd)

MUNICIPAL AND INSTITUTIONAL DISCHARGERS INVENTORY

N. Atlantic Coastal Basin
Manasquan River Segment

| Map Number | Compliance with 1977 Secondary / Best Practicable treatment Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Avg. | Max. | Average Daily Effluent Quality (1975 $BOD_5$ mg/l | #/Day | $NH_3$-N mg/l | #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D | No | Freehold Sewer Co. | Freehold Twp. | Trib. of Manasquan | 0027766 | Extended Aeration Contact Stabilization | .8 | 1.08 | 1.28 | 39 | 351 | 18.2 | 164 | SS:91 mg/l |
| | | Arthur Brisbane Child Treatment Ctr. | Wall | Manasquan River Branch | 0022977 | Intermittent Sand Filter | .02 | .02 | | | | | | |
| | Yes | Farmingdale Garden Apts. | Farmingdale | Marsh Bog Brook | 0026638 | Intermittent Sand Filter | .03 | | .01 | 11 | 0.7 | 11.8 | | SS: 24 mg/l |
| | Yes | Pt. Pleasant Bd. of Education | Pt. Pleasant | Bay Head-Manasquan Canal | 0026611 | Advanced | | | | | | | | |

Table VI.S.1 (cont'd) MUNICIPAL AND INSTITUTIONAL DISCHARGERS

N. Atlantic Coastal Basin

Manasquan River Segment

| Map Number | Compliance with 1977 Secondary / Best Practicable treatment Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Avg. | Max. | Average Daily Effluent Quality (1975) $BOD_5$ mg/l | $BOD_5$ #/Day | $NH_3$-N mg/l | $NH_3$-N #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E | Yes | Neptune Twp. S.T.P. #1 | Neptune Twp. | Atlantic Ocean | 0024881 | Primary | 1.16 | 1.82 | 1.99 | 156 | 2368 | 19.3 | 293 | SS:73 mg/l |
| F | No | Neptune Twp. S.T.P. #2 | Neptune Twp. | Atlantic Ocean | 0024872 | High Rate Trickling Filter | 2.5 | 0.88 | 0.88 | 14.4 | 106 | 16 | 117.6 | SS:14 mg/l |
| G | No | Bradley Beach Evergreen Ave. #1 | Bradley Beach | Atlantic Ocean | 0021059 | Primary | .34 | .23 | .26 | 70 | 136 | 14.7 | 32.2 | SS:22 mg/l |
| H | No | Bradley Beach Ocean Park #2 | Bradley Beach | Atlantic Ocean | 0021059 | Primary | .66 | .75 | 1.03 | 103 | 644 | 18.2 | 114.0 | SS:38 mg/l |
| | Yes | N.J. H'wy Auth. Garden State Pkwy. | Wall | Trib. to Shark River | 0021148 | | | | .038 | | | | | |

## Table VI.S.1 (cont'd) MUNICIPAL AND INSTITUTIONAL DISCHARGERS INVENTORY

N. Atlantic Coastal Basin

Manasquan River Segment

| Number | Compliance with 1977 Secondary / Best Practicable treatment Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Flow (mgd) 1975 Avg. | Flow (mgd) 1975 Max. | Average Daily Effluent Quality (1975) $BOD_5$ mg/l | $BOD_5$ #/Day | $NH_3$-N mg/l | $NH_3$-N #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| I | No | Neptune City | Neptune City Boro. | Atlantic Ocean | 0021075 | Primary | .31 | .57 | .62 | 188 | 892 | 26.9 | 127.7 | SS:116 mg/l |
| J | No | Belmar | Belmar | Atlantic Ocean | 0026760 | Primary | 3.0 | 1.78 | 1.86 | 78 | 1158 | 13.1 | 195 | SS: 35 mg/l |
| K | | S. Monmouth Reg. S.A. | Wall | Atlantic Ocean | 0024562 | Trickling Filter Aerated Polishing Lagoon | 9.10 | | | | | | | |
| L | No | Spring Lake Penn Ave.#1 | Spring Lake | Atlantic Ocean | 0027103 | Primary | 1.5 | .77 | 2.0 | 82 | 537 | 14 | 91.8 | SS:40 mg/l |
| | No | Spring Lake Pitney Ave. #2 | Spring Lake | Atlantic Ocean | 0027111 | Primary | 0.14 | 0.02 | 0.02 | 37 | | 8.7 | 1.4 | SS:30 mg/l |
| M | No | Asbury Park | Asbury Park | Atlantic Ocean | 0025241 | Primary | 5.5 | 3 | 3.0 | 98 | 2451 | 13.6 | 339.0 | SS:76/mg/l |

Table VI.S.1. (cont'd) MUNICIPAL AND INSTITUTIONAL DISCHARGER INVENTORY

N. Atlantic Coastal Basin

Manasquan River Segment

| Map Number | Compliance with 1977 Secondary Practicable treatment Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Avg. | Max. | Average Daily Effluent Quality (1975) BOD$_5$ mg/l | BOD$_5$ #/Day | $NH_3$-N mg/l | $NH_3$-N #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N | Yes<br>No | Ocean Twp. S.A. #1<br>S.A. #2 | Ocean Twp. | Atlantic Ocean | 0024520 | Activated Sludge | 3.0 | 4.3 | 4.4 | 14 | 502 | 14 | 502 | SS:17.5 mg/l |
| O | Yes, | Long Branch S.A. | Long Branch | Atlantic Ocean | 0024785 | Primary | 5.4 | 3.9 | 4.2 | 88 | 2862 | 17.8 | 578 | SS: 44 mg/l |
| P | No | Ocean Grove Camp Meeting Assoc. | Neptune Twp. | Atlantic Ocean | 0022233 | Primary | 8.85 | 0.57 | 0.76 | 185 | 904 | 27.8 | 132 | SS: 73 mg/l |
| Q | No | Avon-by-the-Sea Boro. | Avon-by-the-Sea | Atlantic Ocean | 0020931 | Primary | 0.4 | 0.43 | 0.49 | 72 | 260 | 15.8 | 57.0 | SS: 49 mg/l |
| R | No | Deal Boro. | Deal | Atlantic Ocean | 0020931 | Primary | 0.28 | 0.27 | 0.32 | 30 | 66 | 7.6 | 17 | SS: 21 mg/l |
| S | No | Sea Girt | Sea Girt | Atlantic Ocean | 0023108 | Primary | 0.4 | 0.29 | 0.33 | 107 | 258 | 22.9 | 55 | SS: 35 mg/l |
| T | No | Spring Lake Heights | Spring Lake Heights | Atlantic Ocean | 0022357 | Primary | 0.65 | 0.49 | 0.54 | 155 | 630 | 26.2 | 106.5 | SS: 65 mg/l |

Table VL.S.1 INDUSTRIAL DISCHARGER INVENTORY

(cont'd) N. Atlantic Coastal Basin

Manasquan River Segment

| Map Number | Comliance with 1977 Secondary / Best Practicable treatment Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Avg. | Max. | Average Daily Effluent Quality BOD$_5$ mg/l | BOD$_5$ #/Day | NH$_3$-N mg/l | NH$_3$-N #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Monmouth Water Co. Jumping Brook Sta. (001 of 002) | Neptune Twp. | Jumping Brook | 0001821 | Industrial | | | | | | | | |
| | | Monmouth Water Co. Jumping Brook Sta. (002 of 002) | Neptune Twp. | Jumping Brook | 0001821 | Backwash | | | | | | | | |
| U | | Lapin Products Inc. | Ocean Twp. | Deal Lake | 0003891 | Cooling Water | | .576 | | | | | | |
| | | Shore Gas & Oil Co. Div. of Cities Service | Ocean Twp. | Takannassee Lake | 0021849 | | | | | | | | | |
| | | Cmdr. U.S.A. Electronics Command | Wall Twp. | Trib. to Shark River | 0022209 | | | | | | | | | |

Table VI.S.1 INDUSTRIAL DISCHARGERS INVENTORY
(cont'd) N. Atlantic Coastal Basin
Manasquan River Segment

| Map Number | Compliance with 1977 Secondary / Best Practicable treatment Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Avg. | Max. | Average Daily Effluent Quality (1975) $BOD_5$ mg/l | $BOD_5$ #/Day | $NH_3$-N mg/l | $NH_3$-N #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Foster Canning Co. (001 of 003) | Farmingdale | Marsh Bog Brook | 0026336 | Cooling Water | | .08 | | | | | | |
| | | Foster Canning Co. (002 of 003) | Farmingdale | Marsh Bog Brook | 0026336 | Industrial | | .09 | | | | | | |
| | | Foster Canning Co. (003 of 003) | Farmingdale | Marsh Bog Brook | 0026336 | | | .09 | | | | | | |
| | | Charms Co.,Inc. | Freehold Twp. | DuBois Creek | 0025887 | Extended Aeration Carbon Absorption | .09 | .04 | .048 | 48 | 16 | 6 | 2.0 | S.S. 45 mg/l |
| | | I. Rokeach and Sons(001 of 004) | Farmingdale | Marsh Bog Brook | 0026417 | Cooling Water | | | | | | | | |
| | | I. Rokeach and Sons (002) | Farmingdale | Marsh Bog Brook | 0026417 | Industrial | | | | | | | | |
| | | I. Rokeach and Sons (003) | Farmingdale | Marsh Bog Brook | 0026417 | Backwash | | | | | | | | |
| | | I. Rokeach and Sons (004) | Farmingdale | Marsh Bog Brook | 0026417 | Industrial | | | | | | | | |
| | | 3 M Co. (001 of 005) | Freehold Twp. | DuBois Creek | 0004359 | Industrial | | 0.06 | | | | | | |

RARITAN RIVER MAINSTEM

BASIN DESCRIPTION

The Raritan River mainstem segment originates at the confluence of the North and South branches of the Raritan near the town of South Branch. The river flows eastward through industrial and urban areas, becoming tidal at Fieldsville Dam. Downstream of the dam, the river flows through urban industrial development, landfilling activities, and extensive wetlands prior to entering Raritan Bay.

WATER QUALITY ASSESSMENT

Water quality in the river above Manville is good, but decreases as it flows downstream into the more urbanized, industrial areas. Fecal coliform counts exceed the criterion for primary contact waters at all stations on the Raritan Mainstem except that station immediately below the confluence with the Delaware and Raritan Canal. Dissolved oxygen decreases with downstream flow of the river, falling below criterion levels immediately below the Bound Brook area. The decrease in dissolved oxygen correlates with increases in biochemical oxygen demand within the same river segment. Biochemical oxygen demand decreases to within criterion levels at the mouth of the Rairtan, possibly through tidal mixing with waters of Raritan Bay. The pH levels of the mainstem fluctuate, with major decreases recorded at Bound Brook. Nutrient levels increase at Bound Brook although overall phosphorus levels have decreased in the past five years. Total suspended solids have increased over the past five years with only one station remaining within the criterion level. Dissolved solids have decreased in the most recent five year period, and are currently below the criterion. Turbidity has increased above the criterion throughout most of the Raritan Mainstem.

PROBLEM ASSESSMENT

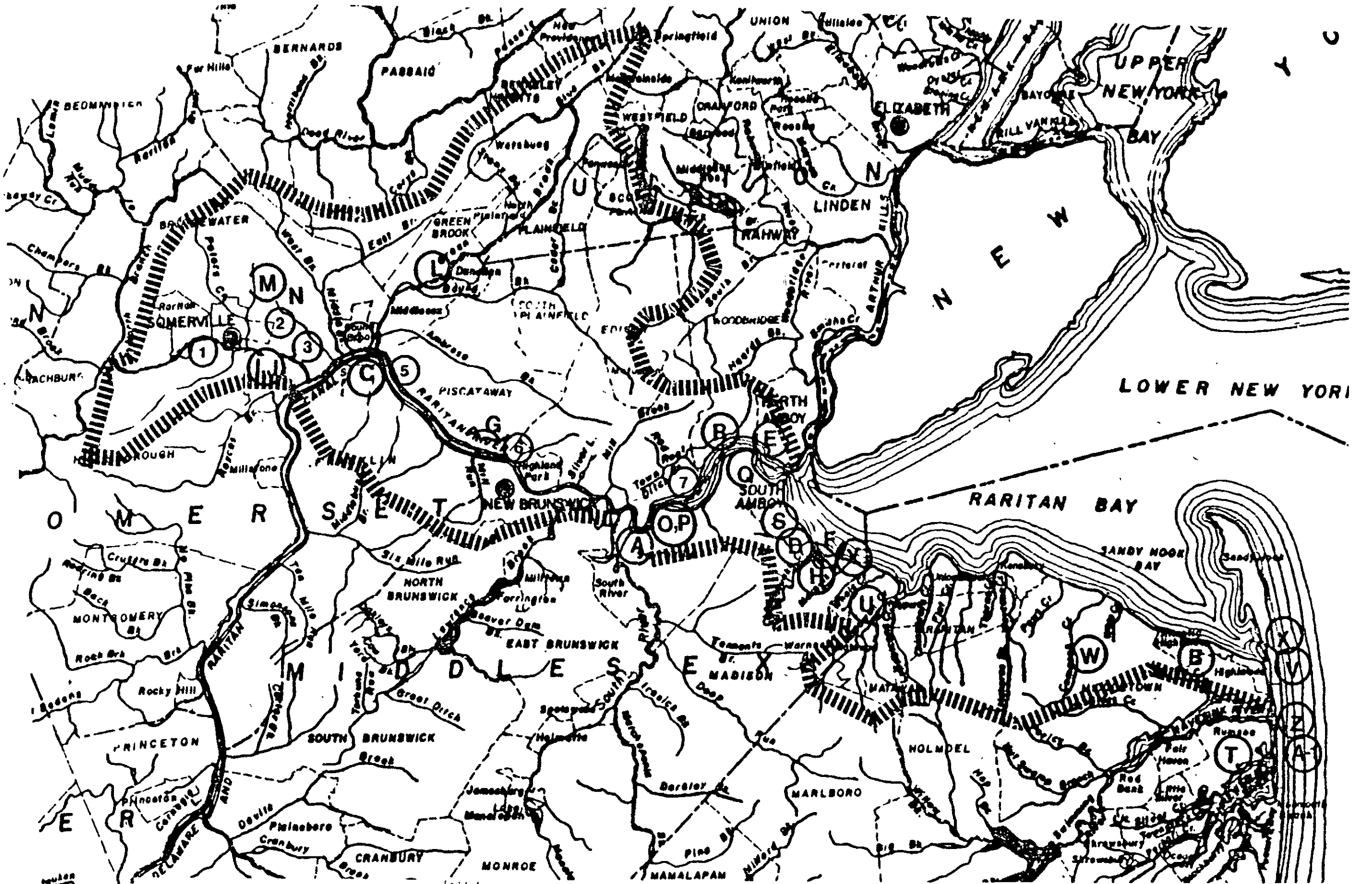
Water quality in the Raritan Mainstem above Manville is chiefly affected by non-point source surface runoff. Below Manville, degradation of water quality is due mainly to point source pollution, with some non-point contributions from urban and storm water runoff, and landfill leachate. The major area of degradation in Raritan Mainstem water quality occurs in the vicinity of Bound Brook, downstream of the confluence with the Millstone River. Although solids, nutrients and turbidity values can be attributed to the Millstone; major biochemical oxygen demand, fecal coliform concentrations, and decreases in pH and oxygen levels are attributable to the major industrial and sanitary sewage treatment plant discharges at Bridgewater. The Cuckels Brook tributary receives an average daily discharge of twenty-five million gallons of mixed industrial and domestic sewage containing 10,000 pounds of suspended solids and 2800 pounds of biochemical oxygen demand. As the sewage of Somerset-Raritan Valley Sewage Authority is mixed with American Cyanamid waste in a common outfall, the organic loading of Cyanamid waste reduces the effectiveness of Somerset-Raritan Valley effluent chlorination through possible chloramine formation, thus resulting in excessive fecal coliform survival. Additional degradation occurs due to significant leachate from Edgeboro, Edison Township, Kin Buc, South Amboy and Industrial Land Reclamation landfills in the downstream Raritan. Tidal flow upstream from the very poor quality Arthur Kill and Raritan Bay also contribute to pollutant loadings in the Raritan.

GOAL ASSESSMENTS AND RECOMMENDATIONS

The Raritan Mainstem has existing fishable quality only from its origin at the confluence of the North Branch and South Branch downstream to Manville. Below confluence with the Millstone, the Raritan is neither fishable nor suitable for contact recreation. The problems of toxic industrial discharges and fecal coliform contributions from domestic sewage treatment plants are currently being addressed through Division enforcement activities and wastewater facility upgrading. American Cyanamid has constructed a multimillion dollar carbon adsorption treatment system to treat the toxic organic effluent from its facility in Bound Brook. This plant will assist in reducing toxic point source pollution at Bound Brook. Completion of expanded treatment facilities at Western Monmouth M.U.A., which discharges into the South River, will reduce the number of raw sewage discharges due to bypassing from this facility. The Somerset-Raritan Valley Sewage Authority also is currently upgrading the quality of its effluent to Cuckels Brook. Additional upgrading of point source dischargers not in compliance with 1977 best practical technology standards is essential for improving mainstem quality. Additional correction efforts must be made in the areas of non-point source pollutant loadings from urban runoff and landfill leachate. Landfills in the lower Raritan must be modified to preclude any migration of toxic leachate into the ground water or the lower Raritan River if the harvest of clams, oysters and mussels in tidal Raritan River and lower Raritan Bay is ever to be permitted. It is unlikely that the Raritan Mainstem will meet 1983 water quality goals, but some upgrading of the waters will occur as a result of ongoing Division activities.

RARITAN RIVER MAINSTEM
STATION LIST

1. Raritan River at Somerville
2. Raritan River at Manville
3. Raritan River near Manville
4. Raritan River at Bound Brook
5. Raritan River near South Bound Brook
6. Raritan River at New Brunswick
7. Raritan River at Victory Bridge




# LOCATION

# MAINSTEM RARITAN RIVER

## LEGEND

Point Source (A) (B) (C) (D) (E)
Monitoring Site (1) (2) (3) (4) (5)
Drainage Basin Boundaries
County Bounderies
Municipal Bounderies

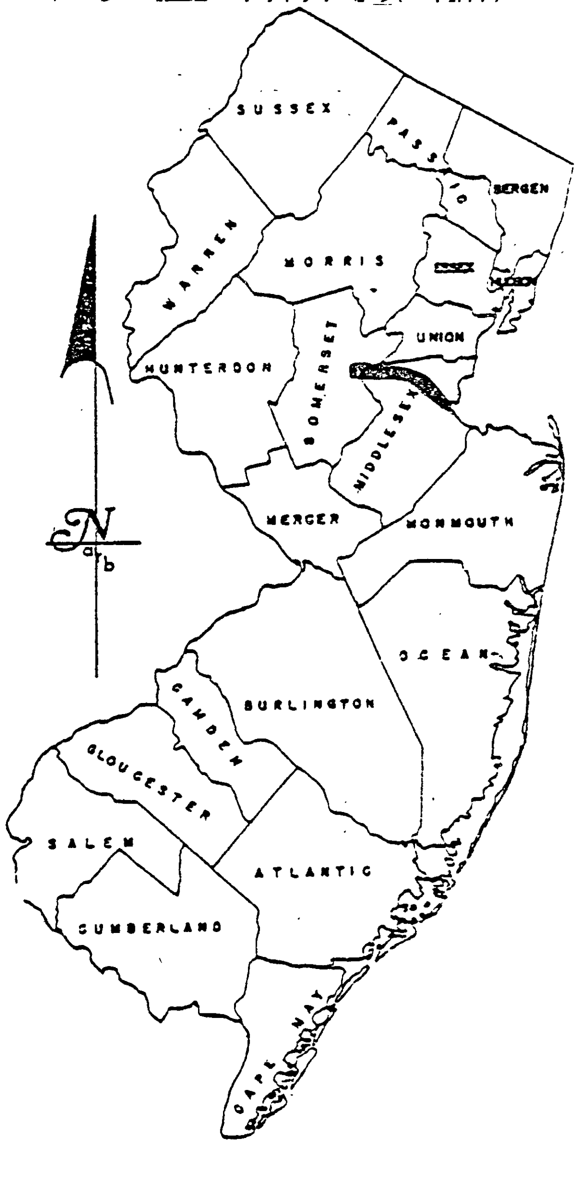



Figure VI.T.1

Figure VI.T.2

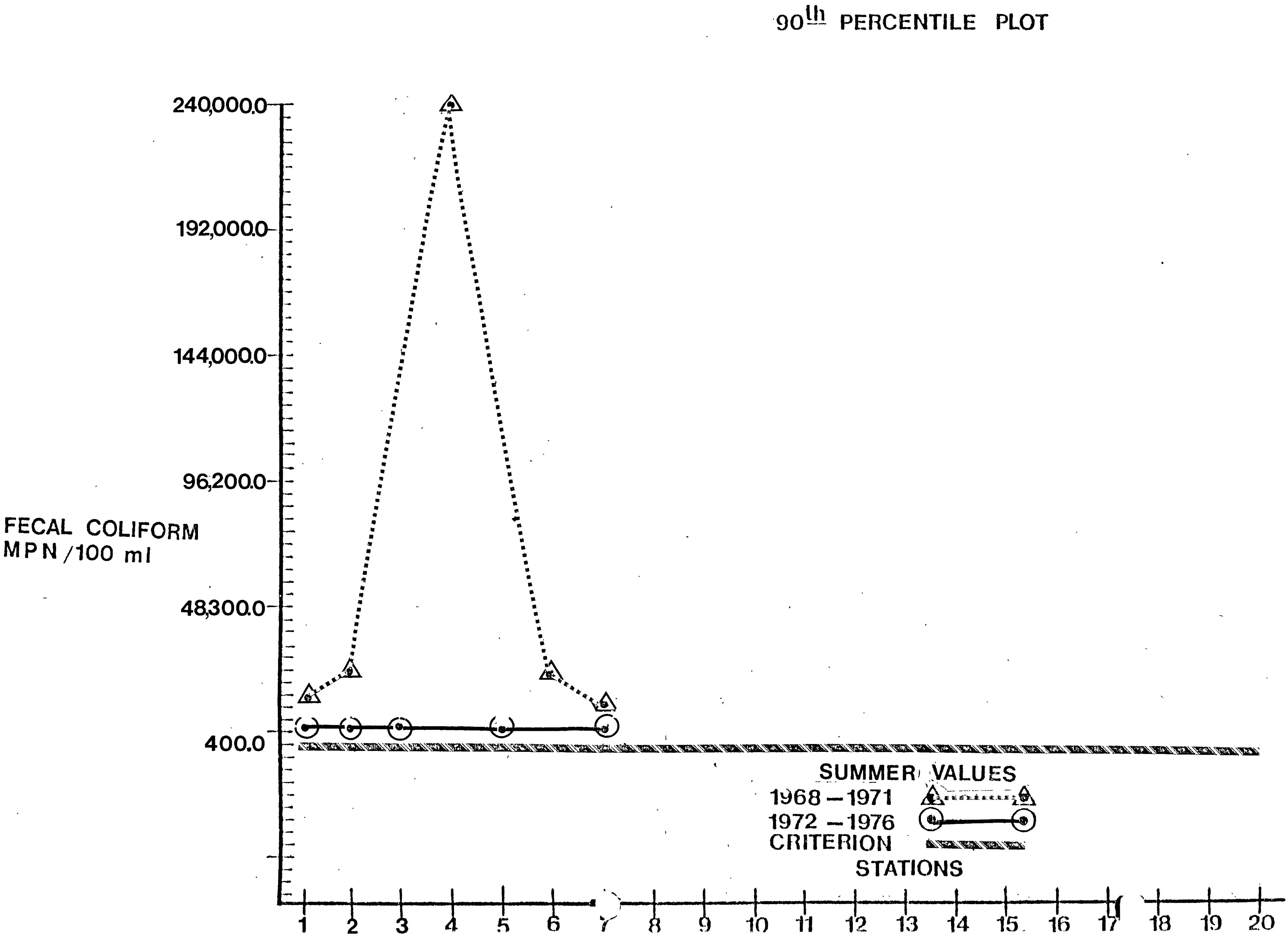

90th PERCENTILE PLOT
240,000.0
192,000.0
144,000.0
96,200.0
48,300.0
400.0
FECAL COLIFORM
MPN/100 ml
SUMMER VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Figure VI.T.3

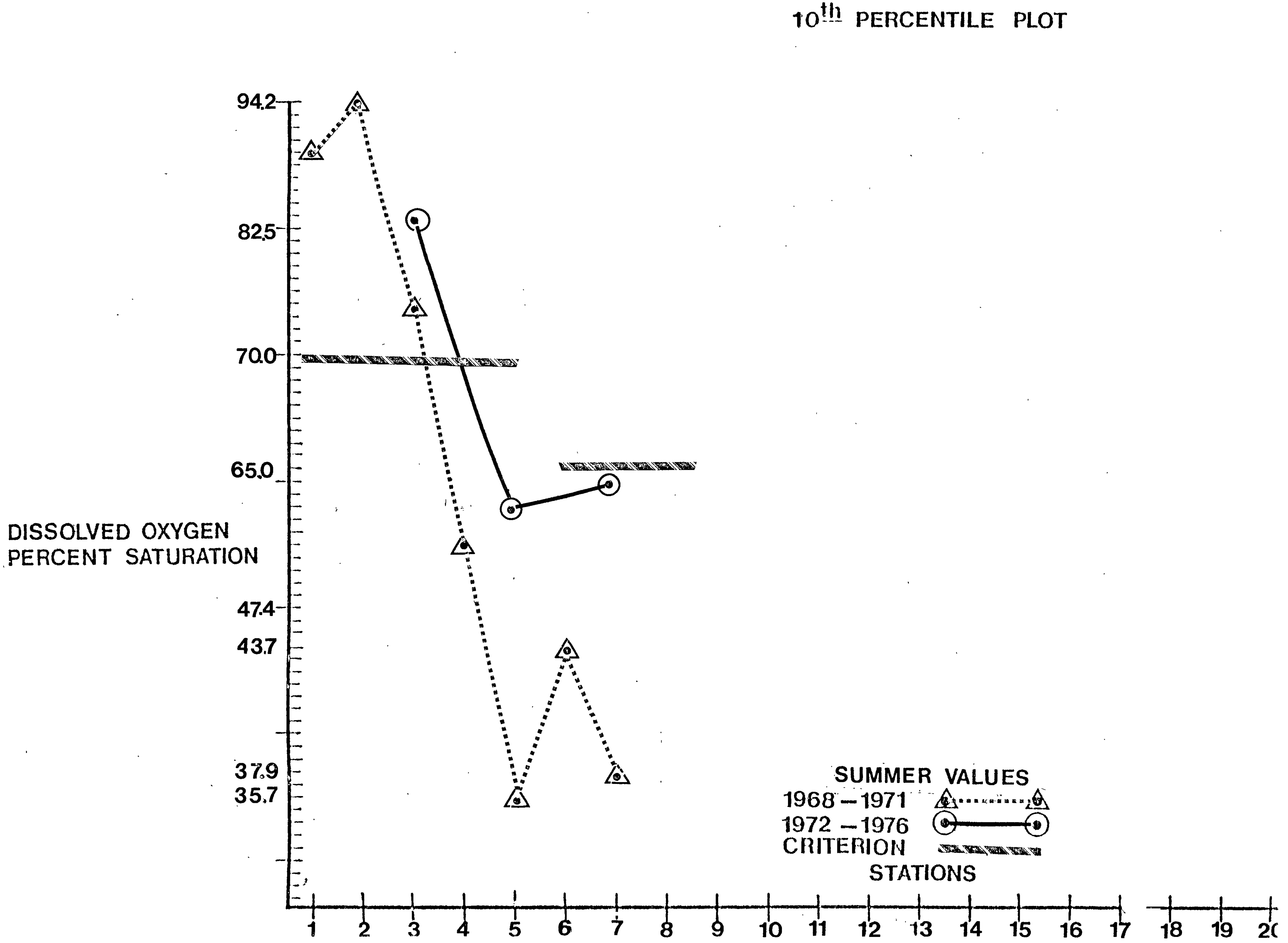
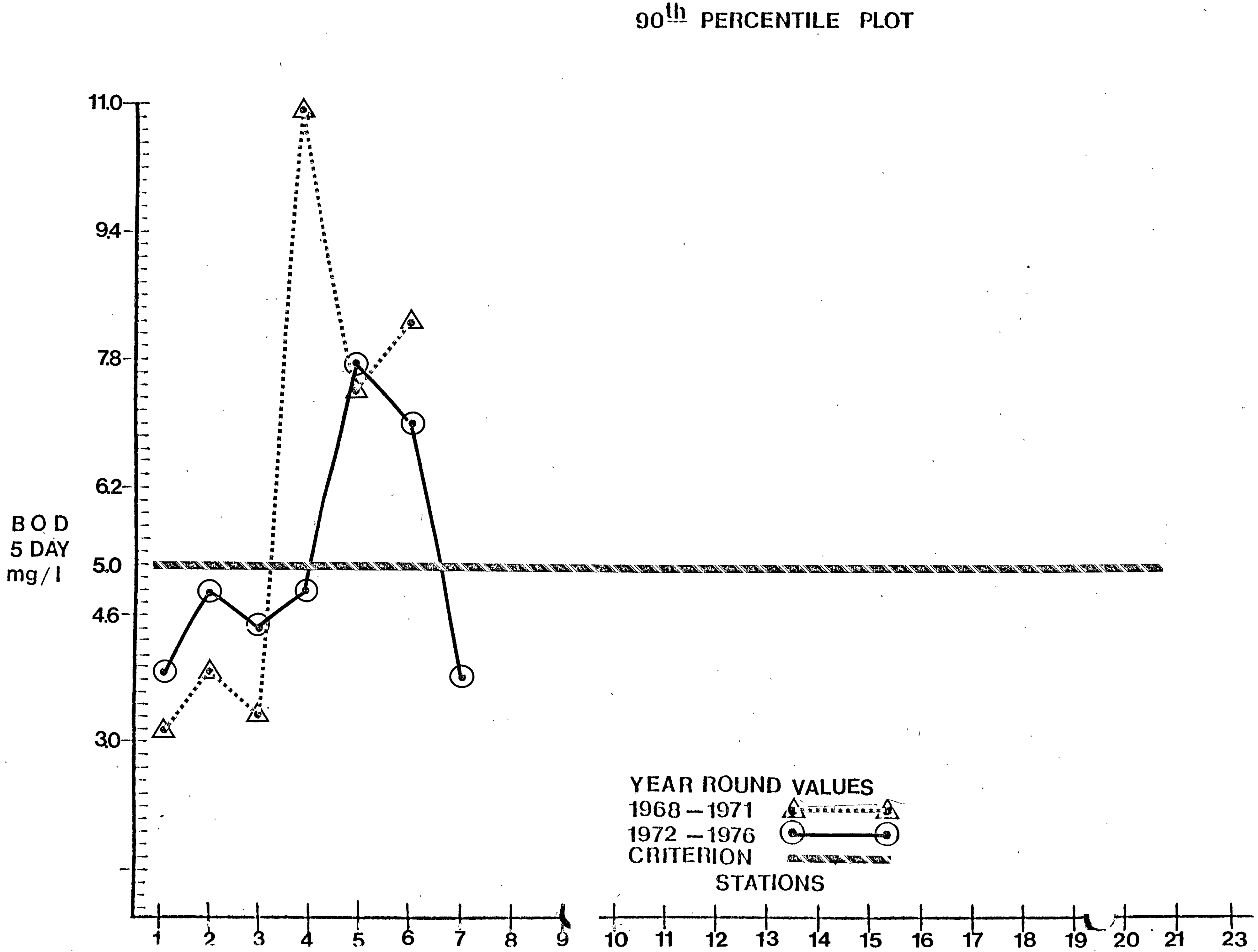

10th PERCENTILE PLOT
94.2
82.5
70.0
65.0
DISSOLVED OXYGEN
PERCENT SATURATION
47.4
43.7
37.9
35.7
SUMMER VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19

Figure VI.T.4



90th PERCENTILE PLOT
11.0
9.4
7.8
6.2
5.0
4.6
3.0
BOD
5 DAY
mg/l
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
23

Figure V–T.5

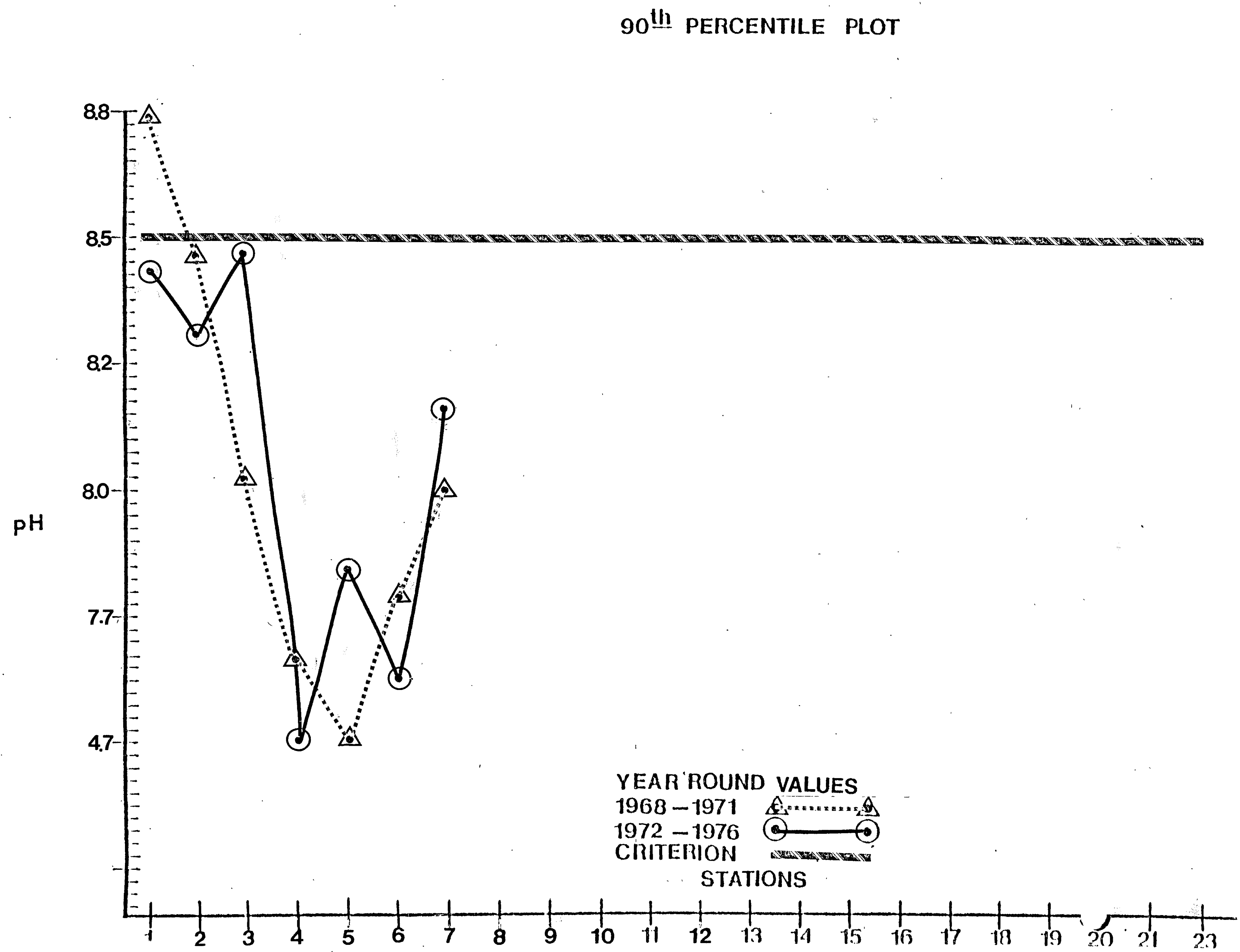
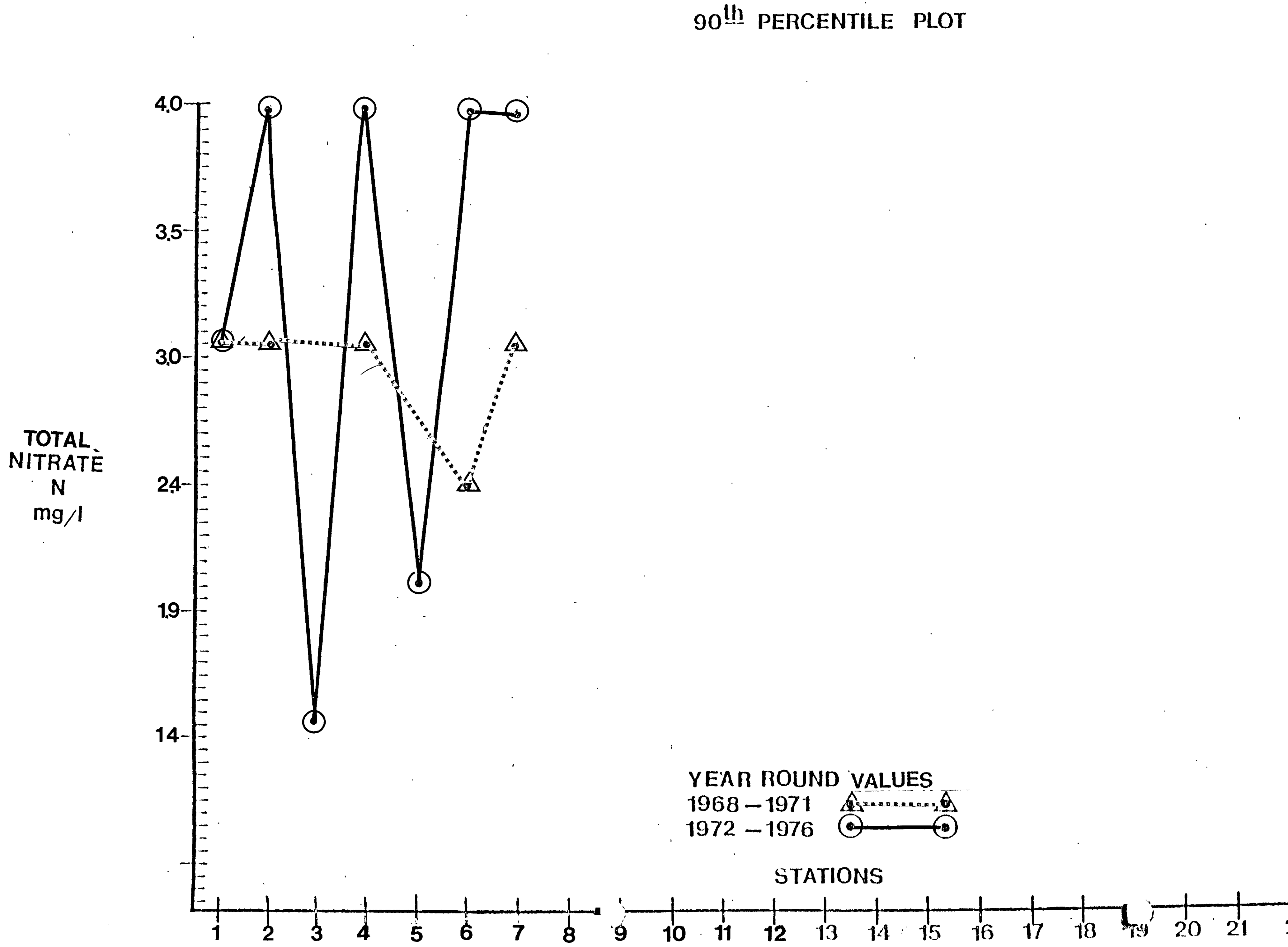
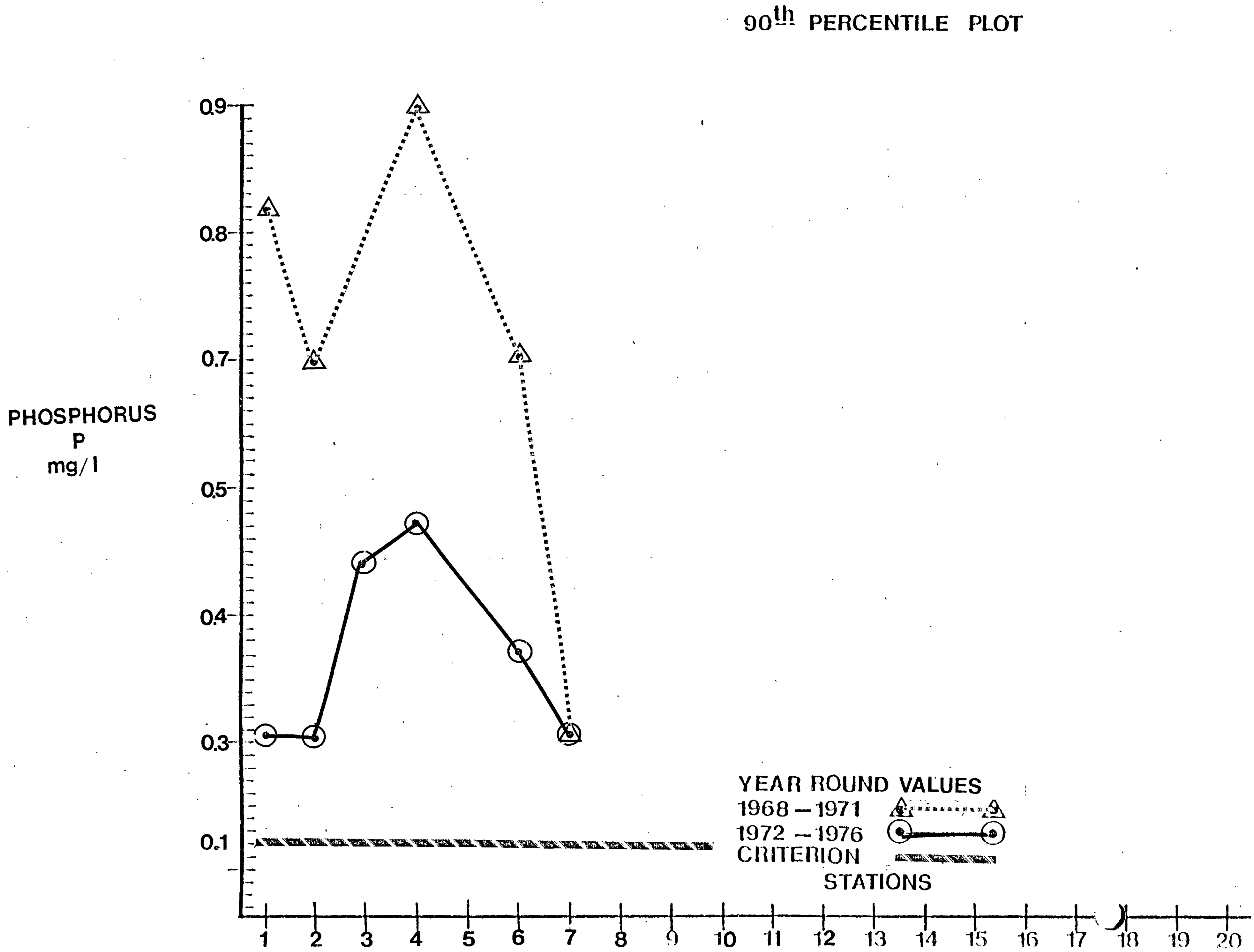

90th PERCENTILE PLOT
pH
8.8
8.5
8.2
8.0
7.7
4.7
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
23

Figure VI.T.6



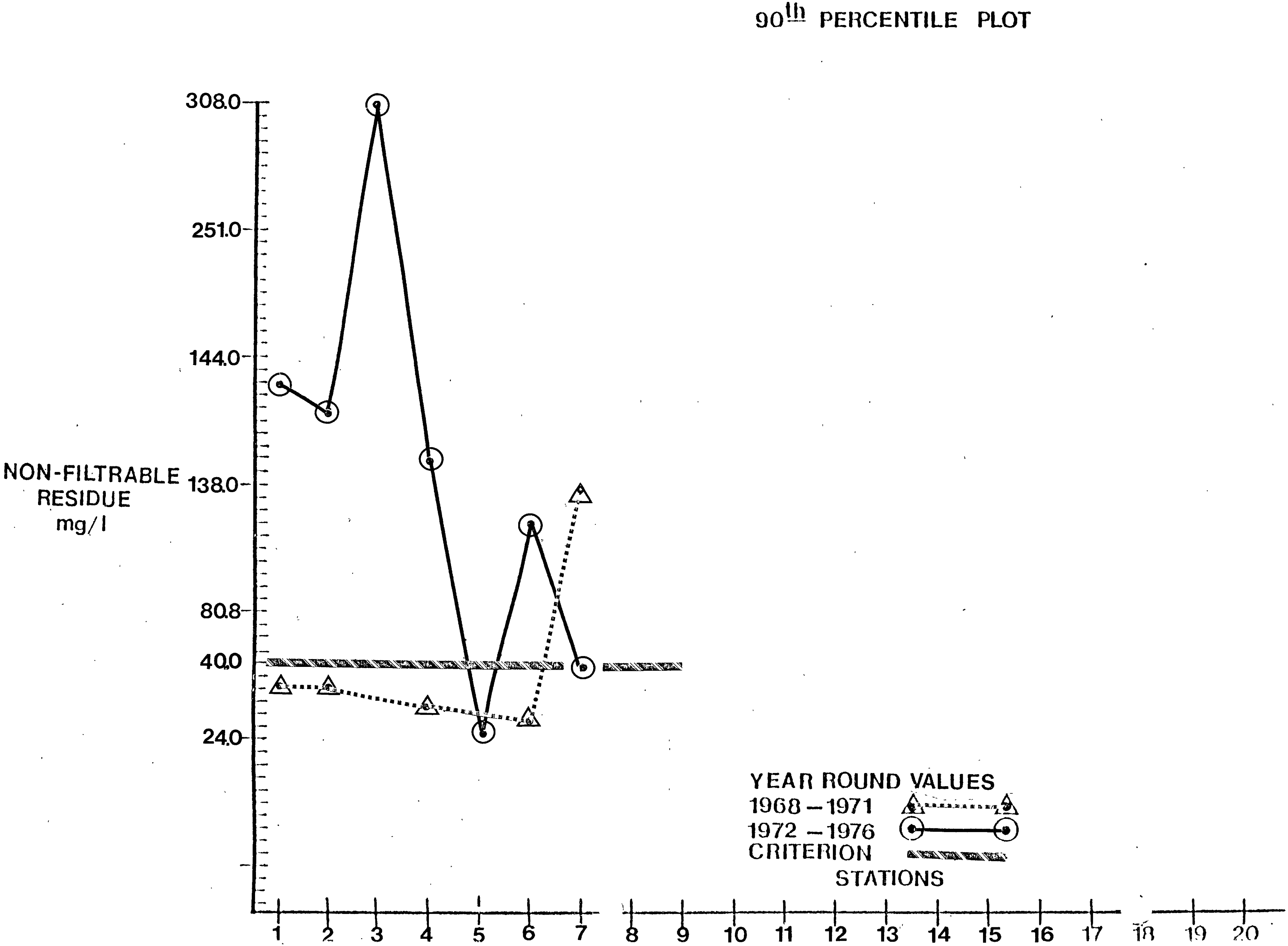
90th PERCENTILE PLOT
4.0
3.5
3.0
2.4
1.9
1.4
TOTAL NITRATE N mg/l
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21

Figure VI.T.7



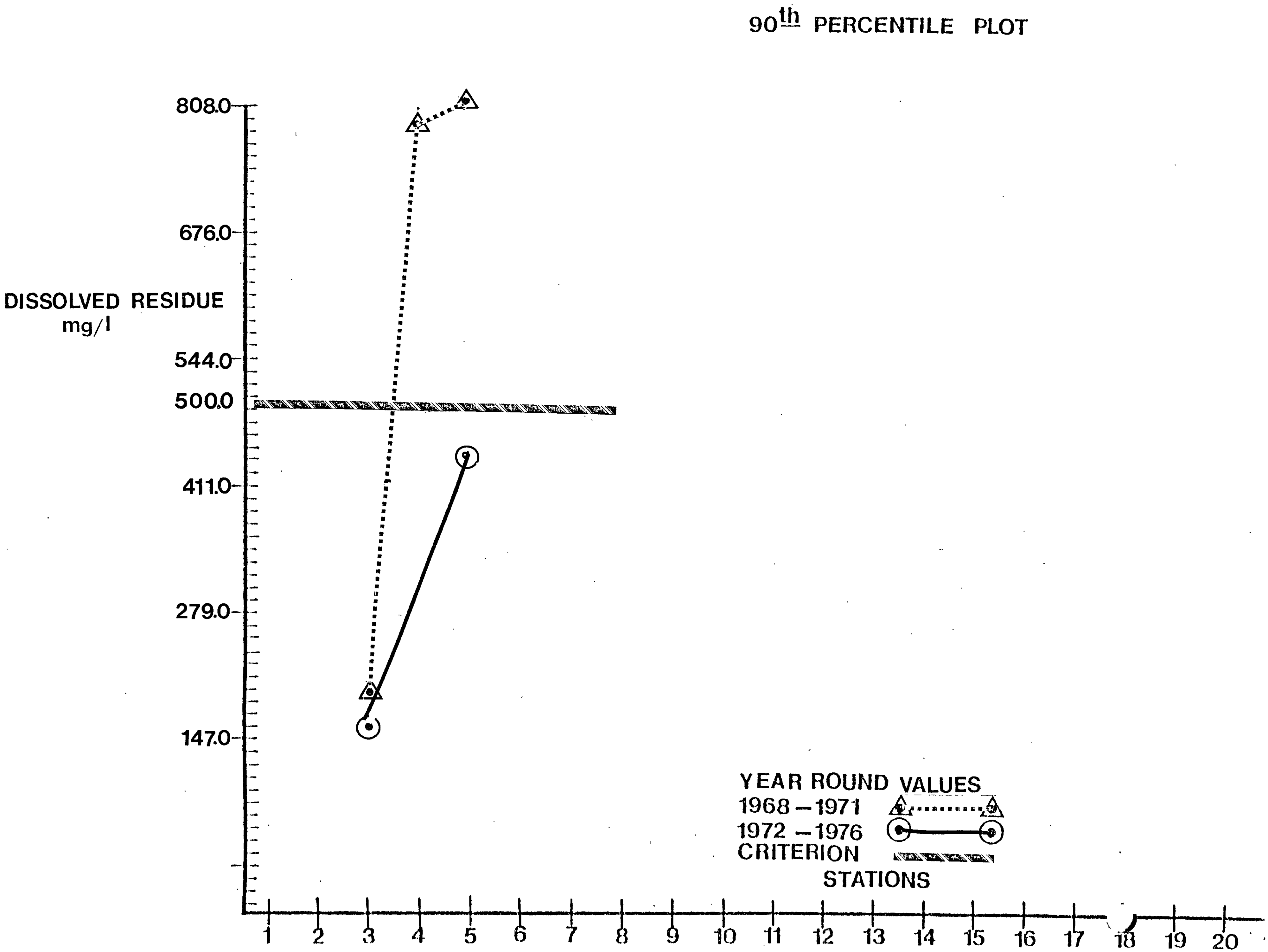
90th PERCENTILE PLOT
PHOSPHORUS
P
mg/l
0.9
0.8
0.7
0.5
0.4
0.3
0.1
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Figure VI.T.8



90th PERCENTILE PLOT
308.0
251.0
144.0
138.0
80.8
40.0
24.0
NON-FILTRABLE RESIDUE mg/l
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Figure VI.T.9


90th PERCENTILE PLOT
DISSOLVED RESIDUE
mg/l
808.0
676.0
544.0
500.0
411.0
279.0
147.0
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
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11
12
13
14
15
16
17
18
19
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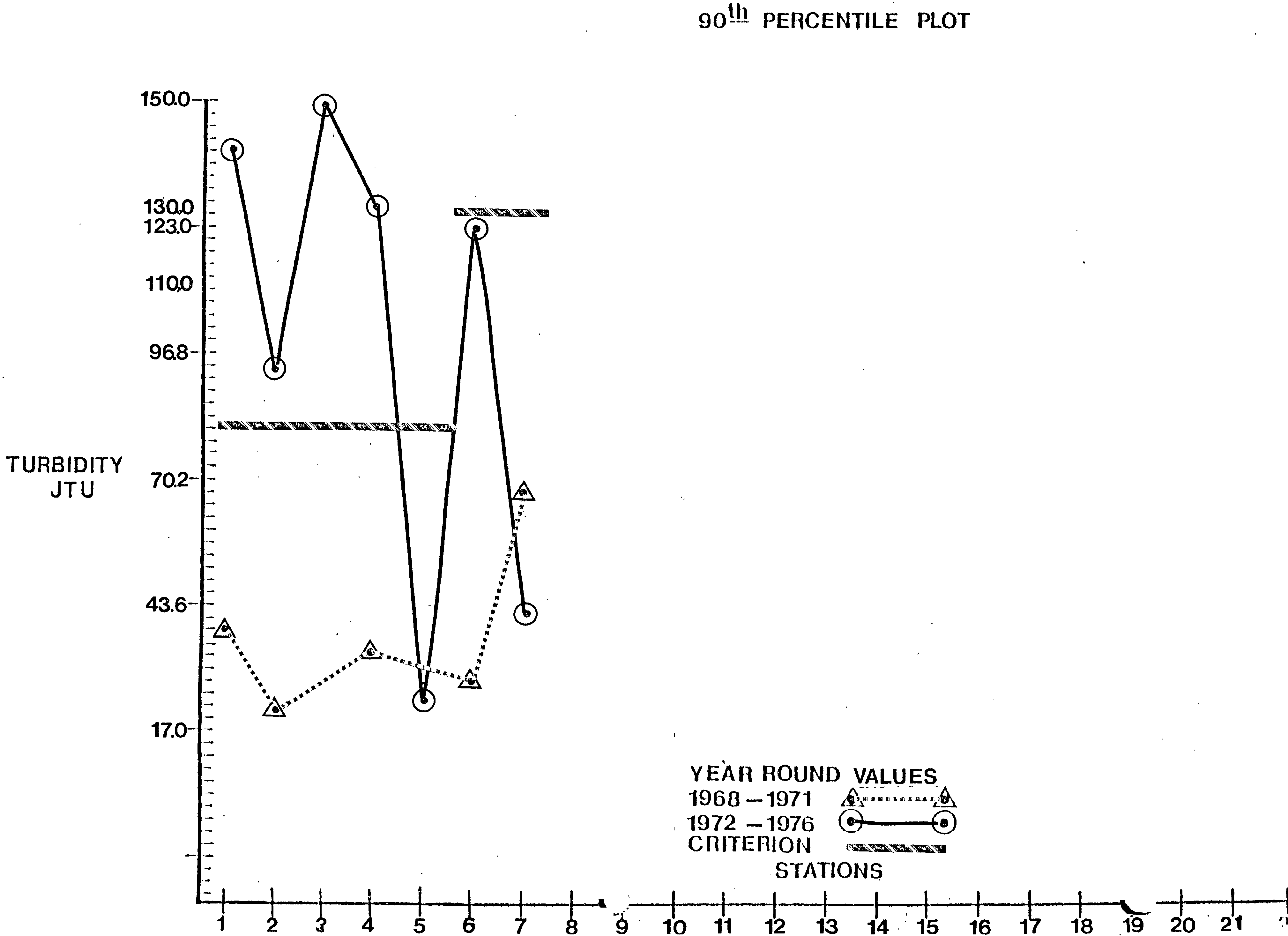
Figure VI.T.10



## Table VI.T.1 MUNICIPAL AND INSTITUTIONAL DISCHARGER INVENTORY

### Mainstem Raritan River Segment

| Map Number | Compliance with 1977 Secondary/ Best Practicable Treatment Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Avg. | Max. | Average Daily Effluent Quality (1975) BOD5 mg/l | BOD5 #/Day | NH3-N mg/l | NH3-N #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | No | Middlesex County Sewerage Authority | Sayreville | Raritan Bay | 0020141 | Primary | 54.0 | 85.0 | 93.0 | 220 | 156000 | | | SS 80 mg/l 56700 #/Day |
| B | No | Boro of Atlantic Highlands | Atlantic Highlands | Sandy Hook Bay | 0025402 | Primary | .6 | .61 | | 33.3 | 169.4 | | | SS 27.6 mg/l 140.4 #/Day |
| C | No | Manville STP | Manville | Raritan | | Advanced | | 1.6 | 2.5 | 15.0 | 200.0 | | | SS 20.0 mg/l 270.0 #/Day |
| D | No | City South Amboy | South Amboy | Raritan Bay | 0020541 | Primary | 1.0 | .82 | | 118.0 | 806.9 | 22.1 | 151.0 | SS 98.0 mg/l 670.2 #/Day |
| E | Yes | Keasbey STP | Woodbridge | Kinsey Creek | 0002041 | Primary | 1.35 | 1.0 | 2.0 | 60.0 | 500.0 | | | SS 50.0 mg/l 420.0 #/Day |
| F | No | Perth Amboy STP | Perth Amboy | Raritan | 0023213 | Primary | | 5.5 | 9.5 | 120 | 5500 | | | SS 75.0 mg/l 3440 #/Day |
| G | Yes | Rutgers, Busch Campus | Piscataway | Raritan | 0022616 | Secondary | .3 | .4 | 1.0 | 5.0 | 16.0 | | | SS 10.0 mg/l 33.0 #/Day |
| H | No | Laurence Harbor STP | Old Bridge | Raritan Bay | 0022471 | Primary | 1.4 | 1.0 | 1.5 | 168 | 1400 | | | SS 144 mg/l 1200 #/Day |
| | No | Melrose STP | Sayreville | Raritan Bay | 0022833 | Primary | .15 | .05 | .07 | | | | | |

## Table VI.T.1 INDUSTRIAL DISCHARGERS INVENTORY (cont'd)

### Mainstem Raritan River Segment

| Map Number | Compliance with 1977 Secondary / Best Practicable treatment Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Flow (mgd) 1975 Avg. | Flow (mgd) 1975 Max. | Average Daily Effluent Quality (1975) $BOD_5$ mg/l | $BOD_5$ #/Day | $NH_3$-N mg/l | $NH_3$-N #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | U.S. Gypsum Co. | South Plainfield | Bound Brook | 0022411 | Cooling Water | | .082 | | 123.0 | 84.0 | | | SS 161.1 mg/l 110.0 #/Day |
| I | Yes | Johns-Manville Discharge #1 | Manville | Raritan | 0001678 | Industrial | 3.74 | 5.0 | 7.0 | 10.0 | 400.0 | | | SS 2.0 mg/l 80.0 #/Day |
| J | Yes | Johns-Manville Discharge #2 | Manville | Raritan | 0001678 | Stormwater | 9.35 | 7.5 | 9.5 | | | | | |
| | | Foley Machinery | Piscataway | Ambrose Brook | 0000043 | | .011 | .03 | | | | | | |
| L | | National Starch | Plainfield | Bonnygutt Brook | 0001333 | | | .35 | | 4.0 | 10.0 | | | SS 9.0 mg/l 25.0 #/Day |
| M | No | American Cyanamid | Bridgewater | Cuckels Brook | 0002313 | Secondary | 22.[illegible] | 20.0 | 25.0 | 10.0 | 1670.0 | | | SS 50.0 mg/l 8330.0 #/Day |
| N | No | Somerset-Raritan Valley S.A. | Bridgewater | Cuckels Brook | 0024864 | Secondary | 10.0 | 4.5 | 5 | 30.0 | 1130.0 | | | SS 50.0 mg/l 1880.0 #/Day |
| | | GAF Granvle Mfg. Div. | Bridgewater | Middle Brook | 0021806 | | | | | | | | | |

Table VI.T.1 (cont'd) INDUSTRIAL DISCHARGERS
Mainstem Raritan River Segment

| Map Number | Compliance with 1977 Secondary / Best Practicable treatment Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Avg. | Max. | Average Daily Effluent Quality (1975) BOD5 mg/l | #/Day | NH3-N mg/l | #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| b | | Jersey Central Power & Light | Sayreville | Raritan | 0002747 | Cooling Water | 329 | 200 | 300 | | | | | |
| | | Panacon, Philip Carey | Perth Amboy | Raritan | 0000051 | | | | | | | | | |
| | | Tenneco Plastics | Edison | Raritan | 0001791 | | Recycled .23 | 0 | 0 | | | | | |
| P | No | National Lead Titanium Pigment | Sayreville | Raritan | 0000931 | Primary | 38.0 | 32.0 | 37.0 | .3 | 100 | | | |
| Q | | Jersey Central Power & Light | South Amboy | Raritan | 0002755 | Cooling Water | 222 | 100 | 220 | | | | | |
| | | Union Carbide | Piscataway | Raritan | | Stormwater | | | | | | | | SS 50.0 mg/l |
| | | Elizabethtown Water Co. | Bridgewater | Raritan | | Filter Backwash | | | | | | | | |

## Table VI.T.1 (cont'd) INDUSTRIAL DISCHARGER INVENTORY

Mainstem Raritan River Segment

| Map Number | Compliance with 1977 Secondary / Best Practicable treatment Requirement | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Avg. | Max. | Average Daily Effluent Quality (1975) $BOD_5$ mg/l | $BOD_5$ #/Day | $NH_3$-N mg/l | $NH_3$-N #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Tenneco Chemical Inc. Discharge #1 | Woodbridge | Black Ditch | 0000116 | Cooling Water | | .525 | | 30.0 | 131.0 | 24.7 | 108.2 | SS 4.0 mg/l<br>18.0 #/Day<br>O&G 240 #/Day<br>Temp. W-40°F<br>S-90°F |
| | | Discharge #2 | Woodbridge | Slingtail Brook | 0000116 | None | | .03 | | 110.0 | 27.0 | 40.0 | 10.0 | SS 25.0 mg/l<br>6.3 #/Day<br>pH SU 6.5<br>Temp W 34°F<br>S 80°F |
| R | | Discharge #3 | Woodbridge | Slingtail Brook | 0000116 | Industrial | | 1.0 | | 1300 | 2713 | | | SS 72.0 mg/l<br>605.0 #/Day<br>pH SU 8.0<br>Temp W 40°F<br>S 90°F |
| S | | Jersey Central Power & Light | South Amboy | Raritan River | 0002755 | Cooling WAter | | 197.7 | | 2.0 | 3297.6 | | | SS 83.0 mg/l<br>136,852 #/Day<br>pH SU 7.3<br>Temp W 52°F<br>S 81°F<br>$Cl_2$ Res. .75 mg/l |
| T | | Ortho Diagnotics, Inc. | Raritan Twp. | Woodmere Brook | 0001988 | None | | .480 | | 18 | 72 | | | SS 94 mg/l<br>376 #/Day |

Table VI.T.1 MUNICIPAL AND INSTITUTIONAL DISCHARGERS
(cont'd) Raritan Bayshore Segment

| Map Number | Compliance with 1977 Secondary / Best Practicable treatment Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Avg. | Max. | Average Daily Effluent Quality (1975) $BOD_5$ mg/l | $BOD_5$ #/Day | $NH_3$-N mg/l | $NH_3$-N #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| T | No | Boro of Highlands | Highlands | Shrewsbury River | 0026204 | Primary | 1.2 | .55 | | 108.8 | 499.0 | 19.8 | 90.8 | SS 92.7 mg/l<br>425.5 #/day<br>$Cl_2$Res.7.4 mg/l |
| U | No | Boro of Matawan | Matawan Boro | Matawan Creek | 0022527 | Primary | .8 | .78 | | 158.0 | 1027.0 | | | SS 105.8 mg/l<br>688.0 #/day |
| V | Yes | Middletown Twp. S.A. Discharge #1 | Middletown Township | Monmouth Co. Outfall Atlantic Ocean | 0025356 | Secondary | 6.5 | 4.86 | 5.15 | 5.5 | 223.0 | 14.0 | 567.3 | SS 21.0 mg/l<br>851.0 #/day<br>FC 945 MAN/ 100ML |
| W | | Discharge #2 | Middletown Township | Comptons Creek | | Secondary | 6.5 | 4.86 | 5.15 | 5.5 | 223.0 | 14.0 | 567.3 | SS 21.0 mg/l<br>851.0 #/day<br>FC 945 MAN/ 100ML<br>Emergency Only |
| X | No | Bayshore Regional Sewerage Authority Discharge #1 | Union Beach | Atlantic Ocean | 0024708 | Secondary | 6.0 | 4.146 | 4.75 | 11.0 | 380.0 | 17.8 | 614.7 | SS 32.5 mg/l<br>1124 #/day<br>FC 20 MAN/100 ML |

Table VI.T.1. MUNICIPAL AND INSTITUTIONAL DISCHARGERS
(cont'd) Mainstem Raritan River Segment

| Map Number | Compliance with 1977 Secondary / Best Practicable treatment Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Avg. | Max. | Average Daily Effluent Quality (1975) BOD$_5$ mg/l | BOD$_5$ #/Day | NH$_3$-N mg/l | NH$_3$-N #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Y | | Discharge #2 | Union Beach | Raritan Bay | 0024708 | Secondary | 6.0 | 4.146 | 4.75 | 11.0 | 380.0 | 17.8 | 614.7 | SS 32.5 mg/ 1124 #/day FC 20 MAN/ 100ML Emergency Only |
| Z | | Monmouth Co. Transmittal Facility | Middletown Township | Atlantic Ocean | 0024694 | | 33.0 | 5.06 | 5.35 | | | | | |
| A' | Yes | NE Monmouth CO. Regional Sewerage Authority | Monmouth Beach | Atlantic Ocean | 0026735 | Secondary | 10.0 | 7.1 | 9.3 | 6.0 | 355.0 | 15.1 | 849.9 | SS 13.0 mg/l 770.0 #/day FC 214 MPN/ 100ML |
| | | US Army Electronics Command Discharge #1 | Oceanport | Parkers Creek | 0022174 | | 0.07 | | | | | | | |

**Table VI.T.1 (cont'd) INDUSTRIAL DISCHARGERS**

**Raritan Bayshore Segment**

| Map Number | Compliance with 1977 Secondary / Best Practicable treatment Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Avg. | Max. | Average Daily Effluent Quality (1975) $BOD_5$ mg/l | #/Day | $NH_3$-N mg/l | #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Monmouth Consolidated Water Co. | Middletown | Swimming River | 0001830 | Industrial | 17.4 | 0 | | | | | | pH 7.6-8.2 SU<br>TS-99 #/day |
| | | US Army Electronics Command Discharge #2 | Oceanport | Parkers Creek | 0022174 | Industrial | | | | | | | | |
| | | Cheese-borough Ponds | Perth Amboy | Raritan | 0002381 | Indus-trial | .15 | | | | | | | |

## SOUTH BRANCH RARITAN RIVER

### BASIN DESCRIPTION

The South Branch begins at Budd Lake in Morris County and flows south through rural and agricultural Hunterdon and Somerset Counties. Its drainage covers 279 square miles and encompasses Spruce Run and Round Valley Reservoirs. There are no marshes, swamps or natural lakes. Intensive development exists at Mount Olive with commercial and industrial development also occurring at Clinton.

### WATER QUALITY ASSESSMENT

Although water quality of the South Branch watershed is generally good and is utilized as a source for potable water supplies, maintaining fishable quality and achieving swimmable quality by 1983 will be extremely difficult. Fecal coliform bacteria counts have decreased slightly, but continue to exceed the criterion throughout the entire length of the South Branch. Dissolved oxygen levels continue to be above criterion levels throughout the South Branch drainage basin, but excessive nitrate and phosphorus nutrient levels have contributed to eutrophication and periodic fish kills in Spruce Run Reservoir. Five day biochemical oxygen demand exceeds the criterion upstream and at Stanton and Three Bridges stations downstream. The pH levels exceed the criterion below Budd Lake to the confluence with Drake's Brook and below High Bridge to the confluence with the North Branch Raritan River. Non-filtrable residue (suspended solids) has increased with time. Turbidity levels have also increased, although levels at all stations remain below the criterion.

### PROBLEM ASSESSMENT

The chief problems in water quality of the South Branch are those of nutrient loading and excessive fecal coliforms. Non-point sources contribute excessive bacteria, phosphorus, and nitrate loadings through agricultural runoff, septic seepage, and storm water runoff. Additionally, tributaries such as Spruce Run, Holland Brook, and Drake's Brook tend to flood and increase suspended solids levels.

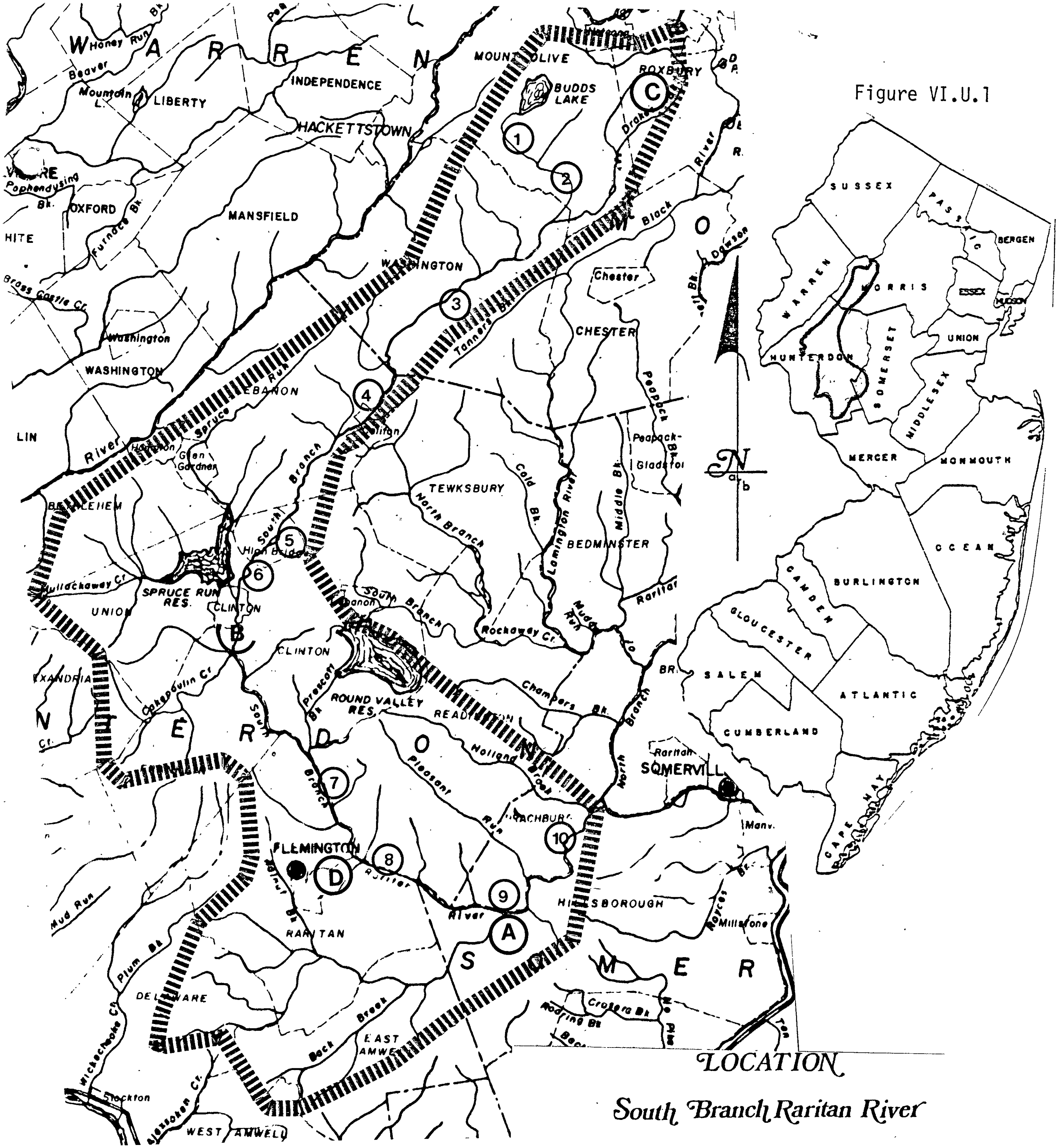
### GOAL ASSESSMENT AND RECOMMENDATIONS

Waters of the South Branch warrant protection under the states non-degradation policy to insure maintenance of existing fishable quality despite ongoing residential, commercial, and industrial development activities, such as those occurring in Mount Olive Township. Seasonal low stream flows throughout this drainage basin demand greater than secondary treatment levels currently practiced. If swimmable goals are to be met in the future, intensive surveys must be conducted to define major non-point source contributions of excessive fecal coliform levels, and aggressive measures must be taken to correct defined problems through enforcement, sewage treatment upgrading, and sound planning. Efforts by the Division have resulted in an improved water treatment system at the Welsh Farms facility on the South Branch.

## SOUTH BRANCH STATION LIST

1. South Branch Raritan River at Budd Lake Outlet.
2. South Branch Raritan River at Bartley.
3. South Branch Raritan River at Long Valley.
4. South Branch Raritan River at Califon.
5. South Branch Raritan River near High Bridge.
6. South Branch Raritan River at High Bridge.
7. South Branch Raritan River at Stanton.
8. South Branch Raritan River at Copper Hill.
9. South Branch Raritan River at Three Bridges.
10. South Branch Raritan River at South Branch.

