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ENVIRONMENTAL SURVEILLANCE REPORT FOR THE NEVADA TEST SITE JULY 1970 THROUGH JUNE 1976

REYNOLDS ELECTRICAL & ENGINEERING CO., INC.
LAS VEGAS, NEVADA 89114

FEBRUARY 1978

PREPARED FOR
THE U.S. DEPARTMENT OF ENERGY
NEVADA OPERATIONS OFFICE
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for the

NEVADA TEST SITE

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Compiled by

M. W. Lantz

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ABSTRACT

This report documents the environmental surveillance program at the Nevada Test Site as conducted by the Energy Research and Development Administration (ERDA) onsite radiological safety contractor from July, 1970 through June, 1976. Summary data for concentrations of radioactivity in air and water samples are presented, and relevancy to ERDA guides is established.

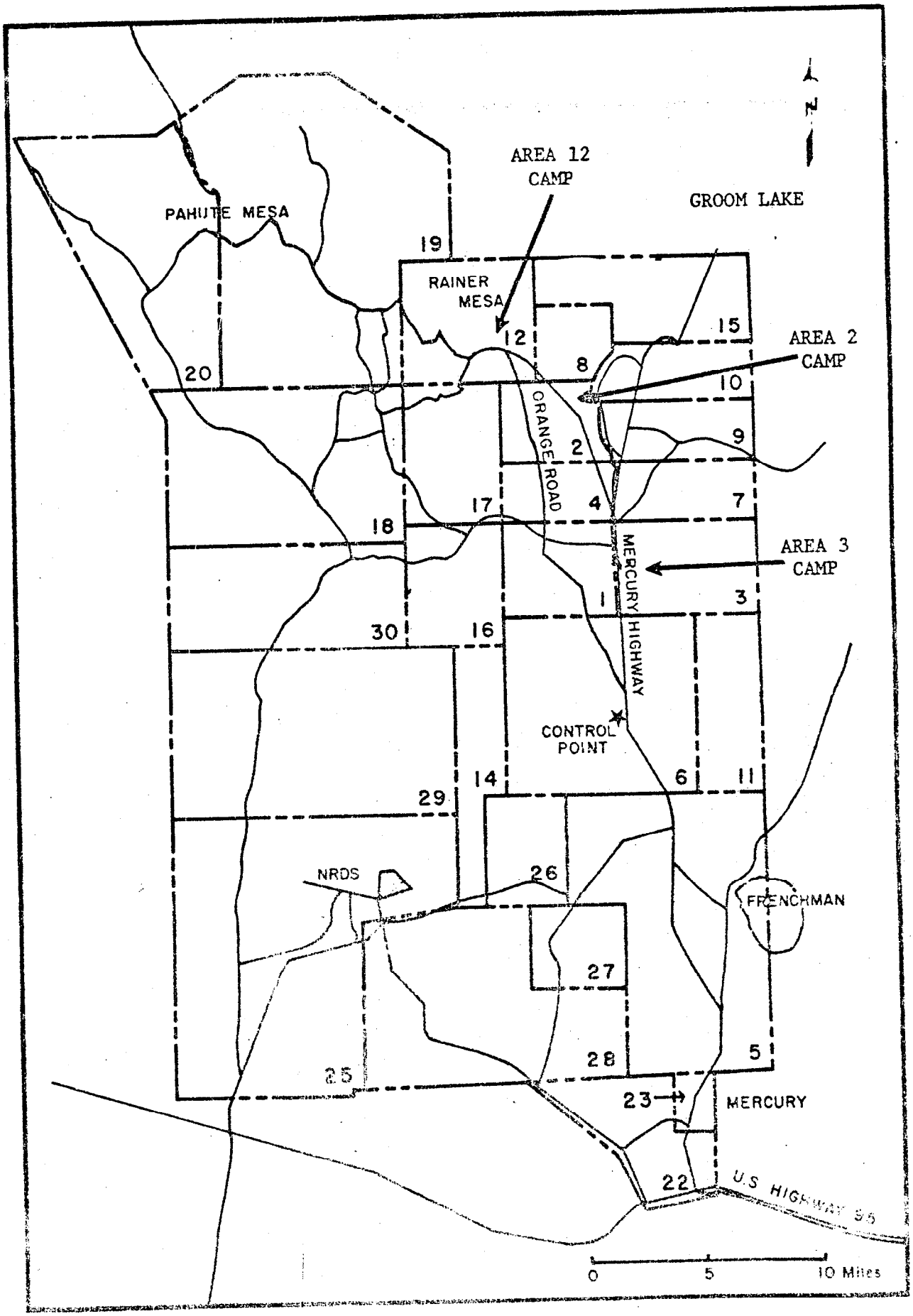
A. INTRODUCTION

This report documents the program conducted at the Nevada Test Site (NTS) for monitoring of radioactivity in the general onsite environment as performed by Reynolds Electrical and Engineering Co., Inc. (REECo) during the Fiscal Years 1971 through 1976. As part of its contract, EY-76-C-08-0410, with the Energy Research & Development Administration (ERDA), REECo is responsible for providing radiological safety services within the confines of the test site. As part of the total program to control, minimize and document exposure of the working population, an environmental surveillance program has been in effect for a number of years.

The NTS is a remote area of approximately 1,400 square miles with terrain and climate conditions typical of the high southwest U. S. desert region and mountainous areas (Fig. 1). Temperatures vary from -10° to 120°F. The area is subject to high winds, dust-laden atmosphere, and low humidity. Elevations range from dry lake beds to rugged mountains as high as 7,500 feet. The NTS has, since 1951, been the primary location for testing the nation's nuclear weapons. Other major projects at the NTS have included nuclear rocket propulsion development and environmental effects studies.

The monitoring program was designed to examine the environment for levels of radioactivity that are of interest in documenting the exposure of NTS workers. Air and potable water samples are collected at selected areas, where personnel may spend significant time apart from the controlled work sites. Additional air sampling stations are located throughout the NTS. Water

Figure 1. Nevada Test Site



sampling of waste ponds, sewage basins, open reservoirs, springs and supply wells is also accomplished. The rate of sampling for each surveillance network is related to potential personnel exposure, i.e., weekly water samples at each cafeteria. Except for the addition of new stations, removal of old stations, inaccessibility of a station, or the loss of data, sampling was continuous during this reporting period.

All samples are routinely analyzed for gross beta activity and are screened for gross gamma activity. Air and water samples are analyzed for plutonium. All water samples are counted for tritium. Additional analyses for specific radionuclides are accomplished as appropriate.* A continuing review of the data relative to "alert levels" of gross beta activity is performed so that potential problems may be noted in a timely manner.

*NOTE: Sampling and analysis for radioactive noble gases and for tritium in air are performed for ERDA onsite by the Environmental Protection Agency.

B. SUMMARY OF RESULTS

The results obtained from this environmental monitoring program for the reporting period of July, 1970, through June, 1976, show that the radioactivity in the NTS environments was low compared to the ERDA guidelines. The maximum yearly average of gross beta activity in air for the entire network occurred in FY-1971 (3.40×10^{-13} µCi/ml). This average represents 1.1% of the applicable Concentration Guide (CG) of 3×10^{-11} µCi/ml as listed in ERDA Manual Chapter 0524, Annex A (assuming Sr-90 to be the most radiotoxic beta emitter present). The FY-1971 average was high because of: (1) an increase in new worldwide fallout from foreign testing; and (2) short-term high values from the Baneberry event (ref. 1). FY-1972 and FY-1974 averages were also increased by worldwide fallout from foreign testing. A lower baseline for gross beta activity of approximately 2.5×10^{-14} µCi/ml appears to be reached during periods of minimized source input, as is seen in FY-1973 and FY-1976. Plutonium-239 concentrations in air were on the order of 10^{-16} µCi/ml as compared with a CG of 6×10^{-14} µCi/ml as listed in ERDA Manual Chapter 0524, Annex A. One surveillance station indicated consistently higher plutonium values (occasionally approaching CG) and, although there is minimal contact between personnel and this area, an increased sampling program has been instituted.

Tritium and ^{239}Pu measurements were primarily below detection limits in potable or supply well samples. Table 1 is a list of 35 values above detection limit in the plutonium data of the potable, supply well, natural springs and open reservoirs. This is less than 1% of the data, and it is suspected that these were primarily seen because of statistical fluctuations about the minimum detection limit (MDL) or cross contamination in the

laboratory. Approximately 10% of the tritium data indicated values above the detection limit, but in most cases subsequent values were less than the detection limit. Table 2 is a list of 42 tritium values greater than 5×10^{-6} µCi/ml. More than half of these apparent positives can be attributed directly to the Baneberry event release. It should also be mentioned that in the Baneberry-associated samples, I-131 was not analytically removed prior to counting for tritium. This may have accounted for some of the positive values. Many of the other apparent positives were near the detection limits of the counting system during 1970 and 1971, and may have been statistical fluctuations above these MDL's. The detection limits had decreased from over 6×10^{-6} to 4×10^{-7} µCi/cc by 1972. The maximum yearly average of gross beta activity in these samples was 5.48×10^{-8} µCi/ml in FY-1974 which is within the CG of 3×10^{-7} µCi/ml as listed in ERDA Manual Chapter 0524, Annex A (Assuming Sr-90 to be the most radiotoxic beta emitter present). Although elevated roughly by a factor of 2, gross beta activities in open reservoirs and natural springs were also within the CG.

Measurable amounts of tritium were present in several contaminated waste ponds. The amounts of effluent released to the environment are calculated on a yearly basis and reported on to ERDA Headquarters in accordance with ERDA Manual Chapter 0513.

C. SAMPLING AND ANALYSIS

1. Air Monitoring

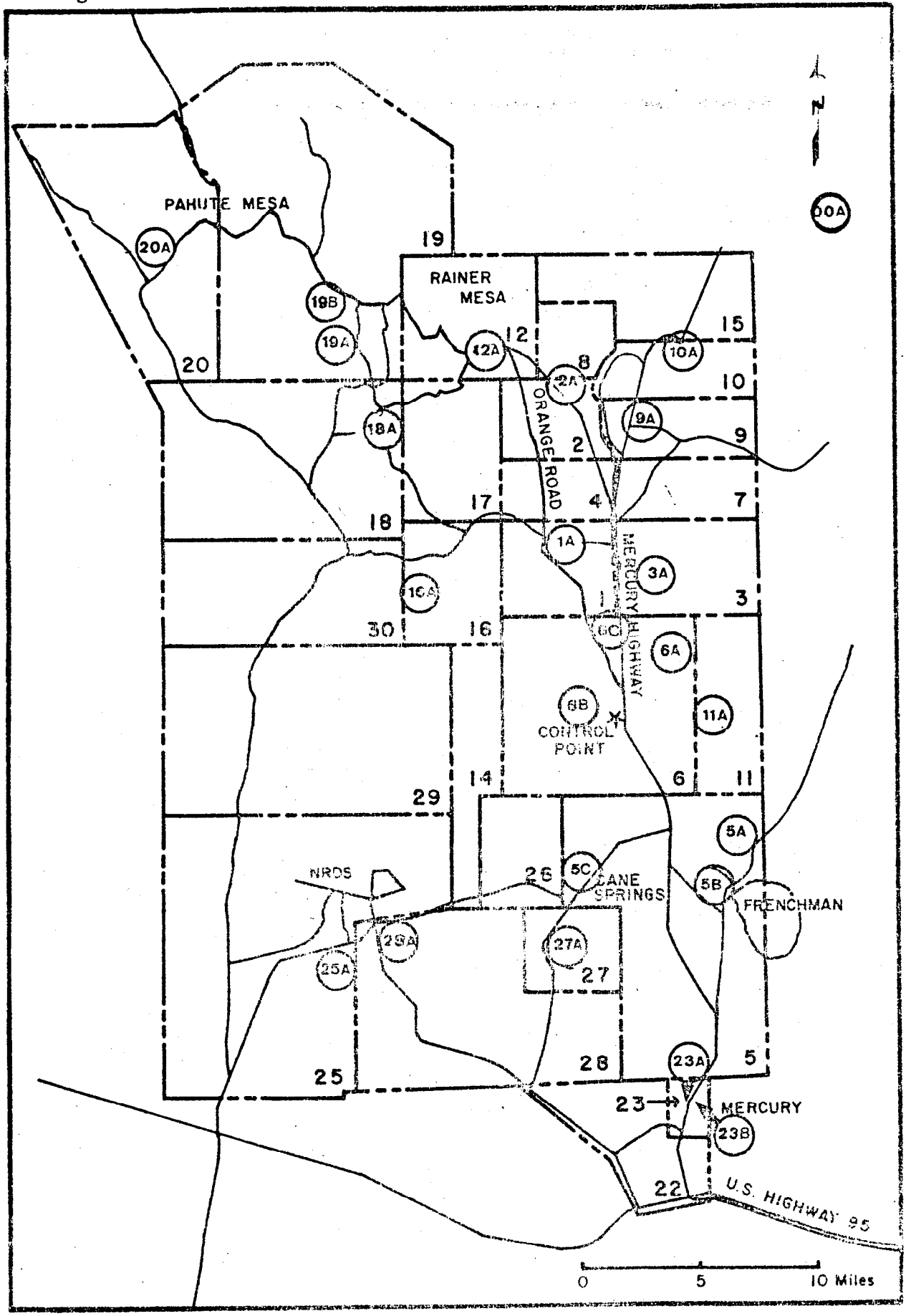
Continuously operating air sampling units are located at 24 permanent stations on the NTS (Figure 2). The locations were primarily chosen to provide monitoring of radioactivity at sites with high occupation factors. Geographical coverage, access and availability of commercial power were also considered.

The sampling units consist of a positive displacement pump pulling air at approximately four cfm through a four-inch Whatman 41 filter paper mounted on a disposable plastic sample holder. A dry-gas meter is utilized to measure the volume of displaced air over the sampling period which is typically seven days. The total volume sampled in this period is approximately 1000 m^3.

The collected samples are held for five days prior to analysis to allow for decay to insignificant levels of naturally occurring radioactive noble gas decay products. Gross beta counting is performed with a gas flow proportional counter (Beckman WIDE BETA II). A nominal minimum detection limit (MDL), defined as that value for which the relative two-sigma error is 100%, for the typical parameters involved is 9×10^{-16} µCi/ml.

Gross gamma screening utilizing a 5" x 5" NaI (Tl) detector coupled to a single channel analyzer is accomplished to give an early indication

Figure 2. NTS Environmental Surveillance Air Sampling Locations



of significant gamma-emitting isotopes. Any sample displaying activity levels indicated by a relative two-sigma error of less than 50% is transferred to a multichannel analysis system for isotopic measurements.

Weekly air samples for a given sampling station are batched on a monthly basis and subjected to a radiochemical analysis for ^{239}Pu. The procedure incorporates an acid dissolution and an ion exchange recovery on a resin bed. Plutonium is deposited by plating on a stainless steel disc. Chemical yield is determined with an internal tracer. Alpha spectroscopy is performed utilizing a solid state surface barrier detector.

2. Water Monitoring

Water samples are collected at various frequencies from selected potable water consumption points, supply wells, natural springs, open reservoirs, final effluent ponds and contaminated ponds. Frequency is determined on the basis of potential use and on contamination potential, i.e., potable sources weekly, supply wells monthly, etc. Samples are collected in one liter glass containers. All samples are analyzed for gross beta and tritium concentrations, and are screened for gross gamma. Plutonium analyses are performed on supply well samples.

A 500 ml aliquot is taken from the original sample for gamma counting. Assuming no significant interference from other isotopes, a five ml sample is aliquoted and subjected to tritium analysis via liquid scintillation. The remainder of the original sample is evaporated to 15 ml, transferred to a stainless steel counting planchet and

evaporated to dryness after the addition of a wetting agent. Beta counting is accomplished as in Section 1. Nominal MDL's are: 1) gross beta - 2×10^{-9} μCi/ml; and 2) ^{3}H - 3×10^{-7} μCi/ml. The MDL for ^{3}H for 1970 and 1971 was 6×10^{-6} μCi/ml and decreased steadily through 1973.

In the case of the supply wells, two one-liter samples are collected and the second used for plutonium analysis. The radiochemical procedure used is similar to that described in Section 1. As mentioned, alpha spectroscopy is used to measure the contained ^{239}Pu, if any. The typical MDL for this procedure is 1×10^{-11} μCi/ml.

3. Data Treatment

Radioactivity in environmental samples has been found to be log-normally distributed (Reference 2). In order to treat the asymmetry, the data shown graphically has been transformed, and the geometric mean $\overline{X}g$ was derived according to the equation:

$$\overline{X}g = \log^{-1} \left[\frac{\Sigma \log X_i}{N} \right]$$

where: X_i = observed value

N = number of observations

For any required comparisons to concentration guides, though, arithmetic means were used in the text.

D. RADIOACTIVITY IN AIR

The locations at which air was continuously sampled are depicted in Figure 2. All stations were sampled over the report period except for the Area 25 Warehouse, which was not activated until FY-1974, the Area 18 Cafeteria, which was discontinued at the same time, and Area 5 Gate 250 which was discontinued. These changes were due to occupancy factors.

The general tr nds of the entire air surveillance network are shown in Appendix A for the gross beta activity and plutonium. The twenty-four stations were averaged together geometrically in order to represent the six-year changes of test site radioactivity in air in the first plot. The remaining plots dep ct the long-term variations at each location throughout the six-year surveillance period. Table 3 shows the yearly average for each location for gross beta, and Table 4 shows the averages for plutonium.

The gross beta concentration is of most interest because of the comparability with other sampling networks. Typically, the weekly means showed temporal variations that represent seasonal phenomena. Certain of the maximum values can be attributed to known site-related sources, i.e., the FY-1971 arithmetic averages were significantly influenced by the release in December, 1970, from the Baneberry test. In November, 1971, the gross beta activity increased significantly, but data were not conclusive to attribute the increase to either a small, onsite venting of the Diagonal Line event or to fallout from foreign testing that occurred at the same time period. Other high values could possibly be interpreted as being perturbations due to fallout from the atmospheric testing by other foreign countries in 1972 and 1974. Maximum

values, calculated arithmetically, above a comparable concentration guide did occur, but subsequent samples were generally lower. Extremely low ranges were attributed to sampling errors, but were retained because of lack of proof and the small impact on the mean. The overall values and trends were similar to those reported elsewhere (Reference 3 and 4). The general trend until 1974 was of a downward nature which could be attributed to the decay and dispersion of old worldwide fallout and the minimized input of new source material. After 1974, the gross beta concentrations seem to have leveled off at the 1973 values except for occasional perturbations due to foreign atmospheric testing and spring fallout. And, although significant differences in the measured activities of all stations existed, the trend was uniform throughout the network.

