ABSTRACT

A water quality study of Proctor Creek in September, 1967, revealed grossly polluted conditions from the approximate area of Simpson Street (between Stations 1 and 2) to the Chattahoochee River. The stream was devoid of macroinvertebrate fauna at Stations 3, 4 and 5. Station 1 at Burbank Drive was clean.

A WATER QUALITY STUDY OF PROCTOR CREEK

A water quality study including biological, bacteriological and chemical data was requested by the Director of the Water Quality Surveys Service to determine the effects of organic and other undetermined wastes on Proctor Creek, Fulton County.

No generalizations can be made regarding the chemical data - at least a dozen separate collections would be necessary to obtain a seasonal view of the stream. The one collection made, however, should reflect extreme stream conditions since samples were taken in the late summer after a lengthy drought when flows were very low. Biological data, on the other hand, reflects stream conditions over an extended period and is quite conclusive. All three parameters (biological, bacteriological and chemical) complemented each other in reaching the same conclusion regarding this stream.

Proctor Creek has its origin immediately west of downtown Atlanta near Hunter Street. It flows in a northwesterly direction alongside the Southern Railway Company's Inman Yards and enters the Chattahoochee River at Highway 285. The stream is short in length and the flow is not great; however, the pollution load (from the appearance of the stream bed and the minimal chemical data) appears to be very heavy.

NATURE OF WASTES AND EFFECT ON AQUATIC LIFE

For the greater part of its length Proctor Creek flows through an economically depressed area where all manner of garbage and refuse is contributed to the stream. The problem is further

complicated in that the entire watershed is urban. The major sources of pollution appear to be both industrial and domestic in origin. One point of massive pollution which obliterated all macroinvertebrate life and discolored the stream was a broken manhole located immediately north of Rice Street on a tributary entering the Creek between Stations 2 and 3. Oils from Southern Railway's Inman Yards enter the stream above Station 4. Runoff with accompanying oils and detergents from a service station at Station 2 was seen to enter the creek. Evidence of domestic sewage was clearly observed at Station 2.

The major waste material received by Proctor Creek is organic. Organic wastes exert an oxygen demand and lower the dissolved oxygen in stream water. In an unpolluted stream with abundant dissolved oxygen, there will be found many different species of organisms representing many major groups of animals. When the dissolved oxygen drops to approximately 3 or 4 mg/l and lower, entire groups of organisms will be eliminated. With the increased amount of organic matter used as a food supply and competition from the pollution sensitive organisms eliminated, animals (such as the snail, Physa, which does not depend upon dissolved oxygen) which can withstand the adverse polluted conditions undergo a population explosion. One will encounter few species of organisms, but there will be enormous numbers of animals belonging to each species. This is the situation in Proctor Creek at Station 2 where there is a marked increase in the number of air-breathing snails.

PROCEDURE:

In September, 1967, a number of stations were established on Proctor Creek. Bacteriological and chemical samples were taken on September 26, 1967, and biological specimens were collected on September 22, 1967. Station locations were as follows:

1. Burbank Drive — Fulton County
2. Highway 278 — Fulton County
3. Johnson Road — Fulton County
4. Hollywood Road — Fulton County
5. Highway 70 — Fulton County

Station 1 was located above all known waste sources. Station 2 was located below an overflowing sewer line. Station 3 was located below the point where effluent from a ruptured manhole enters the stream via a tributary. Stations 4 and 5 were located below Inman Yards.

Organisms were picked from substrata with jeweler's tweezers and preserved in vials of 75% alcohol. The common sense minnow seine was used usually in a futile attempt to capture crayfishes and large aquatic insects. Crayfishes were sent to the U.S. National Museum for confirmation of identification. Other specimens were retained in the files of the Division. The presentation of biological data in the appendix was adapted from formats used by the Institute of Paper Chemistry.

This study was of a qualitative nature; however, similar conditions (for example, riffle areas) were sought at all stations and the same amount of collecting time was expended at each station. Therefore some valid comparison of the relative number of animals

can be drawn between the two productive stations. When possible, large permanent pieces of debris or stones were selected for sampling to insure that the life on them would be characteristic of the ecological area under consideration. It is possible for small pieces of debris with their fauna to float downstream from other ecological areas. This is a minor problem with Proctor Creek since this stream appears to be devoid of macroscopic life throughout much of its course.

In an attempt to summarize biological data and present it in a form immediately acceptable to persons trained in fields other than biology, it was decided to apply the work of the Trent River Board (England) cited by Klein in River Pollution (Volume 2). The biotic index varies from 0-10 with 0 representing grossly polluted conditions and 10 representing extremely clean conditions. The biotic index is especially applicable to streams such as Proctor Creek which are polluted by organic material. Please refer to the biotic index graph in the appendix.

The tables in the appendix of this report contain data pertaining to the biological life of the stream as well as chemical information. The figure in the right column of the biological tables refers to the number of individuals of each genus collected.