Figure VI.U.1




LOCATION

South Branch Raritan River

LEGEND

Point Source Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

Monitoring Site ① ② ③ ④

Drainage Basin Boundaries

County Bounderies

Municipal Bounderies

Figure VI. 2

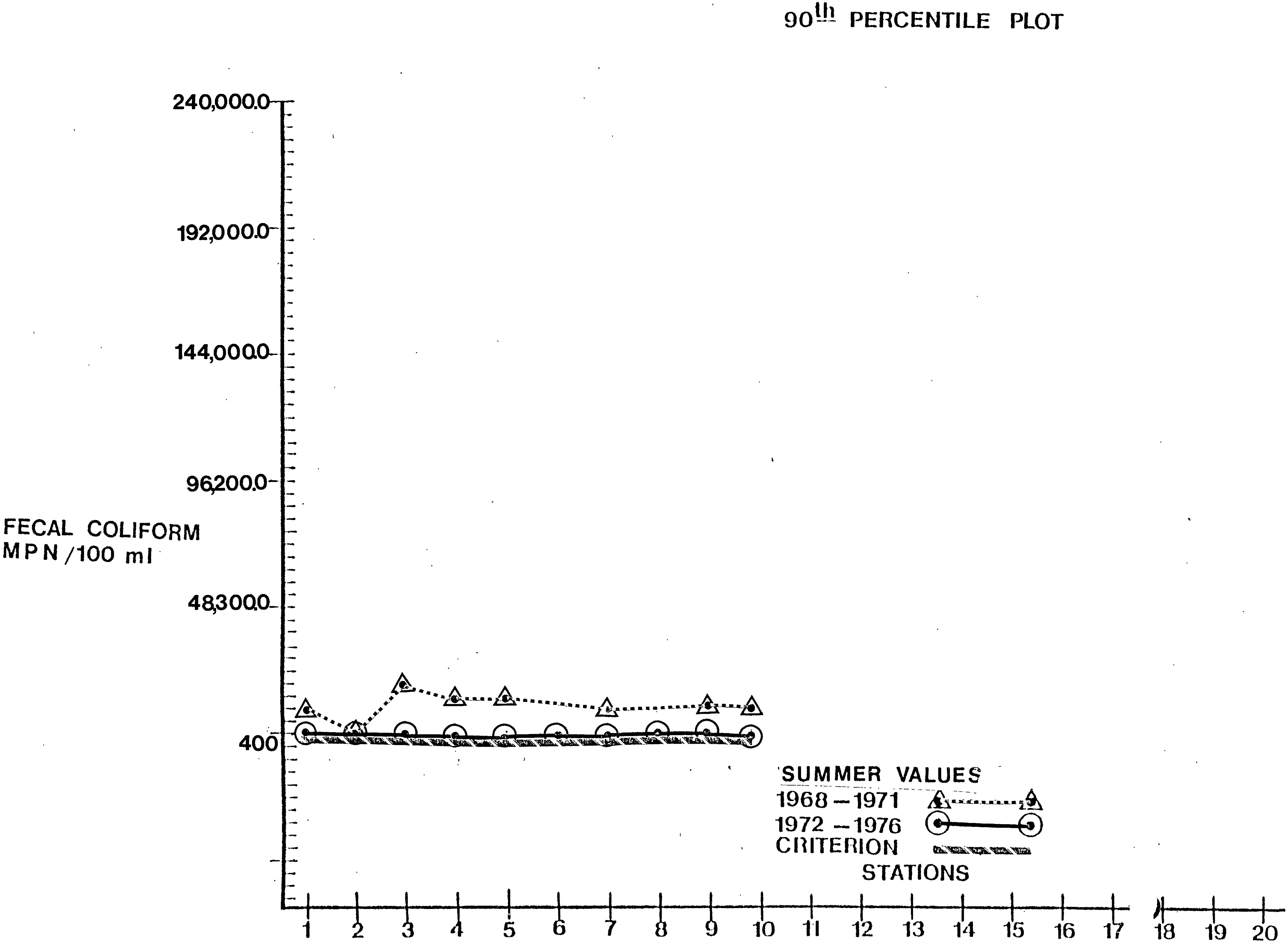

90th PERCENTILE PLOT
240,000.0
192,000.0
144,000.0
96,200.0
48,300.0
400
FECAL COLIFORM
MPN/100 ml
SUMMER VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Figure VI.U.3

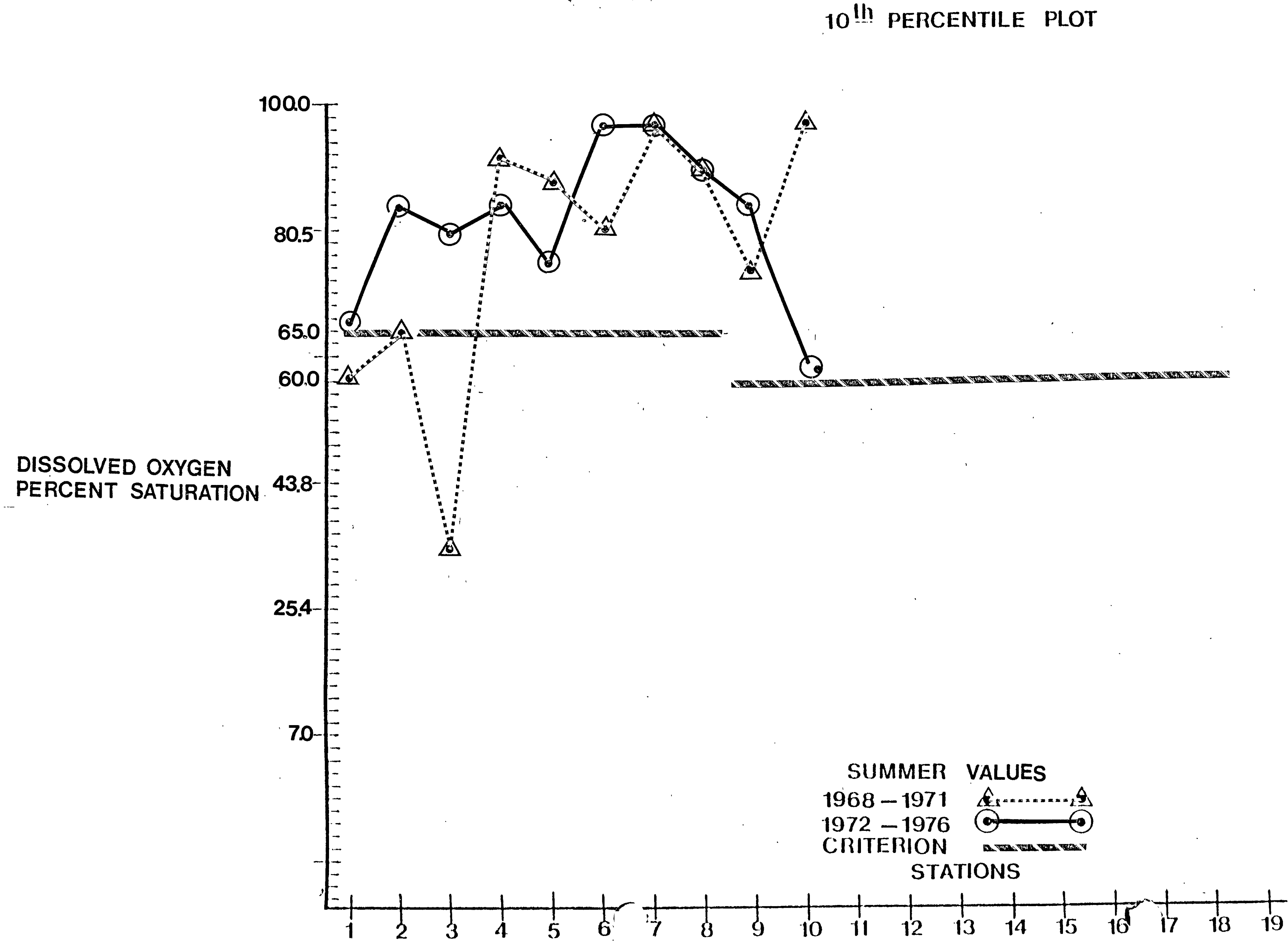

10th PERCENTILE PLOT
100.0
80.5
65.0
60.0
43.8
25.4
7.0
DISSOLVED OXYGEN
PERCENT SATURATION
SUMMER VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19

Figure VI-4

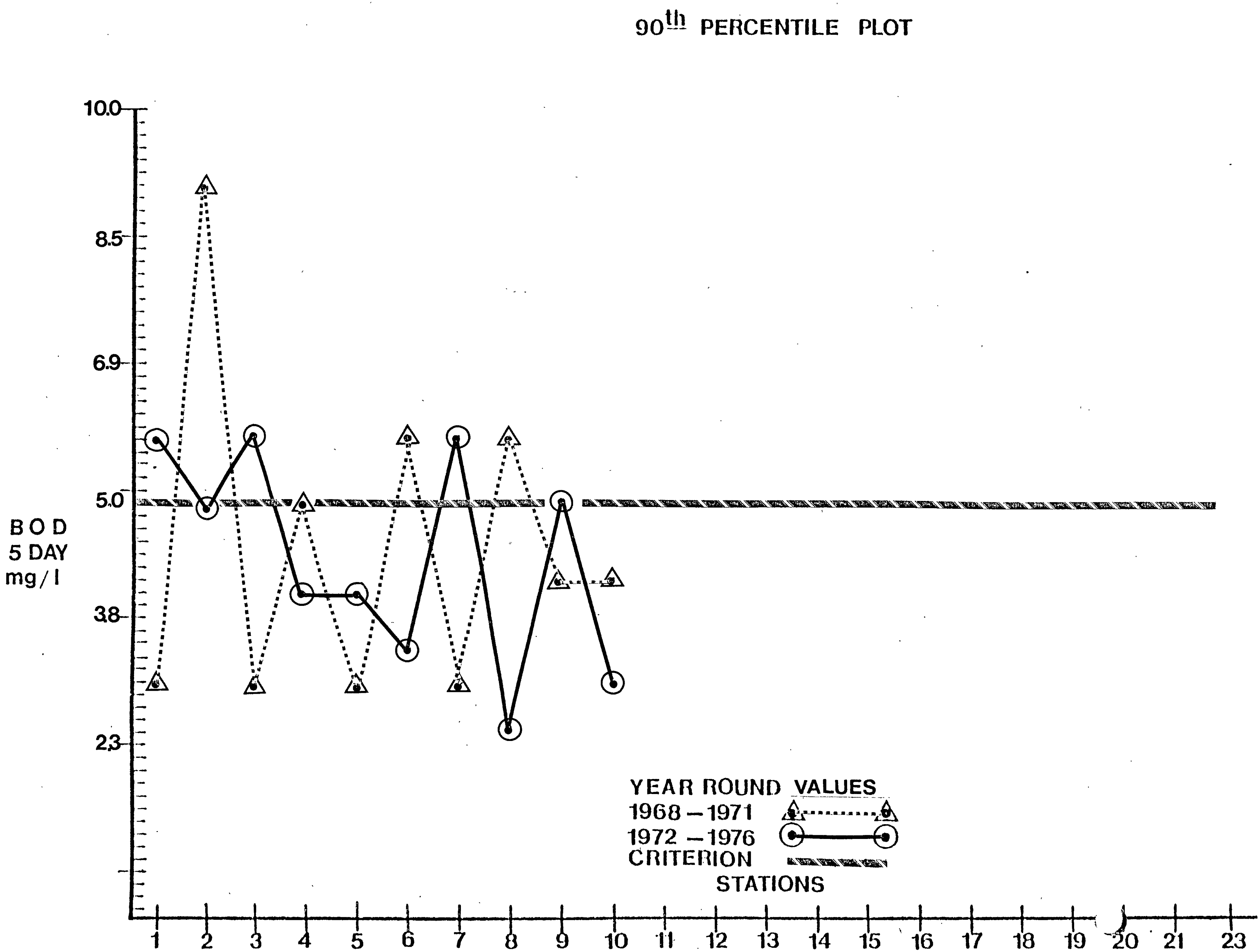
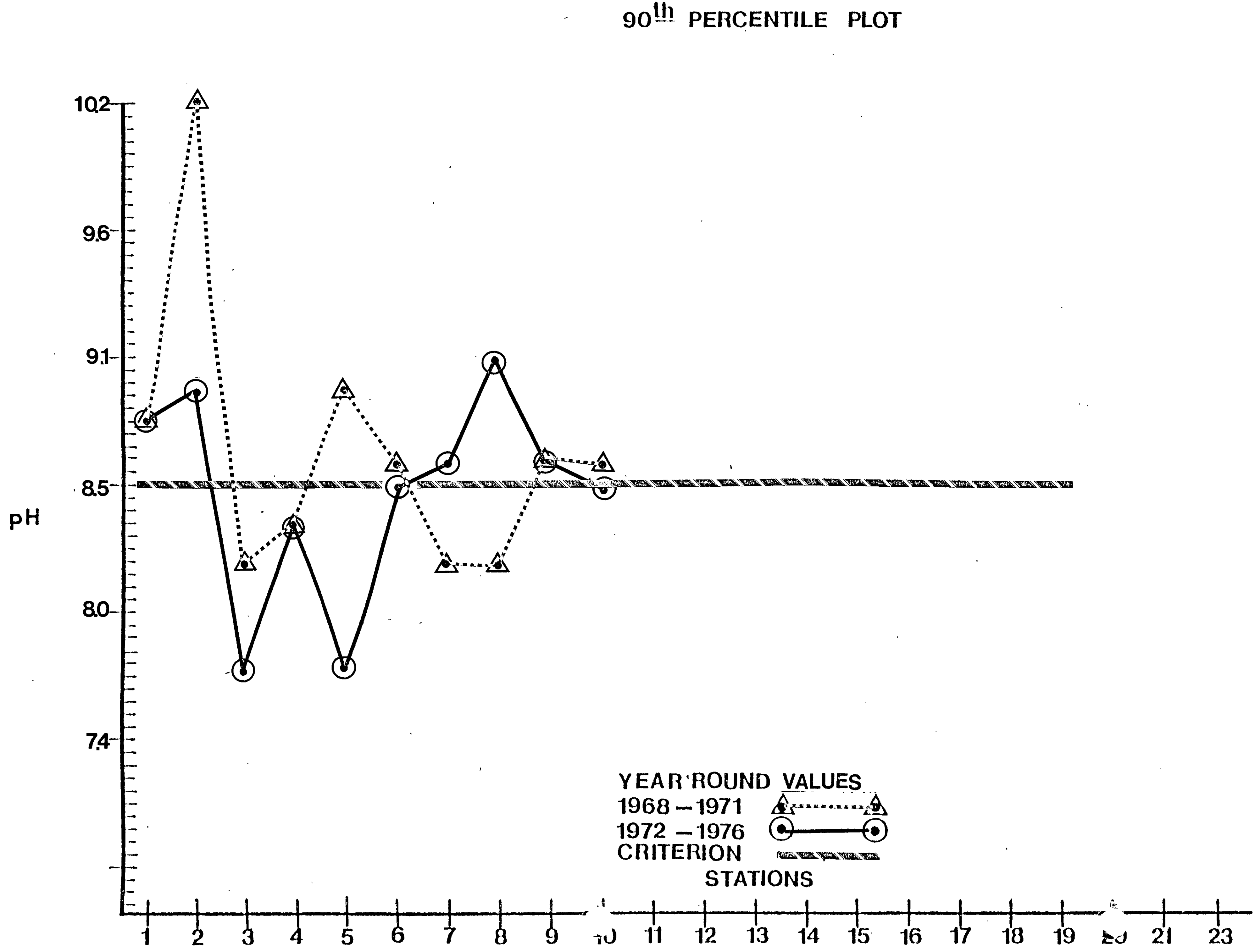

90th PERCENTILE PLOT
10.0
8.5
6.9
5.0
3.8
2.3
BOD
5 DAY
mg/l
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
23

Figure VI.U.5



90th PERCENTILE PLOT
10.2
9.6
9.1
8.5
8.0
7.4
pH
YEAR ROUND VALUES
1968 — 1971
1972 — 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
11
12
13
14
15
16
17
18
19
21
23

Figure VI.U.6

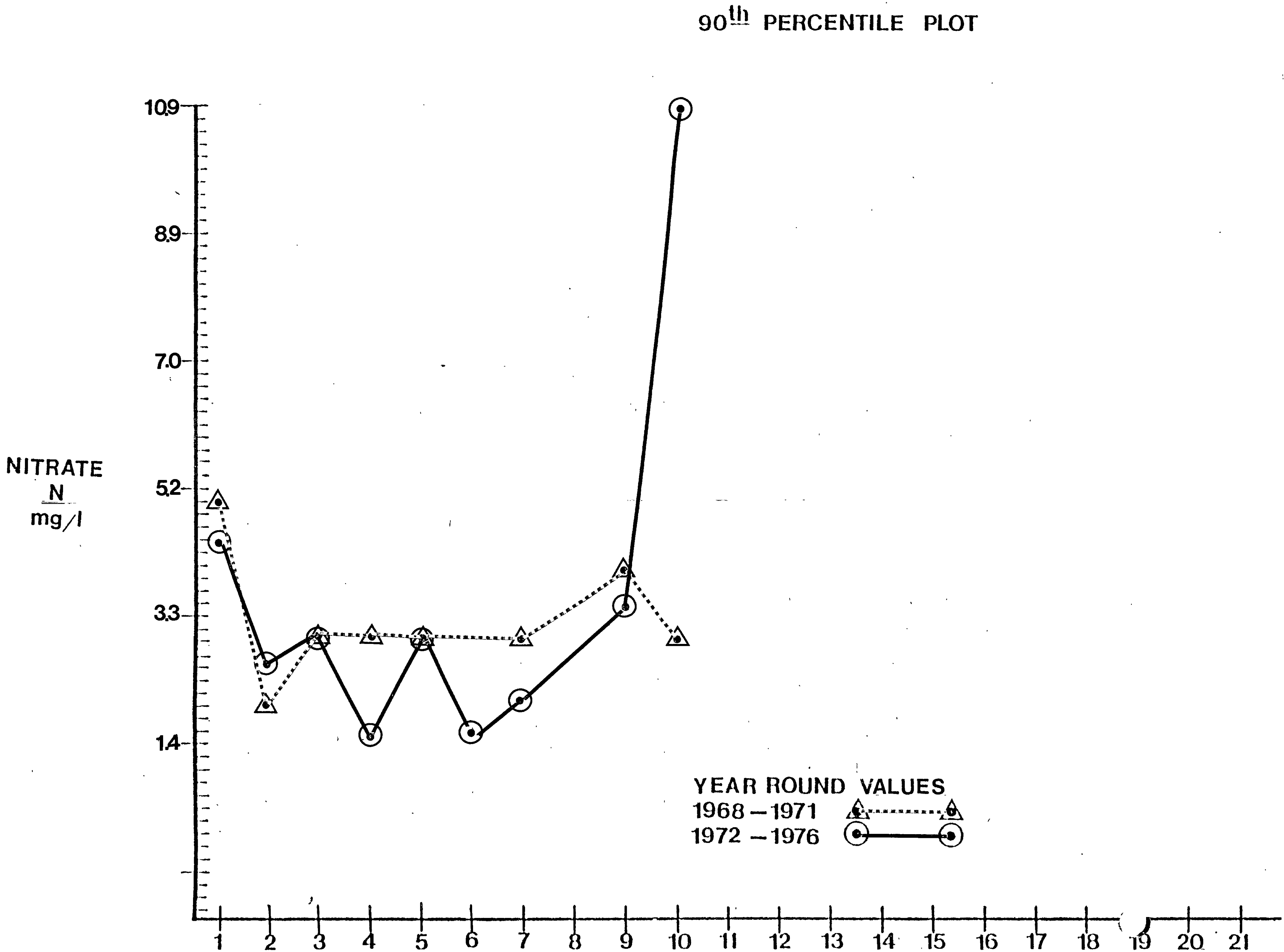

90th PERCENTILE PLOT
NITRATE
N
mg/l
10.9
8.9
7.0
5.2
3.3
1.4
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
YEAR ROUND VALUES
1968 – 1971
1972 – 1976

Figure VI.U.7

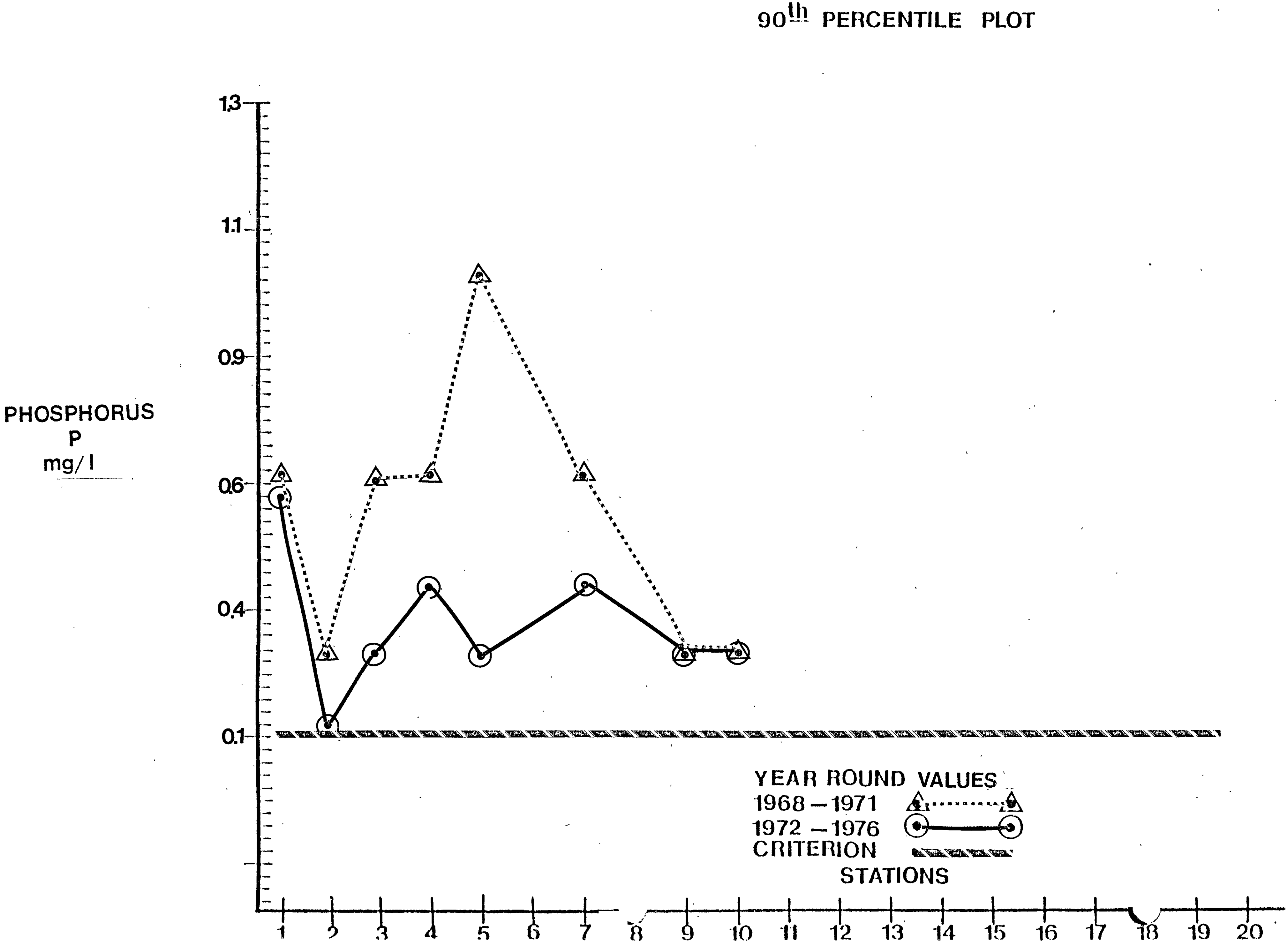

90th PERCENTILE PLOT
PHOSPHORUS
P
mg/l
1.3
1.1
0.9
0.6
0.4
0.1
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Figure VI.U.8

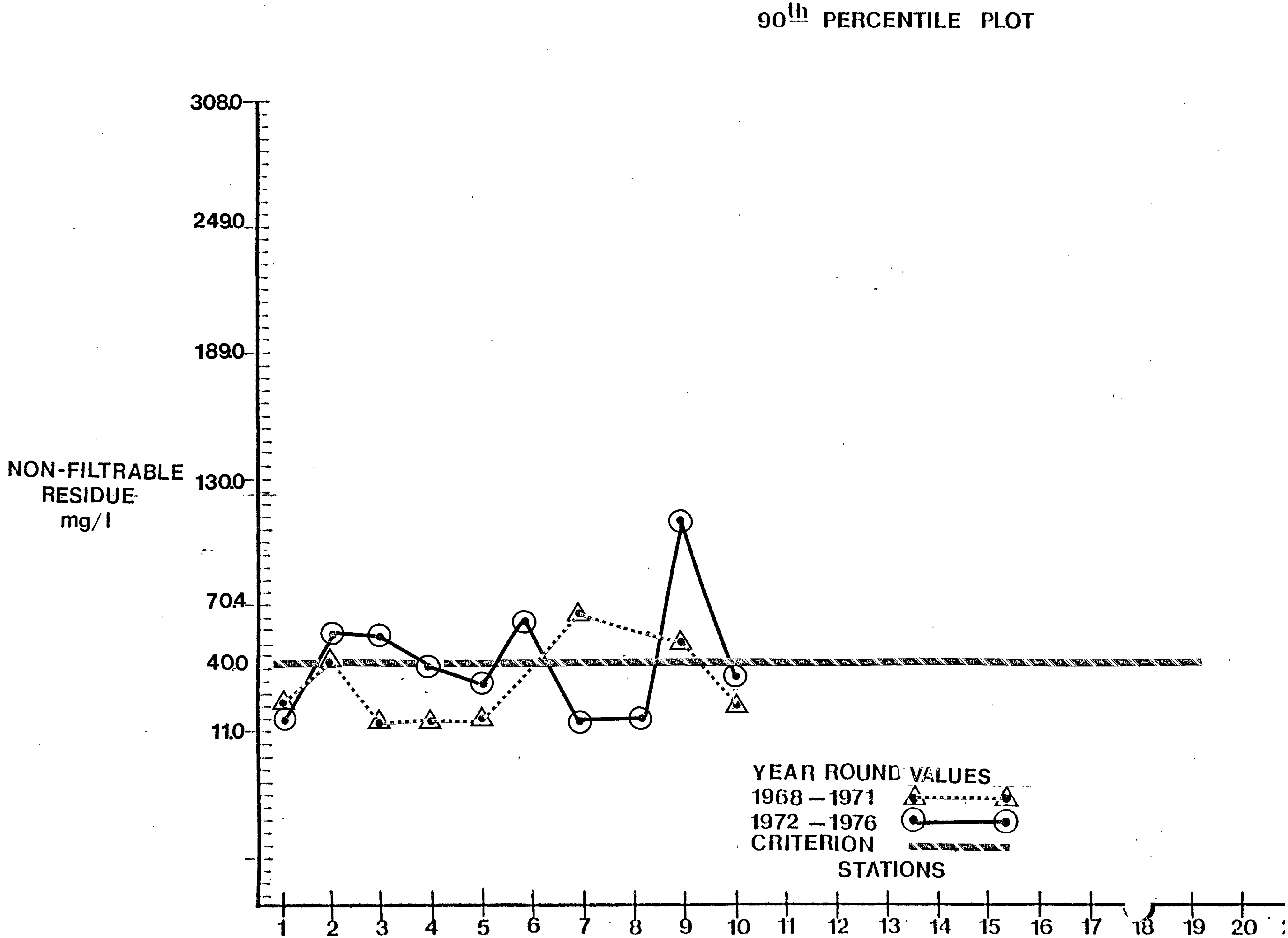
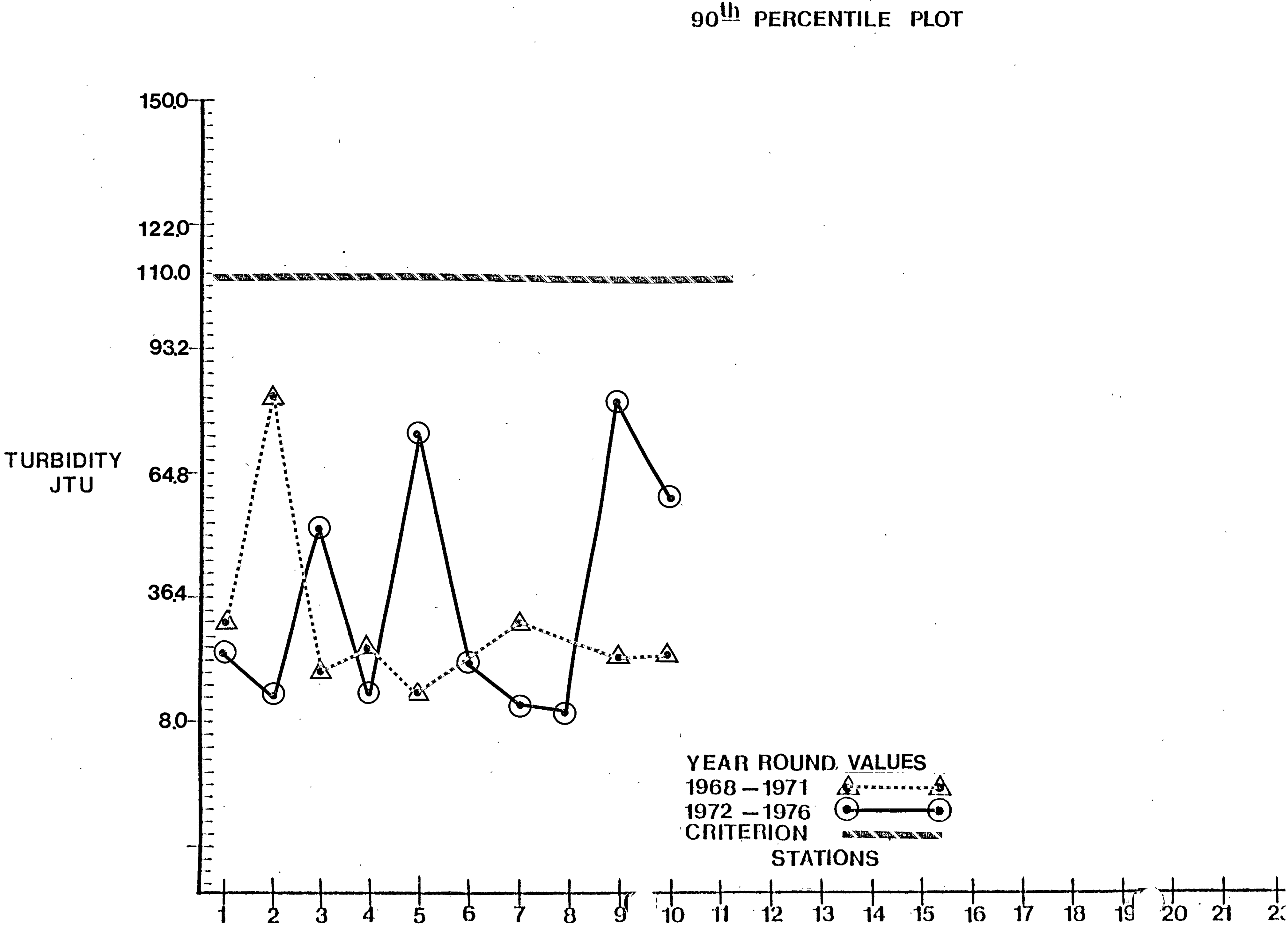

90th PERCENTILE PLOT
NON-FILTRABLE RESIDUE mg/l
308.0
249.0
189.0
130.0
70.4
40.0
11.0
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Figure VI.U.9


90th PERCENTILE PLOT
150.0
122.0
110.0
93.2
64.8
36.4
8.0
TURBIDITY
JTU
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21

## Table VI.U.1 MUNICIPAL AND INSTITUTIONAL DISCHARGER INVENTORY

### South Branch Raritan River Segment

| Number | Compliance with 1977 Secondary / Best Practicable treatment Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Avg. | Max. | Average Daily Effluent Quality (1975) $BOD_5$ mg/l | $BOD_5$ #/Day | $NH_3$-N mg/l | $NH_3$-N #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | Yes | Raritan Twp. MUA | Raritan Twp. | So. Branch Raritan | 0022047 | Secondary | 1.6 | 1.2 | | 20.7 | 207.1 | 3.8 | 38.0 | SS 19.1 mg/l 191.1 #/Day 7.2-7.6 pH $Cl_2$ Res 0.5 mg/l |
| B | Yes | Town of Clinton | Clinton Twp. | So. Branch | 0020389 | Secondary | 1.0 | .573 | | 66.1 | 315.9 | 16.7 | 79.8 | SS 390.5 mg/l 1866.1 #/Day |
| | Yes | North Hunterdon High School | Clinton Twp. | Cramer Creek So. Branch | 0028363 | Secondary | .046 | .016 | | 10.0 | 1.33 | 24.5 | 3.3 | SS 1.20 mg/l .160 #/Day |
| C | No | Mt. Olive Twp. | Mt. Olive Twp. | Drake's Brook So. Branch | 0021954 | | .28 | .379 | | 49.7 | 157.2 | | | SS 309.7 mg/l 979.0#/Day |
| | Yes | Welsh Farms Inc. Discharge #1 | Long Valley | Electric Brook So. Branch | 0001236 | Secondary | | .150 | | 185.6 | 232.1 | 2.24 | 2.8 | SS 69.5 mg/l 66.0#/Day |

Table VI.U.1 INDUSTRIAL DISCHARGERS
(cont'd)
South Branch Raritan River Segment

| Map Number | Compliance with 1977 Requirements of Secondary / Best Practicable treatment | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Flow (mgd) 1975 Avg. | Flow (mgd) 1975 Max. | Average Daily Effluent Quality (1975) $BOD_5$ mg/l | $BOD_5$ #/Day | $NH_3$-N mg/l | $NH_3$-N #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Yes | Welsh Farms Inc. | Long Valley | Electric Brook So. Branch | 0001236 | Industrial | | .135 | | 16.4 | 18.4 | | | SS 46.2 mg/l 52.0 #/Day |
| D | Yes | Tenneco Chemicals, Inc. | Raritan Twp. | Bushkill Creek | 0001660 | Industrial | | 3.2 | | 3.0 | 80.1 | | | SS 15 mg/l 400 #/Day |
| | | Ethyl Corp. Visqueen Div. | Raritan Twp. | South Branch | 0003298 | Industrial | | .06 | | | | | | |
| | | A. M. Best Co. | Oldwick | Rockaway Creek | 0028452 | Advanced | .0075 | .002 | | 14.5 | .24 | | | SS 17 mg/l .28 #/Day |
| | | Washington Wood Products | Washington | Shabecong Creek | 0024422 | Industrial | | .00006 | | | | | | |
| | | Flemington Pipeline Terminal | Raritan Twp. | Second Neshanic River | 0000892 | Industrial | | | | | | | | O&G .25 mg/l Color 37.5 SU Turb. 103.5 SU |

Table VI.U.1 (cont'd) MUNICIPAL AND INSTITUTIONAL DISCHARGERS

South Branch Raritan River Segment

| Map Number | Compliance with 1977 Requirements of Secondary / Best Practicable treatment Limitations | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Flow (mgd) 1975 Avg. | Flow (mgd) 1975 Max. | Average Daily Effluent Quality (1975) $BOD_5$ mg/l | $BOD_5$ #/Day | $NH_3$-N mg/l | $NH_3$-N #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Yes | N. J. Reformatory at Annandale | Clinton | Beaver Brook | | Secondary | .2 | .048 | | 22.4 | 8.9 | | | SS 20.4 mg/l 8.1 #/Day |
| | | Squibb Agriculture Research Center | Readington | South Branch | 0003904 | Advanced | .045 | .005 | | 3.8 | .16 | | | SS 3.0 mg/l .13 #/Day |

Table VI.U.1 INDUSTRIAL DISCHARGERS

South Branch Raritan River Segment

| Discharger | Municipality | Receiving Stream | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Flow (mgd) 1975 Avg. | Flow (mgd) 1975 Max. | Average Daily Effluent Quality (1975) $BOD_5$ mg/l | $BOD_5$ #/Day | $NH_3$-N mg/l | $NH_3$-N #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Wilson Products Co., Div. of Dart Ind. | Hillsborough | South Branch | Cooling Water | | .04 | | 2.4 | 1.0 | | | SS 70 mg/l 1.0 #/Day $NH_3$ .25 mg/l $NO_3$ .06 mg/l |
| Flemington Water Dept. | Flemington | Bushkill Creek | | | .006 | | | | | | |

Table VI.U.1 (cont'd) **MUNICIPAL AND INSTITUTIONAL DISCHARGERS**

South Branch Raritan River Segment

| Discharger | Municipality | Receiving Stream | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Avg. | Max. | Average Daily Effluent Quality (1975) $BOD_5$ mg/l | $BOD_5$ #/Day | $NH_3$-N mg/l | $NH_3$-N #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Raritan Twp. MUA | Raritan Twp. | So. Branch Raritan | Secondary | 1.6 | 1.2 | | 20.7 | 207.1 | 3.8 | 38.0 | SS 19.1 mg/l 191.1 #/Day 7.2-7.6 pH $Cl_2$ Res 0.5 mg/l |
| Town of Clinton | Clinton Twp. | So. Branch | Secondary | 1.0 | .573 | | 66.1 | 315.9 | 16.7 | 79.8 | SS 390.5 mg/l 1866.1 #/Day |
| North Hunterdon High School | Clinton Twp. | Cramer Creek So. Branch | Secondary | .046 | .016 | | 10.0 | 1.33 | 24.5 | 3.3 | SS 1.20 mg/l .160 #/Day |
| Mt. Olive Twp. | Mt. Olive Twp. | Drake's Brook So. Branch | | .28 | .379 | | 49.7 | 157.2 | | | SS 309.7 mg/l 979.0#/Day |
| Welsh Farms Inc. Discharge #1 | Long Valley | Electric Brook So. Branch | Secondary | | .150 | | 185.6 | 232.1 | 2.24 | 2.8 | SS 69.5 mg/l 66.0#/Day |

Table VI.U.1. MUNICIPAL AND INSTITUTIONAL DISCHARGERS
(cont'd) South Branch Raritan River Segment

| Map Number | Compliance with 1977 Secondary / Best Practicable treatment Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Avg. | Max. | Average Daily Effluent Quality (1975) BOD$_5$ mg/l | BOD$_5$ #/Day | $NH_3$-N mg/l | $NH_3$-N #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Yes | West Morris Regional High School District | Mt. Olive | Subsurface | 0020702 | Secondary | .025 | .01 | | 30.2 | 2.5 | | | SS .27 mg/l .057 #/Day |
| | Yes | Upper Elementary School | Mt. Olive | Subsurface | 0022683 | Secondary | .028 | .01 | | 39.8 | 3.3 | | | SS .14 mg/l .012 #/Day |
| | | Skyview | Roxbury | Tributary to Drakes Brook | | Advanced | .08 | .06 | | 14.2 | 7.2 | | | SS 11.3 mg/l 5.8 #/Day |
| | Yes | Union Twp. School | Union | Mulhocaway Creek | 0024091 | Advanced | .011 | .005 | | 5.0 | .2 | | | SS 2.0 mg/l .08 #/Day |
| | Yes | Glen Gardner Sanitorium | Lebanon | Spruce Run | 0022144 | Secondary | .150 | .09 | | | | | | SS 27.2 mg/l 20.4 #/Day |
| | Yes | Branchburg Twp. | Branchburg | South Branch | 0020354 | Advanced | .062 | .024 | | 4.0 | .8 | | | SS 4.0 mg/l .88 #/Day |

## NORTH BRANCH RARITAN RIVER

### BASIN DESCRIPTION

The North Branch Raritan River originates in the highlands of Morris County and flows in a southerly direction through rural agricultural regions of Hunterdon and Somerset Counties. Major development is concentrated along Routes 206 and 22. Near the confluence with the South Branch, the river is bordered by a wide flood plain.

Water related beneficial uses are cold and warm water fishery, contact and non-contact recreation, and potable water supply including a major off stream reservoir, Round Valley.

### WATER QUALITY ASSESSMENT

Although the general water quality of the North Branch is very good, quality decreases immediately below the confluence with the Lamington River. Fecal coliform bacteria counts continue to exceed the criterion at all stations, with highest numbers recorded immediately below confluence with the Lamington River. The 90th percentile summer values for dissolved oxygen are within criterion levels, and tend to increase at downstream stations. Five day biochemical oxygen demand levels continue to meet the criterion, but increase at downstream stations. Upstream pH values are above criterion levels, but decrease to within the criterion at downstream stations. Nitrate and phosphorous levels continue to be excessive in this river. Non-filtrable residue (suspended solids) levels are increasing with time. Levels exceed the criterion at downstream locations, particularly below confluence with the Lamington River. Turbidity levels are increasing with time, but remain below the criterion level.

### PROBLEM ASSESSMENT

The North Branch flows through a predominantly rural region, receiving non-point source contributions of nutrients, solids, fecal coliform bacteria, and biochemical oxygen demand from agricultural runoff, leachate, and septic tank seepage. The Lamington River drainage basin contributes significantly to decreases in water quality in downstream areas of the North Branch. Rapid development in the Chester region with associated septic and storm water runoff, and several industrial and municipal point source discharges are indicated as major pollutant sources on the Lamington.

**Table VI.U.1 (cont'd) INDUSTRIAL DISCHARGERS**

**South Branch Raritan River Segment**

| Map Number | Compliance with 1977 Requirements of secondary/Best Practicable Treatment Limitations | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Flow (mgd) 1975 Avg. | Flow (mgd) 1975 Max. | Average Daily Effluent Quality (1975) $BOD_5$ mg/l | $BOD_5$ #/Day | $NH_3$-N mg/l | $NH_3$-N #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Wilson Products Co., Div. of Dart Ind. | Hillsborough | South Branch | 0003051 | Cooling Water | | .04 | | 2.4 | 1.0 | | | SS 70 mg/l 1.0 #/Day $NH_3$ .25 mg/l $NO_3$ .06 mg/l |
| | | Flemington Water Dept. | Flemington | Bushkill Creek | 0025755 | | | .006 | | | | | | |

## GOAL ASSESSMENT AND RECOMMENDATIONS

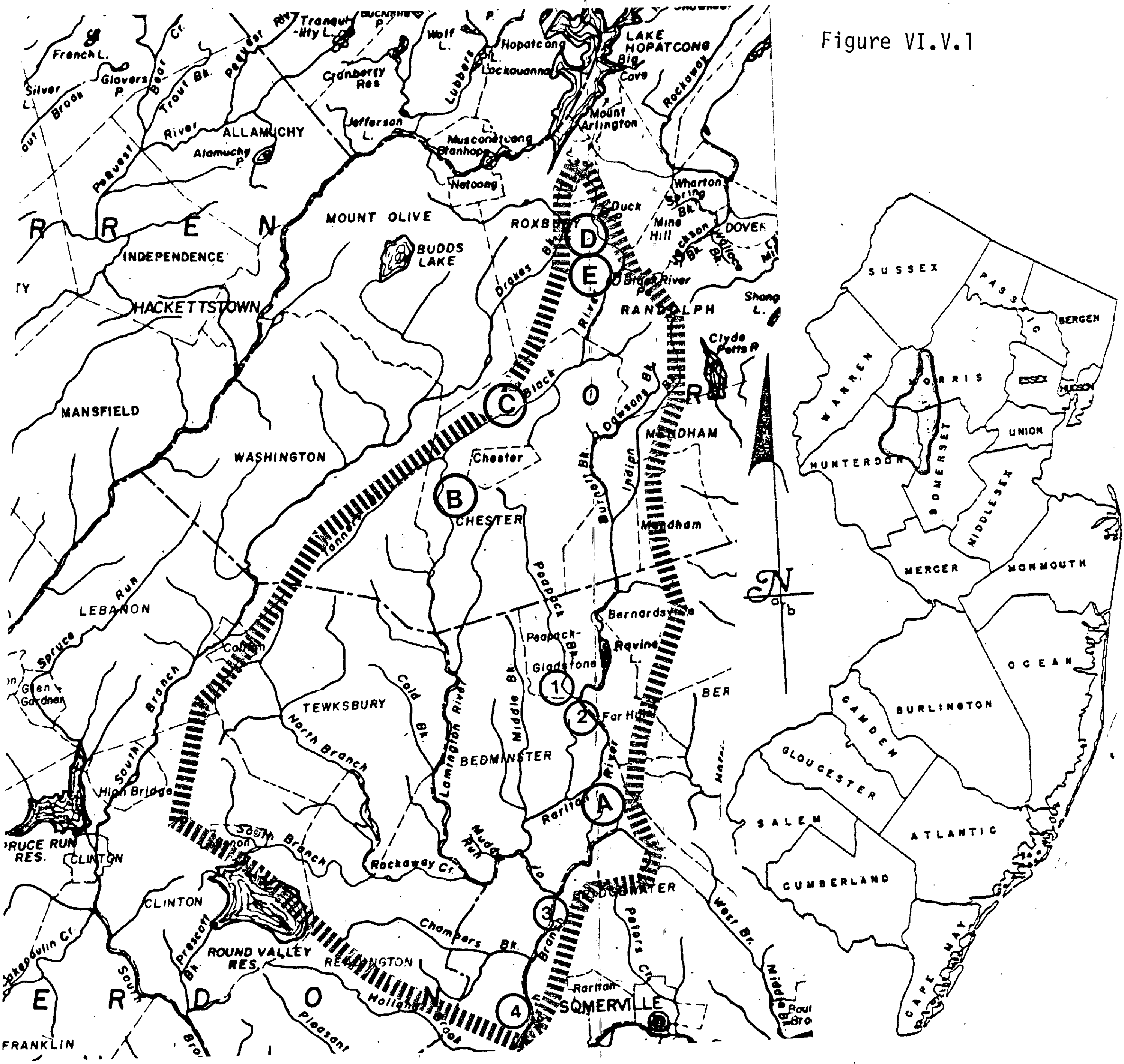
General water quality of the North Branch drainage basin currently meets the goal of fishable waters, with several streams classified as trout maintenance waters. Additionally, the North Branch serves as a source for a surface potable water supply. Due to excessive fecal coliform levels, swimming may be precluded in the North Branch Raritan River. Non-point sources of fecal coliforms, nutrients, biochemical oxygen demand and suspended solids may be reduced by better agricultural practices and implementation of areawide planning efforts in the future. However, maintenance of fishable quality and improvement to possible achievement of swimmable quality by 1983 would appear to be more dependent on identifying, characterizing, and upgrading or eliminating existing industrial and municipal point source discharges in the Lamington River drainage. Initial efforts by the Division in this area have resulted in the elimination of Cooper Chemical Company's halogen waste discharge to the North Branch.

NORTH BRANCH RARITAN RIVER

STATION LIST

1. North Branch Raritan River at Pleasant Valley.
2. North Branch Raritan River at Far Hills.
3. North Branch Raritan River below confluence with the Lamington River.
4. North Branch Raritan River near the confluence with the South Branch Raritan River.

Figure VI.V.1




# LOCATION

## North Branch Raritan River

## LEGEND

| | |
|---|---|
| Point Source | A B C D E |
| Monitoring Site | 1 2 3 4 5 |
| Drainage Basin Boundaries | |
| County Bounderies | |
| Municipal Bounderies | |

Figure VI.V.2

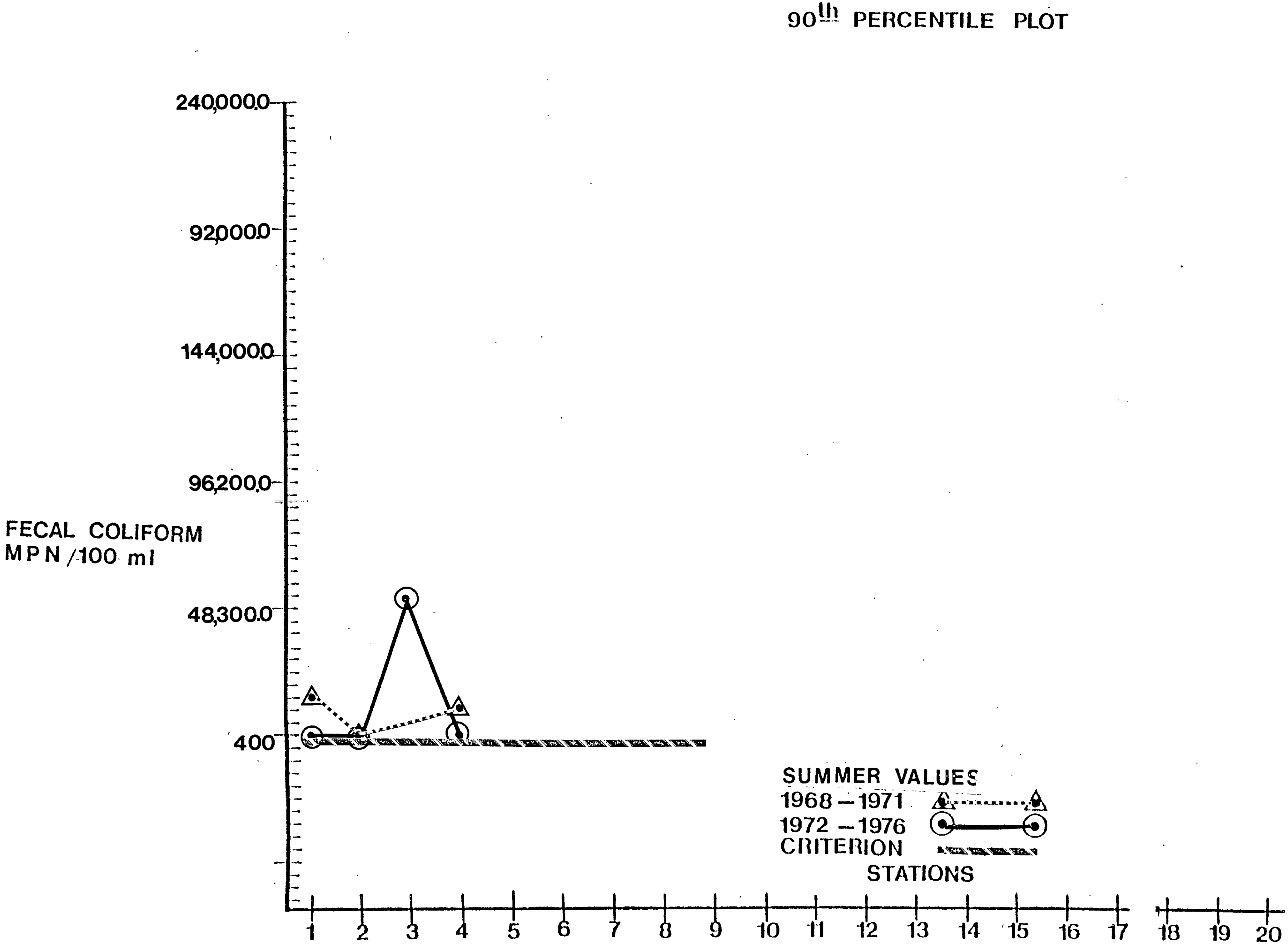
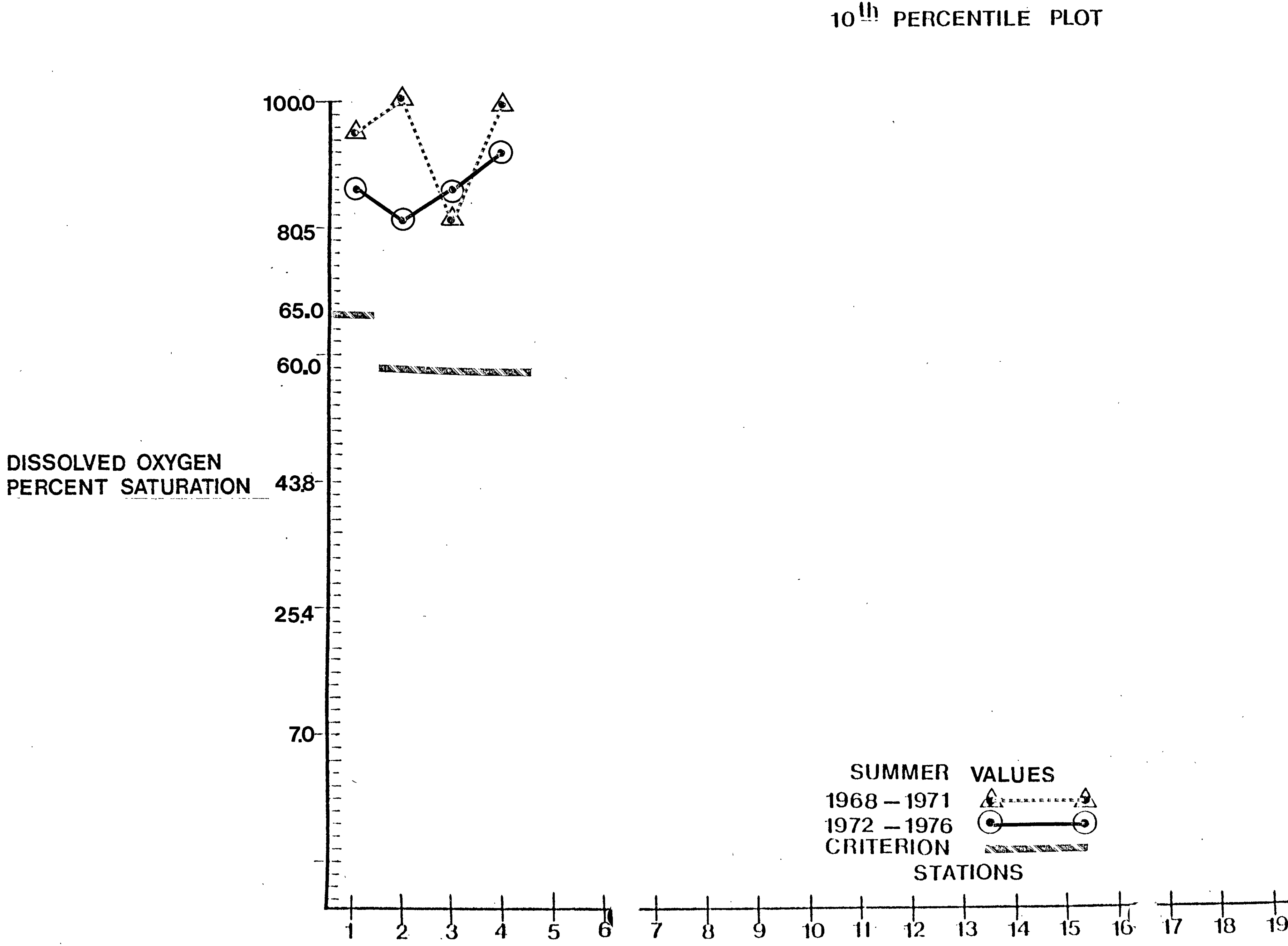

90th PERCENTILE PLOT
240,000.0
92,000.0
144,000.0
96,200.0
48,300.0
400
FECAL COLIFORM
MPN /100 ml
SUMMER VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Figure VI. V.3



10th PERCENTILE PLOT
100.0
80.5
65.0
60.0
DISSOLVED OXYGEN PERCENT SATURATION
43.8
25.4
7.0
SUMMER VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
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5
6
7
8
9
10
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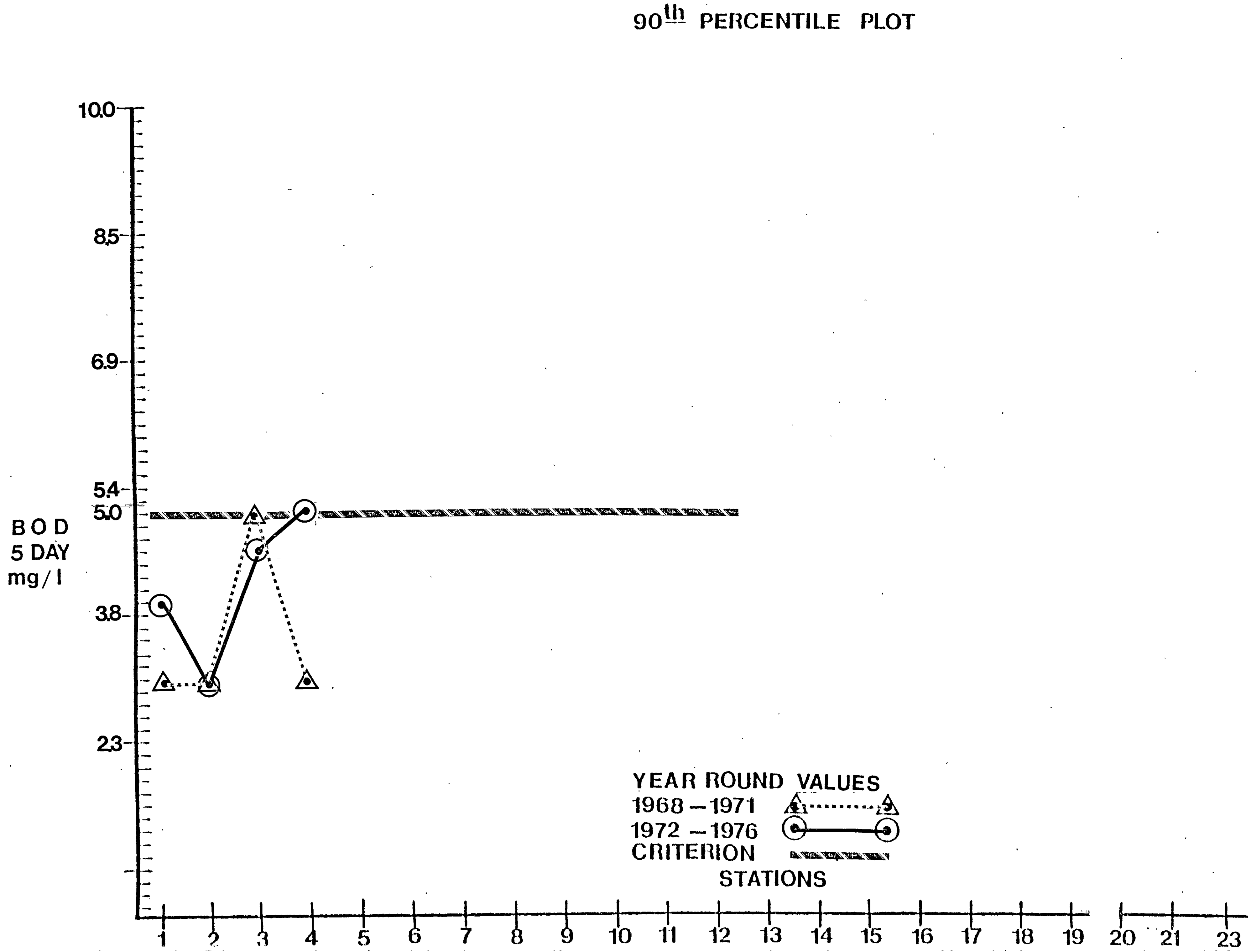
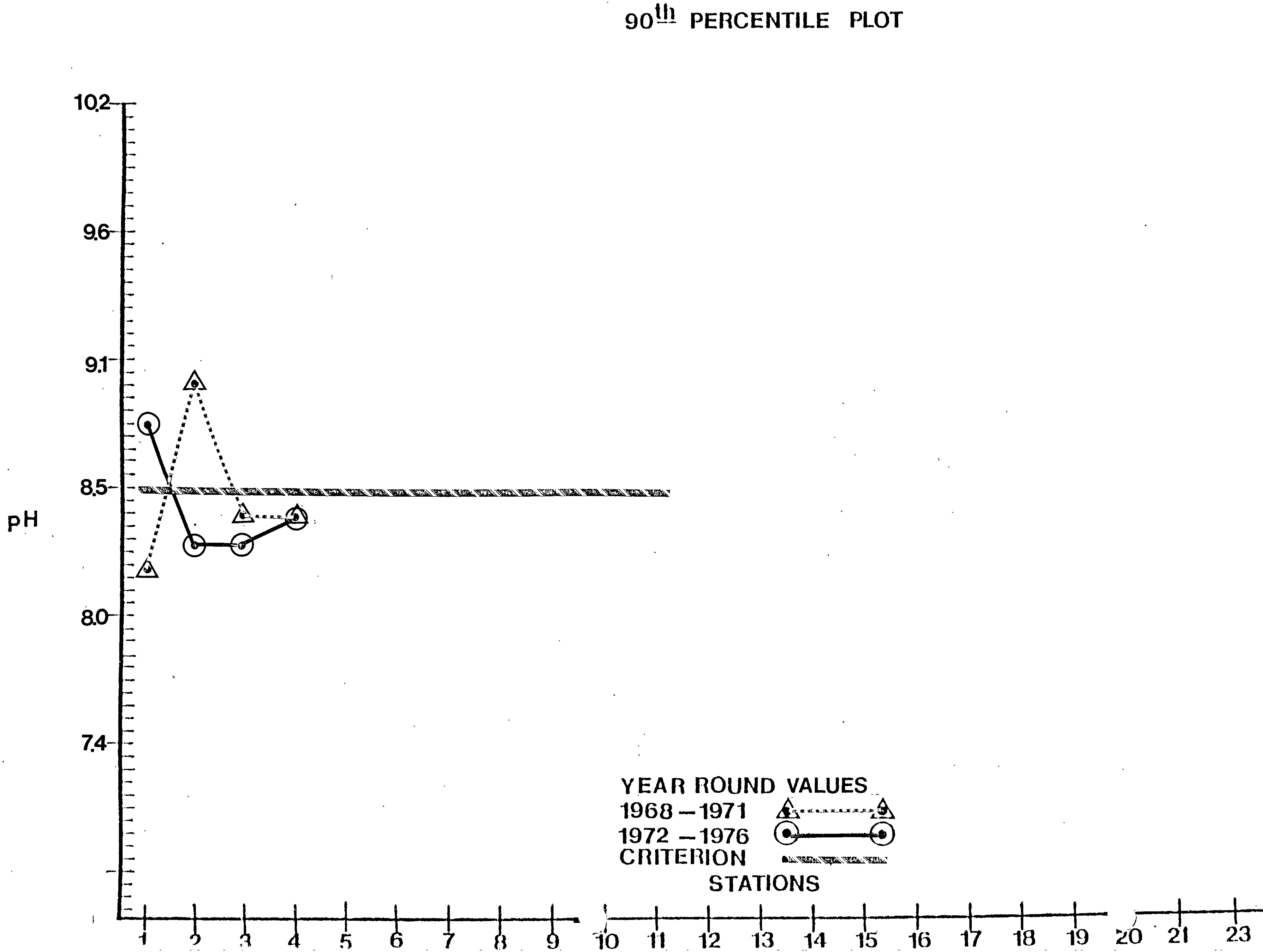
17
18
19

Figure V[illegible]V.4



90th PERCENTILE PLOT
10.0
8.5
6.9
5.4
5.0
3.8
2.3
BOD
5 DAY
mg/l
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
23

Figure VI.V.5



90th PERCENTILE PLOT
10.2
9.6
9.1
8.5
8.0
7.4
pH
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
23

Figure VI...6

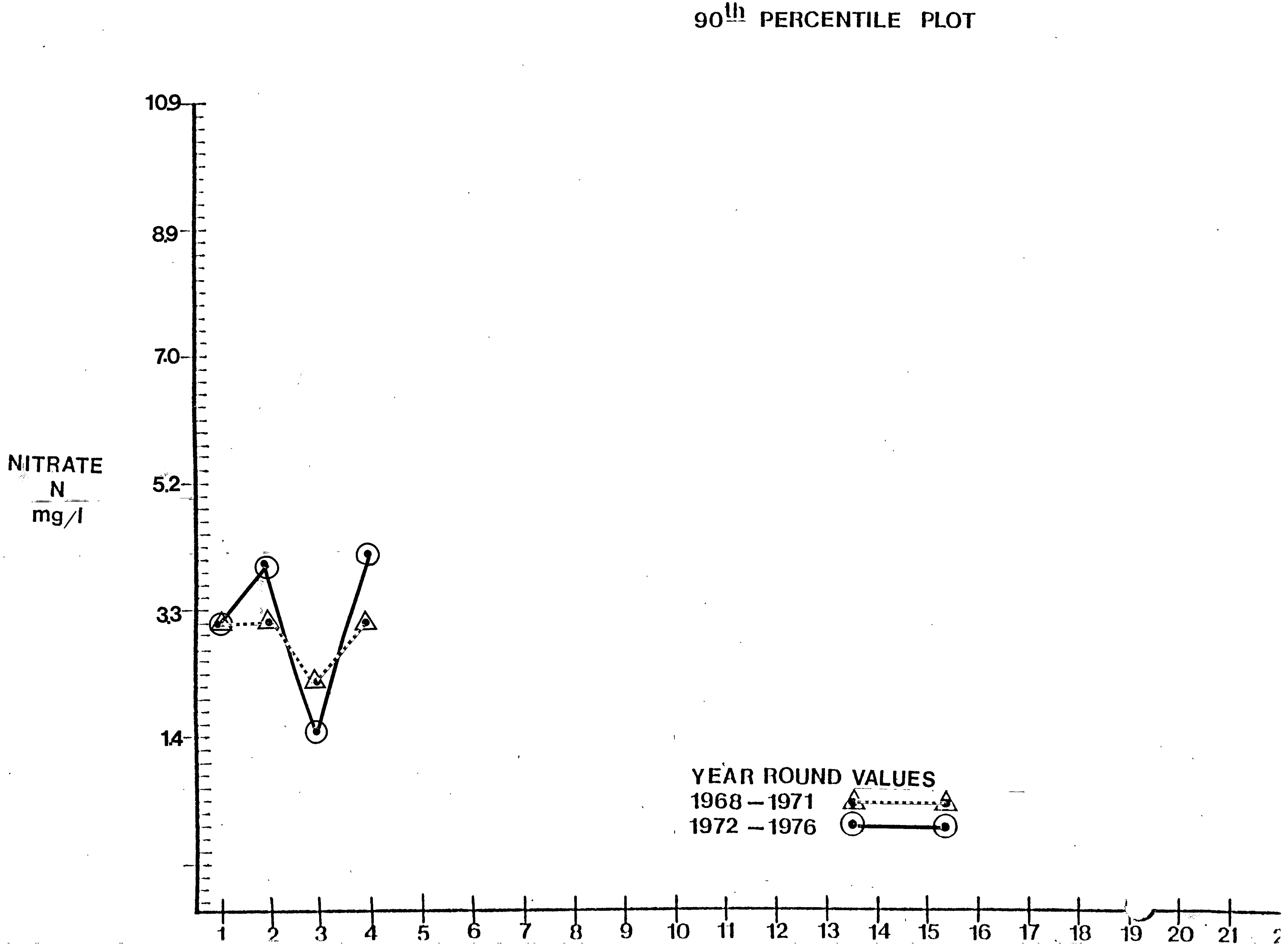

90th PERCENTILE PLOT
NITRATE
N
mg/l
10.9
8.9
7.0
5.2
3.3
1.4
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21

Figure VI.V.7

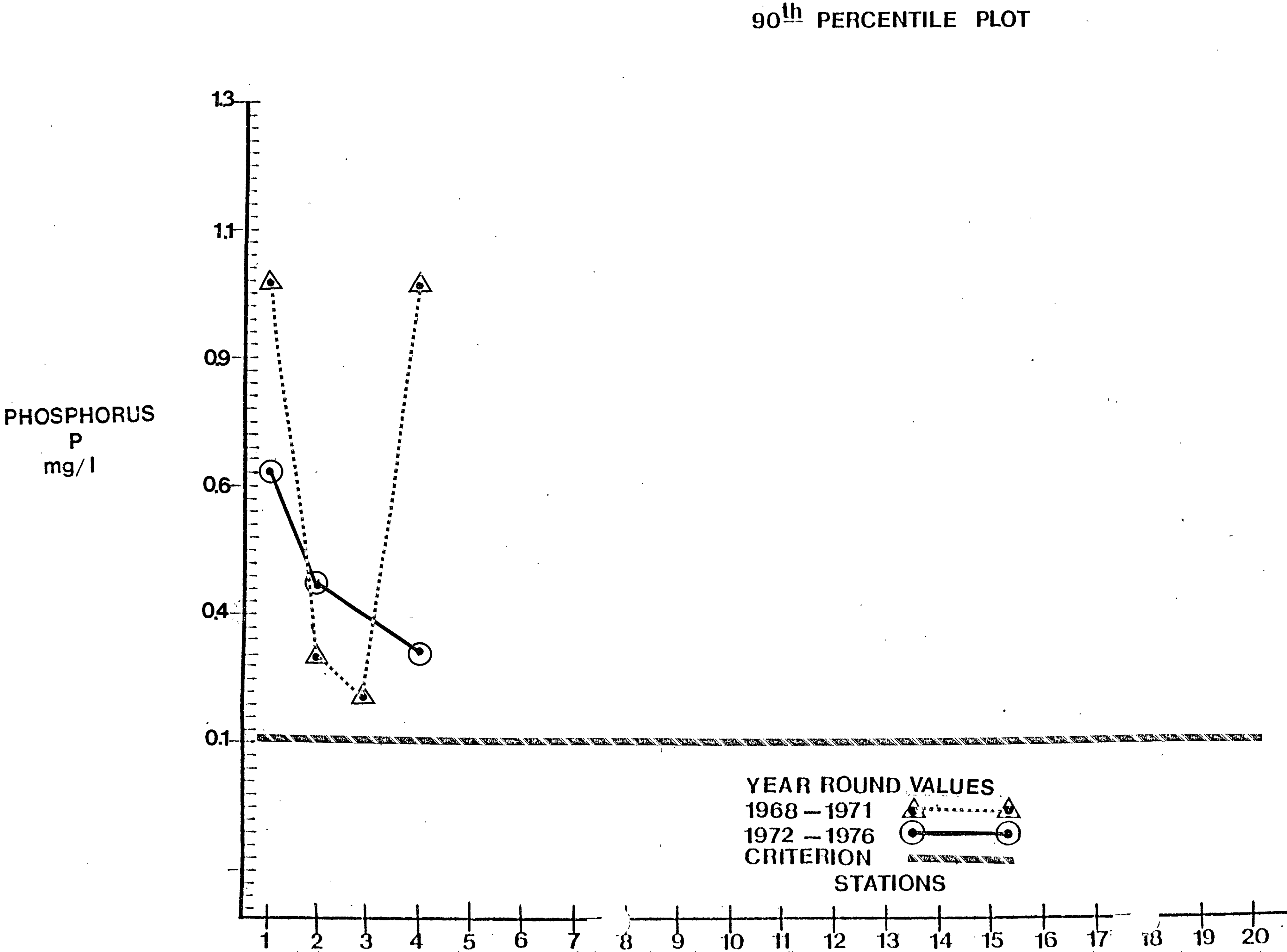
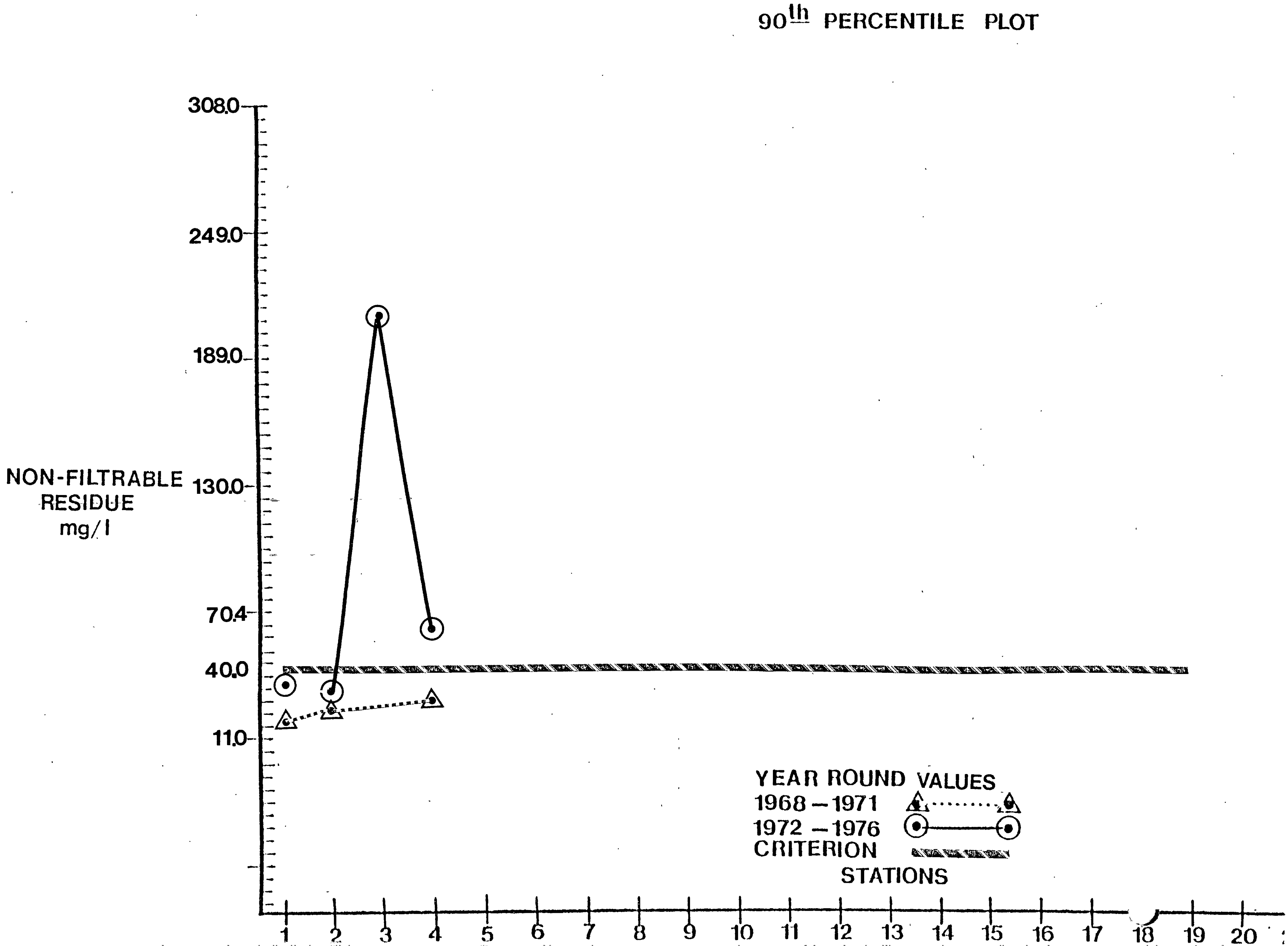
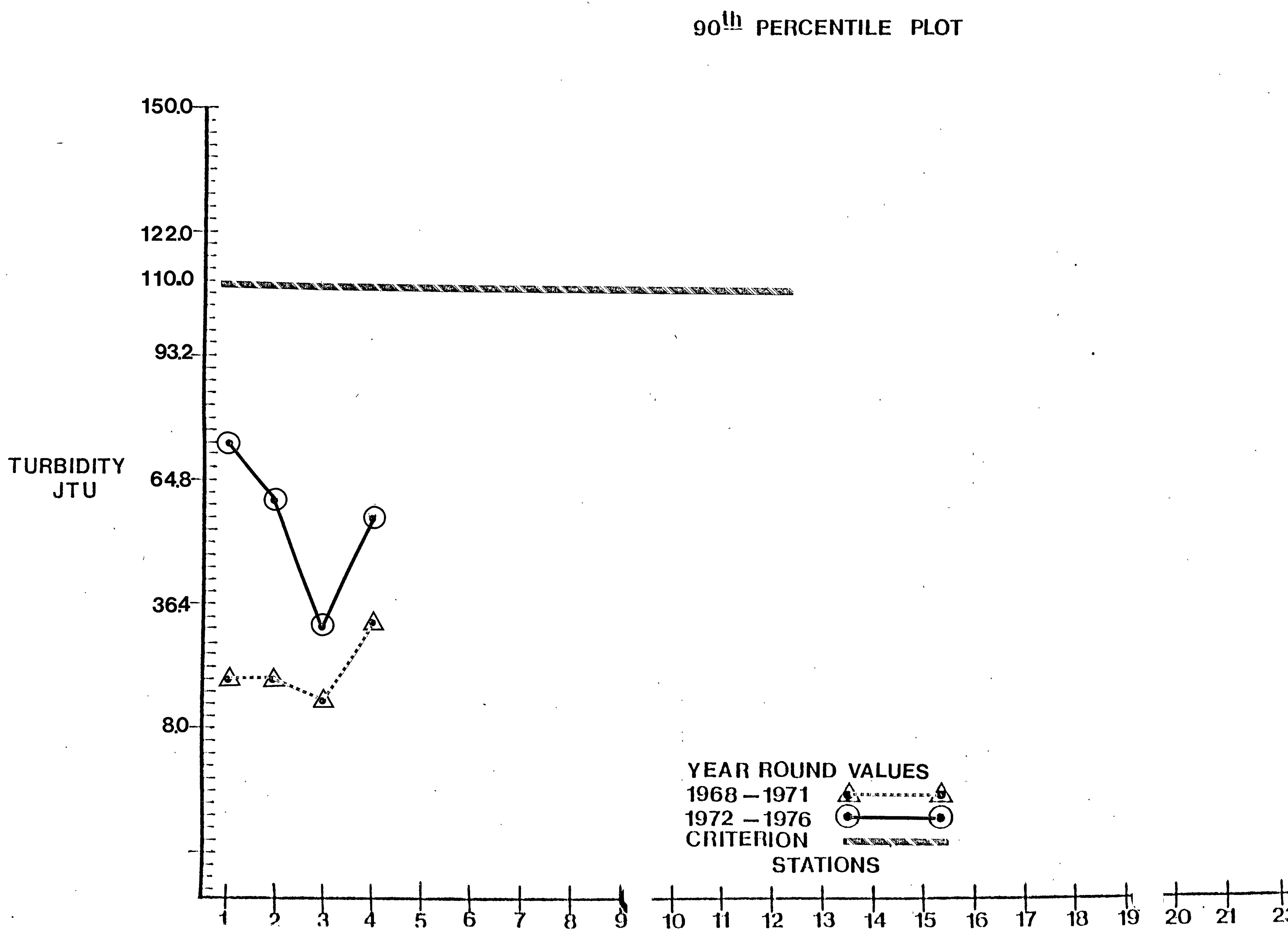

90th PERCENTILE PLOT
PHOSPHORUS
P
mg/l
1.3
1.1
0.9
0.6
0.4
0.1
YEAR ROUND VALUES
1968 — 1971
1972 — 1976
CRITERION
STATIONS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Figure VI.V.3



90th PERCENTILE PLOT
NON-FILTRABLE RESIDUE mg/l
308.0
249.0
189.0
130.0
70.4
40.0
11.0
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Figure VI.V.9


90th PERCENTILE PLOT
150.0
122.0
110.0
93.2
64.8
36.4
8.0
TURBIDITY JTU
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
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9
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11
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16
17
18
19
20
21

Table VI.V.1 MUNICIPAL AND INSTITUTIONAL DISCHARGER INVENTORY

North Branch Raritan River Segment

| Map Number | Compliance with 1977 Secondary/ Best Practicable Treatment Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Avg. | Max. | Average Daily Effluent Quality (1975) BOD$_5$ mg/l | #/Day | NH$_3$-N mg/l | #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Yes | A & P White-house Estates | Readington | Rockaway Creek | 0028673 | Secondary | .012 | | | | | | | |
| | Yes | Valley Road Sewerage Co. | Tewksbury | Lamington River | 6022781 | Advanced | .05 | .02 | | 10 | 1.8 | | | SS 9.0 mg/l 1.5 #/Day |
| A | Yes | Bernardsville Borough | Bernardsville | Mine Brook | 0026387 | Secondary | .5 | .4 | | 9.4 | 31.8 | | | SS 10.6 mg/l 36.1 #/Day |
| | No | Far Hills | Far Hills | North Branch | 0026506 | Primary | .016 | .025 | | 173 | 36 | | | SS 57.5 mg/l 11.9 #/Day |
| B | Yes | Ajax Terrace | Roxbury | Lamington River | 0022675 | Tertiary | 1.0 | .8 | | 10.1 | 67.6 | | | SS 63.4 mg/l 119 #/Day |

## Table VI.V.1 INDUSTRIAL DISCHARGER INVENTORY

North Branch Raritan River Segment

| Map Number | Compliance with 1977 Secondary/ Best Practicable Treatment Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Flow (mgd) 1975 Avg. | Flow (mgd) 1975 Max. | Average Daily Effluent Quality (1975) $BOD_5$ mg/l | $BOD_5$ #/Day | $NH_3$-N mg/l | $NH_3$-N #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No | Houdaille Construction Materials Inc. Discharge #1 | Kenvil | Black River | 0002861 | None | | .024 | | | | | | SS 43 mg/l 8.6 #/Day 8.5 SU pH 85°F-Summer Temp. 25.4 Mg/l Cl |
| C | No | Houdaille Construction Materials Inc. Discharge #2 | Kenvil | Black River | 0002861 | None | | 4.2 | | 1.0 | 35.0 | | | SS 1580 mg/l 55,344.2 #/Day 7.5 SU, pH 72°F- Summer Temp. 29.7 mg/l Cl |
| | | Boro of Peapack-Gladstone | Chester Twp. | Peapack Brook | 0003859 | Filter Backwash | | .0005 | | | | | | |
| D | Yes | Hercules Inc. Discharge #1 | Roxbury | Black River | 0000876 | Industrial | | 2.117 | | 136 | 580 | | | SS 19 mg/l 332.7 #/Day 8.02 SU 43 SU Turb. 22.5 mg/l TC |

## Table VI.V.1 (cont') INDUSTRIAL DISCHARGERS

### North Branch Raritan River Segment

| Map Number | Compliance with 1977 Secondary/ Best Practicable Treatment Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Avg. | Max. | mg/l | #/Day | mg/l | #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E | Yes | Hercules Inc. Discharge #2 | Roxbury | Black River | 0000876 | Industrial | | 1.691 | | 52 | 733.4 | | | SS 1 mg/l 14.0 #/Day 7.7 SU pH 3.5 SU Turb. 700 mg/l TC |
| | | Co-operative Industries | Chester | Black River | 0002330 | Cooling Waters | | .05 | | | | | | FeTOT .03 mg/l mgTOT .85 mg/l |
| | | Bell Telephone Laboratories, Inc. Discharge #1 | Chester Twp. | North Branch | 0000434 | Industrial | | .091 | | | | | | SS 6.0 mg/l 5.0 #/ Day pH 7.4 SU FC 460 MPN/100 |
| | | " " Discharge #2 | Chester Twp. | North Branch | 0000434 | Industrial | | .075 | | | | | | SS 2.0 mg/l 1.0 #/Day pH 7.1 SU Temp. 40°F. Winter 60°F. mmer |

**Table VI.V.1 (cont'd)** MUNICIPAL AND INSTITUTIONAL DISCHARGER INVENTORY

North Branch Raritan River Segment

| Map Number | Compliance with 1977 Requirements of Secondary/Best Practicable Treatment | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Avg. | Max. | Average Daily Effluent Quality (1975) $BOD_5$ mg/l | #/Day | $NH_3$-N mg/l | #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Yes | Merck & Co., Inc. | Branchburg | Tributary to North Branch | 0003671 | Secondary | .03 | .014 | | 17.4 | 2.03 | | | SS 32.1 mg/l 3.7 #/Day |
| | Yes | Central School | Branchburg | Tributary to Chambers Brook | 0020362 | Advanced | .016 | .003 | | 4 | .01 | | | SS .65 mg/l .13 #/Day |
| | | Fox Hollow | Branchburg | Lamington River | 0020338 | Secondary | .05 | .023 | | 9.4 | 1.4 | | | SS 6.1 mg/l 1.09 #/Day |
| | | Windy Willow | Branchburg | Holland Brook | 0020346 | Secondary | .05 | .054 | | 48 | 21.6 | | | SS 71 mg/l #/Day |
| | No | Round Valley School | Clinton Twp. | Rockaway Creek | 0023175 | Secondary | .009 | .001 | | 17.8 | .149 | | | SS 64.5 mg/l .538 #/Day |
| | Yes | Readington Twp. Board of Education | Readington | Holland Brook | 0026697 | Advanced | .017 | .005 | | 12 | .5 | | | SS 21 mg/l .8 #/Day |

Table VI.V.1 MUNICIPAL AND INSTITUTIONAL DISCHARGER INVENTORY

(cont'd) North Branch Raritan River Segment

| Map Number | Compliance with 1977 Secondary/ Best Practicable Treatment Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Avg. | Max. | Average Daily Effluent Quality (1975) $BOD_5$ mg/l | $BOD_5$ #/Day | $NH_3$-N mg/l | $NH_3$-N #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No | Boro of Peapack-Gladstone | Peapack-Gladstone | Peapack Brook | 0021881 | Secondary | .200 | .140 | | 17.5 | 20.5 | 7.5 | 8.8 | SS 25.2 mg/l 29.5 #/Day |
| | Yes | Chester Shopping Mall | Chester Twp. | Ditch to North Branch | 0026824 | Advanced | .01 | .01 | | 32 | 2.7 | | | SS 2.6 mg/l 2.2 #/Day |
| | Yes | Fiddler's Elbow Country Club | Bedminster | Lamington River | 0021865 | Tertiary | .0175 | .01 | | 2.0 | 24 | | | SS 1.8 mg/l 13.1 #/Day |
| | | John K. Cowperwaithe | Bedminster | Tributary to Lamington River | 0027227 | Secondary | .00084 | .001 | | | | | | |
| | Yes | Bedminster Inn | Bedminster | Tributary to North Branch | 0026948 | Advanced | .01 | .0027 | | 30 | .68 | | | SS 22 mg/l #/Day $CL_2$ Res. 2.5 mg/l |

Table VI.V.1 INDUSTRIAL DISCHARGERS (cont'd)
North Branch Raritan River Segment

| Map Number | Compliance with 1977 Secondary/ Best Practicable treatment Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Avg. | Max. | Average Daily Effluent Quality (1975) $BOD_5$ mg/l | $BOD_5$ #/Day | $NH_3$-N mg/l | $NH_3$-N #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Yes | Azoplate Corp. | Branchburg | Tributary to Chambers Brook | 0003158 | Industrial | | .13 | | 3.0 | 3.3 | | | SS 20 mg/l<br>22 #/Day<br>$PO_4$ 4.4 #/Day<br>ALTOT 1.0 mg/l |
| | Yes | Delite Foods, Inc. | Clinton Twp. | Rockaway Creek | 0027804 | Secondary | .007 | .001 | | | | | | |

## MILLSTONE RIVER AND STONY BROOK

### BASIN DESCRIPTION

The Millstone River orginates in Monmouth County and flows north west where it is joined by Stony Brook at Princeton. These rivers drain 287 square miles and are predominantly narrow and slow moving, with frequent periods of low flow. The headwaters rise in an undeveloped agricultural area, flow through public lands and wetlands downstream to the densly developed areas at the mouth. Intense developmental pressure exists for large scale planned unit communities in the areas of Plainsboro, South Brunswick and East Windsor.

### WATER QUALITY ASSESSMENT

Fecal coliform bacteria levels exceed the criterion at all stations on the Millstone and Stony Brook. Bacterial concentrations have decreased in the last five years on the Millstone, and remained relatively constant on the Stony Brook. Dissolved oxygen levels are marginal or below criterion levels on the Millstone. As expected, biochemical oxygen demand at all but one station exceeds the criterion on the Millstone. In general, the levels have increased with time. The Stony Brook dissolved oxygen concentrations have increased, and biochemical oxygen demand levels decreased with time. Both parameters meet the criterion for this river. The pH values of both rivers have increased with time, and levels on the Stony Brook exceed the criterion at several stations. Nitrate levels are high and tend to increase at downstream stations. Phosphorus levels have decreased with time, yet remain above the criterion for both rivers. Non-filterable residue levels increase in downstream areas of the Millstone and exceed the criterion at three stations. The Stony Brook solids levels are within the criterion. Turbidity remains within the criterion, and relatively unchanged over time with the exception of downstream reaches of the Millstone, where turbidity exceeds the criterion.

### PROBLEM ASSESSMENT

The drainage basins of the Millstone and Stony Brook are undergoing major usage changes. The predominant agricultural, semi-rural character of the drainage basin is changing to one of intense development for residential communities. The physiography contributes to erosion and surface runoff from construction, agricultural practices and residential storm drains. High turbidity and sedimentation, as observed in Carnegie Lake, are attributed to these non-point sources. There also are point source problems, i.e. East Windsor M.U.A., but non-point sources appear to be the major pollutant sources to these rivers. Water quality problems are compounded by intensive utilization for irrigation on the Millstone River and resultant low flows during the growing season.

## GOAL ASSESSMENT AND RECOMMENDATIONS

Difficulties will be encountered in achieving fishable, swimmable criteria on the Millstone River by 1983. Dissolved oxygen levels are depressed by the increasingly excessive biochemical oxygen demand. Additionally, high fecal coliform counts preclude swimming in these waters. Increased monitoring and intensive surveys must be conducted on the Millstone to identify pollutant sources for enaction of appropriate remedial measures if the 1983 goals are to be met.

The Stony Brook, in contrast to the Millstone, is currently fishable waters, and its quality is improving with time. Construction and operation of the proposed Stony Brook sewage treatment plants will contribute to the upgrading of this river. Planning and enforcement programs must continue in this drainage basin to preserve and protect the Stony Brook from improper development practices.