Of prime interest for personnel considerations is the gross beta averages compared to the CG. The average of the means for all sample locations for each year was:

Fiscal Year	Average Mean
1976	4.59×10^{-14} µCi/ml
1975	9.74×10^{-14} µCi/ml
1974	1.18×10^{-13} µCi/ml
1973	4.47×10^{-14} µCi/ml
1972	2.81×10^{-13} µCi/ml
1971	3.40×10^{-13} µCi/ml

Assuming ^{90}Sr to be the most radiotoxic beta emitter present, the conservative CG for comparison purposes is 3×10^{-11} µCi/ml for uncontrolled areas. Plutonium results for air samples were uniformly low, i.e., on the order of 10^{-16} µCi/ml. The CG for uncontrolled areas is 6×10^{-14} µCi/ml. Data from one

station, the 9-300 bunker, has indicated a need for increased surveillance. This station is significant because its trend in plutonium concentration appears to be rising. The 1976 average was 5 percent of the CG and increasing. This rise is presumably due to the presence of known plutonium fields. Before 1960, several safety shots spread plutonium throughout Area 9. One event in particular, Juno, dispersed alpha contamination over Area 9 and the Mercury Highway. Decontamination was done by washing roads, blading, windrowing, and oiling the soil. The probability of resuspension of this low-fired plutonium oxide has increased via weathering and possible disturbance by traffic in the past 17 years. The environmental erosion of the decontamination work has been significant. This is an area which will be surveyed extensively in the future. A plot of the network weekly averages over the six-year period is given.

E. RADIOACTIVITY IN SURFACE AND GROUND WATER

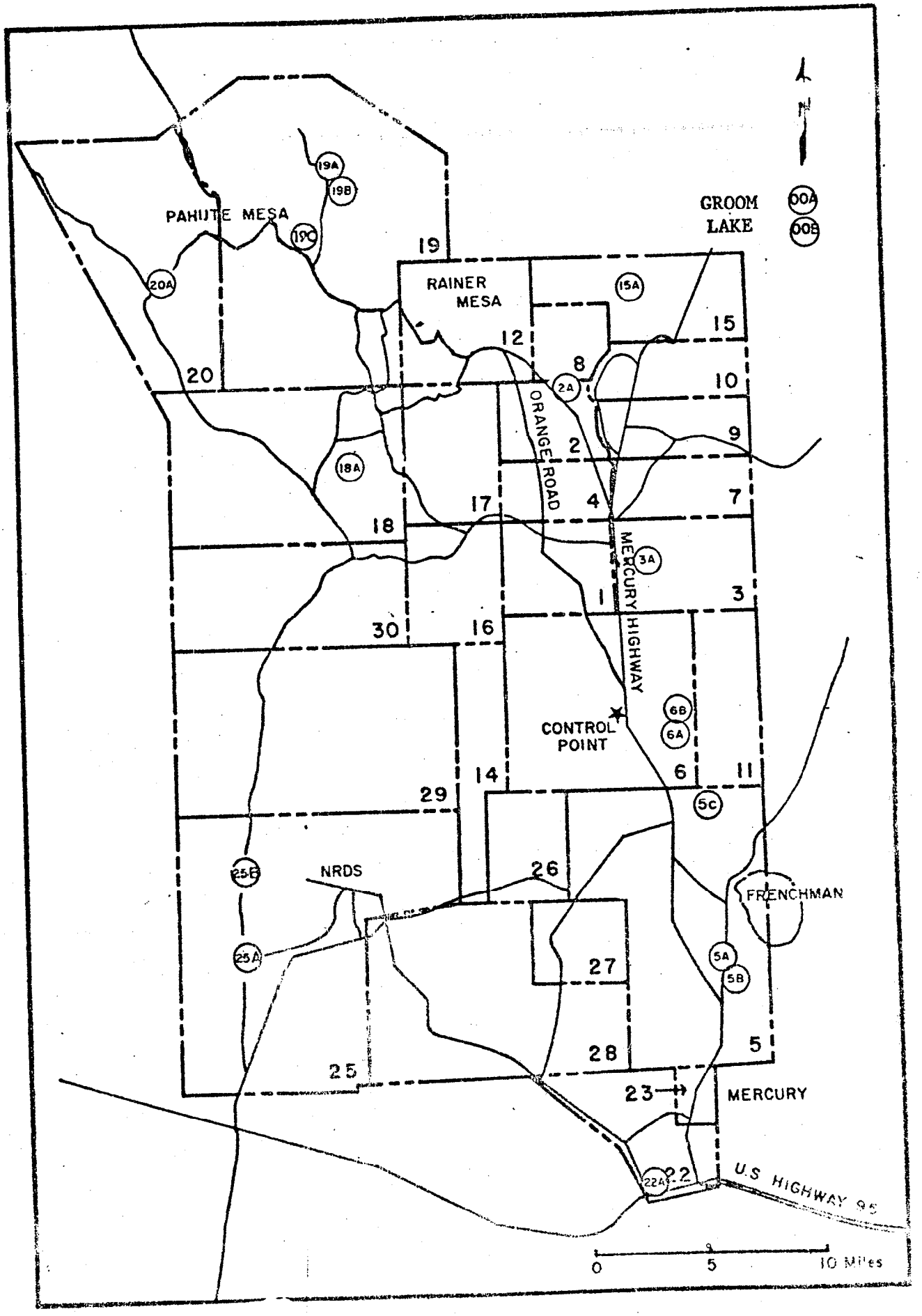
1. Supply Wells

Water from the eighteen sample wells is used for a variety of sanitary and industrial uses. Criteria for selection was primarily based on potential use for human consumption. The locations of these wells are given in Figure 3.

The means and ranges by location, plus the weekly means and ranges for all locations of gross beta activity are given in the plots of Appendix B. Table 5 is a list of the yearly averages for each location for gross beta. Maximum values observed are suspected to be caused by contamination at the collection point or in the laboratory because subsequent values were low; however, the means do not appear to be significantly affected. The activities of each well appear consistent over the reporting period.

The average of the means were:

Fiscal Year	Mean
1976	1.01×10^{-8} µCi/ml
1975	1.13×10^{-8} µCi/ml
1974	1.16×10^{-8} µCi/m.
1973	9.45×10^{-9} µCi/ml
1972	9.08×10^{-9} µCi/ml
1971	1.08×10^{-8} µCi/ml


N
PAHUTE MESA
19A
19B
19C
20A
GROOM LAKE
00A
00B
RAINER MESA
15A
19
20
12
8
2A
15
10
9
2
ORANGE ROAD
18A
17
4
7
18
MERCURY HIGHWAY
3A
1
3
30
16
CONTROL POINT
6B
6A
6
11
14
29
5C
25B
NRDS
26
FRENCHMAN
25A
27
5A
5B
28
5
25
23
MERCURY
22A
22
U.S HIGHWAY 95
0
5
10 Miles

Using the CG for ^{90}Sr as a conservative guide, comparison with 3×10^{-7} µCi/ml is made. Although infrequent positive samples of tritium and plutonium were found, the evaluation of spot checks by other groups and the type of analysis involved indicated that none was detected. Table 1 lists the plutonium positives and Table 2 lists tritium measurements greater than 5×10^{-6} µCi/ml. A plot of the network weekly averages for tritium and plutonium is given.

2. Potable Water

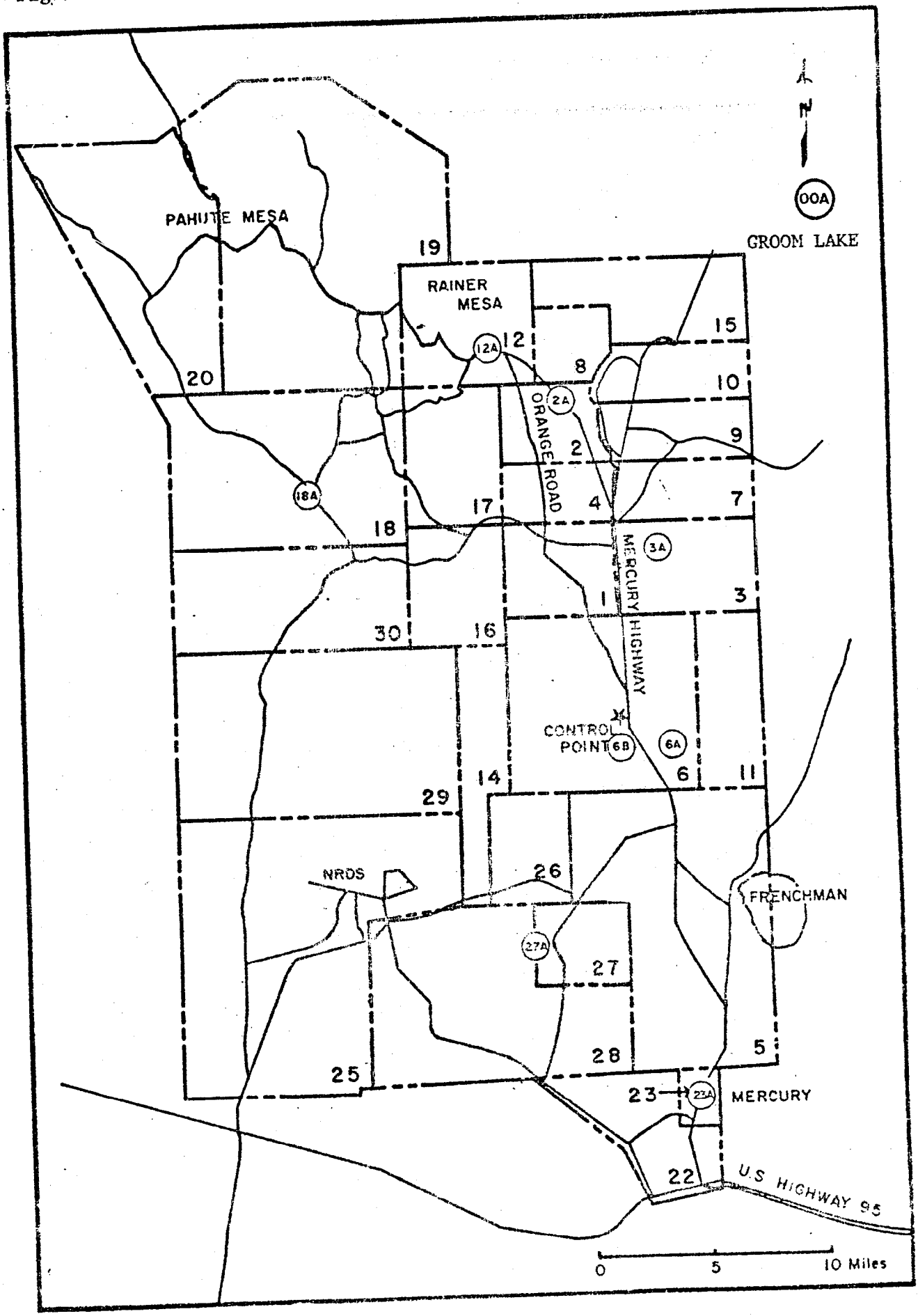
As a check on any effect the water distribution system might have on end use activity, nine consumption points were sampled during the report period. Sampling locations are depicted in Figure 4, and data on gross beta activity are given in the plots of Appendix C and in Table 5. Outlying maximum values are suspected to be caused by cross-contamination suggested in Section E-1. Three extreme values were eliminated from the plots because a review of the data revealed no evidence to retain them as valid.

The average of the means for all locations were:

1976	7.55×10^{-9} µCi/ml
1975	8.89×10^{-9} µCi/ml
1974	6.81×10^{-9} µCi/ml
1973	6.52×10^{-9} µCi/ml
1972	5.64×10^{-9} µCi/ml
1971	5.48×10^{-8} µCi/ml

The same CG comparison made in Section E-1 pertains. Although infrequent

Figure 4. NTS Environmental Surveillance Potable Water Sampling Locations



positive samples of tritium and plutonium were found, the evaluation of spot checks by other groups and the type of analysis involved indicated that none was detected. Table 1 lists the plutonium positives and Table 2 lists the tritium measurements greater than 5×10^{-6} µCi/ml. A plot of the network weekly averages is given for tritium and plutonium.

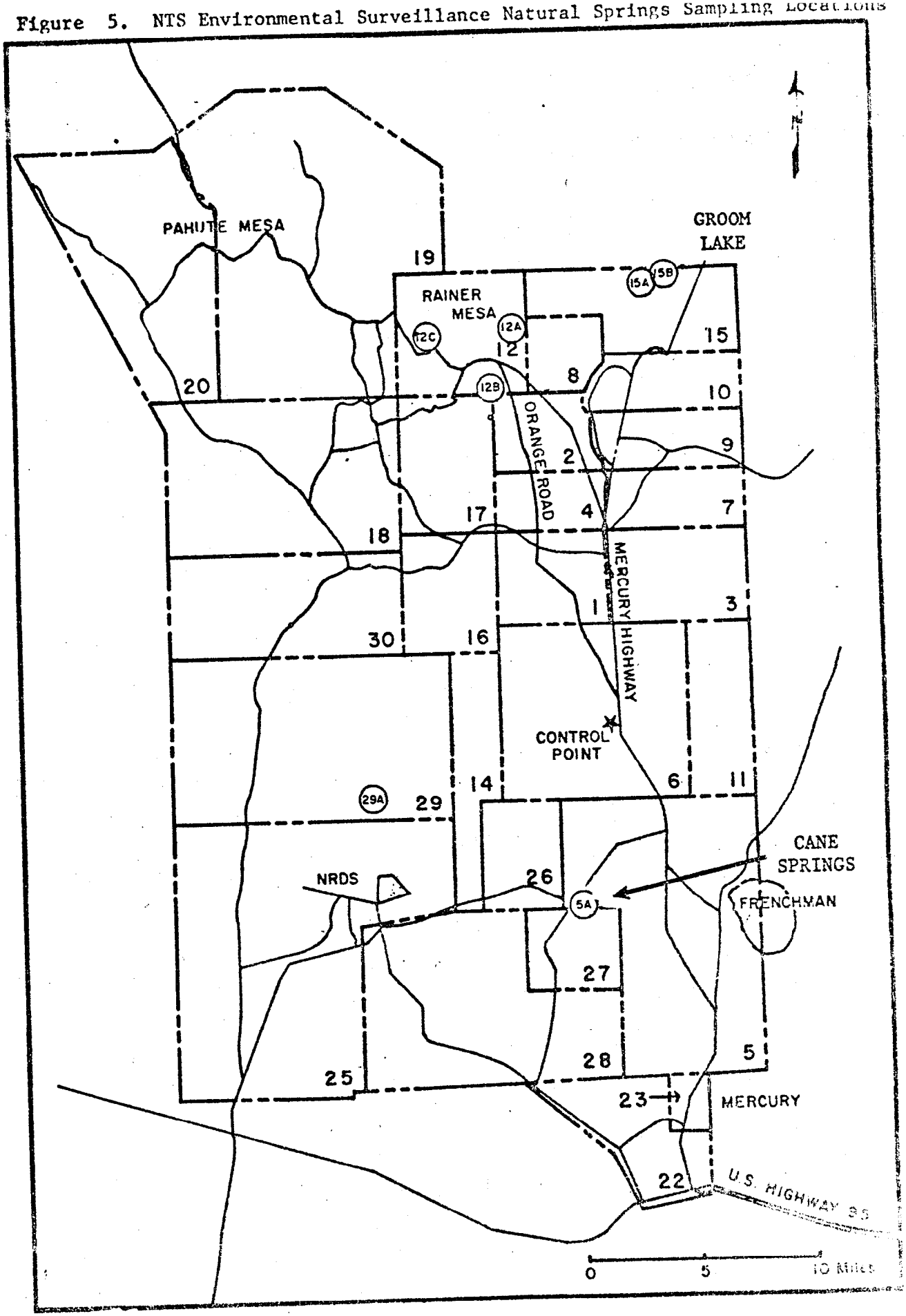
3. Natural Springs

The term "natural springs" includes most of the spring-fed pools located within the NTS. Although human consumption is considered insignificant, wildlife have access to and do use the water. Seven such locations were sampled on a monthly basis (Figure 5).