Identification of the organisms was made with the aid of the following keys:

1. Hobbs, Horton H., Jr., Key to the Crayfishes of Georgia. Personal communication.
2. Pennak, Robert W., Freshwater Invertebrates of the United States. The Ronald Press Company, New York, 1953.

3. Usinger, Robert L., Aquatic Insects of California. University of California Press, Berkeley, 1963.

4. Ward, Henry B. and Whipple, George C., Freshwater Biology. John Wiley and Sons, Inc. New York, 1963.

OBSERVATIONS:

Station 1 (Burbank Drive) was located on the uppermost reach of Proctor Creek above all known major waste sources; however, the stream receives urban surface runoff. The creek at this point was only 6' wide and not more than 6" deep with a bottom of stones and sand. The stones provided an excellent habitat for organisms. The water was clear and the current was moderate-fast in this riffle area. Considering the urban character of the area, there was little trash in the stream. There was a slight amount of detergent foam on the water. The biological situation was not what one would normally find in a very clean stream. Stonefly larvae, several genera of mayfly larvae and caddisfly larvae would be encountered; however, only one genus (Ameletus) of mayfly larvae was present at this station. It is considered a pollution sensitive form. The facultative and tolerant portions of the faunal spectrum were as expected from a clean stream with no one group present in enormous numbers. The percentage of intolerant organisms was 11 and the biotic index was 6 on a scale of 0-10. Due to the large number of mayfly larvae present and the diversity and distribution of the other organisms, the stream at this point was considered CLEAN. The chemical and bacteriological data supported the biological conclusions - the dissolved oxygen was high (7.8 mg/1) and the biochemical oxygen demand was low (0.3 mg/1). The fecal coliform count (4,300 MPN) on the day that chemical samples were taken was

not high enough to indicate pollution by domestic sewage.

Station 2 was located on Proctor Creek at Highway 278. The stream was 15' wide and about 3"-6" deep with a bottom of small stones and sand. The stream appeared deceptively clean from the bridge - the water was a transparent blue green color caused by the growth of a green alga on the bottom. Runoff from an automobile dealer service station entered the stream at this point contributing its oils and detergent to the already polluted creek. The stream water had the appearance of domestic sewage upon close examination. There were extensive sludge banks. The bottoms of stones were jet black and a typical sludge odor was noted when they were overturned. Sphaerotilus and green algae growths were prfuse and extensive. The biological situation was in keeping with the above description. No pollution sensitive organisms were collected - only two genera of facultative animals were encountered. Four tolerant organisms were present: Tendipes, Psychoda, Culex and Physa. Culex and Physa require no dissolved oxygen. Physa was present in profuse numbers. The intolerant percentage of organisms was 0 and the biotic index was a low 3. Stream condition was diagnosed as POLLUTED. The chemical data were in accord with the biological conclusions - dissolved oxygen dropped to 3.0 mg/1 and the biochemical oxygen demand increased to 5.5 mg/1. The fecal coliform count increased to 230,000 MPN which was an indication of the presence of domestic sewage.

Station 3 was located on Proctor Creek at Johnson Road. The stream at this point was about 15' wide and 6" deep. The bottom was

composed of sand and stones which were covered with a growth of Sphaerotilus. The current was moderate-fast in the riffle area which was sampled for organisms downstream from the bridge. At no station on Proctor Creek was pollution so visibly apparent than at this point. The stream water was an opaque milk white. Large amounts of garbage and refuse had been thrown into the stream. Despite a careful and intensive search in an area which would have been productive in an unpolluted situation, no organisms were collected. This is the worst extreme of the biological spectrum - a complete absence of macroinvertebrates. Despite the negative aesthetic qualities of many animals tolerant to pollution, banks of sludge worms would be preferable and more desirable than a biological void. Of course, the intolerant percentage of organisms was 0 and the biotic index was 0. The stream condition was diagnosed as GROSSLY POLLUTED. The dissolved oxygen decreased to 1.2 mg/1 and the biochemical oxygen demand increased to 37 mg/1. The fecal coliform count rose to 23,000,000 MPN. These parameters also indicated the introduction to the stream of large amounts of wastes between Stations 2 and 3.

Station 4 which was located at Hollywood Road was similar to Station 3. The stream was 50' wide in the collecting area 100' downstream from the bridge and approximately 3" deep. The water color was a slate grey green which, according to personnel of the City of Atlanta pumping station adjacent to this point, changes color periodically. The current was moderate-swift. The collecting area would have been ideal in an unpolluted stream. There were many stones of varying sizes to which aquatic animals might adhere. The stones in the riffle area were very slick with a healthy growth

of Sphaerotilus. All stone bottoms were jet black - there were also extensive sludge banks. When a stone was removed, a black colored sludge would spread for several feet. Despite the excellent substrata, a long and careful search revealed no macroinvertebrates. Intolerant percentage of organisms was 0 and the biotic index was 0. Stream condition was GROSSLY POLLUTED. Other data indicate extreme pollution. Dissolved oxygen was 0.0 and biochemical oxygen demand was >62 mg/1. The fecal coliform count was 240,000,000 MPN. It is significant that this station area, the most polluted part of the stream, is used for water contact recreation in warm months.