Station List

1. Millstone River at Hightstown
2. Millstone River (Rte. 535)
3. Millstone River at Penns Neck
4. Millstone River at Princeton-Carnegie Lake Outlet
5. Millstone River at Princeton
6. Millstone River at Rocky Hill
7. Millstone River at Rte. 18
8. Millstone River at Blackwells Mills
9. Millstone River at Blackwells Mills
10. Millstone River near Manville
11. Stony Brook near Hopewell
12. Stony Brook at Pennington
13. Stony Brook at Hopewell Township
14. Stony Brook at Princeton
15. Stony Brook at Princeton
16. Stony Brook at Lawrenceville

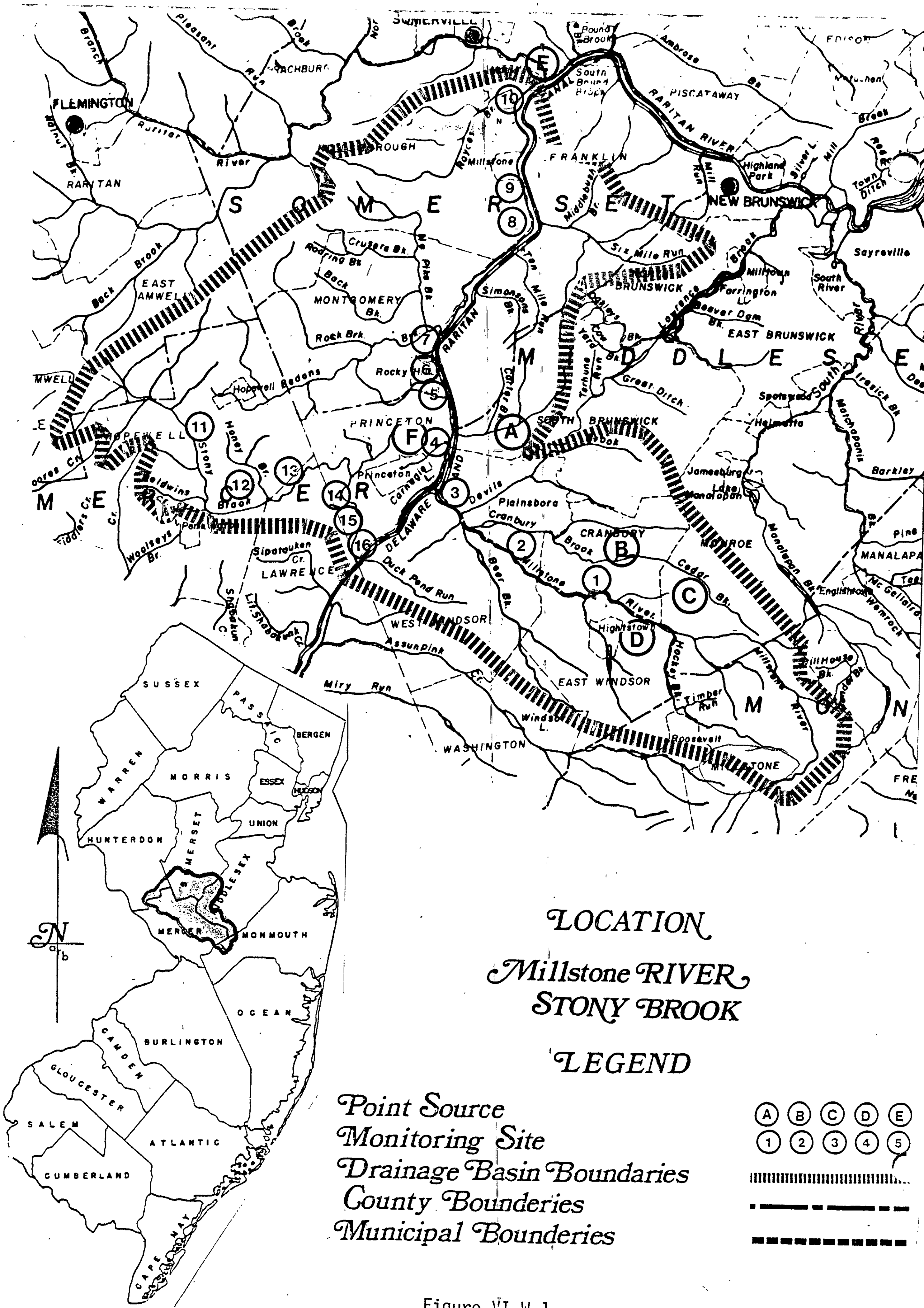
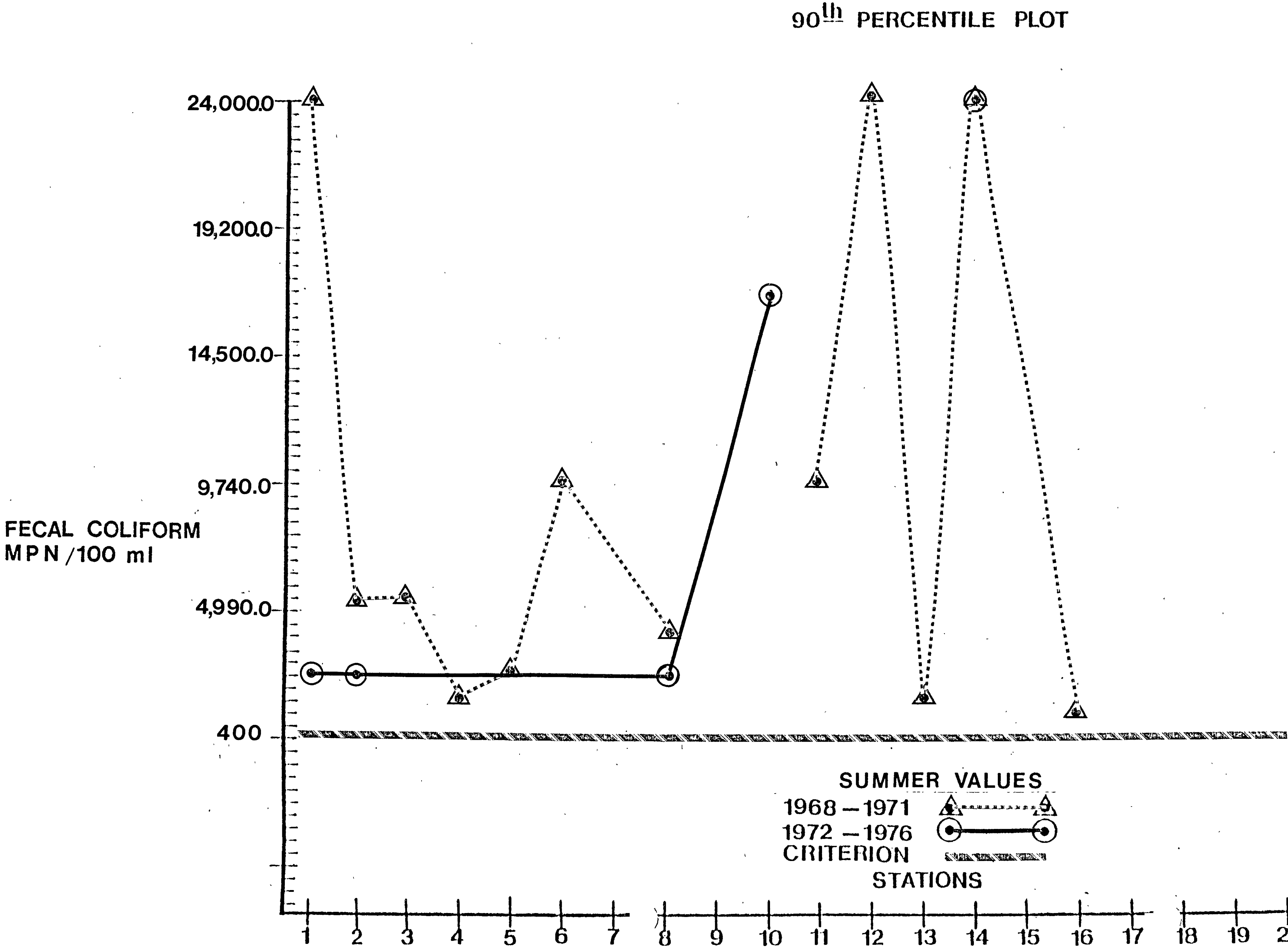

LOCATION
Millstone RIVER
STONY BROOK
LEGEND
Point Source
Monitoring Site
Drainage Basin Boundaries
County Bounderies
Municipal Bounderies
SOMERSET
MIDDLESEX
MERCER
FLEMINGTON
NEW BRUNSWICK
PRINCETON
FRANKLIN
RARITAN RIVER
PISCATAWAY
EAST BRUNSWICK
SOUTH BRUNSWICK
MONTGOMERY
EAST AMWELL
HOPEWELL
LAWRENCE
WEST WINDSOR
EAST WINDSOR
CRANBURY
MONROE
MILLSTONE
WASHINGTON
Hightstown
Plainsboro
Jamesburg
Sayreville
Spotswood
Highland Park
SUSSEX
PASSAIC
BERGEN
WARREN
MORRIS
ESSEX
HUDSON
UNION
HUNTERDON
SOMERSET
MIDDLESEX
MERCER
MONMOUTH
OCEAN
BURLINGTON
CAMDEN
GLOUCESTER
SALEM
ATLANTIC
CUMBERLAND
CAPE MAY

Figure VI.W.1

Figure VI.W.2



90th PERCENTILE PLOT
24,000.0
19,200.0
14,500.0
9,740.0
4,990.0
400
FECAL COLIFORM MPN/100 ml
SUMMER VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
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14
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16
17
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19
20

Figure VI.1

10th PERCENTILE PLOT

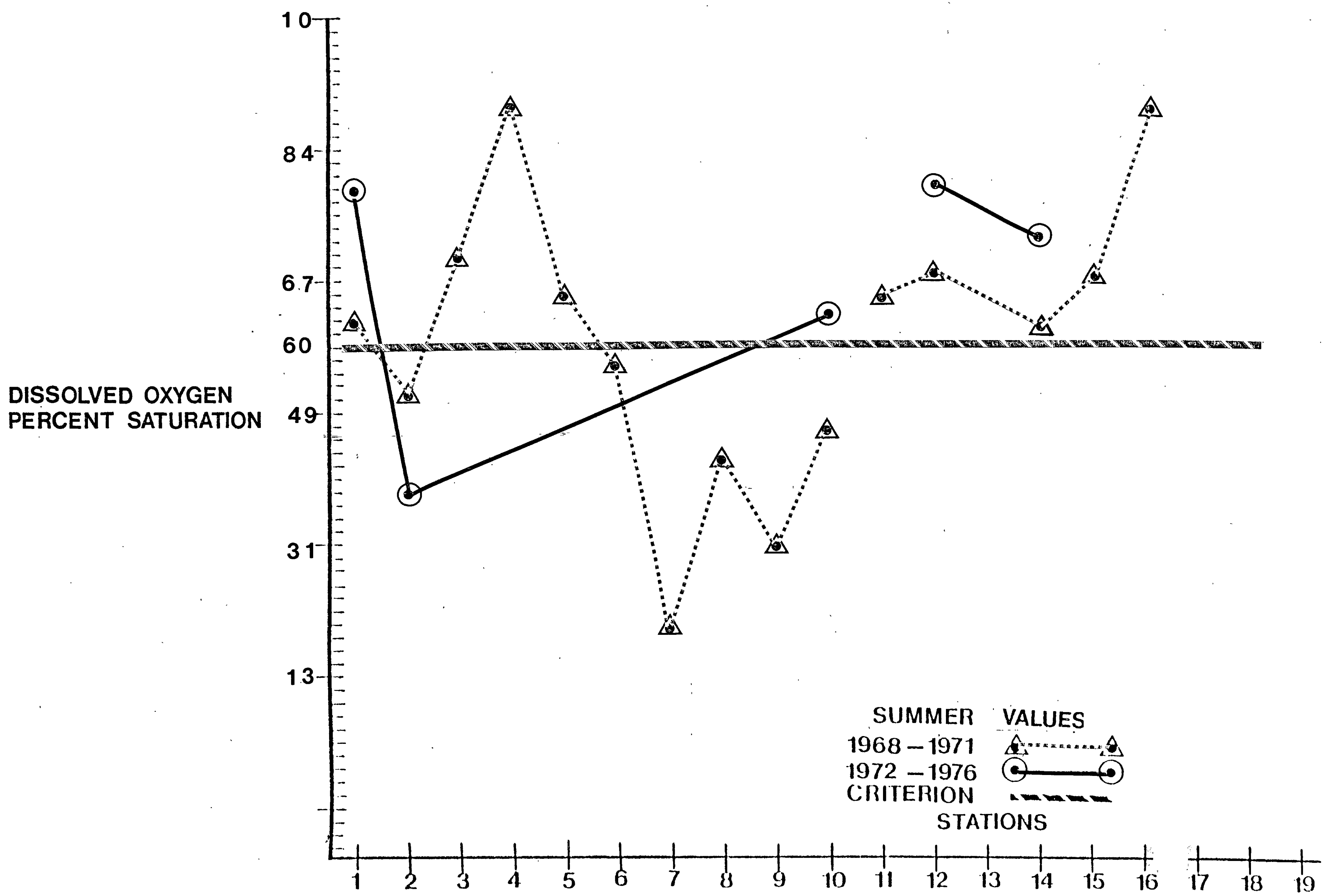
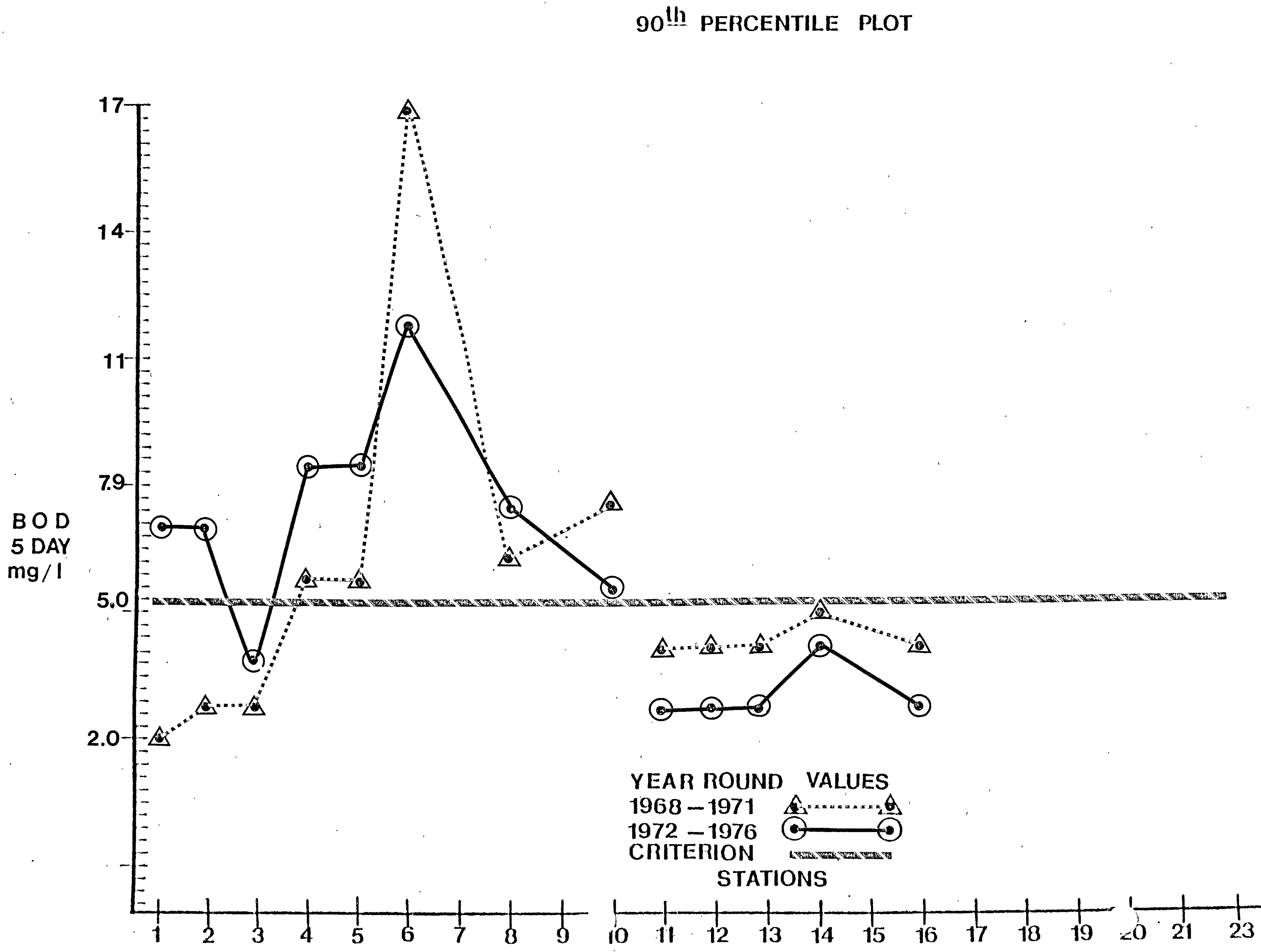


Figure VI.W .4


90th PERCENTILE PLOT
17
14
11
7.9
5.0
2.0
BOD
5 DAY
mg/l
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
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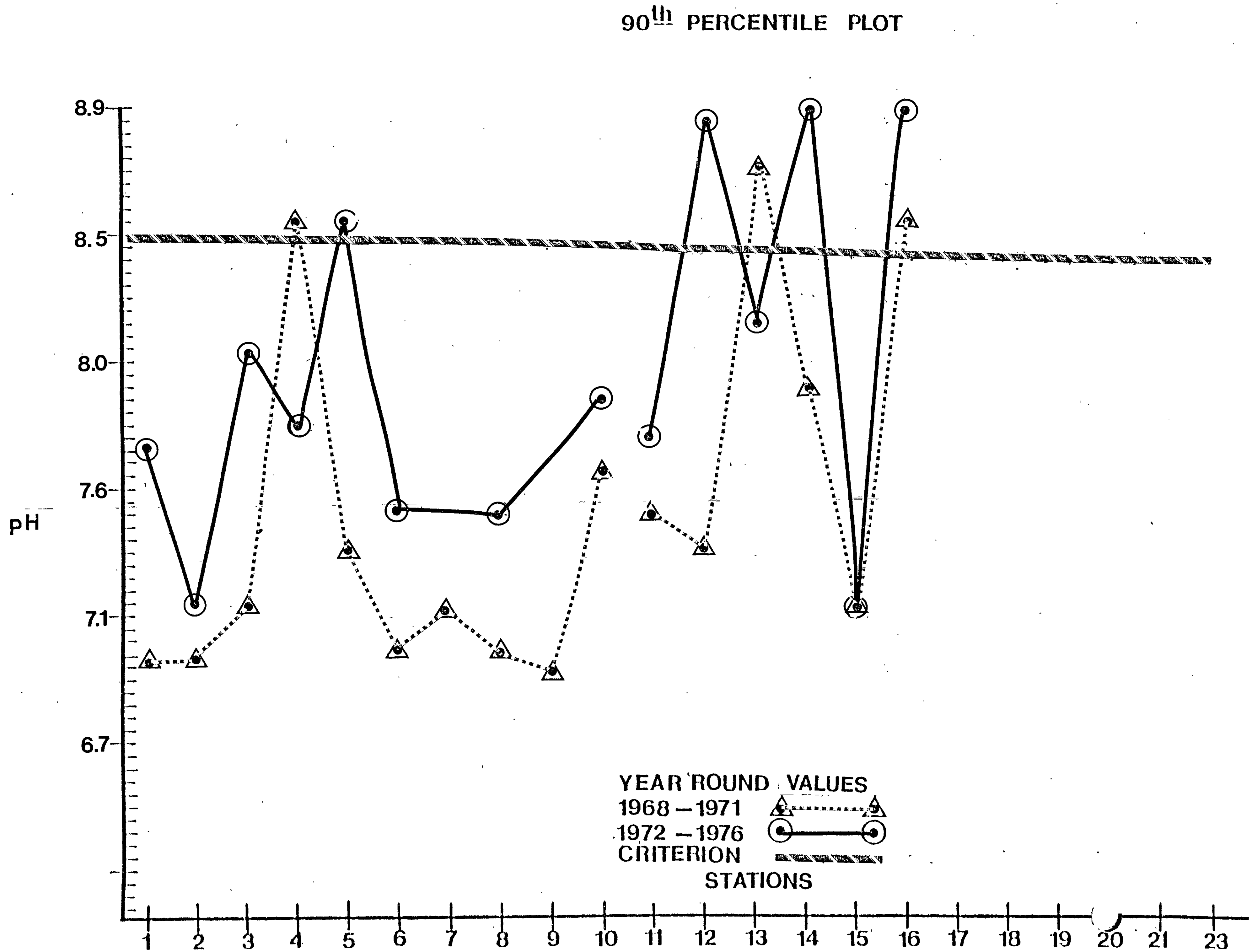
21
23

Figure VI.W.


90th PERCENTILE PLOT
8.9
8.5
8.0
7.6
7.1
6.7
pH
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
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21
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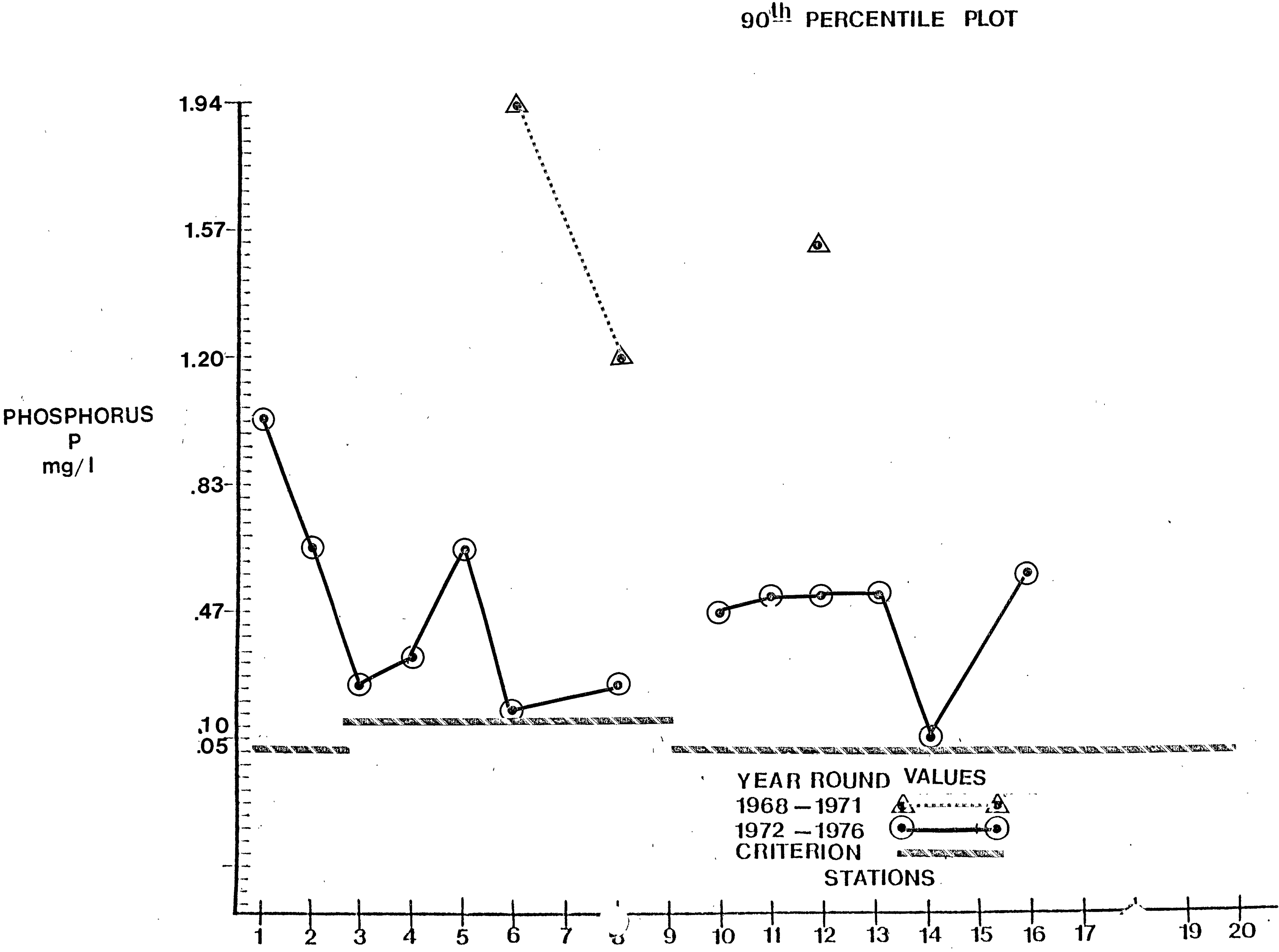
Figure VI.W.6


90th PERCENTILE PLOT
PHOSPHORUS
P
mg/l
1.94
1.57
1.20
.83
.47
.10
.05
YEAR ROUND VALUES
1968 — 1971
1972 — 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
9
10
11
12
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14
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16
17
19
20

Figure VI

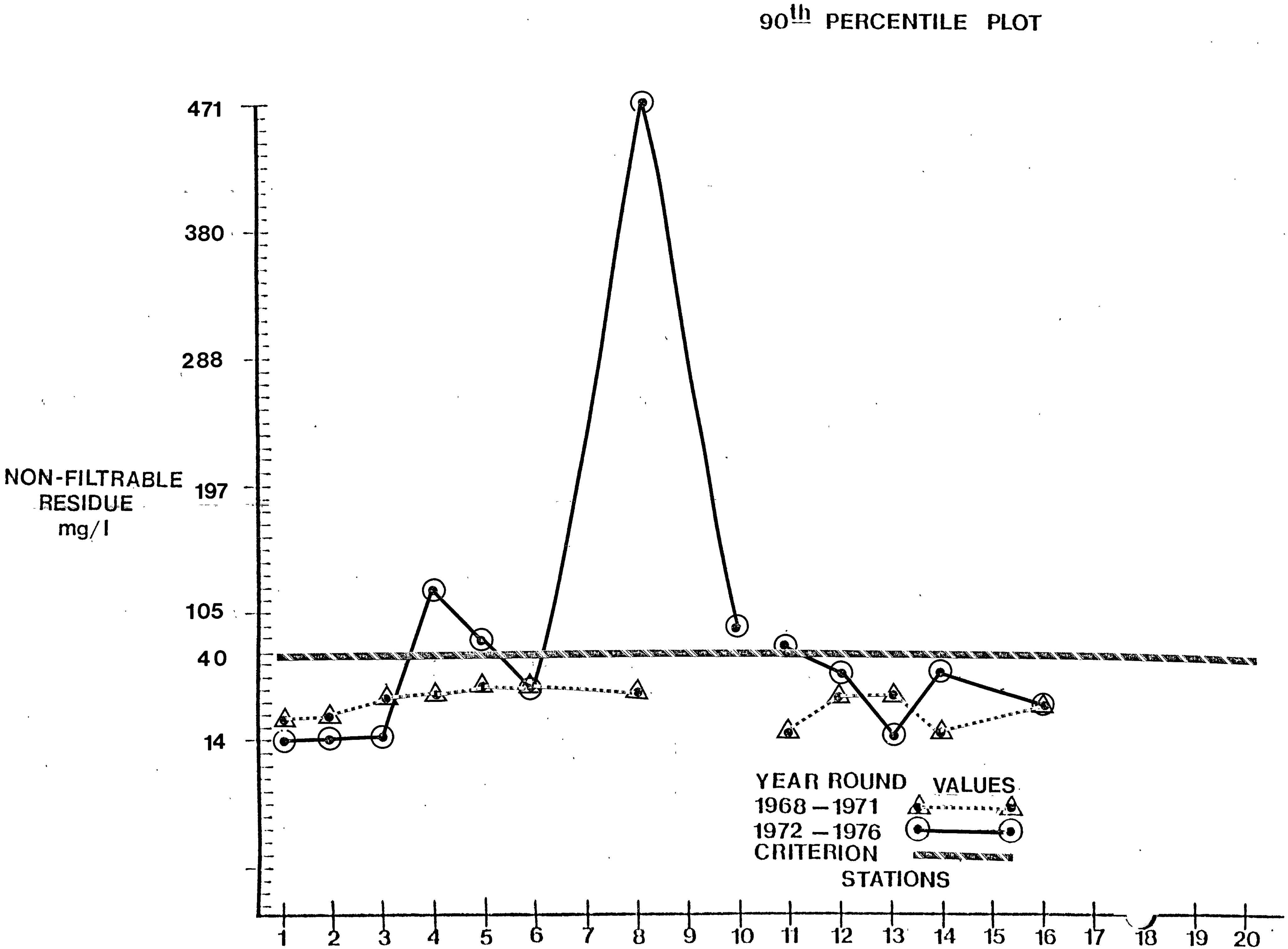
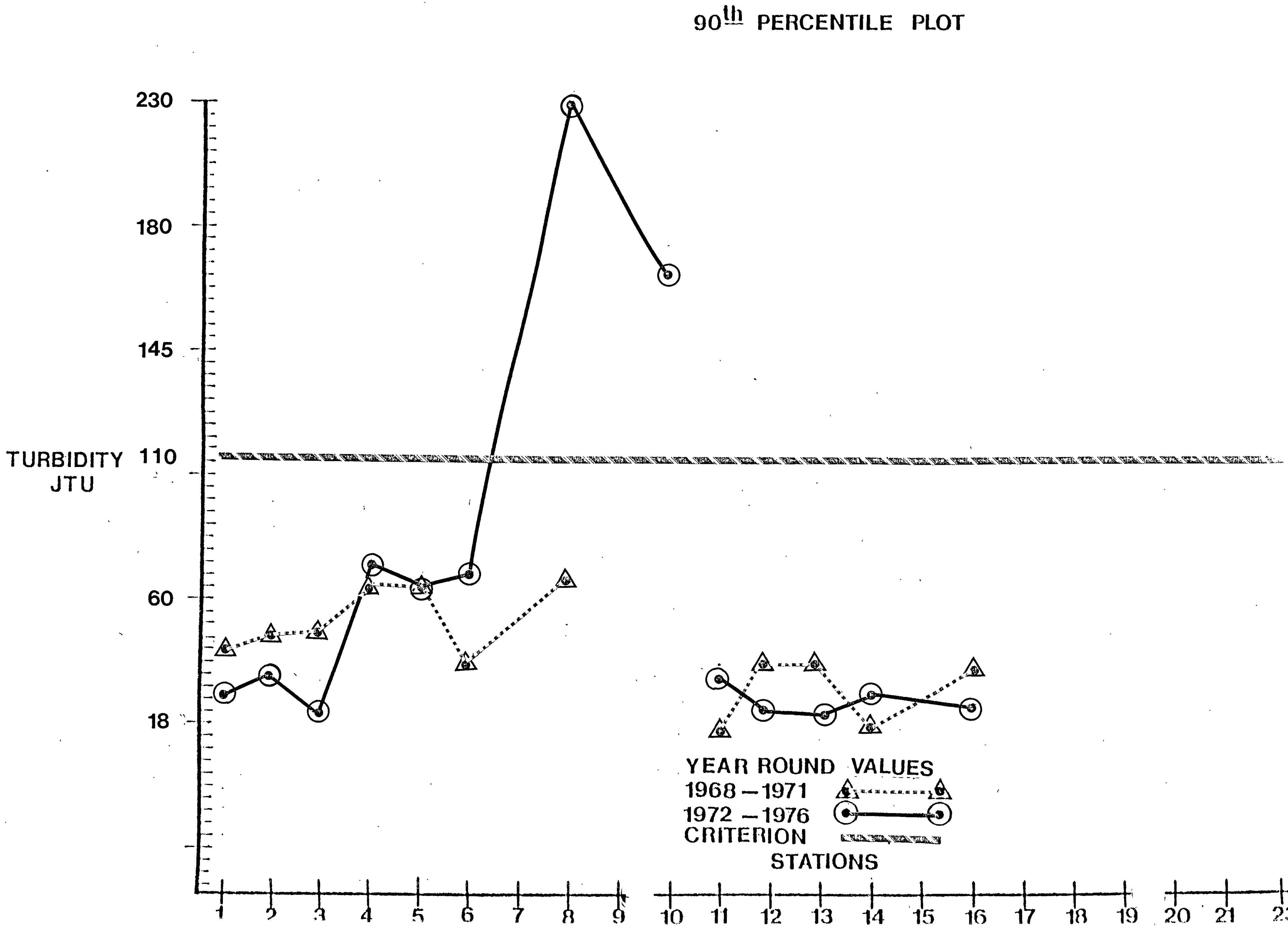

90th PERCENTILE PLOT
NON-FILTRABLE RESIDUE mg/l
471
380
288
197
105
40
14
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Figure VI.W.8


90th PERCENTILE PLOT
230
180
145
TURBIDITY JTU
110
60
18
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
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# Table VI.W.1 MUNICIPAL AND INSTITUTIONAL DISCHARGER INVENTORY
## RAITAN RIVER BASIN
### Millstone River Segment

| Map Number | Compliance with 1977 Secondary / Best Practicable treatment Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Flow (mgd) 1975 Avg. | Flow (mgd) 1975 Max. | Average Daily Effluent Quality (1975) $BOD_5$ mg/l | $BOD_5$ #/Day | $NH_3$-N mg/l | $NH_3$-N #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | Yes | Kingston STP | So. Brunswick | Heathcote Brook | | Secondary | 1.5 | 2.2 | | 46.4 | 851.8 | 16.42 | 301.6 | SS 96.8 mg/l<br>1776.6 #/day<br>~~pHSU 7.7~~<br>$Cl_2$ Res 1.2 mg/l |
| | | Johnson & Johnson Baby Products | Montgomery | Back Brook | | Advanced | .027 | .02 | .05 | 8.0 | 1.3 | 2.0 | .003 | SS 2.0 mg/l<br>2.2 #/day |
| | Yes | Hunt & Augudtine Inc. | Montgomery | Bedens Brk. Irrigation Pd. | | Advanced | .02 | .003 | | 17.9 | .449 | 6.29 | .156 | SS 10.7 mg/l<br>.267 #/day |
| | | Washington Twp. MUA | Washington | Stony Brook | | Advanced | .064 | .078 | | 37.3 | 24.2 | | | SS 45.8 mg/l<br>29.7 #/day<br>$Cl_2$Res 1.89 mg/l |
| | No | Boro of Hightstown | Hightstown | Rocky Waters | | | .6 | .07 | | 77.2 | 45.0 | 15.8 | 9.22 | SS 29.0 mg/l<br>16.9 #/day |
| | | Educational Testing Service | Princeton Township | Stony Brook | | Advanced | .08 | .05 | | 29.8 | 12.42 | 11.17 | 4.66 | SS 19.0 mg/l<br>7.92 #/day<br>DO 9.4 mg/l |
| B | Yes | Forsgate Sanitation | Monroe | Cranbury Brook | | Advanced | 3.0 | .4 | .7 | 4.0 | 13.0 | | | SS 4.0 mg/l<br>13.0 #/day |

Table VI.W.1 (cont'd) MUNICIPAL AND INSTITUTIONAL DISCHARGER INVENTORY

Millstone River Segment

| Map Number | Compliance with 1977 Secondary / Best Practicable treatment Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Avg. | Max. | Average Daily Effluent Quality (1975) $BOD_5$ mg/l | #/Day | $NH_3$-N mg/l | #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Yes<br>Yes | Minnesota Mining & Manufacturing Co. Discharge # 1 | Montgomery | Crusers Brook | 0003255 | Advanced | .0062 | .0064 | | 418.9 | 22.2 | | | SS 20,811.3 mg/l<br>1103.0 #/day<br>DO 5.9 |
| | | Discharge #2 | Montgomery | Crusers Brook | 0003255 | Advanced | .0058 | .004 | | 672.7 | 22.2 | | | SS 33,424.2 mg/l<br>1103 #/day<br>DO 6.8 |
| C | Yes | N.J. Turnpike Authority | Cranbury Township | Cedar Brook | 0020729 | Advanced | .25 | .73 | | 11.45 | 69.7 | | | SS 4.2 mg/l<br>25.5 #/day<br>DO 8.09 mg/l |
| D | Yes | East Windsor MUA | East Windsor | Millstone | 0023787 | Secondary | 1.4 | 1.4 | | 58.0 | 678.0 | | | SS 25.0 mg/l<br>292.0 #/day |
| E | No | Boro of Manville | Manville | Raritan & Millstone | 0028762 | Advanced | .83 | 1.2 | | 24.2 | 242.1 | | | SS 30.2 mg/l<br>302.2 #/day |
| | No | Lewis Bower Inc. | West Windsor | L. Bear Brook | 0023485 | Advanced | .035 | .004 | | | | | | DO mg/l |

## Table VI.W.1 (cont'd) MUNICIPAL AND INSTITUTIONAL DISCHARGERS INVENTORY

### Millstone River Segment

| Map Number | Compliance with 1977 Secondary / Best Practicable treatment Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Avg. | Max. | Effluent Quality (1975) $BOD_5$ mg/l | $BOD_5$ #/Day | $NH_3$-N mg/l | $NH_3$-N #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Yes | Western Electric Co. Inc. Discharge #1 | Hopewell Twp. | Cleveland Brook | 0000809 | Secondary | .04 | .129 | | 7.0 | 7.52 | | | SS 7.0 mg/l 7.42 #/Day |
| | Yes | Socony Mobil Oil Co. Discharge #1 | Hopewell Twp. | Honey Brook | | Advanced | .015 | .004 | | 3.2 | .108 | | | SS 5.25 mg/l .175 #/Day D.O. 5.55 mg/l |
| | Yes | Princeton Farms Development | Hopewell Twp. | Honey Brook | | Advanced | .150 | .046 | | .918 | .352 | | | SS 59.6 mg/l 22.8 #/Day |
| | Yes | Kooltronics | Hopewell Boro | Bedens Brook | | Primary | .009 | | | | | | | |
| F | | Princeton Sewer Operating Committee | Princeton Boro | Millstone River | 0020796 | Secondary | 2.5 | 4.76 | | 8.6 | 341.4 | | | SS 23.2 mg/l 922.9 #/Day |
| | No | Pretty Brook STP | Princeton Boro | Stony Brook | 0020770 | Secondary | .02 | .031 | | 49.1 | 9.0 | | | SS 38.0 mg/l 6.9 #/Day D.O. 7.9 mg/l |
| | | Elizabeth-town Water Co. | Princeton Twp. | Stony Brook | 0000981 | Filter Backwash | | | | | | | | SS 6.0 mg/l 20.9 #/Day CU Tot .6 mg/l |

Table VI.W.1 (cont'd) MUNICIPAL AND INSTITUTIONAL DISCHARGER INVENTORY

Millstone River Segment

| Map Number | Compliance with 1977 Secondary / Best Practicable treatment Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Avg. | Max. | Average Daily Effluent Quality (1975) BOD5 mg/l | BOD5 #/Day | NH3-N mg/l | NH3-N #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Yes | Burnt Hill Road School | Montgomery | Back Brook | 0026891 | Advanced | .015 | .005 | | 9.0 | .450 | | | SS 8.0 mg/l .40 #/Day D.O. 4.15 mg/l |
| | Yes | Veteran's Administration Depot | Hillsborough | Royce Brook | | Secondary | .001 | .003 | | 4.7 | .117 | | | SS 5.5 mg/l .137 #/Day D.O. 8.08 mg/l |
| | Yes | River Road STP | Hillsborough | Millstone | 0022764 | Secondary | .08 | .09 | | 17.0 | 12.7 | | | SS 13.3 mg/l 9.98 #/Day |
| | No | Valley Road Sewerage Co. (Field Hedge) | Hillsborough | Royce Brook | 0022772 | Secondary | .05 | .074 | | 16.4 | 10.12 | | | SS 13.5 mg/l 71.8 #/Day D.O.11.4 mg/l |
| | Yes | Carter-Wallace Inc. | Cranbury Twp. | Canbury Brook | 0002666 | Advanced | .02 | .288 | | 16.6 | 39.8 | | | SS 29.9 mg/l 71.8 #/Day DO 11.4 mg/l |

Table VI.W.1 (cont'd) INDUSTRIAL DISCHARGER INVENTORY
Millstone River Segment

| Map Number | Compliance with 1977 Secondary / Best Practicable treatment Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Avg. | Max. | Average Daily Effluent Quality (1975) BOD5 mg/l | BOD5 #/Day | $NH_3$-N mg/l | $NH_3$-N #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Yes | FMC Corp Discharge #1 | Plainsboro | Millstone | 0027731 | Cooling Water | .015 | .06 | | 3.0 | 1.5 | | | SS 33.3 mg/l<br>17.0 #/day |
| | Yes | Discharge #2 | Plainsboro | Millstone | 0027731 | Secondary | .015 | .012 | | 45.0 | 4.0 | | | SS 27.0 mg/l<br>3.0 #/day |
| | Yes | Discharge #3 | Plainsboro | Millstone | 0027731 | None | | .08 | | 1.5 | 1.0 | | | SS 22.0 mg/l<br>15.4 #/day |
| | Yes | Discharge #4 | Plainsboro | Millstone | 0027731 | None | | .01 | | 4.5 | .34 | | | SS 19.0 mg/l<br>2.0 #/day |
| | Yes | Discharge #5 | Plainsboro | Millstone | 0027731 | Cooling Water | | .04 | | 5.0 | 1.6 | | | SS 21.0 mg/l<br>7.0 #/day |
| | | Rhodia | New Brunswick | Six Mile Run | 0000060 | Stormwater | .018 | .008 | | | | | | |
| | | International Business Machines Inc. | So. Brunswick | Devils Brook | 0000426 | Industrial Landfill | | .0075 | | 2.0 | .125 | 1.0 | .062 | SS 16.0 mg/l |

Table VI.W.1 (cont'd) INDUSTRIAL DISCHARGER INVENTORY

Millstone River Segment

| Map Number | Compliance with 1977 Secondary / Best Practicable treatment Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Avg. | Max. | Average Daily Effluent Quality (1975) $BOD_5$ mg/l | #/Day | $NH_3$-N mg/l | #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Yes | Western Electric Co. Inc. Discharge #2 | Hopewell Township | Honey Brook | 0000809 | Cooling Water | | .001 | | 8.1 | .068 | | | SS 2.2 mg/l .018 #/day Temp W-40°F S-82°F |
| | Yes | Discharge #3 | Hopewell Township | Honey Brook | 0000809 | Cooling Water | | .007 | | 2.02 | .118 | | | SS 1.2 mg/l .068 #/day Temp W-40°F S-82°F |

## Table VI.W.1 (cont'd) INDUSTRIAL DISCHARGER INVENTORY

### Millstone River Segment

| Map Number | Compliance with 1977 Secondary / Best Practicable treatment Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Avg. | Max. | Average Daily Effluent Quality (1975) $BOD_5$ mg/l | $BOD_5$ #/Day | $NH_3$-N mg/l | $NH_3$-N #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Yes | Minnesota Mining & Manufacturing Co. Discharge #3 | Montgomery | Crusers Brook | 0003255 | Cooling Water | | | | | | | | SS 140.0 mg/l 140.0 #/day |
| | | Cities Service Company | South Brunswick | Heathcote Brook | 0000191 | Industrial | .116 | .114 | | | | | | SS 9.36 mg/l 8.9 #/day FeTOT 1.4 mg/l pHSU-5.5-9.0 |
| | | RCA Corp. | East Windsor | Millstone | 0002534 | Cooling Water | | .110 | | | | | | pHSU-7.1 Temp. S-60°F WW-65°F |
| | | Socony Mobil Oil Co. Discharge #2 | Hopewell Township | Honey Brook | | | .037 | .014 | | 9.0 | 1.05 | | | SS 5.16 mg/l .603 #/day DO 1.9 mg/l |
| | Yes | Mobil Research & Development Corp. | Hopewell Twp. | Stony Brook | 0000795 | Industrial | | .04 | | 5.0 | 2.0 | | | SS 24.0 mg/l 8.0 #/day O&G 10.0 mg/l |

## LAWRENCE BROOK AND SOUTH RIVER

### BASIN DESCRIPTION

Lawrence Brook originates in Middlesex County and flows northward through agricultural, suburban and commercial development downstream to the Raritan River. Water is utilized for potable purposes below Farrington Lake. The South River headwaters originate in northwestern Monmouth County and flow Northwest through predominantly agricultural and residential areas into more densely populated suburban, commerical and industrial areas of Middlesex County prior to confluence with the mainstem of the Raritan. South River is heavily utilized for potable and industrial purposes through infiltration wells at Duhernal Lake, infiltration wells at Tennent Pond and its associated canal system, and through pumpage by Sayreville to off-stream lagoons and associated infiltration wells.

### WATER QUALITY ASSESSMENT

Water quality on these rivers is marginally unacceptable. Fecal coliform bacteria concentrations are above criterion levels at all stations. Dissolved oxygen concentrations are in general above criterion levels on both rivers. Biochemical oxygen demand increases markedly as the South River flows through the heavily developed Route 18 corridor in Old Bridge. Levels have increased with time at all stations on Lawrence Brook and South River. Nutrient levels are high in both rivers and result in euthrophic conditions on all lakes in this drainage basin. Solids and turbidity levels are within criterion levels at most stations.

### PROBLEM ASSESSMENT

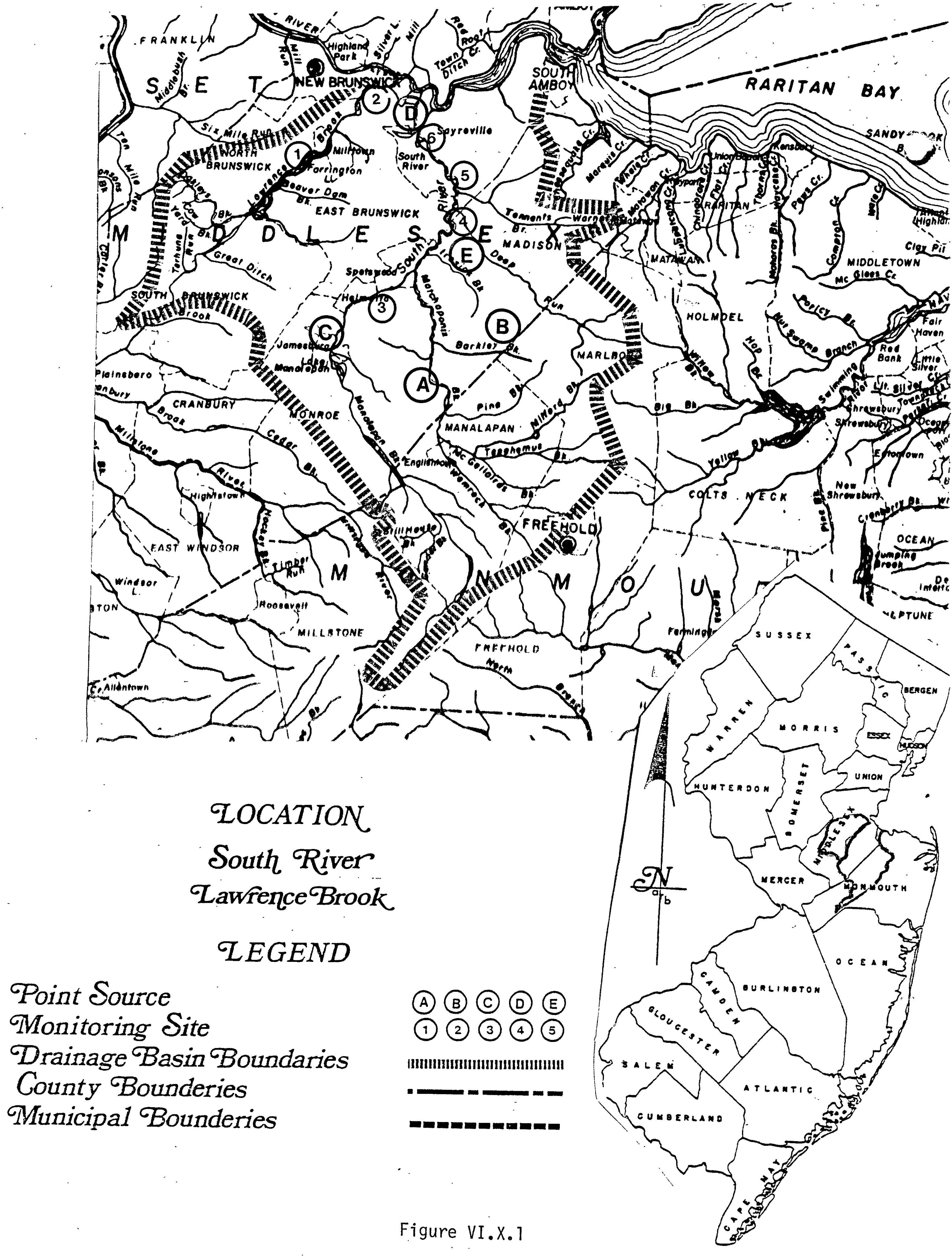
Upstream quality on the South River and Lawrence Brook tributaries is good, although nutrient levels from non-point agricultural runoff are high. Excessive aquatic weed growth in Farrington Lake and Weston Mill impoundments and frequent algal blooms on Lake Duhernal and other watershed lakes can be attributed to the excessive nitrate and phosphorus loadings. Untreated sewage is bypassed from overloaded treatment plants on the South River. Overflowing septic systems and treatment plant effluents also contribute to excessive fecal coliforms, biochemical oxygen demand and depressed dissolved oxygen levels. Several landfills near the downstream tidal portions of these rivers contribute biochemical oxygen demand, turbidity, and excessive coliforms via landfill leachate. Tidal areas of these rivers is of poor quality due to the very poor quality of the lower Raritan River and Bay entering tributaries on incoming tidal cycles.

GOAL ASSESSMENT AND RECOMMENDATIONS

Lawrence Brook and South River drainages are currently supporting recreational fisheries. However, the eutrophic conditions limit the quality of the fishing offered. Several impoundments are ideal candidates for lake restoration under Section 314 of the Federal Water Pollution Control Act. High fecal coliform counts currently exceed criteria for primary contact recreation. Upgrading existing treatment plants and implementing adequate planning procedures for developing farmland in Manalapan, Marlboro, and South Brunswick will assist in meeting swimmable goals by 1983.

SOUTH RIVER AND LAWRENCE BROOK
STATION LIST

1. Farrington Lake
2. Lawrence Brook at Weston Mill Pond Outlets
3. Manalapan Brook prior to Lake DeVoe
4. South River at Old Bridge
5. South River below Old Bridge
6. South River at South River



LOCATION
South River
Lawrence Brook
LEGEND
Point Source
Monitoring Site
Drainage Basin Boundaries
County Bounderies
Municipal Bounderies
RARITAN BAY
NEW BRUNSWICK
SOUTH AMBOY
Sayreville
South River
NORTH BRUNSWICK
EAST BRUNSWICK
SOUTH BRUNSWICK
MADISON
MATAWAN
HOLMDEL
MIDDLETOWN
MARLBORO
MANALAPAN
MONROE
CRANBURY
Jamesburg
Spotswood
Helmetta
Englishtown
FREEHOLD
COLTS NECK
EAST WINDSOR
Hightstown
MILLSTONE
Roosevelt
Allentown
Plainsboro
FRANKLIN
Highland Park
Milltown
Farrington L.
Lawrence Bk.
Six Mile Run
Ten Mile Run
Great Ditch
Matchaponix Bk.
Manalapan Bk.
Barkley Bk.
Pine Bk.
Millstone River
Red Bank
Fair Haven
Shrewsbury
Eatontown
New Shrewsbury
OCEAN
SUSSEX
PASSAIC
BERGEN
WARREN
MORRIS
ESSEX
HUDSON
HUNTERDON
SOMERSET
UNION
MIDDLESEX
MERCER
MONMOUTH
OCEAN
BURLINGTON
CAMDEN
GLOUCESTER
SALEM
ATLANTIC
CUMBERLAND
CAPE MAY


Figure VI.X.1

Figure VI.X.2

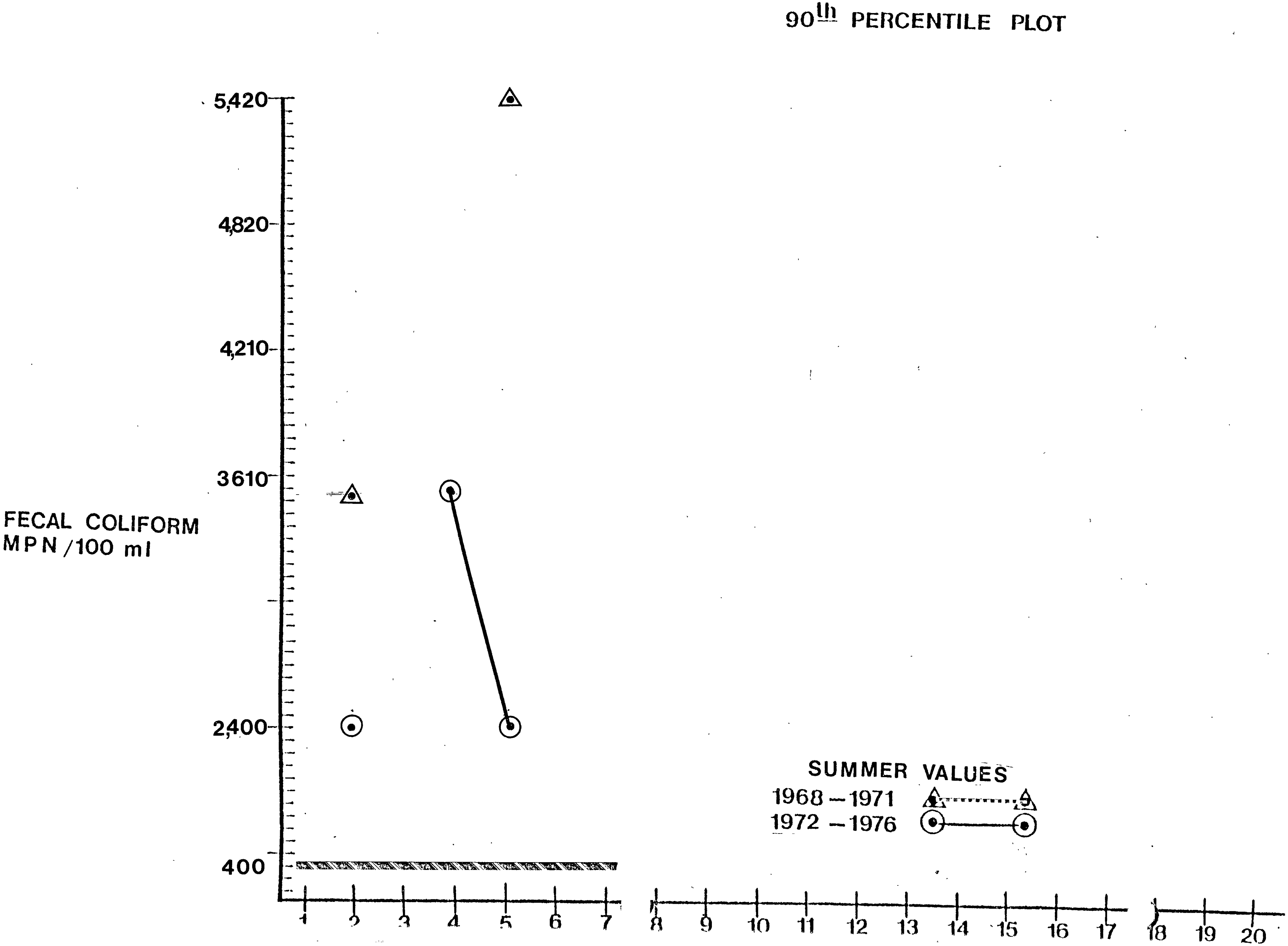

90th PERCENTILE PLOT
FECAL COLIFORM MPN/100 ml
5,420
4,820
4,210
3610
2,400
400
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
SUMMER VALUES
1968 – 1971
1972 – 1976

Figure V[illegible].3

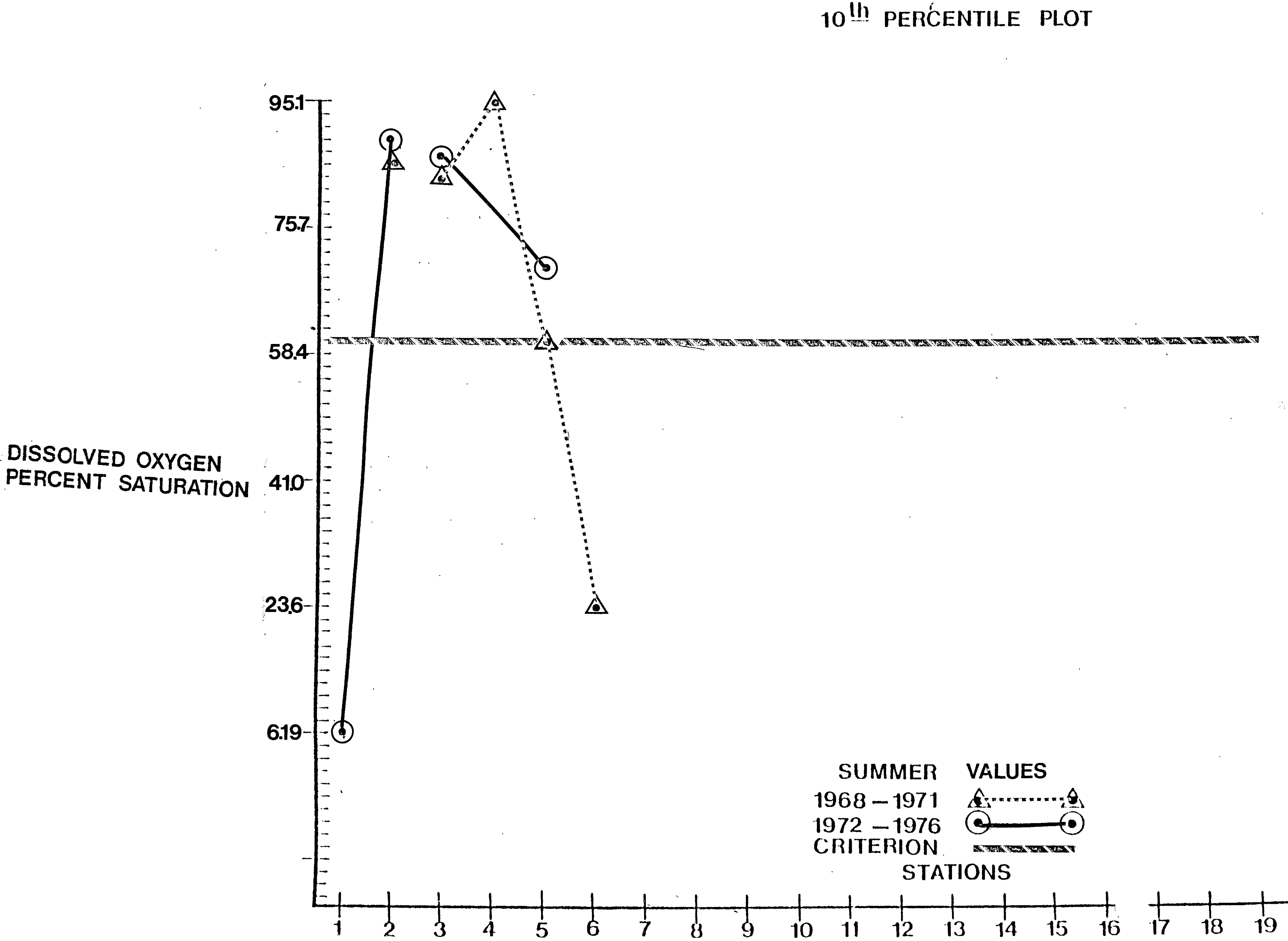
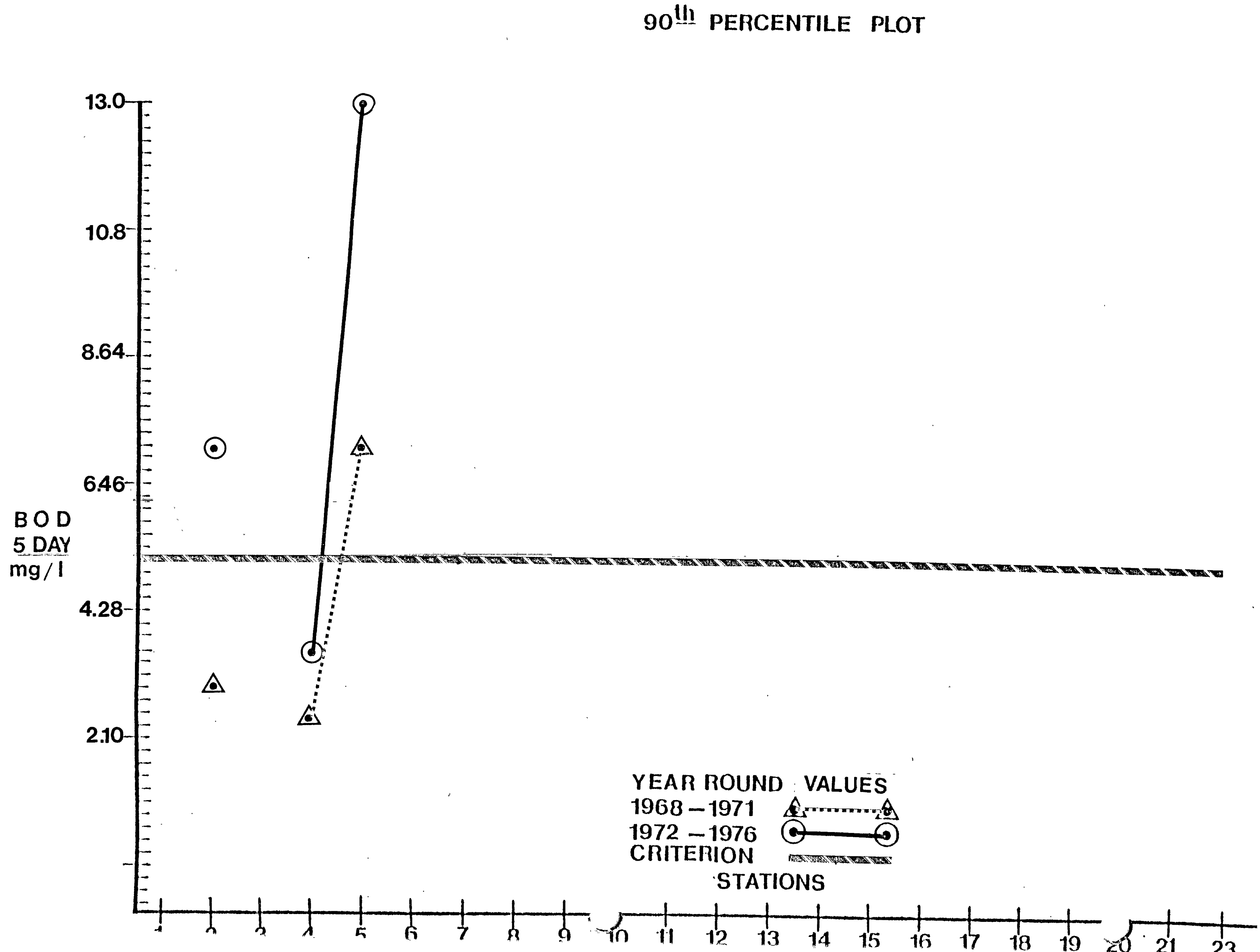

10th PERCENTILE PLOT
DISSOLVED OXYGEN PERCENT SATURATION
95.1
75.7
58.4
41.0
23.6
6.19
SUMMER VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19

Figure VI.X.4



90th PERCENTILE PLOT
13.0
10.8
8.64
6.46
4.28
2.10
BOD
5 DAY
mg/l
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
23

Figure XI

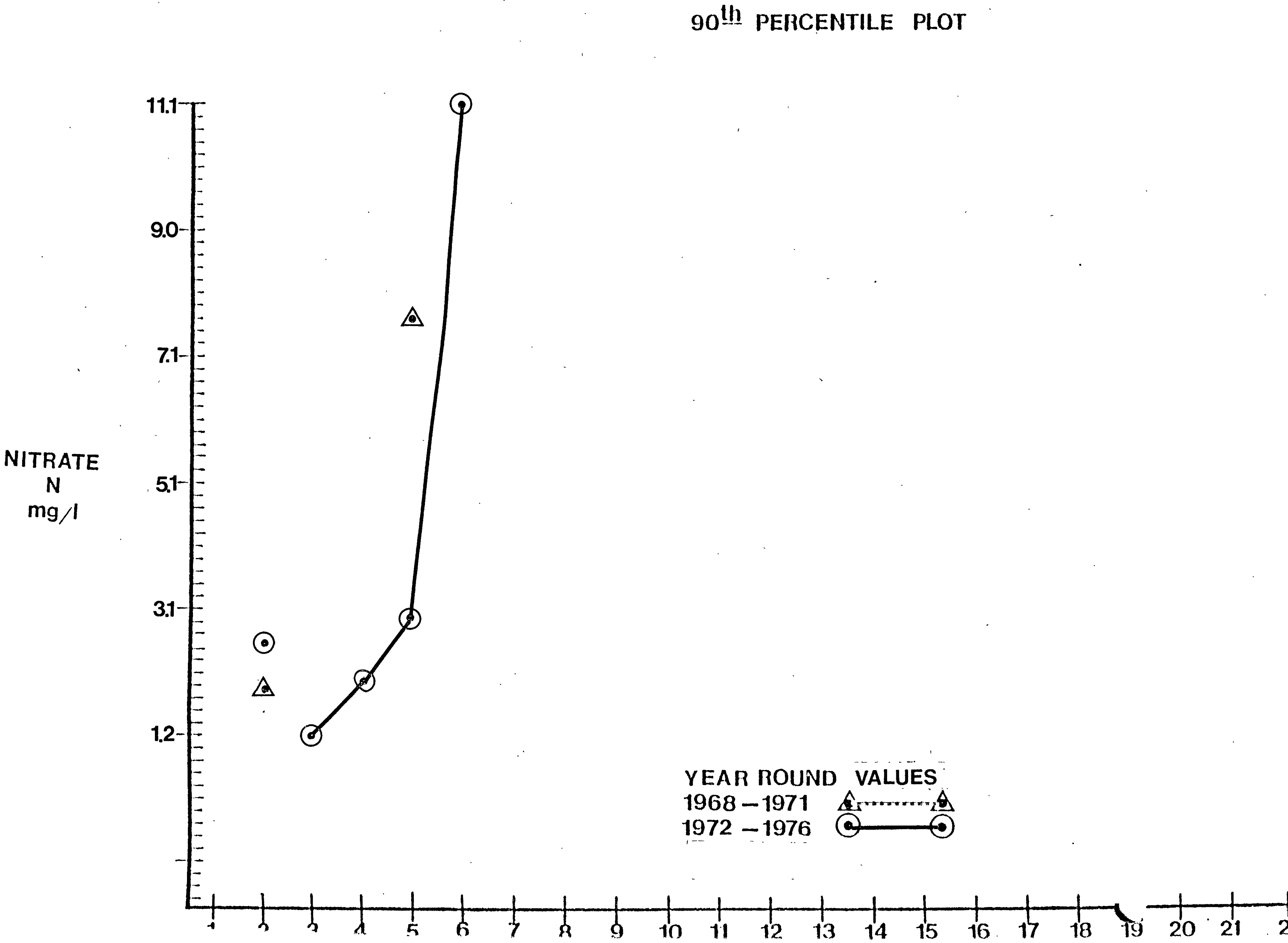

90th PERCENTILE PLOT
NITRATE
N
mg/l
11.1
9.0
7.1
5.1
3.1
1.2
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21

Figure VI.X.6

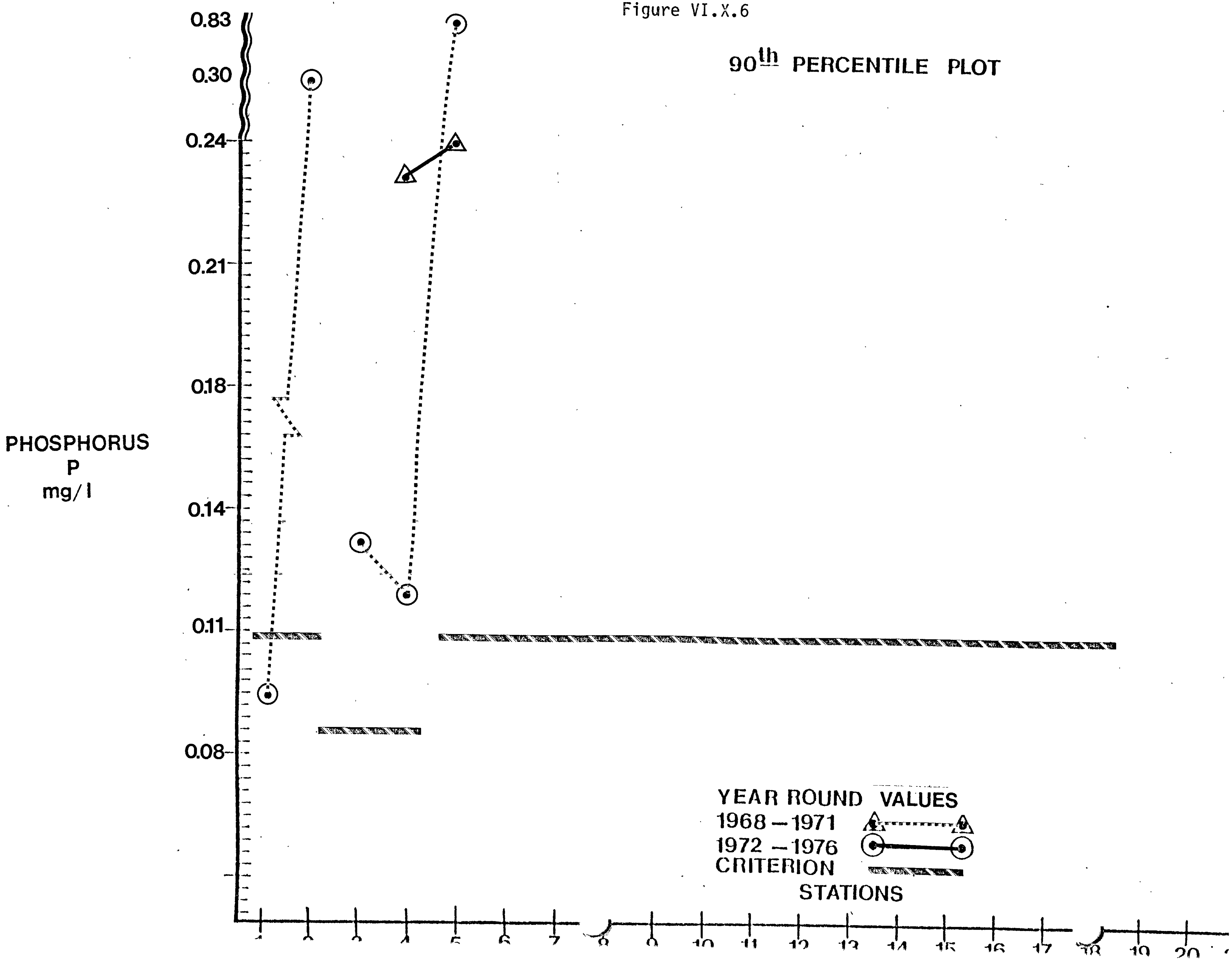
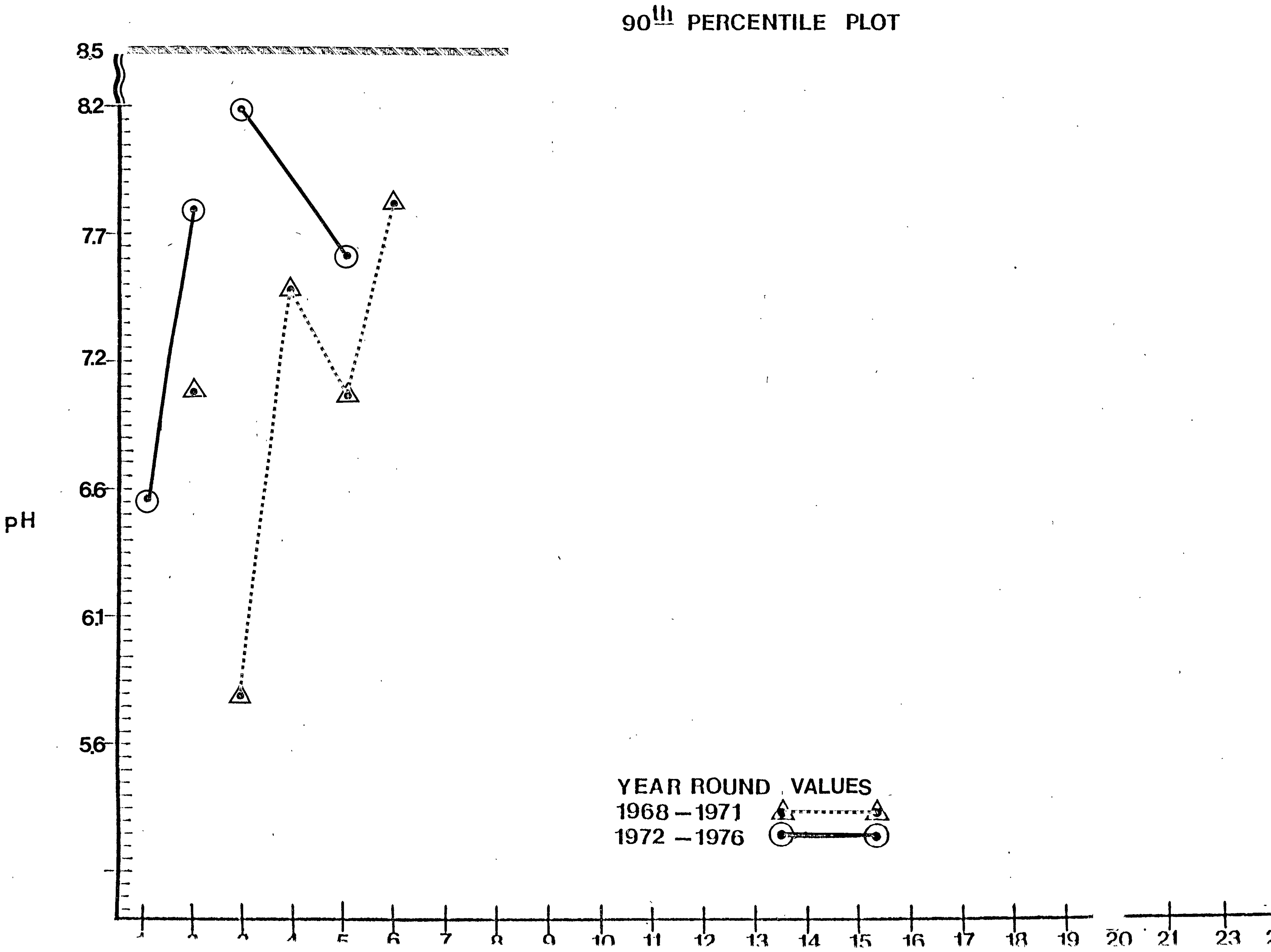

90th PERCENTILE PLOT
PHOSPHORUS
P
mg/l
0.83
0.30
0.24
0.21
0.18
0.14
0.11
0.08
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS

Figure VI.



90th PERCENTILE PLOT
8.5
8.2
7.7
7.2
6.6
pH
6.1
5.6
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
23

Figure VI.X.7

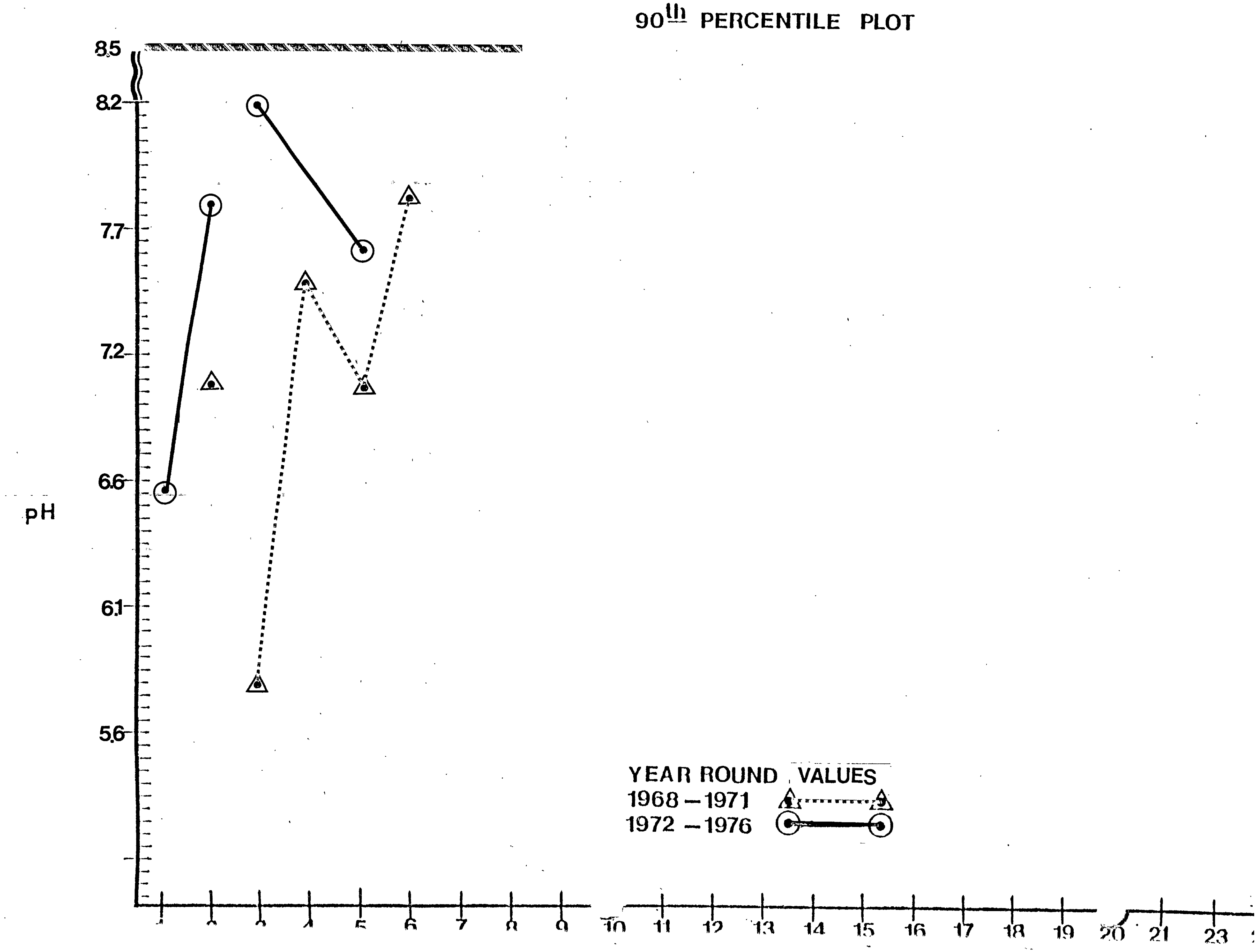

90th PERCENTILE PLOT
8.5
8.2
7.7
7.2
6.6
pH
6.1
5.6
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
23

Figure VI.X.6

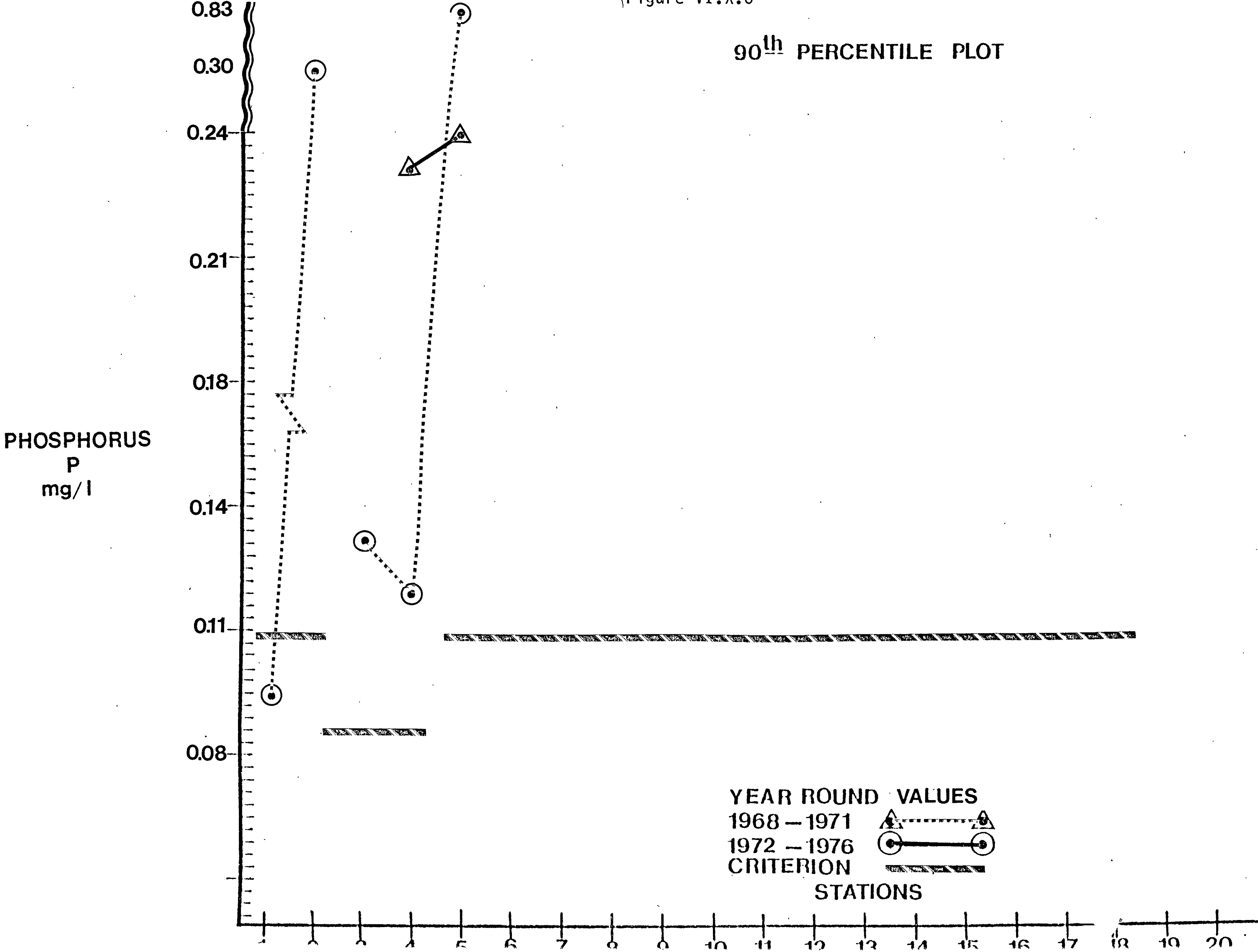

90th PERCENTILE PLOT
PHOSPHORUS
P
mg/l
0.83
0.30
0.24
0.21
0.18
0.14
0.11
0.08
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS

Figure VI.X.8

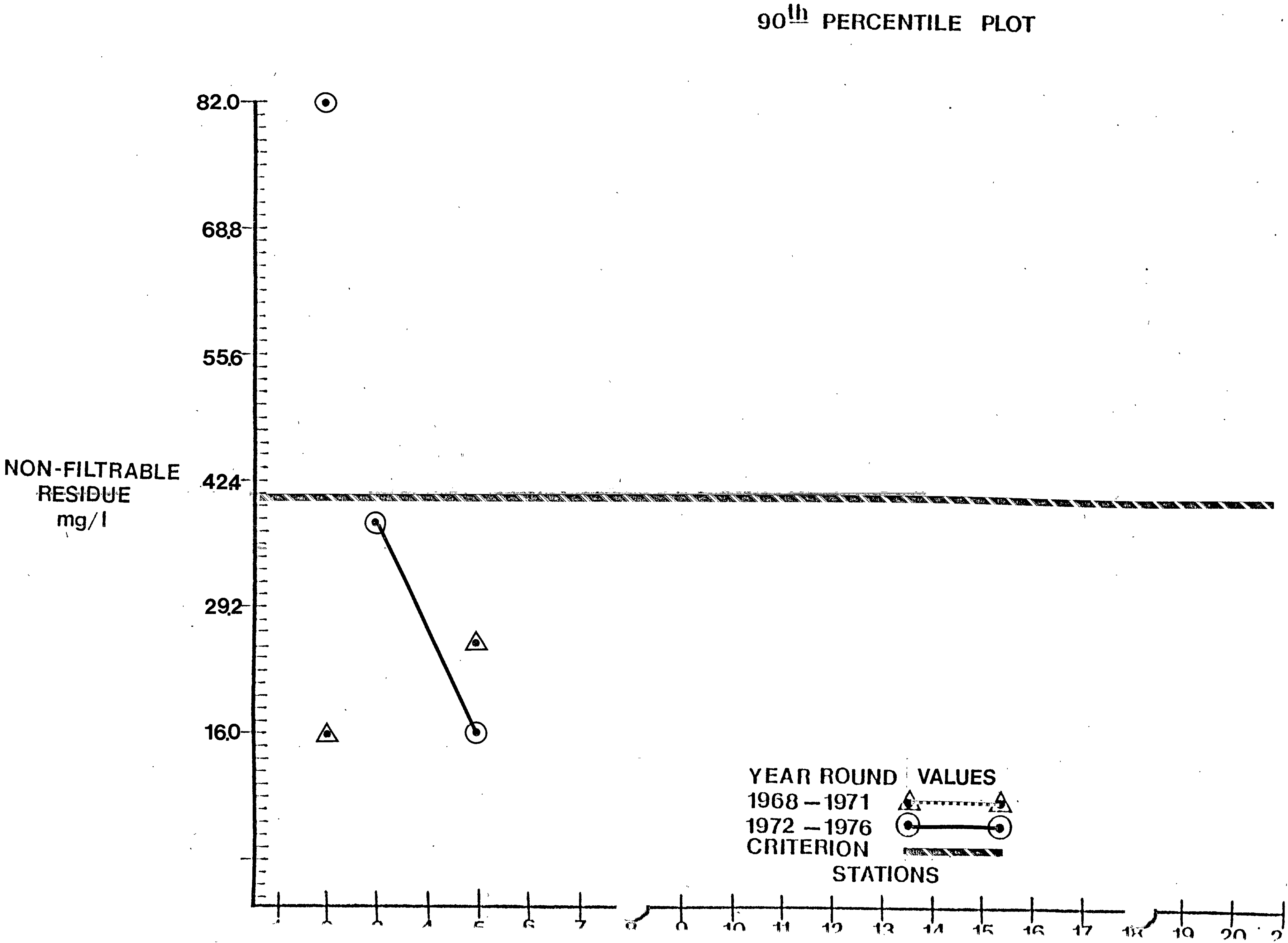

90th PERCENTILE PLOT
82.0
68.8
55.6
42.4
29.2
16.0
NON-FILTRABLE RESIDUE mg/l
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS

Figure VI.X.9

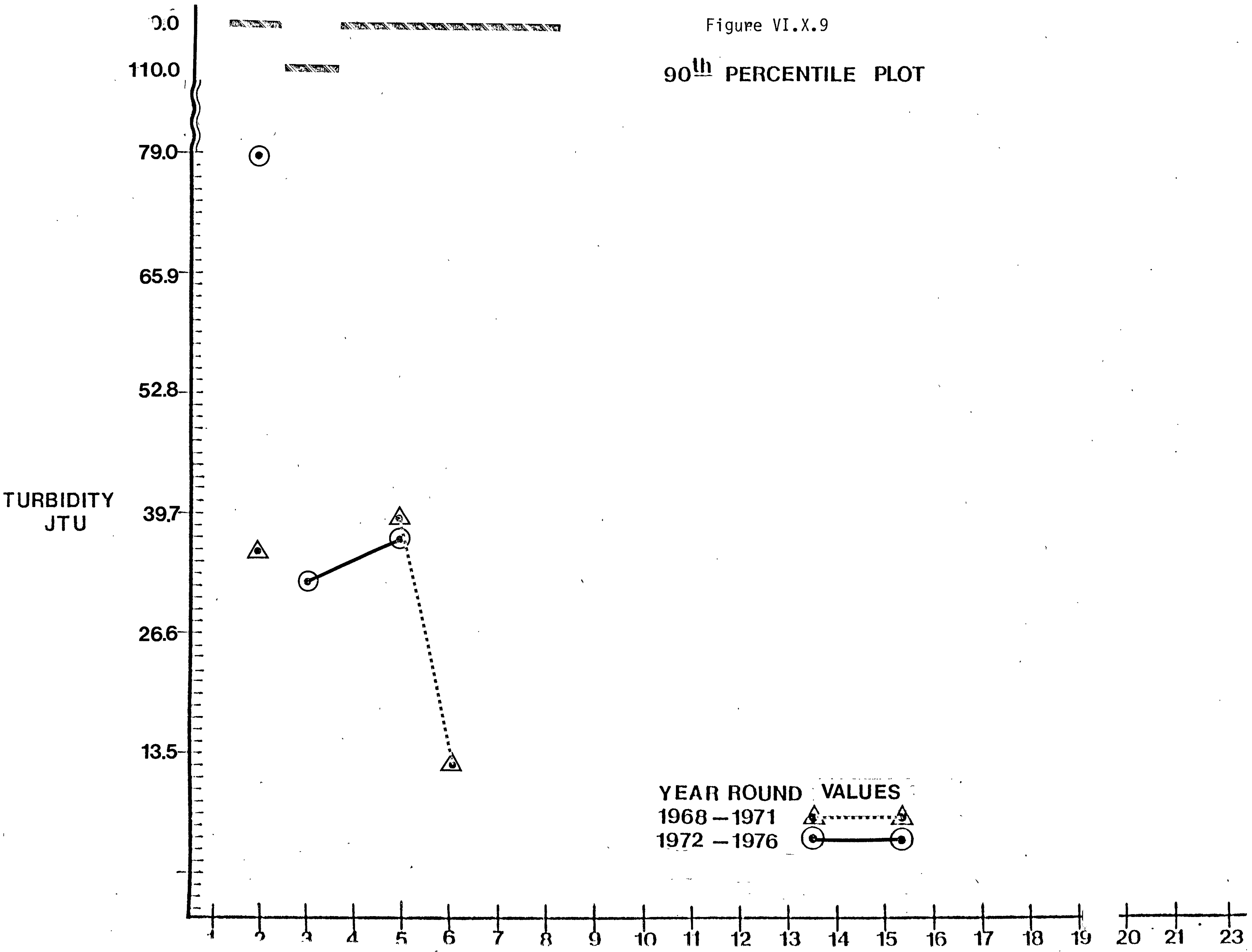

90th PERCENTILE PLOT
TURBIDITY JTU
110.0
79.0
65.9
52.8
39.7
26.6
13.5
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
23

Table VI.X.1 MUNICIPAL AND INSTITUTIONAL DISCHARGERS

South River Segment

| Map Number | Compliance with 1977 Secondary / Best Practicable treatment Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Avg. | Max. | Average Daily Effluent Quality (1975) $BOD_5$ mg/l | #/Day | $NH_3$-N mg/l | #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | | Western Monmouth MUA Pine Brook Discharge #1 | Manalapan | Matchaponix Brook | 0004253 | Secondary | 1.17 | 1.16 | | 8.0 | 77.3 | | | SS 37.0 mg/l<br>357.9 #/Day<br>$Cl_2$ Res. 3.9 mg/l |
| B | | Western Monmouth MUA Whittier Oaks Discharge #2 | Marlboro | Barclay Brook | | Secondary | .475 | .55 | .07 | 20.0 | 92.0 | | | SS 20.0 mg/l<br>92.0 #/Day |
| | | Wickatunk Village | Marlboro | Tributary to Deep Run | | Advanced | .025 | .008 | | 44.2 | 2.9 | 30.6 | 2.02 | SS 12/5 mg/l<br>.049 #/Day |
| C | | Boro of Jamesburg | Jamesburg | Manalapan Brook | | Primary | .25 | .50 | | 36.8 | 153.4 | 8.16 | 34.0 | SS 17.7 mg/l<br>73.8 #/Day |

**Table** VI.X.1 INDUSTRIAL DISCHARGER
(cont'd)

| Number | Compliance with 1977 Secondary / Best Practicable treatment Requirements | Discharger | Municipality | Receiving Stream | NPDES Permit Number | Existing Treatment Process | Flow (mgd) 1975 Des. Cap. | Avg. | Max. | Average Daily Effluent Quality (1975) BOD$_5$ mg/l | BOD$_5$ #/Day | $NH_3$-N mg/l | $NH_3$-N #/Day | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | D | DuPont Photo Products | Sayreville | Second Bridge South River Tital | 0000167 | | | | | | | | | |
| | | DuPont Fabrics and Finishes | Sayreville | South River Tidal | 0000159 | Industrial | 1.3 | .5 | 1.0 | 15.0 | 63.0 | | | |
| | | Hercules Inc. | Sayreville | Pond Creek Tidal So. River | 0001023 | Industrial | .047 | .12 | | | | | | SS 20.0 mg/l 20.0 #/Day |
| | E | Annheuser-Busch | Old Bridge | South River Tidal | 0002470 | Industrial | .78 | | .75 | | | | | |

## MAINSTEM PASSAIC RIVER

### BASIN DESCRIPTION

For the purposes of this section the Passaic River will be categorized into three segments:

| Segment | Location | Drainage Area (square miles) |
|---|---|---|
| Upper Passaic River | Headwaters to the confluence of the Whippany River | 135 |
| Mid-Passaic River | Confluence of the Whippany River to Little Falls | 762[1] |
| Lower Passaic River | Little Falls to Mouth | 950[1] |

1.These are cumulative totals.

The headwaters of Passaic River originate in Morris and Somerset Counties. The upper-Passaic River flows parallel to the Watchung Mountains. From the headwaters to the Great Swamp, near Millington, it is relatively rural. The area is suburban from Millington to the confluence with the Whippany River. The area has potential for recreational, residential, and industrial expansion. The water-related beneficial uses include water supply, canoeing, fishing and swimming.

The mid-Passaic region is also suburban. The river sluggishly flows through the Hatfield Swamp and Great Piece Meadows. A number of conservation educational areas are adjacent to the mid-Passaic River. Water-related beneficial uses include water supply and recreation.

The lower Passaic River is a densely urbanized and industrialized area. There are two dams and one waterfall in this segment of the Passaic River. The dams are at Little Falls and Dundee Dam. The Great Falls is a natural waterfall at Paterson. The Passaic River is tidal from Dundee Dam to its mouth at Newark. Water-related beneficial uses include water supply for industry and recreation.