The means and ranges of gross beta activities for each station and on a monthly basis for all stations are presented in the plots of Appendix D and in Table 5. The effects of the Baneberry test in FY-1971 are apparent, especially at the springs in Areas 12 and 15 which were exposed to fallout from part of the release cloud. However, the average of the means are within the ^{90}Sr CG:

1976	1.45×10^{-3} µCi/ml
1975	1.40×10^{-8} µCi/ml
1974	1.45×10^{-8} µCi/ml
1973	1.17×10^{-8} µCi/ml
1972	3.15×10^{-8} µCi/ml
1971	1.69×10^{-7} µCi/ml

Figure 5. NTS Environmental Surveillance Natural Springs Sampling Locations



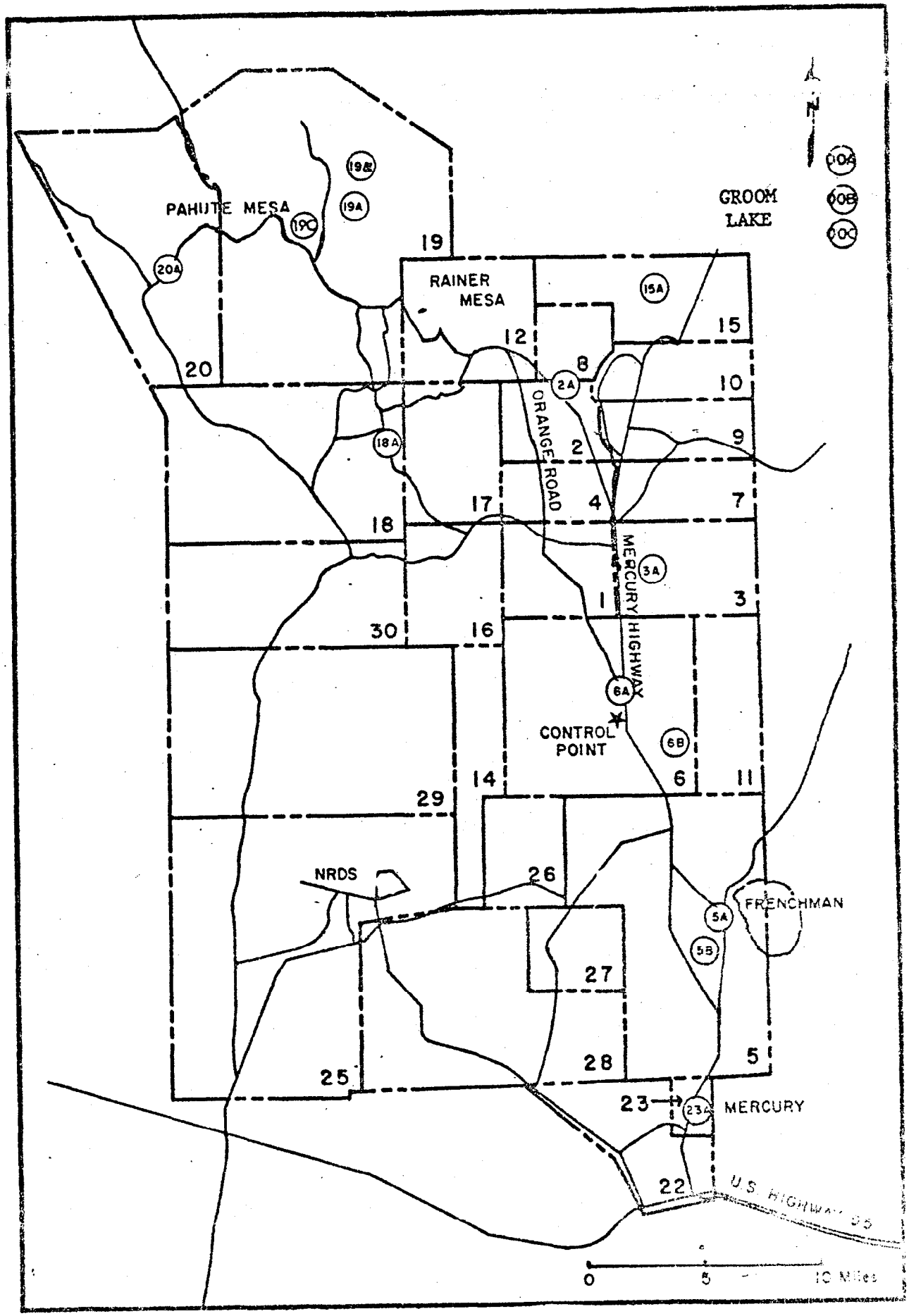
It is anticipated that the near surface waters would be somewhat higher than supply wells due to leaching of surface contaminants into the spring sources and to the possibility of direct runoff into the pools. The few positive plutonium values are listed in Table 1 and Table 2 lists the tritium measurements greater than 5×10^{-6} μCi/ml. A plot of the network weekly averages is given for tritium and plutonium.

4. Open Reservoirs

Open reservoirs have been established at various locations at the NTS primarily for industrial purposes. Sixteen of these impoundments were sampled during the report period (Figure 6). One water body, Papoose Lake, is more properly termed an intermittent desert lake, and is not used by man. This sampling location yielded the highest mean for gross beta activity, i.e., on the order of 10^{-7} μCi/ml over the reporting period. Papoose Lake is situated in an area that was repeatedly exposed to fallout from atmospheric tests; thus, elevated activity would be expected. Other reservoirs are fed by wells. The radioactivity at these locations would be higher than the supply source because of surface exposure to worldwide fallout and to increases in total dissolved solids due to evaporation. The average of the means for gross beta activity were:

1976	2.01×10^{-8} μCi/ml
1975	1.76×10^{-8} μCi/ml
1974	1.67×10^{-8} μCi/ml
1973	3.70×10^{-8} μCi/ml
1972	2.10×10^{-8} μCi/ml
1971	3.00×10^{-8} μCi/ml

Figure 6. NTS Environmental Surveillance Open Reservoirs Sampling Locations



Appendix E and Table 4 represent the data for gross beta concentrations in this network. The few positive plutonium values are listed in Table 1, and Table 2 lists the tritium values greater than 5×10^{-6} μCi/ml. A plot of the network weekly averages for tritium and plutonium is given.

5. Miscellaneous

Twelve contaminated ponds and six final effluent ponds were also sampled on a regular basis (Figures 7 and 8). The contaminated ponds, which impound waters from tunnel test areas (plus a laboratory waste sump) are monitored to provide data to use in calculating any release to the offsite environment. These calculations are done in accordance with ERDA Manual 0513 on an annual basis and are reported to ERDA Headquarters.

The six final effluent ponds are closed systems which contain both sanitary and radioactive waste for evaporative treatment. The data for the sites are of minor interest as the contact with the working population is minimal, but are shown in Appendix F. Appendix G, and Table 6.

Figure 7
NTS Environmental Surveillance
Contaminated Ponds Sampling Locations

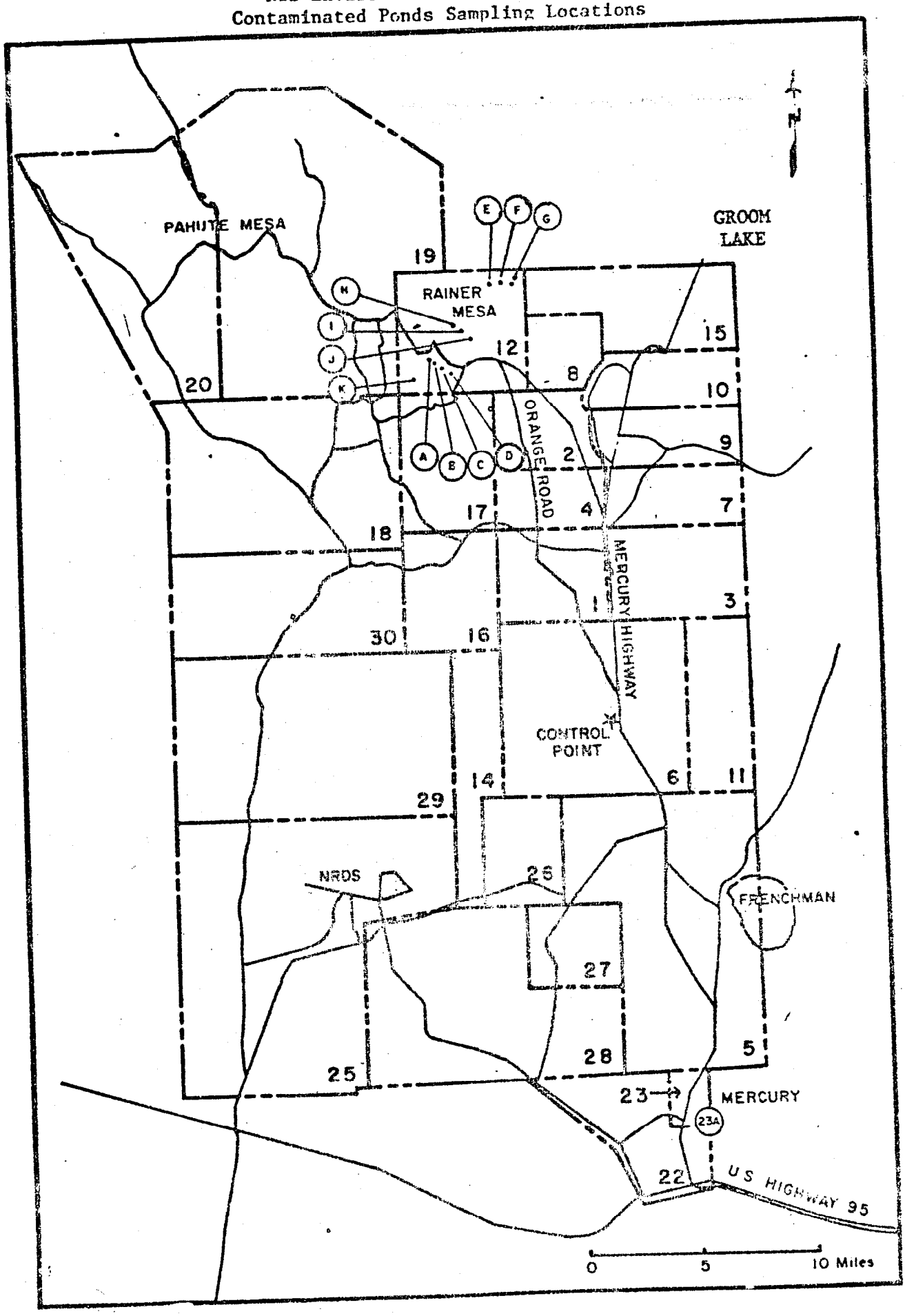
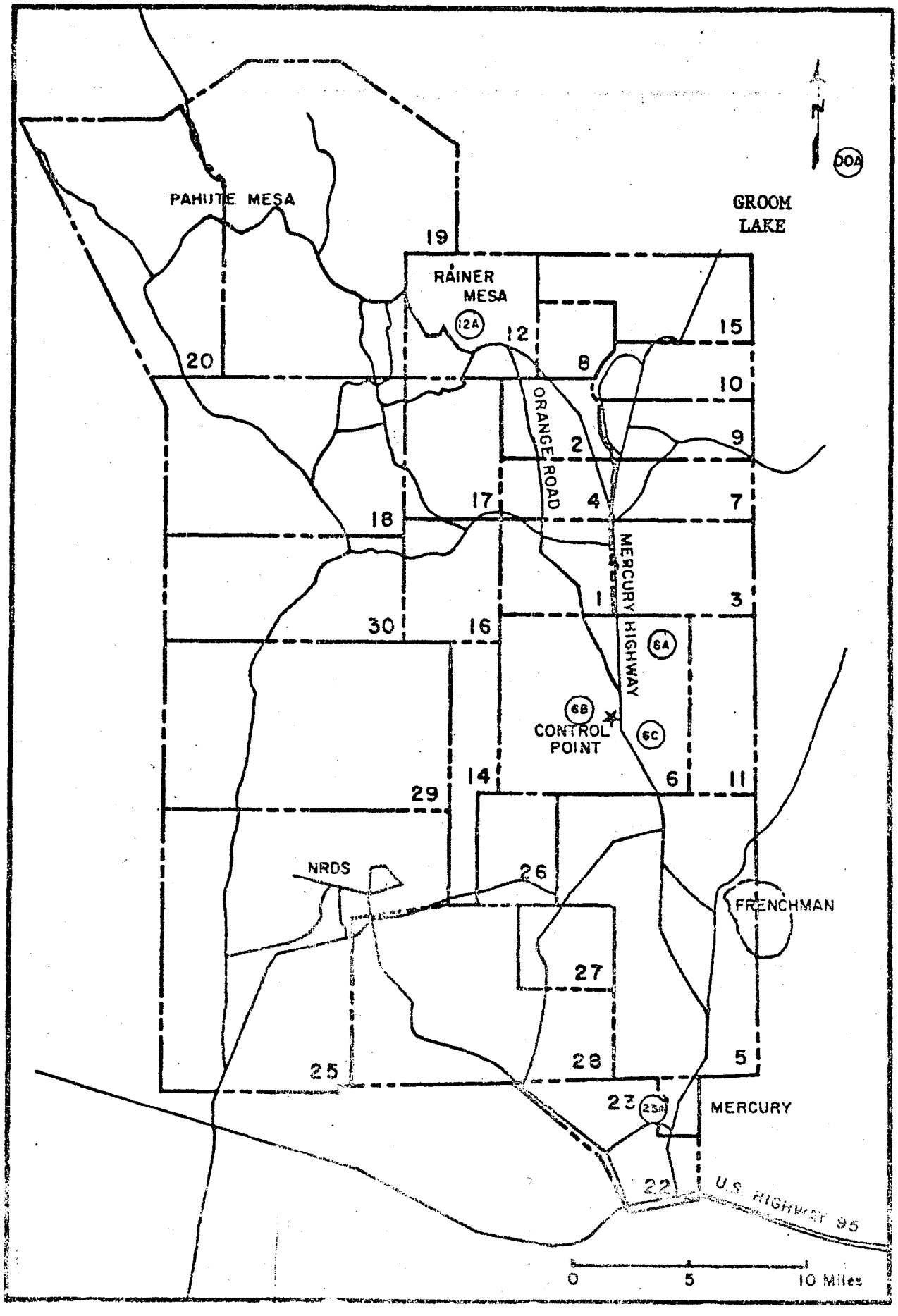


Figure 8
NTS Environmental Surveillance
Effluent Ponds Sampling Locations



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8. Environmental Surveillance Sampling Results at the Nevada Test Site July, 1969 through June, 1970, NVO-410-11. Las Vegas, Nevada: Reynolds Electrical and Engineering Co., Inc., 1972.

TABLE 1

PLUTONIUM VALUES ABOVE DETECTION LIMIT FROM WATER SUPPLY DATA

Water Type	Station		Date	pCi/ml
POTABLE WATER	Area 2	MEN'S REST ROOM	03-02-71	5.98 E-11
POTABLE WATER	Area 3	CAFETERIA	12-07-70	2.10 E-11
POTABLE WATER	Area 12	CAFETERIA	03-02-71	6.52 E-11
NATURAL SPRINGS	Area 12	CAPTAIN JACK SPRING	03-04-71	1.12 E-10
NATURAL SPRINGS	Area 12	CAPTAIN JACK SPRING	12-12-72	6.36 E-11
NATURAL SPRINGS	Area 12	CAPTAIN JACK SPRING	03-27-73	6.74 E-11
NATURAL SPRINGS	Area 12	GOLD MEADOWS POND	03-13-72	3.18 E-11
NATURAL SPRINGS	Area 15	OAK BUTTE SPRING	03-20-75	4.35 E-11
NATURAL SPRINGS	Area 15	OAK BUTTE SPRING	06-26-75	9.85 E-09
NATURAL SPRINGS	Area 15	TUB SPRING	12-18-74	1.53 E-11
NATURAL SPRINGS	Area 15	TUB SPRING	06-20-75	6.90 E-11
NATURAL SPRINGS	Area 29	TOPOPAH SPRING	06-25-75	8.70 E-11
OPEN RESERVOIRS	Area 2	WELL 2 RESERVOIR	12-29-70	1.78 E-10
OPEN RESERVOIRS	Area 6	WELL 3 RESERVOIR	12-18-74	1.23 E-11
OPEN RESERVOIRS	Area 6	WELL 1 RESERVOIR	03-16-71	9.47 E-11
OPEN RESERVOIRS	Area 6	WELL 1 RESERVOIR	03-28-72	2.55 E-11
OPEN RESERVOIRS	Area 15	WELL Ue15d RESERVOIR	12-29-70	9.30 E-11
OPEN RESERVOIRS	Area 15	WELL Ue15d RESERVOIR	12-06-72	7.22 E-11
OPEN RESERVOIRS	Area 19	WELL Ue19e RESERVOIR	12-13-73	7.15 E-11
OPEN RESERVOIRS	GROOM LAKE	WELL 4 RESERVOIR	09-22-70	3.13 E-10
OPEN RESERVOIRS	GROOM LAKE	PAPOOSE RESERVOIR	12-09-70	8.73 E-11
OPEN RESERVOIRS	GROOM LAKE	PAPOOSE RESERVOIR	09-14-71	4.25 E-09
OPEN RESERVOIRS	GROOM LAKE	SWIMMING RESERVOIR	03-24-72	3.50 E-11
SUPPLY WELLS	Area 3	WELL A	12-08-70	2.22 E-11
SUPPLY WELLS	Area 5	WELL 5B	06-06-76	1.09 E-10
SUPPLY WELLS	Area 5	WELL Ue5c	03-04-71	4.49 E-11
SUPPLY WELLS	Area 6	WELL C	02-10-71	3.36 E-10
SUPPLY WELLS	Area 6	WELL C	03-04-71	1.12 E-10
SUPPLY WELLS	Area 6	WELL C	09-26-73	3.20 E-11
SUPPLY WELLS	Area 6	WELL C1	03-04-71	1.24 E-10
SUPPLY WELLS	Area 15	WELL Ue15d	09-08-70	5.05 E-11
SUPPLY WELLS	Area 19	WELL Ue19gs	09-08-70	3.59 E-11
SUPPLY WELLS	Area 19	WELL Ue19gs	03-19-75	3.04 E-11
SUPPLY WELLS	Area 23	ARMY WELL #1	09-10-70	6.32 E-11
SUPPLY WELLS	GROOM LAKE	WELL 3	12-20-74	2.40 E-11

TABLE 2

TRITIUM VALUES FROM WATER SUPPLY DATA

(>5 x 10^{-6} µCi/ml)