Station 5 located at Highway 70 was the last point sampled before the stream enters the river. The creek was 40' wide at the bridge and about 6" deep. The water was a polluted-looking grey green color. Current was slow-moderate and there was considerable detergent foam. Abundant growths of Sphaerotilus and green algae were present. A jet black sludge coat was present on the underside of all stones. A foetid odor was noted when stones were disturbed. Construction and land clearing for an interstate highway had contributed large amounts of sand to the stream. Many stones, sticks and debris provided abundant substrate for organisms; however, none were found. The stream was sterile for macroinvertebrates. The intolerant percentage of organisms was 0 and the biotic index was 0. Stream condition was considered GROSSLY POLLUTED. Dissolved oxygen was 1.0 mg/1 and the biochemical oxygen demand was 48 mg/1. Fecal coliform remained very high at 23,000,000 MPN.

Submitted November 10, 1967.

Edward T. Hall, Jr.
Biologist

Max W. Walker
Biologist

APPENDIX

STATION 1

MACROSCOPIC BENTHIC BIOTA		BURBANK DRIVE
SCIENTIFIC NAME	COMMON NAME	ABUNDANCE
INTOLERANT GENERA		
EPHEMEROPTERA	MAYFLY LARVAE	
Ameletus sp.		94
FACULTATIVE GENERA		
DECAPODA	CRAYFISHES	
Cambarus latimanus		21
DIPTERA	TRUE FLY LARVAE	
Simulium vittatum		
larvae		2
pupae		1
Tendipedidae		
Genus 1		2
Genus 2		34
Genus 3		24
GASTROPODA	SNAILS	
Ferrissia sp.		4
TOLERANT GENERA		
DIPTERA	TRUE FLY LARVAE	
Tendipes sp.		1
GASTROPODA	SNAILS	
Physa sp.		3

Collecting site in stream: 10' downstream from bridge

Substrata: Stones, papers, sticks

Current: Moderate-fast

Depth: 6"

Shore vegetation: Liquidambar, Quercus, Ligustrum, Liriodendron tulipifera

STATION 2

MACROSCOPIC BENTHIC BIOTA — HIGHWAY 278

SCIENTIFIC NAME	COMMON NAME	ABUNDANCE
INTOLERANT GENERA		
NONE		
FACULTATIVE GENERA		
DIPTERA	TRUE FLY LARVAE	
EPHYDRIDAE		
Brachydeutera sp. (pupa)		1
CERATOPOGONIDAE		
Atrichopogon sp.		2
TOLERANT GENERA		
DIPTERA	TRUE FLY LARVAE	
Culex sp.		
larvae		7
pupa		1
Tendipes sp.		3
Psychoda sp.		2
GASTROPODA	SNAILS	
Physa sp.		84

Collecting site in stream: 50' downstream from bridge

Substrata: Debris, sticks

Current: Moderate

Depth: 3" - 6"

Shore vegetation: *Melia*, *Salix*, *Ligustrum*, grasses

STATION 3

MACROSCOPIC BENTHIC BIOTA JOHNSON ROAD

STERILE FOR MACROINVERTEBRATES

Collecting site in stream: 50' downstream from bridge

Substrata: Stones, debris

Current: Moderate-fast

Depth: 6"

Shore vegetation: Salix, Prunus, grasses, Ligustrum

STATION 4

MACROSCOPIC BENTHIC BIOTA HOLLYWOOD ROAD

STERILE FOR MACROINVERTEBRATES

Collecting site in stream: 100' downstream from bridge

Substrata: Stones, debris

Current: Moderate-fast

Depth: 3"-6"

Shore vegetation: Platanus, Carya, Solidago

STATION 5

MACROSCOPIC BENTHIC BIOTA HIGHWAY 70

STERILE FOR MACROINVERTEBRATES

Collecting site in stream: At bridge

Substrata: Stones, sticks, leaves, debris

Current: Slow-moderate

Depth: 6"