### WATER QUALITY ASSESSMENT

Water quality is marginally unacceptable in the upper and mid-Passaic River. Water quality in the lower Passaic is poor. Fecal coliform levels are above the criterion throughout the mainstem of the Passaic River, however, the levels decrease between the two time periods. The coliform levels increase downstream during both time periods but the increase in the downstream direction was not as great in 1972-1976 as it was in the 1968-1971 period. Summer dissolved oxygen percent saturation levels are below the criterion at all stations, except near Basking Ridge in the upper Passaic during the 1972-1976 period.

Dissolved oxygen concentrations are higher during the 1972-1976 period in the Upper Passaic River and lower during the 1972-1976 period in the mid and lower Passaic River than the previous time period. Biochemical oxygen demand (BOD) levels are below and above the criterion in the upper Passaic and mid-and lower-Passaic River respectively. BOD levels have slightly increased in the upper Passaic River and substantially decreased in the mid-and lower-Passaic River between the two time periods. All stations show that pH is very near or below the criterion in both time periods. pH generally decreases in a downstream direction. pH does not appear to have significantly changed between the two time periods. Nutrient levels are high throughout the Passaic River. Phosphorus and nitrate nitrogen levels are highest in mid-Passaic River. Phosphorus levels are above the criterion at all stations. Phosphorus levels are generally lower in the 1972-1976 period than the 1968-1971 period. Nitrate nitrogen levels are generally higher or at the same levels during both times periods. Turbidity and nonfiltrable residue (suspended solids) increase in a downstream direction in the upper-and mid-Passaic River segment during both time periods. Turbidity and nonfiltrable residue are highest in the mid-Passaic River segment. Turbidity levels have generally decreased between the two time periods. Whereas, suspended solids have generally increased between the two time periods, non-filtrable residue exceed the criterion in the mid and lower Passaic River. Dissolved residue (total dissolved solids - TDS) generally increases in a downstream direction. There appears to be no significant changes in dissolved residue levels between the two time periods. Dissolved residue levels are below the criterion at all stations.

PROBLEM ASSESSMENT

In the upper Passaic River water quality appears to be affected primarily by point source discharges and secondarily by nutrient and BOD loadings from the Great Swamp. The combination of these impacts promotes conditions which are detrimental to maintaining a sport fishery. The high fecal coliform levels make swimming undesirable in the upper-Passaic River.

In the mid-Passaic River, water quality, and hence the water-related beneficial uses, are also affected by point source discharges. Nutrient, BOD, and nonfiltrable residue loadings from Troy and Black Meadows, which are adjacent to tributary streams, and Hatfield Swamp and Great Piece Meadows, have a substantial impact on water quality. These loadings probably account for the lower quality waters in the mid-Passaic River. Increases in nonfiltrable solids may have deleterious effects on aquatic life such as reducing the feeding ability of fish, reducing the successful hatching of fish eggs and the successful reproduction of aquatic insects which are fish food items. The end result may be a reduction in sport fishery.

Water quality in the lower Passaic River is primarily affected by upstream potable water diversions, artificial and natural reaeration processes by dam spillways and waterfalls, urban storm runoff, construction activity and tidal dilution. Wastewater treatment facilities probably have a lesser impact on water quality than the impacts mentioned earlier. However, industrial users of public facilities may have a significant impact on treatment efficiency and subsequently water quality. Upstream diversions reduce streamflow which in turn reduces the assimilative capacity of the river. It is suspected that this is somewhat balanced by higher reaeration rates at Little Falls, Great Falls, and Dundee dam.

## GOAL ASSESSMENT AND RECOMMENDATIONS

It is expected that the 1983 goals will be achieved in the upper and mid-Passaic River segments. Upgrading and regionalization of some wastewater treatment facilities should aid in protecting these waters for sport fishing, swimming, canoeing, and water supply. However, it will be necessary to develop an understanding of the complexity of nonpoint source loadings, from both natural swamplands and unnatural suburban areas and subsequent impacts on water quality. Such a determination is necessary so that the most cost-effective areawide water quality management plan can be selected and implemented.

It is not expected that the 1983 goal of fishing will be achieved in the lower Passaic River. Non-point loadings may be controlled by 1983 through implementation of areawide water quality management plans. However, BOD loadings from benthal deposits may mask any improvement in water quality that would be achieved by controlling existing point and nonpoint sources of pollution. Thus it will be necessary to study the relative BOD loadings from benthal deposits that have accumulated over a number of years and BOD loadings from storm runoff and wastewater treatment bypasses.

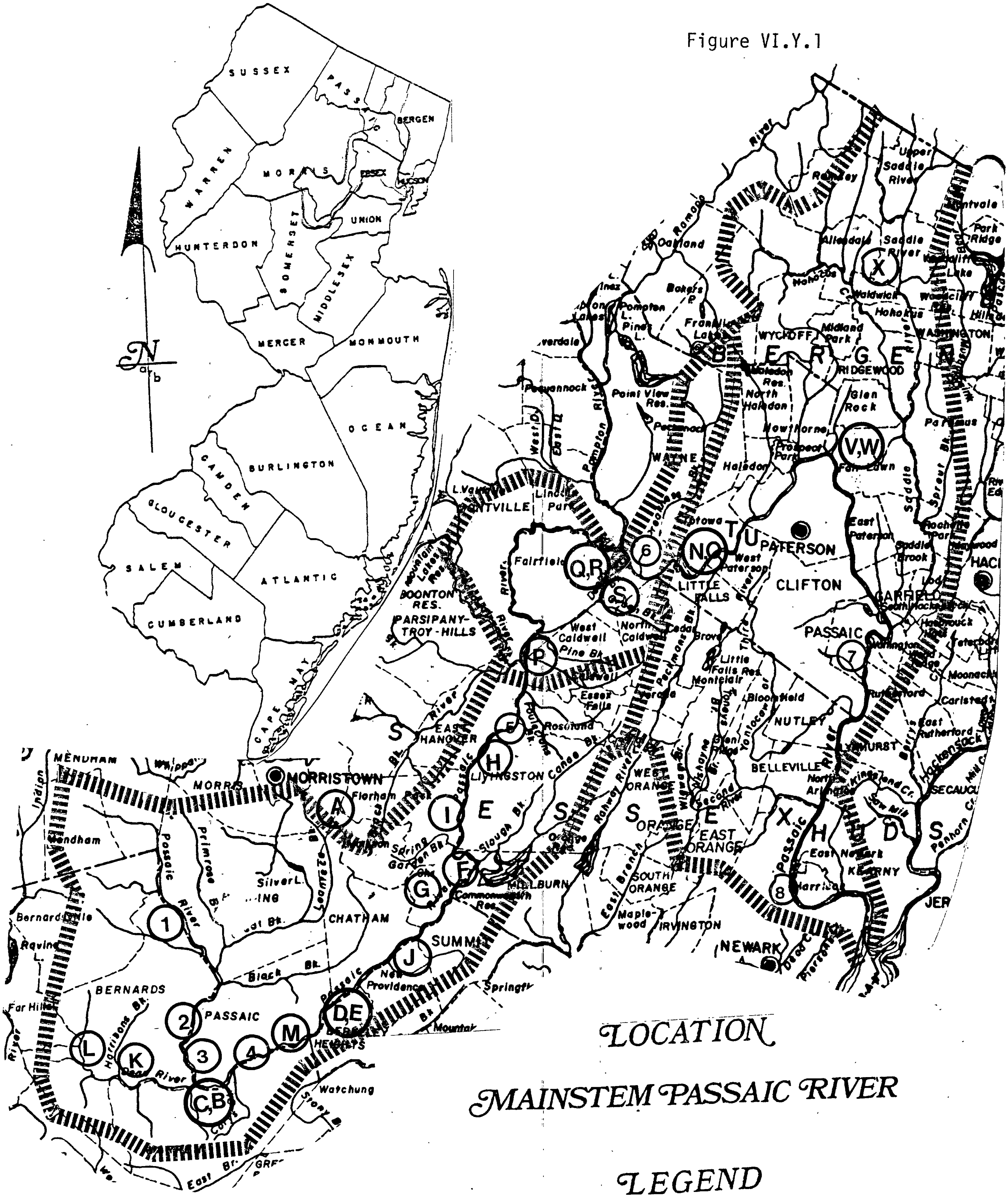
It is also not expected that the 1983 goal of swimming will be achieved in the lower Passaic River. Large capital investments are necessary to rehabilitate sewers, to separate combined sewers, and to eliminate stormwater bypasses at wastewater treatment facilities. All of these are sources of bacterial contamination.

The impact of toxic substances on achieving the goal and objectives of PL 92-500 were discussed in a previous section.

## MAINSTEM PASSAIC RIVER
## STATION LIST

1. Passaic River near Basking Ridge
2. Passaic River near Millington
3. Passaic River at Millington
4. Passaic River near Chatham
5. Passaic River near Livingston
6. Passaic River at Two Bridges
7. Passaic River at Elmwood
8. Passaic River at Harrison

Figure VI.Y.1




# LOCATION

# MAINSTEM PASSAIC RIVER

## LEGEND

| | |
|---|---|
| Point Source | Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ |
| Monitoring Site | ① ② ③ ④ ⑤ |
| Drainage Basin Boundaries | ||||||||||||||||||||||| |
| County Bounderies | — · — · — |
| Municipal Bounderies | — — — — — |

Figur II.Y.2

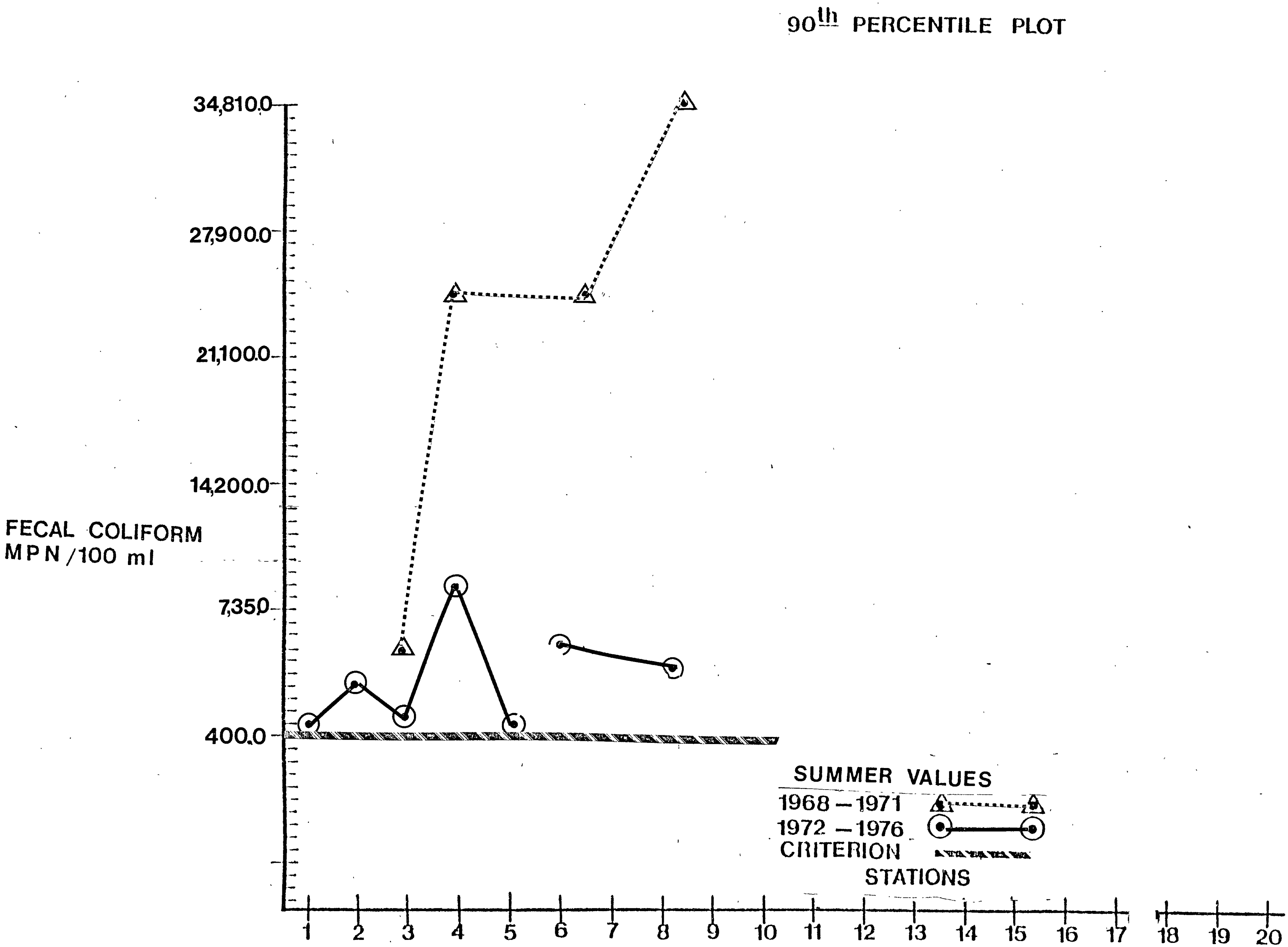
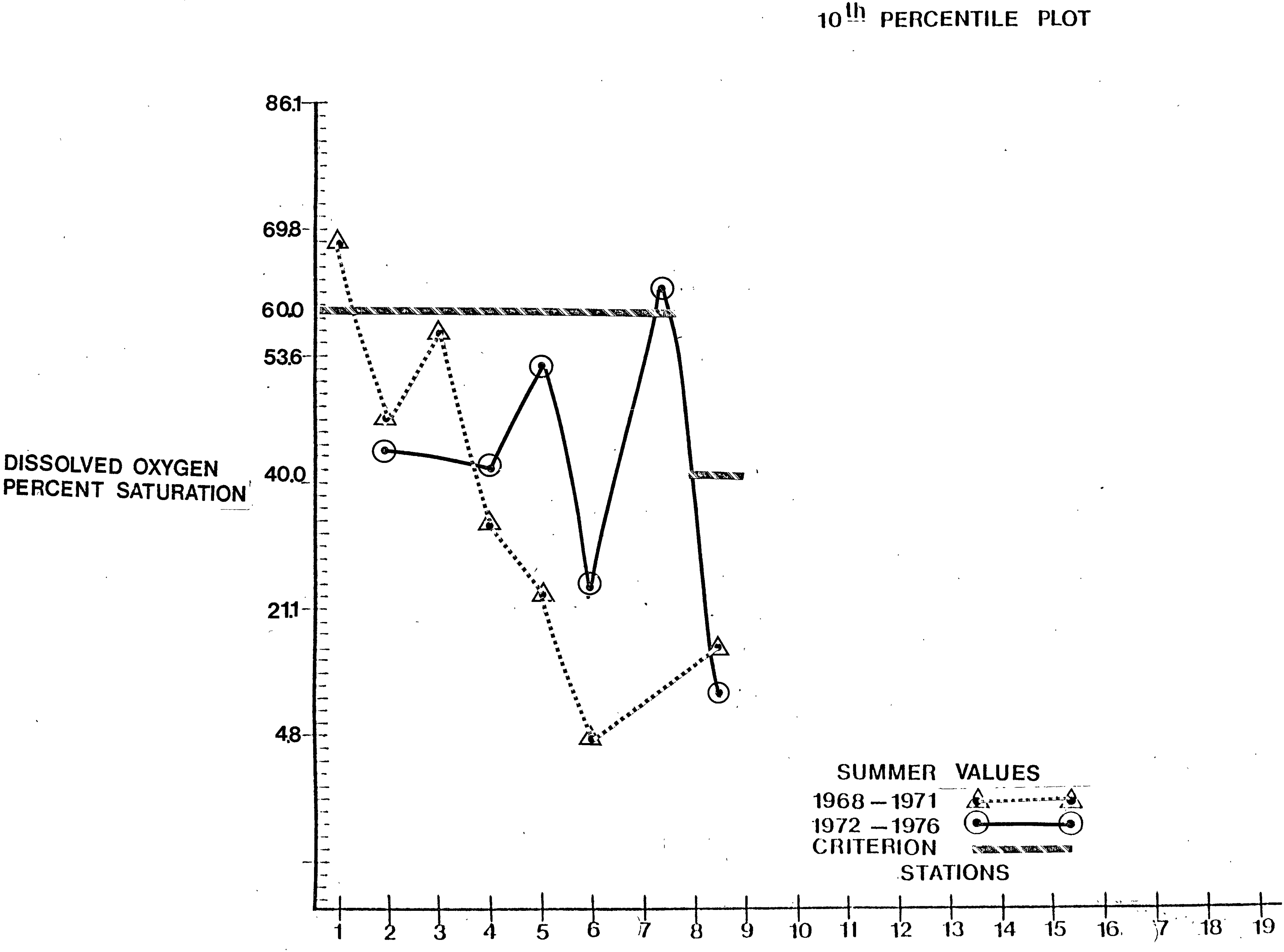

90th PERCENTILE PLOT
34,810.0
27,900.0
21,100.0
14,200.0
FECAL COLIFORM
MPN/100 ml
7,350
400.0
SUMMER VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Figure VI.Y.3



10th PERCENTILE PLOT
DISSOLVED OXYGEN PERCENT SATURATION
86.1
69.8
60.0
53.6
40.0
21.1
4.8
SUMMER VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
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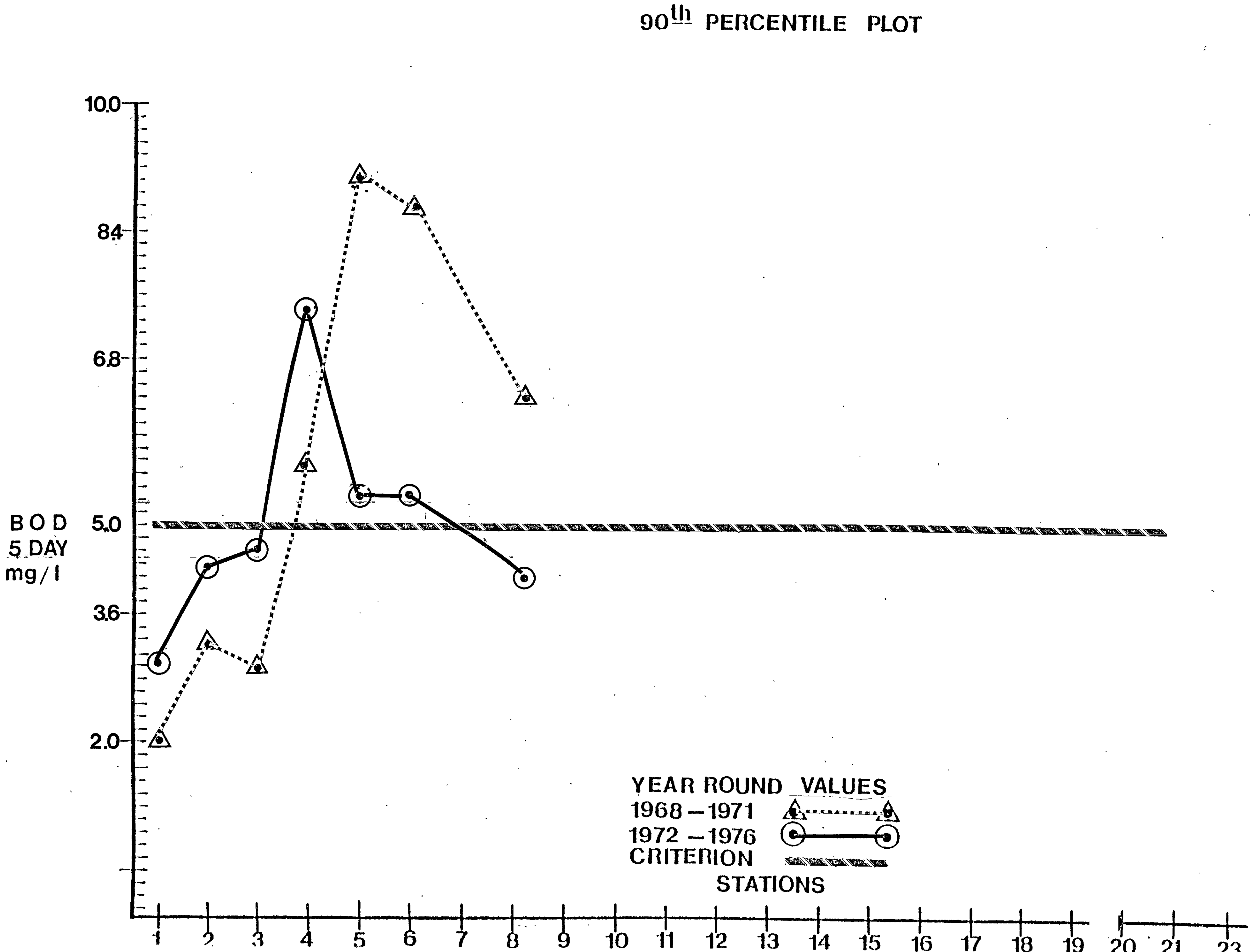
Figure VI 4



90th PERCENTILE PLOT
10.0
8.4
6.8
5.0
3.6
2.0
BOD
5 DAY
mg/l
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 23

Figure VI.Y.5

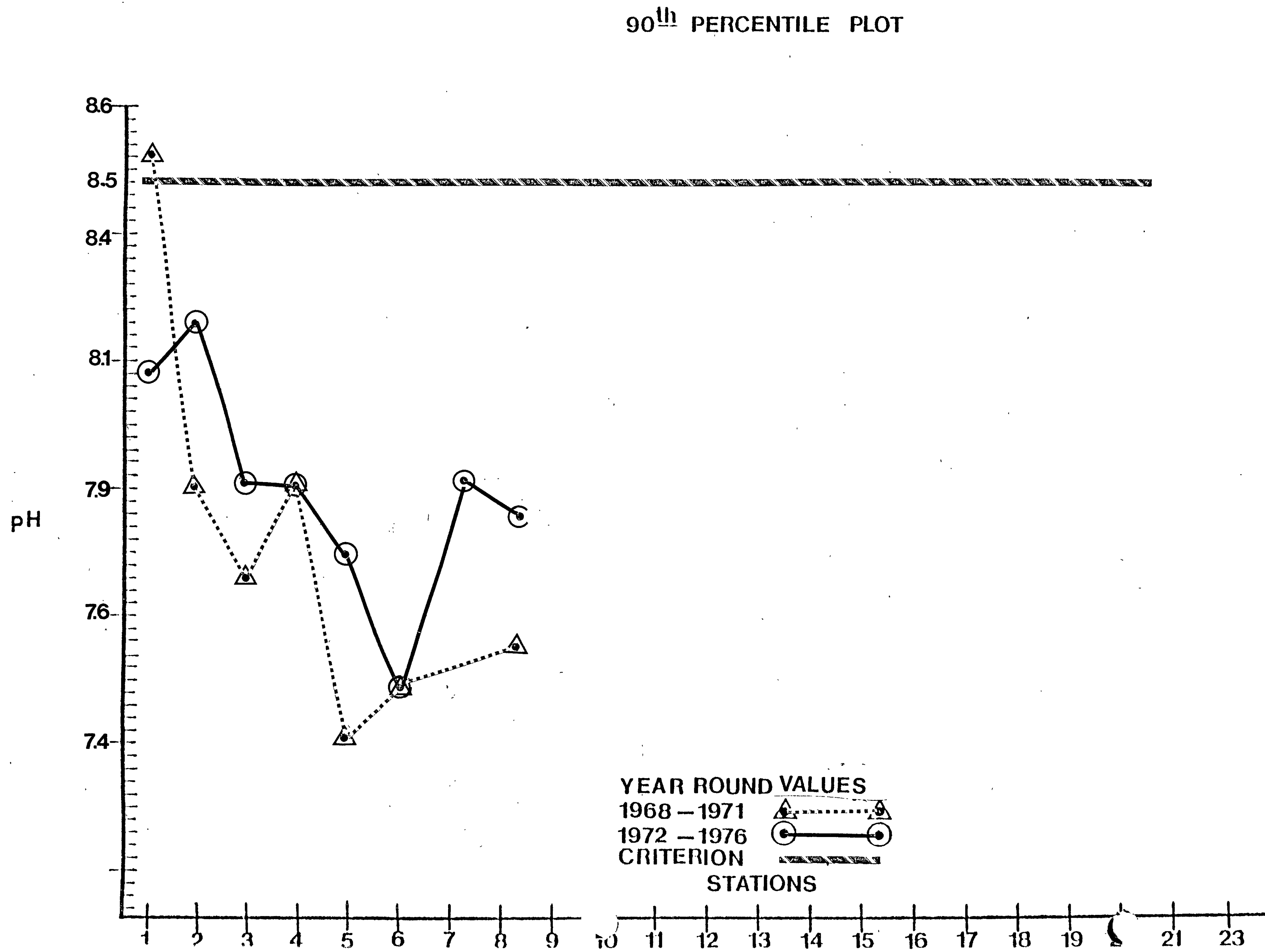

90th PERCENTILE PLOT
8.6
8.5
8.4
8.1
7.9
7.6
7.4
pH
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
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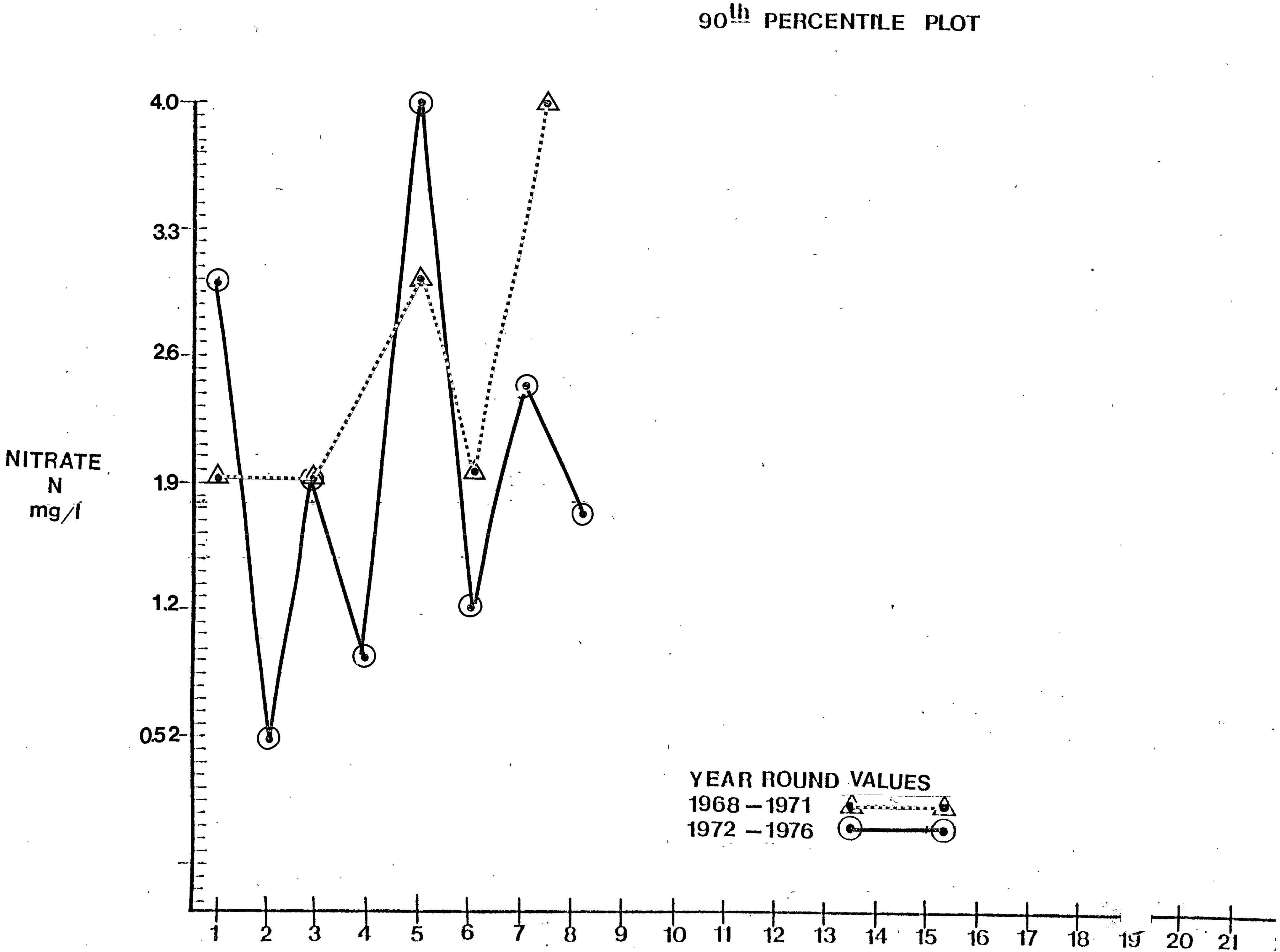
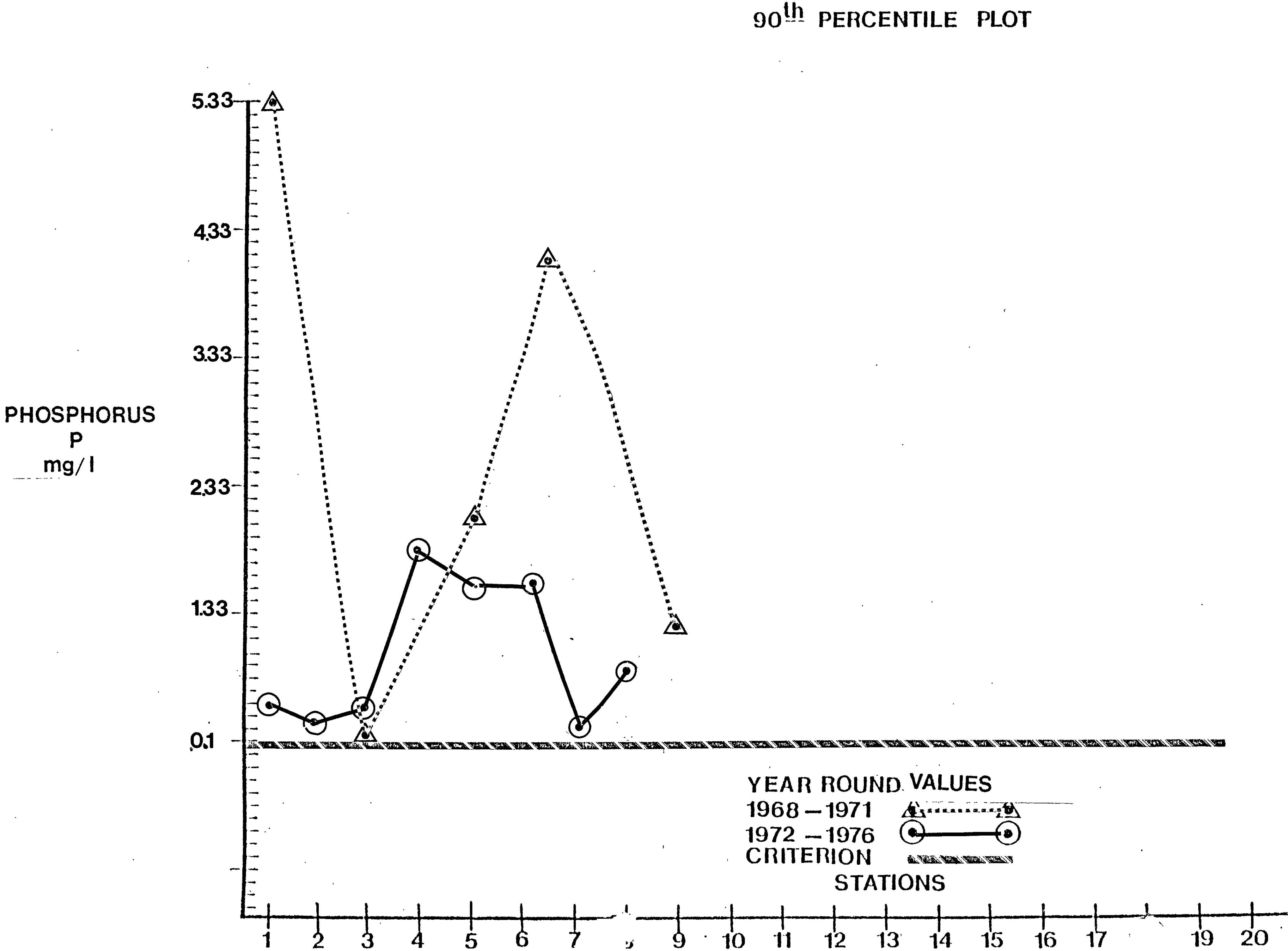
Figure VI.



90th PERCENTILE PLOT
NITRATE N mg/l
4.0
3.3
2.6
1.9
1.2
0.52
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
YEAR ROUND VALUES
1968 – 1971
1972 – 1976

Figure VI.Y.7



90th PERCENTILE PLOT
5.33
4.33
3.33
2.33
1.33
0.1
PHOSPHORUS
P
mg/l
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
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20

Figure V .8

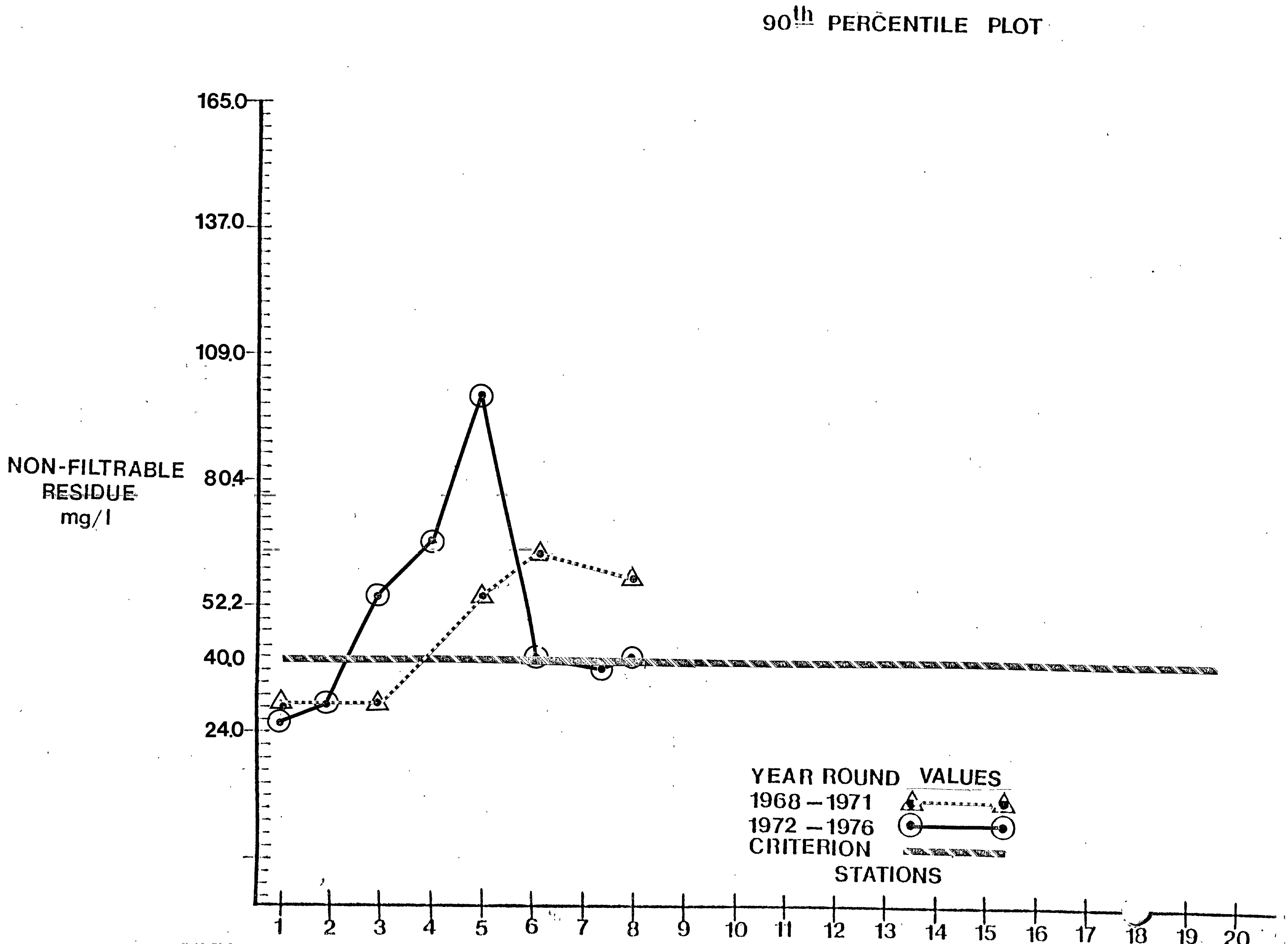
90th PERCENTILE PLOT
165.0
137.0
109.0
80.4
52.2
40.0
24.0
NON-FILTRABLE RESIDUE mg/l
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
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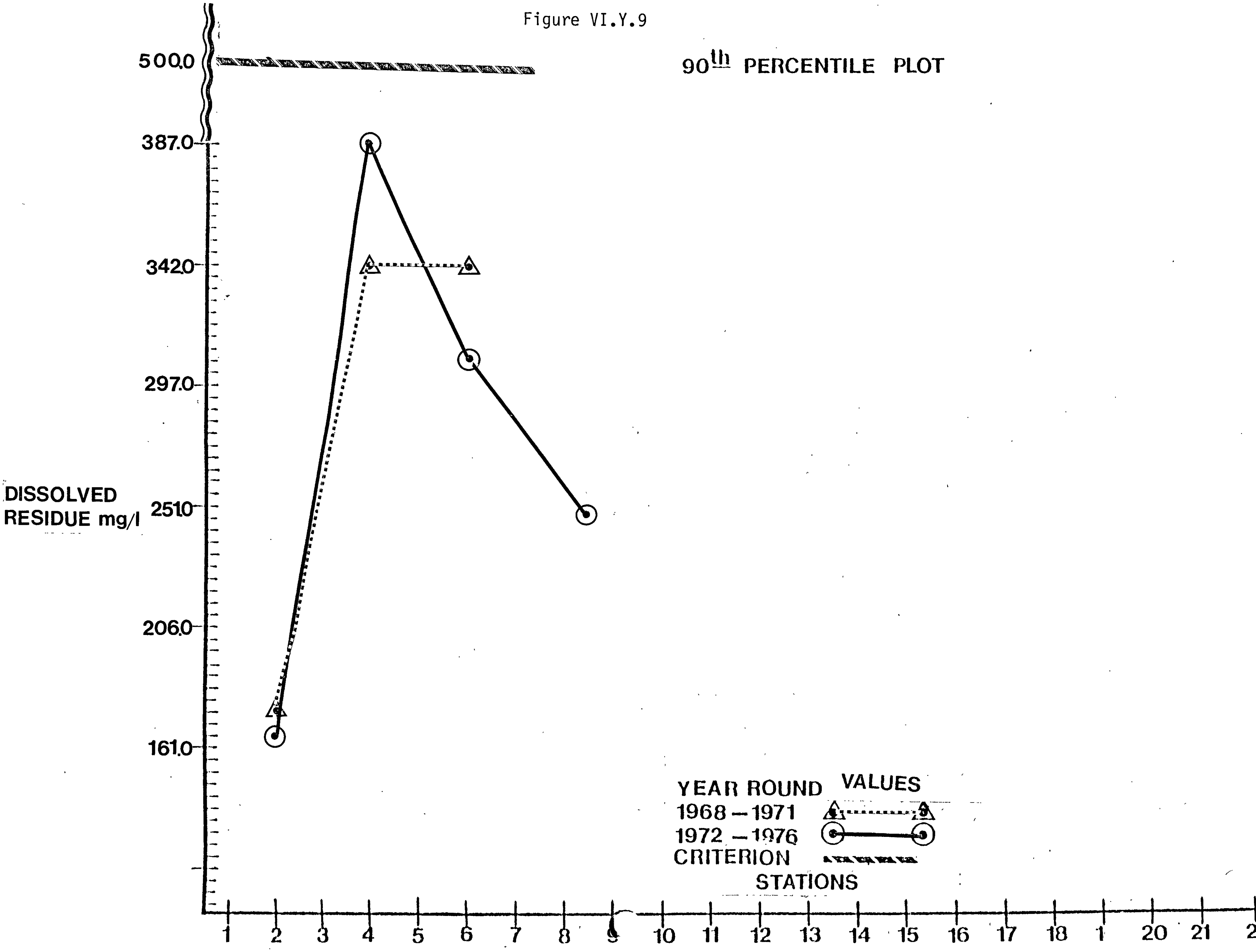
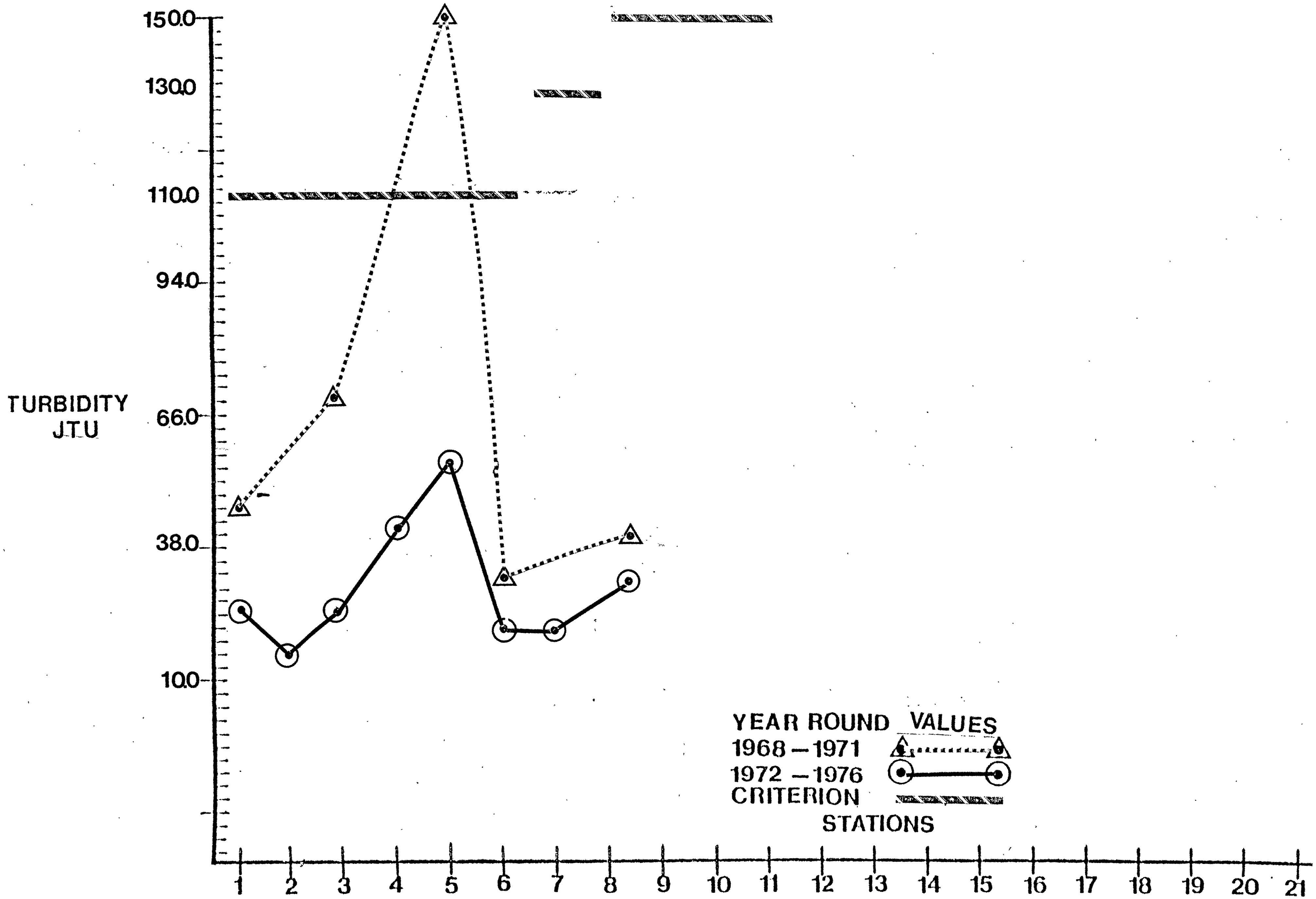
Figure VI.Y.9



90th PERCENTILE PLOT
500.0
387.0
342.0
297.0
251.0
206.0
161.0
DISSOLVED RESIDUE mg/l
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 1 20 21 2

90TH PERCE...



150.0
130.0
110.0
94.0
66.0
38.0
10.0
TURBIDITY
JTU
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
3
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Table VI.Y.1

DISCHARGER INVENTORY

Freshwater Passaic River Basin
Upper Passaic River Segment

| MAP NUMBER | MUNICIPALITY | PLANT NAME | DEGREE OF TREATMENT | RECEIVING STREAM | AVG. (MGD) DAILY FLOW 1973 | 1974 | 1975 | COMPLIANCE WITH 1977 SECONDARY/BEST PRACTICABLE TREATMENT REQUIREMENTS |
|---|---|---|---|---|---|---|---|---|
| A | Morris Township | Woodland | Sec. | Loantoka Brook | 1.1 | 1.1 | 1.130 | Yes |
| B | Warren Township | Mun.Stage I&II | Sec. | Passaic River | 0.32 | 0.35 | 0.347 | No |
| C | Warren Twp. | Mun.Stage IV | Sec. | Passaic River | 0.35 | 0.35 | 0.356 | No |
| D | Berkeley Hgts. | Reheis Chem.Co. | Ind. | Passaic River | 0.26 | 0.35 | 0.30 | No |
| E | Berkeley Hgts. | Berkeley Hgts.Mun. | Sec. | Passaic River | 1.4 | 1.4 | 1.590 | No |
| F | Chatham Twp. | Madison-Chatham J.M. | Ter. | Passaic River | 2.5 | 2.5 | 3.000 | Yes |
| G | Chatham Twp. | Municipal | Ter. | Passaic River | .65 | .65 | 0.715 | Yes |
| H | Livingston | Municipal | Sec. | Passaic River | 3.3 | 3.3 | 3.340 | Yes |
| I | Florham Park | Florham Park S.A. | Sec. | Passaic River | 0.700 | 0.700 | 0.787 | No |
| J | New Providence | Municipal | Sec. | Passaic River | 0.75 | 0.80 | 1.1210 | Yes |
| K | Bernards Twp. | U.S. Veterans Hosp. Lyons | Ter. | Dead River | 0.395 | 0.403 | 0.389 | Yes |
| L | Bernards Twp. | Bernards Twp.S.A. Harrison Brook | Ter. | Dead River | 0.83 | 0.69 | 0.970 | Yes |
| M | Passaic Twp. | Municipal (Sterling) | Sec. | Passaic River | 0.5 | 0.49 | 0.513 | Yes |

Table VI.Y.1 (cont'd)
DISCHARGER INVENTORY

Freshwater Passaic River Basin
Upper Passaic River Segment (con't)

| MAP NUMBER | MUNICIPALITY | PLANT NAME | DEGREE OF TREATMENT | RECEIVING STREAM | AVG. (MGD) DAILY FLOW 1973 | 1974 | 1975 | COMPLIANCE WITH 1977 SECONDARY/BEST PRACTICABLE TREATMENT REQUIREMENTS |
|---|---|---|---|---|---|---|---|---|
| | Chatham Twp. | Park Central#5 | Sec. | Passaic River | .030 | .030 | 0.030 | Yes |
| | Millburn | Commonwealth | Sec. | Passaic River | 0.0001 | 0.0001 | 0.0003 | Yes |
| | East Hanover | Wilbur DriveCo. | Sec. | Passaic River | .002 | .0019 | 0.0011 | No |
| | Florham Park | Sun Valley Swim Club | Sec. | Passaic River | 0.010 | 0.010 seasonal | 0.010 | Yes |

Table VI.Y.1 (cont'd)
DISCHARGER INVENTORY

Freshwater Passaic River Basin
Mid Passaic River Segment

| MAP NUMBER | MUNICIPALITY | PLANT NAME | DEGREE OF TREATMENT | RECEIVING STREAM | AVG. (MGD) DAILY FLOW 1973 | 1974 | 1975 | COMPLIANCE WITH 1977 SECONDARY/ PRACTICABLE TREAT-MENT REQUIREMENTS |
|---|---|---|---|---|---|---|---|---|
| N | Totowa | Municipal (W. End) | Sec. | Passaic River | 0.62 | 0.61 | 0.695 | No |
| O | Totowa | North Jersey Training (Sch. N.J. Dept. I&A) | Ter. | Passaic River | 0.35 | 0.36 | 0.226 | No |
| P | Caldwell | Municipal | Sec. | Passaic River | 3.9 | 317 | 3.600 | No |
| Q | Fairfield Borough | Municipal-Deer Park | Sec. | Passaic River | .29 | .30 | 0.350 | Yes |
| R | Fairfield Borough | Curtiss Wright | Ind. | Passaic River | .25 | .25 | 0.210 | |
| S | Wayne Township | Municipal (Mt. View) | Sec. | Passaic River | 5.0 | 4.8 | 4.66 | No |
| | Lincoln Park | Lincoln Park Nursing Home | Ter. | Passaic River | 0.050 | 0.050 | 0.046 | Yes |
| | Fairfield Borough | Curtiss Wright | Ter. | Passaic River | .017 | .017 | 0.019 | Yes |
| | Fairfield Borough | Essex County Improvement Authority | Sec. | Passaic River | .005 | .005 | 0.001 | Yes |
| | West Caldwell | Welsh Farms | Ind. | DePavall Brook | ---- | 0.003 | 0.004 | No |
| | Montville Township | Forest Park | Sec. | Passaic River | 0.034 | 0.034 | 0.035 | No |
| | Wayne Township | Howard Johnsons | Sec. | Passaic River | 0.005 | 0.005 | 0.005 | No |

Table VI.Y.1 (cont'd)
DISCHARGER INVENTORY

Urban Passaic River Basin
Lower Passaic River Segment

| MAP NUMBER | MUNICIPALITY | PLANT NAME | DEGREE OF TREATMENT | RECEIVING STREAM | AVG. (MGD) DAILY FLOW 1973 | 1974 | 1975 | COMPLIANCE WITH 1977 SECONDARY/BES PRACTICABLE TREAT-MENT REQUIREMENTS |
|---|---|---|---|---|---|---|---|---|
| T | Totowa | Municipal (Riverview) | Sec. | Passaic River | 2.5 | 2.4 | 1.47 | No |
| U | West Paterson | Municipal | Sec. | Passaic River | 1.5 | 1.5 | 1.63 | No |
| V | Fair Lawn | Municipal (Radburn) | Sec. | Saddle River | 2.3 | 2.5 | 2.45 | Yes |
| W | Glen Rock | Municipal (Ridgewood) | Sec. | Saddle River | 2.8 | 3.1 | 3.34 | Yes |
| X | Waldwick | N.W.B.C.S.A. | Sec. | Saddle River | 4.5 | 4.3 | 4.6 | Yes |
| | Totowa | P.V.W. Comm. | Sec. | Passaic River | 0.0015 | 0.0012 | 0.0049 | Yes |
| | Mahwah | Hearthstone | Ter. | Saddle River | 0.009 | 0.012 | 0.0101 | Yes |
| | Mahwah | Apple Ridge C.C. | Ter. | Saddle River | 0.012 | 0.013 | 0.012 | Yes |
| | Franklin Lakes | IBM | Ter. | Hohokus Brook | 0 018 | 0.015 | 0.014 | Yes |
| | North Haledon | Municipal (Cory) #2 | Sec. | Molly Ann Brook | 0.010 | 0.008 | 0.008 | No |

Table VI.Y.1 (cont'd)

DISCHARGER INVENTORY

Urban Passaic River Basin
Lower Passaic River Segment

| MAP NUMBER | MUNICIPALITY | PLANT NAME | DEGREE OF TREATMENT | RECEIVING STREAM | AVG. (MGD) DAILY FLOW 1973 | 1974 | 1975 | COMPLIANCE WITH 1977 SECONDARY/BEST PRACTICABLE TREATMENT REQUIREMENTS |
|---|---|---|---|---|---|---|---|---|
| | North Haledon | Municipal (Beldon) | Sec. | Molly Ann Brook (Passaic) | 0.01 | 0.01 | 0.010 | No |
| | North Haledon | Municipal (Hilltop) | Sec. | Molly Ann Brook (Passaic) | 0.005 | 0.005 | 0.004 | No |
| | North Haledon | Board of Education High Mt. School | Sec. | Molly Ann Brook | .025 | .030 | 0.0034 | Yes |
| | North Haledon | Municipal (Cory) #1 | Sec. | Molly Ann Brook | 0.010 | 0.009 | 0.008 | No |

MID-PASSAIC RIVER TRIBUTARIES
(WHIPPANY, ROCKAWAY, POMPTON, PEQUANNOCK, RAMAPO AND WANAQUE RIVERS)

## BASIN DESCRIPTION

The Whippany River has a drainage area of 72 square miles. The headwaters are located in Randolph Township, Morris County, and its confluence with the Passaic River is at Pine Brook. The upper river drains rural and suburban areas while the mid and lower Whippany River drains swamplands. Its primary use is water supply. The Whippany River and its tributaries near its headwaters have a trout production classification.

The Rockaway River has a drainage area of 133 square miles. The headwaters are in the hilly, mountainous area of Bearfort and Green Pond Mountains. The river flows easterly to its confluence with the Passaic River at Pine Brook. The area drains rural and suburban areas. Until recently iron mining was an important industry in this drainage basin. This area contains numerous natural lakes and reservoirs. Taylortown and Boonton Reservoirs are water supplies for Boonton and Jersey City. Other water-related beneficial uses include recreation and fishing.

The Pompton River sub-basin includes the Pompton, Pequannock, Wanaque and Ramapo Rivers. The drainage area and location of these rivers are:

| River | Drainage Area (Square Miles) | Location (County) |
|---|---|---|
| Ramapo | 160[1] | Bergen |
| Wanaque | 108[2] | Passaic |
| Pequannock | 90 | Boundary between Morris and Passaic |
| Pompton | 382[3] | Boundary between Morris and Passaic |

Notes: (1) Includes 112 square miles in New York State
(2) Includes 24 square miles in New York State
(3) Includes Ramapo, Wanaque, and Pequannock basins and 136 square miles of these basins are in New York State.

The rivers of this sub-basin have been extensively developed for public water supply. The headwaters of the Pequannock River are in the Bearfort and Kanouse Mountains. The Pequannock River flows mainly through preserved watershed area, which is maintained by the City of Newark. The City of Newark has also built numerous reservoirs in the Pequannock Basin. The area is sparsely populated, with the main population centers occurring along Route 23. The headwaters of the Wanaque River, which is tributary to the Pequannock River, are in the Greenwood Lake region of New York State. Wanaque

Reservoir, which is the major reservoir of the North Jersey District Water Supply Commission, is located on the Wanaque River. Both rivers also serve as a fishing and recreation area. Most of the Pequannock River and headwater tributaries have a trout maintenance or trout production classification. Wanaque Reservoir and its tributaries have a trout maintenance or trout production classification.

The Ramapo River drainage is very similar to that of the Pequannock-Wanaque River system. The headwaters of the Ramapo River are in the Ramapo Mountains in New York State. One of the small tributaries has a trout production classification. Much of the drainage is still wilderness, with a few population centers occurring in the lower reaches, along Route 202. After the Ramapo River flows through Pompton Lake which is surrounded by summer and year round homes, it joins the Pequannock River to form the Pompton River. The Pompton River flows through a relatively flat and more suburban area than the drainage areas of the Pequannock, Wanaque, and Ramapo Rivers. The water-related beneficial uses of the Pompton River include water supply, fishing, and other forms of recreation.

## WATER QUALITY ASSESSMENT

The waters of the mid-Passaic River tributaries are of generally high quality, and are heavily relied on as a potable water supply. Fecal coliform levels in all mid-Passaic River tributaries are very near or above the criterion. Fecal coliform levels are exceptionally high in the Whippany River. Fecal coliform levels have decreased at all stations except for the station located on the Whippany River at Morristown. Although fecal coliform levels have become acceptable on the Ramapo River, high fecal coliform levels have resulted in beach closings on Pompton Lake. Summer dissolved oxygen concentrations have increased at all stations, however, summer dissolved oxygen percent saturation levels do fall below the criterion in portions of the Whippany and Rockaway Rivers. Biochemical oxygen demand (BOD) concentrations are generally below the criterion. These concentrations increase significantly in a downstream direction in the Rockaway and Whippany Rivers. In addition a majority of the stations exhibit a temporal increase in BOD. pH levels are alkaline in these mid-Passaic River tributaries but usually below the criterion. Nitrate-nitrogen levels appear to increase in a downstream direction in these surface waters, however, nitrate-nitrogen levels have decreased in Pompton Lakes, Ramapo River, and Whippany River. Nitrate-nitrogen concentrations are highest in the Whippany River. Phosphorus levels exceed the criterion in all mid-Passaic River tributaries but appear to have decreased. Phosphorus concentrations increase in a downstream direction in the Whippany River. Nutrient inputs into Pine Cliff, Pompton, and Greenwood Lakes have contributed to their eutrophic conditions. Seasonal algal blooms, subsequent death and decomposition have resulted in high BOD demands and low dissolved oxygen concentrations in these lakes. Nonfiltrable residue (suspended solids) and turbidity are highest in the Whippany River. Nonfiltrable residues have generally increased while turbidity has generally decreased.

## PROBLEM ASSESSMENT

The water quality of the Whippany River is largely reflective of the land types it drains. Nutrients, dissolved oxygen and BOD levels may greatly be influenced by drainage from Troy and Black Meadows in the lower Whippany River. The water quality in the mid-Whippany River is affected by point source discharges in Morristown and Hanover Townships. This is aggravated by the fact that the 7 day/10 year low flow river discharge to point source discharge ratio is less than unity.

The Rockaway Valley Regional Sewerage (RVRSA) is a major discharger to the Rockaway River, downstream of Boonton Reservoir. RVRSA has a significant impact on BOD concentrations in the mid-Rockaway River region. Drainage from Troy Meadows, in the lower Rockaway River, has a major impact on water quality in this portion of the Rockaway River.

The elevated fecal coliform levels that appear throughout the Pompton River sub-basin may be caused by the large number of small package wastewater treatment facilities.

## GOAL ASSESSMENT

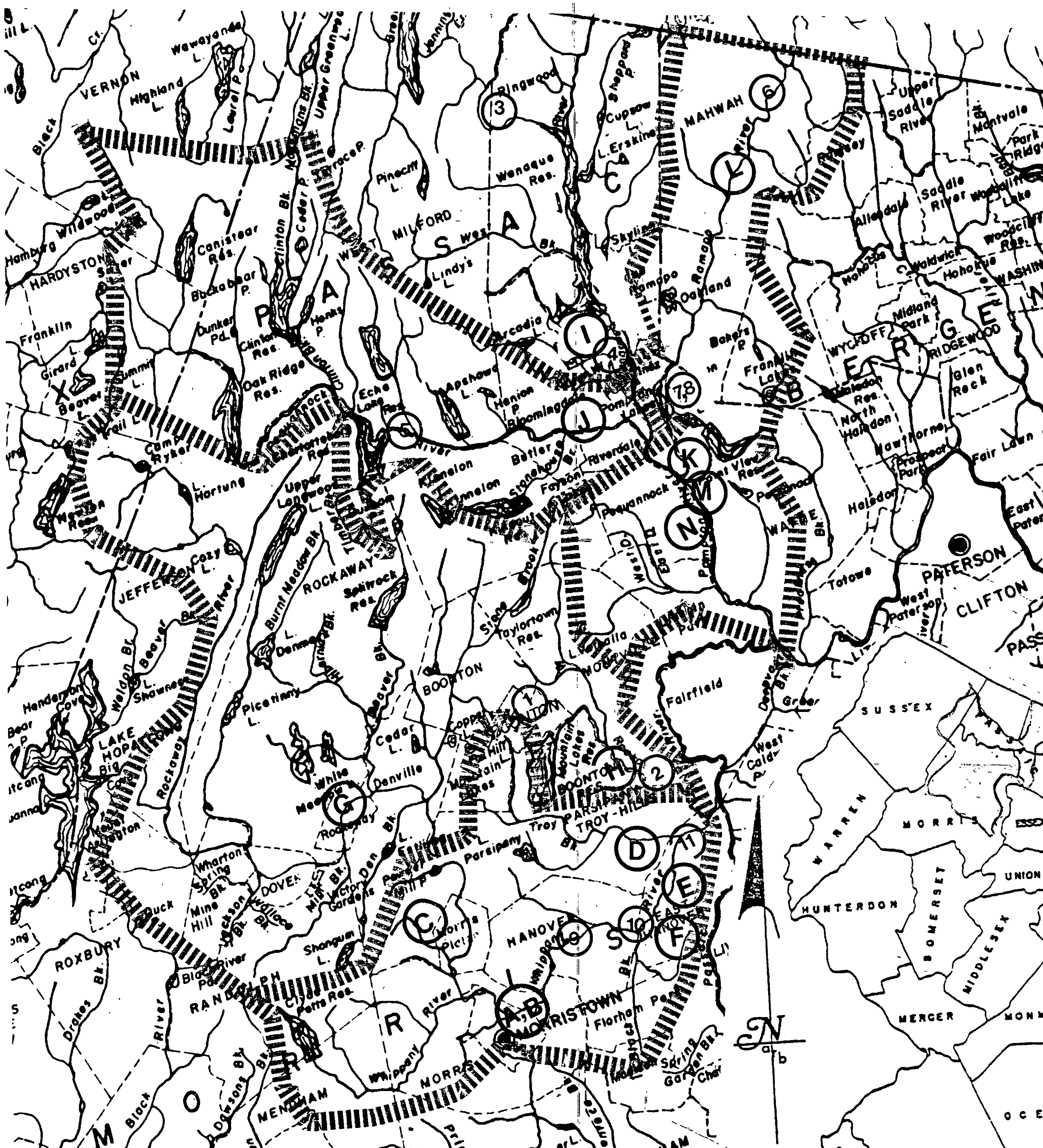
It is expected that 1983 goals in all mid-Passaic River tributaries will be atained. However, these expectations will be achieved provided that a number of wastewater treatment facilities are upgraded above 1977 requirements, and areawide water quality management plans are implemented. Crescent Park STP is scheduled for expansion and phosphorus removal. The Parsippany-Troy Hills plant is also expanding this year. The Rockaway Valley Regional STP will be upgrading to advanced treatment. These improvements should be reflected in future water quality assessments.

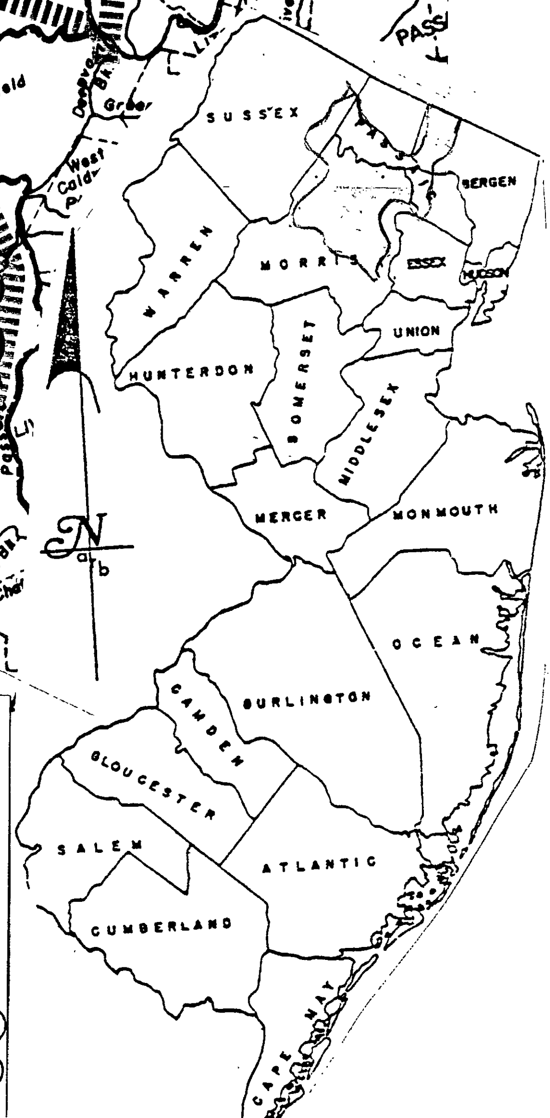
All waters in this area are fishable and parts of the Whippany, Wanaque and Pequannock Rivers are classified as Trout Maintenance or Production. Swimming criteria is generally met on Pequannock, Wanaque and Pompton Rivers. However, there have been occasional beach closings on Pompton Lake due to elevated fecal coliform levels. Many Lakes in this area are protected potable water reservoirs which preclude swimming. The shallow depths of the Wanaque and Pequannock Rivers and the swampy portions of the Rockaway and Whippany Rivers make swimming undesirable. Maintenance of swimmable waters, where physical characteristics of the surface water does not preclude swimming, should continue in the future. However, sanitary surveys, and subsequent appropriate action, should be conducted in the Pompton Lakes area. This is necessary to determine the extent of fecal coliform contamination and solutions necessary to prevent future beach closings.

The overall objectives of PL 92-500 is that the physical, chemical, and biological integrity of surface waters shall be restored and maintained. Some of the surface waters are of exceptional quality. Thus it will be necessary to develop areawide water quality management plans that will implement the State's antidegradation policy, so as to be consistent with these objectives.

MID-PASSAIC RIVER TRIBUTARIES
STATION LIST

1. Rockaway River above Boonton Reservoir at Boonton
2. Rockaway River at Pine Brook
3. Wanaque River at Ringwood
4. Wanaque River at Pompton Lakes
5. Pequannock River at Kinnelon Borough
6. Ramapo River at Mahwah
7. Pompton Lakes
8. Ramapo River at Pompton Lakes
9. Whippany River at Morristown
10. Whippany River at Whippany
11. Whippany River near Rockaway Neck



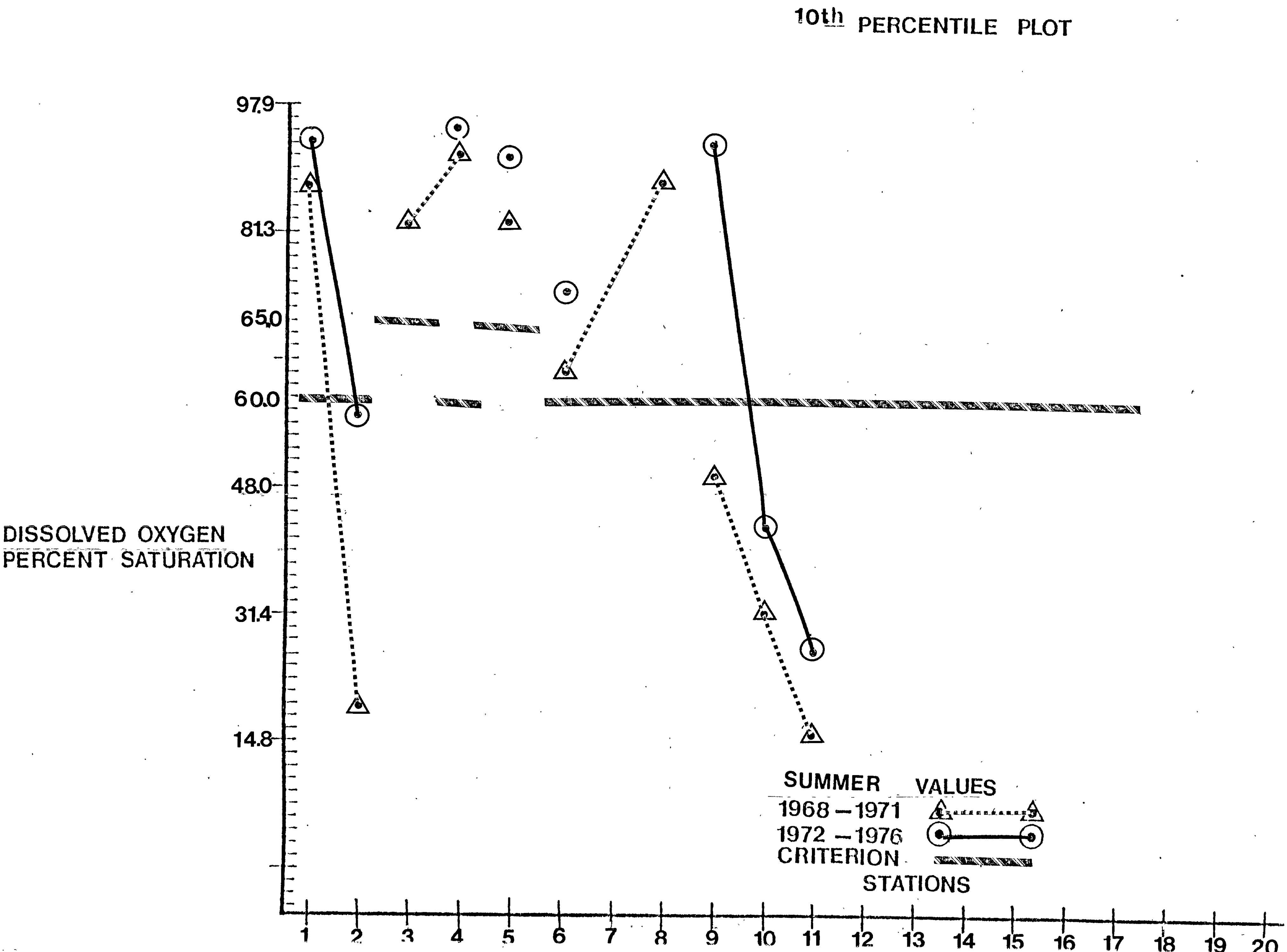

# LOCATION
# PASSAIC RIVER
# FRESHWATER TRIBUTARIES

## LEGEND

| | |
|---|---|
| Point Source | Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ |
| Monitoring Site | ① ② ③ ④ ⑤ |
| Drainage Basin Boundaries | (hatched line) |
| County Bounderies | (dash-dot line) |
| Municipal Bounderies | (dashed line) |

Figure VI.X.1

Figure VI.Z.3



10th PERCENTILE PLOT
97.9
81.3
65.0
60.0
48.0
31.4
14.8
DISSOLVED OXYGEN
PERCENT SATURATION
SUMMER VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
2
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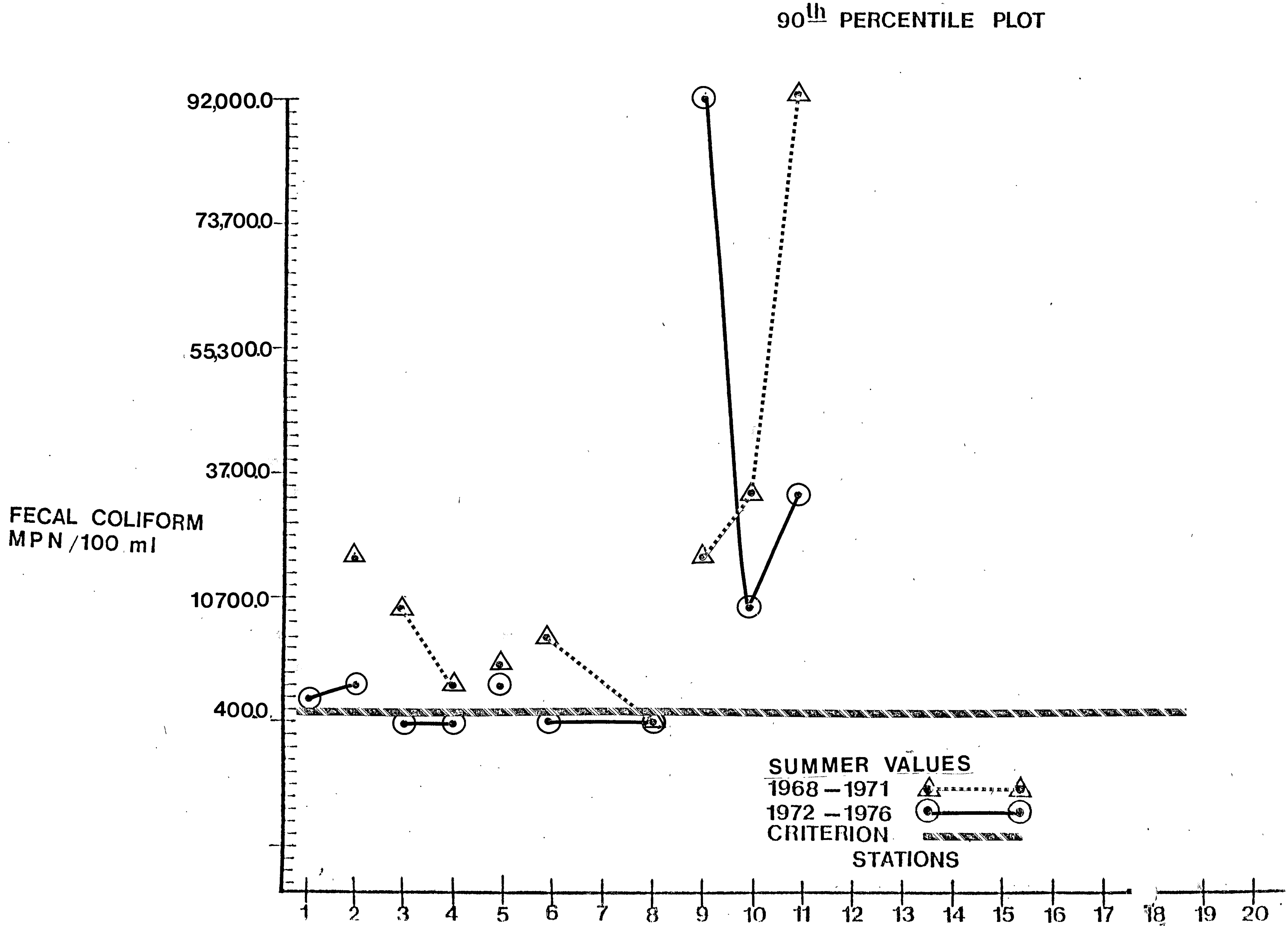
Figure VI.Z.2



90th PERCENTILE PLOT
FECAL COLIFORM
MPN /100 ml
92,000.0
73,700.0
55,300.0
37,000.0
10700.0
400.0
SUMMER VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
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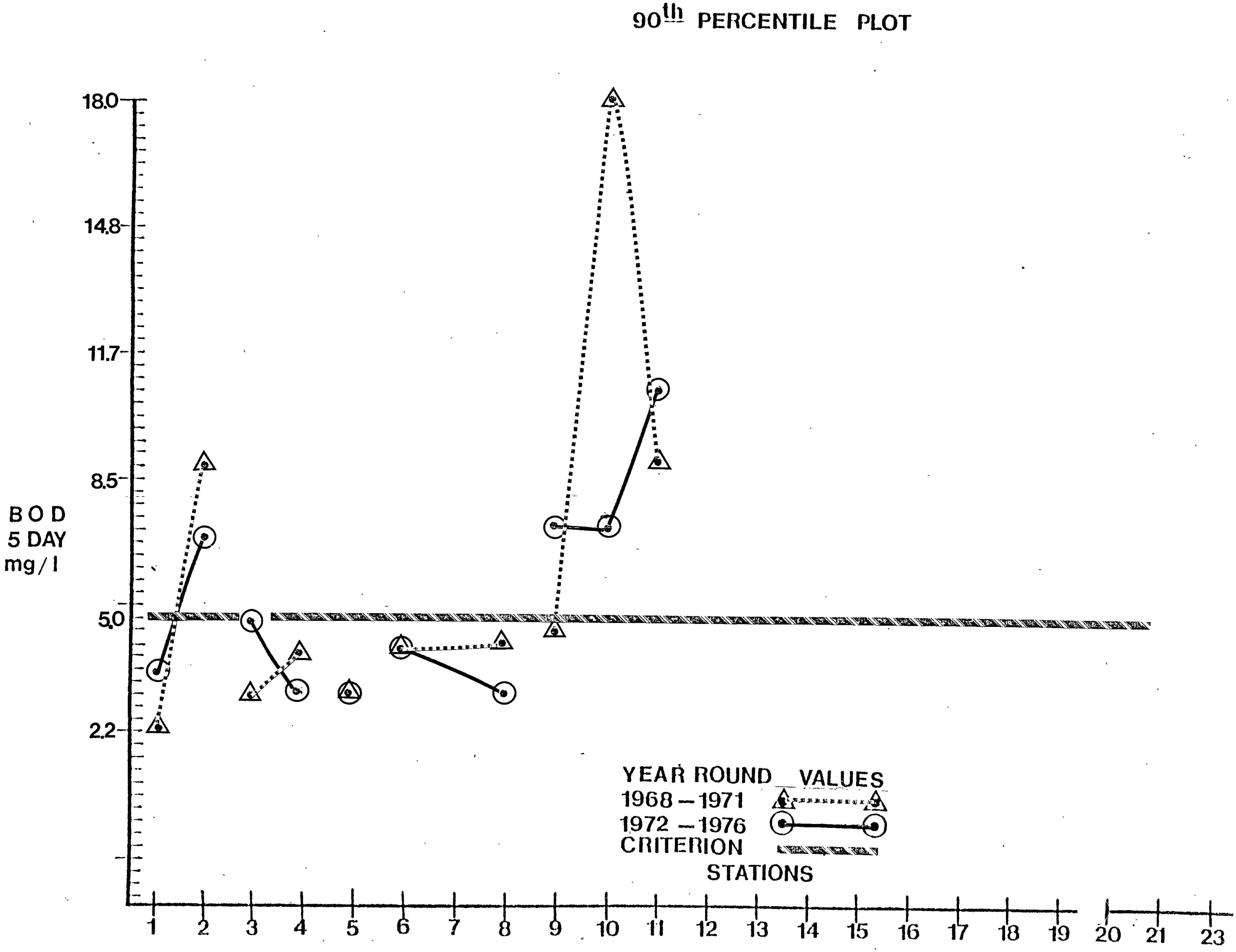
Figure VI.



90th PERCENTILE PLOT
18.0
14.8
11.7
8.5
5.0
2.2
BOD
5 DAY
mg/l
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1
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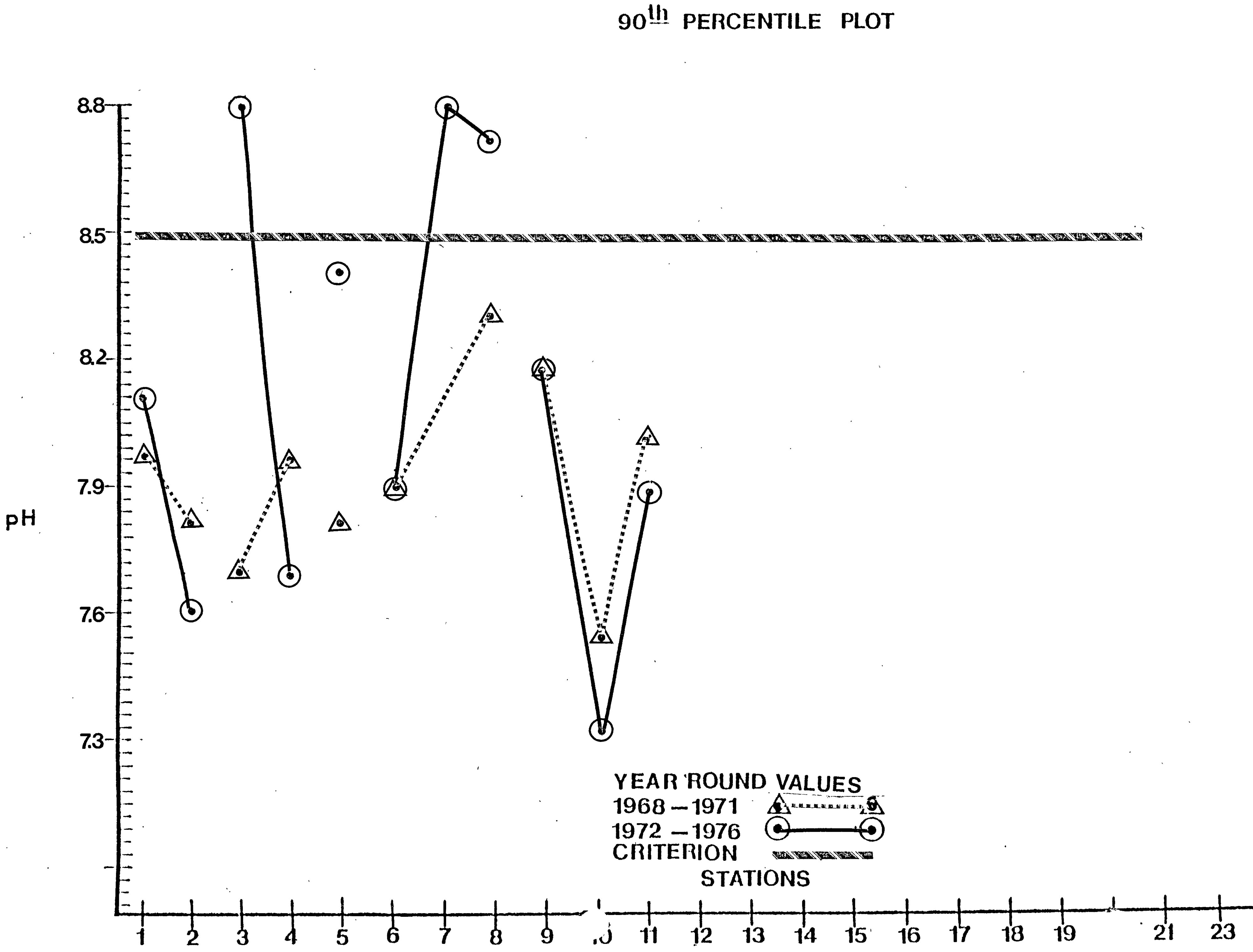
Figure VI.Z.5



90th PERCENTILE PLOT
8.8
8.5
8.2
7.9
7.6
7.3
pH
YEAR ROUND VALUES
1968 — 1971
1972 — 1976
CRITERION
STATIONS
1
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Figure VI.