Water Type	Station		Date	µCi/ml
Potable Water	Area 2	Men's Rest Room	09-22-70	6.22 E-06
Potable Water	Area 2	Men's Rest Room	03-24-75	6.23 E-06
Potable Water	Area 3	Cafeteria	11-10-70	6.61 E-06
Potable Water	Area 3	Cafeteria	01-11-71	5.34 E-06
Potable Water	Area 12	Cafeteria	01-12-71	5.17 E-06
Potable Water	Area 12	Cafeteria	03-02-72	5.37 E-06
Potable Water	Area 12	Cafeteria	03-24-75	6.24 E-06
Potable Water	Area 18	Fire Station	12-07-70	6.29 E-06
Potable Water	Area 23	Cafeteria	01-08-71	6.87 E-06
Potable Water	Area 23	Cafeteria	02-12-71	5.94 E-06
Potable Water	Area 27	Cafeteria	01-08-71	5.11 E-06
Potable Water	Area 27	Cafeteria	03-25-75	5.34 E-06
Potable Water	Groom Lake	Cafeteria	11-10-70	5.91 E-06
Potable Water	Groom Lake	Cafeteria	01-19-71	5.83 E-06
Potable Water	Groom Lake	Cafeteria	04-12-71	5.24 E-06
Potable Water	Groom Lake	Cafeteria	08-18-75	9.46 E-06
Natural Springs	Area 12	Captain Jack Spring	01-21-71	8.62 E-06
Natural Springs	Area 12	Gold Meadows Pond	01-28-71	9.06 E-06
Natural Springs	Area 12	Gold Meadows Pond	02-10-71	6.89 E-06
Natural Springs	Area 12	Gold Meadows Pond	05-04-71	1.09 E-05
Open Reservoirs	Area 5	Well 5B Reservoir	04-21-71	5.38 E-06
Open Reservoirs	Area 5	Well 5B Reservoir	07-13-73	5.42 E-06
Open Reservoirs	Area 5	Well Ue5c Reservoir	11-18-70	5.71 E-06
Open Reservoirs	Area 5	Well Ue5c Reservoir	06-21-71	4.73 E-05
Open Reservoirs	Area 15	Well Ue15d	10-06-70	5.41 E-06
Open Reservoirs	Area 15	Well Ue15d Reservoir	01-21-71	6.01 E-06
Open Reservoirs	Area 15	Well Ue15d Reservoir	11-21-73	6.09 E-06
Open Reservoirs	Area 18	Camp 17 Reservoir	12-02-70	7.99 E-06
Open Reservoirs	Area 18	Camp 17 Reservoir	09-08-75	9.55 E-06
Open Reservoirs	Area 19	Well Ue19gs Reservoir	07-14-70	3.55 E-05
Open Reservoirs	Area 19	Well Ue19gs Reservoir	01-23-71	5.19 E-06
Open Reservoirs	Area 19	Well Ue19gs Reservoir	02-26-71	5.41 E-06
Open Reservoirs	Area 23	Swimming Pool	04-21-71	5.45 E-06
Supply Wells	Area 3	Well A	01-15-71	7.71 E-06
Supply Wells	Area 5	Well Ue5c	01-15-71	6.00 E-06
Supply Wells	Area 6	Well C	07-10-72	1.00 E-04
Supply Wells	Area 15	Well Ue15d	04-19-71	5.05 E-06
Supply Wells	Area 18	Well 8	03-04-71	5.93 E-06
Supply Wells	Area 18	Well 8	04-19-71	5.54 E-06
Supply Wells	Area 19	Well Ue19gs	09-14-71	5.99 E-06
Supply Wells	Area 19	Well Ue19e	04-09-71	5.76 E-06
Supply Wells	Area 23	Army Well #1	08-07-70	1.02 E-05

TABLE 3

YEARLY (FY) AVERAGES OF AIR SURVEILLANCE DATA FOR GROSS BETA

(1×10^{-14} µCi/ml)

Station		1971	1972	1973	1974	1975	1976
Area 1	GRAVEL PIT	33.2	23.0	3.9	12.7	9.5	9.3
Area 2	COMPOUND	37.4	20.0	4.1	10.9	8.3	3.0
Area 3	CAFETERIA	22.8	20.1	3.9	9.7	9.0	3.8
Area 5	MAINTENANCE COMPLEX	44.3	15.9	3.1	10.4	11.1	4.4
Area 5	WELL 5B	30.0	22.2	4.1	12.3	11.5	8.2
Area 5	GATE 250	24.4	14.5	3.4	6.5	--	--
Area 6	YUCCA COMPLEX	60.3	75.9	4.8	11.7	11.1	6.3
Area 6	CP-2 COMPLEX	37.0	21.5	3.4	9.3	8.7	4.3
Area 6	WELL 3 COMPLEX	36.8	50.4	4.1	11.8	10.2	4.2
Area 9	9-300 BUNKER	34.8	37.0	4.2	12.1	10.3	57.4
Area 10	GATE 700	22.9	15.6	3.1	9.6	8.5	3.2
Area 11	GATE 293	28.5	18.3	3.7	9.6	8.9	9.5
Area 12	CHANGE HOUSE	26.6	24.3	4.2	12.9	11.0	4.0
Area 16	TUNNEL MAINTENANCE	28.5	66.7	3.4	18.1	9.2	9.9
Area 18	CAFETERIA	29.3	18.4	5.3	--	--	--
Area 19	ECHO PEAK	29.0	43.9	19.9	13.3	8.7	3.7
Area 19	PM SUBSTATION	32.1	33.3	5.7	14.2	10.1	6.1
Area 20	DISPENSARY	27.4	28.4	4.0	4.9	9.1	3.2
Area 23	CETO	50.0	19.5	5.3	15.4	10.3	3.4
Area 23	H&S BUILDING	31.4	19.1	3.7	13.1	10.1	7.1
Area 25	WAREHOUSE	--	--	--	19.5	9.2	5.1
Area 27	DISPENSARY	28.6	22.6	3.0	9.9	9.3	2.8
Area 28	HENRE SITE	45.4	26.5	3.7	13.0	11.9	3.4
GROOM LAKE	CAFETERIA	26.0	15.1	4.7	10.3	8.1	3.2

TABLE 4

YEARLY (FY) AVERAGES OF AIR SURVEILLANCE DATA FOR PLUTONIUM

(1×10^{-17} µCi/ml)

	STATION	1971	1972	1973	1974	1975	1976
Area 1	GRAVEL PIT	37.9	14.8	8.7	8.0	2.9	28.7
Area 2	COMPOUND	66.1	22.4	22.3	6.8	3.8	17.2
Area 3	CAFETERIA	16.5	36.8	20.6	12.6	14.6	104.
Area 5	MAINTENANCE COMPLEX	18.3	10.6	5.6	4.2	4.1	17.9
Area 5	WELL 5B	8.3	19.6	15.1	5.8	4.5	12.1
Area 5	GATE 250	8.8	11.7	5.5	6.4	----	----
Area 6	YUCCA COMPLEX	12.5	31.8	10.7	10.1	6.0	57.5
Area 6	CP-2 COMPLEX	8.0	16.8	17.8	7.2	5.3	35.4
Area 6	WELL 3 COMPLEX	31.1	353.	7.6	6.5	7.5	39.7
Area 9	9-300 BUNKER	72.1	429.	85.9	21.1	16.8	318.
Area 10	GATE 700	20.8	29.0	4.4	5.7	5.7	21.3
Area 11	GATE 293	9.1	24.3	8.7	8.0	4.9	23.6
Area 12	CHANGE HOUSE	16.3	78.6	4.3	5.8	3.3	27.9
Area 16	TUNNEL MAINTENANCE	19.3	16.9	4.4	6.0	4.5	15.6
Area 18	CAFETERIA	8.0	14.5	3.8	----	----	----
Area 19	ECHO PEAK	36.9	532.	3.9	4.8	3.3	7.9
Area 19	PM SUBSTATION	8.3	14.5	10.4	8.4	3.4	11.9
Area 20	DISPENSARY	7.5	11.7	9.1	3.7	5.9	18.4
Area 23	CETO	9.4	57.0	7.0	7.4	5.5	87.6
Area 23	H&S BUILDING	9.3	12.2	4.2	9.6	3.3	26.0
Area 25	WAREHOUSE	----	----	----	8.6	5.7	20.1
Area 27	DISPENSARY	8.4	16.6	3.7	7.2	6.8	13.7
Area 28	HENRE SITE	9.8	15.6	3.9	5.1	3.3	11.7
GROOM LAKE	CAFETERIA	176.	16.6	4.3	9.5	4.3	17.0

TABLE 5

YEARLY (FY) AVERAGES OF WATER SUPPLY DATA FOR GROSS BETA

(1×10^{-9} µCi/ml)

SUPPLY WELLS			1971	1972	1973	1974	1975	1976
Area 2	Well 2		6.6	5.7	6.5	6.0	6.3	6.9
Area 3	Well A		9.9	8.8	9.9	8.7	9.7	9.7
Area 5	Well 5B		10.3	10.1	11.8	10.7	9.2	13.0
Area 5	Well 5C		7.3	7.1	8.4	8.7	7.4	7.7
Area 5	Well Ue5c		8.7	7.4	----	----	----	----
Area 6	Well C		16.6	14.9	16.4	37.2	14.9	14.6
Area 6	Well C1		17.6	14.0	18.3	13.5	15.8	15.9
Area 15	Well Ue15d		26.2	20.4	17.9	13.6	14.0	17.2
Area 18	Well 8		2.8	6.7	2.7	2.6	4.7	5.4
Area 19	Well Ue19gs		7.7	3.9	5.8	3.6	4.5	3.0
Area 19	Well Ue19e		3.6	2.2	2.6	1.7	2.3	2.2
Area 19	Well U19c		14.9	2.5	2.9	3.5	2.8	2.5
Area 20	Well U20a		6.4	6.7	5.6	7.0	5.7	6.4
Area 23	Army Well #1		4.1	3.9	4.1	5.0	5.2	----
Area 25	Well J12		4.5	3.8	4.7	5.0	4.4	5.2
Area 25	Well J13		7.0	5.9	7.3	7.4	6.2	7.3
GROOM LAKE	Well 3		27.7	24.4	24.9	23.2	19.9	24.6
GROOM LAKE	Well 4		----	----	----	----	----	4.0
POTABLE WATER								
Area 2	Men's Rest Room		5.5	3.2	3.7	4.2	7.3	3.9
Area 3	Cafeteria		10.9	8.0	10.0	8.8	11.9	9.1
Area 6	Cascade		----	1.4	1.7	2.1	6.0	2.6
Area 6	Cafeteria		6.9	13.2	13.3	14.6	12.8	15.3
Area 12	Cafeteria		4.9	3.1	4.0	3.5	7.3	3.8
Area 18	Fire Station		10.9	----	----	----	----	----
Area 23	Cafeteria		4.8	3.5	6.3	7.8	7.1	9.0
Area 27	Cafeteria		5.0	3.7	6.7	7.4	6.4	9.4
GROOM LAKE	Cafeteria		4.4	6.3	6.5	6.4	12.3	7.3
NATURAL SPRINGS								
Area 5	Cane Springs		24.5	11.5	8.9	10.7	9.1	7.6
Area 12	White Rock Spring		334.	66.5	9.9	8.1	8.5	14.5
Area 12	Captain Jack Spring		65.8	12.7	9.5	9.8	20.0	14.6
Area 12	Gold Meadows Pond		265.	87.4	59.2	53.6	16.8	37.1
Area 15	Oak Butte Spring		359.	52.0	12.5	11.1	22.1	7.5
Area 15	Tub Spring		8.6	8.6	6.0	6.6	5.6	6.7
Area 29	Topopah Spring		----	12.0	11.6	10.2	17.6	13.7
OPEN RESERVOIRS								
Area 2	Well 2	Reservoir	14.7	6.2	7.3	7.0	7.7	8.6
Area 3	Well A	Reservoir	16.9	11.4	15.3	13.7	13.9	11.8
Area 5	Well 5b	Reservoir	13.7	10.9	11.6	13.0	15.2	15.2
Area 5	Well Ue5c	Reservoir	7.8	8.4	13.1	----	----	----
Area 6	Well 3	Reservoir	16.1	16.3	18.9	42.5	17.5	17.4
Area 6	Well 1	Reservoir	17.1	16.8	19.7	15.4	25.4	16.3
Area 15	Well Ue15d	Reservoir	26.5	17.0	18.9	14.1	14.1	17.6
Area 18	Camp 17	Reservoir	7.5	4.9	4.0	3.9	5.3	4.2
Area 19	Well Ue19gs	Reservoir	10.1	10.8	5.3	16.7	6.2	3.7
Area 19	Well Ue19e	Reservoir	7.1	12.1	2.0	4.4	3.3	3.4
Area 20	Well U20a	Reservoir	6.4	8.9	36.8	6.0	6.3	5.3
Area 23	Swimming Pool		16.7	5.3	8.8	9.2	8.8	36.2

			1971	1972	1973	1974	1975	1976
OPEN RESERVOIRS (continued)								
GROOM LAKE	Well 4	Reservoir	44.9	43.3	45.4	35.4	38.9	37.5
GROOM LAKE	Papoose	Reservoir	371.	222.	302.	147.	105.	138.
GROOM LAKE	Swimming	Reservoir	39.6	7.9	9.0	8.6	7.4	8.1
Area 19	Well U19c	Reservoir	----	----	----	----	----	3.6

TABLE 6

YEARLY (FY) AVERAGES OF CONTAMINATED AND EFFLUENT PONDS FOR GROSS BETA

(1×10^{-8} µCi/ml)

	Station	1971	1972	1973	1974	1975	1976
	Contaminated Ponds						
Area 12	HAINES UPPER	4840.	137.	43.6	24.9	22.6	32.6
Area 12	HAINES #2	----	----	----	24.1	19.8	22.8
Area 12	HAINES #3	----	----	----	16.2	16.4	23.2
Area 12	HAINES LOWER	4340.	154.	33.5	21.2	17.0	22.9
Area 12	MINT UPPER	7230.	314.	3.9	2.9	2.7	1.5
Area 12	MINT MID	----	----	----	2.8	3.2	1.5
Area 12	MINT LOWER	10100.	196.	22.3	2.1	3.8	1.5
Area 12	N UPPER	----	2.1	2.4	4.0	5.9	5.7
Area 12	N MID	----	----	----	3.8	8.7	4.4
Area 12	N LOWER	----	1.5	2.2	3.4	2.6	4.2
Area 12	G TUNNEL						
Area 23	H&S SUMP	3.6	3.1	5.5	243.	8.4	15.1
	Effluent Ponds						
Area 6	YUCCA POND	54.3	134.	783.	67.7	54.5	238.
Area 6	CP-2 WASTE	392	26.7	----	----	----	----
Area 6	FINAL EFFLUENT POND	4.3	12.7	3.3	4.6	2.0	----
Area 12	FINAL EFFLUENT POND	44.	1170.	2.9	2.2	1.5	----
Area 23	FINAL EFFLUENT POND	4.4	1.7	1.5	1.9	1.9	----
GROOM LAKE	FINAL EFFLUENT POND	4.2	2.2	3.0	1.8	1.4	----

APPENDIX A

NTS Environmental Surveillance

Air Sampling Locations and Plots

Several symbols are used in Appendix A to denote the data points. In the first plot, the air network averages, a square represents the geometric mean of all values at that point in time, and the vertical line is the range. The notations (a) and (b) depict significant events that may perturb the data. The symbol (a) represents foreign atmospheric testing and (b) denotes the Baneberry test at NTS.

The remaining plots of Appendix A show the gross beta data of each station. The data symbols for the plots are as follows:

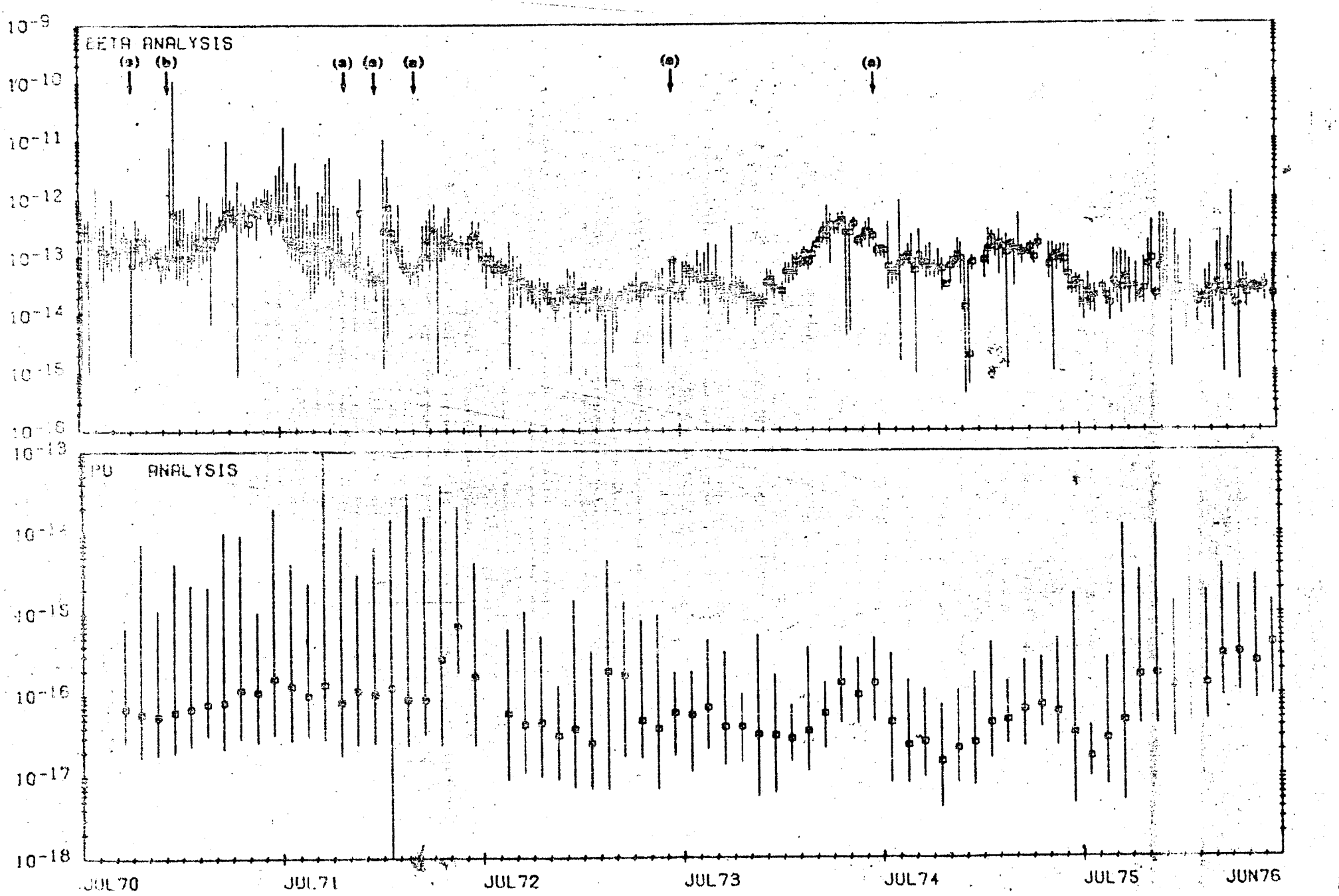
Plot #	Symbol
1-4	X
5-9	◇
10-14	⧖
15-19	⬡
20-24	☆