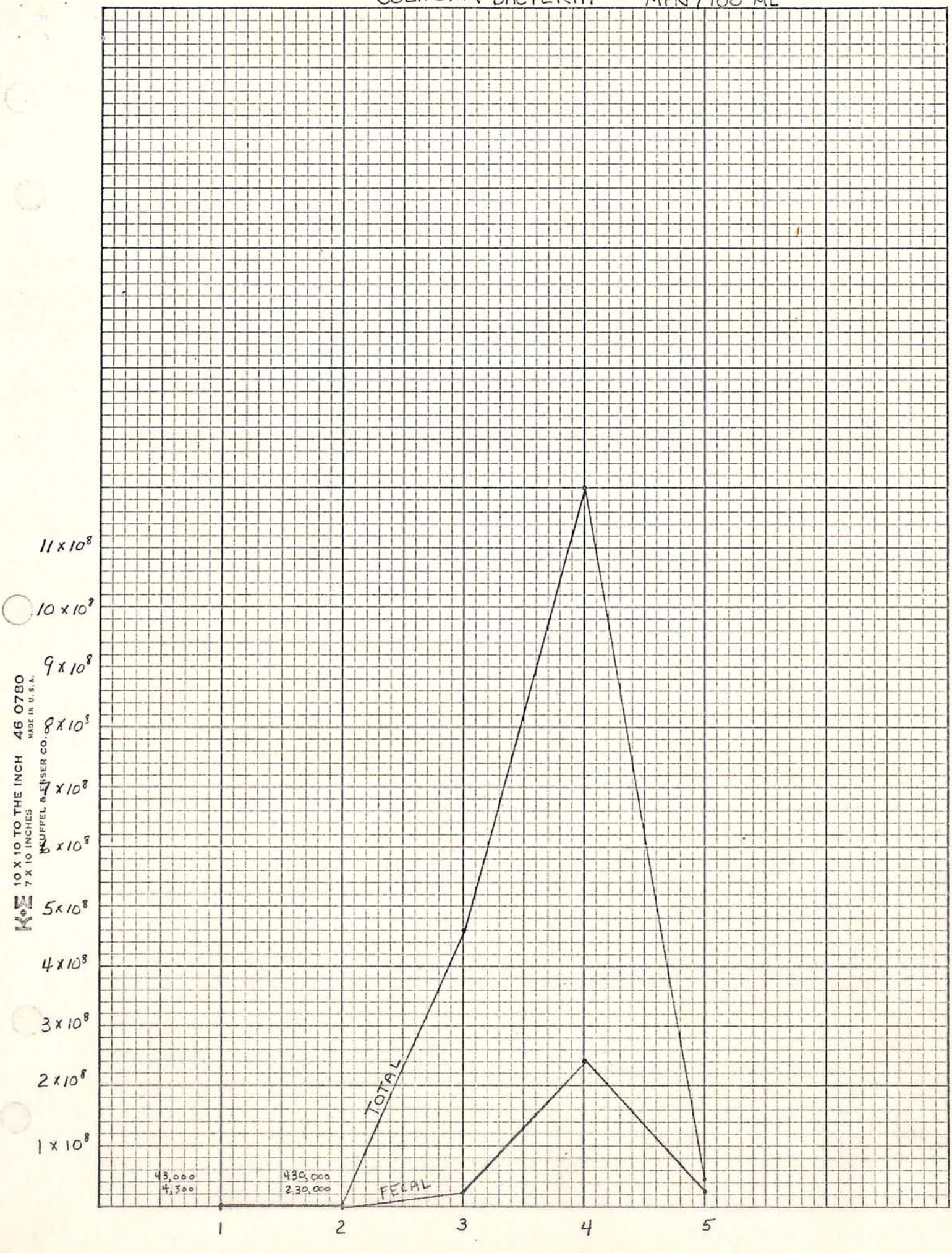
Shore vegetation: No vegetation - adjacent areas recently cleared for highway construction.