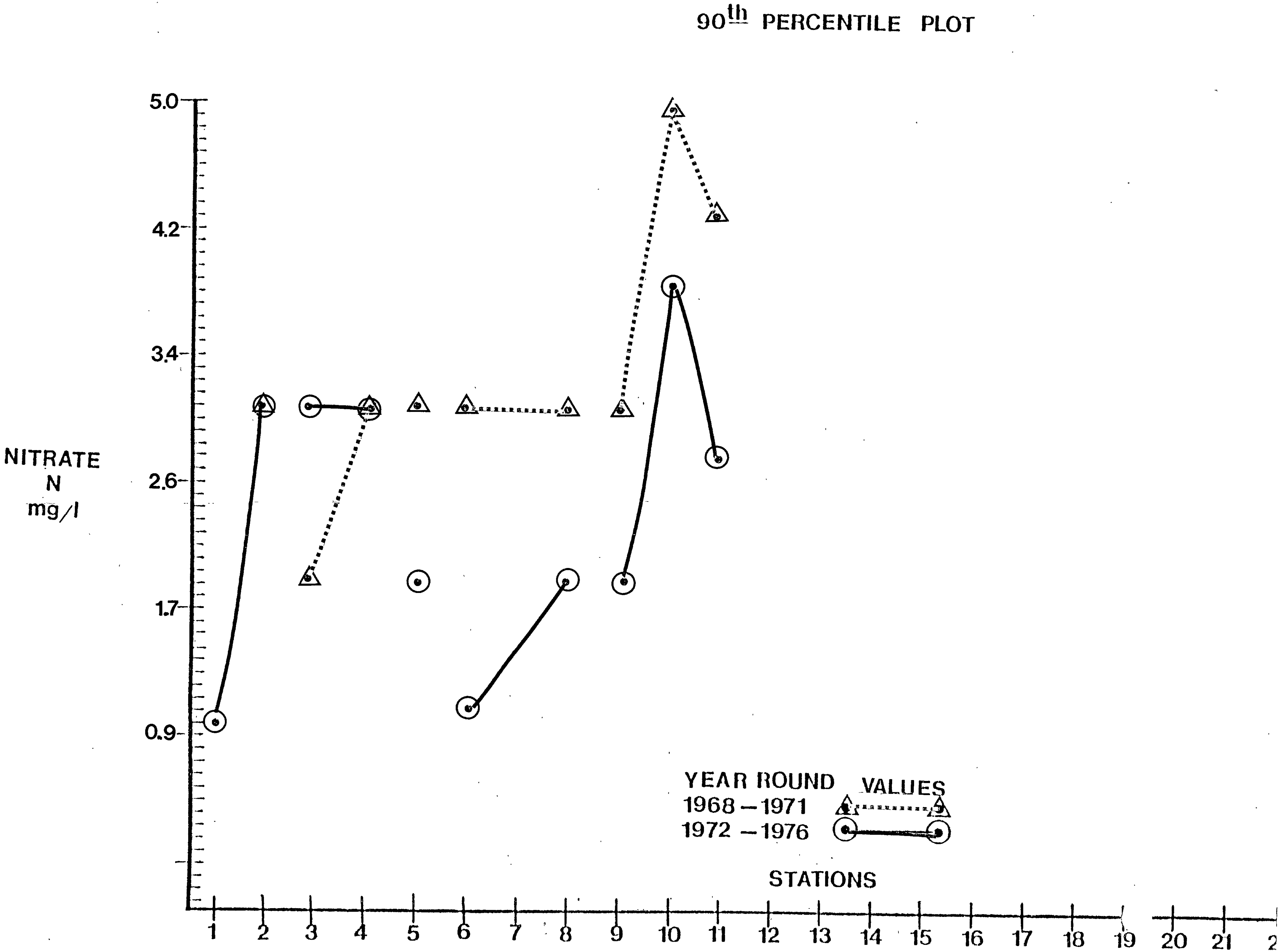
90th PERCENTILE PLOT
NITRATE
N
mg/l
5.0
4.2
3.4
2.6
1.7
0.9
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
STATIONS
1
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Figure VI .Z.7

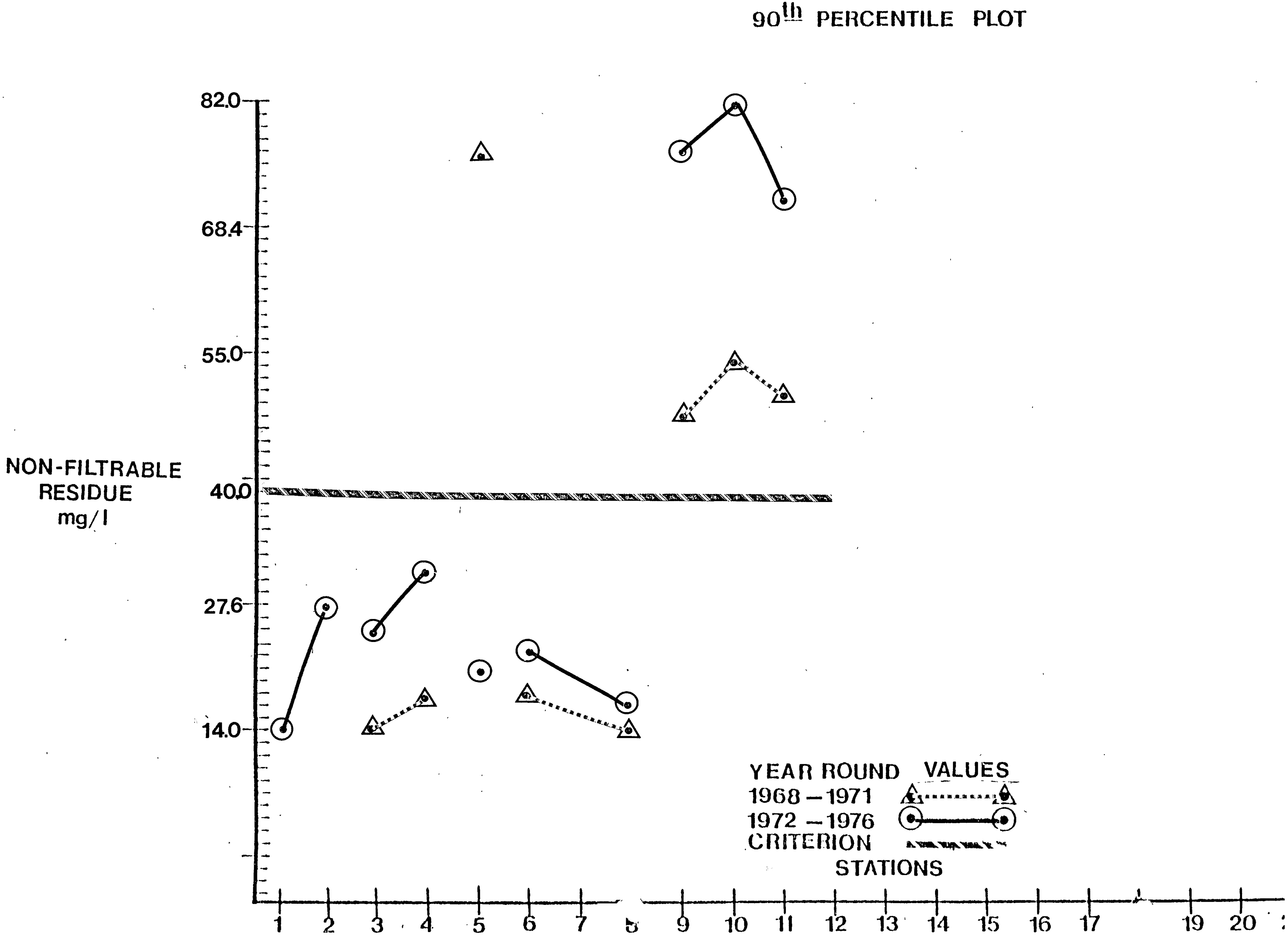
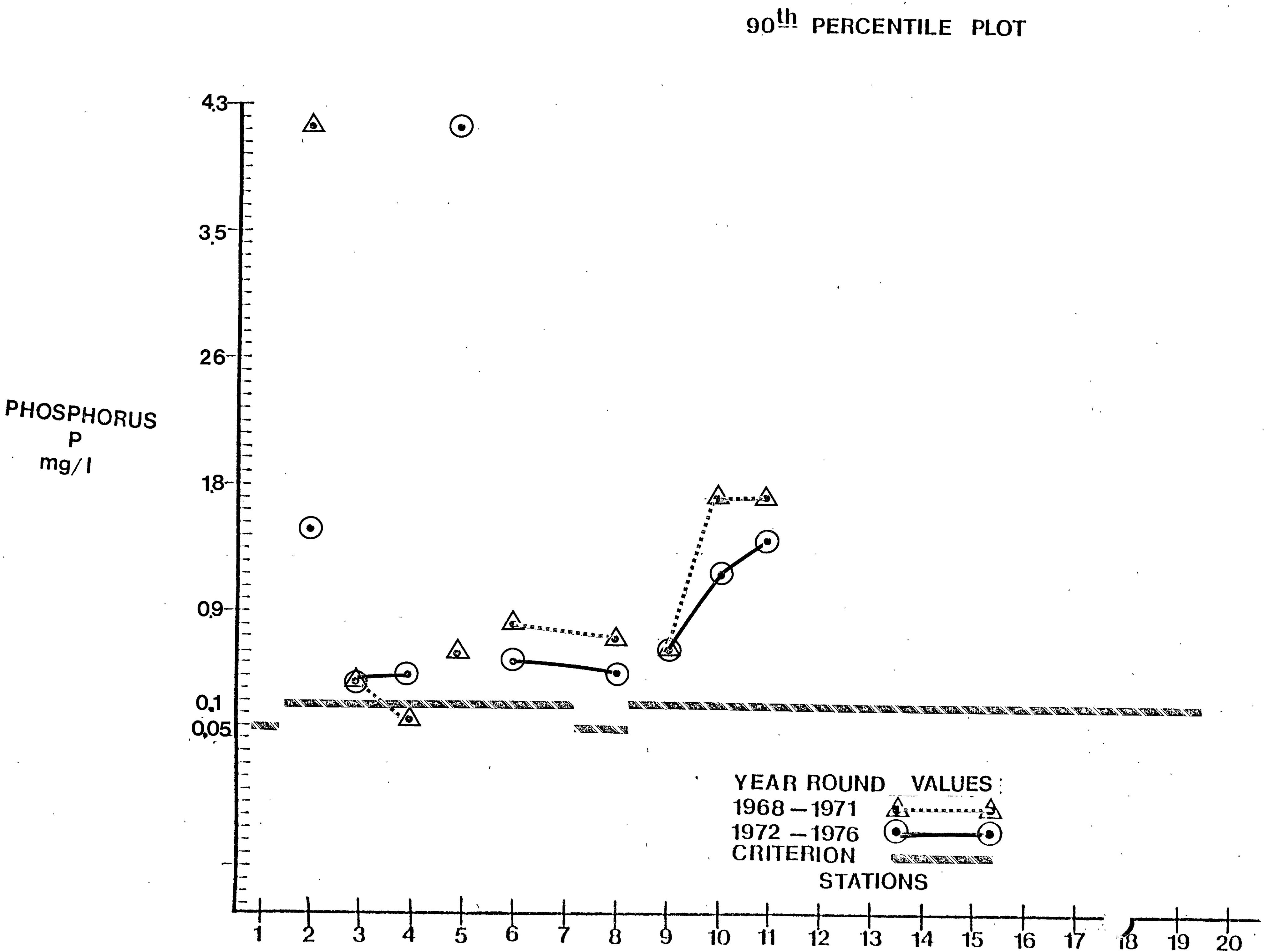

90th PERCENTILE PLOT
82.0
68.4
55.0
40.0
27.6
14.0
NON-FILTRABLE
RESIDUE
mg/l
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 19 20

Figure VI .8



90th PERCENTILE PLOT
PHOSPHORUS
P
mg/l
4.3
3.5
2.6
1.8
0.9
0.1
0.05
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
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Figure VI .Z.9

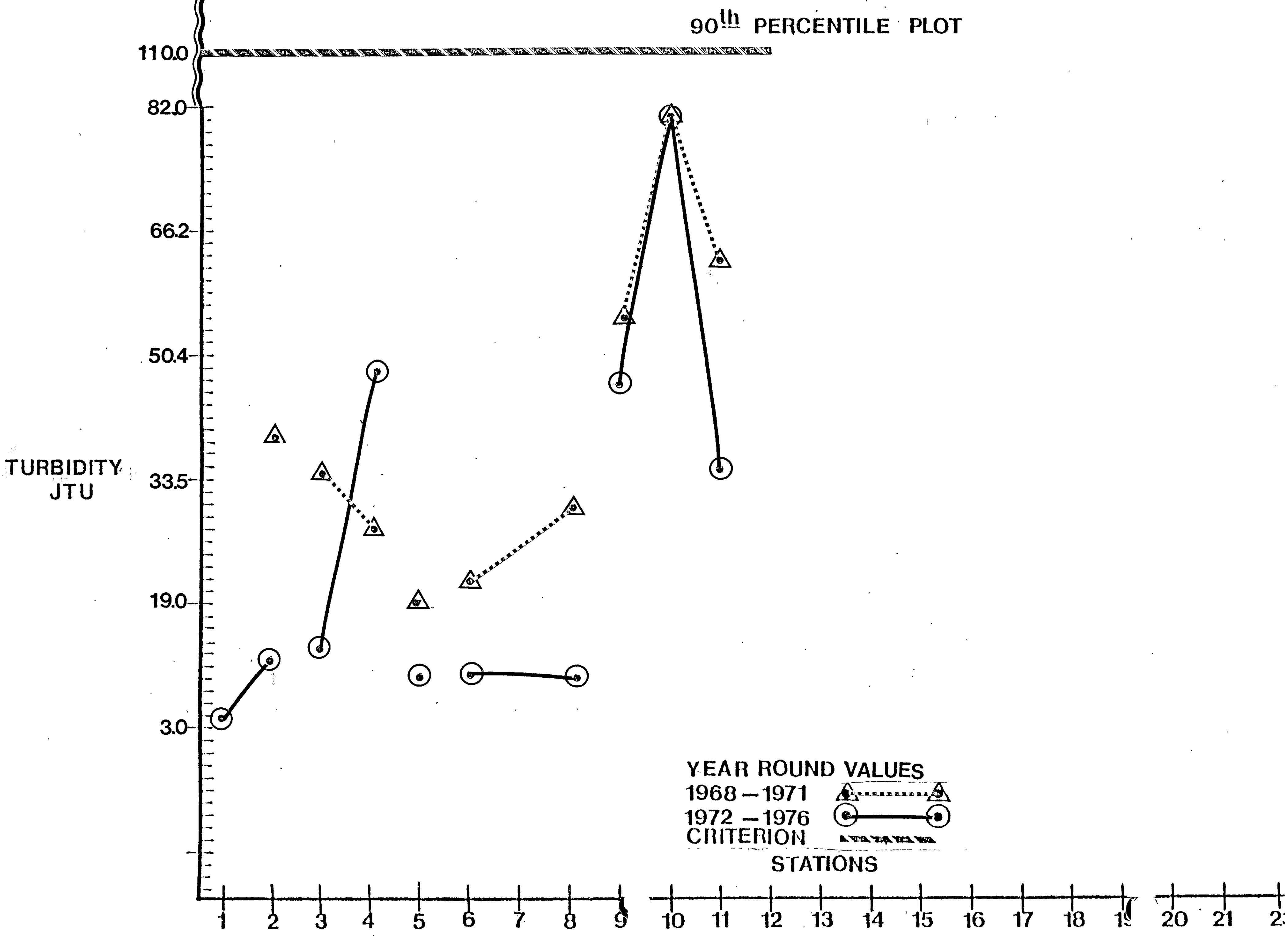
90th PERCENTILE PLOT
110.0
82.0
66.2
50.4
33.5
19.0
3.0
TURBIDITY
JTU
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
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Table VI.Z.1
DISCHARGER INVENTORY

Freshwater Passaic River Basin
Whippany River Segment

| MAP NUMBER | MUNICIPALITY | PLANT NAME | DEGREE OF TREATMENT | RECEIVING STREAM | AVG. (MGD) DAILY FLOW 1973 | 1974 | 1975 | COMPLIANCE WITH 1977 SECONDARY/BE PRACTICABLE TREAT- MENT REQUIREMENTS |
|---|---|---|---|---|---|---|---|---|
| A | Morristown | Municipal | Sec. | Whippany River | 3.0 | 1.85 | 2.130 | Yes |
| B | Morris Township | Butterworth Farms | Sec. | Whippany River | 1.5 | 1.6 | 1.280 | Yes |
| C | Parsippany-Troy | Greystone Hospital | Sec. | Whippany River | 0.56 | 0.49 | 0.524 | Yes |
| D | Parsippany-Troy | Municipal | Sec. | Whippany River | 5. | 4.8 | 5.430 | Yes |
| E | Hanover Township | Hanover Township SA | Sec. | Whippany River | 1.6 | 1.5 | 1.790 | No |
| F | Hanover Township | Whippany Paper Bd. | Ind. | Whippany River | 4.2 | 4.2 | 3.210 | Yes |
| | Hanover Township | ITT Rayonier | Ind. | Whippany River | 0.045 | 0.045 | 0.041 | Yes |
| | Hanover Township | Airtron, Inc. | Ind. | Whippany River | 0.025 | 0.025 | 0.025 | |
| | Hanover Township | Bell Labs | Ind. | Whippany River | 0.0015 | 0.013 | 0.024 | Yes |
| | Hanover Township | Allied Chemical | Sec. | Whippany River | 0.006 | 0.006 | 0.003 | Yes |
| | East Hanover | Board of Education Hanover Park High School | Sec. | Whippany River | .023 | .022 | 0.030 | Yes |
| | Florham Park | Esso Research | Ter. | Whippany River | .100 | .100 | 0.150 | Yes |
| | Morris Township | St. Benedicts | Sec. | Whippany River | 0.03 | 0.03 | 0.030 | Yes |
| | Morris Township | St. Elizabeth College | Sec. | Whippany River | 0.115 | 0.155 | 0.156 | Yes |
| | Parsippany-Troy | Texas Chemical Co. | Sec. | Whippany River | 0.02 | 0.035 | 0.036 | Yes |

Table VI. Z.2
DISCHARGER INVENTORY

Freshwater Passaic River Basin
Rockaway River Segment

| MAP NUMBER | MUNICIPALITY | PLANT NAME | DEGREE OF TREATMENT | RECEIVING STREAM | AVG. (MGD) DAILY FLOW 1973 | 1974 | 1975 | COMPLIANCE WITH 1977 SECONDARY/BEST PRACTICABLE TREATMENT REQUIREMENTS |
|---|---|---|---|---|---|---|---|---|
| G | Rockaway Township | Picatinny Ars.Bl. 80-B | Sec. | Rockaway River | 0.030 | 0.030 | 0.250 | No |
| H | Parsippany-Troy | R.V.R.S.A. | Sec. | Rockaway River | 6.5 | 7.0 | 7.310 | Yes |
| | Randolph Township | Board of Education | Ter. | Rockaway River | 0.010 | 0.010 | 0.020 | Yes |
| | Rockaway Township | Picatinny Ars. Bl. 45 | Ind. | Rockaway River | 0.035 | 0.030 | --- | No |
| | Rockaway Township | Mt.Hope Materials | Sec. | Rockaway River | 0.002 | 0.001 | 0.0019 | Yes |
| | Rockaway Township | Picatinny Ars. "ABC" Ar. | Sec. | Rockaway River | 0.002 | 0.0025 | --- | No |
| | Rockaway Township | Hewlett-Packard Radio | Sec. | Rockaway River | 0.006 | 0.006 | 0.0052 | Yes |
| | Rockaway Township | Picatinny Ars. Bl. 3419 | Sec. | Rockaway River | 0.02 | 0.013 | 0.015 | --- |
| | Rockaway Township | White Meadow Lake | Sec. | Rockaway River | 0.001 | 0.001 | 0.0018 | No |
| | Rockaway Township | Hewlett-Packard | Ind.&Dom. | Rockaway River | --- | --- | 0.0015 | Yes |
| | Mt. Lakes | Mt. Lakes Club | Sec. | Rockaway River | 0.001 | 0.001 | 0.0013 | No |
| | Mt. Lakes | Paulis Diner | Ter. | Rockaway River | 0.004 | 0.004 | 0.004 | No |
| | Jefferson Twp. | High Ridge Sewer Co. | Ter. | Rockaway River | 0.081 | 0.078 | 0.078 | Yes |

Table VI.Z.3
DISCHARGER INVENTORY

Freshwater Passaic River Basin
Wanaque River/Pequannock River Segment

| MAP NUMBER | MUNICIPALITY | PLANT NAME | DEGREE OF TREATMENT | RECEIVING STREAM | AVG. (MGD) DAILY FLOW 1973 | 1974 | 1975 | COMPLIANCE WITH 1977 SECONDARY/BEST PRACTICABLE TREATMENT REQUIREMENTS |
|---|---|---|---|---|---|---|---|---|
| I | Wanaque | Municipal (Haskell) | Ter. | Wanaque River | 0.25 | 0.24 | 0.276 | No |
| J | Butler-Bloom. | Butler Municipal | Sec. | Pequannock River | 1.54 | 1.74 | 2.000 | No |
| | Kinnelon | Church of Magnificat | Ter. | Pequannock River | 0.009 | 0.009 | 0.0009 | Yes |
| | Kinnelon | Board of Ed. H.S. | Ter. | Pequannock River | 0.015 | 0.018 | 0.016 | Yes |
| | West Milford | Milford Manor Nursing Home | Ter. | Pequannock River | 0.0037 | 0.004 | 0.004 | Yes |
| | West Milford | M.U.A. (Highview) | Ter. | Pequannock River | 0.019 | 0.030 | 0.029 | No |
| | Ringwood | High Point Development | Ter. | Wanaque River | 0.039 | 0.040 | 0.043 | Yes |
| | Ringwood | Ringwood Shopping Plaza | Ter. | Wanaque River | 0.021 | 0.017 | 0.015 | Yes |
| | Wanaque | Municipal (Meadow Br.) | Ter. | Wanaque River | 0.11 | 0.11 | 0.114 | Yes |
| | West Milford | M.U.A. (Awosting) | Ter. | Wanaque River | 0.070 | 0.055 | 0.058 | No |
| | West Milford | M.U.A. (Waldy) Crescent Park | Ter. | Wanaque River | 0.060 | 0.065 | 0.064 | No |
| | West Milford | Macopin Sch. Bd. of Ed. High School | Sec. | Wanaque River | 0.028 | 0.030 | 0.003 | No |
| | West Milford | M.U.A. (Milford) Olde Milford Estates (Camelot) | Ter. | Wanaque River | 0.040 | 0.045 | 0.0441 | Yes |

Wanaque River/Pequannock River Segment (Continued) Table VI.Z.3

| MAP NUMBER | MUNICIPALITY | PLANT NAME | DEGREE OF TREATMENT | RECEIVING STREAM | AVG. (MGD) DAILY FLOW 1973 | 1974 | 1975 | COMPLIANCE WITH 1977 SECONDARY/BEST PRACTICABLE TREATMENT REQUIREMENTS |
|---|---|---|---|---|---|---|---|---|
| | Ringwood | Robt. Erskine School | Sec. | Erskine School | 0.006 | 0.006 | 0.004 | Yes |
| | Ringwood | Peter Cooper School | Ter. | High Mountain Creek | 0.006 | 0.006 | 0.005 | Yes |
| | Wanaque | Arrow Metal Prod. | Ind. | Post Brook | 0.045 | 0.045 | 0.023 | No |
| | West Milford | Reflection Lakes Apts. | Ter. | Belchers Creek | 0.0021 | 0.002 | 0.002 | Yes |
| | West Milford | Birch Hill Park Disposal Co. | Ter. | Belchers Creek | 0.012 | 0.015 | 0.015 | No |
| | West Milford | Shopping Center (Lappas Association) | | Belchers Creek | --- | ------ | 0.0028 | Yes |
| | West Milford | Marshall High School Bd. of Education | Sec. | Belchers Creek | 0.0026 | 0.0026 | 0.0026 | Yes |

## Table VI.Z.4
## DISCHARGER INVENTORY

### Freshwater Passaic River Basin
### Ramapo River Segment

| MAP NUMBER | MUNICIPALITY | PLANT NAME | DEGREE OF TREATMENT | RECEIVING STREAM | AVG. (MGD) DAILY FLOW 1973 | 1974 | 1975 | COMPLIANCE WITH 1977 SECONDARY/BEST PRACTICABLE TREATMENT REQUIREMENTS |
|---|---|---|---|---|---|---|---|---|
| K | Pompton Lakes | M.U.A. | Sec. | Ramapo River | 0.75 | 0.71 | 0.781 | Yes |
| L | Mahwah | Ford Motor Co. | Ter. | Ramapo River | 0.400 | 0.400 | 0.216 | Yes |
| | Ramsey | Society Hill, Inc. | Ter. | Ramapo River | 0.005 | 0.005 | 0.0056 | Yes |
| | [a]Ramsey | Swiss Chalet | Sec. | Ramapo River | 0.004 | 0.009 | 0.010 | No |
| | [a]Ramsey | Regency Park Apts. | Ter. | Ramapo River | 0.018 | 0.018 | 0.0185 | Yes |
| | Ramsey | Holiday Inn | Ter. | Ramapo River | 0.01 | 0.011 | 0.0116 | Yes |
| | Ramsey | Okonite Company | Ter. | Ramapo River | 0.003 | 0.003 | 0.0032 | Yes |
| | [a]Wayne Township | Pompton Lks. Nursing Home | Sec. | Ramapo River | 0.0045 | 0.005 | 0.0042 | Yes |
| | [a]Franklin Lakes | Tri. Corner Realty | Sec. | Ramapo River | 0.001 | 0.001 | 0.001 | Yes |
| | Mahwah | Chan's Hawaii Rest. | Ter. | Ramapo River | 0.011 | 0.011 | 0.0106 | No |
| | [a]Mahwah | Ramapo College | Ter. | Ramapo River | 0.02 | 0.07 | 0.056 | Yes |
| | Mahwah | Blue Hills | Ter. | Ramapo River | 0.014 | 0.018 | 0.012 | Yes |
| | [a]Mahwah | Starview Gardens | Ter. | Ramapo River | 0.025 | 0.025 | 0.025 | Yes |
| | [a]Mahwah | Nu Car Carriers | Ter. | Ramapo River | 0.0015 | 0.0015 | 0.0015 | Yes |
| | [a]Mahwah | Mahwah Ridge | Ter. | Masonicus Brook | None | 0.019 | 0.004 | Yes |

Table VI.Z.4 (cont'd)

Freshwater Passaic River Basin
Ramapo River Segment

| MAP NUMBER | MUNICIPALITY | PLANT NAME | DEGREE OF TREATMENT | RECEIVING STREAM | AVG. (MGD) DAILY FLOW 1973 | 1974 | 1975 | COMPLIANCE WITH 1977 SECONDARY/BEST PRACTICABLE TREATMENT REQUIREMENTS |
|---|---|---|---|---|---|---|---|---|
| | Mahwah | Prime Equities Realty Syndicate | Ter. | Ramapo River | 0.015 | 0.015 | 0.0151 | Yes |
| | Mahwah | Hamilton Apts. | Ter. | Ramapo River | 0.037 | 0.032 | 0.033 | Yes |
| | [a]Mahwah | ABEX Corporation | Sec. | Ramapo River | 0.009 | 0.009 | 0.010 | Yes |
| | Oakland | Board of Education Manito Ele. School | Sec. | Ramapo River | 0.0045 | 0.0045 | 0.0041 | Yes |
| | Oakland | Oakwood Knolls | Ter. | | 0.012 | 0.020 | 0.0225 | Yes |
| | Oakland | Regional High School | Ter. | Ramapo River | 0.011 | 0.011 | 0.010 | Yes |
| | Oakland | Skyview Estates | Ter. | Ramapo River | 0.023 | 0.022 | 0.0236 | Yes |

Table VI.Z.5
DISCHARGER INVENTORY

**Freshwater Passaic River Basin**
Pompton River Segment

| MAP NUMBER | MUNICIPALITY | PLANT NAME | DEGREE OF TREATMENT | RECEIVING STREAM | AVG. (MGD) DAILY FLOW 1973 | 1974 | 1975 | COMPLIANCE WITH 1977 SECONDARY/BEST PRACTICABLE TREATMENT REQUIREMENTS |
|---|---|---|---|---|---|---|---|---|
| M | Wayne Township | Municipal (Sheffield) | Sec. | Pompton River | 1.5 | 1.5 | 1.1310 | No |
| N | Pequannock Township | Municipal (Greenview) | Sec. | Pompton River | 0.25 | 0.25 | 0.274 | Yes |
| | [a]Kinnelon | Board of Ed. Stony Brook | Ter. | Pompton River | 0.008 | 0.005 | 0.004 | Yes |
| | Lincoln Park | Beaver Bk. Garden Apts. | Sec. | Pompton River | 0.065 | 0.065 | 0.045 | |
| | Lincoln Park | LynPark (Municipal) | Sec. | Pompton River | 0.069 | 0.070 | 0.078 | No |
| | [a]Pequannock Township | Bea Construction Co. (Grant City Shop. Cntr.) | Ter. | Pompton River | 0.018 | 0.018 | 0.014 | Yes |
| | [a]Pequannock Township | Municipal (Laurel) | Sec. | Pompton River | 0.0075 | 0.0075 | 0.007 | Yes |

Table VI.Z.5 (cont'd)
DISCHARGER INVENTORY

Freshwater Passaic River Basin
Pompton River Segment

| MAP NUMBER | MUNICIPALITY | PLANT NAME | DEGREE OF TREATMENT | RECEIVING STREAM | AVG. (MGD) DAILY FLOW 1973 | 1974 | 1975 | COMPLIANCE WITH 1977 SECONDARY/BEST PRACTICABLE TREATMENT REQUIREMENTS |
|---|---|---|---|---|---|---|---|---|
| | Jefferson Twp. Board of Ed. | Jefferson Twp. | Ter. | Rockaway River | 0.013 | 0.013 | 0.012 | Yes |
| | Montville | Board of Education (Cedar Hill) | Ter. | Rockaway River | 0.009 | 0.009 | 0.0009 | Yes |
| | Montville | M.U.A. (Norwood) | Sec. | Rockaway River | 0.005 | 0.005 | 0.005 | No |
| | Montville Twp. | Brook Valley | Sec. | Vahalla Brook | 0.005 | 0.005 | 0.005 | Yes |
| | Boonton Borough | Boonton Molding | Ind. | Crooked Brook | 0.028 | 0.028 | 0.022 | No |
| | Boonton Township | Johanson Manuf. | Ind. | Beaver Brook | 0.004 | 0.004 | 0.0036 | No |

## HACKENSACK RIVER AND PECKMAN RIVER

### BASIN DESCRIPTION

The Hackensack River originates in Rockland County, New York and flows southward through Bergen and Hudson counties. The drainage basin encompasses dense residential, commercial, and industrial development. Some undeveloped land exists in the Hackensack Meadowlands near the entry into Newark Bay. However, this land has historically been subjected to landfilling and indiscriminate industrial waste disposal. Upstream waters are heavily utilized as potable water sources at Oradell and Woodcliff Lake reservoirs. Downstream areas are heavily utilized for commercial navigation.

The Peckman River originates in northern Essex County and flows northward into Passaic County to its confluence with the Passaic River. Its drainage basin also encompasses densely populated areas, but development is more suburban, with commercial and light industrial areas rather than the more highly urban, heavily industrialized areas on the lower Hackensack.

### WATER QUALITY ASSESSMENT

Overall water quality on the Hackensack River is marginally acceptable from the headwater downstream to Oradell Reservoir. Nutrient levels are high in this segment, and the reservoir is classified as eutrophic. Downstream of Oradell Reservoir to the mouth of the Hackensack at Newark Bay, water quality is poor. High fecal coliforms, low dissolved oxygen, and high biochemical oxygen demand contribute to the degraded quality. Peckman River quality is good, and it serves as a source of relatively high quality water entering the Passaic River. Fecal coliform counts have decreased in recent years, but remain at or above the criterion in this river. The biochemical oxygen demand levels have generally decreased, and dissolved oxygen concentrations are above the criterion. Phosphorus and nitrate nutrient levels are excessive.

### PROBLEM ASSESSMENT

The lower Hackensack River water quality is degraded as a result of point source, non-point source discharges, and low flows induced by heavy withdrawal at Oradell Reservoir. Surface and storm water runoff, the latter often carried through combined sewer systems, result in substantial non-point source pollution. Thermal degradation by the large number of industrial cooling water discharges, downstream of Oradell Reservoir, often raise temperatures in the lower Hackensack River to in excess of 90° fahrenheit during summer months. Combined sewer collection systems are antiquated and overloaded sewage treatment plants frequently bypass raw sewage directly into the Hackensack River. Additionally, sewage treatment plants are inadequate in their treatment of industrial toxics. Extensive landfilling and illegal dumping in the Meadowlands have contributed significant quantities of leachate to the lower Hackensack, as do groundwater seeps from industrial facilities.

The Peckman River has better quality than the Hackensack. However, two of three major point source discharges remain below 1977 standards for best practicable treatment. Non-point sources, i.e. storm water and surface runoff, also contribute fecal coliform bacteria, solids, nutrients, and biochemical oxygen demand.

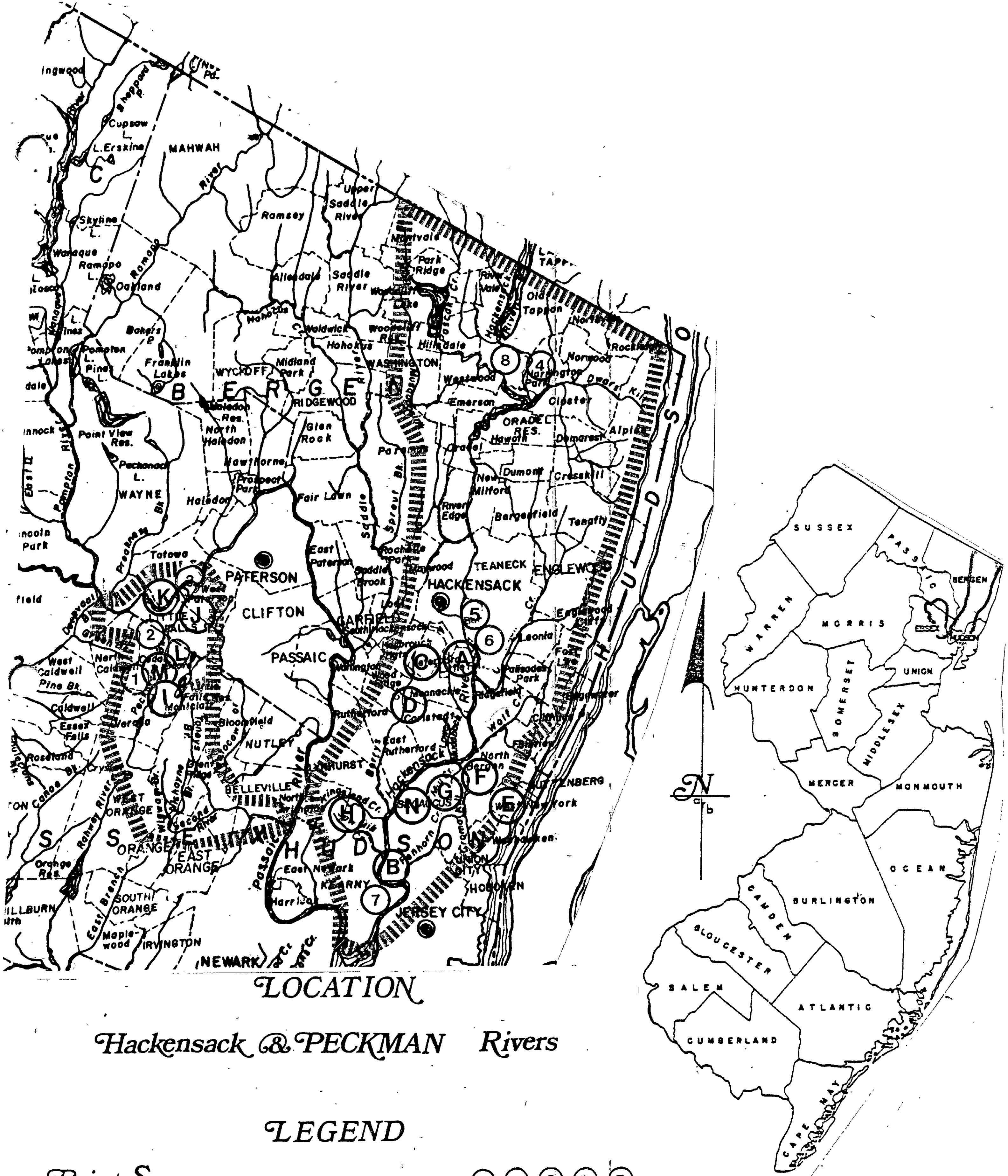
GOAL ASSESSMENT AND RECOMMENDATIONS

It is not anticipated that the Hackensack River will meet 1983 goals of fishable and swimmable water quality. Low flows are compounded by the excessive withdrawals by Hackensack Water Company at Oradell Reservoir. During periods of low rainfall, no flow occurs over the dam, greatly reducing the assimalative capacity of downstream areas. As fifteen of the twenty three major point source discharges on the Hackensack are not in compliance with 1977 best practicable treatment requirements, immediate attention must be directed toward upgrading these facilities to meet requirements. Additionally, effective pretreatment standards for industrial discharges must be developed and enforced. Adequate surface water standards must be developed and enforced to reduce point source thermal loading and to eliminate combined sewer discharges. More effective standards and regulations must be enforced to eliminate the indiscriminate dumping of industrial wastes in the Meadowlands. Landfills must be modified to eliminate leachate degradation of groundwater and surface waters. More intensive surveys and monitoring for toxics and carcinogens must be conducted in the downstream areas as well as above the reservoirs. Additional water supplies should be developed to augment existing Hackensack Water Company sources. This would enable increases in flow to improve downstream water quality.

The Peckman River quality may meet the 1983 fishable, swimmable goals if major discharger treatment systems are upgraded to best practicable technology standards, and adequate limits are established and enforced for all point source discharges.

## HACKENSACK RIVER AND PECKMAN RIVER
## STATION LIST

| Station No. | Location |
|---|---|
| 1. | Peckman River at Verona |
| 2. | Peckman River at Cedar Grove |
| 3. | Peckman River at West Paterson |
| 4. | Hackensack River at Oradell Reservoir Inlet |
| 5. | Hackensack River at Bogota |
| 6. | Hackensack River at Little Ferry |
| 7. | Hackensack River at Harrison |
| 8. | Pascack Brook at Harrington Park |




# LOCATION

## Hackensack & PECKMAN Rivers

## LEGEND

Point Source — (A) (B) (C) (D) (E)

Monitoring Site — (1) (2) (3) (4) (5)

Drainage Basin Boundaries

County Bounderies

Municipal Bounderies

Figure VI.AA.1

Figure VI.AA.2

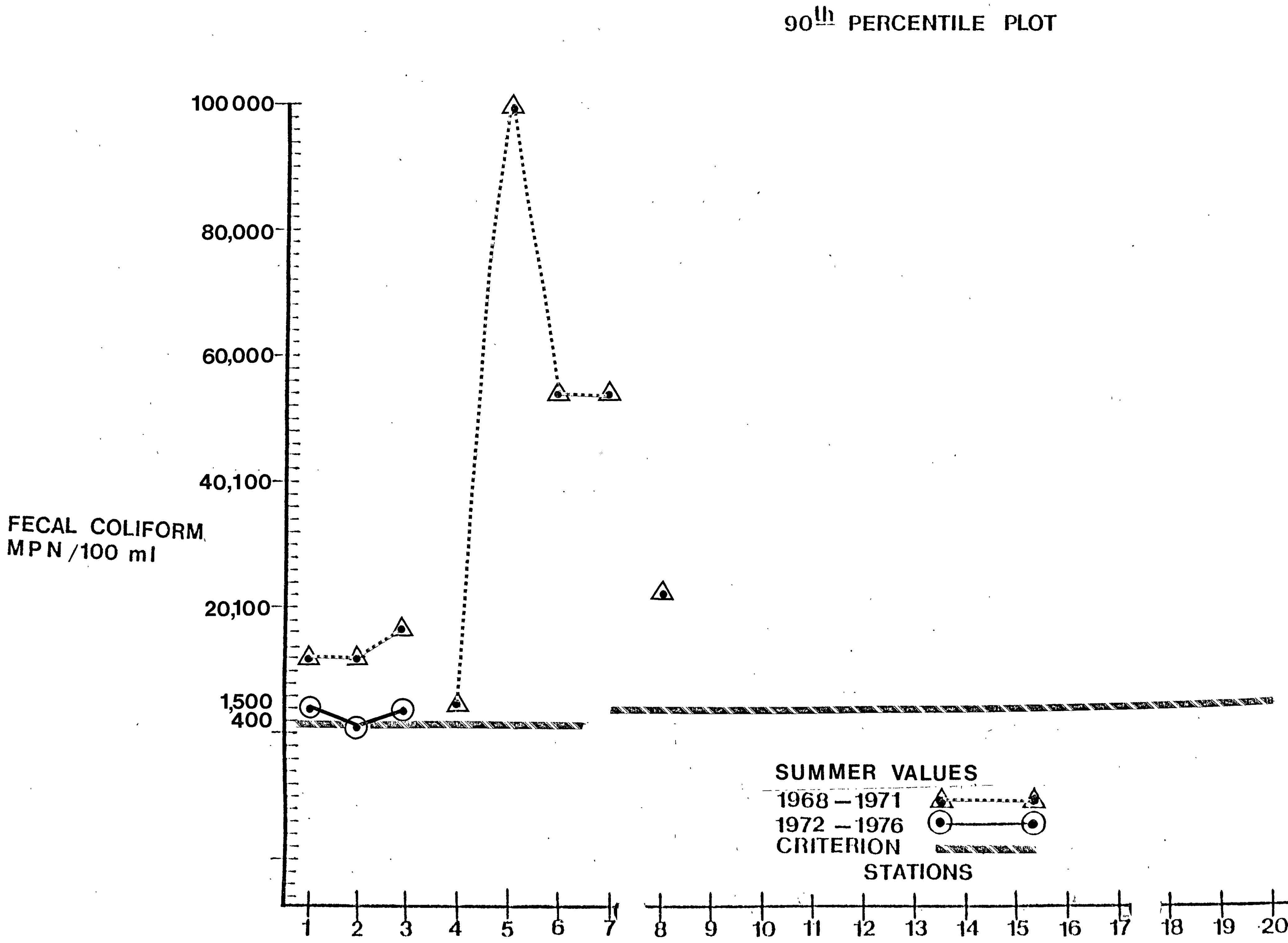


Figure VI .3

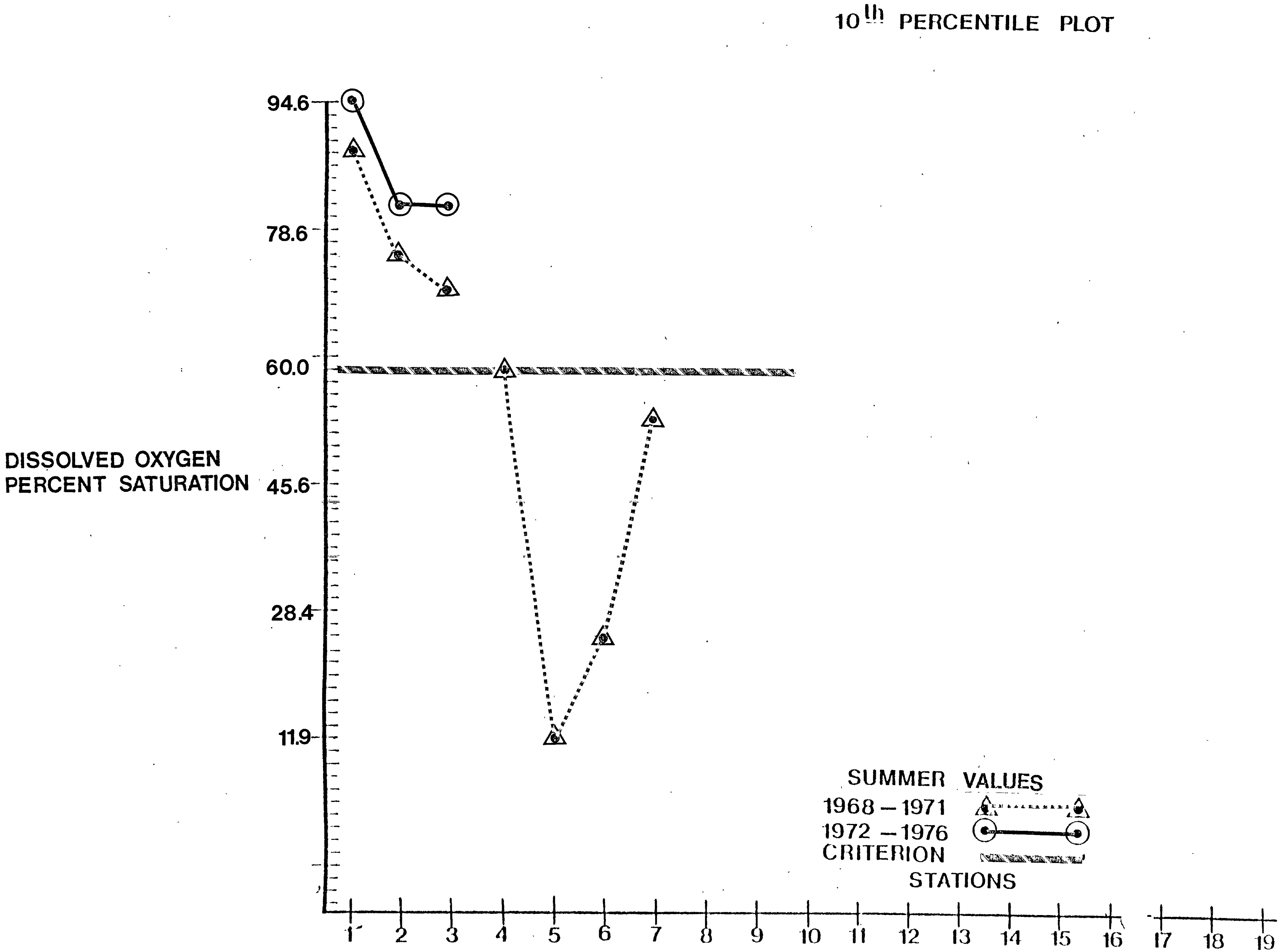

10th PERCENTILE PLOT
DISSOLVED OXYGEN
PERCENT SATURATION
94.6
78.6
60.0
45.6
28.4
11.9
SUMMER VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
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Figure VI.AA.4

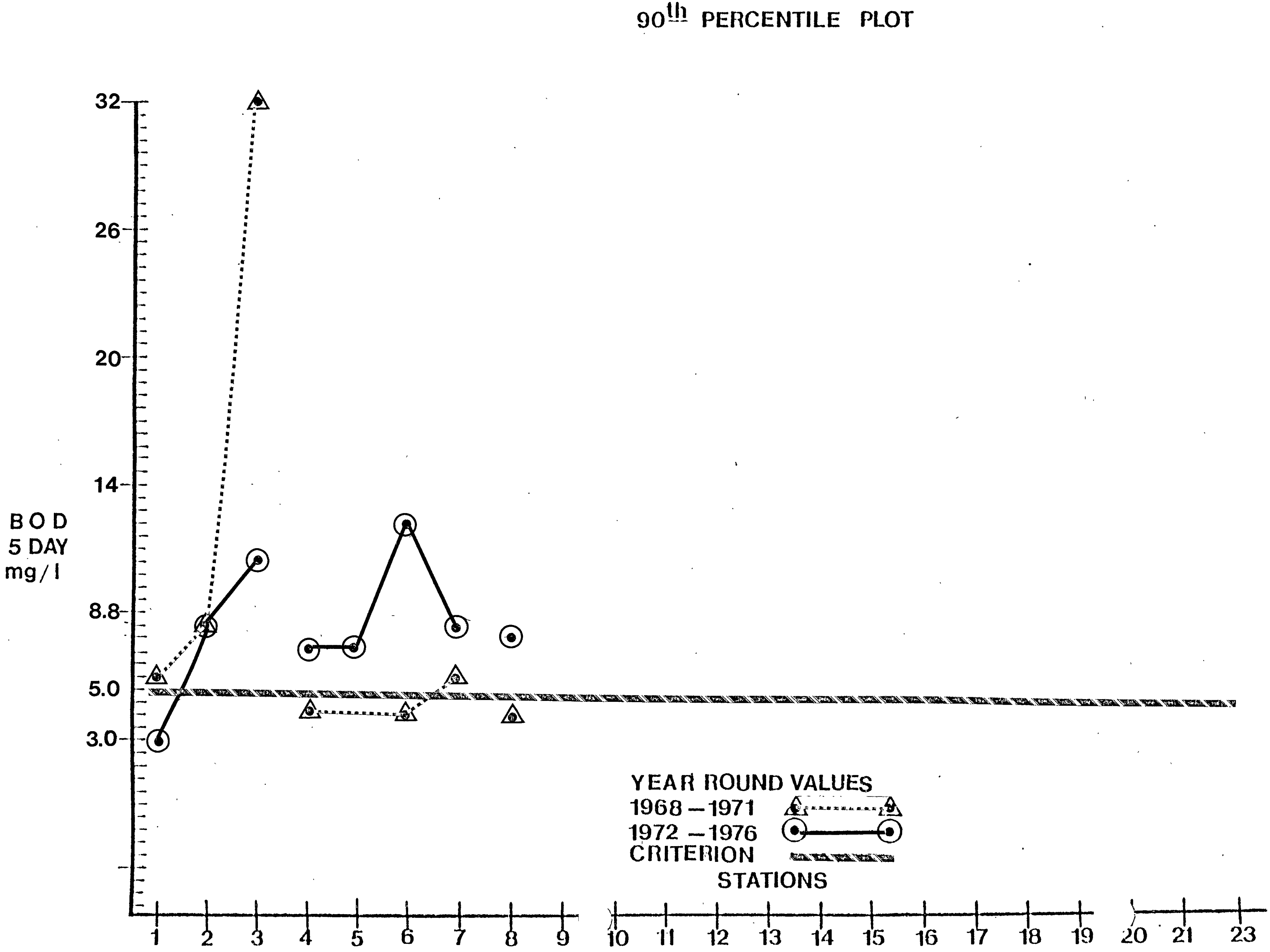

Figure VI. .5

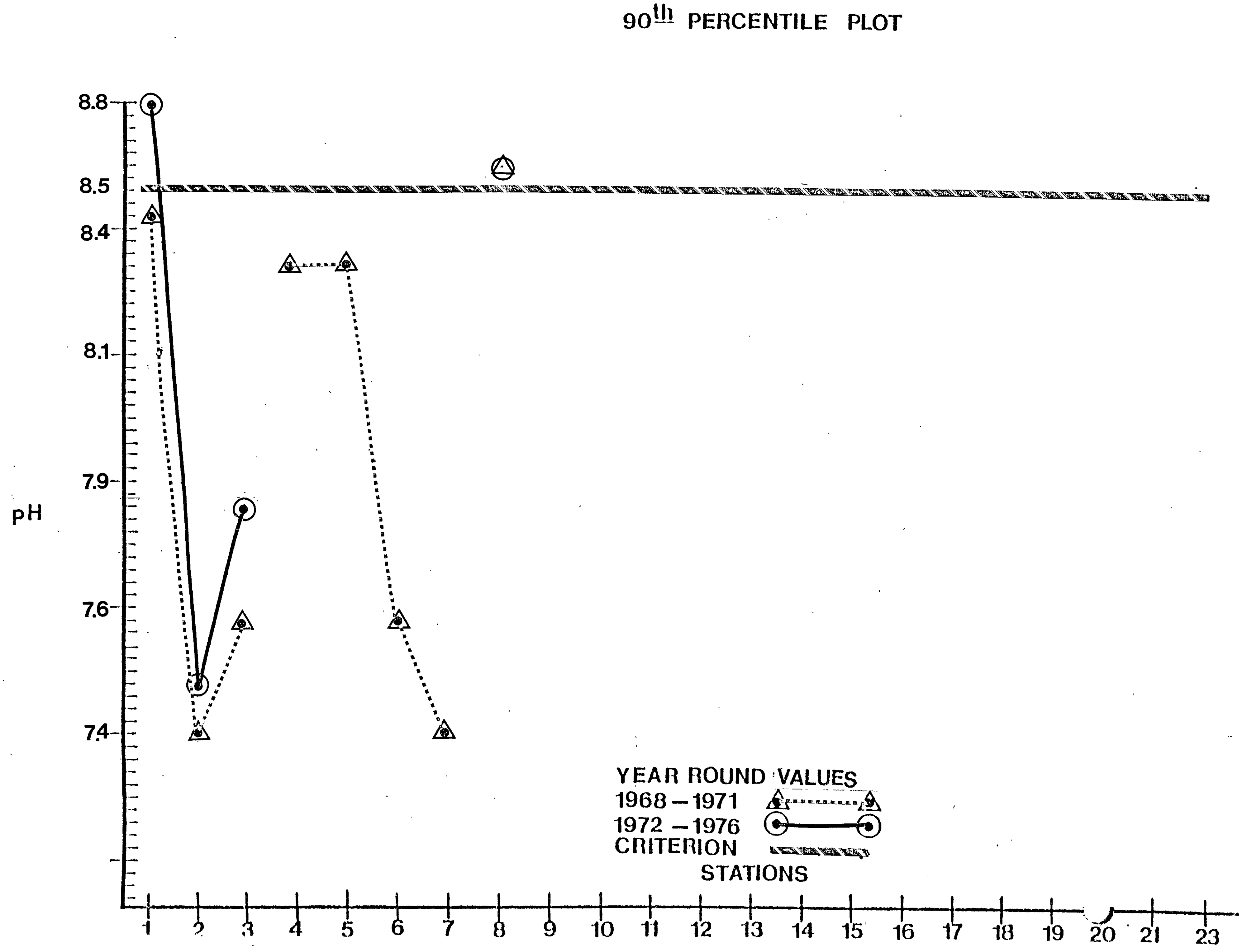
90th PERCENTILE PLOT
8.8
8.5
8.4
8.1
7.9
pH
7.6
7.4
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 23

Figure VI.AA.6

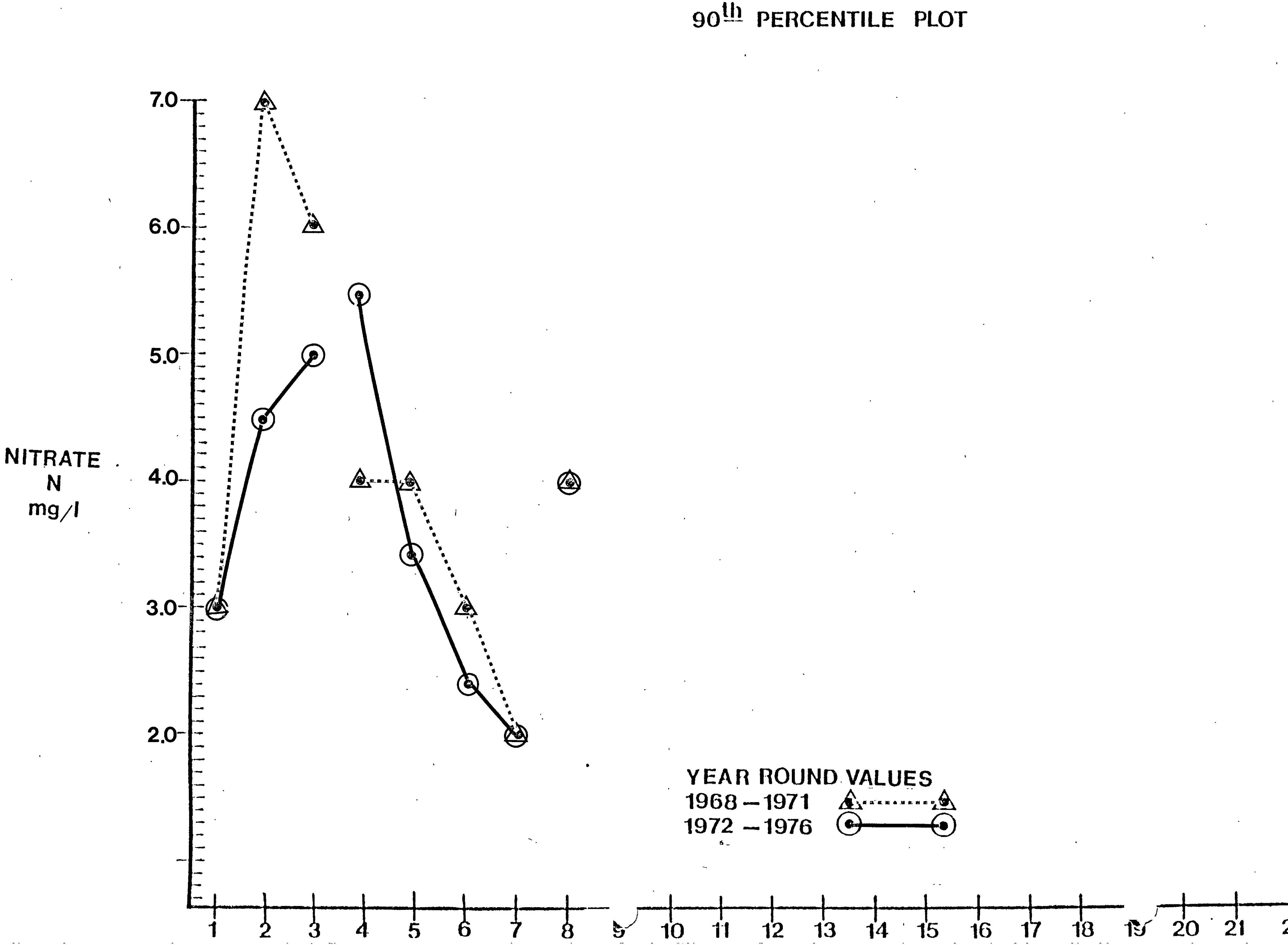

Figure VI ,7

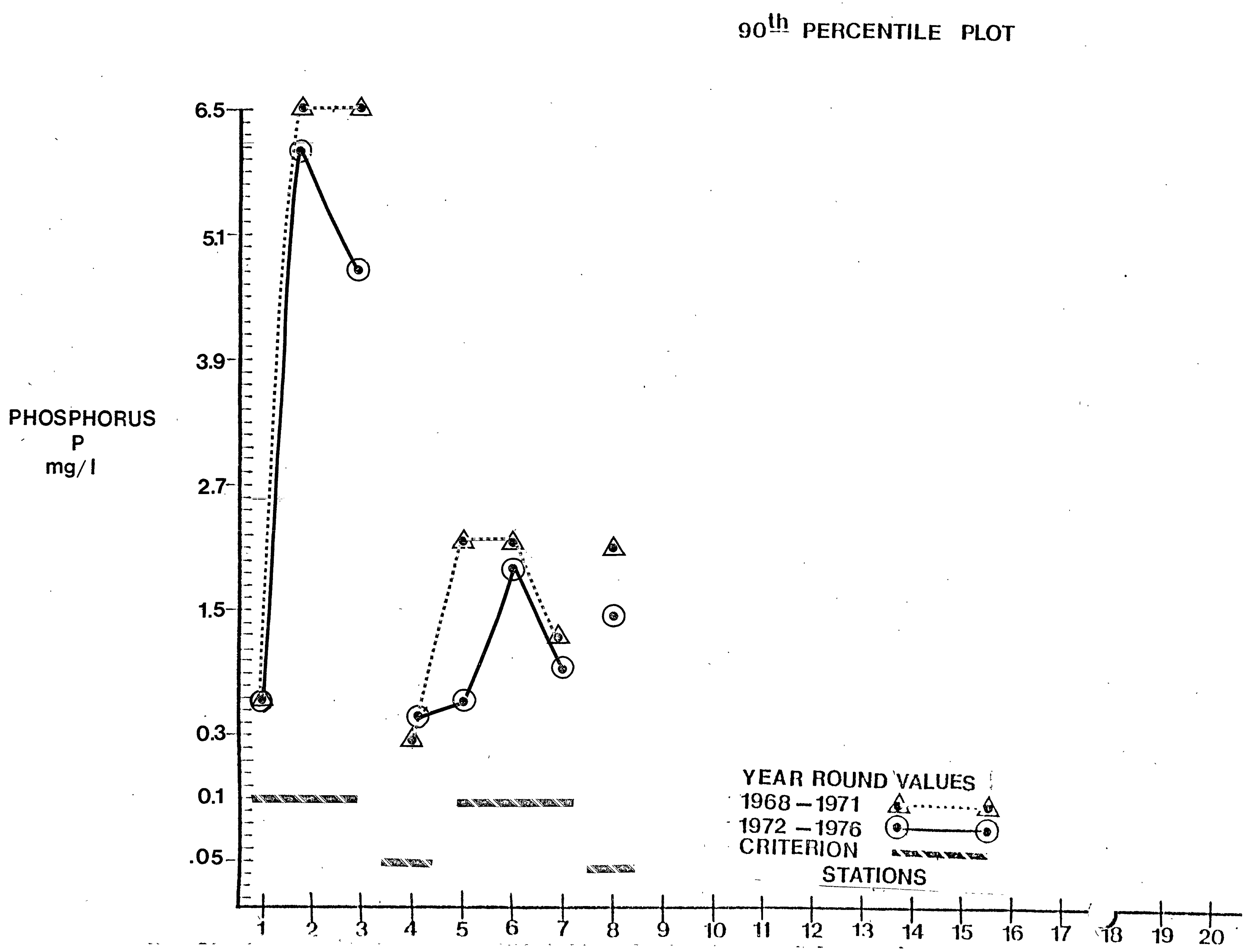
90th PERCENTILE PLOT
PHOSPHORUS
P
mg/l
6.5
5.1
3.9
2.7
1.5
0.3
0.1
.05
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
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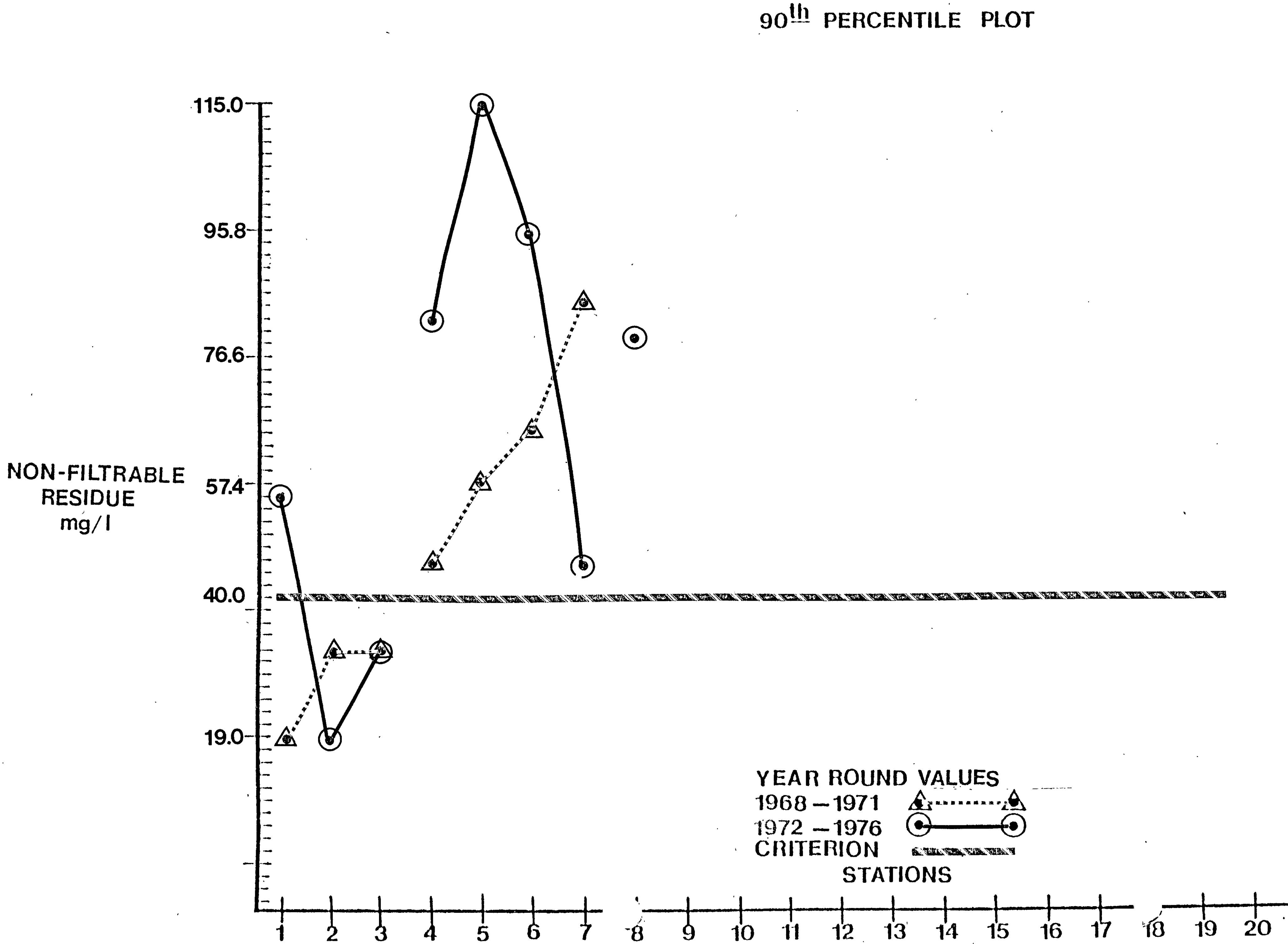
Figure VI.AA.8



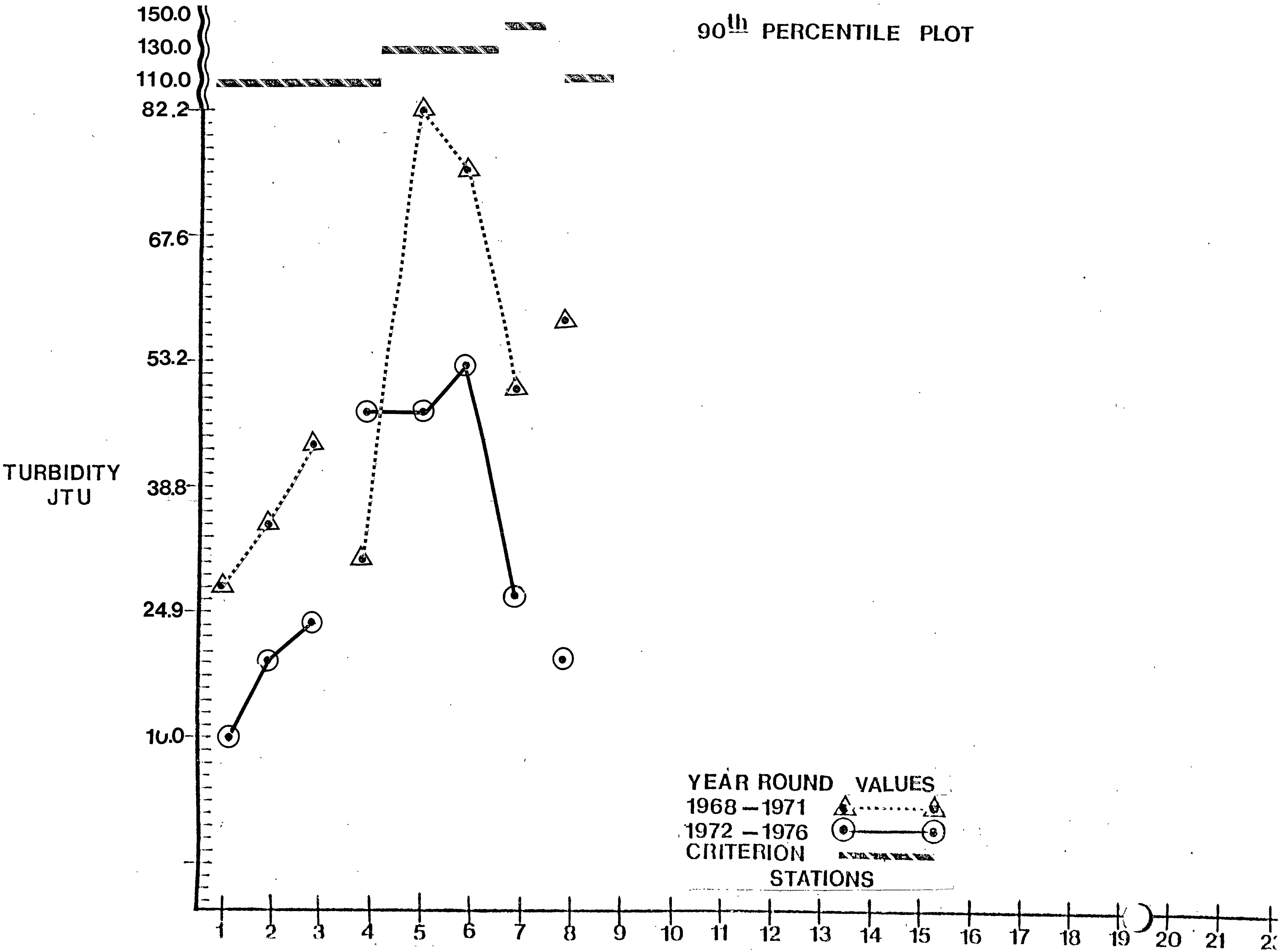

90th PERCENTILE PLOT
150.0
130.0
110.0
82.2
67.6
53.2
38.8
24.9
10.0
TURBIDITY
JTU
YEAR ROUND VALUES
1968 – 1971
1972 – 1976
CRITERION
STATIONS
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21

Table VI.AA.1

DISCHARGER INVENTORY

Urban Passaic River Basin
Hackensack River & Peckman River Segment

| MAP NUMBER | MUNICIPALITY | PLANT NAME | DEGREE OF TREATMENT | RECEIVING STREAM | AVG. (MGD) DAILY FLOW 1973 | 1974 | 1975 | COMPLIANCE WITH 1977 SECONDARY/BEST PRACTICABLE TREAT-MENT REQUIREMENTS |
|---|---|---|---|---|---|---|---|---|
| A | Little Ferry | B.C.S.A. | Sec. | Hackensack River | 62 | 61 | 67.0 | No |
| B | Kearny | Western Electric | Ind. | Hackensack River | --- | --- | 0.241 | Yes |
| C | Wood-Ridge | Municipal | Sec. | Berry's Creek to Hackensack River | .62 | .58 | 0.598 | No |
| D | Rutherford | Tri. Boro J.M. | Sec. | Berrys Creek (Hackensack) | 3.2 | 3.2 | 2.42 | No |
| E | North Bergen | Municipal (Central) | Pri. | Chromakill Creek (Hackensack) | 1.0 | 1.0 | 1.0 | No |
| F | North Bergen | Municipal (North) | Pri. | Bellman's Creek (Hackensack) | 2.0 | 2.0 | 2.0 | No |
| G | Secaucus | Municipal | Sec. | Mill Creek (Hackensack) | 1.0 | 1.1 | 1.19 | Yes |
| H | North Arlington | N. Arlington - Lyndhurst J.M. | Pri. | Kingsland Creek (Hackensack) | 1.5 | 1.7 | 2.04 | No |
| I | Verona | Municipal | Sec. | Peckman River | 2.5 | 2.4 | 2.62 | |

Urban Passaic River Basin
Hackensack River & Peckman River Segment (Continued)
Page 2

Table VI.AA.1

| MAP NUMBER | MUNICIPALITY | PLANT NAME | DEGREE OF TREATMENT | RECEIVING STREAM | AVG. (MGD) DAILY FLOW 1973 | 1974 | 1975 | COMPLIANCE WITH 1977 SECONDARY/BEST PRACTICABLE TREAT-MENT REQUIREMENTS |
|---|---|---|---|---|---|---|---|---|
| J | Little Falls | Municipal | Ter. | Peckman | 1.1 | 1.2 | 1.62 | No |
| K | [a]Little Falls Twp. | Little Falls Laundry | Ind. | Peckman River | 1.5 | 1.05 | | |
| L | Cedar Grove | Municipal | Sec. | Peckman River | 1.86 | 1.86 | 2.10 | No |
| M | Cedar Grove | Essex County Overbrook Hospital | Sec. | Peckman River | 0.864 | 0.723 | 0.509 | Yes |
| N | Secaucus | Meadowview (H.C.B.C.F.) | Sec. | Hackensack River | 0.300 | 0.300 | 0.190 | No |
| | Ridgefield | PSE&G | | Hackensack | | | 0.0075 | Yes |
| | Secaucus | N.J. Motor Vehicles | Sec. | Hackensack River | 0.0004 | 0.0004 | 0.0005 | Yes |
| | Secaucus | Howard Johnsons | Sec. | Hackensack River | 0.009 | 0.007 | 0.007 | Yes |
| | Secaucus | Lincoln Ind. Park | Sec. | Hackensack River | 0.009 | 0.009 | 0.009 | No |
| | Secaucus | Erie-Lackawanna R.R. | Ind. | Hackensack River | 0.0005 | 0.0005 | 0.0005 | No |
| | [b]North Arlington | Haward Corp. | Ind. | Hackensack River | .02 | .03 | 0.025 | No |

| MAP NUMBER | MUNICIPALITY | PLANT NAME | DEGREE OF TREATMENT | RECEIVING STREAM | AVG. (MGD) DAILY FLOW 1973 | 1974 | 1975 | COMPLIANCE WITH 1977 SECONDARY/BEST PRACTICABLE TREATMENT REQUIREMENTS |
|---|---|---|---|---|---|---|---|---|
| | Kearny | Jeryl Industries | Sec. | Hackensack River | 0.007 | 0.009 | 0.009 | No |
| | Kearny | Koppers Co. Inc. | Ind. | Hackensack River | ---- | ---- | 0.0036 | Yes |
| | Kearny | P.S.E. & G. | Ind. | Hackensack River | .015 | .015 | 0.015 | Yes |
| | Kearny | Post Office | Sec. | Hackensack River | .10 | .15 | 0.150 | Yes |
| | Kearny | Lloyd A. Fry Roofing | Ind. | Hackensack River | .0008 | .0008 | 0.0008 | No |
| | Kearny | Lloyd Fry | Pri. | Hackensack Ground Recharge | 0.0008 | 0.0008 | 0.0008 | No |
| | Jersey City | P.S.E. & G. | Ind. | Hackensack River | .015 | .015 | 0.070 | |
| | North Bergen | Sears Roebuck | Sec. | Penhorn Creek (Hackensack) | .007 | .0065 | 0.0064 | No |
| | Jersey City | Clipper Express | Sec. | Pen Horn Creek | 0.0012 | 0.0012 | 0.0012 | No |

# CHAPTER VII

## SHELLFISH HARVEST

The shellfish industry in New Jersey is a significant national industry. New Jersey shellfish account for a major portion of the national market of clams, oysters and mussels. From 1967 through 1975 the areas open to shellfish harvesting decreased about 11%. This trend continued in 1976 as an additional 7007 acres were reclassified either from approved to condemned or approved to seasonally approved[1]; 5150 of these acres were in the Atlantic Ocean and were reclassified as a result of the ocean monitoring system developed and required at that time by the Federal government. In 1977, 1641 acres were reclassified but unlike previous years most of this area was upgraded from condemned to approved (only 42 acres were downgraded from approved to condemned).[2] For the first time in six years the areas approved for shellfish harvesting experienced a net gain.

In New Jersey there are four major basins subject to shellfish regulations. These are: 1) Raritan River Basin; 2) New Jersey North Coastal Basin; 3) New Jersey South Coastal Basin; 4) Delaware Basin Zone 5 and 6. The Shellfish Control Unit of the New Jersey Department of Environmental Protection has classified these basins into four categories of shellfish harvesting areas. These read as follows:

1) <u>Approved</u> - Waters meeting the sanitary standards for approved shellfish harvesting as recommended by the National Shellfish Sanitation Program. Waters not classified as condemned, special restricted, or seasonal shall be considered approved for the harvest of shellfish.

2) <u>Special Restricted Area</u> - Waters condemned for the harvest of oysters, clams and mussels. However, harvesting for further processing may be done under special permit from the State Department of Environmental Protection.

3) <u>Seasonal</u> - Waters, except Delaware Bay, which are condemned for the harvest of oysters, clams and mussels from May 1 through December 31 of each year and approved for harvest from January 1 through April 30 of each year. Seasonal waters in Delaware Bay are condemned for the harvest of oysters, clams and mussels from May 1 through October 31 and are approved for harvest from November 1 through April 30 of each year.

4. Condemned - Waters not meeting the established sanitary standards as recommended by the National Shellfish Sanitation Program of the Federal Food and Drug Administration. Applications for removal of shellfish to be used for human consumption from areas classified as condemned will be considered for relay purposes only.

RARITAN RIVER BASIN

Only a small portion of the Raritan River Basin need be examined, as most of this Basin consists of freshwater habitats. Considered here are Raritan Bay, Lower Bay, Sandy Hook Bay, Navesink River, Shrewsbury River, and their tributaries. There are no waters in this Basin classified fully open to shellfish harvesting. Out of the total acreage available for shellfish, 35% are fully closed while the rest are classified Special Restricted.

NEW JERSEY NORTH COASTAL BASIN

This Basin consists of a large portion of the Atlantic Ocean coastal environment in New Jersey. Much of the acreage classified in this Basin is in the Barnegat Bay area. The Barnegat Bay area comprises 65% of the total acreage available for shellfish harvesting in this Basin (46,158 acres). The rest of the Basin is made up of a number of smaller bays, rivers, creeks and their tributaries. These include Shark River, Manasquan River, Little Egg Harbor, Cedar Run, Westcunk Creek, Tuckerton Creek, Big Thorofare and Big Creek.

Fully open shellfish harvesting acreage constitutes 81% of the total available acreage in this Basin. These areas are located in Barnegat Bay and Little Egg Harbor. This leaves 18% of the total available acreage fully closed, and 1% classified as seasonal. All of the acreage reclassified in 1977 was located in this basin and was reported in the "New Jersey Register, February 10, 1977" as follows:

Swan Point - A small number of acres of a small cove north of Swan Point has been down graded from approved to condemned.

Sloop Point to Havens Point - Approximately 12 acres of an unnamed creek between Sloop Point and Haven Point has been downgraded from approved to condemned.

Silver Bay - Approximately 345 acres has been upgraded from condemned to approved.

Applegate Cove - Approximately 102 acres has been upgraded from condemned to approved.

Barnegat Bay north of the Thomas A. Mathis Bridge - Approximately 1152 acres has been upgraded from condemned to approved.

Stouts Creek - approximately 30 acres has been downgraded from approved to condemned.

The New Jersey North Coastal Basin is comprised of two counties, Monmouth County and Ocean Couty (although the northern tip of Monmouth County is in the Raritan River Basin). According to the annual summaries of the New Jersey Landings reports (1972 through 1976), these two counties have had decreasing shellfish catches.

Table VII.1 SHELLFISH CATCHES (in pounds)

| YEAR | MONMOUTH | OCEAN |
|---|---|---|
| 1976 | 267,077 | 3,412,915 |
| 1975 | 294,524 | 5,142,586 |
| 1974 | 209,425 | 4,470,665 |
| 1973 | 263,049 | 5,065,799 |
| 1972 | 529,524 | 5,910,245 |

NEW JERSEY SOUTH COASTAL BASIN

The New Jersey South Coastal Basin, combined with the New Jersey North Coastal Basin, make up more than 90% of the Atlantic Ocean coastal zone in New Jersey. In comparison with the three other basins (Raritan River, New Jersey North Coastal and Delaware Zones 5 and 6) that support shellfish harvesting, this is the most productive one. According to statistics reported in the annual summaries of New Jersey Landings reports, this Basin has an annual shellfish harvest of at least double the combined totals of the other three basins. However, much of this production is due to the Special Restricted Area "Relay Program".

In the New Jersey South Coastal Basin the acreage available for shellfish harvesting is located in Atlantic and Cape May Counties. The annual summaries of the New Jersey Landings reports (1972-1976) reported shellfish poundage to be as follows:

Table VII.2 SHELLFISH CATCHES (in pounds)

| YEAR | ATLANTIC | CAPE MAY |
|---|---|---|
| 1976 | 11,725,866 | 14,724,054 |
| 1975 | 15,458,909 | 16,476,528 |
| 1974 | 7,236,818 | 12,600,416 |
| 1973 | 5,653,320 | 12,536,934 |
| 1972 | 2,252,502 | 14,833,040 |

The Shellfish Control Unit of the Division of Water Resources, NJDEP, assigns shellfish classifications to over 160 rivers, bays, creeks, thorofares and channels in this basin. The largest systems are Great Bay, Mullica River, Absecon Bay, Great Egg Harbor Bay, Great Egg Harbor River, Ludlam Bay and Great Sound. Of the total area classified, 46% of the acreage is designated as approved, 41% is fully closed, 6% is classified as special restricted and 7% is seasonal.

DELAWARE BASIN

This Basin has six areas which are subject to shellfish classifications. The Delaware Bay contains 97% of the total classified acreage in the basin and is the only area in the basin that contains waters acceptable to fully approved shellfish harvesting. The other five areas, which are classified either fully closed or seasonal, include the Maurice River and Cove area, the Cohansey River area, the Back Creek area, the Cedar Creek area and the Nantuxent Creek area.

Most of the important shellfish harvesting areas in this basin are in Cumberland County. The annual summaries for the New Jersey Landings reports for the years 1972 through 1976 are given below:

Table VII.3

CUMBERLAND COUNTY

| YEAR | TOTAL CATCH (in pounds) |
|---|---|
| 1976 | 1,389,801 |
| 1975 | 953,393 |
| 1974 | 948,528 |
| 1973 | 1,377,392 |
| 1972 | 1,683,437 |

Of the total acreage available for shellfish harvesting, 88% is classified approved, 10% fully closed and 2% seasonally approved.

ATLANTIC OCEAN

None of the four basins previously discussed included figures on the Atlantic Ocean. There are 280,708 acres of marine waters which are regulated by the Shellfish Control Unit, of this total area 66% (185,944 acres) of the waters are classified as approved while the remainder were classified as fully closed.

SUMMARY

It is important to be cautious when examining shellfish harvesting data for the past ten years as seen in the following "Total N.J. Shellfish Catch". These figures represent the total amount of shellfish (clams, oysters & mussels) produced in New Jersey and not the total amount taken from New Jersey harvest areas. Two major factors affecting this data must be considered: 1) catches from non-state harvest areas are included in these figures and; 2) out of state fishermen use New Jersey's harvest areas and take their catches to other states for processing.

When these two factors are combined with the fact that no other data is available, one can readily see the difficulty involved when attempting to discuss past and future harvest trends.

Table VII.4

| YEAR | TOTAL NJ SHELLFISH CATCH (in pounds) |
|---|---|
| 1967 | 45,597,800 |
| 1968 | 36,096,057 |
| 1969 | 39,383,458 |
| 1970 | 42,955,839 |
| 1971 | 32,067,077 |
| 1972 | 25,303,811 |
| 1973 | 24,896,494 |
| 1974 | 25,501,852 |
| 1975 | 38,325,940 |
| 1976 | 31,519,713 |

However, it should be noted that the total acreage approved for shellfish harvesting in New Jersey experienced a net gain in 1977 which is the reverse of a five year downward trend.

The New Jersey Register, dated April 10, 1975 and February 10, 1977, published the following tables to indicate the net change in shellfish growing area acreage and the total shellfish growing area acreage by designated classifications.[3]

Table VII.5

BAY AND ESTUARINE SHELLFISH GROWING AREA ACREAGES RECLASSIFIED

Table VII.5

| YEAR ADOPTED | TOTAL ACRES DOWNGRADED | TOTAL ACRES UPGRADED | NET CHANGE |
|---|---|---|---|
| 1977 | 42 | 1599 | +1557 |
| 1976 | 2353 | 2135 | -218 |
| 1975 | 5018 | 885* | -4133 |
| 1974 | 5462 | 146 | -5316 |
| 1973 | 2490 | 0 | -2490 |
| 1972 | 2951 | 5511* | +2560 |

*represents acreage reclassified from condemned to special restricted

## SHELLFISH GROWING AREA ACREAGE BY DESIGNATED CLASSIFICATIONS

Table VII.6

### BAY AND ESTUARINE AREAS

| YEAR APPROVED | APPROVED | FULLY CLOSED | SPECIAL RESTRICTED | SEASONAL | TOTAL |
|---|---|---|---|---|---|
| 1977 | 281645 | 73394 | 28193 | 9620 | 392,852 |
| 1976 | 280088 | 74951 | 28193 | 9620 | 399,852 |
| 1975 | 281852 | 74230 | 27243 | 9527 | 392,852 |
| 1974 | 284185 | 74012 | 27243 | 7412 | 392,852 |
| 1973 | 289052 | 73464 | 25723 | 4612 | 392,852 |
| 1972 | 293235 | 70930 | 23478 | 5209 | 392,852 |
| 1971 | 295513 | 68592 | 23478 | 5209 | 392,852 |

### OCEAN WATER

| YEAR APPROVED | APPROVED | FULLY CLOSED | SPECIAL RESTRICTED | SEASONAL | TOTAL |
|---|---|---|---|---|---|
| 1975 | 144750 | 85650 | - | - | 230,400 |
| 1976 | 185944 | 94764 | - | - | 280,708 |
| 1977 | 196168 | 84540 | | | 280,708 |

1. New Jersey Register, Thursday, January 8, 1976

2. New Jersey Register, Thursday, February 10, 1977

3. Chart updated by Data Aquisition and Analysis Unit, NJDEP.

CHAPTER VIII

## TOXIC MATERIALS SPILLS AND FISH KILLS

Hazardous materials spills and fish kills, though short in duration, upset biological communities for periods beyond that required for clean-up and dispersion. The number and volumes of oil and hazardous materials spills reported to the Department has increased steadily in the past six years as follows:

| Year | Spills Reported | Vol. (gallons) | No. of spills of unknown volume |
|---|---|---|---|
| 1976 | 826 | 7,264,012 | 383 |
| 1975 | 676 | 30,947,321 | 273 |
| 1974 | 546 | 1,305,710 | 179 |
| 1973 | 514 | 2,124,185 | 171 |
| 1972 | 194 | 183,895 | 61 |
| 1971 | 55 | 159,994 | 36 |

A breakdown of the number of spills by product is shown in the following table. Note that the total number of spills in 1975 exceeds that of the actual number of product spills in 1975. This occurs because some spills were composed of more than one product.

Table VIII.1

OIL AND HAZARDOUS MATERIAL SPILLS
NUMBER OF SPILLS BY PRODUCT

| PRODUCT | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 |
|---|---|---|---|---|---|---|
| Gasoline | 4 | 21 | 39 | 51 | 69 | 130 |
| Kerosine | 2 | 3 | 3 | 0 | 7 | 1 |
| Aviation Fuel | 1 | 4 | 6 | 6 | 4 | 5 |
| #2 | 7 | 25 | 80 | 67 | 88 | 110 |
| #4 | 0 | 15 | 14 | 21 | 20 | 20 |
| #5 | 0 | 1 | 2 | 21 | 20 | 20 |
| #6 | 7 | 35 | 63 | 65 | 46 | 48 |
| Diesel | 3 | 7 | 22 | 23 | 31 | 64 |
| Asphalt | 1 | 3 | 12 | 10 | 10 | 12 |
| Miscellaneous Oil | 2 | 31 | 127 | 108 | 220 | 206 |
| Crude | 1 | 7 | 26 | 25 | 12 | 13 |
| Mineral Spirits | 0 | 2 | 1 | 0 | 0 | 8 |
| Miscellaneous Chemicals | 0 | 12 | 45 | 17 | 28 | 71 |
| Food Products | 0 | 0 | 4 | 7 | 6 | 4 |
| Unknown | 21 | 23 | 34 | 84 | 30 | 45 |
| Paint | 0 | 0 | 6 | 4 | 6 | 6 |
| Petro Wax | 0 | 0 | 2 | 1 | 1 | 0 |
| Formaldehyde | 0 | 0 | 1 | 1 | 0 | 0 |
| Other | 2 | 5 | 11 | 64 | 18 | 40 |
| Solvents | 0 | 0 | 0 | 0 | 17 | 22 |
| Butyle Cellosove | 0 | 0 | 0 | 0 | 1 | 0 |
| Acid | 0 | 0 | 0 | 0 | 21 | 10 |
| Cutting Oil | 0 | 0 | 0 | 0 | 3 | 0 |
| Pesticide | 0 | 0 | 0 | 0 | 3 | 0 |
| Mercury | 0 | 0 | 0 | 0 | 0 | 2 |

The rivers in the New York - New Jersey interstate area have the highest percent frequency of oil and hazardous material spills. The Delaware River had the most frequent occurrences for a single river.

The following table shows receiving waters in which multiple spills have occurred.