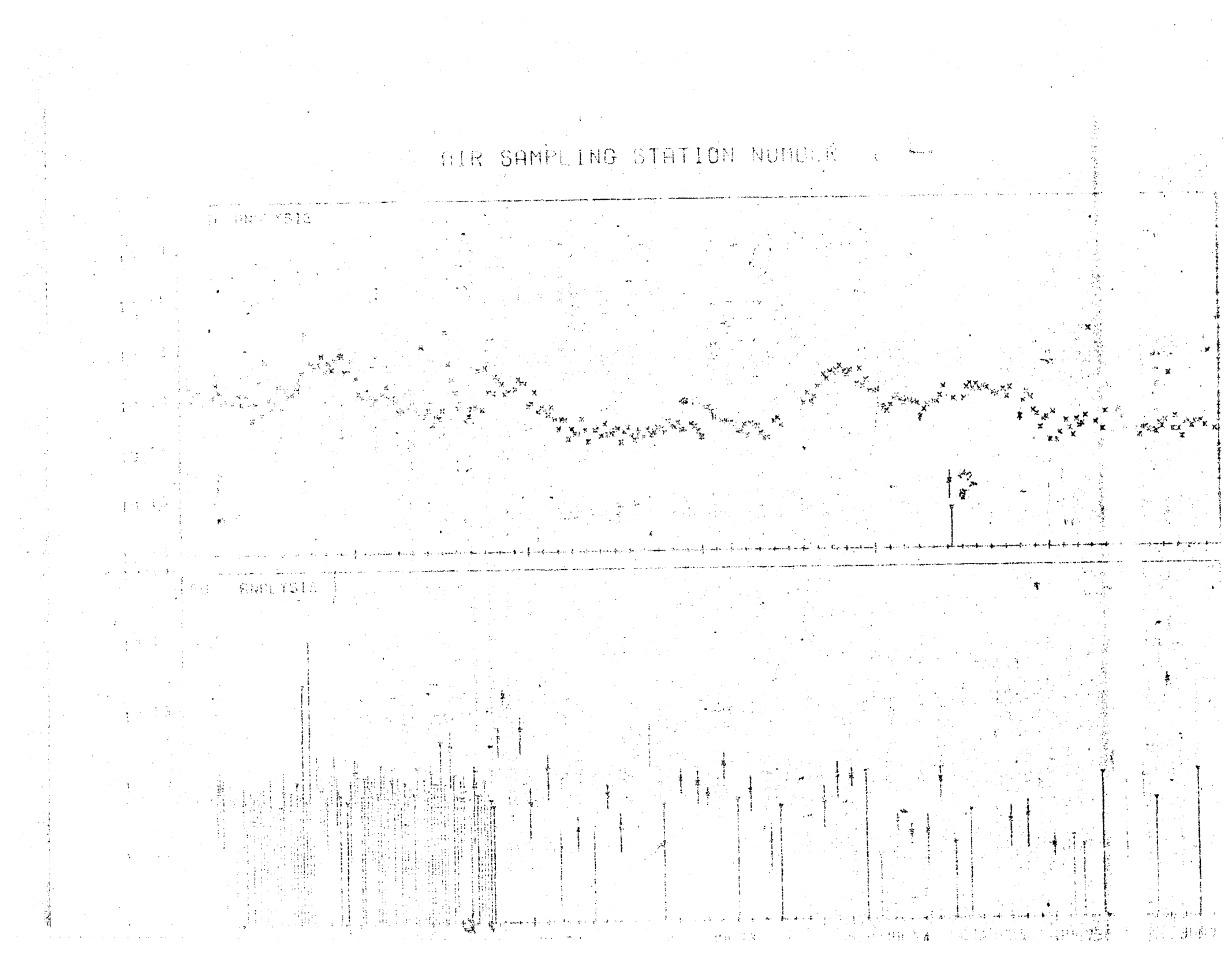
A two-sigma error bar is also added to the data points, and, in all plots, a delta with the line to the bottom of the plot means below detection limit.

NTS ENVIRONMENTAL SURVEILLANCE AIR SAMPLING LOCATIONS

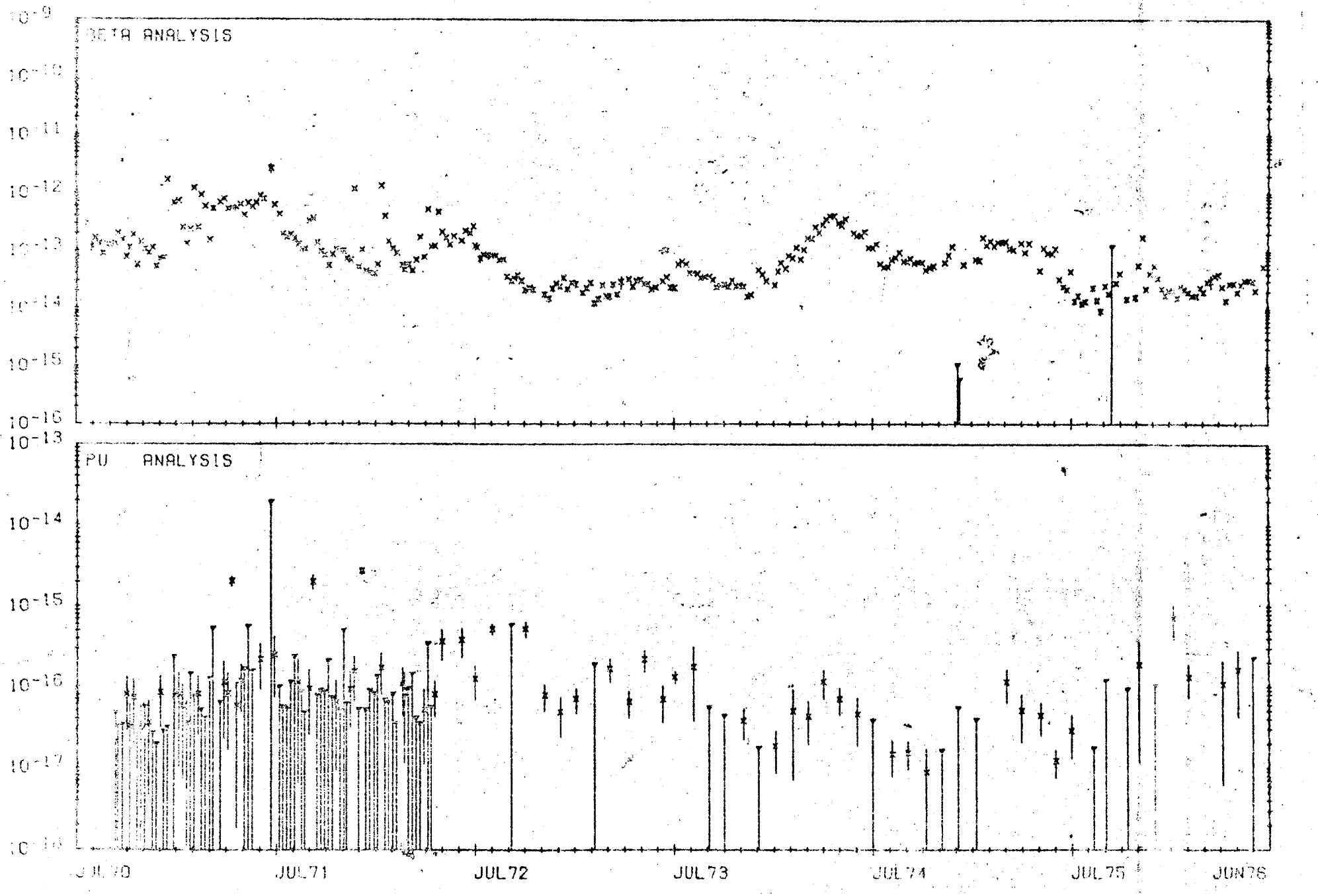
Number	Location	Map Code (Figure 2)
1	Area 1 Gravel Pit	1A
2	Area 2 Compound	2A
3	Area 3 Cafeteria	3A
4	Area 5 Maintenance Complex	5A
5	Area 5 Well 5B	5B
6	Area 5 Gate 250	5C
7	Area 6 Yucca Complex	6A
8	Area 6 CP-2 Complex	6B
9	Area 6 Well 3 Complex	6C
10	Area 9 9-300 Bunker	9A
11	Area 10 Gate 700	10A
12	Area 11 Gate 293	11A
13	Area 12 Changehouse	12A
14	Area 16 Tunnel Maintenance	16A
15	Area 18 Cafeteria	18A
16	Area 19 Echo Peak	19A
17	Area 19 PM Substation	19B
18	Area 20 Dispensary	20A
19	Area 23 CETO	23A
20	Area 23 H&S Building	23B
21	Area 25 Warehouse	25A
22	Area 27 Dispensary	27A
23	Area 28 Project Henre	28A
24	East of Groom Lake Cafeteria	00A

AIR NETWORK AVERAGES




AIR SAMPLING STATION NUMBER

AIR SAMPLING STATION NUMBER 2



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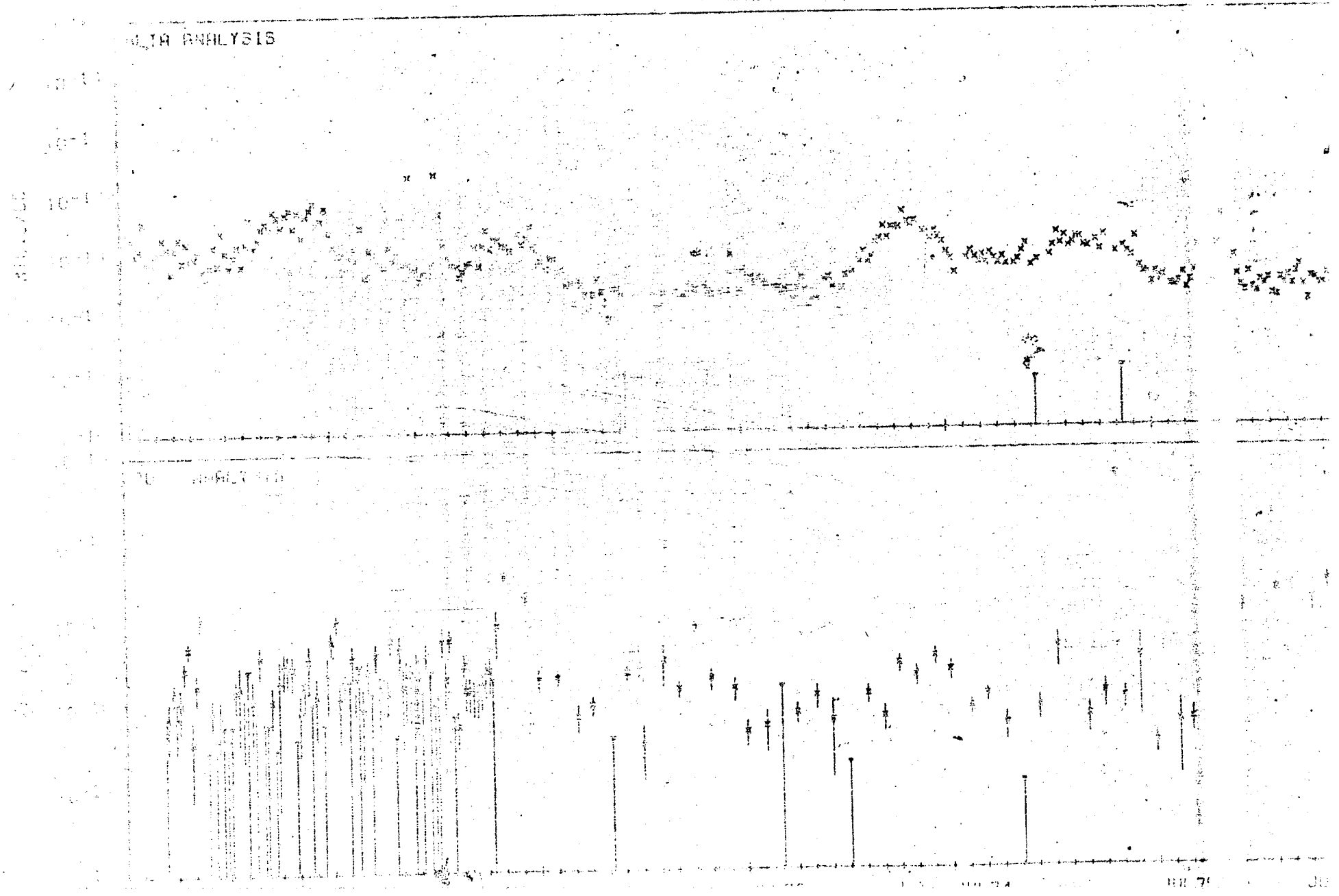

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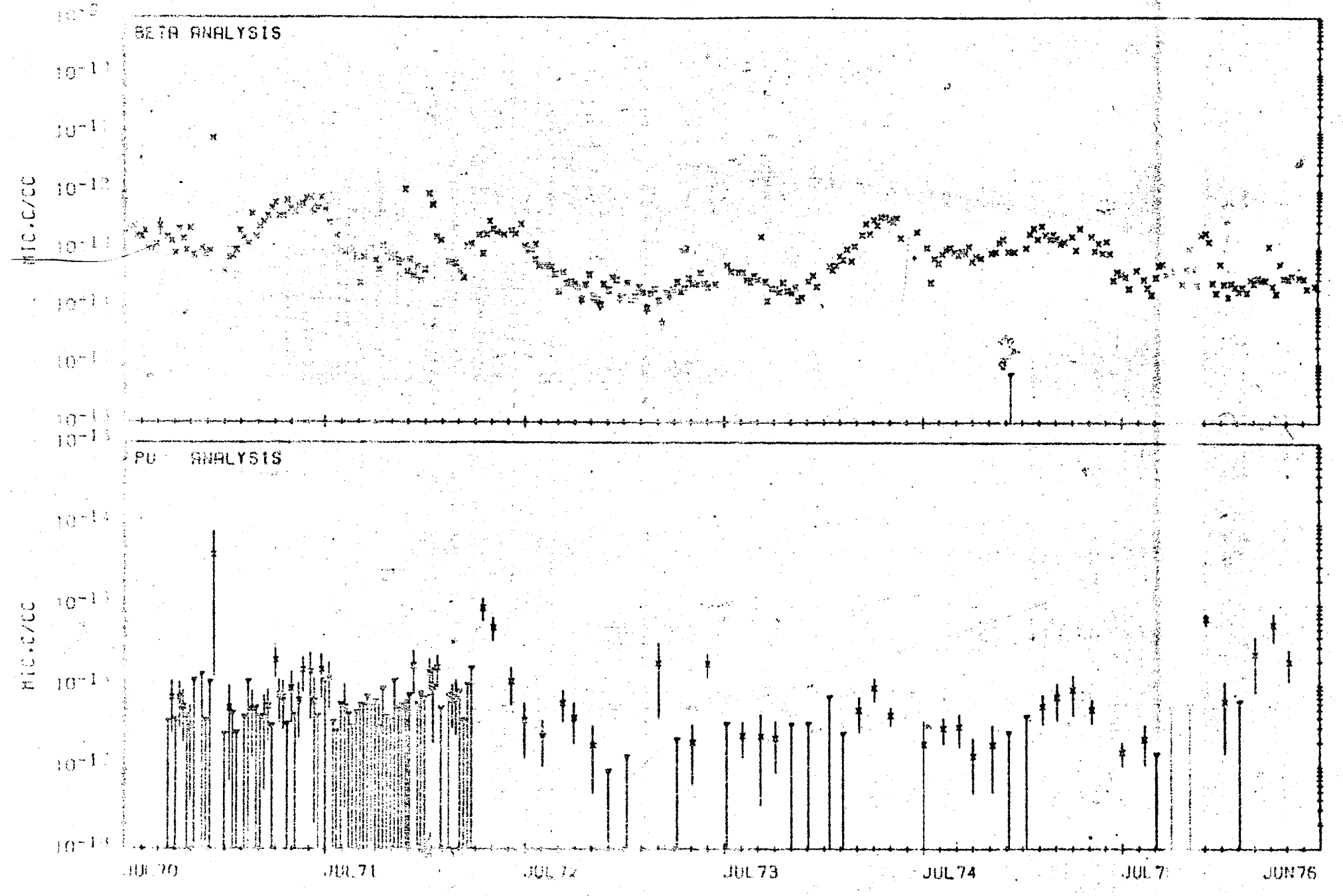