SUMMARY OF DATA

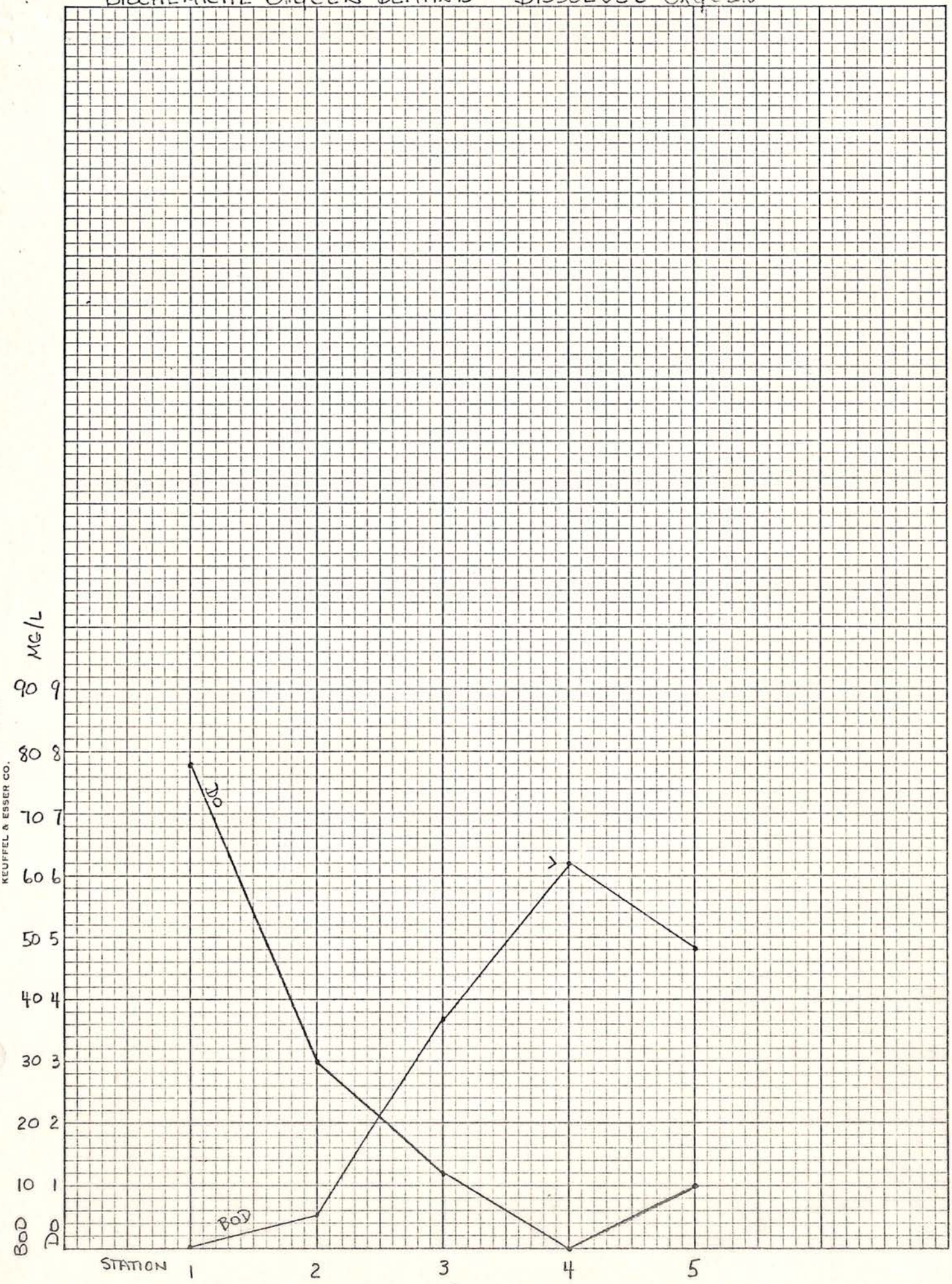
STATION	NUMBER OF GENERA INTOLERANT	FACULTATIVE	TOLERANT	PER CENT INTOLERANT	DIAGNOSIS
1	1	6	2	11	CLEAN
2	0	2	4	0	POLLUTED
3	0	0	0	0	GROSSLY POLLUTED
4	0	0	0	0	GROSSLY POLLUTED
5	0	0	0	0	GROSSLY POLLUTED