Table VIII.2

OIL AND HAZARDOUS MATERIAL SPILLS
INCIDENTS BY SEGMENT

| | 1972 | 1973 | 1974 | 1975 | 1976 |
|---|---|---|---|---|---|
| Arthur Kill | 42 | 76 | 87 | 104 | 125 |
| Delaware River | 40 | 80 | 89 | 104 | 130 |
| Raritan River | 23 | 26 | 23 | 36 | 60 |
| Passaic River | 16 | 32 | 22 | 53 | 64 |
| Hackensack River | 10 | 28 | 27 | 22 | 30 |
| Atlantic Ocean | 10 | 16 | 8 | 13 | 17 |
| Rahway River | 7 | 8 | 9 | 17 | 20 |
| Musconetcong River | 6 | 6 | 4 | 9 | 5 |
| Kill Van Kull | 5 | 40 | 28 | 34 | 45 |
| Rancocas Creek | 4 | 6 | 4 | 6 | 3 |
| Rockaway River | 4 | 0 | 4 | 3 | 10 |
| Barnegat Bay | 3 | 3 | 2 | 9 | 17 |
| Elizabeth River | 3 | 0 | 2 | 3 | 10 |
| Raritan Bay | 2 | 6 | 5 | 5 | 2 |
| Millstone River | 2 | 3 | 6 | 1 | 12 |
| Maurice River | 1 | 10 | 2 | 0 | 5 |
| Newark Bay | 0 | 14 | 14 | 32 | 45 |
| Pennsauken Creek | 0 | 5 | 1 | 1 | 5 |
| Metedeconk River | 0 | 3 | 3 | 2 | 9 |
| New York Bay (Upper) | 0 | 2 | 7 | 8 | 27 |
| Delaware Raritan Canal | 0 | 5 | 2 | 2 | 5 |
| Hudson River | 1 | 6 | 9 | 22 | 27 |
| Berry's Creek | 0 | 0 | 5 | 6 | 9 |
| Cohansey River | 0 | 0 | 6 | 1 | 7 |
| Toms River | 0 | 0 | 5 | 0 | 6 |
| Whale Creek | 0 | 0 | 0 | 2 | 4 |

Since 1960, when annual fish kills summaries were initiated, the destruction of 5 million fish has been recorded. Fish kill summaries by cause and by area are presented below.

The major single cause of fish kills is shock wasteloads from municipal and industrial-chemical discharges. Fish kills are also attributed to shock thermal loads from utility and industry cooling water effluent. The major problem area in New Jersey is the Raritan River Basin.

Because the ambient monitoring sampling interval is less than monthly, spills have little chance of being detected. Thus, spills will not generally be reflected in the monitoring data.

As a result of expanding development and the State's need for more energy, the numbers of both hazardous material spills and fish kills is expected to increase in 1977.

New legislation in New Jersey is intended both to reduce the number and impact of spills and to provide immediate compensation for damages caused by spills. More information on the control of toxic and hazardous materials can be found in the New Jersey 1977 Water Resources Program Plan and in N.J.S.A. 58:10-23.11 et.seq.

FISH KILL SUMMARY BY SOURCE OF POLLUTION
1974

Table VIII.3

| Source of Pollution | Number of Reports | | No. of Fish Killed | |
|---|---|---|---|---|
| AGRICULTURAL | | | | |
| Insecticides | 4 | | 1250 | |
| Fertilizers | 1 | | 100 | |
| Subtotal | | 5 | | 1350 |
| INDUSTRIAL | | | | |
| Mining | 1 | | 500 | |
| Chemicals | 7 | | 2650 | |
| Petroleum | 5 | | 5700 | |
| Metals | 2 | | 550 | |
| Other | 3 | | 900 | |
| Subtotal | | 18 | | 10,300 |
| MUNICIPAL | | | | |
| Sewerage Systems | 16 | | 221,947 | |
| Water Systems | 2 | | 950 | |
| Swimming Pool | 1 | | 100 | |
| Power | 4 | | 21,100 | |
| Subtotal | | 23 | | 244,097 |
| TRANSPORTATION | | | | |
| Truck | 4 | | 1400 | |
| Subtotal | | 4 | | 1400 |
| OTHER OPERATIONS | 5 | | 1950 | |
| Subtotal | | 5 | | 1950 |
| UNKNOWN | 9 | | 19,600 | |
| Subtotal | | 9 | | 19,600 |
| TOTAL | | 64 | | 278,697 |

INVESTIGATED FISH KILLS
(by $303_e$ BASIN)

Table VIII.4

number by year
(percent of total fish kills)

| BASIN | 1970 | 1971 | 1972 | 1973 | 1974 |
|---|---|---|---|---|---|
| DELAWARE RIVER BASIN: | | | | | |
| Planning Area A | 6(21) | 3(11) | 1( 5) | 3( 7) | 6( 9) |
| Planning Area B | 2( 7) | 0( 0) | 2(10) | 2( 4) | 2( 3) |
| Planning Area C | 2( 7) | 1( 4) | 2(10) | 3( 7) | 9(14) |
| Planning Area D | 1( 3) | 2( 8) | 0( 0) | 2( 4) | 4( 6) |
| NEW JERSEY COASTAL BASIN: | | | | | |
| North | 1( 3) | 1( 4) | 2(10) | 9(20) | 6( 9) |
| South | 0( 0) | 3(11) | 0( 0) | 1( 2) | 1( 2) |
| PASSAIC RIVER BASIN: | | | | | |
| Freshwater | 6(21) | 5(19) | 1( 5) | 7(16) | 6( 9) |
| Urban | 4(14) | 2( 8) | 3(15) | 4( 9) | 11(17) |
| RARITAN RIVER BASIN | 7(24) | 9(35) | 8(40) | 14(31) | 16(25) |
| WALLKILL RIVER BASIN | 0( 0) | 0( 0) | 1( 5) | 0( 0) | 3( 5) |
| TOTAL | 29 | 26 | 20 | 45 | 64 |

# APPENDICIES

A. DELAWARE RIVER BASIN COMMISSION REPORT ON THE DELAWARE RIVER

DELAWARE RIVER BASIN COMMISSION

# WATER QUALITY

# of the

# DELAWARE RIVER

# 1976

# A STATUS REPORT

305(b) REPORT

March 29, 1977

## Table of Contents

Water Quality
of the
DELAWARE RIVER
1976
A Status Report

305(b) Report

## Introduction

### Purpose and Scope

Section 305(b) of the Federal Water Pollution Control Act Amendments of 1972 requires the annual submission of a water quality inventory report which describes the current status of water quality, the amount of water quality improvement which has occurred, the status and costs of point source pollution abatement and the nature of non-point pollution sources. This report is addressed to the 1976 status of the main stem of the Delaware River from Hancock, New York to the mouth of the Delaware Bay between Cape May, New Jersey and Cape Henlopen, Delaware (Figure 1) for these purposes.

### The Delaware River and Bay

The 330 mile long Delaware River serves as an interstate boundary first between Pennsylvania and New York in its upper reaches, then between Pennsylvania and New Jersey and finally between New Jersey and Delaware in its lower reaches.

The river drains a total area of 12,765 square miles including approximately 14 percent of the land area of Pennsylvania (6,430 sq. mi.), 40 percent of New Jersey (2,969 sq. mi.), five percent of New York (2,362 sq. mi.) and 51 percent of Delaware (1004 sq. mi.).

The East and West Branches of the Delaware River rise in the Catskill Mountains of New York and join near Hancock, New York to form the main stem Delaware River. For the first 180 miles the river is non-tidal, flowing first through mountain areas and then emerging through the scenic Delaware Water Gap into rolling open country. At Trenton, New Jersey the river becomes tidal and then flows for 135 miles through the Delaware River Estuary and the Delaware Bay.

About 7 million people live within the basin with the heaviest concentrations along the upper estuary encompassing the Trenton, New Jersey, Philadelphia, Pennsylvania, Camden, New Jersey, and Wilmington, Delaware metropolitan areas. Lesser concentrations occur along the lower reaches of the Lehigh and Schuylkill Rivers, the two principal tributaries of the Delaware.

Water quality standards for the Delaware River provide for maintenance and propagation of fish and other aquatic life and primary contact recreation except for the central portion of the Delaware Estuary. In that reach, approximately 50 miles in length, standards provide for maintenance of fish and other aquatic life and secondary contact recreation. The standards also encompass use of water for agricultural, industrial, and public water supplies after reasonable treatment, except where precluded by natural salinity.

## Segment Classifications

For purposes of water quality management, the Delaware River has been divided into six water quality zones. Zone 1 extends from Hancock, New York to the head of tide at Trenton, New Jersey. It, in turn, has been divided into five subzones, Zones 1A, 1B, 1C, 1D, and 1E. Zones 2 through 5 (Figure 2 ) encompass the Delaware River Estuary from Trenton, New Jersey to the head of Delaware Bay at Liston Point, Delaware, and Zone 6 is Delaware Bay. Zones 1 and 6 are "effluent quality limited" segments, that is, minimum effluent requirements including secondary treatment for municipal wastes are sufficient to achieve and maintain water quality standards. Zones 2 through 5 are "water quality limited" segments where more stringent effluent limits are required, based on allocations of assimilative capacity, to achieve water quality standards.

## Non-tidal Delaware River

The quality of the non-tidal Delaware River, which extends from Hancock, New York to Trenton, New Jersey ranges from excellent to good and is suitable for all uses.

### Dissolved Oxygen

Dissolved oxygen concentrations observed in samples taken from the non-tidal Delaware River at East Stroudsburg, Martins Creek and Trenton, during 1976 are presented in Figure 3. Concentrations ranged from 7.3 mg/l observed at Martins Creek, to 16 mg/l at East Stroudsburg. Average concentrations during the year were above 10 mg/l at all three stations.

In the reach from the Delaware Water Gap to Trenton[1] dissolved oxygen concentrations are generally at or near saturation with small depressions occurring in local areas, such as the Easton-Phillipsburg area. However, in the summer there are diurnal variations between 2 to 5 mg/l which may cause occasional early morning minimum dissolved oxygen concentrations less than 5 mg/l. The summary of dissolved oxygen data for the Delaware River at Trenton, New Jersey, during the years 1970-1974[2] showed minimum monthly values ranging from 4.6 to 6.4 mg/l.

In 1976 the minimum value recorded at Trenton by the automatic water quality monitor was 5.5 mg/l. The minimum dissolved oxygen concentration observed on the non-tidal Delaware River during 1976 was 5.0 mg/l at Lambertville, New Jersey.

Total Nitrogen

Total nitrogen concentrations observed in 1976 (Figure 4) indicated a slight increase in nitrogen levels as the Delaware River flows from the Delaware Water Gap area to Trenton. At East Stroudsburg values observed ranged from 0.4 mg/l to 1.5 mg/l with an average concentration of 0.85 mg/l. At Martins Creek the average concentration observed was 1.0 mg/l, which increased to 1.3 mg/l at Trenton. The maximum observed value was 3.6 mg/l at Martins Creek.

Total Phosphorus

Total phosphorus concentrations observed in 1976 also increased in the downstream direction. At East Stroudsburg, total phosphorus ranged from 0.01 mg/l to a high of 0.11 mg/l as P, and averaged 0.4 mg/l (Figure 5). At Trenton concentrations ranged from 0.01 to 0.57 mg/l and averaged 0.12 mg/l. Concentrations of total phosphorus at Trenton were somewhat lower in 1976 than in 1975 (0.05 to 1.5 mg/l, average 1.6 mg/l).

Fecal Coliform

Fecal coliform levels in 1976 ranged from a geometric average at East Stroudsburg of 42/100 ml to a geometric average of 172/100 ml at Trenton (Figure 6 ). Concentrations greater than 200/100 ml occurred on several occasions at both Trenton and Martins Creek. A value greater than 2400/100 ml was recorded on one occasion at Trenton. It has been previously noted (3) that the Easton-Phillipsburg area and the Lehigh River contribute high fecal coliform bacteria levels to downstream reaches of the Delaware River.

## Delaware Estuary

The Delaware Estuary remains severely degraded, particularly in the Philadelphia, Camden, and Wilmington area. Overall, dissolved oxygen criteria continue not to be met in a significant portion of the estuary during summer months.

Dissolved Oxygen

The average of dissolved oxygen concentrations observed at selected locations in the Delaware Estuary and Bay during the summers of 1967 through 1976 are presented in Figure 7. For each June 16 to September 15 period, the average concentration of dissolved oxygen at each sampling location is plotted against its river mile location to obtain a profile of dissolved oxygen from the head of tide at Trenton, New Jersey, to the mouth of the Mahon River in the Bay. The results of two series of special surveys conducted during the July 31 to August 14, 1975 and the July 12-23, 1976 periods are also depicted.

Dissolved oxygen profiles for the summers of 1967 through 1972 show that a "classic" dissolved oxygen sag had occurred in the Delaware Estuary. At Trenton (River Mile 135) dissolved oxygen averaged between 8 and 10 mg/l. From Trenton to River Mile 100 dissolved oxygen levels fell sharply. At the bottom of the sag, between River Miles 100 and 70, dissolved oxygen concentrations ranged between 1 and 2.5 mg/l, then recovered to River Mile 55, where values between 4.5 and 5.5 mg/l were observed.

Profiles for the summers of 1973, 1974, and 1975 indicated a significant improvement in the seasonal average dissolved oxygen between River Miles 90 and 60. During the 1975 summer period the average dissolved oxygen concentration ranged from about 2.5 mg/l at River Mile 90 to nearly 5 mg/l at River Mile 60.

The profile of the average of dissolved oxygen observed during the series of 12 special surveys conducted from July 31 to August 14, 1975, indicated even high values, ranging from 3 mg/l at River Mile 90 to over 5 mg/l between River Miles 70 and 50, despite higher temperatures.

In the summer of 1976, however, the 1973-75 trend towards increasing average dissolved oxygen concentrations did not continue. Average concentrations of dissolved oxygen in the river from River Mile 85 to River Mile 95 were about 2 mg/l, essentially the same as observed in 1973. Although the bottom of the sag curve is lower than in the previous three years, Figure 7 indicates that the sag curve has not increased in length. In the lower estuary, below River Mile 75, dissolved oxygen concentrations were equal to or higher than 1975 concentrations.

Profiles of average summer water temperature are presented in Figure 8. Figures 9 and 10 present average summer dissolved oxygen and temperatures observed at River Miles 90 and 70 for 1967 through 1976.

Figure 9 also presents a comparison of average water temperatures and average air temperatures for the summer season. A comparison of 1975 and 1976 temperatures as well as those for other years indicates that ambient air temperature is the major determinant of the water temperature of the Estuary.

Phosphate

Decreases in phosphate concentrations during the period 1967 to 1975 were previously reported.(4) Figure 11, which depicts the changes which occurred at River Mile 90 in averages for the winter, spring, summer, and fall seasons for the years 1967 to 1976 indicates that the trend toward decreasing phosphate concentrations in the Estuary continued through 1976.

Fecal Coliform

High fecal coliform concentrations continued during 1976 in the Delaware River Estuary. Profiles of geometric average annual concentrations observed during the years 1967 to 1976 are presented in Figure 12.

Ammonia

In 1976 ammonia concentrations (as nitrogen) were lower than levels observed in previous years (Figure 13), particularly below River Mile 90.

## Delaware Bay

Water quality in the Delaware Bay is generally considered to be good. However, there are some problem areas.

Dissolved Oxygen

Average summer dissolved oxygen observed in the upper reaches of the Delaware

Bay are presented in Figure 7. Summer average concentrations for 1976 ranged from 6 mg/l to 7 mg/l. Minimum values observed in this reach during the summer of 1976 ranged from 4 to 6 mg/l.

Total Coliform

During the summer of 1976 average total coliform concentrations (geometric mean) decreased from upstream to downstream for three stations in the upper Delaware Bay, a reverse of the pattern observed in 1975.(5) At River Mile 44 an average concentration of 66/100 ml was observed with a maximum concentration of 1200/100 ml. At River Miles 36 and 31 the maximum observed concentrations were 320/100 ml and 350/100 ml, respectively. Average concentrations at River Miles 36 and 31 were 62/100 ml and 38/100 ml, respectively.

Total coliform concentrations observed at River Mile 36 and 31 were substantially less than values reported previously in 1975 (5). In 1975 maximum observed concentrations were 10,000/100 ml with average concentrations of 500/100 ml and 1200/100 ml, respectively at River Miles 36 and 31.

## Water Pollution Control Programs

### Effluent Requirements

In the Delaware River Basin all waste sources must receive a minimum of secondary treatment prior to discharge to Basin waters. Where these levels of treatment are not sufficient to achieve and maintain water quality standards, more stringent treatment requirements can be imposed by the Commission, based on allocations of the capacity of the receiving waters to assimilate waste discharges. Currently minimum treatment levels are sufficient to meet water quality standards in the non-tidal Delaware River above Trenton and in the Delaware Bay.

## Allocation Program

In the Delaware River Estuary, encompassing Zones 2, 3, 4, and 5, an allocation program is necessary in order to achieve and maintain water quality standards. Based on mathematical modeling studies [6] the assimilative capacity of each zone was determined. After setting aside a small reserve in each zone, the remaining capacity was apportioned among waste discharges in that zone based on the concept of equal waste reduction by all discharges in a zone. Allocations to individual discharges are made without regard to political boundaries but are based on the need of the discharger to dispose of wastewater after adequate treatment in relation to the similar needs of other discharges and the capacity of the receiving waters. In 1968, allocations were issued to approximately 90 waste dischargers to the Delaware Estuary.

## Status of Abatement

There are 86 dischargers with assigned allocations currently discharging to the Delaware Estuary. Based on sampling data and other information, 27 of these dischargers are in compliance with their assigned allocation. They represent a combined total of 9 percent of the total allocations assigned. Of the remaining dischargers 24 have approved abatement programs, while 35 do not.

The major municipal facilities for the City of Philadelphia and the City of Camden (representing 57% of the total assigned allocations) are not expected to be in compliance until the 1980's. It is anticipated that dissolved oxygen criteria will not be met until these major facilities are upgraded.

Abatement Costs

Table 1 indicates that the total investment in water pollution abatement facilities to meet requirements will be over one billion dollars. This includes $146 million already spent on facilities which were started since 1969 and have been completed. The remaining $879 million are for facilities now under construction or in the planning stage. Approximately 87 percent of these costs, totaling $767 million, are for facilities in the Delaware River Estuary.

## Non-Point Sources and Other Problems

Non-tidal Delaware River

Studies [1] have indicated that in the non-tidal portion of the Delaware River, where stream quality generally meets or is better than water quality standards, the major pollution loads imposed on the river are from non-point sources. These result from natural as well as some man-made causes.

Delaware River Estuary

Previous studies [6] have indicated that 25 percent of the oxygen demand exerted in the Delaware Estuary is attributable to the background loads entering from tributaries, combined sewer overflows, and sludge deposits. The goals of the current abatement program can be attained without abatement of these loads, which are currently not subject to practical means of control. With abatement of point sources, non-point sources will assume greater significance.

Table 1

Summary of Abatement Costs (millions of dollars)

| State | Completed | Under Construction or Planned | Total |
|---|---|---|---|
| **Delaware River, Hancock to Trenton** | | | |
| New Jersey | 6.3 | 8.6 | 14.9 |
| New York | 0.1 | 2.7 | 2.8 |
| Pennsylvania | 6.6 | 24.1 | 30.7 |
| | 13.0 | 35.4 | 48.4 |
| **Delaware Estuary** | | | |
| New Jersey | 46.1 | 251.3 | 297.4 |
| Pennsylvania | 30.5 | 488.5 | 519.0 |
| Delaware | 42.8 | 27.2 | 70.0 |
| | 119.4 | 767.0 | 886.4 |
| **Delaware Bay** | | | |
| New Jersey | 2.2 | 66.9 | 69.1 |
| Delaware | 11 | 10.0 | 21.0 |
| | 13.2 | 76.9 | 90.1 |
| **Totals** | | | |
| Delaware | 53.8 | 37.2 | 91.0 |
| New Jersey | 54.6 | 326.8 | 381.4 |
| New York | 00.1 | 2.7 | 2.8 |
| Pennsylvania | 37.1 | 512.6 | 549.7 |
| | 145.6 | 879.3 | 1024.9 |

## Salinity

Within the tidal Delaware River, the intrusion of seawater has resulted in chloride levels which make the waters unacceptable for use as water supplies. This intrusion is due to the natural variations in tide, wind, and natural flow of freshwater. However, it can be controlled to some extent by augmenting low stream flows.

## Overview

Where the Delaware River is currently of good quality, most pollution loads result from non-point sources. In the Delaware River Estuary, which is heavily polluted, dissolved oxygen goals were established recognizing the impact of both point and non-point sources of pollution. The adopted goals require upgraded treatment of wastewater discharges, but abatement of combined sewer overflows, sludge deposits, tributary inflows, and other non-point sources were not called for. As point sources of pollution in the estuary are upgraded, the relative effects of these non-point sources will become more significant.

## Summary and Conclusions

For most of its length, the water quality of the main stem of the Delaware River is good. Water quality in the Delaware River Estuary portion of the main stem however, is seriously degraded due to the impact of municipal and industrial wastes discharged as the river passes the Trenton, Philadelphia, Camden and Wilmington metropolitan areas. Current discharges in this area are subject to a waste load allocation program in order to upgrade this reach to meet water quality standards. In other portions of the Delaware River it is necessary to continue programs to preserve and enhance water quality where it is currently satisfactory.

The non-tidal Delaware River has maintained satisfactory water quality. A trend towards lower phosphorus levels and a continued problem with high fecal coliform concentrations at Trenton continued to be observed in 1976.

The Delaware River Estuary water quality continues to show the effects of gross pollution, such as low dissolved oxygen levels and high fecal coliform concentrations. The apparent trend towards improved dissolved oxygen concentrations observed during the last three years did not continue. In 1976, minimum dissolved oxygen concentrations were similar to levels observed in 1973. The year 1976 was noted by lower ammonia levels, and total phosphorus levels continued to decline. This portion of the Delaware River is expected to remain degraded until the early 1980's pending the upgrading of major wastewater discharges.

Water quality in the Delaware Bay appears good at this time. Occasional low dissolved oxygen concentrations in the upper Bay indicates the need for further investigation. In 1976 increased dissolved oxygen concentrations and lower total coliform concentrations were noted.

Abatement of point sources on the Delaware River will require a total investment of approximately one billion dollars. A majority of this cost is required to upgrade the water quality of the Delaware River Estuary. As abatement programs for point sources reach fruition, non-point sources of pollution will receive increased attention.

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2. "Water Quality Inventory, Delaware River Main Stem (305(b) Report)," Delaware River Basin Commission, Trenton, N. J., Page 16 (April 2, 1975).

3. "Water Quality of the Delaware River, 1975, A Status Report, 305(b) Report," Delaware River Basin Commission, Trenton, N. J., Page 5 (March 31, 1976).

4. "Water Quality of the Delaware River, 1975, A Status Report, 305(b) Report," Delaware River Basin Commission, Trenton, N. J., Page 7 (March 31, 1976).

5. "Water Quality of the Delaware River, 1975, a Status Report, 305(b) Report," Delaware River Basin Commission, Trenton, N. J., Page 8 (March 31, 1976).

6. Wright, J. F., and R. Porges, "Water Quality Planning and Management Experiences of the Delaware River Basin Commission," Proc. Fifth Intl. Conf. on Water Poll. Res., San Francisco, Cal. (1970).

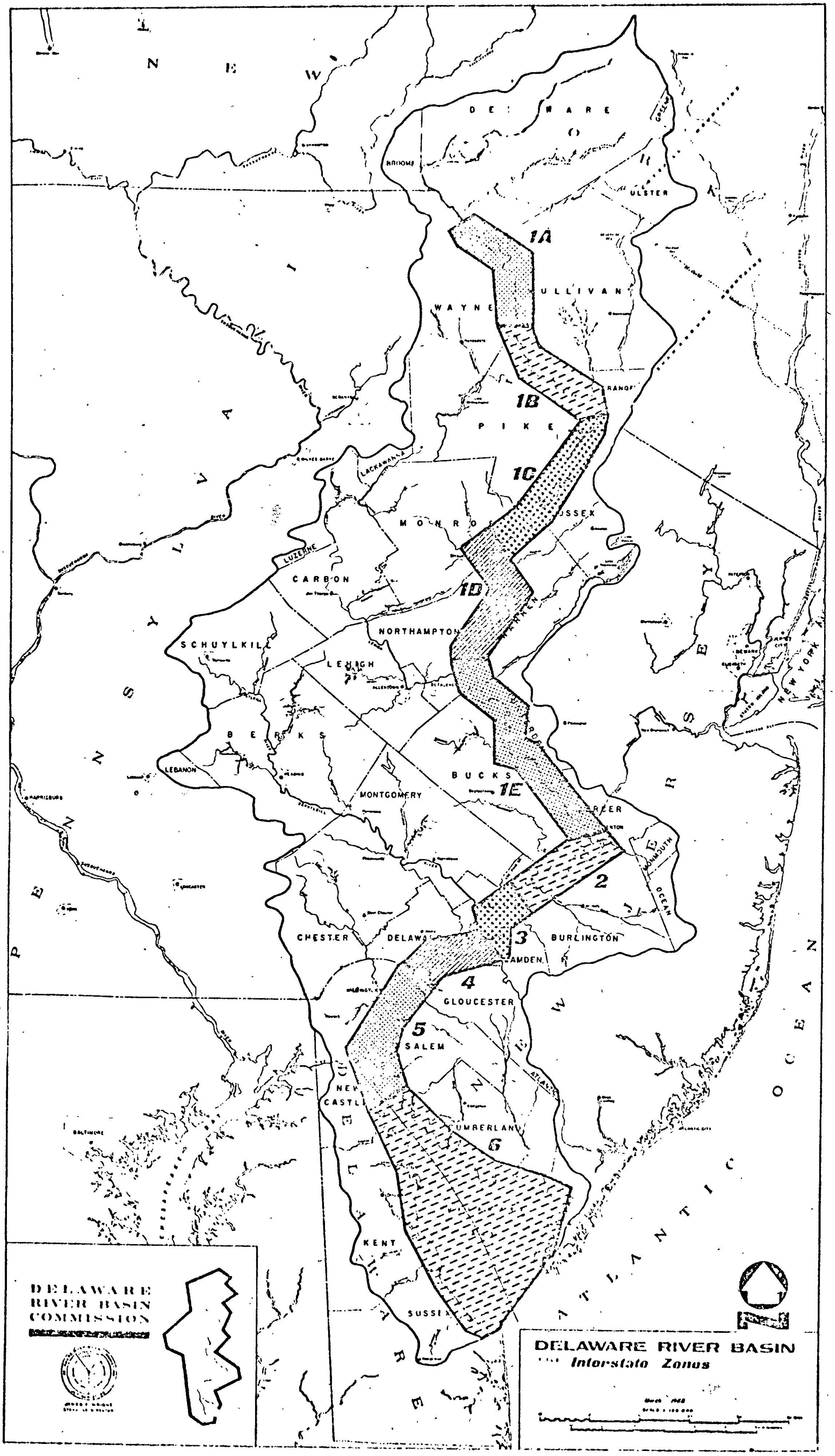

DELAWARE RIVER BASIN
Interstate Zones
DELAWARE
RIVER BASIN
COMMISSION
1A
1B
1C
1D
1E
2
3
4
5
6
BROOME
ULSTER
WAYNE
PIKE
MONROE
CARBON
LUZERNE
LACKAWANNA
SCHUYLKILL
NORTHAMPTON
LEHIGH
BERKS
LEBANON
BUCKS
MONTGOMERY
CHESTER
BURLINGTON
GLOUCESTER
SALEM
KENT
SUSSEX
ATLANTIC OCEAN
NEW YORK

Figure I

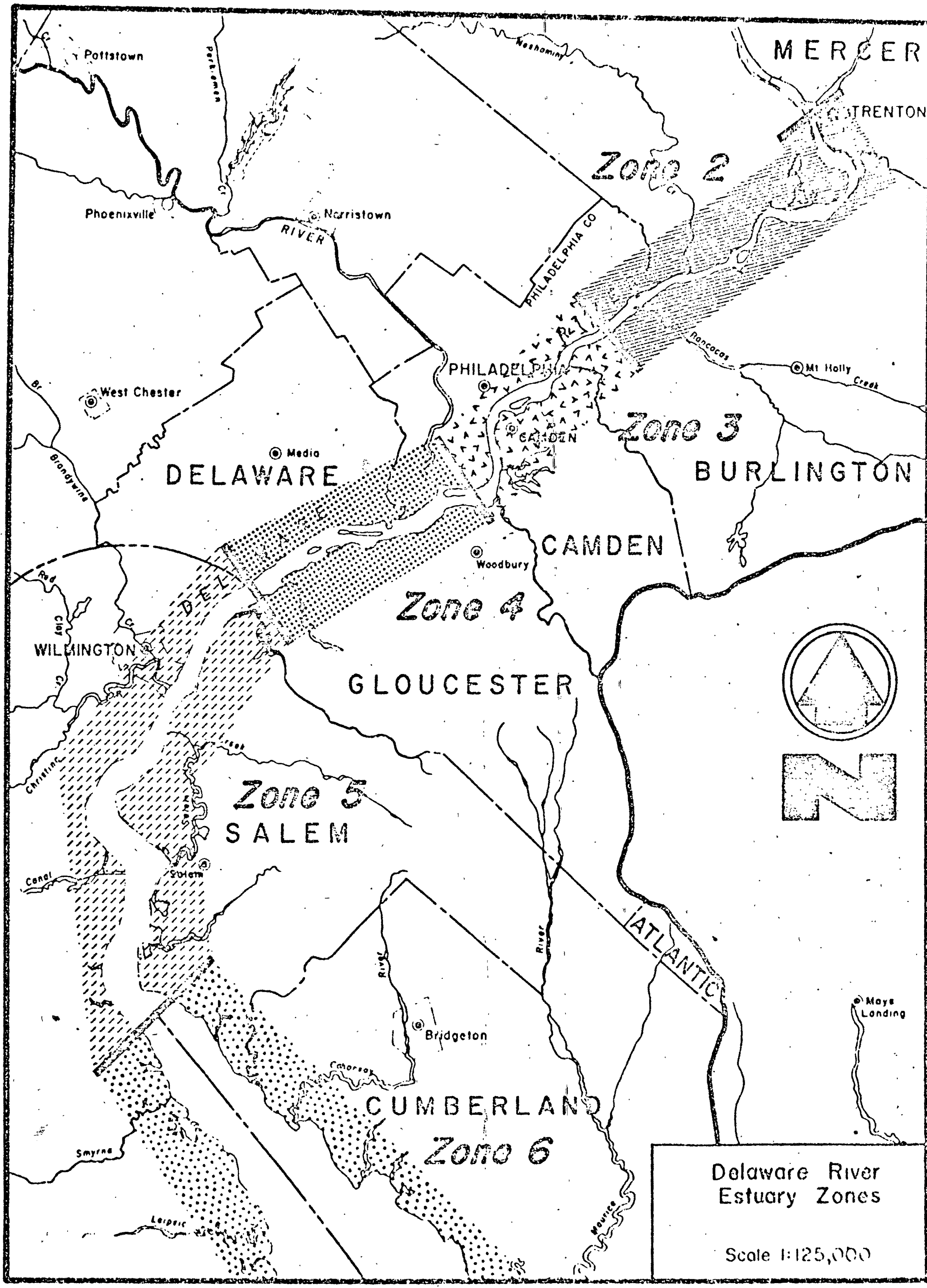

Pottstown
MERCER
TRENTON
Zone 2
Phoenixville
Norristown
RIVER
PHILADELPHIA CO
PHILADELPHIA
Rancocas
Mt Holly
Creek
West Chester
Zone 3
CAMDEN
Media
DELAWARE
BURLINGTON
CAMDEN
Woodbury
Zone 4
WILMINGTON
GLOUCESTER
Zone 5
SALEM
Canal
ATLANTIC
River
Mays Landing
Bridgeton
CUMBERLAND
Zone 6
Smyrna
Maurice
Delaware River
Estuary Zones
Scale 1:125,000
N

Figure 2

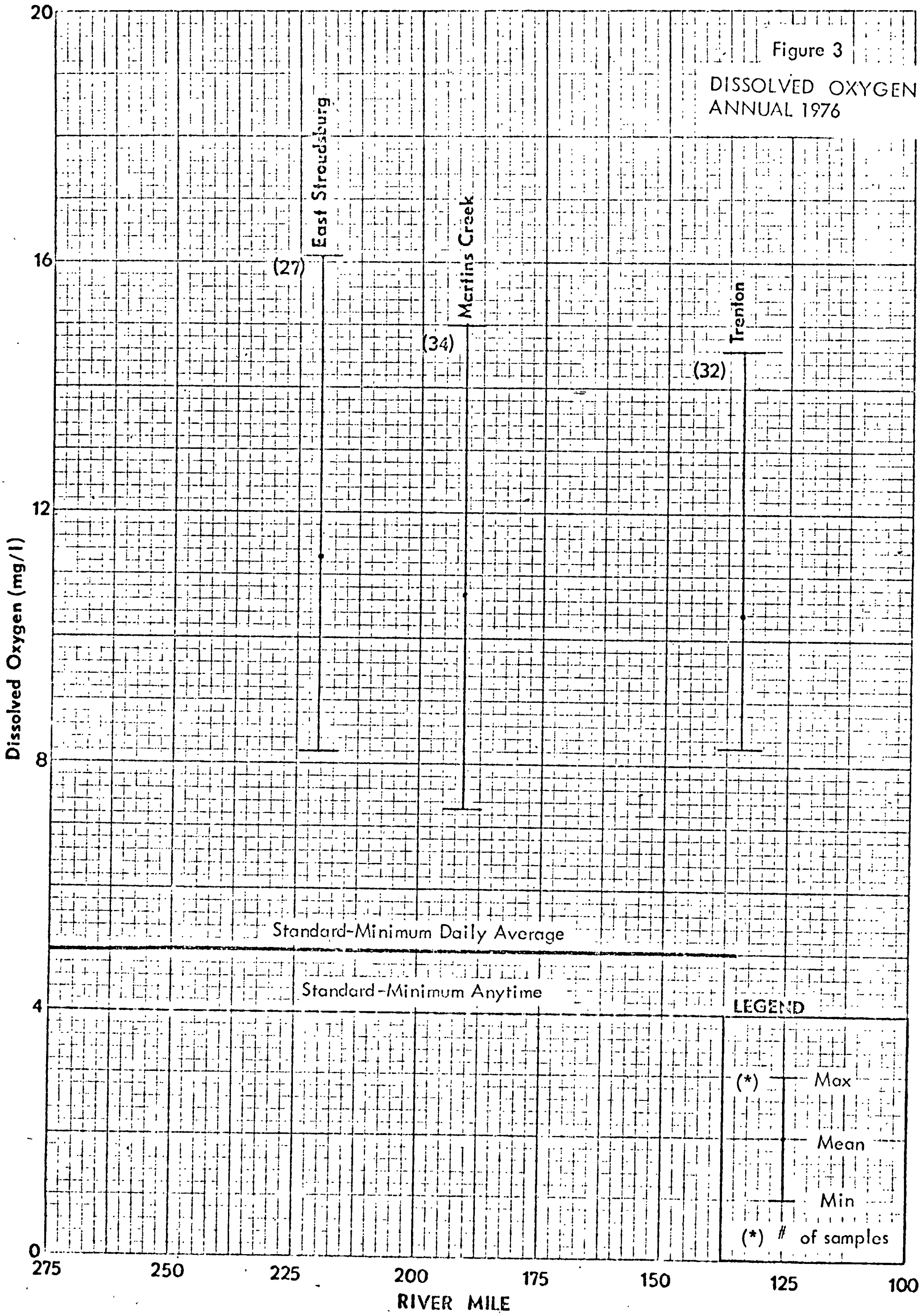


Figure 3
DISSOLVED OXYGEN
ANNUAL 1976
East Stroudsburg
Martins Creek
Trenton
(27)
(34)
(32)
Standard-Minimum Daily Average
Standard-Minimum Anytime
LEGEND
(*)
Max
Mean
Min
(*) # of samples
Dissolved Oxygen (mg/l)
20
16
12
8
4
0
275
250
225
200
175
150
125
100
RIVER MILE

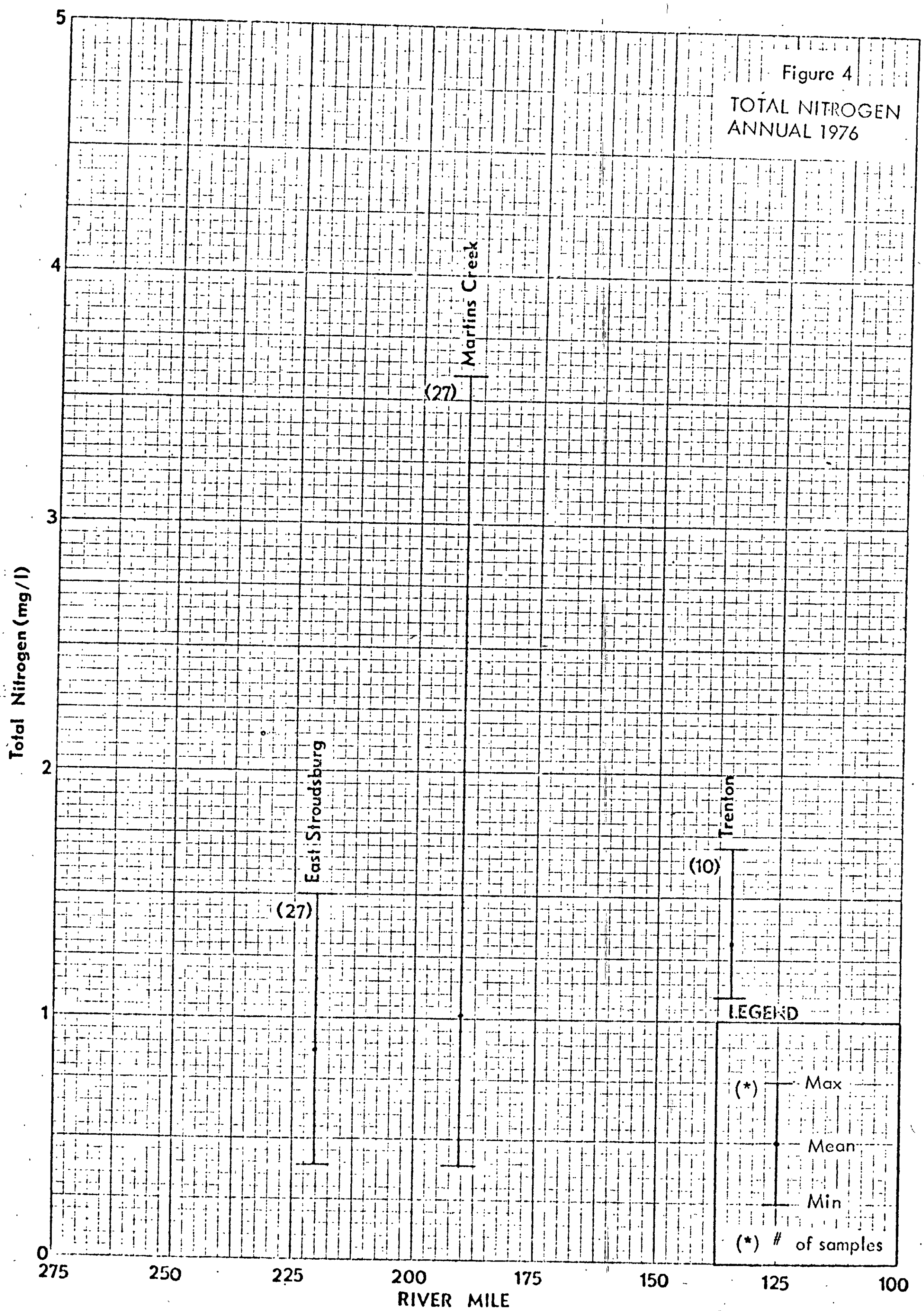
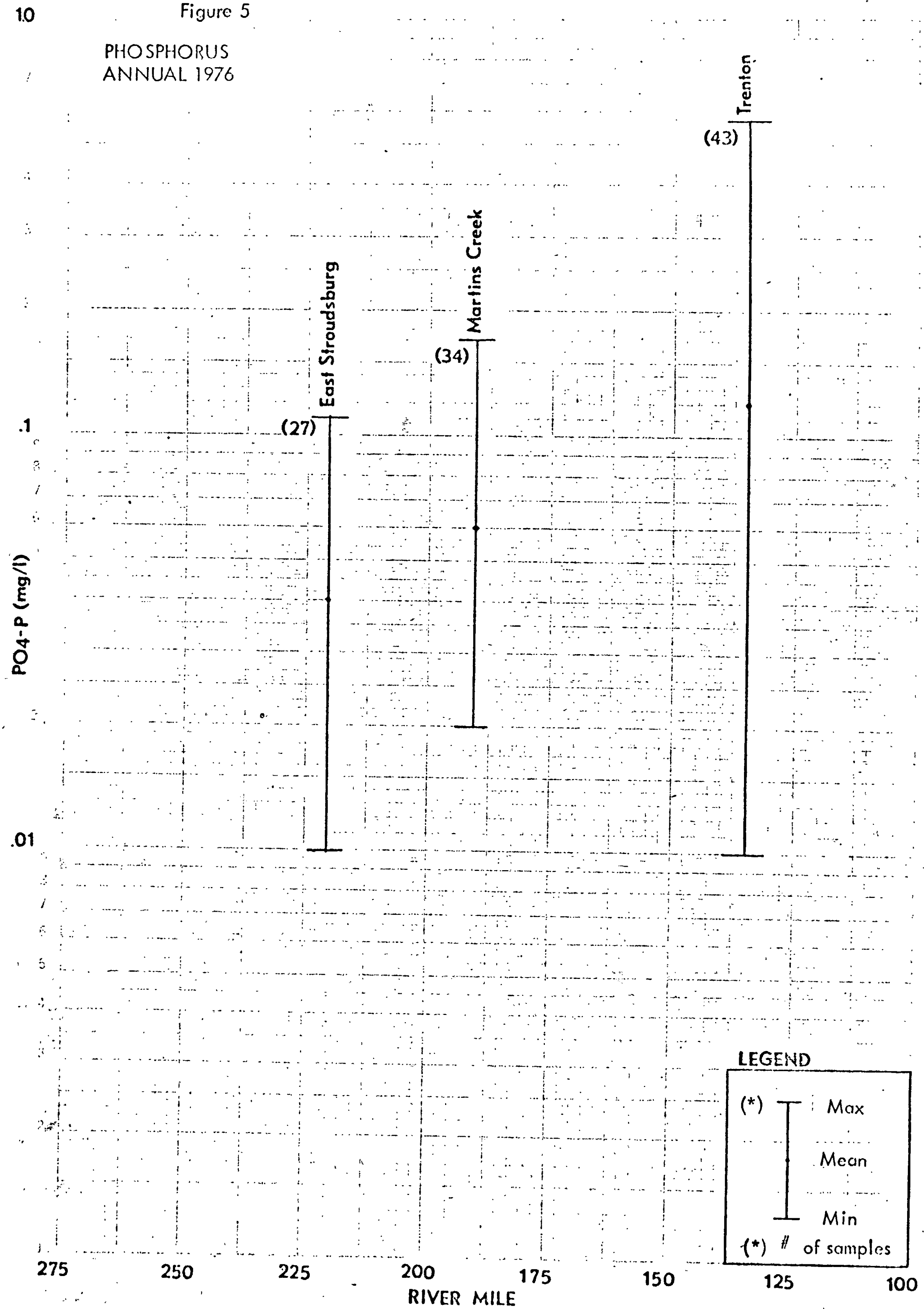


Figure 4
TOTAL NITROGEN
ANNUAL 1976
Total Nitrogen (mg/l)
5
4
3
2
1
0
275
250
225
200
175
150
125
100
RIVER MILE
East Stroudsburg
(27)
Martins Creek
(27)
Trenton
(10)
LEGEND
(*)
Max
Mean
Min
(*) # of samples

Figure 5

PHOSPHORUS
ANNUAL 1976



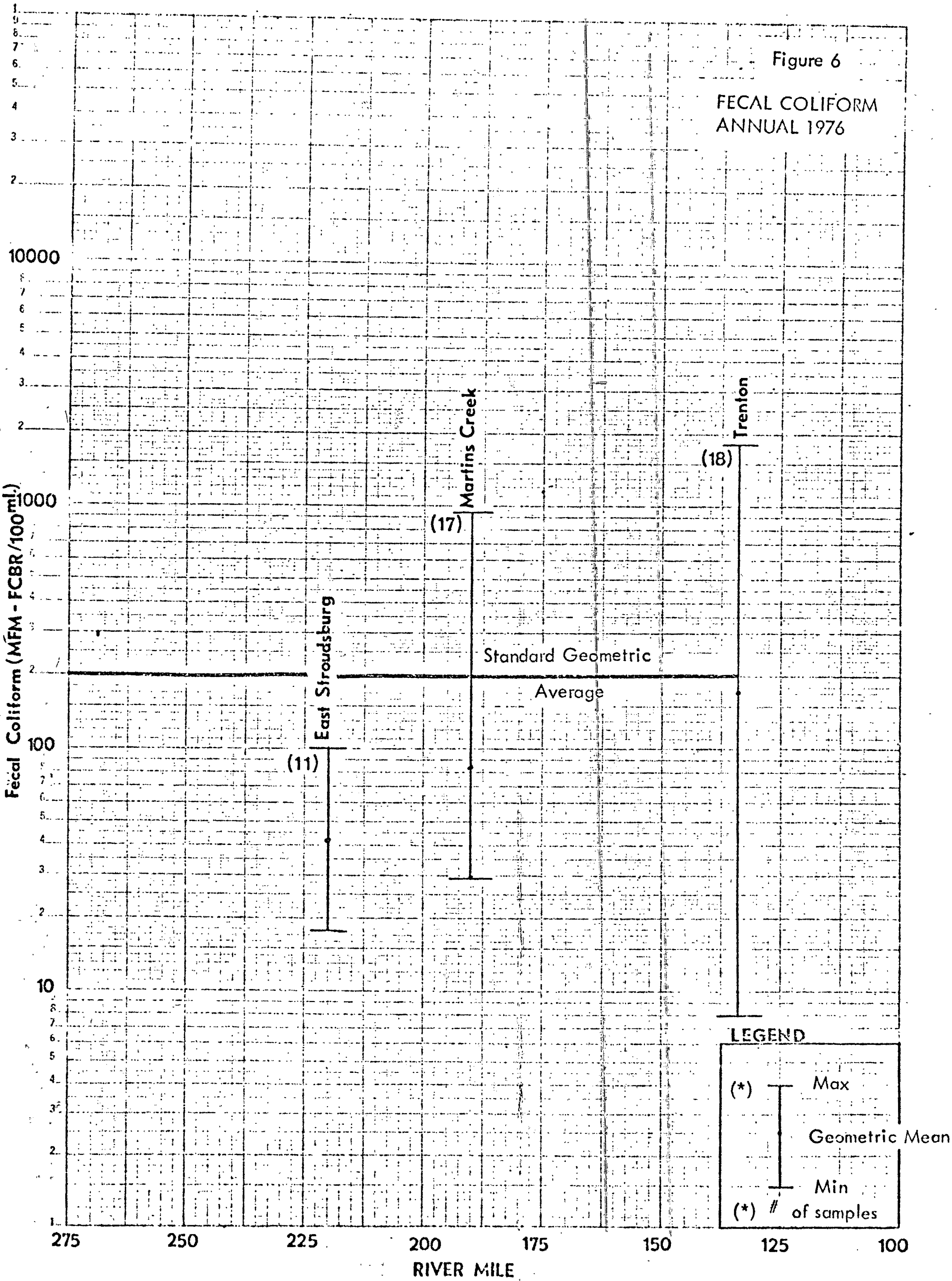


Figure 6
FECAL COLIFORM
ANNUAL 1976
Fecal Coliform (MFM - FCBR/100ml.)
10000
1000
100
10
East Stroudsburg
(11)
Martins Creek
(17)
Trenton
(18)
Standard Geometric
Average
LEGEND
(*)
Max
Geometric Mean
Min
(*) # of samples
275
250
225
200
175
150
125
100
RIVER MILE

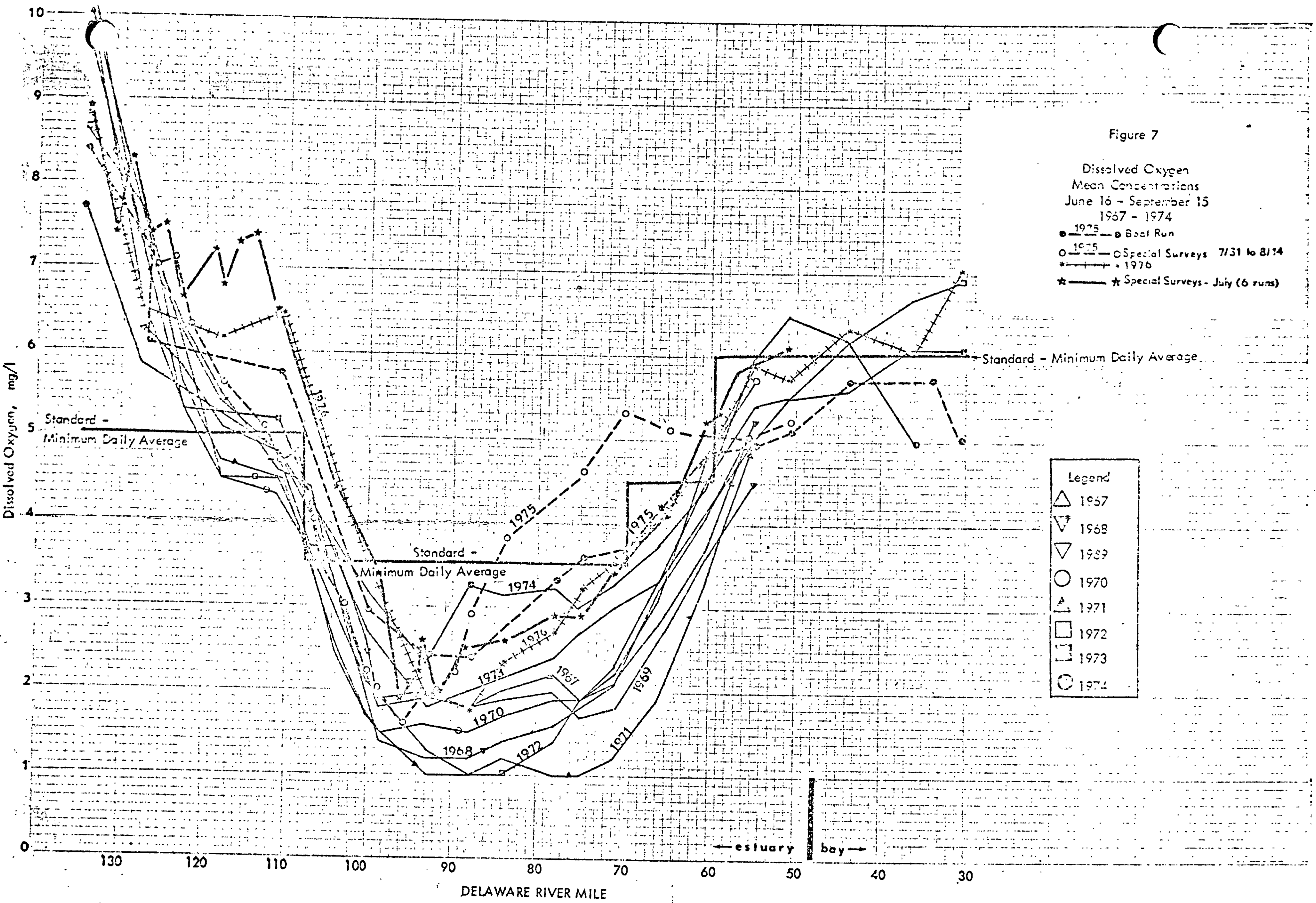


Figure 7
Dissolved Oxygen
Mean Concentrations
June 16 - September 15
1967 - 1974
1975 Boat Run
1975 Special Surveys 7/31 to 8/14
1976
Special Surveys - July (6 runs)
Standard - Minimum Daily Average
Standard - Minimum Daily Average
Standard - Minimum Daily Average
Legend
1967
1968
1969
1970
1971
1972
1973
1974
Dissolved Oxygen, mg/l
DELAWARE RIVER MILE
estuary
bay

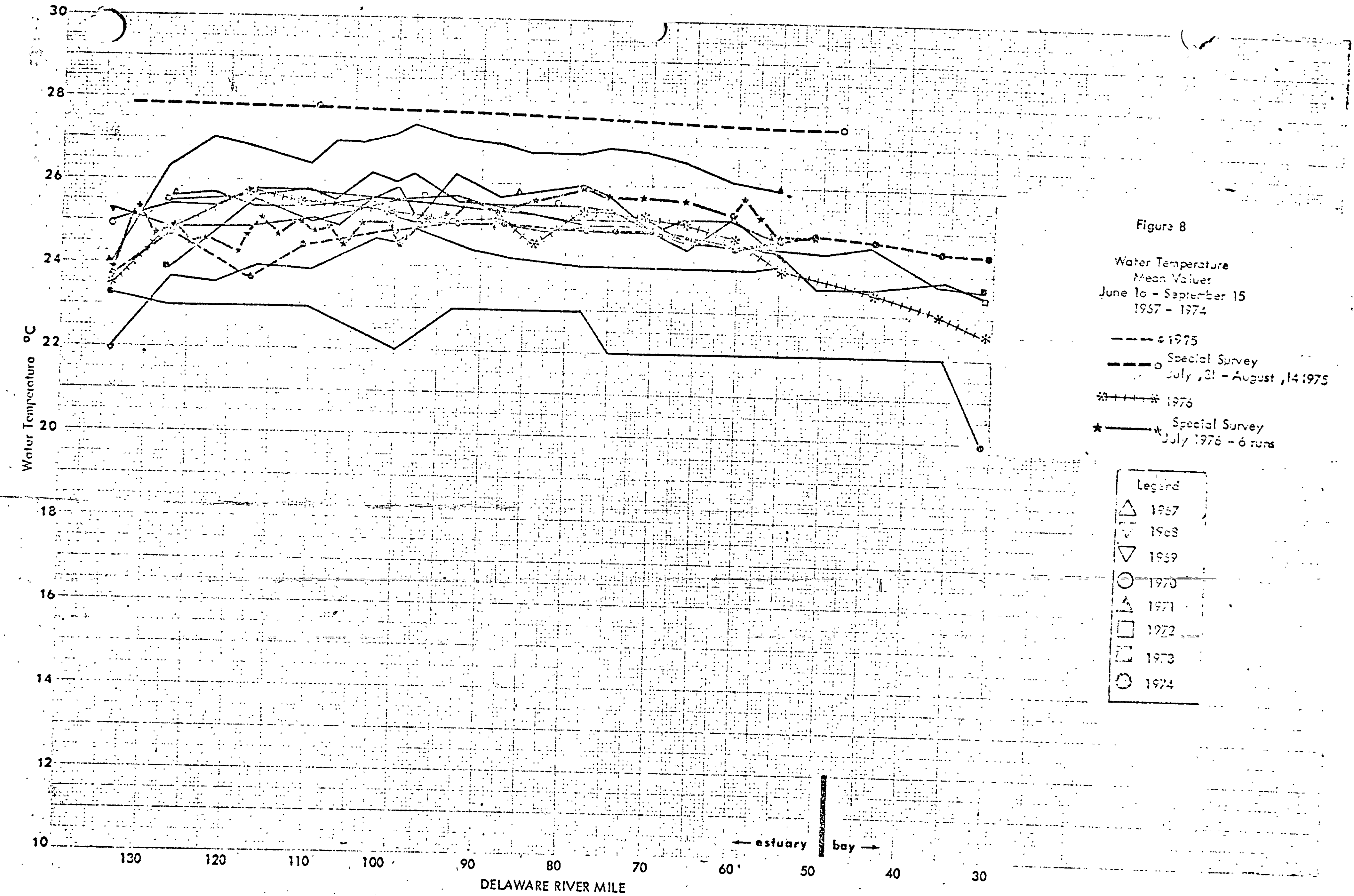



Figure 8

Water Temperature Mean Values June 16 – September 15 1967 – 1974

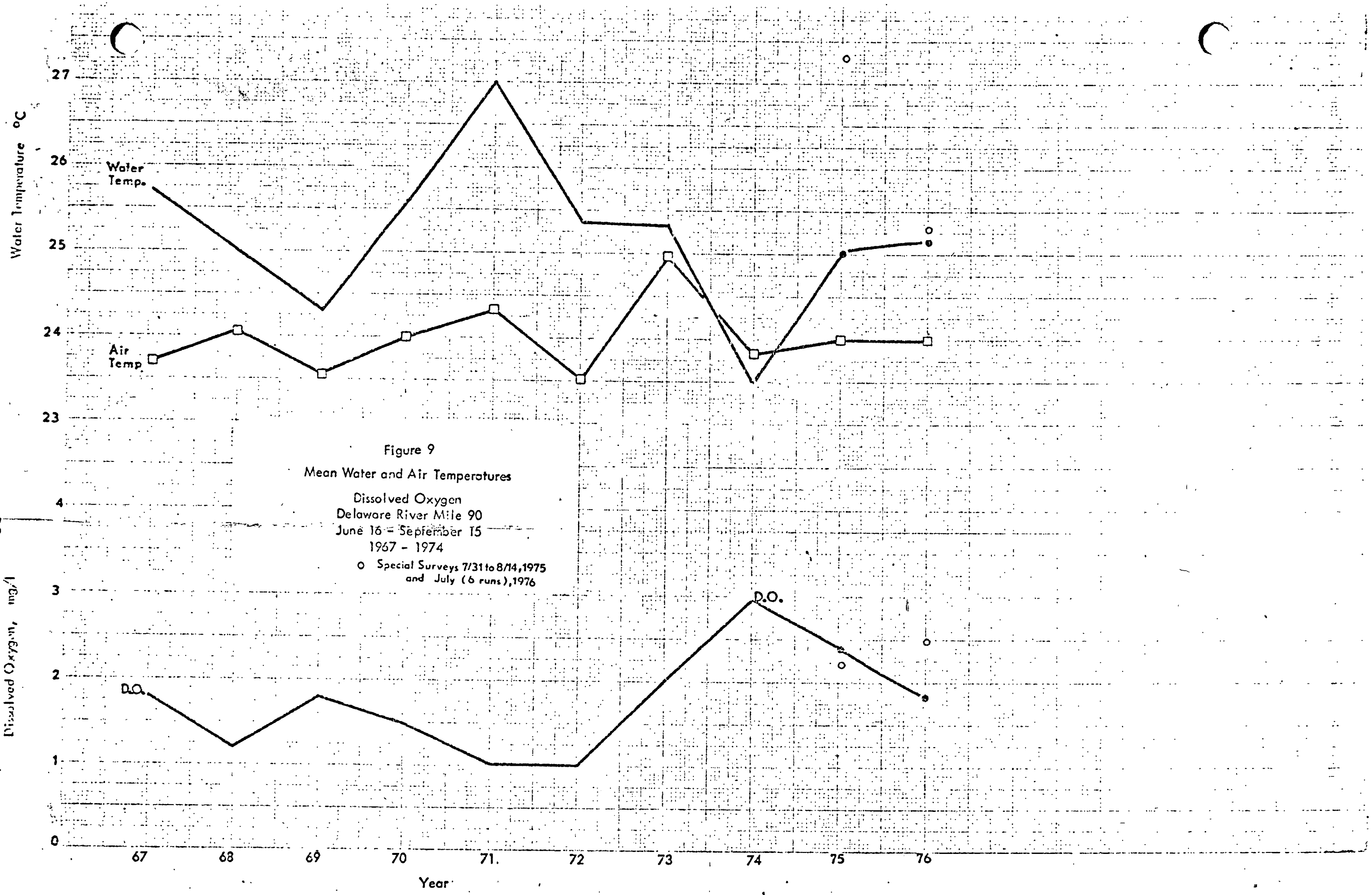



Figure 9

Mean Water and Air Temperatures

Dissolved Oxygen
Delaware River Mile 90
June 16 – September 15
1967 – 1974

o Special Surveys 7/31 to 8/14,1975
and July (6 runs),1976

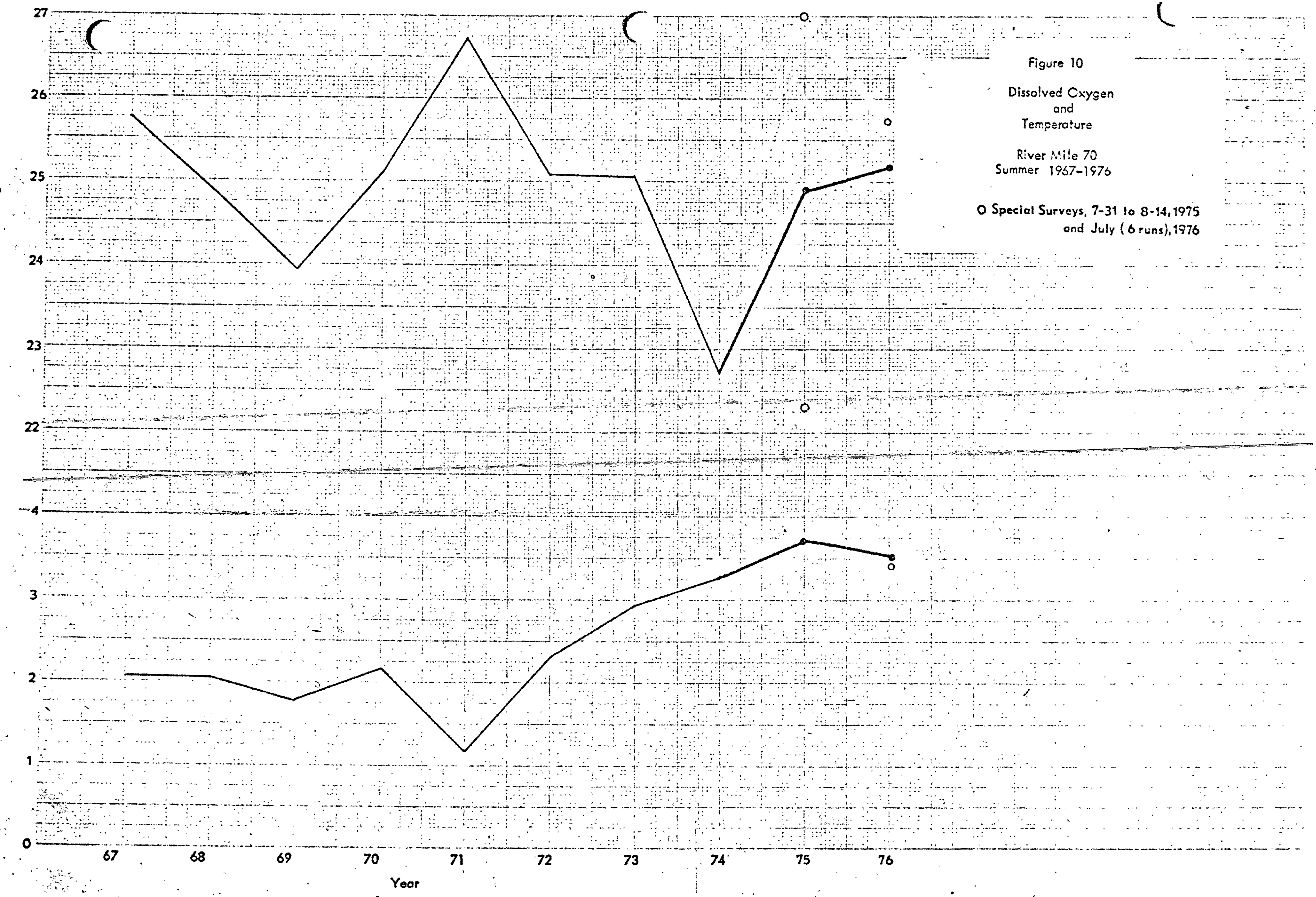


Figure 10
Dissolved Oxygen
and
Temperature
River Mile 70
Summer 1967-1976
O Special Surveys, 7-31 to 8-14, 1975
and July (6 runs), 1976
Water Temperature °C
27
26
25
24
23
22
4
3
2
1
0
Dissolved Oxygen, mg/l
67
68
69
70
71
72
73
74
75
76
Year

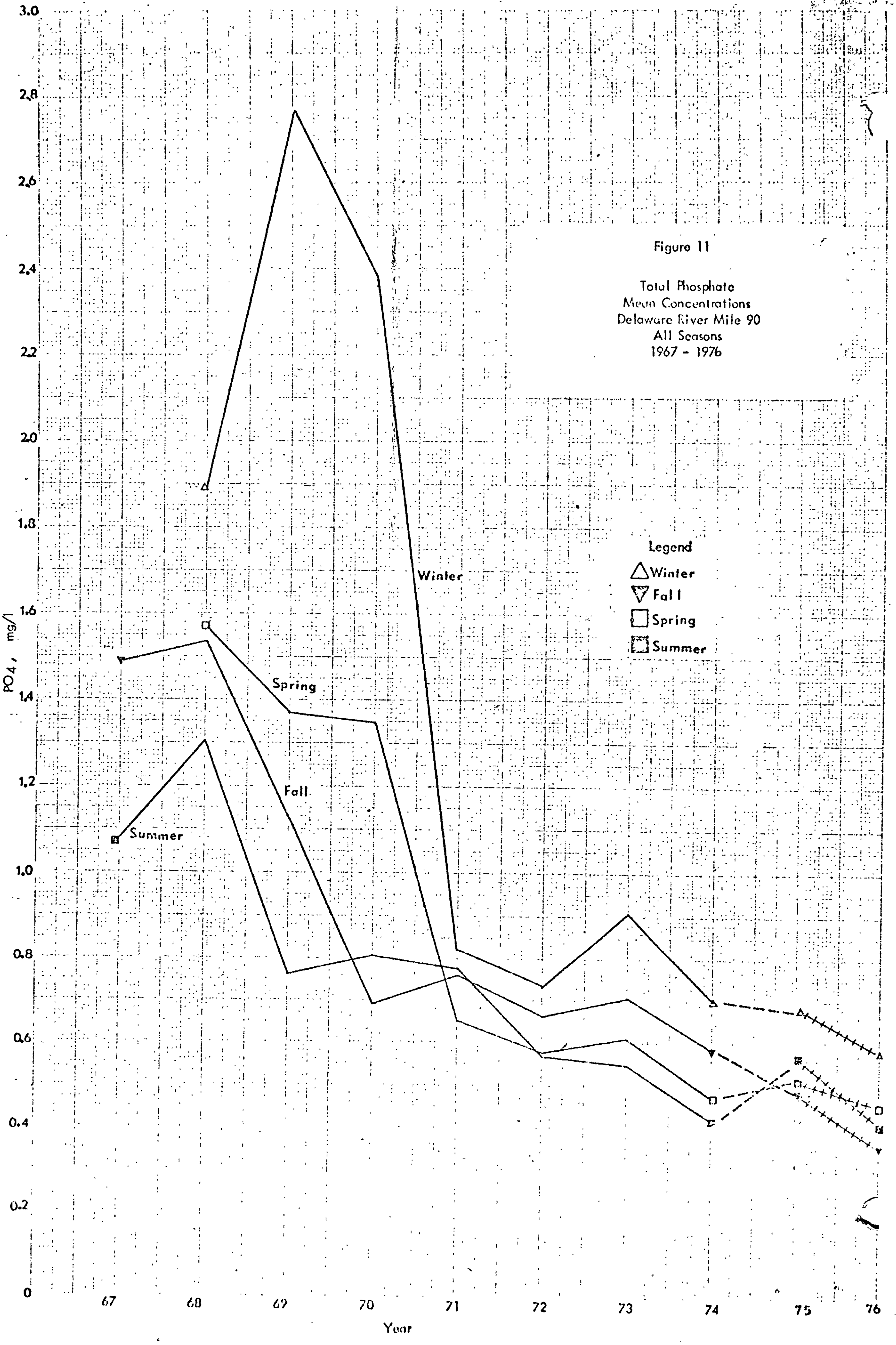
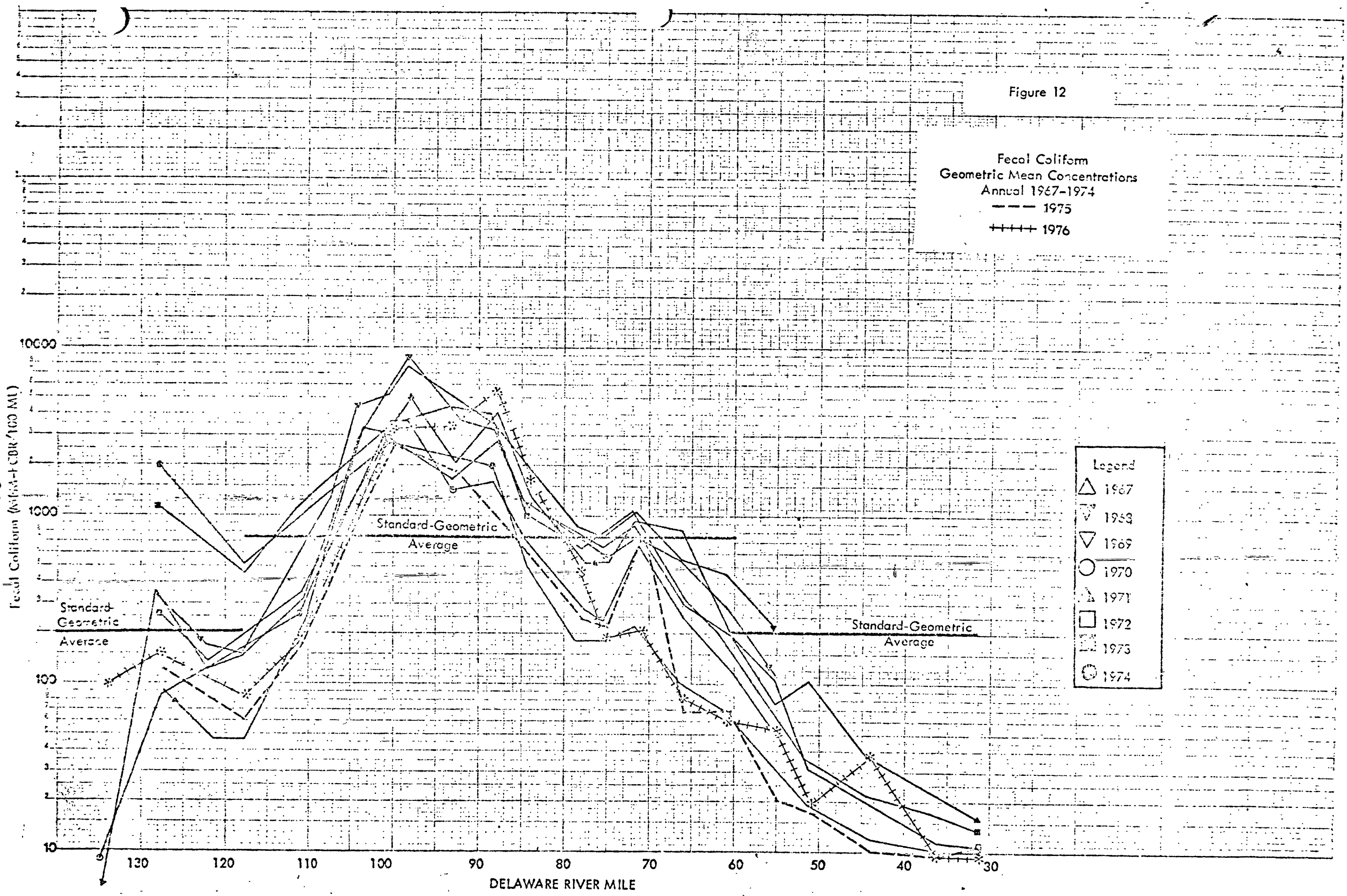


Figure 11
Total Phosphate
Mean Concentrations
Delaware River Mile 90
All Seasons
1967 - 1976
Legend
Winter
Fall
Spring
Summer
Winter
Spring
Fall
Summer
PO4, mg/l
3.0
2.8
2.6
2.4
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0
67
68
69
70
71
72
73
74
75
76
Year

Figure 12


Fecal Coliform
Geometric Mean Concentrations
Annual 1967-1974
1975
1976
Legend
1967
1968
1969
1970
1971
1972
1973
1974
Standard-Geometric Average
Standard-Geometric Average
Standard-Geometric Average
10000
1000
100
10
130
120
110
100
90
80
70
60
50
40
30
DELAWARE RIVER MILE

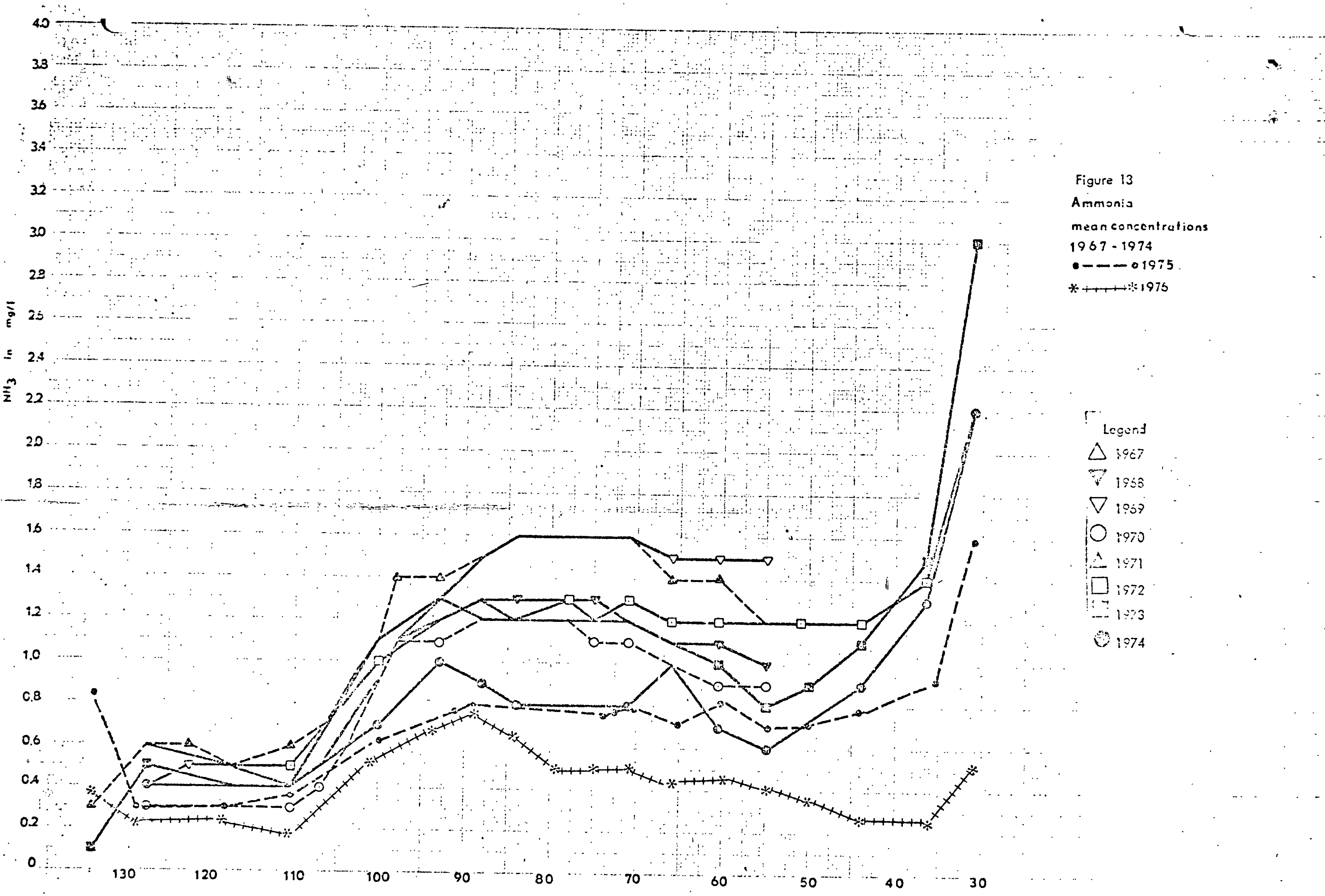



Figure 13
Ammonia
mean concentrations
1967 - 1974

## B. INTERSTATE SANITATION DISTRICT REPORT

## B. INTERSTATE SANITATION DISTRICT REPORT

# INTERSTATE SANITATION COMMISSION

10 COLUMBUS CIRCLE • NEW YORK, N.Y. 10019
AREA CODE 212-582-0380



September 12, 1977

Mr. John Ruggero
Department of Environmental Protection
State of New Jersey
P. O. Box 2809
Trenton, New Jersey - 08625

Dear Mr. Ruggero:

Enclosed are two copies of the "Status Report on the Interstate Sanitation District Waters" for use in the preparation of your 305(b) report to the U.S. Environmental Protection Agency.

Very truly yours,

Alan I. Mytelka

Alan I. Mytelka, Ph.D.
Assistant Chief Engineer

AIM:rym
Enclosures

# STATUS REPORT ON THE INTERSTATE SANITATION DISTRICT WATERS

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***

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September 1977

## SUMMARY

In 1976, there was essentially no change in the dissolved oxygen levels in the Interstate Sanitation District waters. While the District waters meet dissolved oxygen requirements during the winter, the dissolved oxygen values in the summer drop below 1 mg/l for extended periods in some locations. In general, the waters also have high heavy metals content, oil and grease, and bacterial contamination.

## INTRODUCTION

New Jersey surface waters located within the New Jersey-New York Metropolitan Area form part of the jurisdiction of the Interstate Sanitation Commission.

The Commission's programs for the improvement of these waters in conjunction with the states include the following:

(1) establishment and attainment of minimum dissolved oxygen requirements for all surface waters;

(2) establishment of necessary pollutant removals for discharges into District waters;

(3) monitoring of surface waters by the analysis of samples obtained from continuous automatic sampling stations and regularly scheduled boat surveys;

(4) routine sampling and analysis of municipal and industrial dischargers in order to determine whether Compact requirements are being met;

(5) assistance to the states and the U.S. EPA for NPDES compliance monitoring; and

(6) assistance to the 208 agencies within the Interstate Sanitation District.

The waters described in this report and their tributary treatment plants are shown in Figure 1. These waters are:

| | |
|---|---|
| ISC Class A Waters -- N.J. TW 1 Waters: | Sandy Hook Bay<br>Raritan River<br>Raritan Bay |
| ISC Class B-1 Waters -- N.J. TW 2 Waters: | Hudson River<br>Upper New York Bay<br>Arthur Kill South of the Outerbridge Crossing |
| ISC Class B-2 Waters -- N.J. TW 3 Waters: | Kill Van Kull<br>Newark Bay<br>Arthur Kill North of the Outerbridge Crossing |

The water classes and uses described below were promulgated by the Interstate Sanitation Commission and are compatible with New Jersey's classifications and uses, namely:

Class A Waters -- Suitable for primary contact recreation and in designated areas for shellfish harvesting

Class B-1 Waters -- Suitable for fishing and secondary contact recreation

Class B-2 Waters -- Suitable for fish survival, passage of anadramous fish and for any other reasonable purposes compatible with their use for navigation

## EXTENT OF WATER POLLUTION

The conditions of waters in this area have not changed appreciably since last year's 305(b) inventory was compiled and they still range from good to poor.

Primary municipal treatment plants that provide inadequate pollutant removals, biological treatment plants that require upgrading, untreated municipal and industrial discharges, combined sewers that pour raw sewage into the waterways during heavy rainfalls, and large concentrations of both heavy metals and oil from inadequately treated municipal and industrial wastes all combine to degrade the quality of the District's waters.

The evaluation of the water quality has been determined from the following:

(1) graphs of the seasonal variation of dissolved oxygen, temperature, pH, and conductivity derived from four ISC remote automatic water quality monitors located within New Jersey and interstate (NJ-NY) waters;

(2) a statistical analysis of the dissolved oxygen data obtained from the four remote water quality monitoring stations;

(3) pollutant parameters such as dissolved oxygen, heavy metals, nutrients, temperature, etc., derived from the analysis of samples obtained from ISC boat runs "A", "B", and "E".

The remote automatic water quality monitor locations are shown in Figure 2, station descriptions in Table 1, graphs of the monthly values in Figures 3-10, and dissovled oxygen data in Tables 2-5.

Figure 11 is a map of the five boat survey routes. Listings of the sampling stations are found in Tables 6-8, and 1975-1976 data are given in Tables 9-18.

The boat surveys were run once per month in the winter and twice per month in the summer.

## CURRENT WATER CONDITIONS

### General

An analysis of the data presented indicates that the effects of a constant influx of pollutants to the metropolitan New York area waters are especially pronounced during the summer months. At this time, the waterways are plagued by bacterial contamination and low dissovled oxygen. Thermal pollution is also a problem in some areas. Tables 19-26 show the current status of all municipal wastewater treatment plants in New Jersey that are within the Interstate Sanitation District.

### Dissolved Oxygen

The remote automatic water monitor quality data shown in this report indicates the severity of the dissolved oxygen problem during the summer months. This is illustrated in Tables 2-5 where the continuous monitors show that dissolved oxygen requirements are at best being met only 36.5% of the time in the summer. One of the stations, in fact, only met the requirements 6.4% of the time during the summer.

### Heavy Metals/Oil & Grease

The Boat Run Data tables show that heavy metals and oil and grease present problems throughout ISC District waters.

## FUTURE USES OF THE WATERS

The future uses of the waters will more nearly approach their classifications compared to today's uses. Although secondary treatment of municipal sewage will be the norm when present construction is completed, its effectiveness may be overshadowed by the following factors:

(1) Combined sewers will still discharge untreated sewage into the waters during heavy rains.

(2) If stringent pretreatment standards are not adopted and strictly enforced, large amounts of oils and heavy metals from industrial users will still be discharged into the receiving waters.

(3) The heavy concentration of both population and industry along certain narrow, confined waterways such as the Arthur Kill and Kill Van Kull contribute such large quantities of waste that even when secondary treatment is completed, a maximum of only 3 mg/l of dissolved oxygen will be achieved in B-2 waters.

Secondary treatment and adequate pretreatment, if universally applied, should render such stretches of water as Lower Bay and Raritan Bay more suitable for fishing and swimming. Another means for opening up miles of beaches would be to build short dikes out from Fort Wadsworth, Staten Island, and Nortons

Point, Brooklyn, to divert the flow from New Jersey and New York treatment plants through The Narrows away from beaches and more nearly straight out to sea. However, no practical amount of treatment technology will improve the Arthur Kill and Kill Van Kull to the point where these waters will be able to be raised to 4 or 5 mg/l of dissolved oxygen.

## CONTROL ACTIONS AND COSTS

### General

Although many of the waters of this District will never be able to be used for swimming, it is essential to stem the tide of any further deterioration in their quality. As the population and industrial capacity of this region continue to grow, the surrounding waters will be required to meet the increased demands placed upon them. The ability of many of the waters to assimilate waste material and thermal discharges has already been exceeded for a considerable portion of the year.

However, the planning and construction of secondary treatment plants throughout the region and the universal application of Best Practical Treatment Technology to industrial discharges constitute a program capable of rendering the District waterways aesthetically appealing and viable for both public and commercial users. It must be kept in mind, however, that much of the effectiveness of both secondary treatment and BPT Technology will be negated unless a conscientious effort is directed toward abating the following forms of pollution: (1) combined sewers, (2) heavy metals, (3) sludge, and (4) oily wastes.

Combined Sewers - Very little advantage will be gained by having secondary treatment plants exist alongside uncontrolled combined sewers. Whereas the treatment plant will provide a high degree of pollutant removal, and discharge an effluent with minimal bacterial contamination, heavy rains will cause regulators to bypass raw sewage and industrial wastes directly into the waterways. The heavy flows that occur during rainfall scour the sewers and carry off vast quantities of solids, heavy metals, and oils that have settled out in the conduits during dry weather. Since these wastes receive no treatment whatsoever, their bacterial count is high and this tends to negate the chlorine usage on the part of the waste treatment plant.

It is therefore quite obvious that even though secondary treatment represents a major step forward in pollution abatement, the existence of combined sewers prevents it from being as effective as it should be. Mitigation of the effects of combined sewers may well reach into the billions of dollars.

Heavy Metals - Heavy metals represent a particularly toxic group of elements that are discharged in large concentrations by many industries. Their effectiveness in causing pollution is two-fold.

During dry weather, much of the metal content of an industrial waste never reaches a treatment plant because the metals simply settle out of solution and increase in concentration. During heavy rains, they are scoured from the sewer where they were deposited and are swept directly into a watercourse. On the other hand, those metals that reach the treatment plant are only minimally removed and also lower biological treatment efficiency.