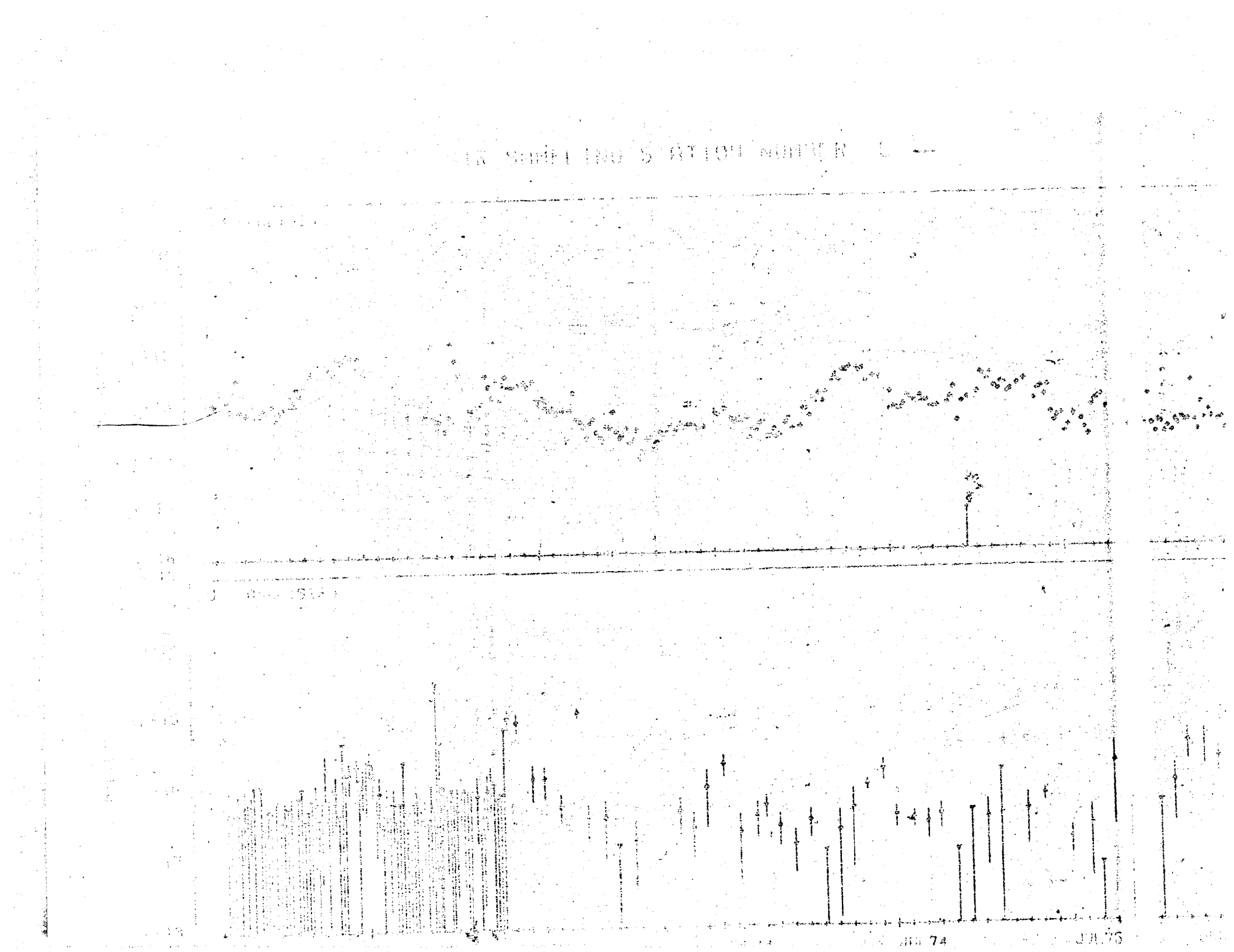

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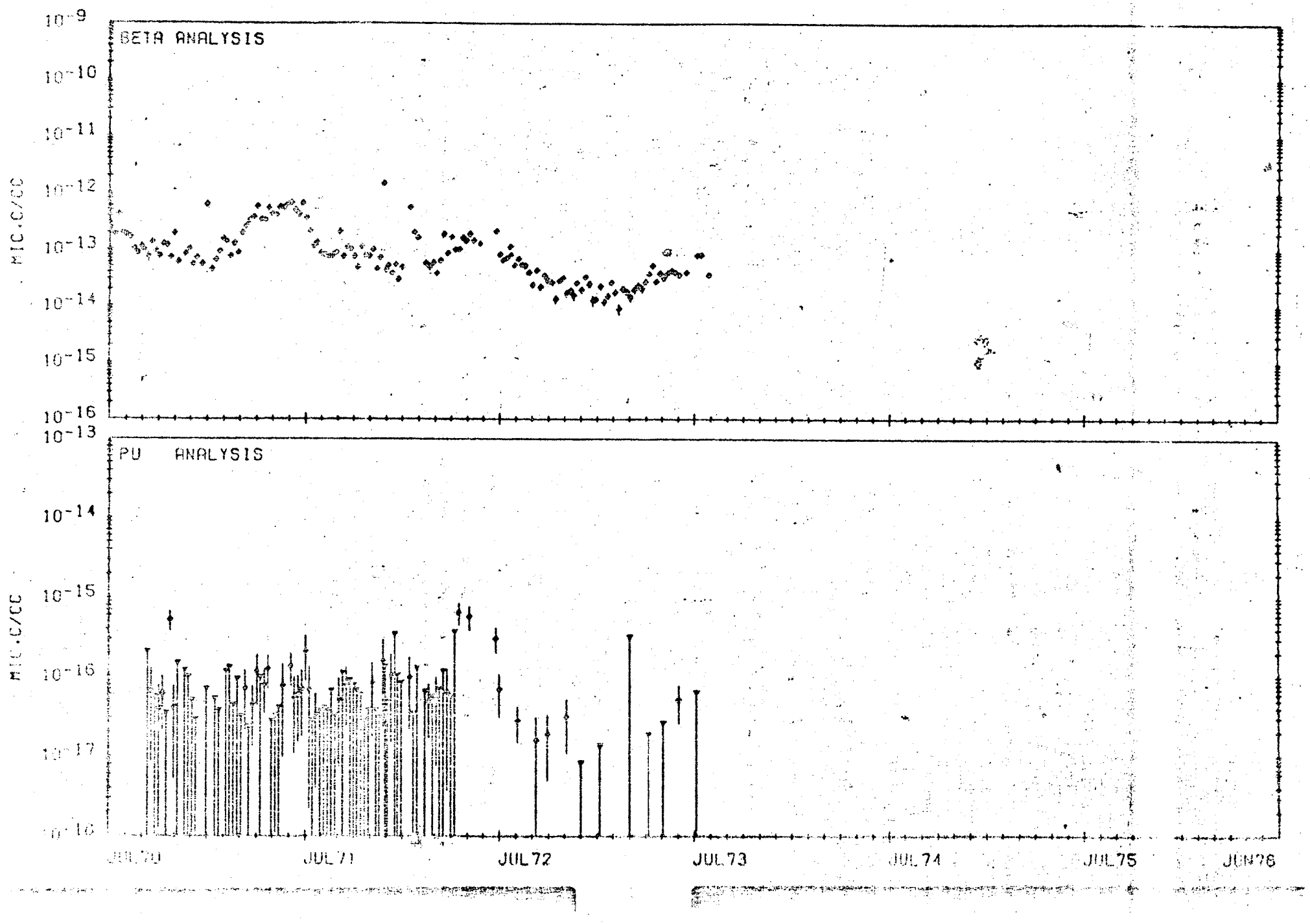

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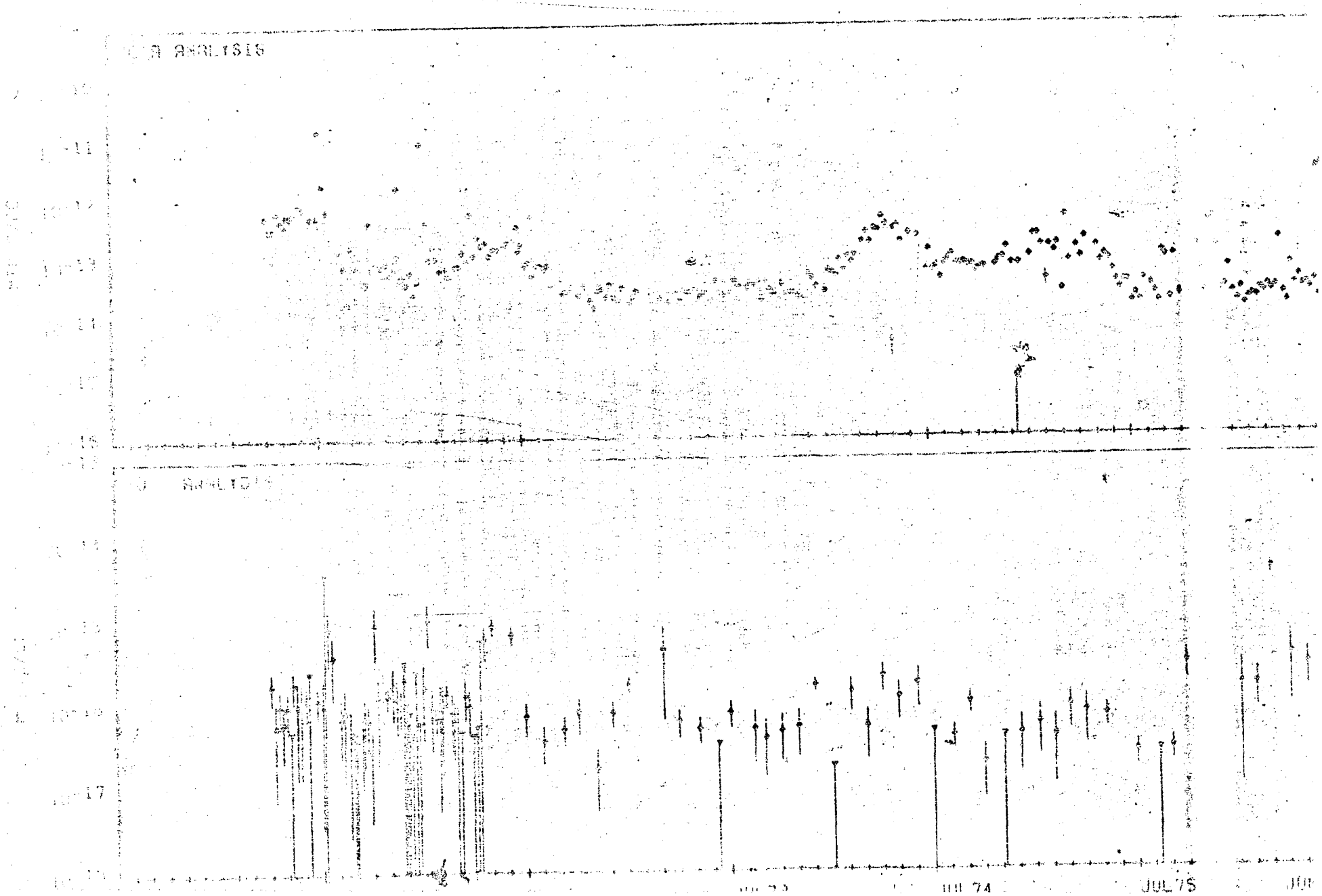
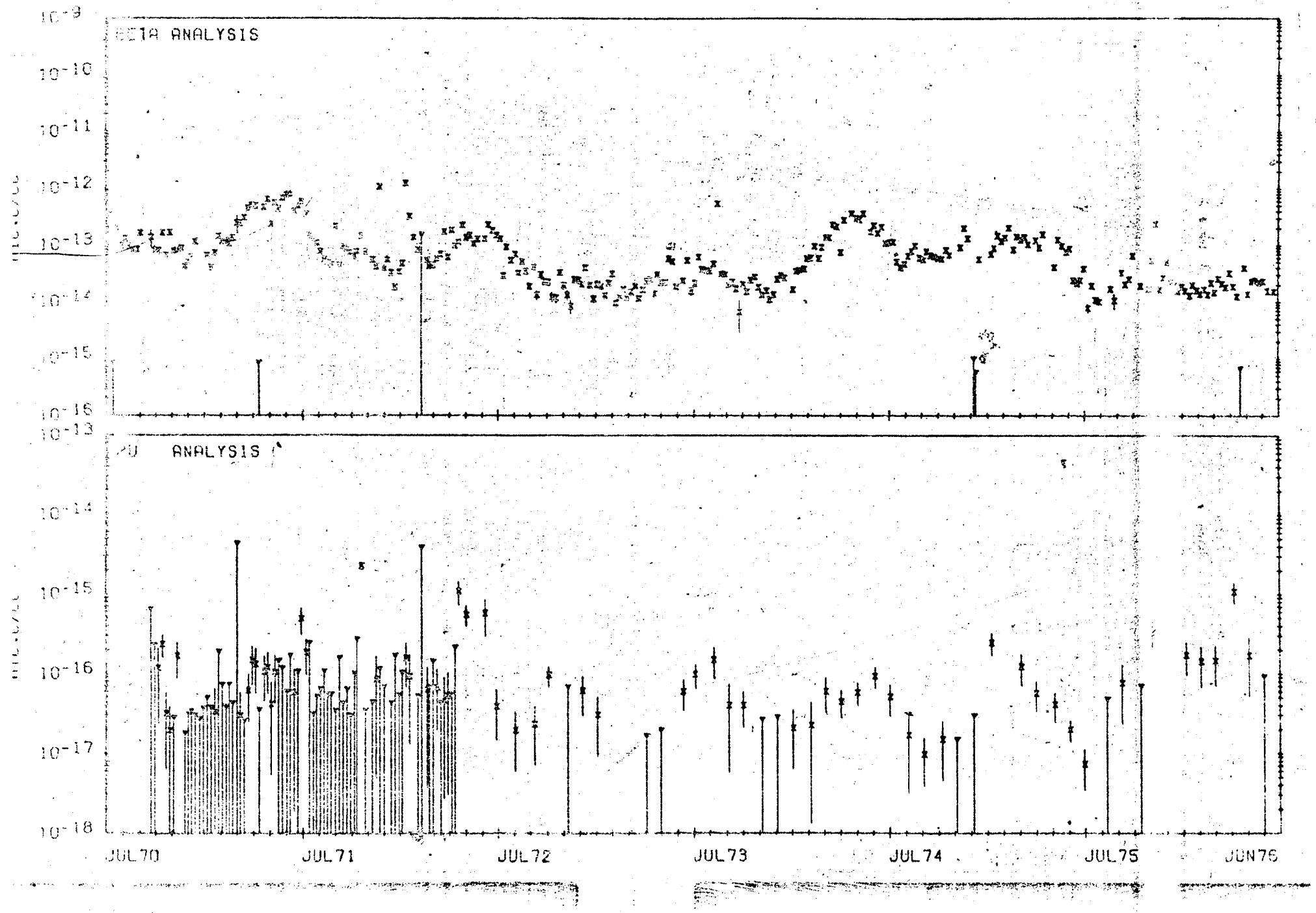


AIR SAMPLING STATION NUMBER 11



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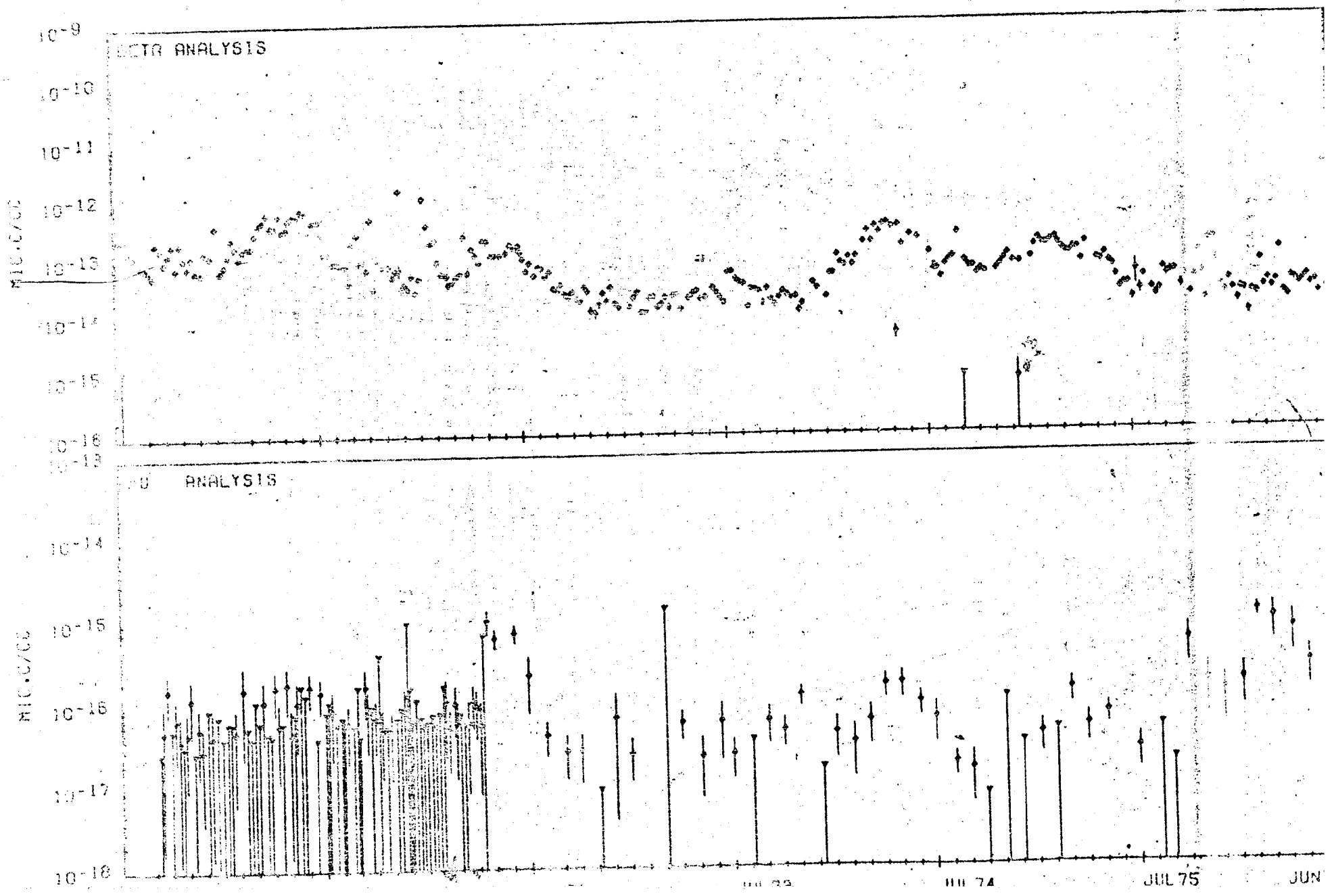