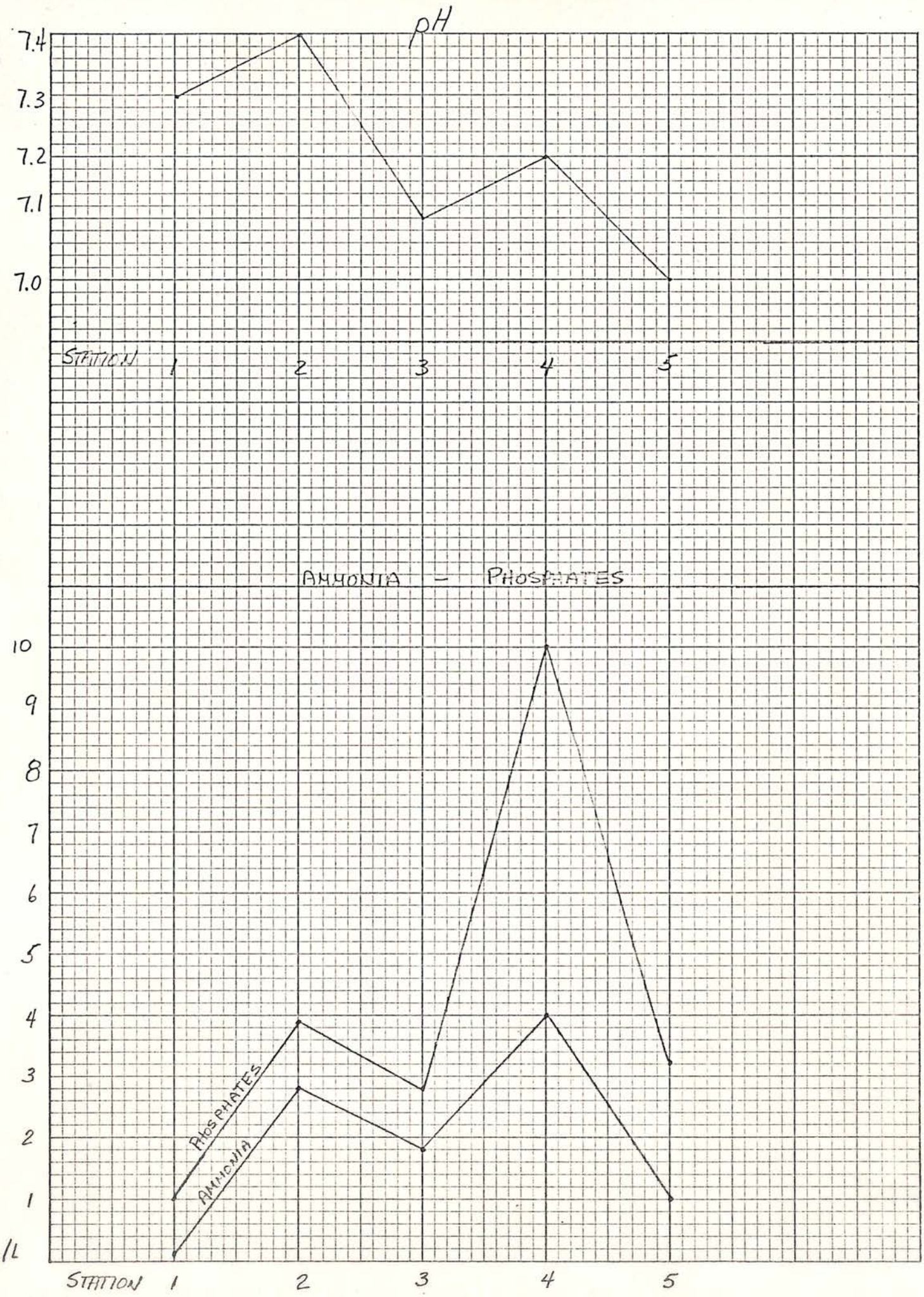
BIOTIC INDEX

1	=	6
2	=	3
3	=	0
4	=	0
5	=	0

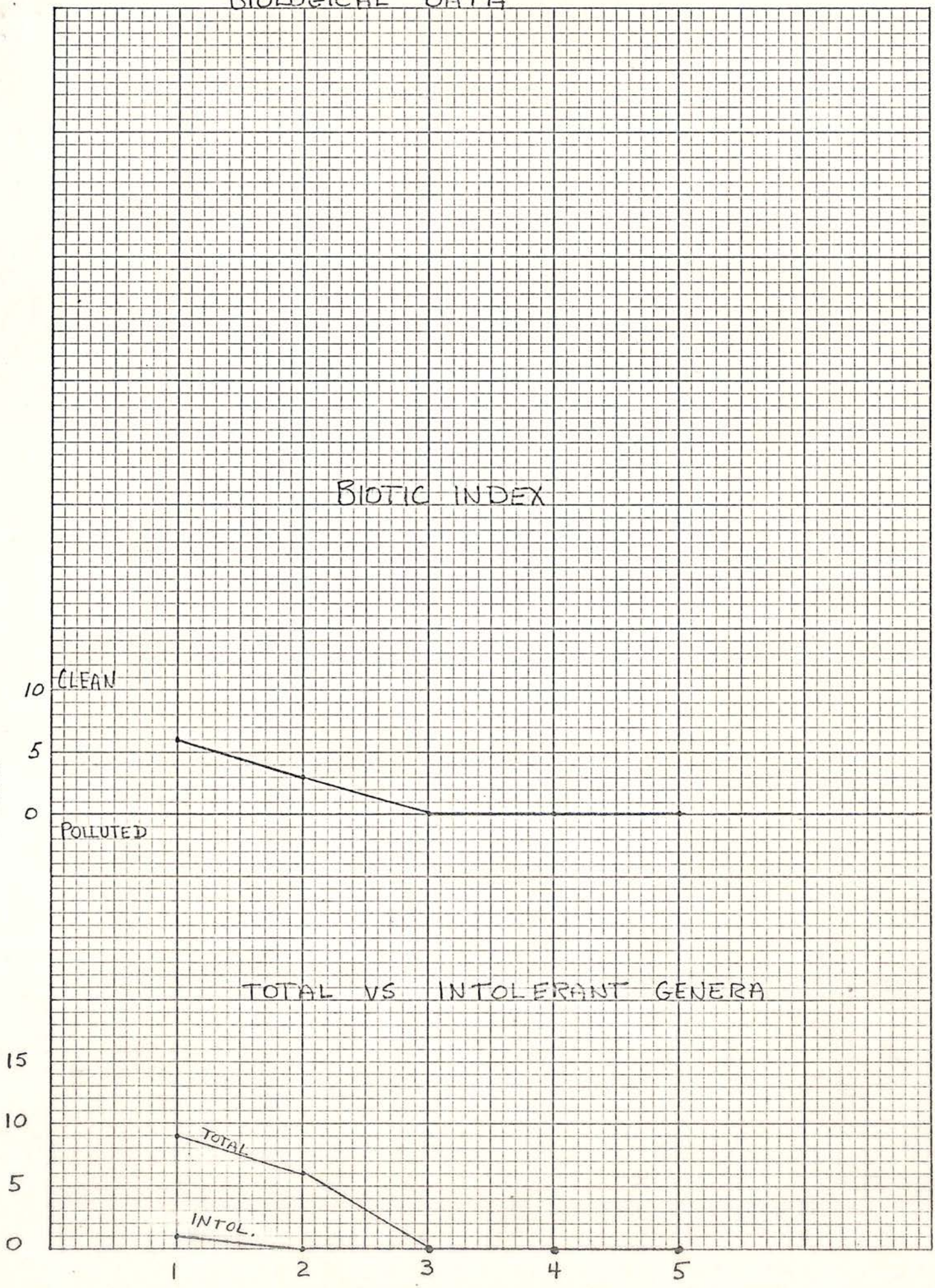

COLIFORM BACTERIA - MPN/100 ML
11 x 10^8
10 x 10^8
9 x 10^8
8 x 10^8
7 x 10^8
6 x 10^8
5 x 10^8
4 x 10^8
3 x 10^8
2 x 10^8
1 x 10^8
TOTAL
FECAL
43,000
4,300
430,000
230,000
1
2
3
4
5
10 X 10 TO THE INCH 46 0780
7 X 10 INCHES
KEUFFEL & ESSER CO.
MADE IN U.S.A.

BIOCHEMICAL OXYGEN DEMAND - DISSOLVED OXYGEN





BIOLOGICAL DATA



GEORGIA WATER QUALITY CONTROL BOARD
DIVISION FOR GEORGIA WATER QUALITY CONTROL
47 Trinity Avenue, S.W.
Atlanta, Georgia 30334

LABORATORY REPORT

SOURCE OF WATER SAMPLE	MUNICIPALITY	COUNTY
PROCTOR CREEK	ATLANTA	FULTON

SAMPLES COLLECTED BY	DATE COLLECTED	DATE TEST REPORTED	EXAMINED BY
HALL & WALKER	9/26/67	10/4/67	O.W. K.W.