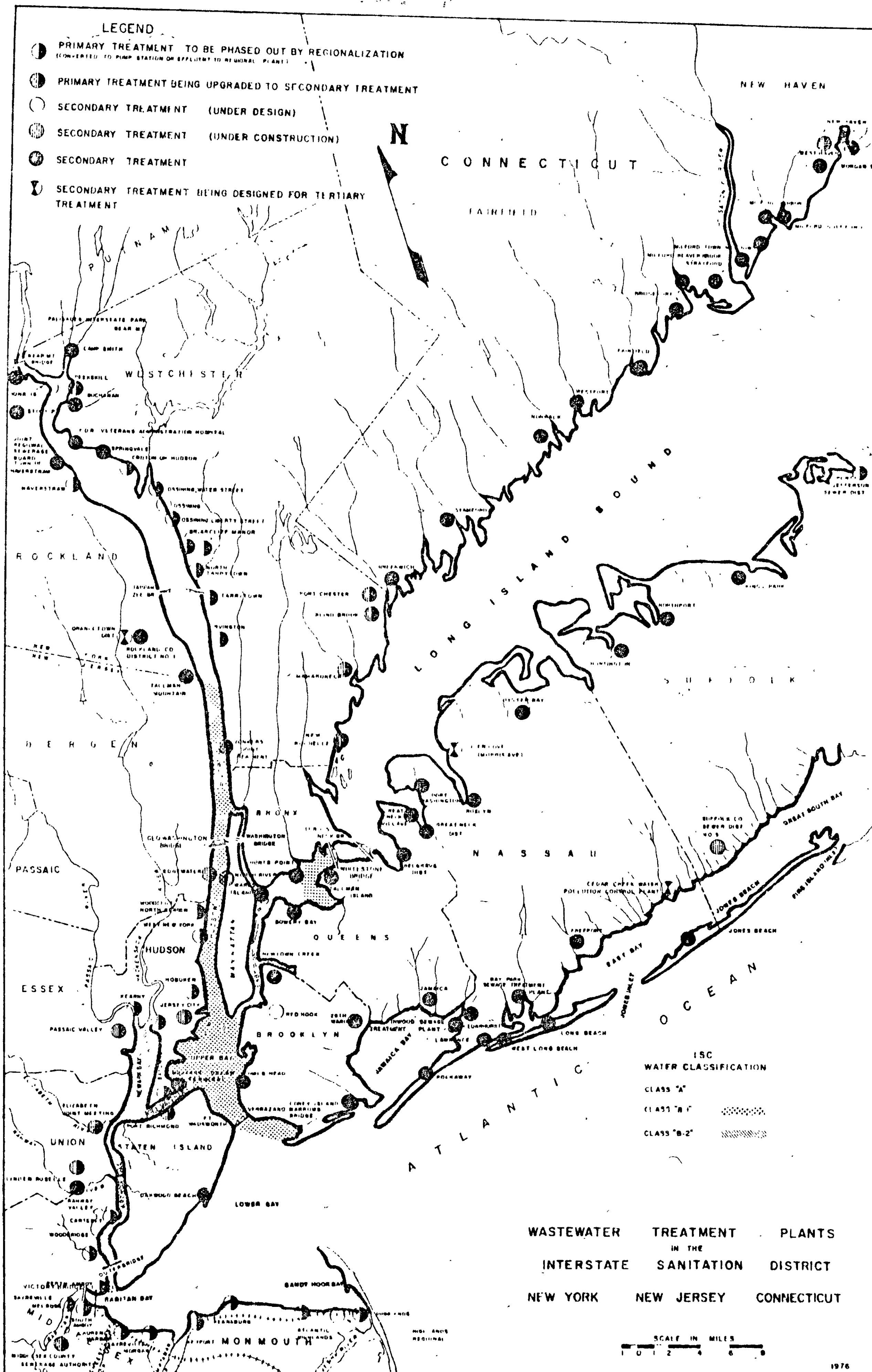
Sludge - As treatment plant efficiencies increase and secondary treatment plants come on-stream, ever greater quantities of solids will result from wastewater treatment. It is estimated that the sludge volume will triple. Because of the concentration of treatment plants in the New York-New Jersey Metropolitan Area, the amount of this sludge that must be disposed of daily has already reached large proportions.

Recognizing a need to deal with this problem, the Interstate Sanitation Commission, in coordination with the states, has completed a sludge management program, the results of which indicate that composting and dewatering of the sludge accompanied by pyrolysis of the resulting cake offers a viable alternative to ocean dumping within the New York-New Jersey Metropolitan Area.

Oily Wastes - Because of its location and concentration of population, the northeast region of the United States has an enormous need for petroleum products, especially heating oils and gasoline. As a result of this, the area is the scene of an extensive concentration of oil refineries, oil terminals, and a product transportation system that includes ships, trucks, and trains. Because of the need to handle both crude and refined products on so vast a scale, the opportunities for loss are significant and the petroleum products that find their way into the receiving waterways of the District contribute a substantial pollutant load.

In order to restore the quality of the waterways, all inadequately treated oil-laden wastes must be eliminated. For this reason, the Interstate Sanitation Commission has an effluent requirement of no noticeable oil. The costs to reach this requirement are modest.

Figure 1



LEGEND
PRIMARY TREATMENT TO BE PHASED OUT BY REGIONALIZATION
PRIMARY TREATMENT BEING UPGRADED TO SECONDARY TREATMENT
SECONDARY TREATMENT (UNDER DESIGN)
SECONDARY TREATMENT (UNDER CONSTRUCTION)
SECONDARY TREATMENT
SECONDARY TREATMENT BEING DESIGNED FOR TERTIARY TREATMENT
N
CONNECTICUT
NEW HAVEN
PUTNAM
WESTCHESTER
ROCKLAND
BERGEN
PASSAIC
ESSEX
HUDSON
UNION
BRONX
MANHATTAN
QUEENS
BROOKLYN
STATEN ISLAND
NASSAU
LONG ISLAND SOUND
UPPER BAY
LOWER BAY
RARITAN BAY
SANDY HOOK BAY
MONMOUTH
ATLANTIC OCEAN
GREAT SOUTH BAY
EAST BAY
JONES BEACH
ISC
WATER CLASSIFICATION
CLASS "A"
CLASS "B-1"
CLASS "B-2"
WASTEWATER TREATMENT PLANTS
IN THE
INTERSTATE SANITATION DISTRICT
NEW YORK NEW JERSEY CONNECTICUT
SCALE IN MILES
0 1 2 4 6 8
1976

Figure 2

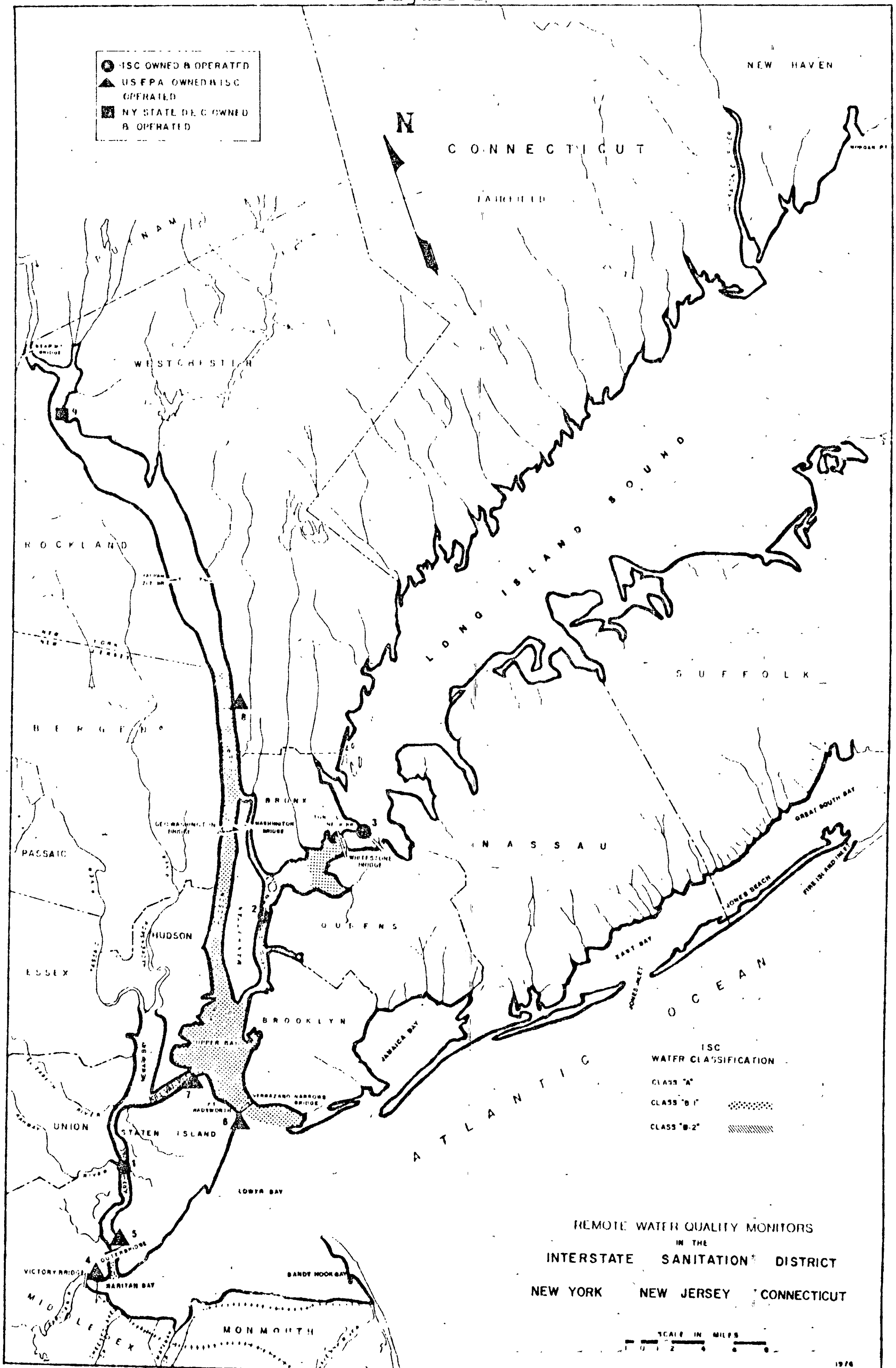
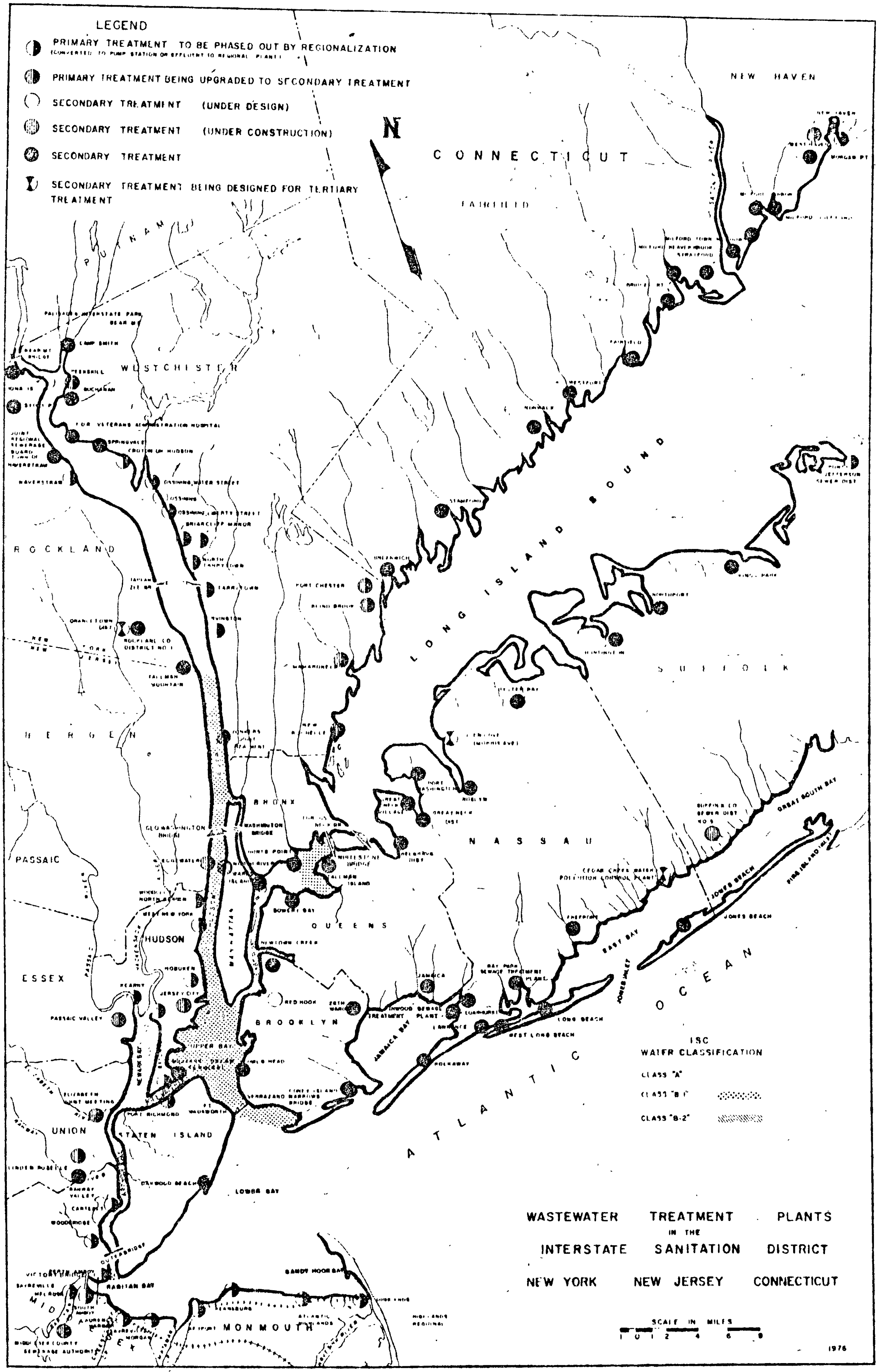

ISC OWNED & OPERATED
US EPA OWNED & ISC OPERATED
N.Y. STATE D.E.C. OWNED & OPERATED
N
CONNECTICUT
NEW HAVEN
FAIRFIELD
PUTNAM
WESTCHESTER
ROCKLAND
BERGEN
PASSAIC
HUDSON
ESSEX
UNION
MIDDLESEX
MONMOUTH
BRONX
QUEENS
BROOKLYN
NASSAU
SUFFOLK
STATEN ISLAND
LONG ISLAND SOUND
ATLANTIC OCEAN
UPPER BAY
LOWER BAY
RARITAN BAY
SANDY HOOK BAY
JAMAICA BAY
EAST BAY
GREAT SOUTH BAY
JONES BEACH
FIRE ISLAND INLET
JONES INLET
WASHINGTON BRIDGE
WHITESTONE BRIDGE
VERRAZANO NARROWS BRIDGE
FT. WADSWORTH
OUTERBRIDGE
VICTORY BRIDGE
ISC WATER CLASSIFICATION
CLASS "A"
CLASS "B-1"
CLASS "B-2"
REMOTE WATER QUALITY MONITORS
IN THE
INTERSTATE SANITATION DISTRICT
NEW YORK NEW JERSEY CONNECTICUT
SCALE IN MILES
0 1 2 4 6 8
1976

Figure 1



LEGEND
PRIMARY TREATMENT TO BE PHASED OUT BY REGIONALIZATION
PRIMARY TREATMENT BEING UPGRADED TO SECONDARY TREATMENT
SECONDARY TREATMENT (UNDER DESIGN)
SECONDARY TREATMENT (UNDER CONSTRUCTION)
SECONDARY TREATMENT
SECONDARY TREATMENT BEING DESIGNED FOR TERTIARY TREATMENT
N
CONNECTICUT
NEW HAVEN
FAIRFIELD
PUTNAM
WESTCHESTER
ROCKLAND
BERGEN
PASSAIC
HUDSON
ESSEX
UNION
BRONX
MANHATTAN
QUEENS
BROOKLYN
STATEN ISLAND
NASSAU
SUFFOLK
MONMOUTH
LONG ISLAND SOUND
ATLANTIC OCEAN
UPPER BAY
LOWER BAY
RARITAN BAY
SANDY HOOK BAY
ISC
WATER CLASSIFICATION
CLASS "A"
CLASS "B-1"
CLASS "B-2"
WASTEWATER TREATMENT PLANTS
IN THE
INTERSTATE SANITATION DISTRICT
NEW YORK NEW JERSEY CONNECTICUT
SCALE IN MILES
0 1 2 4 6 8
1976

Table 1.

REMOTE AUTOMATIC WATER QUALITY MONITORING
STATIONS IN THE INTERSTATE SANITATION DISTRICT

INTERSTATE SANITATION COMMISSION OWNED AND OPERATED

1. Arthur Kill - Consolidated Edison Arthur Kill Generating Station, Staten Island, New York

2. East River - Consolidated Edison Ravenswood Generating Station, Long Island City, New York

3. East River - Throgs Neck Bridge, Fort Schuyler, Bronx, New York

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY OWNED AND INTERSTATE SANITATION COMMISSION OPERATED

4. Raritan River - Victory Bridge, Perth Amboy, New Jersey

5. Arthur Kill - Outerbridge Crossing, Staten Island, New York*

6. The Narrows - Fort Wadsworth, Staten Island, New York

7. Kill Van Kull - U. S. Gypsum Company, Staten Island, New York**

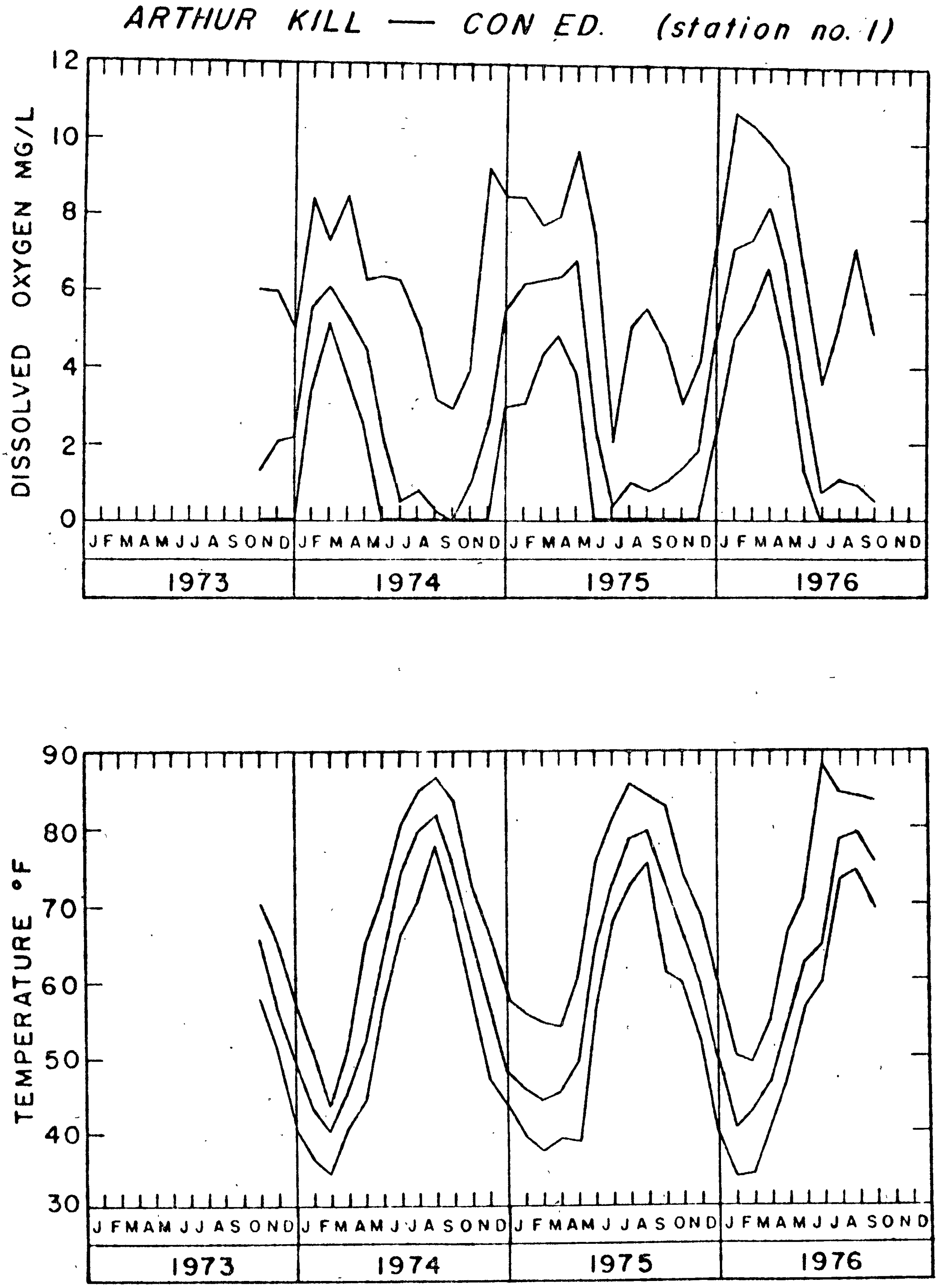
8. Hudson River - Consolidated Edison Glenwood Generating Station, Yonkers, New York***

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION OWNED AND OPERATED

9. Hudson River - Verplanck, New York

*Installed during the last quarter of 1976
**Is presently approximately 150 feet east of U.S. Gypsum Plant
***Future Installation

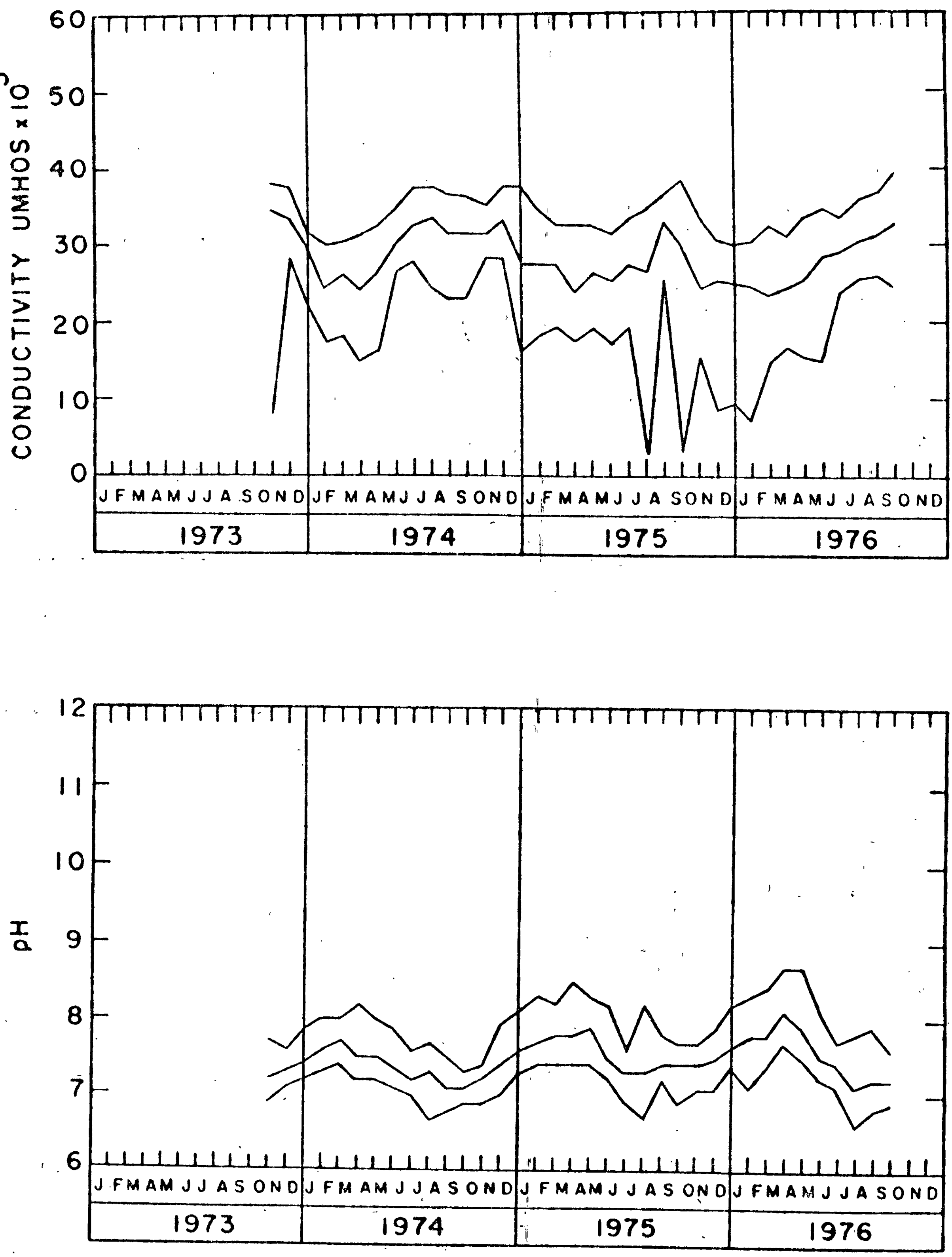
Figure 3




TOP LINE — maximum monthly value
CENTER LINE — average of the daily average values
BOTTOM LINE — minimum monthly value

Figure 4

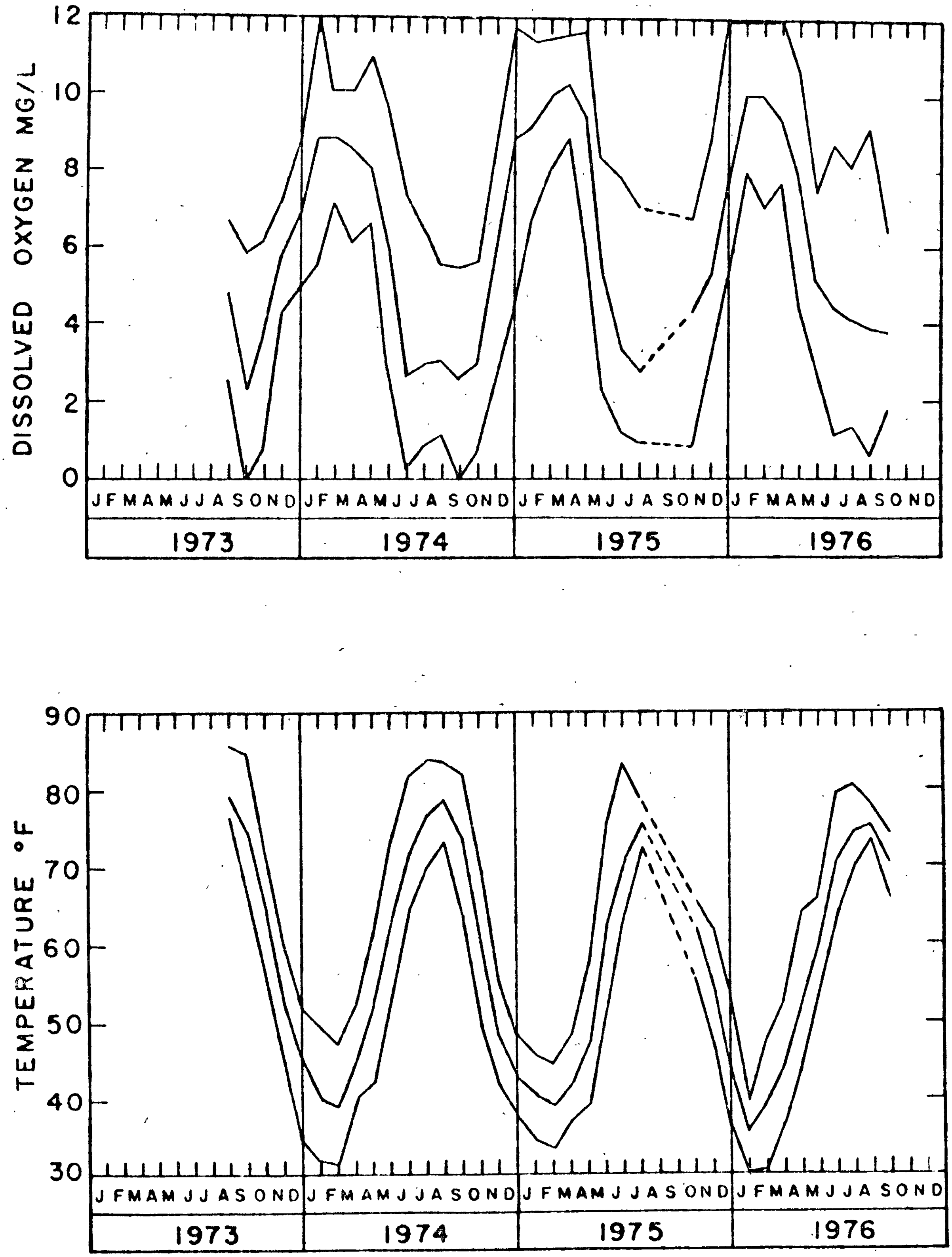
*ARTHUR KILL — CON ED. (station no. 1)*




TOP LINE — maximum monthly value
CENTER LINE — average of the daily average values
BOTTOM LINE — minimum monthly value

Figure 5

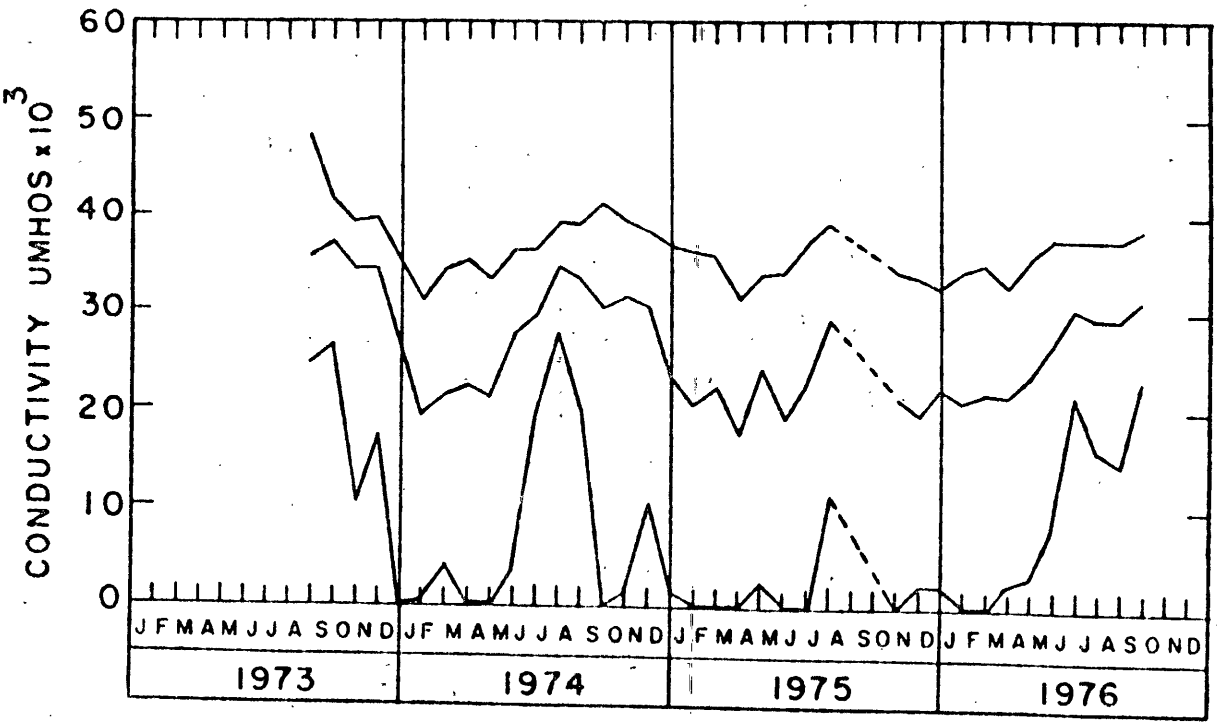
*RARITAN RIVER—VICTORY BRIDGE (station no. 4)*

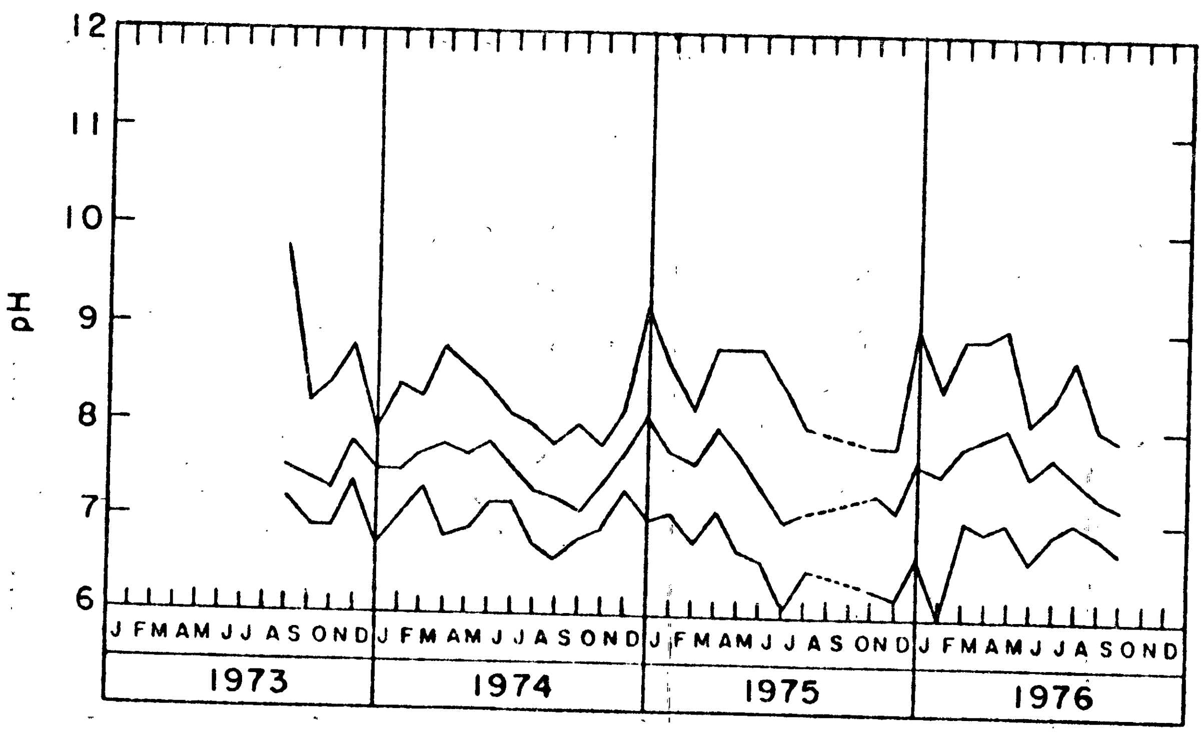



**TOP LINE — maximum monthly value**
**CENTER LINE — average of the daily average values**
**BOTTOM LINE — minimum monthly value**

Figure 6

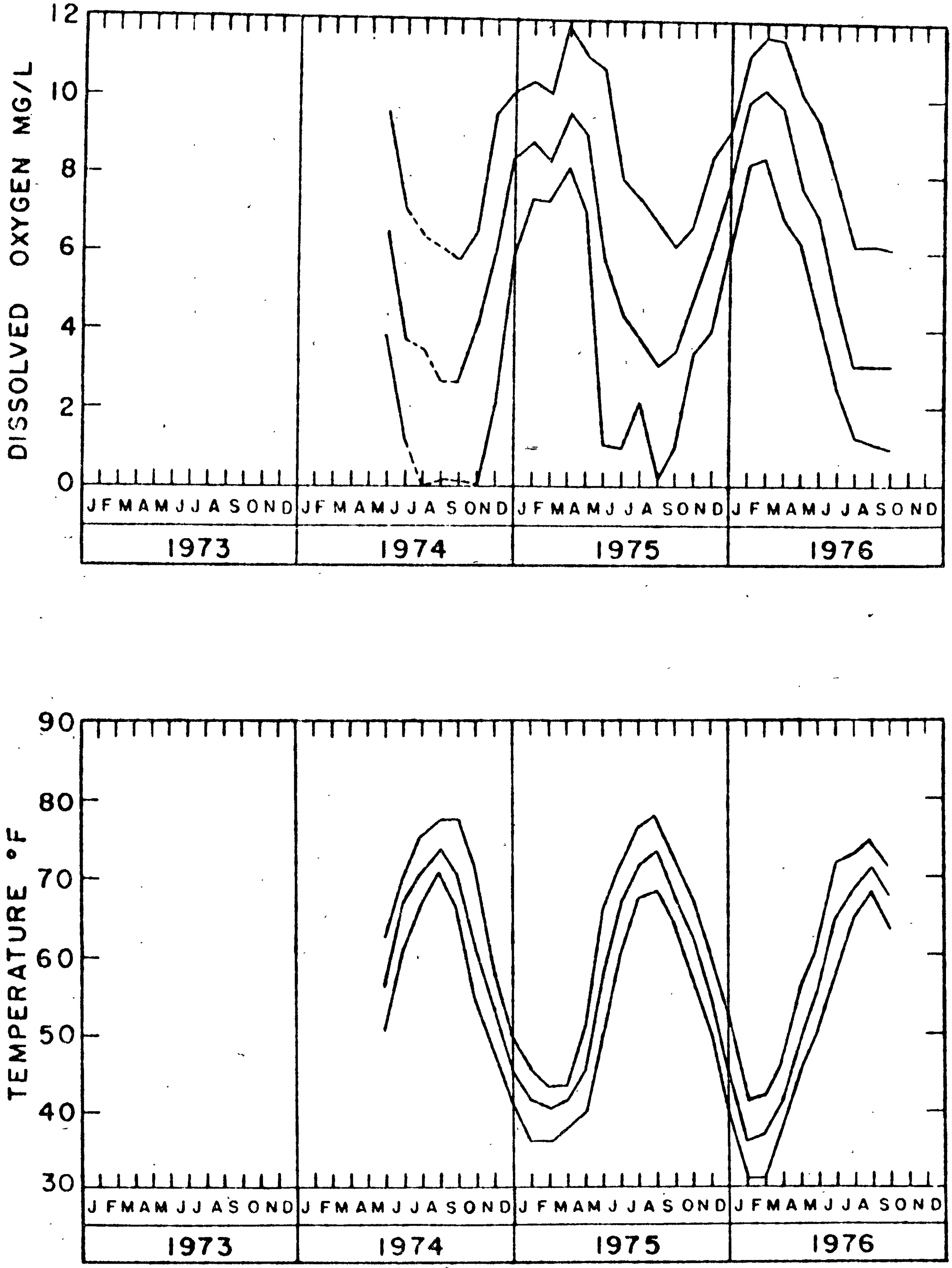
RARITAN RIVER—VICTORY BRIDGE (station no. 4)




TOP LINE — maximum monthly value
CENTER LINE — average of the daily average values
BOTTOM LINE — minimum monthly value

THE NARROWS — FT. WADSWORTH (station no. 6)



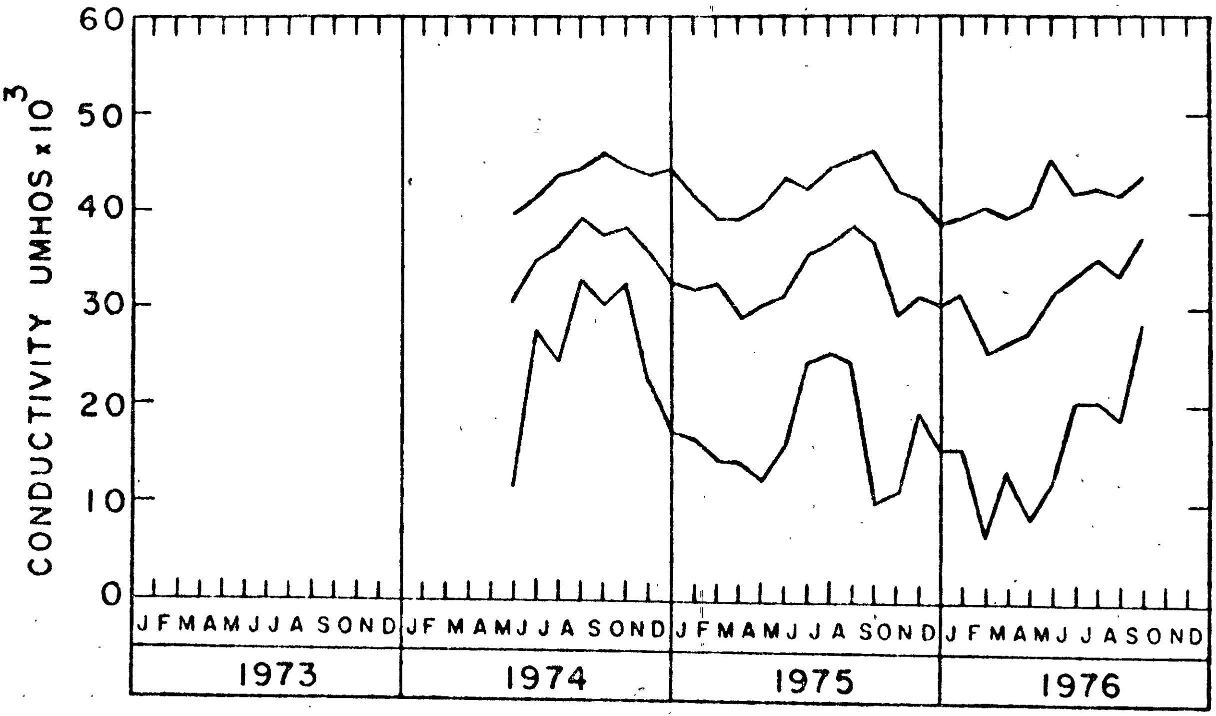

TOP LINE — maximum monthly value

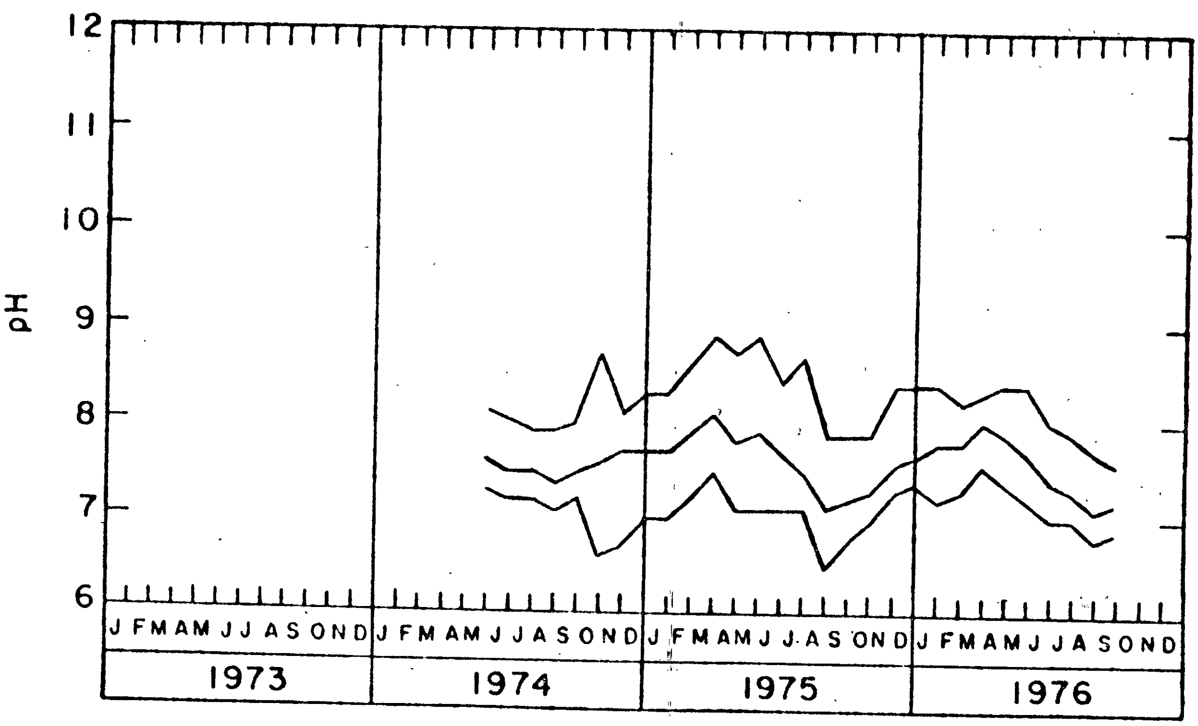
CENTER LINE — average of the daily average values

BOTTOM LINE — minimum monthly value

Figure 8

THE NARROWS — FT. WADSWORTH (station no. 6)




TOP LINE — maximum monthly value
CENTER LINE — average of the daily average values
BOTTOM LINE — minimum monthly value

Figure 9

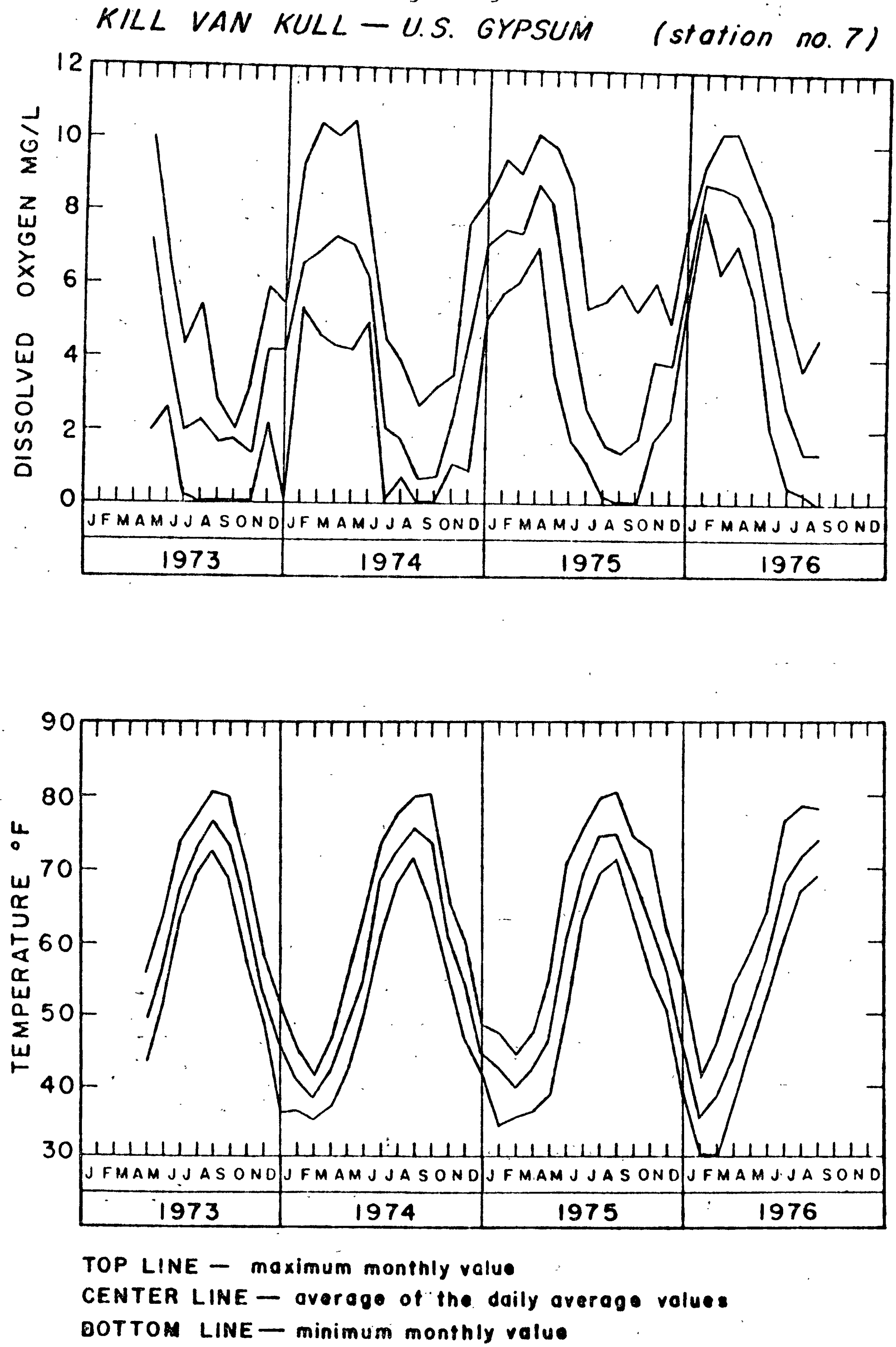
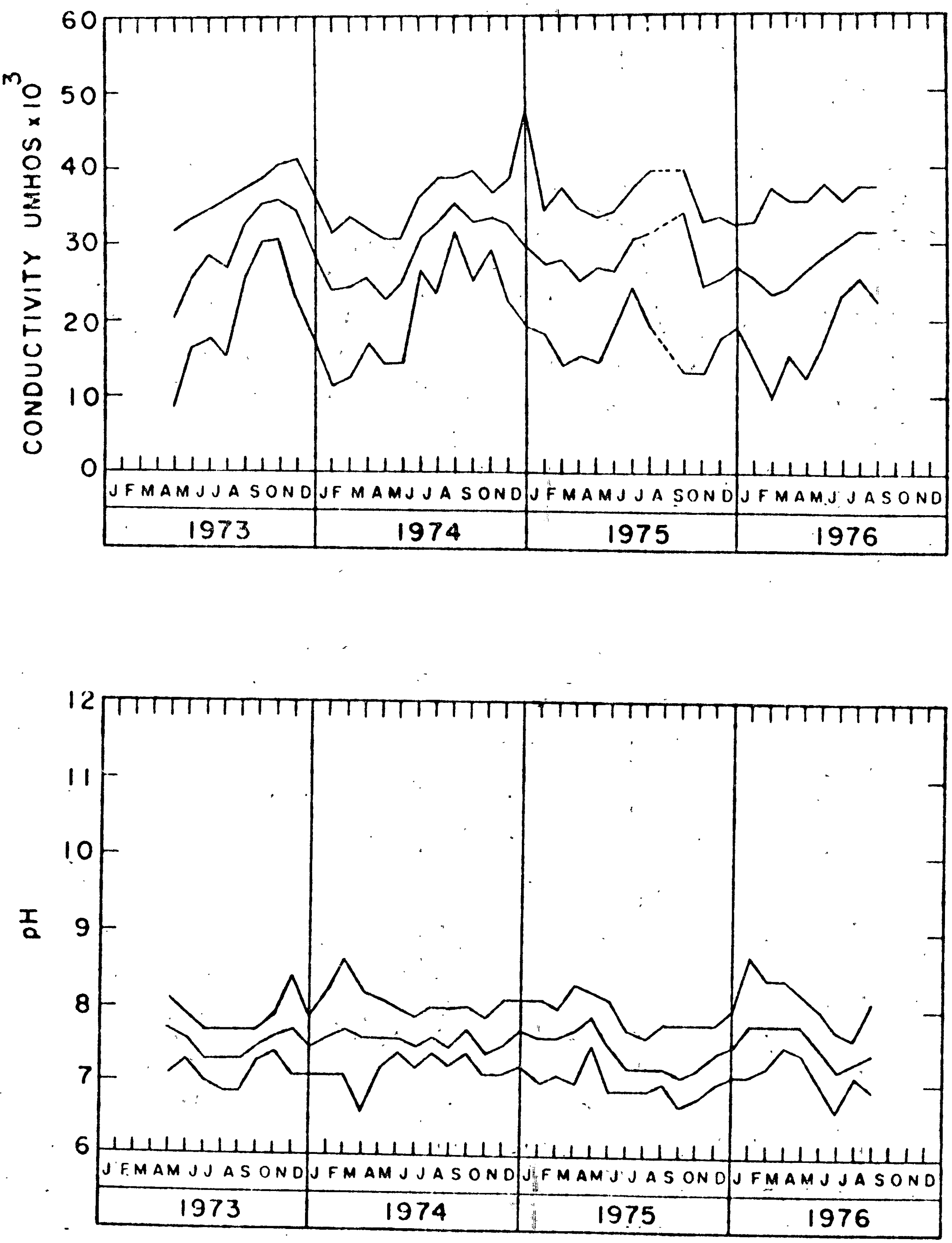

KILL VAN KULL — U.S. GYPSUM (station no. 7)
DISSOLVED OXYGEN MG/L
0
2
4
6
8
10
12
J F M A M J J A S O N D
1973
1974
1975
1976
TEMPERATURE °F
30
40
50
60
70
80
90
TOP LINE — maximum monthly value
CENTER LINE — average of the daily average values
BOTTOM LINE — minimum monthly value

Figure 10

*KILL VAN KULL — U.S. GYPSUM (station no. 7)*




TOP LINE — maximum monthly value

CENTER LINE — average of the daily average values

BOTTOM LINE — minimum monthly value

Table 2

ARTHUR KILL - CON EDISON

1976 SUMMER DISSOLVED OXYGEN ANALYSIS

REMOTE AUTOMATIC WATER QUALITY MONITOR DATA

| D. O. RANGE | % OF VALUES | CUMULATIVE % OF VALUES |
|---|---|---|
| 0 | 14.3 | 14.3 |
| 0.01 - 0.99 | 50.6 | 64.9 |
| 1.00 - 1.99 | 21.7 | 86.6 |
| 2.00 - 2.99 | 7.0 | 93.6 |
| =>3.0 | 6.4 | 100.0 |

NOTES:

(1) Dissolved oxygen values are milligrams/liter.

(2) Data are for June, July and August 1976.

(3) I.S.C. minimum dissolved oxygen requirement is 3.0 mg/l.

Table 3

RARITAN RIVER - VICTORY BRIDGE

1976 SUMMER DISSOLVED OXYGEN ANALYSIS

REMOTE AUTOMATIC WATER QUALITY MONITOR DATA

| D. O. RANGE | % OF VALUES | CUMULATIVE % OF VALUES |
|---|---|---|
| 0 | 0.0 | 0.0 |
| 0.01 - 0.99 | 0.1 | 0.1 |
| 1.00 - 1.99 | 4.3 | 4.4 |
| 2.00 - 2.99 | 18.4 | 22.8 |
| 3.00 - 3.99 | 27.7 | 50.5 |
| 4.00 - 4.99 | 20.4 | 70.9 |
| =>5.0 | 29.1 | 100.0 |

NOTES:

(1) Dissolved oxygen values are milligrams/liter.

(2) Data are for June, July and August 1976.

(3) I.S.C. minimum dissolved oxygen requirement is 5.0 mg/l.

Table 4

THE NARROWS - FORT WADSWORTH

1976 SUMMER DISSOLVED OXYGEN ANALYSIS

REMOTE AUTOMATIC WATER QUALITY MONITOR DATA

| D. O. RANGE | % OF VALUES | CUMULATIVE % OF VALUES |
|---|---|---|
| 0 | 0.0 | 0.0 |
| 0.01 - 0.99 | 0.0 | 0.0 |
| 1.00 - 1.99 | 6.1 | 6.1 |
| 2.00 - 2.99 | 28.3 | 34.4 |
| 3.00 - 3.99 | 29.1 | 63.5 |
| =>4.0 | 36.5 | 100.0 |

NOTES:

(1) Dissolved oxygen values are milligrams/liter.

(2) Data are for June, July and August 1976.

(3) I.S.C. minimum dissolved oxygen requirement is 4.0 mg/l.

Table 5

KILL VAN KULL - U. S. GYPSUM

1976 SUMMER DISSOLVED OXYGEN ANALYSIS

REMOTE AUTOMATIC WATER QUALITY MONITOR DATA

| D. O. RANGE | % OF VALUES | CUMULATIVE % OF VALUES |
|---|---|---|
| 0 | 0.0 | 0.0 |
| 0.01 - 0.99 | 26.4 | 26.4 |
| 1.00 - 1.99 | 34.1 | 60.5 |
| 2.00 - 2.99 | 23.2 | 83.7 |
| =>3.0 | 16.3 | 100.0 |

NOTES:

(1) Dissolved oxygen values are milligrams/liter.

(2) Data are for June, July and August 1976.

(3) I.S.C. minimum dissolved oxygen requirement is 3.0 mg/l.

Figure 11

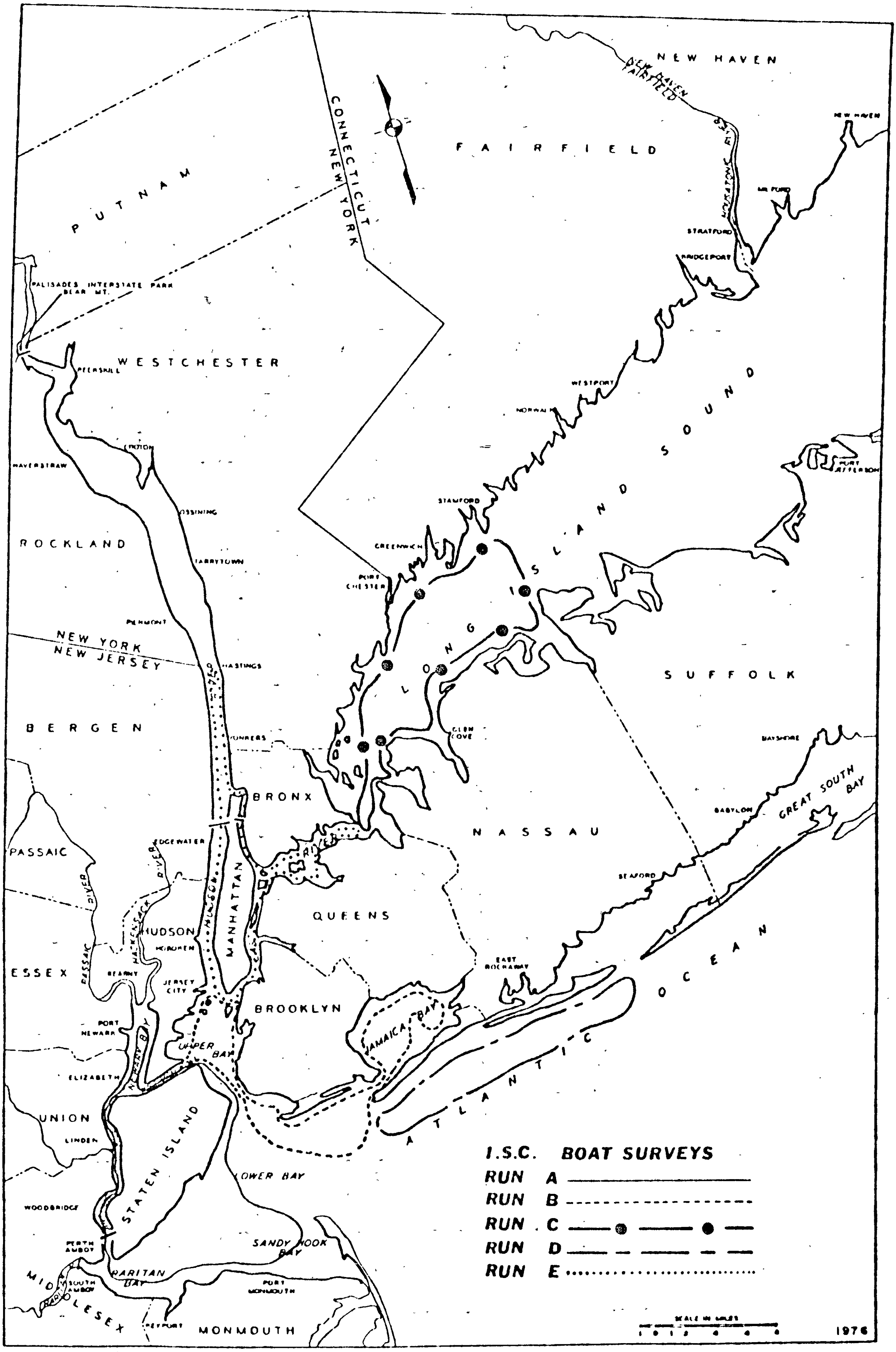

I.S.C. BOAT SURVEYS
RUN A
RUN B
RUN C
RUN D
RUN E
1976
PUTNAM
WESTCHESTER
FAIRFIELD
ROCKLAND
BERGEN
PASSAIC
HUDSON
ESSEX
UNION
MIDDLESEX
MONMOUTH
BRONX
MANHATTAN
QUEENS
BROOKLYN
NASSAU
SUFFOLK
STATEN ISLAND
CONNECTICUT
NEW YORK
NEW JERSEY
NEW HAVEN
LONG ISLAND SOUND
ATLANTIC OCEAN
GREAT SOUTH BAY
JAMAICA BAY
UPPER BAY
LOWER BAY
SANDY HOOK BAY
RARITAN BAY
STAMFORD
GREENWICH
NORWALK
WESTPORT
BRIDGEPORT
STRATFORD
GLEN COVE
YONKERS
HASTINGS
TARRYTOWN
OSSINING
HAVERSTRAW
PIERMONT
EDGEWATER
HOBOKEN
JERSEY CITY
KEARNY
PORT NEWARK
ELIZABETH
LINDEN
WOODBRIDGE
PERTH AMBOY
SOUTH AMBOY
KEYPORT
EAST ROCKAWAY
SEAFORD
BABYLON
BAYSHORE

Table 6

INTERSTATE SANITATION COMMISSION
BOAT RUN "A"

| SAMPLING STATION | LATITUDE | LONGITUDE | DESCRIPTION |
|---|---|---|---|
| AK-18 | 40°30'24"N | 74°15'34"W | Mid-channel of Ward Point Bend (west) and opposite Perth Amboy Ferry Slip |
| RB-10 | 40°29'07"N | 74°15'38"W | Qk Fl G "3" Buoy |
| RB-14 | 40°28'05"N | 74°11'20"W | Buoy C "3" off Conaskonk Point at channel entrance to Keyport Harbor |
| RB-8 | 40°27'10"N | 74°04'30"W | E-W: Line of Nun Buoy N "2" at channel entrance to Compton Creek & standpipe on Pt. Comfort. N-S: Approximately 200 yds west of Pews Creek |
| RB-7 | 40°27'35"N | 74°02'45"W | Flashing Red Buoy R "4" off the tip of Leonardo (U.S.N.) Pier |
| LB-1 | 40°30'44"N | 74°06'03"W | 500 feet from Old Orchard Light in line with the beacon at Old Orchard Shore |
| LB-2 | 40°33'45"N | 74°04'20"W | B.W. Bell off Midland Beach |
| UH-13 | 40°36'26"N | 74°02'45"W | Middle of channel in Narrows under Verrazano Bridge |
| UH-11 | 40°39'05"N | 74°05'10"W | Located in the Kill Van Kull, in mid-channel & directly opposite Fl G & Black Buoy #3 |
| NB-5 | 40°38'47"N | 74°09'10"W | Midway between Flashing Red Buoy #14 and Buoy N "2A" |
| NB-3 | 40°39'20"N | 74°08'45"W | Northside of C.R.N.J. Bridge over the Newark Bay South Reach channel (mid-channel) |
| NB-12 | 40°41'57"N | 74°07'10"W | Newark Bay North Reach at mid-channel northside of LVRR Bridge |
| AK-3 | 40°38'18"N | 74°11'45"W | At the center of & on the north side of the B&O R.R. Bridge |
| AK-7 | 40°35'35"N | 74°12'22"W | Middle of mouth of Rahway River and in line with shoreline along Tremley Reach |
| AK-13 | 40°33'02"N | 74°15'00"W | Mid-channel between Flashing Red Buoy #12 & Flashing Green, Black Buoy #1 |

Table 7

INTERSTATE SANITATION COMMISSION
BOAT RUN "B"

| SAMPLING STATION | LATITUDE | LONGITUDE | DESCRIPTION |
|---|---|---|---|
| LB-3 | 40° 34'03"N | 73° 59'00"W | 200 feet south of Steeplechase Pier at Coney Island - N "2S" |
| LB-4 | 40° 35'00"N | 74° 00'51"W | 1/4 mile northeast of Norton Point, near the white nun Buoy |
| UH-13 | 40° 36'26"N | 74° 02'45"W | Middle of channel in Narrows under Verrazano Bridge |
| UH-22 | 40° 38'25"N | 74° 02'50"W | In mid-channel of Bay Ridge channel. E-W: Flashing Red Beacon on 69th St. Ferry Dock (Brooklyn). N-S: Fl G Bell Buoy #3 & Fl R Gong Buoy #22 |
| UH-29 | 40° 42'17"N | 75° 59'54"W | Mid-channel of East River in line with Pier #11 (Manhattan) & Pier #1 (Brooklyn) |
| UH-28 | 40° 42'20"N | 74° 01'36"W | Mid-channel of Hudson River; N-S: Line of black buoys; E-W: Fire boat pier (NY) & railroad pier (NJ) |
| UH-21 | 40° 40'23"N | 74° 02'28"W | Main ship channel 10 yds to the west of Fl R Bell Buoy #30 |
| UH-3 | 40° 39'14"N | 74° 03'35"W | Passaic Valley Outfalls - E-W: Robbins Reef Light & forward water tower on Naval Dock. N-S: Statue of Liberty & Black Bell Buoy #1-G |
| AO-1 | 40° 31'47"N | 73° 56'37"W | Flashing Red R "2" Gong (4 sec.) |
| RI-1 | 40° 34'00"N | 73° 55'51"W | As near the outfall structure of the Coney Island plant as safety permits |
| RI-2 | 40° 34'24"N | 73° 53'08"W | Under center of bridge from Barran Island to Rockaway |
| JB-8 | 40° 36'20"N | 73° 48'56"W | Under center of R.R. Trestle |
| JB-5 | 40° 35'45"N | 73° 48'40"W | At center pier of bridge over Beach Channel-Hammels |
| JB-7 | 40° 38'52"N | 73° 49'20"W | At mouth of Bergen Basin, southeast of the sludge storage tank |
| JB-3 | 40° 37'37"N | 73° 53'00"W | In channel 400 ft. south of the end of Canarsie Pier |
| JB-2 | 40° 36'27"N | 73° 53'09"W | Mill Basin - at east end of channel |

Table 8

INTERSTATE SANITATION COMMISSION
BOAT RUN "E"

| SAMPLING STATION | LATITUDE | LONGITUDE | DESCRIPTION |
|---|---|---|---|
| ER-1 | 40° 42'24"N | 73° 59'27"W | Under Manhattan Bridge - Mid-channel |
| ER-2 | 40° 42'48"N | 73° 58'20"W | Under Williamsburg Bridge-Mid-channel |
| ER-3 | 40°44'05"N | 73° 58'05"W | Mid-channel of East River; E-W: Pier #73 (School Ship) Manhattan with open pier, ft. of Greene St., Brooklyn; N-S: Poorhouse Flats Range |
| ER-4 | 40° 45'22"N | 73°57'11"W | Under Queensboro Bridge - East Channel |
| ER-9 | 40°47'26"N | 73° 54'53"W | Mid-channel of East River; E-W: Fl R Bell Beacon on Wards Island with tall stack on Con Edison's Astoria Plant |
| ER-11 | 40°47'50"N | 73° 52'02"W | Mid-channel of East River; E-W: Fl R Beacon (College Pt.) with stack on Rikers Island; N-S: Line from center of Sanitation Pier (Hunts Pt.) with Fl R #4 Buoy (Station approx. 250 yds S.E. of #4 Buoy) |
| HA-1 | 40°48'40"N | 73°56'02"W | Third Bridge after Triboro Bridge |
| HA-2 | 40° 50'44"N | 73° 55'45"W | Hamilton Bridge (middle bridge of 3) |
| HR-1 | 40°42'20"N | 74°01'36"W | Mid-channel of Hudson River; N-S: Line of black buoys; E-W: Fire boat pier (NY) and railroad pier (NJ) |
| HR-2 | 40° 45'17"N | 74°00'58"W | Mid-channel of Hudson River; E-W: Heliport (NY) & Seatrain pier (NJ) |
| HR-3 | 40°47'41"N | 73° 59'09"W | Mid-channel of Hudson River; E-W: Soldiers & Sailors Monument (NY) and Circular apartment bldgs. (NJ) |
| HR-4 | 40° 51'04"N | 73° 57'04"W | Mid-channel of Hudson River; Under George Washington Bridge |
| HR-5 | 40°52'40"N | 73° 55'02"W | Mid-channel of Spuyten Duyvil Creek; Under Henry Hudson Bridge |
| HR-7 | 40° 56'51"N | 73° 54'27"W | Mid-channel of Hudson River; E-W: Opposite Phelps Dodge (Yonkers) |

Table 9

1975 - 1976 BOAT SURVEY DATA

| PARAMETER | HUDSON RIVER | NEWARK BAY | KILL VAN KULL | ARTHUR KILL |
|---|---|---|---|---|
| Temperature (C) (Winter) | | | | |
| Low | 6.5 | 8.0 | 8.2 | 8.0 |
| High | 7.0 | 9.2 | 9.0 | 9.8 |
| Average | 6.7 | 8.8 | 8.6 | 8.9 |
| No. of Values | 2 | 6 | 2 | 8 |
| Temperature (C) (Summer) | | | | |
| Low | 19.2 | 18.0 | 17.0 | 14.5 |
| High | 24.0 | 24.4 | 22.7 | 27.3 |
| Average | 21.6 | 21.8 | 20.8 | 22.4 |
| No. of Values | 19 | 15 | 5 | 20 |
| Biochemical Oxygen Demand (Winter) | | | | |
| Low | 4.6 | 2.6 | 5.2 | 3.2 |
| High | 4.6 | 5.8 | 5.2 | 6.4 |
| Average | 4.6 | 3.8 | 5.2 | 5.0 |
| No. of Values | 1 | 3 | 1 | 4 |
| Biochemical Oxygen Demand (Summer) | | | | |
| Low | 1.3 | 2.4 | >3.0 | 0.6 |
| High | >4.4 | >3.4 | >3.1 | >4.6 |
| Average | >3.2 | >2.9 | >3.1 | >3.0 |
| No. of Values | 10 | 6 | 2 | 8 |
| Dissolved Oxygen (Winter) | | | | |
| Low | 9.4 | 6.4 | 6.4 | 3.8 |
| High | 9.6 | 9.6 | 11.0 | 9.4 |
| Average | 9.5 | 8.1 | 8.7 | 7.1 |
| No. of Values | 2 | 6 | 2 | 8 |
| Dissolved Oxygen (Summer) | | | | |
| Low | 2.1 | 3.0 | 3.0 | 1.4 |
| High | 6.1 | 7.5 | 6.0 | 5.4 |
| Average | 4.2 | 4.2 | 4.3 | 3.6 |
| No. of Values | 19 | 15 | 5 | 20 |
| Fecal Coliform Organisms/100 ml (Winter) | | | | |
| Low | 4800 | 330 | 160 | 2200 |
| High | 4800 | 2200 | 160 | 30000 |
| Average | 4800 | 1000 | 160 | 5600 |
| No. of Values | 1 | 3 | 1 | 4 |

Notes:
(1) All values are milligrams/liter, except where indicated.
(2) All averages are arithmetic means except fecal coliforms which are geometric means.
(3) Data are for September 1975 through August 1976.

Table 11

1975 - 1976 BOAT SURVEY DATA

| PARAMETER | HUDSON RIVER | NEWARK BAY | KILL VAN KULL | ARTHUR KILL |
|---|---|---|---|---|
| Oil & Grease | | | | |
| Low | 0.1 | 0.1 | 0.1 | 0.1 |
| High | 2.1 | 0.6 | 0.2 | 1.6 |
| Average | 0.4 | 0.3 | 0.2 | 0.5 |
| No. of Values | 11 | 10 | 3 | 14 |
| Copper | | | | |
| Low | 0.006 | 0.010 | 0.011 | 0.018 |
| High | 0.051 | 0.086 | 0.067 | 0.182 |
| Average | 0.017 | 0.036 | 0.034 | 0.059 |
| No. of Values | 19 | 14 | 4 | 18 |
| Zinc | | | | |
| Low | 0.005 | 0.017 | 0.045 | 0.005 |
| High | 0.136 | 0.141 | 0.105 | 0.156 |
| Average | 0.036 | 0.068 | 0.072 | 0.083 |
| No. of Values | 19 | 14 | 4 | 18 |
| Chromium | | | | |
| Low | <0.005 | <0.005 | <0.005 | <0.005 |
| High | <0.005 | <0.005 | <0.005 | <0.005 |
| Average | <0.005 | <0.005 | <0.005 | <0.005 |
| No. of Values | 19 | 14 | 4 | 18 |
| Lead | | | | |
| Low | 0.005 | 0.005 | 0.010 | <0.005 |
| High | 0.025 | 0.025 | 0.015 | 0.025 |
| Average | 0.012 | 0.014 | 0.013 | <0.014 |
| No. of Values | 19 | 14 | 4 | 18 |
| Iron | | | | |
| Low | 0.062 | 0.105 | 0.120 | 0.109 |
| High | 0.357 | 0.320 | 0.270 | 0.495 |
| Average | 0.192 | 0.238 | 0.212 | 0.274 |
| No. of Values | 11 | 7 | 3 | 11 |
| Nickel | | | | |
| Low | <0.005 | 0.010 | 0.015 | 0.015 |
| High | 0.060 | 0.065 | 0.035 | 0.355 |
| Average | <0.011 | 0.022 | 0.023 | 0.049 |
| No. of Values | 19 | 14 | 4 | 18 |

Table 12

1975 - 1976 BOAT SURVEY DATA

| PARAMETER | HUDSON RIVER | NEWARK BAY | KILL VAN KULL | ARTHUR KILL |
|---|---|---|---|---|
| Cadmium | | | | |
| Low | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| High | 0.0035 | 0.0060 | 0.0170 | 0.0090 |
| Average | <0.0013 | <0.0013 | <0.0055 | <0.0017 |
| No. of Values | 19 | 14 | 4 | 18 |
| Mercury | | | | |
| Low | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| High | 0.0001 | 0.0010 | 0.0004 | 0.0021 |
| Average | <0.0001 | <0.0003 | <0.0002 | <0.0004 |
| No. of Values | 16 | 10 | 4 | 15 |
| Tin | | | | |
| Low | <0.050 | <0.050 | <0.050 | <0.050 |
| High | 0.050 | <0.050 | <0.050 | <0.050 |
| Average | <0.050 | <0.050 | <0.050 | <0.050 |
| No. of Values | 4 | 6 | 2 | 8 |
| Arsenic | | | | |
| Low | <0.010 | <0.010 | <0.010 | <0.010 |
| High | <0.010 | <0.010 | <0.010 | <0.010 |
| Average | <0.010 | <0.010 | <0.010 | <0.010 |
| No. of Values | 1 | 3 | 1 | 4 |
| Silver | | | | |
| Low | <0.001 | <0.001 | <0.001 | <0.001 |
| High | 0.007 | 0.002 | 0.006 | 0.009 |
| Average | 0.003 | <0.001 | <0.003 | <0.003 |
| No. of Values | 11 | 7 | 3 | 11 |
| Cobalt | | | | |
| Low | <0.001 | <0.001 | <0.001 | <0.001 |
| High | 0.010 | 0.010 | <0.001 | 0.005 |
| Average | <0.003 | <0.003 | <0.001 | <0.001 |
| No. of Values | 11 | 7 | 3 | 11 |

NOTES: (1) All Values Are Milligrams Per Liter

(2) Metals Values Are For Total Metals

(3) Data Is For September 1975 Through August 1976, inclusive

Table 13
1975 - 1976 BOAT SURVEY DATA

| PARAMETER | RARITAN BAY | SANDY HOOK BAY | UPPER N.Y. BAY | LOWER N.Y. BAY |
|---|---|---|---|---|
| Temperature (C) (Winter) | | | | |
| Low | 7.4 | 7.8 | 7.0 | 7.0 |
| High | 8.5 | 8.2 | 8.6 | 8.7 |
| Average | 8.0 | 8.0 | 7.5 | 8.0 |
| No. of Values | 4 | 4 | 10 | 8 |
| Temperature (C) (Summer) | | | | |
| Low | 14.0 | 13.2 | 17.0 | 13.0 |
| High | 24.0 | 22.6 | 23.5 | 23.0 |
| Average | 20.6 | 20.0 | 21.0 | 20.1 |
| No. of Values | 10 | 12 | 33 | 28 |
| Biochemical Oxygen Demand (Winter) | | | | |
| Low | 5.2 | 4.8 | 3.5 | 4.0 |
| High | 5.8 | 6.8 | 7.2 | 8.2 |
| Average | 5.5 | 5.8 | 4.5 | 5.1 |
| No. of Values | 2 | 2 | 5 | 4 |
| Biochemical Oxygen Demand (Summer) | | | | |
| Low | 2.6 | 1.3 | 1.9 | 2.3 |
| High | >5.8 | 6.7 | 3.4 | 5.8 |
| Average | >4.1 | >4.2 | 2.6 | 3.6 |
| No. of Values | 4 | 4 | 10 | 8 |
| Dissolved Oxygen (Winter) | | | | |
| Low | 6.4 | 8.0 | 7.2 | 5.4 |
| High | 10.6 | 12.0 | 11.4 | 12.0 |
| Average | 8.9 | 10.1 | 9.1 | 9.2 |
| No. of Values | 4 | 4 | 10 | 8 |
| Dissolved Oxygen (Summer) | | | | |
| Low | 4.0 | 4.8 | 1.8 | 3.5 |
| High | 7.6 | 9.8 | 7.6 | 8.4 |
| Average | 5.6 | 6.8 | 4.4 | 6.5 |
| No. of Values | 10 | 12 | 33 | 28 |
| Fecal Coliform Organisms/100 ml (Winter) | | | | |
| Low | 220 | 63 | 900 | 90 |
| High | 420 | 100 | 15000 | 16000 |
| Average | 300 | 79 | 4300 | 690 |
| No. of Values | 2 | 2 | 5 | 4 |

Notes:
(1) All values are milligrams/liter, except where indicated.
(2) All averages are arithmetic means except fecal coliforms which are geometric means.
(3) Data are for September 1975 through August 1976.

Table 14

1975 - 1976 BOAT SURVEY DATA

| PARAMETER | RARITAN BAY | SANDY HOOK BAY | UPPER N.Y. BAY | LOWER N.Y. BAY |
|---|---|---|---|---|
| Fecal Coliform Organisms/100 ml (Summer) | | | | |
| Low | 30 | 10 | <10 | <10 |
| High | 5300 | 3000 | 25000 | 2800 |
| Average | 600 | 140 | 2100 | 160 |
| No. of Values | 9 | 11 | 31 | 26 |
| Ortho Phosphate Phosphorus | | | | |
| Low | 0.02 | 0.01 | <0.01 | <0.01 |
| High | 1.30 | 1.10 | 1.15 | 1.30 |
| Average | 0.29 | 0.27 | 0.16 | 0.17 |
| No. of Values | 8 | 18 | 23 | 18 |
| Total Phosphate Phosphorus | | | | |
| Low | 0.14 | 0.13 | 0.12 | 0.07 |
| High | 0.33 | 0.24 | 0.24 | 0.33 |
| Average | 0.22 | 0.18 | 0.17 | 0.17 |
| No. of Values | 4 | 4 | 12 | 9 |
| Ammonia Nitrogen | | | | |
| Low | 0.10 | 0.15 | 0.18 | <0.10 |
| High | 1.50 | 2.65 | 1.00 | 0.76 |
| Average | 0.92 | 0.69 | 0.48 | 0.33 |
| No. of Values | 8 | 8 | 24 | 19 |
| Nitrite + Nitrate Nitrogen | | | | |
| Low | 0.44 | 0.20 | 0.14 | 0.05 |
| High | 0.65 | 0.56 | 0.69 | 0.56 |
| Average | 0.52 | 0.42 | 0.47 | 0.40 |
| No. of Values | 7 | 7 | 17 | 14 |
| Total Kjeldahl Nitrogen | | | | |
| Low | 0.56 | 0.35 | 0.45 | 0.28 |
| High | 1.25 | 0.94 | 0.95 | 1.37 |
| Average | 0.97 | 0.61 | 0.61 | 0.55 |
| No. of Values | 4 | 4 | 11 | 8 |
| Phenols | | | | |
| Low | 0.034 | 0.008 | <0.001 | <0.001 |
| High | 0.034 | 0.008 | <0.001 | 0.068 |
| Average | 0.034 | 0.008 | <0.001 | <0.035 |
| No. of Values | 1 | 1 | 2 | 2 |

Notes: (1) All values are milligrams/liter, except where indicated.
(2) All averages are arithmetic means except fecal coliforms which are geometric means.
(3) Data are for September 1975 through August 1976.

Table 15

1975 - 1976 BOAT SURVEY DATA

| PARAMETER | RARITAN BAY | SANDY HOOK BAY | UPPER N.Y. BAY | LOWER N.Y. BAY |
|---|---|---|---|---|
| **Oil & Grease** | | | | |
| Low | 0.0 | 0.0 | 0.0 | 0.1 |
| High | 0.6 | 0.4 | 3.0 | 8.7 |
| Average | 0.3 | 0.2 | 0.8 | 2.1 |
| No. of Values | 7 | 7 | 17 | 14 |
| **Copper** | | | | |
| Low | 0.019 | 0.010 | 0.007 | 0.010 |
| High | 0.151 | 0.110 | 0.084 | 0.108 |
| Average | 0.072 | 0.040 | 0.032 | 0.045 |
| No. of Values | 10 | 10 | 23 | 19 |
| **Zinc** | | | | |
| Low | 0.015 | 0.009 | 0.015 | 0.011 |
| High | 0.165 | 0.164 | 0.151 | 0.174 |
| Average | 0.102 | 0.087 | 0.055 | 0.073 |
| No. of Values | 10 | 10 | 23 | 19 |
| **Chromium** | | | | |
| Low | <0.005 | <0.005 | <0.005 | <0.005 |
| High | <0.005 | <0.005 | <0.005 | <0.005 |
| Average | <0.005 | <0.005 | <0.005 | <0.005 |
| No. of Values | 10 | 10 | 23 | 19 |
| **Lead** | | | | |
| Low | 0.005 | 0.005 | 0.005 | 0.005 |
| High | 0.020 | 0.020 | 0.015 | 0.025 |
| Average | 0.015 | 0.013 | 0.011 | 0.013 |
| No. of Values | 10 | 10 | 23 | 19 |
| **Iron** | | | | |
| Low | 0.175 | 0.103 | 0.060 | 0.048 |
| High | 0.3[illegible] | 0.229 | 0.294 | 0.171 |
| Average | 0.282 | 0.141 | 0.143 | 0.097 |
| No. of Values | 6 | 6 | 14 | 11 |
| **Nickel** | | | | |
| Low | 0.015 | 0.009 | 0.005 | <0.005 |
| High | 0.090 | 0.060 | 0.180 | 0.110 |
| Average | 0.033 | 0.020 | 0.026 | 0.019 |
| No. of Values | 10 | 10 | 23 | 19 |

Table 16

1975 - 1976 BOAT SURVEY DATA

| PARAMETER | RARITAN BAY | SANDY HOOK BAY | UPPER N.Y. BAY | LOWER N.Y. BAY |
|---|---|---|---|---|
| **Cadmium** | | | | |
| Low | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| High | 0.0050 | 0.0030 | 0.0060 | 0.0090 |
| Average | <0.0018 | <0.0011 | <0.0016 | <0.0022 |
| No. of Values | 10 | 10 | 23 | 19 |
| **Mercury** | | | | |
| Low | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| High | 0.0004 | 0.0002 | 0.0005 | 0.0005 |
| Average | <0.0002 | <0.0001 | <0.0002 | <0.0002 |
| No. of Values | 8 | 8 | 17 | 15 |
| **Tin** | | | | |
| Low | <0.050 | <0.050 | <0.050 | <0.050 |
| High | <0.050 | <0.050 | <0.050 | 0.050 |
| Average | <0.050 | <0.050 | <0.050 | <0.050 |
| No. of Values | 4 | 4 | 10 | 8 |
| **Arsenic** | | | | |
| Low | <0.010 | <0.010 | <0.010 | <0.010 |
| High | <0.010 | <0.010 | <0.010 | <0.010 |
| Average | <0.010 | <0.010 | <0.010 | <0.010 |
| No. of Values | 2 | 2 | 5 | 4 |
| **Silver** | | | | |
| Low | <0.001 | <0.001 | <0.001 | <0.001 |
| High | 0.009 | 0.009 | 0.020 | 0.030 |
| Average | <0.004 | <0.004 | <0.006 | <0.007 |
| No. of Values | 6 | 6 | 14 | 11 |
| **Cobalt** | | | | |
| Low | <0.001 | <0.001 | <0.001 | <0.001 |
| High | 0.125 | 0.010 | 0.010 | 0.015 |
| Average | <0.022 | <0.003 | <0.002 | <0.003 |
| No. of Values | 6 | 6 | 14 | 11 |

NOTES:
(1) All Values are Miligrams Per Liter
(2) Metals Values Are For Total Metals
(3) Data Is For September 1975 Through August 1976, inclusive

Table 17

**INTERSTATE SANITATION COMMISSION**
**CHLOROPHYLL DATA**
**DECEMBER 1975 - SEPTEMBER 1976**

| STATION | DECEMBER CHLOROPHYLL a | DECEMBER CHLOROPHYLL c | FEBRUARY CHLOROPHYLL a | FEBRUARY CHLOROPHYLL c | APRIL CHLOROPHYLL a | APRIL CHLOROPHYLL c | JUNE-JULY CHLOROPHYLL a | JUNE-JULY CHLOROPHYLL c | AUGUST-SEPTEMBER CHLOROPHYLL a | AUGUST-SEPTEMBER CHLOROPHYLL c |
|---|---|---|---|---|---|---|---|---|---|---|
| AO-1 | 0.000 | 0.003 | - | - | - | - | 0.008 | 0.020 | 0.011 | 0.019 |
| RI-1 | 0.003 | 0.006 | - | - | 0.009 | 0.004 | 0.026 | 0.033 | 0.017 | 0.023 |
| RI-2 | 0.000 | - | 0.053 | 0.019 | - | - | 0.008 | 0.017 | 0.029 | 0.027 |
| JB-2 | 0.008 | 0.005 | - | - | 0.007 | 0.005 | 0.112 | 0.036 | 0.025 | 0.036 |
| JB-3 | 0.005 | 0.005 | 0.073 | 0.032 | - | - | 0.008 | 0.009 | 0.031 | 0.027 |
| JB-5 | 0.007 | 0.009 | 0.068 | 0.018 | - | - | 0.004 | 0.016 | 0.040 | 0.033 |
| JB-7 | 0.005 | 0.009 | - | - | 0.020 | 0.025 | 0.033 | 0.029 | 0.044 | 0.034 |
| JB-8 | 0.001 | 0.001 | - | - | 0.031 | 0.036 | 0.036 | 0.032 | 0.016 | 0.011 |
| LB-1 | 0.007 | 0.005 | - | - | 0.032 | 0.034 | 0.024 | 0.024 | 0.013 | 0.021 |
| LB-2 | 0.003 | 0.012 | 0.007 | 0.004 | - | - | 0.069 | 0.044 | 0.027 | 0.032 |
| LB-3 | 0.008 | 0.010 | 0.015 | 0.005 | - | - | 0.008 | 0.017 | 0.008 | 0.015 |
| LB-4 | 0.004 | 0.010 | - | - | 0.012 | 0.003 | 0.020 | 0.018 | 0.008 | 0.008 |
| UH-3 | 0.000 | 0.000 | - | - | 0.005 | 0.005 | 0.011 | 0.017 | 0.006 | 0.020 |
| UH-11 | 0.013 | 0.031 | 0.007 | 0.009 | - | - | 0.006 | 0.016 | 0.010 | 0.023 |
| UH-13 | 0.007 | 0.016 | 0.009 | 0.016 | 0.007 | 0.021 | 0.009* | 0.014* | 0.009* | 0.014* |
| UH-21 | 0.000 | 0.000 | 0.008 | 0.003 | - | - | 0.011 | 0.023 | 0.006 | 0.008 |
| UH-22 | 0.001 | 0.012 | - | - | - | - | 0.009 | 0.009 | 0.006 | 0.005 |
| UH-29 | 0.005 | 0.007 | 0.009 | 0.012 | - | - | 0.007 | 0.011 | 0.004 | 0.024 |
| NB-3 | 0.009 | 0.012 | 0.004 | 0.008 | - | - | 0.031 | 0.027 | 0.008 | 0.028 |
| NB-5 | 0.003 | 0.011 | - | - | 0.011 | 0.010 | 0.015 | 0.019 | 0.059 | 0.037 |
| NB-12 | 0.001 | 0.012 | - | - | 0.001 | 0.018 | 0.013 | 0.020 | 0.019 | 0.024 |
| AK-3 | 0.003 | 0.007 | 0.003 | 0.011 | - | - | 0.008 | 0.019 | 0.015 | 0.032 |
| AK-7 | - | 0.001 | - | - | 0.008 | 0.010 | 0.016 | 0.014 | 0.024 | 0.024 |
| AK-13 | - | 0.008 | 0.005 | 0.005 | - | - | 0.011 | 0.010 | 0.020 | 0.022 |
| AK-18 | 0.004 | 0.002 | 0.020 | 0.005 | - | - | 0.022 | 0.016 | 0.011 | 0.019 |
| RB-7 | 0.007 | 0.007 | 0.017 | 0.000 | - | - | 0.075 | 0.049 | 0.042 | 0.033 |
| RB-8 | 0.007 | 0.010 | - | - | 0.077 | 0.042 | 0.027 | 0.016 | 0.007 | 0.015 |
| RB-10 | 0.009 | 0.012 | - | - | 0.024 | 0.019 | 0.017 | 0.016 | 0.015 | 0.019 |
| RB-14 | 0.009 | 0.014 | 0.027 | 0.007 | - | - | 0.034 | 0.029 | 0.023 | 0.025 |

NOTES:
(1) All Values Are Milligrams Per Liter.
(2) Chlorophyll a Values Are Corrected For Pheopigments.
(3) Values Shown Are Single Values Or Averages Of 2 Values.
*indicates an average of 4 values.