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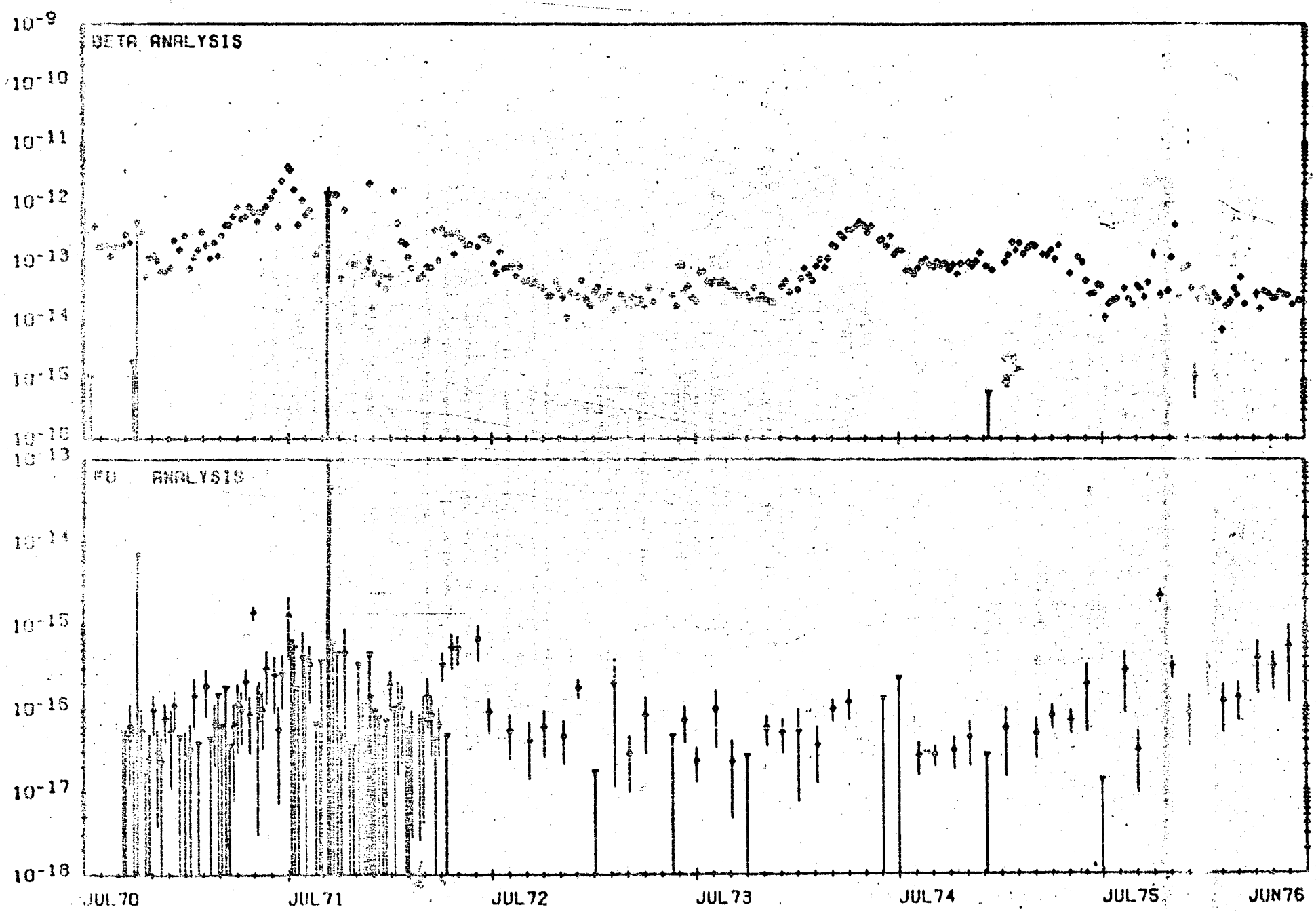

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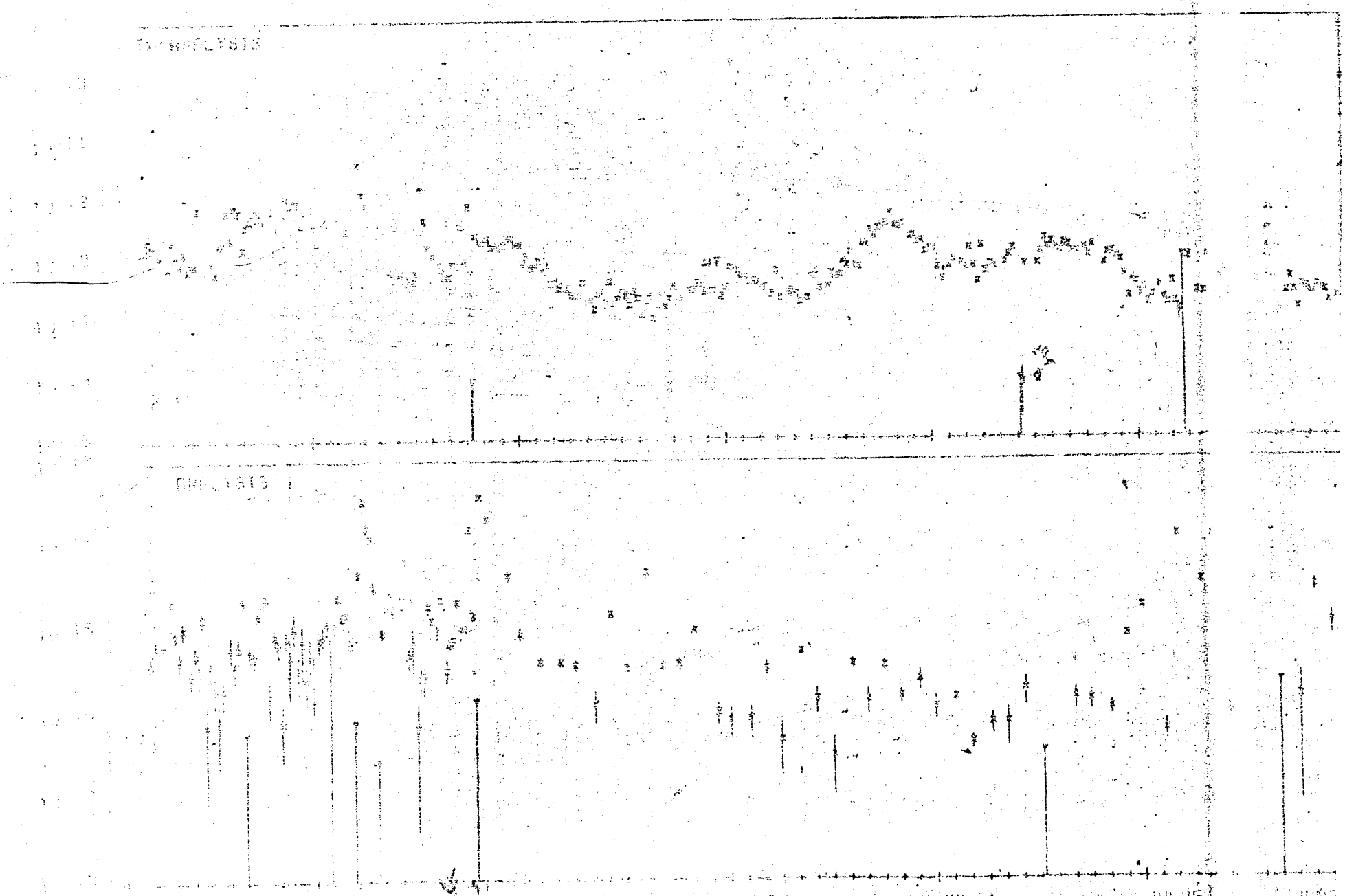

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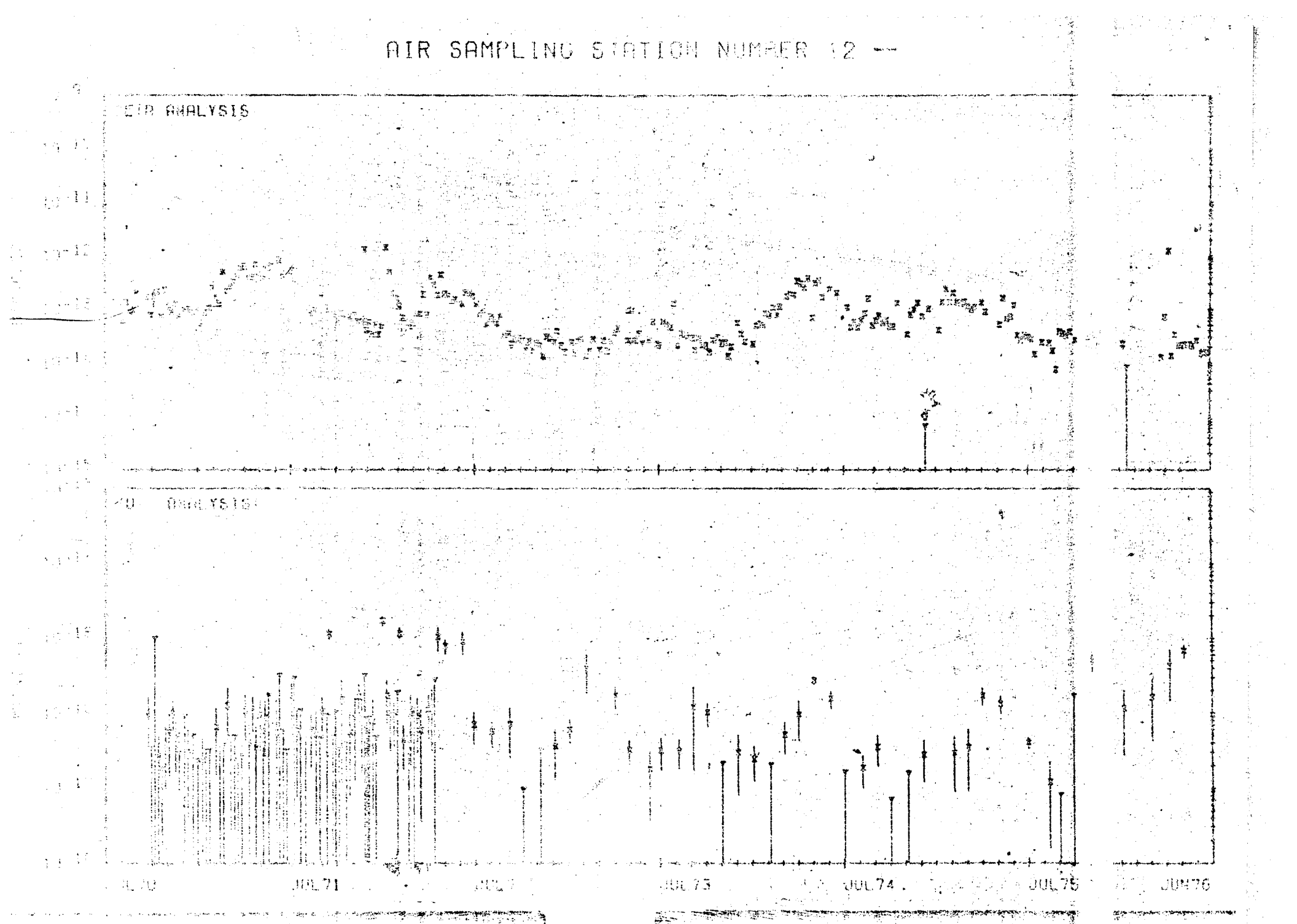

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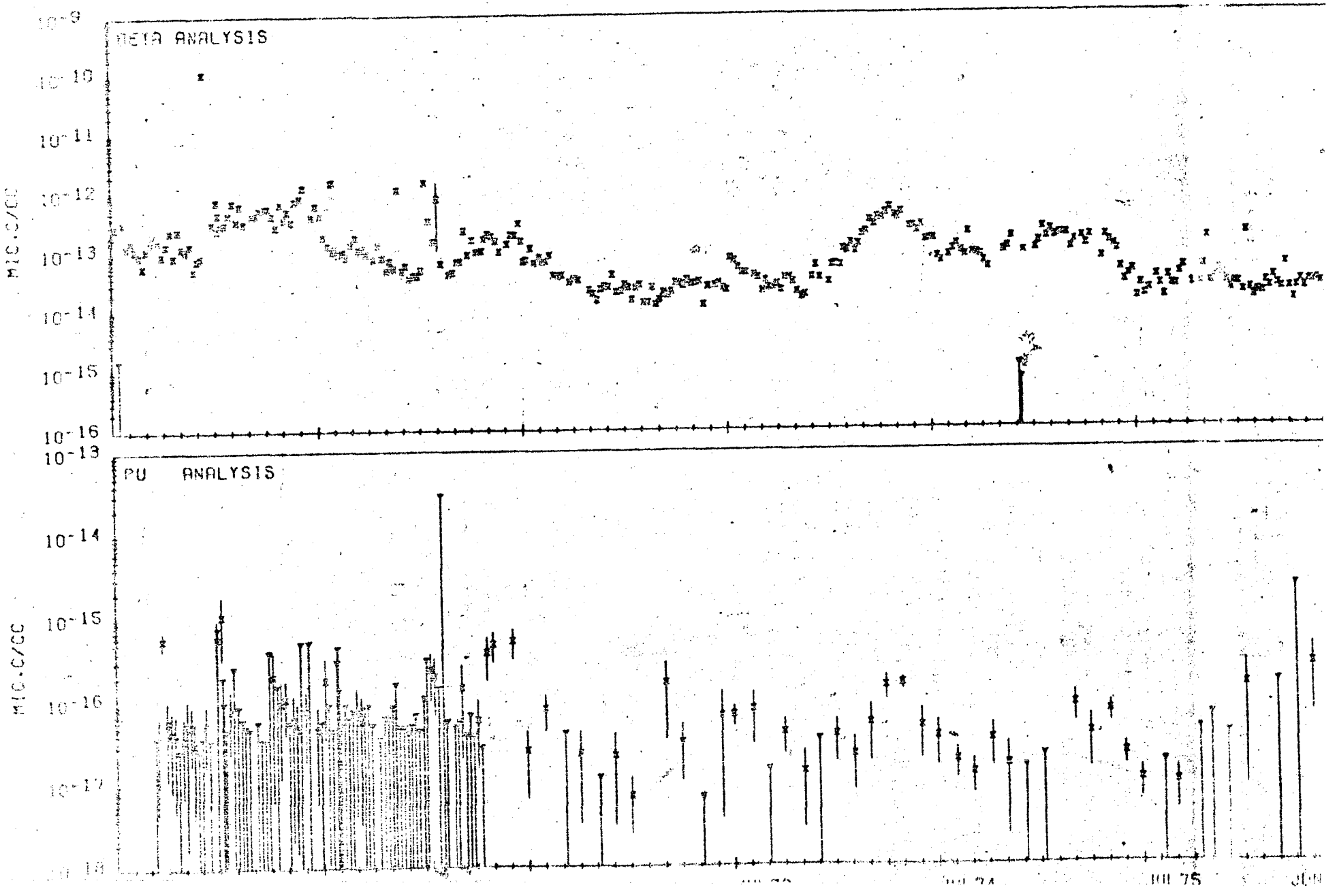