SAMPLE NUMBER	STATION NUMBER	TIME SAMPLE TAKEN	TEMP OF SAMPLE °C	TEMP. OF AIR °C	SPECIFIC LOCATION AND SOURCE OF SAMPLE
1	1	A.M. 11:00	18.5°C	68°F	
2	2	A.M. 10:45	20°C	68°F	
3	3	A.M. 10:20	19.5°C	68°F	
4	4	A.M. 10:00	18.5°C	67°F	
5	5	A.M. 9:40	18.5°C	67°F	
6					

TEST

INDICATE (X) TEST(S) REQUIRED FOR EACH SAMPLE. RESULTS ARE RECORDED IN MILLIGRAMS PER LITER

Sample Number	1	2	3	4	5	6
Chemical Bottle Number						
ALKALINITY - TOTAL (As CaCO3)	46	126	84	166	90	
OXYGEN (DISSOLVED)	7.8	3.0	1.2	0.0	1.0	
OXYGEN DEMAND (BIOCHEMICAL)	0.3	5.5	37.0	62	48	
SOLIDS - FILTRABLE						
SOLIDS - NON-FILTRABLE	13.6	21.6	117	116	78	
SOLIDS - TOTAL	110	256	323	709	354	
SOLIDS-TOTAL VOLATILE	47	78	109	302	157	
SOLIDS -VOLATILE SUSPENDED	11.8	15.0	55.5	79	53	
PHOSPHATE	1.0	3.9	2.8	10.0	3.2	
AMMONIA (N)	0.1	2.8	1.8	4.0	1.0	
MGAS					3.8	
pH	7.3	7.4	7.1	7.2	7.0	