Table 18

INTERSTATE SANITATION COMMISSION
CHLOROPHYLL DATA
DECEMBER 1975 - SEPTEMBER 1976

| STATION | DECEMBER CHLOROPHYLL a | DECEMBER CHLOROPHYLL c | FEBRUARY CHLOROPHYLL a | FEBRUARY CHLOROPHYLL c | APRIL CHLOROPHYLL a | APRIL CHLOROPHYLL c | JUNE-JULY CHLOROPHYLL a | JUNE-JULY CHLOROPHYLL c | AUGUST-SEPTEMBER CHLOROPHYLL a | AUGUST-SEPTEMBER CHLOROPHYLL c |
|---|---|---|---|---|---|---|---|---|---|---|
| ER-1 | - | - | - | - | 0.004 | 0.007 | 0.008 | 0.016 | 0.004 | 0.011 |
| ER-2 | - | - | - | - | 0.009 | 0.018 | 0.004 | 0.018 | 0.000 | 0.018 |
| ER-3 | - | - | - | - | 0.007 | 0.022 | 0.008 | 0.018 | - | 0.012 |
| ER-4 | - | - | - | - | 0.011 | 0.034 | 0.004 | 0.017 | - | 0.010 |
| ER-9 | - | - | - | - | 0.015 | 0.019 | 0.005 | 0.016 | 0.007 | 0.015 |
| LI-15 | 0.001 | 0.011 | - | - | - | 0.005 | 0.034 | 0.025 | 0.031 | 0.029 |
| LI-17 | - | - | - | - | 0.032 | 0.010 | 0.001 | 0.013 | 0.009 | 0.010 |
| LI-19 | 0.013 | 0.008 | - | - | 0.007 | 0.011 | 0.034 | 0.024 | 0.009 | 0.015 |
| LI-24 | 0.003 | - | - | - | 0.024 | 0.013 | - | 0.015 | 0.003 | 0.023 |
| LI-25 | 0.003 | 0.008 | - | - | 0.019 | 0.033 | 0.034 | 0.026 | 0.020 | 0.022 |
| LI-26 | 0.001 | 0.008 | - | - | 0.021 | 0.015 | 0.013 | 0.026 | 0.010 | 0.018 |
| LI-27 | 0.008 | 0.007 | - | - | 0.004 | 0.004 | 0.047 | 0.035 | 0.014 | 0.016 |
| LI-28 | 0.009 | 0.022 | - | - | 0.009 | 0.023 | 0.015 | 0.022 | 0.007 | 0.025 |
| LI-29 | - | - | - | - | 0.005 | 0.007 | 0.032 | 0.026 | - | 0.012 |
| LI-30 | 0.005 | 0.014 | - | - | 0.009 | 0.012 | 0.075 | 0.048 | 0.014 | 0.020 |
| LI-31 | 0.007 | 0.014 | - | - | 0.005 | 0.007 | 0.034 | 0.019 | 0.016 | 0.020 |
| LI-32 | 0.001 | 0.009 | - | - | 0.013 | 0.011 | 0.004 | 0.025 | 0.011 | 0.022 |
| LI-33 | 0.001 | 0.010 | - | - | 0.012 | 0.012 | 0.018 | 0.029 | 0.024 | 0.023 |
| LI-34 | 0.007 | 0.018 | - | - | 0.041 | 0.026 | 0.017 | 0.033 | 0.037 | 0.036 |
| HA-1 | - | - | - | - | 0.019 | 0.018 | 0.016 | 0.012 | 0.004 | 0.012 |
| HA-2 | - | - | - | - | 0.001 | 0.008 | 0.017 | 0.024 | 0.000 | 0.015 |
| HR-1 | - | 0.003 | - | - | 0.007 | 0.008 | 0.008 | 0.014 | 0.007* | 0.013 |
| HR-2 | - | - | - | - | 0.000 | 0.002 | 0.000 | 0.023 | - | 0.008 |
| HR-3 | - | - | - | - | 0.004 | 0.015 | 0.009 | 0.014 | 0.000 | 0.014 |
| HR-4 | - | - | - | - | 0.001 | 0.008 | 0.015 | 0.025 | 0.000 | 0.012 |
| HR-5 | - | - | - | - | 0.012 | 0.014 | 0.009 | 0.025 | - | 0.025 |

NOTES:
(1) All Values Are Milligrams Per Liter.
(2) Chlorophyll a Values Are Corrected For Pheopigments.
(3) Values Shown Are Either Single Values Or Averages of 2 Values. *indicates an average of 3 values.
(4) April Values For Stations LI-15 Through LI-34 Consist Of March And April Data.

TABLE 19

RECEIVING WATERWAY: HUDSON RIVER

| WASTEWATER TREATMENT PLANT | DEGREE OF TREATMENT | AVG. DAILY FLOW (MGD) 1975 | AVG. DAILY FLOW (MGD) 1976 | COMPLIANCE WITH TREATMENT R'QMNTS 1975 | COMPLIANCE WITH TREATMENT R'QMNTS 1976 | BASIS FOR NON-COMPLIANCE* |
|---|---|---|---|---|---|---|
| 1. Edgewater | primary | 2.3 | 2.7 | no | no | 3 |
| 2. Hoboken | primary | 18.0 | 14.2 | no | no | 3 |
| 3. Jersey City - East Side | primary | 33.9 | 34.6 | no | no | 3 |
| 4. West New York | primary | 7.3 | 8.7 | no | no | 3 |
| 5. Woodcliff-North Bergen | primary | 1.5 | 1.6 | no | no | 3 |
| | | | | | | |
| | | | | | | |
| | | | | | | |

* See Table 26 for explanatio

TABLE 20.

RECEIVING WATERWAY: UPPER NEW YORK BAY

| WASTEWATER TREATMENT PLANT | DEGREE OF TREATMENT | AVG. DAILY FLOW (MGD) 1975 | AVG. DAILY FLOW (MGD) 1976 | COMPLIANCE WITH TREATMENT RQMNTS 1975 | COMPLIANCE WITH TREATMENT RQMNTS 1976 | BASIS FOR NON-COMPLIANCE * |
|---|---|---|---|---|---|---|
| 6. Military Ocean Terminal | secondary activated sludge | 0.18 | 0.13 | | yes | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

*See Table 26 for explanation.

TABLE 21

RECEIVING WATERWAY: KILL VAN KULL

| WASTEWATER TREATMENT PLANT | DEGREE OF TREATMENT | AVG. DAILY FLOW (MGD) 1975 | AVG. DAILY FLOW (MGD) 1976 | COMPLIANCE WITH TREATMENT R'QMNTS 1975 | COMPLIANCE WITH TREATMENT R'QMNTS 1976 | BASIS FOR NON-COMPLIANCE * |
|---|---|---|---|---|---|---|
| 7. Bayonne | primary | 12.7 | 12.7 | no | no | 3 |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

*See Table 26 for explanation.

TABLE 22

| RECEIVING WATERWAY: NEWARK BAY | | | | COMPLIANCE WITH | | BASIS FOR |
|---|---|---|---|---|---|---|
| WASTEWATER TREATMENT PLANT | DEGREE OF TREATMENT | AVG. DAILY FLOW (MGD) 1975 | 1976 | TREATMENT R'QMNTS 1975 | 1976 | NON-COMPLIANCE * |
| 8. Jersey City - West Side | primary | 22.0 | 23.9 | no | no | 3 |
| 9. Kearny | primary | 2.6 | 2.7 | no | no | 3 |
| 10. Passaic Valley | primary | 250.0 | 250.0 | no | no | 1 |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

*See Table 26 for explanation.

TABLE 23

RECEIVING WATERWAY: ARTHUR KILL

| WASTEWATER TREATMENT PLANT | DEGREE OF TREATMENT | AVG. DAILY FLOW (MGD) 1975 | AVG. DAILY FLOW (MGD) 1976 | COMPLIANCE WITH TREATMENT RQMNTS 1975 | COMPLIANCE WITH TREATMENT RQMNTS 1976 | BASIS FOR NON-COMPLIANCE * |
|---|---|---|---|---|---|---|
| 11. Carteret | primary | 3.0 | 3.0 | no | no | 2 |
| 12. Elizabeth Joint Meeting | primary | 68.6 | 66.7 | no | no | 1 |
| 13. Linden-Roselle | primary | 12.8 | 11.7 | no | no | 1 |
| 14. Rahway Valley Sewerage Authority | secondary activated sludge | 31.4 | 29.5 | yes | yes | - |
| 15. Woodbridge | primary | 4.9 | 4.2 | no | no | 2 |
| | | | | | | |
| | | | | | | |
| | | | | | | |

*See Table 26 for explanation.

TABLE 24

| RECEIVING WATERWAY: RARITAN BAY | | | | COMPLIANCE WITH | | BASIS FOR |
|---|---|---|---|---|---|---|
| WASTEWATER TREATMENT PLANT | DEGREE OF TREATMENT | AVG. DAILY FLOW (MGD) 1975 | 1976 | TREATMENT RQMNTS 1975 | 1976 | NON-COMPLIANCE * |
| 16. Keansburg | primary | 2.3 | 2.0 | no | no | converted to pump station in Jan. 1977 |
| 17. Keyport | primary | 0.8 | 0.9 | no | no | Abandoned in Feb. 1977 |
| 18. Madison Township Sewerage Authority | primary | 1.2 | 0.9 | no | no | 2 |
| 19. Middlesex County Sewerage Authority | primary | 81.5 | 81.5 | no | no | 1 |
| 20. Perth Amboy | primary | 5.4 | 5.2 | no | no | 2 |
| 21. Sayreville-Melrose | primary | 0.04 | 0.04 | no | no | 2 |
| 22. Sayreville-Morgan | primary | 0.3 | 0.3 | no | no | 2 |
| 23. South Amboy | primary | 1.0 | 0.8 | no | no | 2 |

*See Table 26 for explanation.

TABLE 25

RECEIVING WATERWAY: SANDY HOOK BAY

| WASTEWATER TREATMENT PLANT | DEGREE OF TREATMENT | AVG. DAILY FLOW (MGD) 1975 | AVG. DAILY FLOW (MGD) 1976 | COMPLIANCE WITH TREATMENT R'QMNTS 1975 | COMPLIANCE WITH TREATMENT R'QMNTS 1976 | BASIS FOR NON-COMPLIANCE * |
|---|---|---|---|---|---|---|
| 24. Atlantic Highlands | primary | 0.6 | 0.5 | no | no | 2 |
| 25. Highlands | primary | 0.5 | 0.6 | no | no | 2 |
| 26. Highlands Regional | secondary | - | - | - | - | 3 |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

*See Table 26 for explanation.

Table 10

1975 - 1976 BOAT SURVEY DATA

| PARAMETER | HUDSON RIVER | NEWARK BAY | KILL VAN KULL | ARTHUR KILL |
|---|---|---|---|---|
| Fecal Coliform Organisms/100 ml (Summer) | | | | |
| Low | 260 | 640 | 820 | 2200 |
| High | 20000 | 14000 | 8000 | >100000 |
| Average | 4000 | 2400 | 3500 | 17000 |
| No. of Values | 15 | 12 | 4 | 15 |
| Ortho Phosphate Phosphorus | | | | |
| Low | 0.04 | 0.12 | 0.01 | 0.03 |
| High | 0.67 | 1.25 | 0.14 | 1.72 |
| Average | 0.15 | 0.47 | 0.10 | 0.40 |
| No. of Values | 19 | 14 | 4 | 18 |
| Total Phosphate Phosphorus | | | | |
| Low | 0.12 | 0.19 | 0.22 | 0.22 |
| High | 0.17 | 0.39 | 0.24 | 0.38 |
| Average | 0.15 | 0.30 | 0.23 | 0.30 |
| No. of Values | 8 | 5 | 2 | 8 |
| Ammonia Nitrogen | | | | |
| Low | 0.20 | 0.40 | <0.01 | 0.25 |
| High | 1.90 | 1.65 | 0.91 | 4.10 |
| Average | 0.63 | 0.87 | 0.63 | 1.44 |
| No. of Values | 19 | 14 | 4 | 18 |
| Nitrite + Nitrate Nitrogen | | | | |
| Low | 0.30 | 0.38 | 0.42 | 0.40 |
| High | 0.78 | 0.70 | 0.53 | 0.99 |
| Average | 0.49 | 0.58 | 0.49 | 0.59 |
| No. of Values | 11 | 11 | 3 | 14 |
| Total Kjeldahl Nitrogen | | | | |
| Low | 0.33 | 0.78 | 1.44 | 0.88 |
| High | 0.60 | 1.76 | 1.44 | 2.93 |
| Average | 0.46 | 1.40 | 1.44 | 1.59 |
| No. of Values | 4 | 7 | 1 | 7 |
| Phenols | | | | |
| Low | - | 0.074 | 0.080 | 0.064 |
| High | - | 0.074 | 0.080 | 0.095 |
| Average | - | 0.074 | 0.080 | 0.083 |
| No. of Values | - | 1 | 1 | 3 |

Notes:
(1) All values are milligrams/liter, except where indicated.
(2) All averages are arithmetic means except fecal coliforms which are geometric means.
(3) Data are for September 1975 through August 1976.

TABLE C.1 SUMMARY OF DISCHARGERS ELIMINATED OR REGIONALIZED (1971-1983), DELAWARE AND WALLKILL BASINS

| Facility Eliminated or Regionalized | Year Eliminated or Regionalized | Flow (MGD) Eliminated or Regionalized | Receiving Water Discharge Removed From | Reason for Elimination |
|---|---|---|---|---|
| Clayton Borough | 1975 | 0.450 | Still Run (Trib. to Maurice River) | Connect to Gloucester Co. S.A. |
| Deptford Township: | | | | |
| Board of Education | 1975 | 0.012 | Monongahelo Brook (Trib. to Mantua Creek) | " |
| MUA - Cooper Village | 1973 | 0.100 | Woodbury Creek | " |
| MUA - Oak Valley | 1973 | 0.500 | Mantua Creek | " |
| MUA - RCA | 1973 | 0.020 | Tributary to Big Timber Creek | " |
| Robert Barry Apartments | 1973 | 0.030 | Tributary to Big Timber Creek | " |
| Woodbury Terrace Sewerage Corp. | 1973 | 0.120 | Tributary to Big Timber Creek | " |
| East Greenwich Township: | | | | |
| Board of Choseh Freeholders | 1973 | 0.027 | Mantua Creek | " |
| Shady Lane Homes | 1975 | 0.012 | Tributary to Mantua Cr. | " |
| Glassboro Municipal | 1973 | 1.600 | Tributary to Delaware R. | " |
| Mantua Township: | | | | |
| Buckingham Utilities | 1975 | 0.055 | Chestnut Brook (Trib. to Mantua Creek | " |
| Center City Developers | 1973 | 0.175 | Edwards Run (Trib. to Mantua Creek | " |
| Edenwood Sewer Co. | 1975 | 0.110 | Tributary to Mantua Creek | " |
| Mantua Improvement Association | 1973 | 0.030 | Mantua Creek | " |

## C. SUMMARY OF DISCHARGES ELIMINATED OR REGIONALIZED

BASIS FOR NON-COMPLIANCE

1. Secondary Treatment Required

   Construction Underway

2. Secondary Treatment Required

   Plant is to be converted to a pump station with flows diverted to a regional sewage treatment plant

3. Secondary Treatment Required

   Planning Underway

4. Secondary Treatment Required

   Plant is to be abandoned with flows diverted to a regional sewage treatment plant

TABLE 26

TABLE C.1 SUMMARY OF DISCHARGERS ELIMINATED OR REGIONALIZED (1971-1983), DELAWARE AND WALLKILL BASINS

| Facility Eliminated or Regionalized | Year Eliminated or Regionalized | Flow (MGD) Eliminated or Regionalized | Receiving Water Discharge Removed From | Reason for Elimination |
|---|---|---|---|---|
| National Park MUA | 1973 | 0.450 | Woodbury Creek | Connect to Gloucester Co. S.A. |
| Pitman Municipal | 1973 | 0.800 | Chestnut Brook | " |
| Washington Township | | | | |
| Bells Lake Sanitation Company | 1973 | 0.160 | South Branch of Big Timber Creek | " |
| Whitman Square Development | 1973 | 0.300 | South Branch of Big Timber Creek | " |
| West Deptford: | | | | |
| Greenfield Sanitary Improvement Co. | 1973 | 0.275 | Mathews Brook (Trib. to Woodbury Creek) | " |
| Sheel Chemical Co. | 1975 | 2.750 | Delaware River | " |

TABLE C.2 SUMMARY OF DISCHARGERS ELIMINATED OR REGIONALIZED (1971-1983), DELAWARE BASIN

| Facility Eliminated or Regionalized | Year Eliminated or Regionalized | Flow (MGD) Eliminated or Regionalized | Receiving Water Discharge Removed From | Reason for Elimination |
|---|---|---|---|---|
| Industrial: | | | | |
| Fakelstein Farms | 1973 | 0.030 | Cohansey River | Contract Hauling |
| Millville Dyeing and Finishing | 1973 | 0.380 | Maurice River | Closed |
| Northern Dyeing and Fininshing | 1973 | 0.250 | Pohatcong River | Closed |
| Olin Corporation | 1975 | 17.0 | Delaware River | Closed |
| Dupont Co. | 1975 | 2.9 | Delaware River | Diverted to Dupont Deepwater |
| Shell Co. | 1975 | 2.8 | Mantua Creek | Connect to Gloucester Co. S.A. |

TABLE C.3 SUMMARY OF DISCHARGERS ELIMINATED OR REGIONALIZED (1971-1983), SOUTH ATLANTIC COASTAL BASIN

| Facility Eliminated or Regionalized | Year Eliminated or Regionalized | Flow (MGD) Eliminated or Regionalized | Receiving Water Discharge Removed From | Reason for Elimination |
|---|---|---|---|---|
| Beach Haven SA | 1977 | 0.600 | Atlantic Ocean | Connect to Ocean County SA, Southern Area |
| Little Egg Harbor Township, Mystic Islands Sewerage Co. | 1977 | 0.308 | Roses Creek (Trib. to Great Bay) | " |
| Long Beach Township[1] Municipal SA | 1977 | 2.0 | Atlantic Ocean | " |
| Ship Bottom SA[1] | 1977 | 1.2 | Atlantic Ocean | " |
| Stafford Township MUA | 1977 | 0.314 | Tributary to Manahawkin Bay | " |
| Surf City Municipal[1] | 1977 | 0.722 | Atlantic Ocean | " |
| Tuckerton MUA | 1977 | 0.500 | Tuckerton Creek | " |
| | Grand Total | 5.654 | | |
| Egg Harbor Township, National Aviation Experimental Station | 1980 | 0.130 | Gravelly Run (Trib. to Great Egg Harbor River) | Connect to Atlantic County SA, Lower Great Egg Harbor Area |
| Hamilton Township: Atlantic City Race Track | 1980 | 0.019 | Babcock Creek (Trib. to Great Egg Harbor River) | " |
| MUA | 1980 | 0.480 | " | " |
| Zaberer's Restaurant | 1980 | 0.020 | Gravelly Run (Trib. to Great Egg Harbor River) | " |
| | Grand Total = | 0.649 | | |

1. Primary treatment level

TABLE C.3 SUMMARY OF DISCHARGERS ELIMINATED OR REGIONALIZED (1971-1983), SOUTH ATLANTIC COASTAL BASIN

| Facility Eliminated or Regionalized | Year Eliminated or Regionalized | Flow (MGD) Eliminated or Regionalized | Receiving Water Discharge Removed From | Reason for Elimination |
|---|---|---|---|---|
| Atlantic City, City Island Plant[1] | 1978 | 13.500 | Thorofare to Absecon Bay | Connect to Atlantic County SA at City Island (Atlantic City) |
| Brigantine | 1978 | 1.390 | Atlantic Ocean | " |
| Longport[1] | 1978 | 0.421 | Great Egg Harbor | " |
| Margate Ventnor[1] | 1978 | 4.900 | Great Egg Harbor | " |
| Pleasantville | 1978 | 1.060 | Lake's Bay (Tributary to Great Egg Harbor) | " |
| Somers Point | 1978 | 0.925 | Patcong Creek (Tributary to Great Egg Harbor) | " |
| | Grand Total = | 22.196 | | |

1. Primary treatment level

TABLE C.4 SUMMARY OF DISCHARGERS ELIMINATED OR REGIONALIZED (1971-1983), NORTH ATLANTIC COASTAL BASIN

| acility Eliminated r Regionalized | Year Eliminated or Regionalized | Flow (MGD) Eliminated or Regionalized | Receiving Water Discharge Removed From | Reason For Elimination |
|---|---|---|---|---|
| ay Head Municipal | 1977 | 0.500 | Atlantic Ocean | Connect to Ocean County SA Northern Service Area |
| rick Township: | | | | |
| MUA | 1977 | 0.200 | Beaver Dam (Trib. to Metedeconk River) | " |
| MUA | 1977 | 0.040 | Kettle Creek | " |
| MUA | 1978 | 0.400 | Land Disposal | " |
| MUA | 1978 | 0.013 | " " | " |
| Milza Realty | 1978 | 0.015 | Cedar Bridge Brook (Trib. to Metedeconk River) | " |
| Brick Plaza Inc. | 1978 | 0.030 | | " |
| owell Township, Cricket Restaurant | 1978 | 0.006 | North Branch Metedeconk River | " |
| ackson Township: | | | | |
| Brookwood #1 | 1977 | 0.150 | Metedeconk River | " |
| Brookwood #2 | 1977 | 0.150 | " " | " |
| Brookwood #3 | 1977 | 0.300 | " " | " |
| Harmony Sewer Co. | 1978 | 0.144 | " " | " |

TABLE C.4 SUMMARY OF DISCHARGERS ELIMINATED OR REGIONALIZED (1971-1983), NORTH ATLANTIC COASTAL BASIN

| Facility Eliminated or Regionalized | Year Eliminated or Regionalized | Flow (MGD) Eliminated or Regionalized | Receiving Water Discharge Removed From | Reason For Elimination |
|---|---|---|---|---|
| Lakewood Township: | | | | |
| South Lakewood Sewer Company | 1977 | 0.300 | Kettle Creek | Connect to Ocean County SA Northern Service Area |
| N.J. Water Company | 1976 | 1.900 | Metedeconk River | " |
| Maxim Sewerage Corp. (Maxim #3) | 1978 | 0.450 | North Branch Metedeconk River | " |
| Point Pleasant, Board of Education | 1978 | 0.022 | Bay Head | " |
| Point Pleasant Beach[1] Municipal | 1977 | 1.500 | Atlantic Ocean | " |
| | Grand Total = | 6.12 | | |
| Berkeley Township: | | | | |
| Berkeley Township SA | 1978 | 0.500 | Lagoon to Barnegat Bay | Connect to Ocean County SA Central Service Area |
| Berkeley Township SA | 1978 | 0.250 | Clamming Creek (Trib. to Barnegat Bay | " |
| Island Heights Municipal | 1978 | 0.400 | Dillons Creek (Trib. to Toms River) | " |
| Jackson Township, Board of Education | | 0.021 | Toms River | " |

1. Primary 1 1 treatment

TABLE C.4 SUMMARY OF DISCHARGERS ELIMINATED OR REGIONALIZED (1971-1983), NORTH ATLANTIC COASTAL BASIN

| Facility Eliminated or Regionalized | Year Eliminated or Regionalized | Flow (MGD) Eliminated or Regionalized | Receiving Water Discharge Removed From | Reason For Elimination |
|---|---|---|---|---|
| Bellcrest | 1973 | 0.030 | Barnegat Bay | Connect to Dover Township SA (Discharge to Atlantic Ocean) |
| Holiday City | 1973 | 0.250 | Kettle Creek | " |
| Toms River Plant | 1973 | 0.544 | Toms River | " |
| Toms River, Board of Education | 1975 | 0.040 | Applegates Cove | " |
| Berkeley Township | 1978 | 0.500 | Atlantic Ocean | " |
| Lavallette[1] | 1978 | 0.868 | Atlantic Ocean | " |
| Seaside Heights[1] | 1978 | 1.700 | Atlantic Ocean | " |
| Seaside Park[1] | 1978 | 0.960 | Atlantic Ocean | " |
| | Grand Total = | 4.892 | | |
| Belmar | 1977 | 3.0 | Atlantic Ocean | Connect to South Monmouth Regional SA |
| Manasquan[1] | 1977 | 0.702 | Atlantic Ocean | " |
| Sea Girt[1] | 1977 | 0.347 | Atlantic Ocean | " |
| Spring Lake[1] | 1977 | 0.851 | Atlantic Ocean | " |
| Spring Lake Heights[1] | 1977 | 0.447 | Atlantic Ocean | " |
| | Grand Total = | 5.347 | | |

1. Primary level of treatment

TABLE C.4 SUMMARY OF DISCHARGERS ELIMINATED OR REGIONALIZED (1971-1983), NORTH ATLANTIC COASTAL BASIN

| Facility Eliminated or Regionalized | Year Eliminated or Regionalized | Flow (MGD) Eliminated or Regionalized | Receiving Water Discharge Removed From | Reason For Elimination |
|---|---|---|---|---|
| Lacey Township: | | | | |
| N.J. Highway Authority | 1978 | 0.040 | Cedar Creek (Trib. to Barnegat Bay) | Connect to Ocean County SA Central Service Area |
| Forked River Marina | 1978 | 0.006 | Forked River | " |
| Lakehurst Municipal | 1978 | 0.300 | Malapaqua Branch (Trib. to Toms River) | " |
| Manchester Township: | | | | |
| U.S. Navy | | 0.500 | Ridgeway Branch (Trib. to Toms River) | " |
| Ocean Township: | | | | |
| Mid-Jersey S. Co. Inc. | 1978 | 0.085 | Waretown Creek (Trib. to Barnegat Bay) | " |
| Indianola Sewerage Co. | 1978 | 0.100 | Lochial Creek (Trib. to Barnegat Bay) | " |
| Union Township | 1978 | 0.500 | Land Disposal | " |
| | Grand Total = | 2.702 | | |
| INDUSTRIAL: | | | | |
| Charms Company, Freehold Township | 1983 | | Debois Creek | Pretreatment |
| Foster Canning Co., Farmingdale Borough | 1983 | | Marsh Bog Brook | " |
| I. Rokeach & Sons Inc. | 1983 | | Marsh Bog Brook | " |

TABLE C.5 SUMMARY OF DISCHARGERS ELIMINATED OR REGIONALIZED (1971-1983), RARITAN BASIN

| Facility Eliminated or Regionalized | Year Eliminated or Regionalized | Flow (MGD) Eliminated or Regionalized | Receiving Water Discharge Removed From | Reason for Elimination |
|---|---|---|---|---|
| Mainstem Raritan River Segment: | | | | |
| Raritan Borough | 1972 | 0.500 | Raritan River | Connect to Somerset-Raritan |
| Somerville Borough | 1972 | 1.000 | Raritan River | " |
| Branchburg Township | 1972 | Not Available | Not Available | |
| Bridgewater Township | 1972 | Not Available | Not Available | |
| Hillsborough Township | 1972 | Not Available | Not Available | |
| | Grand Total = | Not Available | | |
| Millstone River/Stony Brook Segment: | | | | |
| Princeton | 1978 | 4.0 | Millstone River | Connect to Stony Brook Regional SA |
| South Brunswick | 1978 | 1.5 | Millstone River | " |
| West Windsor (3 plants) | 1978 | 0.16 (total) | Millstone River | " |
| | Grand Total = | 5.66 | | |
| Lawrence Brook/South River Segment: | | | | |
| Central Jersey STP | 1978 | 0.185 | Barclay Brook | Connect to Western Monmouth SA |

TABLE C.5 SUMMARY OF DISCHARGERS ELIMINATED OR REGIONALIZED (1971-1983), RARITAN BASIN

| Facility Eliminated or Regionalized | Year Eliminated or Regionalized | Flow (MGD) Eliminated or Regionalized | Receiving Water Discharge Removed From | Reason for Elimination |
|---|---|---|---|---|
| South Branch Raritan River Segment: | | | | |
| Glen Gardner | 1982 | 0.15 | Spruce Run | Clinton Township |
| Clinton Board of Education | 1982 | 0.04 | Cramer Creek | " " |
| Correctional Institute for Women | 1982 | 0.17 | Beaver Brook | " " |
| | Grand Total = | 0.36 | | |
| North Branch Raritan River Segment: | | | | |
| Flemington (Partial) | 1971 | 0.500 | North Branch Raritan River | Connect to Raritan Township MUA |
| Hunterdon Hospital | 1971 | 0.082 | " | " |
| Standard Pressed Steel | 1971 | 0.500 | " | " |
| | Grand Total = | 1.082 | | |
| Lebanon Cheese | 1980 | 0.01 | Rockaway Creek | Readington-Lebanon SA |
| Round Valley School | 1980 | 0.01 | " " | " |
| Delite Foods | 1980 | 0.007 | " " | " |
| Darling Farms | 1980 | 0.05 | " " | " |
| | Grand Total = | 0.077 | | |

TABLE C.5 SUMMARY OF DISCHARGERS ELIMINATED OR REGIONALIZED (1971-1983), RARITAN BASIN

| Facility Eliminated or Regionalized | Year Eliminated or Regionalized | Flow (MGD) Eliminated or Regionalized | Receiving Water Discharge Removed From | Reason for Elimination |
|---|---|---|---|---|
| Navesink River/Raritan Bay Segment: | | | | |
| Hazlet Township: Beer Street School | 1974 | 0.001 | Luppatacong Creek (Trib.to Raritan Bay) | Connect to Bay-shore |
| Bradlees | 1975 | 0.013 | Flat Creek (Trib. to Raritan Bay) | " |
| Hazlet Township SA | 1974 | 0.188 | Luppatacong Creek | " |
| Holly Hills Mobile Homes | 1974 | 0.005 | Thorn Creek (Trib. to Raritan Bay) | " |
| J.M. Fields | 1974 | 0.007 | Monascunk Creek (Trib. to Raritan Bay) | " |
| K-Mart | 1975 | 0.018 | Monascunk Creek | " |
| Keansburg | 1977 | 2.070 | Raritan Bay | " |
| Keyport | 1977 | 0.900 | Raritan Bay | " |
| Matawan Borough | 1977 | 0.755 | Matawan Creek (Trib. to Raritan Bay) | " |
| Matawan Township (3 plants) | 1980 | 0.750 | Raritan Bay | " |

1. Primary level of treatment

TABLE C.5 SUMMARY OF DISCHARGERS ELIMINATED OR REGIONALIZED (1971-1983), RARITAN BASIN

| Facility Eliminated or Regionalized | Year Eliminated or Regionalized | Flow (MGD) Eliminated or Regionalized | Receiving Water Discharge Removed From | Reason for Elimination |
|---|---|---|---|---|
| Navesink River/Raritan Bay Segment: | | | | |
| Carteret | 1980 | 3.0 | Arthur Kill | Connect to Middlesex County SA |
| Helmetta | 1980 | 0.04 | Manalapan Brook | " |
| Jamesburg | 1980 | 0.25 | Manalapan Brook | " |
| Perth Amboy | 1980 | 10.0 | Raritan Riber | " |
| Woodbridge/Keasby | 1980 | 1.35 | Raritan River | " |
| Woodbridge/Seawaren | 1980 | 1.0 | Arthur Kill | " |
| Sayreville (Z Plants) | 1981 | 0.4 (Total) | Raritan Bay | " |
| South Amboy | 1981 | 1.0 | Raritan Bay | " |
| Old Bridge | 1981 | 1.4 | Raritan Bay | " |
| | Grand Total = | 18.44 | | |
| Highlands | 1981 | 1.0 | Raritan Bay | Atlantic-Highlands Highlands SA |
| Atlantic Highlands | 1981 | 1.0 | " " | " |
| | Grand Total = | 2.0 | | |

TABLE C.5 SUMMARY OF DISCHARGERS ELIMINATED OR REGIONALIZED (1971-1983), RARITAN BASIN

| Facility Eliminated or Regionalized | Year Eliminated or Regionalized | Flow (MGD) Eliminated or Regionalized | Receiving Water Discharge Removed From | Reason for Elimination |
|---|---|---|---|---|
| Navesink River/Raritan Bay Segment: | | | | |
| Middletown Township: | | | | |
| Atlantic Projects Corp. | 1975 | 0.006 | Claypit Crrek (Trib. to Sandy Hook Bay) | Connect to Middletown Twp. STP |
| Fairways and Lincroft | 1973 | 0.035 | Navesink River | " |
| Middletown Creens SA | 1975 | 0.100 | Nut Swamp Brook (Trib. to Sandy Hook Bay) | " |
| Monmouth Sanitation Co. | | | | |
| (Short Crest) | 1973 | 0.120 | Blossom Cove (Trib. to Navesink River) | " |
| St. Catherine's | 1973 | 0.008 | Sandy Hook Bay | " |
| Sea Star Swim Club | - | 0.008 | Waackaack Creek (Trib. to Sandy Hook Bay) | " |
| | Grand Total = | 0.277 | | |
| Camp Charleswood | 1973 | 0.350 | Shrewsbury River | Connect to Northeast Monmouth Co. SA |
| Fort Monmouth | 1973 | 0.500 | " | |
| North Beach Apartments | 1973 | 0.030 | " | |
| Red Bank | 1973 | 1.250 | " | |
| | Grand Total = | 2.130 | | |

TABLE C.5 SUMMARY OF DISCHARGERS ELIMINATED OR REGIONALIZED (1971-1983), RARITAN BASIN

| Facility Eliminated or Regionalized | Year Eliminated or Regionalized | Flow (MGD) Eliminated or Regionalized | Receiving Water Discharge Removed From | Reason for Elimination |
|---|---|---|---|---|
| Navesink River/Raritan Bay Segment (Contd.): | | | | |
| Middletown Township: | | | | |
| Atlantic Highlands Nursing Home Inc. | 1974 | 0.013 | Many Mind Brook (Trib.toRaritan Bay) | Connect to Bayshore Regional SA |
| Board of Education (Junior High School) | 1974 | 0.025 | Wagner's Creek (Trib. to Raritan Bay) | " |
| Board of Education (Senior High School) | 1974 | 0.057 | Compton's Creek (Trib. to Raritan Bay) | " |
| Daisy Maid Launderette | 1974 | 0.028 | Tributary to Compton's Creek | " |
| Food Fair Properites, Inc. | 1974 | 0.050 | Tributary to Compton's Creek | " |
| Howard Johnsons | 1974 | 0.015 | Twin Brook (Trib. to Compton's Creek) | " |
| St. Mary's School | 1974 | 0.060 | Compton's Creek | " |
| Sears Roebuck | 1974 | 0.015 | Maharos Brook (Trib. to Raritan Bay) | " |
| Raritan Township (Monmouth County): | | | | |
| Bayshore Sewerage Co., Inc. | 1974 | 0.550 | Flat Creek | " |
| Family Circle Assoc. Inc. of Keyport, N.J. | 1974 | 0.072 | Flat Creek | " |
| Tulip Realty (Food Fair Stores) | 1974 | 0.020 | Monascunk Creek | " |
| Union Beach: | | | | |
| Board of Education | 1974 | 0.005 | Monascunk Creek (Trib. to Raritan Bay) | " |
| IFF | 1975 | 0.025 | East Creek (Trib.to Raritan Bay) | " |

Grand Total = 5.642

TABLE C.5 SUMMARY OF DISCHARGERS ELIMINATED OR REGIONALIZED (1971-1983), RARITAN BASIN

| Facility Eliminated or Regionalized | Year Eliminated or Regionalized | Flow (MGD) Eliminated or Regionalized | Receiving Water Discharge Removed From | Reason for Elimination |
|---|---|---|---|---|
| Industrial: RCA | 1971 | 0.017 | North Branch Raritan | Pretreatment and diverted to Somerset-Raritan S.A. |
| American Cyanamid | 1972 | 0.060 | Woodbridge Creek | Pretreatment and diverted to Middlesex Co.S.A. |
| Consumer Farmer | 1973 | 0.023 | Cruser's Brook | Closed |
| Daisy Maid Launderette | 1973 | 0.028 | Compton's Creek | Closed |
| Hercules Powder | 1974 | 5000 GPM | South River | Pretreatment and diverted to Middlesex Co.S.A. |
| IFF | 1974 | | Chingorora Creek | Pretreatment and diverted to Bayshore Regional S.A. |
| Phelps Dodge | 1974 | 0.432 | Subsurface | Closed |
| Amenada Hess | 1975 | | Arthur Kill | Closed |
| IFF | 1975 | | East Creek | Pretreatment and diverted to Bayshore Regional S.A. |
| Tenneco | 1975 | 1.00 | Bushkill Brook | Pretreatment and diverted to Raritan Twp MUA |
| Metallurigical International, Inc. | 1972 | .002 | Wampum Brook | Pretreatment and diverted to Mid-Monmouth Industrial STP |
| Sherwin Williams | 1971 | | Raritan River | Closed |

TABLE C.6 SUMMARY OF DISCHARGERS ELIMINATED OR REGIONALIZED (1971-1983), NORTHEAST AREA (Continued)

| Facility Eliminated or Regionalized | Year Eliminated or Regionalized | Flow (MGD) Eliminated or Regionalized | Receiving Water Discharge Removed From | Reason for Elimination |
|---|---|---|---|---|
| Municipal: | | | | |
| Mid-Passaic River Segment: | | | | |
| Fairfield-Deer Park | 1978 | 0.400 | Passaic River | Pequannock, Lincoln Park, and Fairfield S.A. (to Pompton and Passaic Rivers) |
| Fairfield-Curtis Wright | 1978 | 0.250 | Passaic River | " |
| Fairfield-Curtis Wright | 1978 | 0.020 | " " | " |
| Fairfield-Caldwell Airport | " | 0.005 | " " | " |
| Lincoln Park-Nursing Home | 1979 | 0.050 | " " | " |
| Lincoln Park-Municipal | " | 0.070 | " " | " |
| Lincoln Park-Beaver Park | " | 0.070 | " " | " |
| Pequannock-Greenview | " | 0.250 | " " | " |
| | Total | 1.115 | | |

TABLE C.6 SUMMARY OF DISCHARGERS ELIMINATED OR REGIONALIZED (1971-1983), NORTHEAST AREA

| Facility Eliminated or Regionalized | Year Eliminated or Regionalized | Flow (MGD) Eliminated or Regionalized | Receiving Water Discharge Removed From | Reason for Elimination |
|---|---|---|---|---|
| Industrial: | | | | |
| Hackensack River Segment: | | | | |
| Koppers - Coke Plant | 1971 | 0.050 | Hackensack River | Closed |
| Diamond Shamrock-Production Only | 1972 | | Hackensack River | Closed |
| Amerace Esna Molded Products | 1973 | 0.080 | Kikeout Brook | Closed |
| PSE and G Co., Marion Generating | 1974 | 0.075 | Hackensack River | Closed |
| Dalebrook Finishers | 1974 | | Ho-Ho-Kus Brook | |
| Diamond Shamrock | 1975 | | Berry Creek | |
| PVO | 1975 | | Crooked Brook | Closed |
| Wood-Ridge Chemical (Ventnor Inc.) | 1975 | | Berrys Creek | Closed |
| Technical Oil Products | 1976 | | Berrys Creek | |
| Whippany River Segment: | | | | |
| Campbell Soup | 1974 | | Whippany River | Closed |
| Ramapo River Segment: | | | | |
| Cooper Labs | 1977 | 0.006 | Pompton River | |
| Advance Piece Die | 1974 | | Passaic River | Closed |
| Burroughs Corporation | 1974 | 0.015 | Passaic River | Warren Township Municipal to Passaic ver |

## D. CONSTRUCTION PROJECTS COMPLETED

Table D.1 CONSTRUCTION PROJECTS COMPLETED (1971-1975) DELAWARE AND WALLKILL BASINS (continued)

| Name of Facility owner | Year Completed | Location of Facility | Receiving Water | Scope of Project | Level of Treatment | Design flow (MGD) | Total Cost ($) | Regional Systems Dischargers Eliminated | Flow Eliminated (MGD) | Receiving Water |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Mantua Twp: | | |
| | | | | | | | | Buckingham Utilities | 0.055 | Chestnut Brook (trib. to Mantua Cr) |
| | | | | | | | | Center City Developers | 0.175 | Edwards Run (trib. to mantua Cr.) |
| | | | | | | | | Edenwood Sewer Company | 0.110 | Trib. to Mantua Creek |
| | | | | | | | | Mantua Improvement Assoc. | 0.030 | Mantua Creek |
| | | | | | | | | National Park MUA | 0.450 | Woodbury Cr. |
| | | | | | | | | Pitman Munici. | 0.800 | Chestnut Br. |
| | | | | | | | | Washington Twp: (Gloucester Co.): | | |
| | | | | | | | | Bells Lake Sanitation Co. | 0.160 | South Br. Big Timber Cr |
| | | | | | | | | Whitman Sqiare Developers | 0.300 | So. Branch Big Timber Cr |
| | | | | | | | | West Deptford: Greenfield Sanitary Improvement Co. | 0.275 0.275 | Mathews Br. (trib. to Woodbury Cr.) |
| | | | | | | | | Shell Chemical Company | 2.750 | Delaware R. |
| Pemberton Twp. M.U.A. | 1975 | Pemberton Township | North Br. Rancocas Cr. | WWT,IS,PS | Secondary | 2.5 | 7,700,000 | ? | | |

Table D.1

CONSTRUCTION PROJECTS COMPLETED (1971-1975) DELAWARE AND WALLKILL BASINS

| Name of Facility owner | Year Completed | Location of Facility | Receiving Water | Scope of Project | Level of Treatment | Design flow (MGD) | Total Cost ($) | Regional Systems: Dischargers Eliminated | Regional Systems: Flow Eliminated (MGD) | Regional Systems: Receiving Water |
|---|---|---|---|---|---|---|---|---|---|---|
| Gloucester County S.A. | 1972 | West Deptford Township | Delaware R. | WWT, PS, FM, CS, IS | Secondary | 15.0 | 42,000,000 | Clayton Borough SA | 0.450 | Still Run (Trib. to Maurice R.) |
| | | | | | | | | Deptford Twp: Bd. of Educa. | 0.012 | Monogahelo Br (Trib. to Mantua Cr. |
| | | | | | | | | MUA-Cooper Village | 0.100 | Woodbury Cr. |
| | | | | | | | | MUA-Oak Valley | 0.500 | Mantua Cr. |
| | | | | | | | | MUA-RCA | 0.020 | Trib. to Big Timber Cr. |
| | | | | | | | | Robert Barry Apartments | 0.030 | Trib. to Big. Timber Creek. |
| | | | | | | | | Woodbury Terrace Sew. Company | 0.120 | Trib. to Big Timber Cr. |
| | | | | | | | | East Greenwich: Bd. of Chosen Freeholders | 0.027 | Mantua Cr. |
| | | | | | | | | Shady Lane Homes | 0.010 | Trib. to Mantua Cr. |
| | | | | | | | | Glassboro Municipal | 1.600 | Trib. to Mantua Cr. |

Table D.2

CONSTRUCTION PROJECTS TO BE COMPLETED (1976-1983) DELAWARE AND WALLKILL BASINS

| Name of Facility owner | Projected Year of Completion | Location of Facility | Receiving Water | Scope of Project | Level of Treatment | Design flow (MGD) | Total Cost ($) | Dischargers Eliminated | Regional Systems Flow Eliminated (MGD) | Regional Systems Receiving Water |
|---|---|---|---|---|---|---|---|---|---|---|
| Camden Co. MUA | 1983(?) | Undecided | Delaware R. | WWT,IS,PS, FM | Secondary | 100(?) | 400,000,000 | Not Avail. | ---- | ---- |
| Ewing-Lawrence SA | 1979 | Lawrence Twp. | Assumpink Dr. | WWT,IS,PS FM | Tertiary | 16.0 | 16,000,000 | None | ---- | ----- |
| Hamilton Twp. | 1976 | Hamilton Twp, | N/A[1] | IS | N/A | N/A[1] | | None | ----- | ----- |
| Hamilton Twp. | 1978 | Hamilton Twp, | Crosswicks Creek | WWT,IS,PS FM | Secondary | 16.0 | 16,000,000 | Yardville-Groveville Municipal | 0.430 | Doctor's Cr. |
| Mount Holly SA | 1978 | Mt. Holly | Rancocas Creek | WWT,IS,PS, FM | Tertiary | 5.0 | 12,000,000 | None | ---- | ----- |
| Mount Laurel SA | 1979 | Mt. Laurel | Rancoxas Creek | WWT,IS,CS | Tertiary | 3.5 | 11,000,000 | N.J. Turnpike Authority | 0.035 | Rancocas Cr. |
| | | | | | | | | Ramblewood | 0.500 | Pensauken Cr, |
| | | | | | | | | Ramblewood MUA | 0.055 | So. Branch Rancocas Cr. |
| Lambertville SA | 1976 | Stockton | Delaware R. | IS,CS | N/A | ----- | ------ | None | ----- | ----- |
| Sussex County MUA | 1982(?) | Hardystone Township | Wallkill Ri. | WWT,IS,CS | Tertiary | 5.0 | 22,000,000 | ? | | |
| Trenton | 1979 | Trenton | Delaware Ri. | WWT,IS,PS | Secondary | 24.0 | 23,000,000 | None | ----- | -------- |
| Washington Township | 1978 | Hamilton Township | Crosswicks Creek | CS | N/A | N/A | _____ | None | ------ | -------- |

1.) Not Applicable

05P-8

Table D.2

CONSTRUCTION PROJECTS TO BE COMPLETED (1976-1983) DELAWARE AND WALLKILL BASINS

| Name of Facility owner | Projected Year of Completion | Location of Facility | Receiving Water | Scope of Project | Level of Treatment | Design flow (MGD) | Total Cost ($) | Dischargers Eliminated | Regional Systems Flow Eliminated (MGD) | Regional Systems Receiving Water |
|---|---|---|---|---|---|---|---|---|---|---|
| DuPont Company | 1976 | Deepwater | Delaware Ri. | WWT | Advanced | 102.0 | 32,000,000 | None | ------ | ----- |
| American Cyanamid | 1976 | West Windsor | Assumpink Cr. | WWT | Secondary | 0.053 | 130,000 | None | ------ | ----- |
| Hoffman-LaRoche | 1976 | Belvidere | Delaware Ri. | WWT | Secondary | 3.00 | 3,600,000 | None | ------ | ----- |
| Matlack | 1976 | Swedesboro | Racoon Cr. | WWT | Advanced | 0.015 | 442,250 | None | ----- | ----- |
| Mobile Oil | 1976 | Paulsboro | Delaware Ri. | WWT | Advanced | 15.800 | 5,900,000 | None | ----- | ----- |
| Texaco, Inc. | 1976 | West Deptford | Delaware Ri. | WWT | Secondary | 5.7 | 3,700,000 | None | ----- | ----- |

Table D.3 CONSTRUCTION PROJECTS TO BE COMPLETED (1976-1983), SOUTH ATLANTIC COASTAL BASIN

| Name of Facility owner | Year Completed | Location of Facility | Receiving Water | Scope of Project | Level of Treatment | Design flow (MGD) | Total Cost ($) | Regional Systems: Dischargers Eliminated | Regional Systems: Flow Eliminated | Regional Systems: Receiving Water |
|---|---|---|---|---|---|---|---|---|---|---|
| Atlantic County SA Coastal (C-34-344) | 1978 | City Island (Atlantic City) | Atlantic Ocean | WWT, PS, IS, FM | Secondary | 40.0 | 123,508,000 | City Island Plant[1] | 13.5 | Beach Thoro-fare to Absecon Bay |
| | | | | | | | | Brigantine | 1.390 | Atlantic Ocean |
| | | | | | | | | Longport[1] | 0.421 | Great Egg Harbor |
| | | | | | | | | Margate Ventnor[1] | 4.9 | Great Egg Harbor |
| | | | | | | | | Pleasantville | 1.060 | Lakes's Bay |
| | | | | | | | | Somers Point | 0.925 | Patcong Creek (Trib. to Great Egg Harbor) |
| Atlantic County SA, Little Great Harbor Area | 1980 | Hamilton Township | Great Egg Harbor River | WWT | Advanced Secondary | 2.0 | | Egg Harbor Township, National Aviation Experimental Station | 0.130 | Gravelly Run (Trib. to Great Egg Harbor Rvr.) |
| | | | | | | | | Hamilton Township: Atlantic City Race Track | 0.019 | Babcock Crk. (Trib. to Great Egg Harbor Rvr.) |
| | | | | | | | | MUA | 0.480 | Babcock Crk. |
| | | | | | | | | Zaberer's Restaurant | 0.020 | Gravelly Run |

1. Primary level of treatment

Table D.3 CONSTRUCTION PROJECTS TO BE COMPLETED (1976-1983) SOUTH ATLANTIC COASTAL BASIN

| Name of Facility owner | Year Completed | Location of Facility | Receiving Water | Scope of Project | Level of Treatment | Design flow (MGD) | Total Cost ($) | Regional Systems Dischargers Eliminated | Flow Eliminated | Receiving Water |
|---|---|---|---|---|---|---|---|---|---|---|
| Ocean County SA Southern Service Area (C-34-379) | 1976 | Long Beach Island | N/A | IS,PS | N/A | N/A | 8,500,000 | None | - | - |
| Ocean County SA Southern Service Area (C-34-371) | 1977 | | | IS,PS, LS,WWT | Secondary | 20 | 88,000,000 | Beach Haven SA | 0.600 | Atlantic Ocean |
| | | | | | | | | Little Egg Harbor Twp., Mystic Islands Sewerage Co. | 0.308 | Roses Creek (Trib. to Great Bay) |
| | | | | | | | | Long Beach Twp., Municipal SA[1] | 2.0 | Atlantic Ocean |
| | | | | | | | | Ship Bottom SA[1] | 1.2 | Atlantic Ocean |
| | | | | | | | | Stafford Twp. MUA | 0.314 | Trib. to Manahawkin Bay |
| | | | | | | | | Surf City Municipal[1] | 0.722 | Atlantic Ocean |
| | | | | | | | | Tuckerton MUA | 0.500 | Tuckerton Cr. |

1. Primary level of treatment

Table D. 4 CONSTRUCTION PROJECTS COMPLETED (1971-1975) NORTH ATLANTIC COASTAL BASIN

| Name of Facility (Owner) | Year Completed | Location of Facility | Receiving Water | Scope of Project | Level of Treatment | Design Flow (MGD) | Total Cost ($) | Regional Systems: Dischargers Eliminated | Regional Systems: Flow Elimin. (MGD) | Regional Systems: Receiving Water |
|---|---|---|---|---|---|---|---|---|---|---|
| Dover Township SA (C-34-216) | 1975 | Ortley Beach | Atlantic Ocean | PS,IS,FM WWT | Secondary | 12.0 | 20,391,000 | Bellcrest (1973) | 0.030 | Barnegat Bay |
| | | | | | | | | Holiday City (1973) | 0.250 | Kettle Creek |
| | | | | | | | | Toms River: Board of Education (1975) | 0.040 | Applegates Cove (Trib. to Barnegat Bay) |
| | | | | | | | | Toms River Plant (1973) | 0.544 | Toms River |
| | | | | | | | | Berkeley Twp. (1979) | 0.500 | Atlantic Ocean |
| | | | | | | | | Lavallette[1] (1978) | 0.868 | Atlantic Ocean |
| | | | | | | | | Seaside[1] Heights (1978) | 1.7 | Atlantic Ocean |
| | | | | | | | | Seaside Park (1978) | 0.960 | Atlantic Ocean |
| Borough of Mantoloking (C-34-507) | 1978 | — | None | FM,PS,CS | N/A | N/A | 3,456,200 | None | --- | ---- |
| Neptune Twp. (Shark River C-34-315) | 1977 | Neptune Twp. | None | PS,FM | N/A | N/A | 408,200 | None | --- | ---- |

1. Primary level of treatment

Table D.5

CONSTRUCTION PROJECTS TO BE COMPLETED (1976-1983) NORTH ATLANTIC COASTAL BASIN

| Name of Facility (Owner) | Proposed Year of Project Completion | Location of Facility | Receiving Water | Scope of Project | Level of Treatment | Design Flow (MGD) | Total Cost ($) | Regional Systems | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Dischargers Eliminated | Flow Elimin. (MGD) | Receiving Water |
| Bayshore Regional SA (C-34-462) | | Union Beach | Atlantic | FM,PS,CS WWT Expansion | N/A | N/A | 10,414,000 | ---- | ---- | ---- |
| Borough of Barnegat Light (C-34-0543001) | 1976 | | N/A | CS,PS | N/A | N/A | 1,580,605 | None | ---- | ---- |
| Brick Twp. MUA (C-34-448) | 1978 | Brick Twp. | N/A | FM,CS,PS | N/A | N/A | 59,684,800 | None | ---- | ---- |
| Borough of Fieldsboro (C-34-455) | 1976 | Fieldsboro | N/A | CS,PS,FM | N/A | N/A | ? | None | ---- | ---- |
| Borough of Harvey Cedars (C-34-0544) | 1976 | ---- | N/A | CS,PS | N/A | N/A | 1,303,363 | None | ---- | ---- |
| Long Beach SA (C-34-499) | 1976 | ---- | N/A | CS | N/A | N/A | 1,500,000 | None | ---- | ---- |
| Long Branch SA (C-34-356) | 1976 | Long Branch | Atlantic Ocean | WWT (Expansion and upgrade), outfall | Secondary | 5.4 | 9,890,000 | None | ---- | ---- |
| Neptune Twp. | 1976 | Neptune Trp. | N/A | LS,CS | N/A | N/A | 2,066,450 | None | ---- | ---- |
| Borough of Point Pleasant (C-34-0479-01) | 1977 | ---- | N/A | FM,PS,CS | N/A | N/A | 18,633,800 | None | ---- | ---- |

Table D.5

CONSTRUCTION PROJECTS TO BE COMPLETED (1976-1983) NORTH ATLANTIC COASTAL BASIN

| Name of Facility (Owner) | Proposed Year of Project Completion | Location of Facility | Receiving Water | Scope of Project | Level of Treatment | Design Flow (MGD) | Total Cost ($) | Regional Systems: Dischargers Eliminated | Regional Systems: Flow Elimin. (MGD) | Regional Systems: Receiving Water |
|---|---|---|---|---|---|---|---|---|---|---|
| South Monmouth Regional SA (C-34-377) | 1977 | Wall Township | Atlantic Ocean | WWT, Ocean Diffuser, FM, IS, CS, PS | Secondary | 8.5 | 28,307,000 | Belmar | 3.0 | Atlantic Ocean |
| | | | | | | | | Manasquan[1] | 0.702 | Atlantic Ocean |
| | | | | | | | | Sea Girt[1] | 0.347 | Atlantic Ocean |
| | | | | | | | | Spring Lake[1] | 0.851 | Atlantic Ocean |
| | | | | | | | | Spring Lake[1] Heights | 0.447 | Atlantic Ocean |
| INDUSTRIAL: | | | | | | | | | | |
| Charms Co. | 1983 | Freehold Twp. | Debois Creek | WWT | Secondary | 0.09 | 30,000 | N/A | N/A | N/A |
| Foster Canning Company | 1983 | Farmingdale Borough | Marsh Bog Br. | WWT | Secondary | 0.134 | 35,000 | N/A | N/A | N/A |
| I. Rokeach & Sons, Inc. | | Farmingdale Borough | Marsh Bog Br. | WWT | Secondary | 0.164 | 100,000 | N/A | N/A | N/A |

1. Primary level of treatment

Table D.5

CONSTRUCTION PROJECTS TO BE COMPLETED (1976-1983) NORTH ATLANTIC COASTAL BASIN (Continued)

| Name of Facility (Owner) | Proposed Year of Project Completion | Location of Facility | Receiving Water | Scope of Project | Level of Treatment | Design Flow (MGD) | Total Cost ($) | Regional Systems | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Dischargers Eliminated | Flow Elimin (MGD) | Receiving Water |
| Ocean County SA Northern (C-34-356) (continued) | | | | | | | | Lakewood Township: | | |
| | | | | | | | | South Lakewood Sewer Co. (1978) | 0.300 | Kettle Creek |
| | | | | | | | | N.J. Water Co. (1978) | 1.9 | Metedeconk River |
| | | | | | | | | Maxim Sew. Corp. (1978) | 0.450 | |
| | | | | | | | | Point Pleasant Bd. of Education (1978) | 0.002 | Bay Head |
| | | | | | | | | Point Pleasant Beach[1] Municipal (1978) | 1.5 | Atlantic Ocean |

1. Primary level of treatment.

Table D.6

CONSTRUCTION PROJECTS COMPLETED (1976-1983) RARITAN BASIN

| Name of Facility (Owner) | Year Completed | Location of Facility | Receiving Water | Scope of Project | Level of Treatment | Design flow (MGD) | Total Cost ($) | Regional Systems Dischargers Eliminated | Regional Systems Flow (MGD) Eliminated | Regional Systems Receiving Water |
|---|---|---|---|---|---|---|---|---|---|---|
| Mainstem Raritan River Segment: | | | | | | | | | | |
| Somerset Raritan Valley SA (C-34- | 1977 | Somerville | Cuckholds Brook | WWT | Secondary | 10.0 | Not Available | Not Available | – | – |
| Bridgewater Township: | | | | | | | | | | |
| (C-34-597) | 1978 | Bridgewater | N/A | CS | – | – | 2,800,000 | – | – | – |
| (C-34-368-1) | 1980 | Bridgewater | N/A | IS | – | – | 5,500,000 | – | – | – |
| (C-34-638-11) | 1980 | Bridgewater | N/A | CS | – | – | 2,500,000 | – | – | – |
| (C-34-456) | 1980 | Branchburg | N/A | CS | – | – | 2,000,000 | – | – | – |
| (C-34-575) | 1981 | Hillsborough | N/A | CS | – | – | 4,500,000 | – | – | – |
| Warren Township (C-34-469) | 1980 | Warren | – | CS | N/A | – | 3,500,000 | N/A | – | – |
| Manville Borough (C-34-578) | 1981 | Manville | Raritan River | WWT | Secondary | 2.0 | 1,000,000 | None | – | – |
| Greenbrook (C-34-604) | 1981 | Greenbrook | – | CS | N/A | – | 1,500,000 | N/A | – | – |
| Watchung Borough (C-34-0470) | 1979 | Watchung | Raritan River | Sludge CS | N/A | – | 1,300,000 | None | – | – |
| North Plainfield (C-34-0470) | 1980 | North Plainfield | Raritan River | IS | N/A | – | 2,000,000 | None | – | – |

Table D.6

CONSTRUCTION PROJECTS COMPLETED (1971-1975) RARITAN BASIN

| Name of Facility(owner) | Year Completed | Location of Facility | Receiving Water | Scope of Project | Level of Treatment | Design flow (MGD) | Total Cost ($) | Regional Systems Dischargers Eliminated | Regional Systems Flow (MGD) Eliminated | Regional Systems Receiving Water |
|---|---|---|---|---|---|---|---|---|---|---|
| North Branch Raritan River Segment: | | | | | | | | | | |
| Raritan Twp. MUA (C-34-262) | 1971 | Raritan Township | North Branch Raritan River | WWT,PS, IS | Tertiary | 1.6 | 2,200,000 | Flemington | 0.500 | North Branch |
| | | | | | | | | Hunterdon Hospital | 0.082 | " |
| | | | | | | | | Standard Pressed Steel | 0.500 | |
| Roxbury | 1971 | Roxbury | Lamington River | WWT,IS | Tertiary | 1.0 | | | | |
| Mainstem Raritan River Segment: | | | | | | | | | | |
| Somerset Raritan Valley S.A. | 1972 | Bridgewater Township | Raritan River | WWT | Secondary | 10.0 | 5,000,000 | Raritan Borough | 0.500 | Raritan Ri. |
| | | | | | | | | Somerville | 1.000 | Raritan Ri. |
| | | | | | | | | Hillsborough Twp. | Not Avail. | Not Avail. |
| | | | | | | | | Bridgewater Twp. | " | |
| | | | | | | | | Branchburg Twp. | " | |

Table D.6

CONSTRUCTION PROJECTS COMPLETED (1971-1975) RARITAN BASIN

| Name of Facility(owner) | Year Completed | Location of Facility | Receiving Water | Scope of Project | Level of Treatment | Design flow (MGD) | Total Cost ($) | Regional Systems Dischargers Eliminated | Regional Systems Flow (MGD) Eliminated | Regional Systems Receiving Water |
|---|---|---|---|---|---|---|---|---|---|---|
| Navesink River/Raritan Bay Segment: | | | | | | | | | | |
| Bayshore Regional S.A. | 1971 1974 & 1975 | Union Beach | Atlantic | WWT,FM, IS,PS,CS | Secondary | 6.0 | 13,100,000 | Hazlet Township: | | |
| | | | | | | | | Bradlees | 0.013 | Flat Creek (Trib. to Raritan Bay) |
| | | | | | | | | Beer St. Sch. | 0.001 | Luppatacong Creek (Trib. to Raritan Bay) |
| | | | | | | | | Hazlet Twp. SA | 0.188 | Luppatacong Creek |
| | | | | | | | | Holly Hill Mobile Homes | 0.005 | Thorn Creek (trib. to Raritan Bay) |
| | | | | | | | | J.M. Fields | 0.007 | Monascunk Cr. (Trib. to Raritan Bay) |
| | | | | | | | | K-Mart | 0.018 | Monascunk Cr. |
| | | | | | | | | Middletown Township: | | |
| | | | | | | | | Atlantic Highlands Nursing Home Inc. | 0.013 | Many Mind Brook (Trib. to Raritan Bay) |
| | | | | | | | | Board of Education Junior (H.S.) | 0.025 | Wagner's Creek (Trib. to Raritan Bay) |
| | | | | | | | | Board of Education Senior (H.S.) | 0.057 | Compton's Creek (Trib. to Raritan Bay) |

Table D.6

CONSTRUCTION PROJECTS COMPLETED (1971-1975) RARITAN BASIN

| Name of Facility (owner) | Year Completed | Location of Facility | Receiving Water | Scope of Project | Level of Treatment | Design flow (MGD) | Total Cost ($) | Regional Systems Dischargers Eliminated | Regional Systems Flow (MGD) Eliminated | Regional Systems Receiving Water |
|---|---|---|---|---|---|---|---|---|---|---|
| Navesink River/Raritan Bay Segment (Cont'd): | | | | | | | | | | |
| Bayshore Regional S.A. (Cont'd) | | | | | | | | | | |
| | | | | | | | | Daisy Maid Launderette | 0.028 | Trib. to Compton's Cr. |
| | | | | | | | | Food Fair Properties Inc. | 0.050 | Trib. to Compton's Cr. |
| | | | | | | | | Howard Johnsons | 0.015 | Twin Brook (Trib. to Compton's Cr) |
| | | | | | | | | St. Mary's School | 0.060 | Compton's Cr. |
| | | | | | | | | Sears Roebuck | 0.015 | Maharos Brk. (Trib. to Raritan Bay) |
| | | | | | | | | Raritan Township (Monmouth County): | | |
| | | | | | | | | Bayshore Sewerage Co., Inc. | 0.550 | Flat Creek (Trib. to Raritan Bay) |
| | | | | | | | | Family Circle Assoc. Inc. of Keyport, N.J. | 0.072 | Flat Creek |
| | | | | | | | | Tulip Realty Corp. (Food Fair Stores) | 0.020 | Monasconk Cr. |
| | | | | | | | | Union Beach: | | |
| | | | | | | | | Board of Education | 0.005 | Conaskunk Cr. (Trib. to Raritan Bay) |
| | | | | | | | | IFF | 0.025 | East Creek (Trib. to Raritan Bay) |

Table D.6

CONSTRUCTION PROJECTS COMPLETED (1971-1975) RARITAN BASIN

| Name of Facility(Owner) | Year Completed | Location of Facility | Receiving Water | Scope of Project | Level of Treatment | Design flow (MGD) | Total Cost ($) | Regional Systems: Dischargers Eliminated | Regional Systems: Flow (MGD) Eliminated | Regional Systems: Receiving Water |
|---|---|---|---|---|---|---|---|---|---|---|
| Navesink River/Raritan Bay Segment (Cont'd): | | | | | | | | | | |
| Middletown Township STP | 1973 | Middletown Township | Atlantic Ocean | WWT, IS, PS, FM | Secondary | 6.5 | 20,000,000 | Middletown Township: Atlantic Proj. | 0.006 | Claypit Cr. (Trib. to Sandy Hook Bay) |
| | | | | | | | | Fairways & Lincroft | 0.035 | |
| | | | | | | | | Middletown Grns. SA | 0.100 | Nut Swamp Brook (Trib. to Sandy Hook Bay) |
| | | | | | | | | Monmouth Sanitation Co. (Short Crest) | 0.120 | Blossom Cove (Trib. to Navesink R.) |
| | | | | | | | | St. Catherines | 0.008 | Tidal ditch (Trib. to Sandy Hook) |
| | | | | | | | | Sea Star Swim Club | 0.008 | Waackaack Cr. (Trib. to Sandy Hook Bay) |
| Monmouth County Bayshore Outfall Authority (C-34-325) | 1974 | Monmouth Co. (serving Bayshore SA, Northeast Monmouth County SA, Atlantic Highlands, and Highlands) | Atlantic Ocean | IS, PS, FM | Ocean outfall | 33.0 | 12,201,000 | Bayshore Regional SA | 6.0 | Raritan Bay |
| | | | | | | | | Belford SA | 6.5 | Raritan Bay |
| | | | | | | | | Atlantic Highland | 2.0 | Sandy Hook |
| | | | | | | | | Highlands (proposed) | 0.6 | Sandy Hook Bay |

Table D.6

CONSTRUCTION PROJECTS COMPLETED (1971-1975) RARITAN BASIN

| Name of Facility (owner) | Year Completed | Location of Facility | Receiving Water | Scope of Project | Level of Treatment | Design flow (MGD) | Total Cost ($) | Regional Systems: Dischargers Eliminated | Regional Systems: Flow (MGD) Eliminated | Regional Systems: Receiving Water |
|---|---|---|---|---|---|---|---|---|---|---|
| Navesink River/Raritan Bay Segment (Cont'd): | | | | | | | | | | |
| Northeast Monmouth County SA (C-34-2311) | 1973 | Monmouth Beach | Atlantic Ocean | WWT, IS, PS, FM | Secondary | 10.0 | 20,000,000 | Camp Charles Wood | 0.350 | Shrewsbury R. |
| | | | | | | | | Fort Monmouth | 0.500 | Shrewsbury R. |
| | | | | | | | | Monmouth Beach Apartments | 0.030 | Shrewsbury R. |
| | | | | | | | | Red Bank | 1.250 | Shrewsbury R. |
| Rahway Valley SA (C-34-273) | 1973 | Rahway | Arthur Kill | WWT | Secondary | 42.0 | 19,058,000 | None | - | - |

Table D.7

CONSTRUCTION PROJECTS COMPLETED (1976-1983) RARITAN BASIN

| Name of Facility(owner) | Year Completed | Location of Facility | Receiving Water | Scope of Project | Level of Treatment | Design flow (MGD) | Total Cost ($) | Regional Systems Dischargers Eliminated | Flow (MGD) Eliminated | Receiving Water |
|---|---|---|---|---|---|---|---|---|---|---|
| South Branch Raritan River Segment: | | | | | | | | | | |
| Raritan Township MUA (C-34-485) | 1981 | Raritan Twp. | South Branch Raritan River | WWT,CS,IS | Advanced | 3.0 | 8,000,000 | N/A | – | – |
| Clinton Township (C-34-530) | 1982 | Clinton Area | South Branch Raritan River | WWT,PS,FM IS | Advanced | 3.5 | 5,000,000 | Glen Gardner | 0.15 | Spruce Run |
| | | | | | | | | Clinton Board of Education | 0.04 | Cramer Cr. |
| | | | | | | | | Correctional Institute for Women | 0.17 | Beaver Br. |
| North Branch Raritan River Segment: | | | | | | | | | | |
| Readington-Lebanon SA (C-34-535) | 1980 | Readington | Rockaway Creek | WWT,PS,FM IS | Advanced | 1.3 | 5,000,000 | Lebanon Cheeso | 0.01 | Rockaway Cr. |
| | | | | | | | | Round Valley School | 0.01 | " " |
| | | | | | | | | Delite Foods | 0.007 | " " |
| | | | | | | | | Darling Farms | 0.05 | " " |
| (C-34-577) | 1980 | Readington | – | CS | N/A | – | 1,500,000 | N/A | – | – |
| (C-34-577) | 1981 | Readington | – | CS | N/A | – | 450,000 | N/A | – | – |
| (C-34-509) | 1980 | Lebanon | – | CS | N/A | – | 700,000 | N/A | – | – |

Table D.7

CONSTRUCTION PROJECTS COMPLETED (1976-1983) RARITAN BASIN

| Name of Facility(owner) | Year Completed | Location of Facility | Receiving Water | Scope of Project | Level of Treatment | Design flow (MGD) | Total Cost ($) | Regional Systems: Dischargers Eliminated | Regional Systems: Flow (MGD) Eliminated | Regional Systems: Receiving Water |
|---|---|---|---|---|---|---|---|---|---|---|
| Millstone River/Stony Brook Segment: | | | | | | | | | | |
| Stoney Brook Regional SA: (C-34-400-01) | 1977 | Princeton | Millstone River | WWT | Advanced | 10.0 | 28,000,000 | Princeton | 4.0 | Millstone River |
| | | | | | | | | South Brunswick | 1.5 | Millstone River |
| | | | | | | | | West Windsor (3 Plants) | 0.16 (total) | Millstone River |
| (C-34-491) | 1979 | West Windsor | N/A | CS | - | - | 6,000,000 | - | - | - |
| (C-34-400-02) | 1979 | Princeton | N/A | IS | - | - | Not Available | - | - | - |
| (C-34-400-03) | 1981 | Hopewell | Bedens Brook | WWT | Advanced | 0.5 | 1,200,000 | - | - | - |
| (C-34-441) | 1977 | Hopewell | N/A | CS | - | - | 2,400,000 | - | - | - |
| (C-34-400-04) | 1981 | Pennington | Stony Brook | WWT | Advanced | 0.6 | 1,500,000 | - | - | - |
| (C-34-444) | 1977 | Pennington | N/A | CS | - | - | 2,300,000 | - | - | - |
| (510-71-4184A) | 1976 | South Brunswick Township | N/A | IS,PS,FM | - | - | Not Available | - | - | - |
| East Windsor MUA (C-34-599) | 1981 | East Windsor | Millstone River | WWT | Advanced | 4.0 | 5,000,000 | - | - | - |
| Lawrence Brook/South River Segment: | | | | | | | | | | |
| Western Monmouth SA (C-34-380-1) | 1976 | Marlboro | Matchaponix Brook | WWT, IS | Secondary | 4.4 | 17,300,000 | None | - | - |
| (C-34-452) | 1978 | Marlboro | - | PS,FM | - | - | Not Available | Central Jersey STP | 0.185 | Barclay Brook |
| (C-34-380-2) | 1980 | Marlboro | Matchaponix | WWT | Advanced | 4.4 | 2,500,000 | None | - | - |

Table D.7

CONSTRUCTION PROJECTS COMPLETED (1976-1983) RARITAN BASIN

| Name of Facility(owner) | Year Completed | Location of Facility | Receiving Water | Scope of Project | Level of Treatment | Design flow (MGD) | Total Cost ($) | Regional Systems: Dischargers Eliminated | Regional Systems: Flow (MGD) Eliminated | Regional Systems: Receiving Water |
|---|---|---|---|---|---|---|---|---|---|---|
| Navesink River/Raritan Bay Segment (Cont'd): | | | | | | | | | | |
| Bayshore Regional SA: (C-34-462-01) | 1977 | Union Beach | Atlantic Ocean | WWT Expansion | Secondary | 6.0 | 11,000,000 | Keansburg | 2.070 | Raritan Bay |
| | | | | | | | | Keyport | 0.900 | Raritan Bay |
| (C-34-462-02) | Not Avail. | Union Beach | Atlantic Ocean | WWT Expansion | Secondary | 8.0 | Not Available | Matawan Borough | 0.800 | Raritan Bay |
| (C-34-697) | 1981 | Matawan Twp. | - | IS | N/A | - | Not Available | Matawan Township | 0.750 | Matawan Creek |
| | | | | | | | | Matawan (3 plants) | 1.2 | Raritan Bay |
| Linden-Roselle SA: (C-34-0299-01) | 1978 | Linden | Raritan Bay | FM WWT,CS,PS | Secondary | 17.0 | 2,000,000 | None | - | - |
| (C-34-682) | 1981 | Linden | - | Land Based Sludge | | N/A | 17,000,000 | N/A | - | - |
| Essex-Union County JM: (C-34-340) | 1978 | Elizabeth | Arthur Kill | WWT | Secondary | 78.0 | 47,000,000 | None | - | - |
| (C-34-686) | 1981 | Elizabeth | - | Land Based | - | - | 30,000,000 | None | - | - |
| Atlantic Highlands Highlands SA (C-34-519) | 1981 | Highlands | Atlantic Ocean | WWT, IS | Secondary | 2.0 | 4,000,000 | Highlands | 1.0 | Raritan Bay |
| | | | | | | | | Atlantic Highlands | 1.0 | Raritan Bay |
| Middletown SA: (C-34-685) | 1981 | Middletown | - | Land Based Sludge | - | - | 8,000,000 | - | - | - |
| Northeast Monmouth Regional SA: (C-34-684) | 1981 | Oceanport | - | Land Based Sludge | - | - | 5,000,000 | - | - | - |
| Rahway Valley SA: (C-34-0681) | 1981 | Rahway | - | Land Based | - | N/A | 14,000,000 | N/A | - | - |

Table D.7 CONSTRUCTION PROJECTS COMPLETED (1976-1983) RARITAN BASIN

| Name of Facility (owner) | Year Completed | Location of Facility | Receiving Water | Scope of Project | Level of Treatment | Design flow (MGD) | Total Cost ($) | Regional Systems: Dischargers Eliminated | Regional Systems: Flow (MGD) Eliminated | Regional Systems: Receiving Water |
|---|---|---|---|---|---|---|---|---|---|---|
| Navesink River/Raritan Bay Segment (Cont'd): | | | | | | | | | | |
| Middlesex County SA: (C-34-342) | 1977 | Sayreville | Raritan Bay | WWT | Secondary | 120.0 | 84,000,000 | Seawaren/ Woodbridge | 1.0 | Arthur Kill |
| | 1980 | Sayreville/ Bound Brook | - | IS | N/A | 240.0 | 100,000,000 | Woodbridge Keasby | 1.35 | Raritan R. |
| | | | | | | | | Perth Amboy | 10.0 | Raritan R. |
| | | | | | | | | Carterette | 3.0 | Arthur Kill |
| | | | | | | | | Jamesburg | 0.25 | Manalapan Brk |
| | | | | | | | | Helmelta | 0.04 | Manalapan Brk |
| Cranbury Township (C-34-0506-01) | 1977 | Cranbury | - | CS,PS,FM | N/A | - | 2,000,000 | - | - | - |
| Edison Township (C-34-334) | 1976 | Edison Twp. | - | CS,FM,PS IS | N/A | - | Not Available | - | - | - |
| (C-34-428) | 1980 | Edison Twp. | - | IS,PS,FM | N/A | - | 3,000,000 | - | - | - |
| Woodbridge (C-34-433) | 1981 | Woodbridge | Raritan Bay | PS,FM,IS | N/A | - | 15,000,000 | - | - | - |
| Perth Amboy (C-34-435) | 1981 | Perth Amboy | Raritan Bay | PS,FM | N/A | - | 3,000,000 | - | - | - |
| Carteret (C-34-451) | 1981 | Carteret | Raritan Bay | PS,FM | N/A | - | 3,000,000 | - | - | - |
| Monroe Township MUA: (C-34-672) | 1979 | Monroe Twp. | Raritan Bay | PS,FM, IS,CS | N/A | | 5,300,000 | - | - | - |
| Sayreville/South Amboy (C-34-326) | 1981 | Sayreville South Amboy | Raritan Bay | IS,PS,FM | N/A | - | 8,000,000 | Sayreville 2 plants | 0.4(total) | Raritan Bay |
| | | | | | | | | South Amboy | 1.0 | Raritan Bay |
| Old Bridge (C-34-672) | 1981 | Old Bridge | Raritan | PS,PM | N/A | - | 4,000,000 | Old Bridge | 1.4 | |

Table D.7

CONSTRUCTION PROJECTS COMPLETED (1976-1983) RARITAN BASIN

| Name of Facility (owner) | Year Completed | Location of Facility | Receiving Water | Scope of Project | Level of Treatment | Design flow (MGD) | Total Cost ($) | Regional Systems Dischargers Eliminated | Regional Systems Flow (MGD) Eliminated | Regional Systems Receiving Water |
|---|---|---|---|---|---|---|---|---|---|---|
| Interstate Sanitation Commission Segment: | | | | | | | | | | |
| Passaic Valley Sewerage Commission | | | | | | | | | | |
| (C-34-318) | 1976 | Newark | New York Bay | Head End Facilities | Secondary | 300.0 | 19,300,000 | None | – | – |
| (C-34-401) | " | " | " | Chlorine Facilities | N/A | N/A | 1,000,000 | None | – | – |
| (C-34-511-01) | " | " | " | IS | " | " | 314,000 | None | – | – |
| (C-34-0683) | 1981 | Newark | Atlantic Ocean | Land Based Sludge Disposal | – | – | 50,000,000 | N/A | – | – |
| (C-34-0369) | 1982 | Newark | New York Bay | WWT | Secondary | 300.0 | 450,000,000 | None | – | – |
| Edgewater Borough: | | | | | | | | | | |
| (C-34-433) | 1980 | Edgewater | Hudson River | WWT | Secondary | 4.4 | 4,000,000 | None | – | – |
| Hudson County SA: | | | | | | | | | | |
| (C-34-399) | 1982 | Jersey City | Hackensack River | WWT,IS | Secondary | 25.0 | 35,000,000 | North Bergen | 10.0 | Hackensack River |
| | 1982 | Jersey City | Hudson River | WWT | Secondary | 36.0 | 25,000,000 | None | – | – |
| (C-34-581) | 1982 | Bayonne | Arthur Kill | WWT | Secondary | 20.0 | 14,000,000 | None | – | – |
| (C-34-582) | 1982 | West New York | Hudson River | WWT | Secondary | 10.0 | 16,000,000 | None | – | – |
| | 1982 | Hoboken | Hudson River | WWT | Secondary | 20.0 | 23,000,000 | North Bergen | 3.4 | Hudson River |

## Table D.9

CONSTRUCTION PROJECTS TO BE COMPLETED (1976-1983), NORTHEAST AREA (Continued)

| Name of Facility (owner) | Year Completed | Location of Facility | Receiving Water | Scope of Project | Level of Treatment | Design flow (MGD) | Total Cost ($) | Regional Systems: Dischargers Eliminated | Regional Systems: Flow (MGD) Eliminated | Regional Systems: Receiving Water |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Caldwell Airport | 0.005 | Passaic R. |
| | | | | | | | | Lincoln Park: | | |
| | | | | | | | | Beaver Park | 0.070 | Pompton R. |
| | | | | | | | | Municipal | 0.070 | " " |
| | | | | | | | | Nursing Home | 0.050 | " " |
| | | | | | | | | Pequannock, Greenview | 0.250 | Pompton R. |
| Wayne Township | N/A | Wayne Twp. | Signac Br. and Passaic River | WWT | | | 7,038,509 | None | ---- | ---- |

## Table D.9

### CONSTRUCTION PROJECTS TO BE COMPLETED (1976-1983), NORTHEAST AREA

| Name of Facility (owner) | Year Completed | Location of Facility | Receiving Water | Scope of Project | Level of Treatment | Design flow (MGD) | Total Cost ($) | Regional Systems: Dischargers Eliminated | Regional Systems: Flow (MGD) Eliminated | Regional Systems: Receiving Water |
|---|---|---|---|---|---|---|---|---|---|---|
| **Hackensack River Segment:** | | | | | | | | | | |
| Bergen County | N/A | Little Ferry | Hackensack R. | Phase I WWT | Secondary | 62.5 | | | ---- | ---- |
| | | | | Phase II WWT | Secondary | 75.0 | 10,120,000 | None | | |
| Bergen County SA: Allendale, Park Ridge, Woodcliff Lake | N/A | N/A | | IS | ---- | ---- | 2,701,000 | None | | |
| Bergen County SA: Washington | N/A | N/A | ---- | IS | ---- | ---- | 1,986,000 | None | | |
| Montvale Boro | N/A | Montvale Borough | N/A | IS | ---- | ---- | 1,080,000 | None | ---- | ---- |
| **Upper Passaic River Segment:** | | | | | | | | | | |
| New Providence Borough | N/A | New Providence Borough | Passaic R. | WWT | Secondary | ---- | 84,550 | None | ---- | ---- |
| Livingston Twp. | N/A | Livingston Township | Passaic R. | WWT | Secondary | N/A | 6,221,689 | None | ---- | ---- |
| **Whippany River Segment:** | | | | | | | | | | |
| Hanover SA | 1979 | Hanover Twp. | Whippany R. | WWT | Secondary | 3.0 | ? | None | ---- | ---- |
| Parsippany-Troy Hills Township | 1976 | Parsippany-Troy Hill Twp. | Whippany and Passaic Rivers | WWT | Secondary | | 31,185,200 | None | ---- | ---- |
| **Ramapo River Segment:** | | | | | | | | | | |
| Pequannock, Lincoln Park, and Fairfield SA | N/A | | Pompton and Passaic Rivers | WWT | Advanced | 75.0 | 33,081,000 | Fairfield: | | |
| | | | | | | | | Deer Park | 0.400 | Passaic Ri. |
| | | | | | | | | Curtis Wright | 0.250 | " " |
| | | | | | | | | Curtis Wright | 0.020 | " " |

## Table D.8

CONSTRUCTION PROJECTS COMPLETED (1971-1975), NORTHEAST AREA

| Name of Facility (owner) | Year Completed | Location of Facility | Receiving Water | Scope of Project | Level of Treatment | Design flow (MGD) | Total Cost ($) | Regional Systems: Dischargers Eliminated | Regional Systems: Flow (MGD) Eliminated | Regional Systems: Receiving Water |
|---|---|---|---|---|---|---|---|---|---|---|
| Hackensack River Segment: | | | | | | | | | | |
| Bergen County SA | 1972 | Little Ferry | Hackensack R. | Hackensack IS | N/A | N/A | 19,960,000 | None | ---- | ---- |
| Bergen County SA | 1973 | Little Ferry | Hackensack R. | North Valley IS | N/A | N/A | | None | ---- | ---- |
| Passaic Valley Water Commission | 1975 | Newark | N/A | Sludge Facility | N/A | N/A | 4,688,000 | None | ---- | ---- |