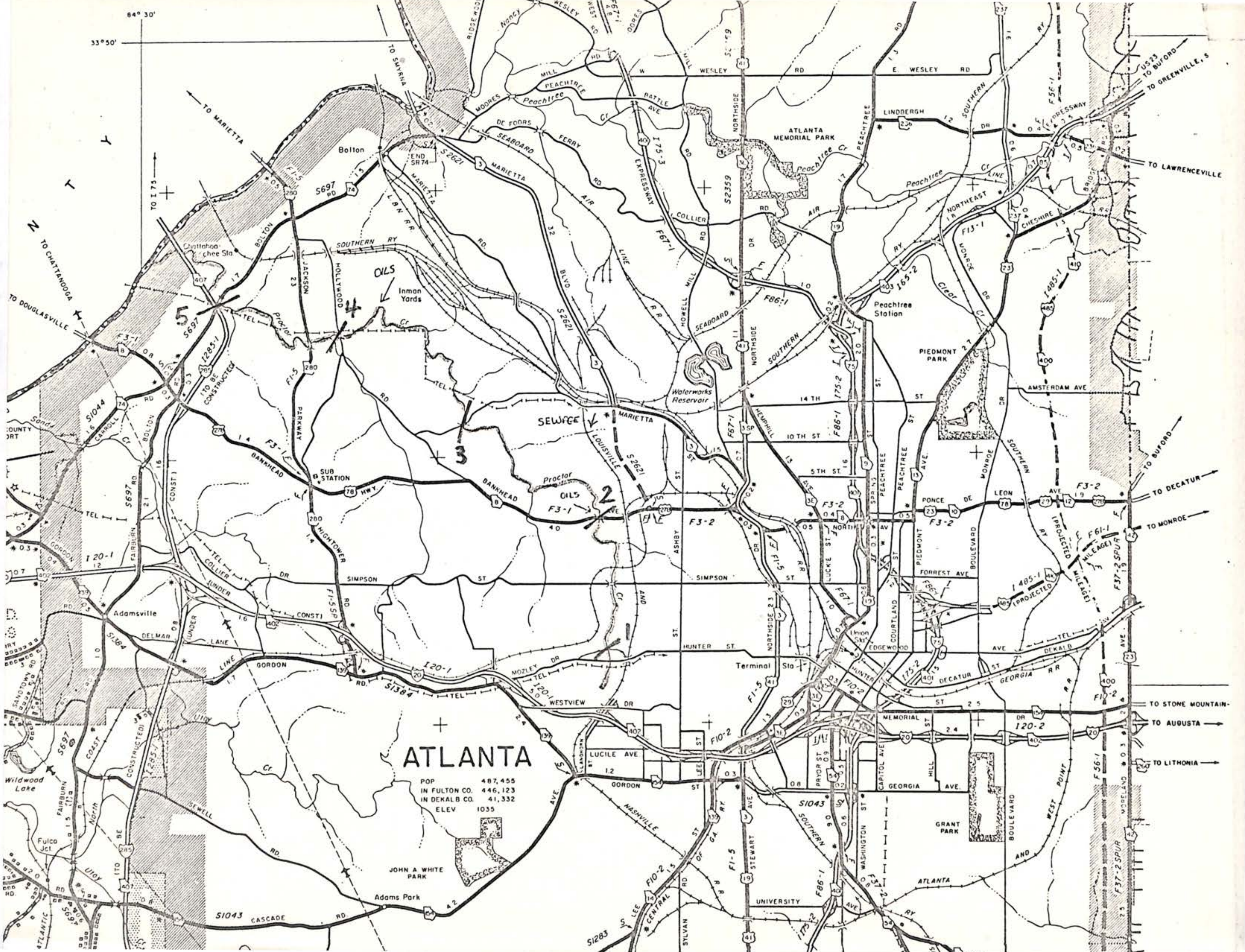
Sample Number	1	2	3	4	5	6
Bacteriological Bottle Number						
COLIFORM COUNT (MPN) 100 ml	43000	430,000	460,000,000	1,100,000,000	43,000,000	
FECAL COLIFORM	4300	230,000	23,000,000	240,000,000	23,000,000	

REMARKS

Copies to:

(S) Otis. C. Woods, Jr.

Otis C. Woods, Jr., Chemist
Water Quality Surveys Service


84° 30'
33°50'
TO MARIETTA
TO SMYRNA
TO I 75
TO CHATTANOOGA
TO DOUGLASVILLE
Bolton
END SR74
Chattahoochee Sta.
Inman Yards
OILS
SEWAGE
Proctor Cr
SUB STATION
Adamsville
Wildwood Lake
Fulco Jct.
(TO BE CONSTRUCTED)
ATLANTA MEMORIAL PARK
Peachtree Cr
Peachtree Station
PIEDMONT PARK
Waterworks Reservoir
Union Sta.
Terminal Sta.
GRANT PARK
JOHN A WHITE PARK
Adams Park
ATLANTA
POP 487,455
IN FULTON CO. 446,123
IN DEKALB CO. 41,332
ELEV 1035
TO LAWRENCEVILLE
US23 TO BUFORD
TO GREENVILLE, S
TO BUFORD
TO DECATUR
TO MONROE
TO STONE MOUNTAIN
TO AUGUSTA
TO LITHONIA
BANKHEAD HWY
MARIETTA
PEACHTREE
NORTHSIDE DR
PONCE DE LEON AVE
MEMORIAL DR
SIMPSON ST
HUNTER ST
GORDON ST
CASCADE RD
E. WESLEY RD
LINDBERGH DR
COLLIER RD
I 485-1 (PROJECTED)
F61-1 (PROJECTED MILEAGE)
I 20-1
I 20-2
I 75-2
I 85-1
F3-1
F3-2
F1-5
F10-2
F86-1
F67-1
F56-1
F37-2 SPUR
S697
S2621
S2359
S1384
S1043
S1044
S1283
5
4
3
2

KNOWN WASTE SOURCES