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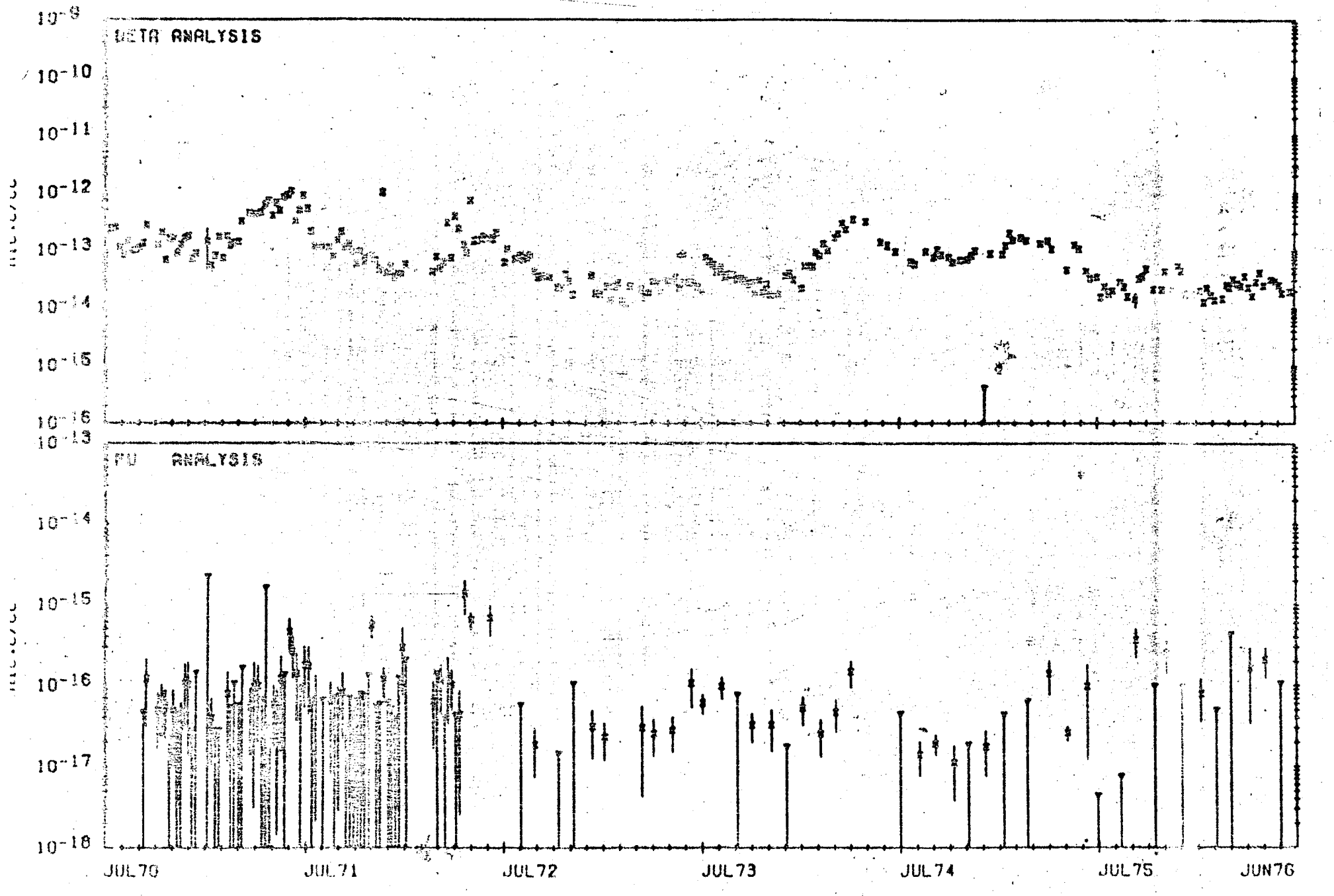
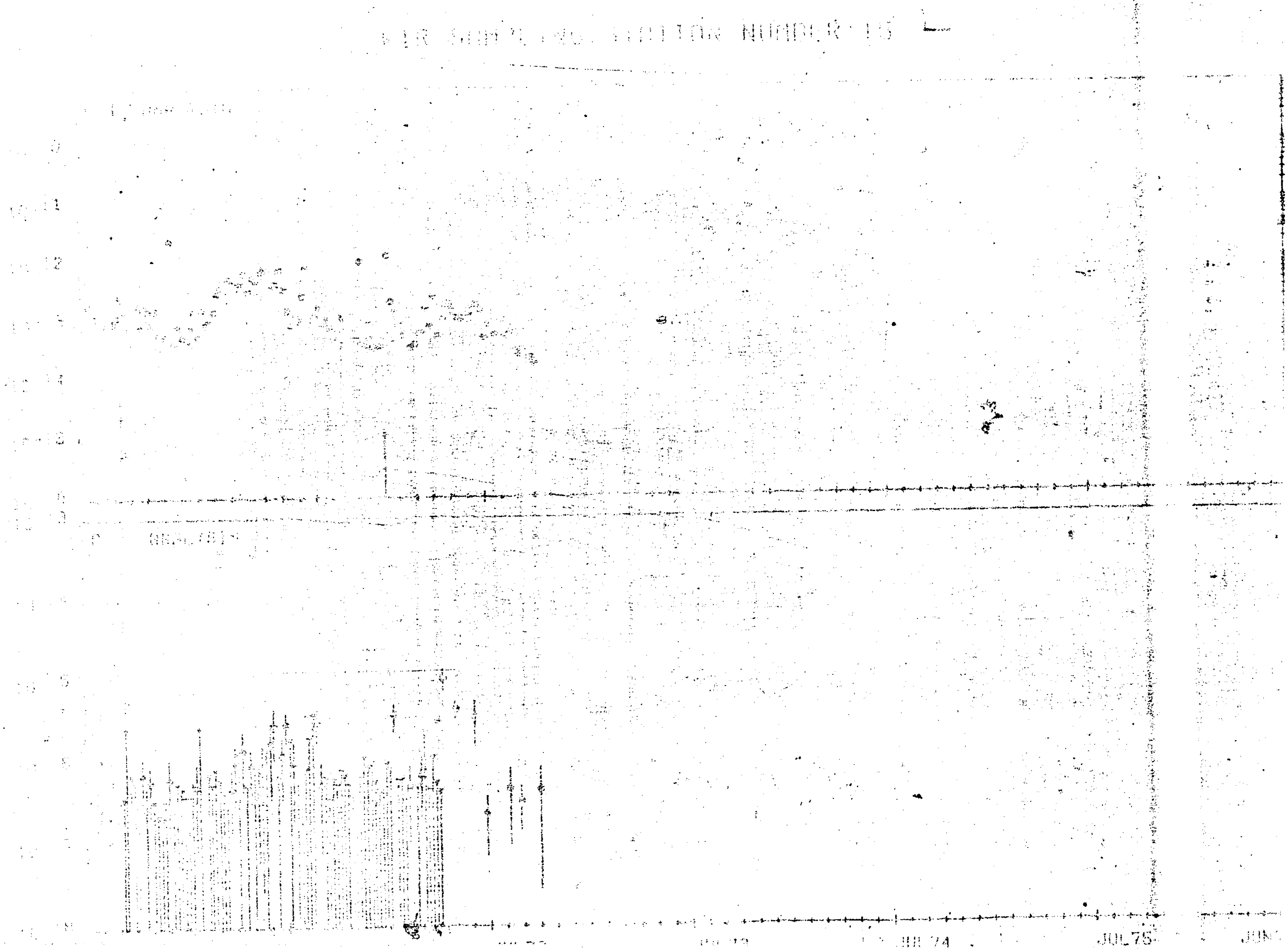
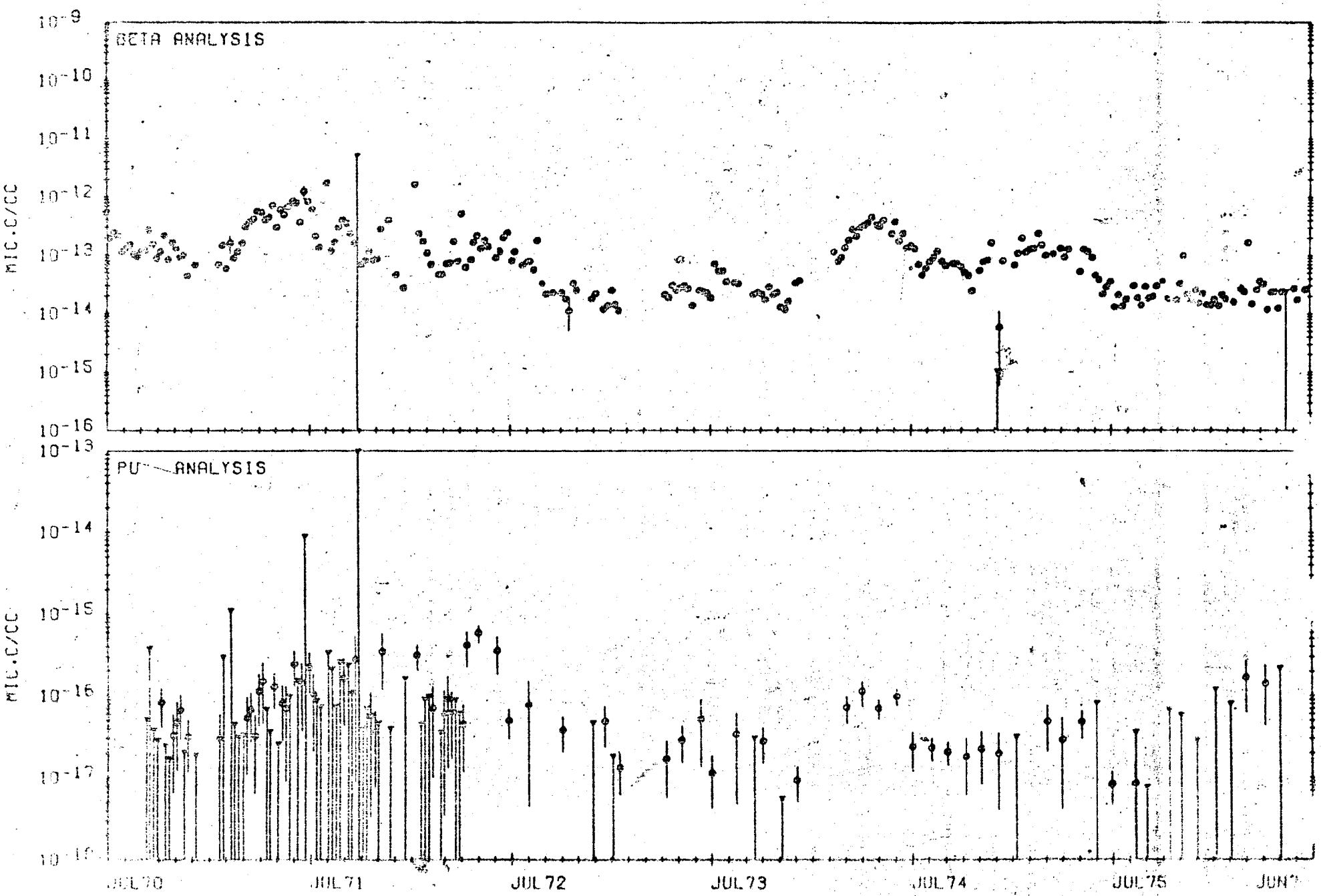
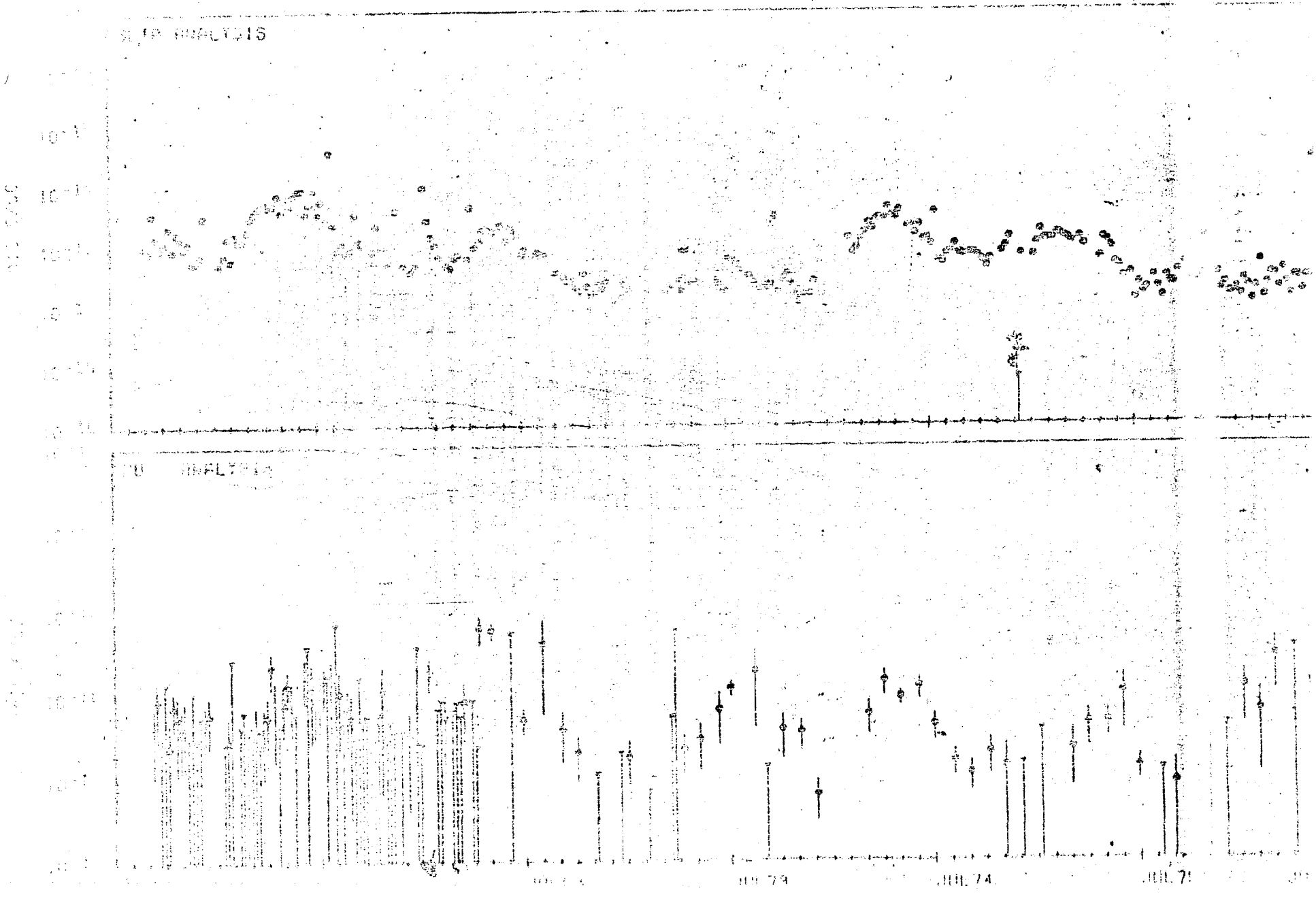



NUMBER 15
JUL 74
JUL75

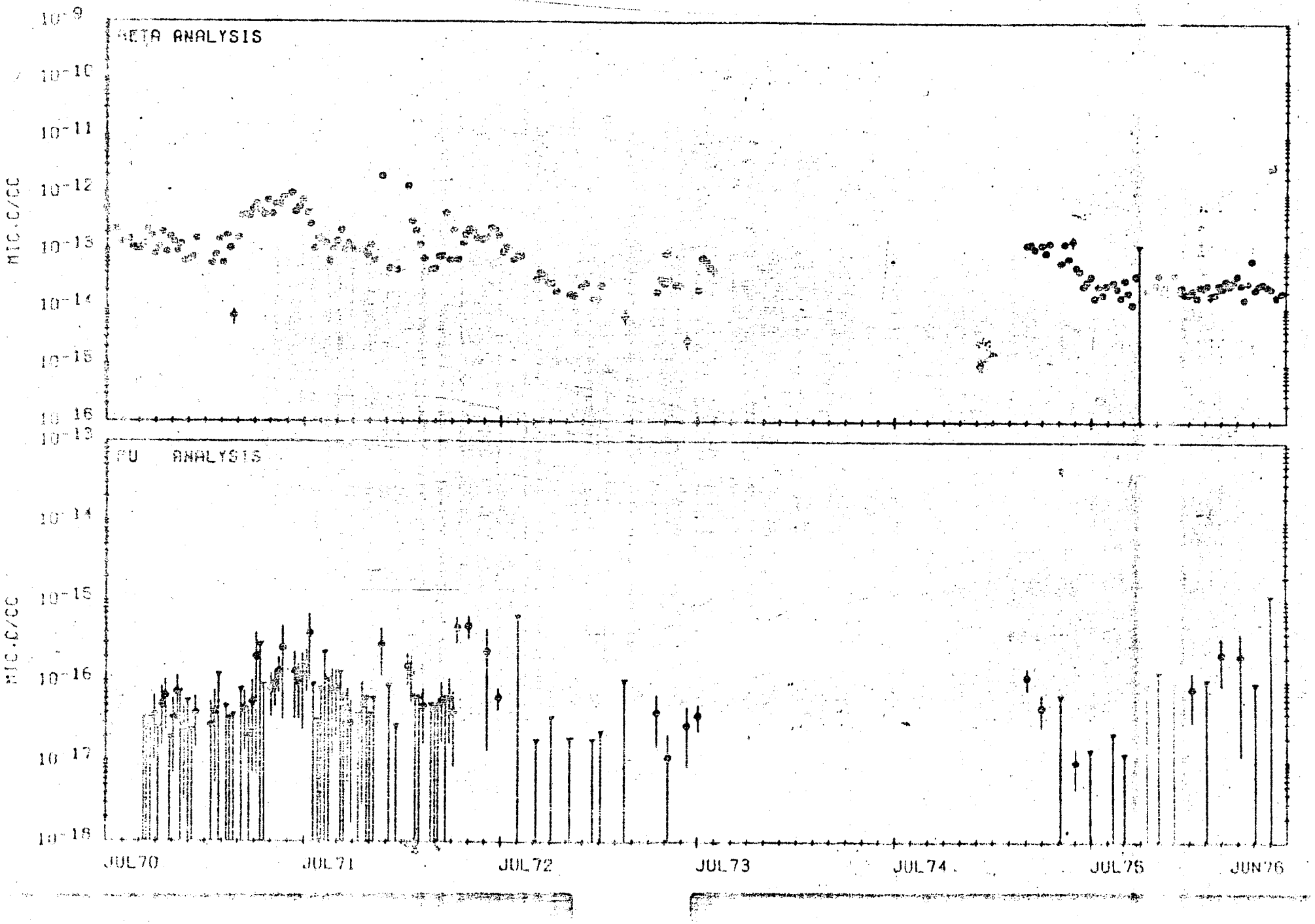
AIR SAMPLING STATION NUMBER 16



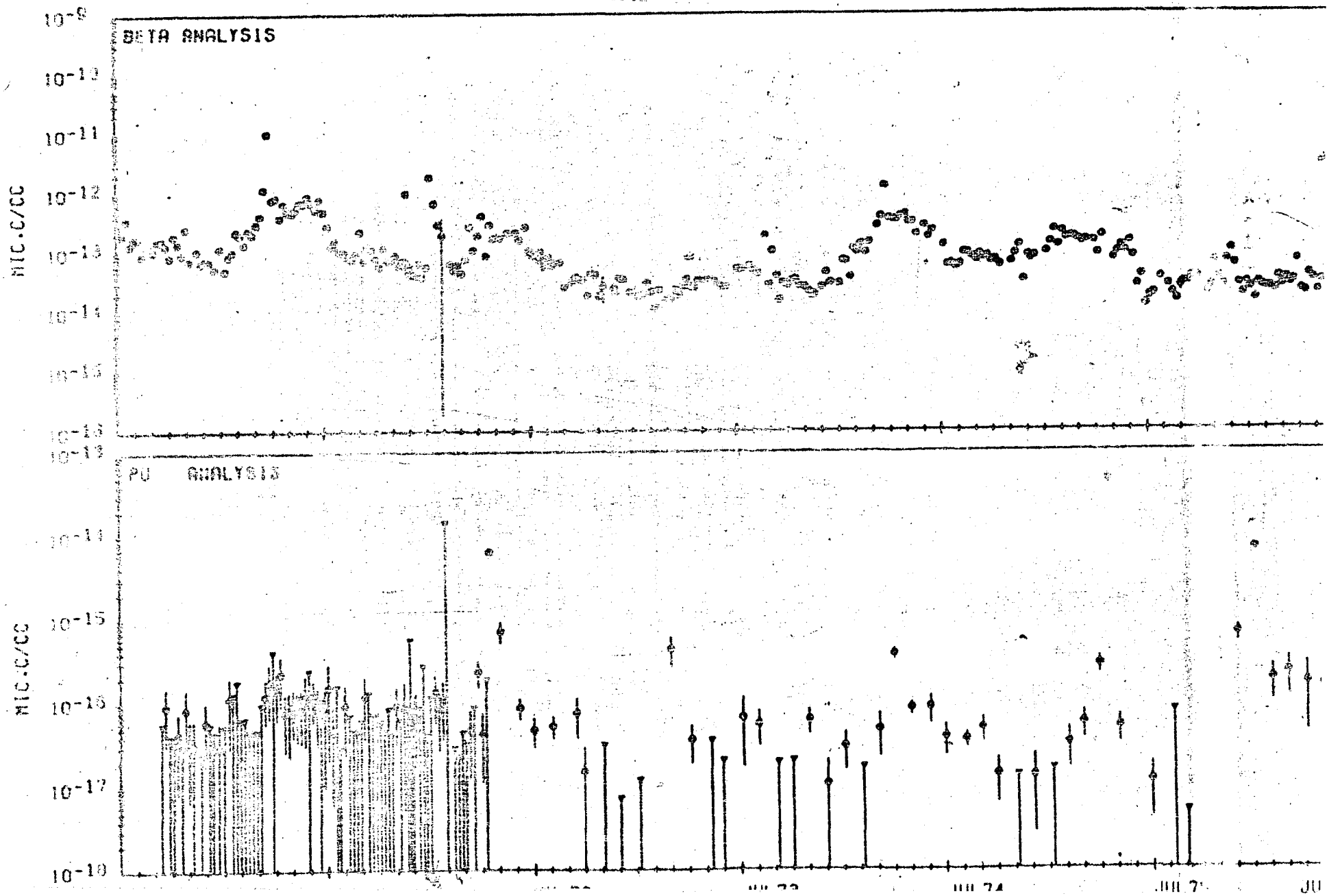
AIR SAMPLING STATION NUMBER 17 —

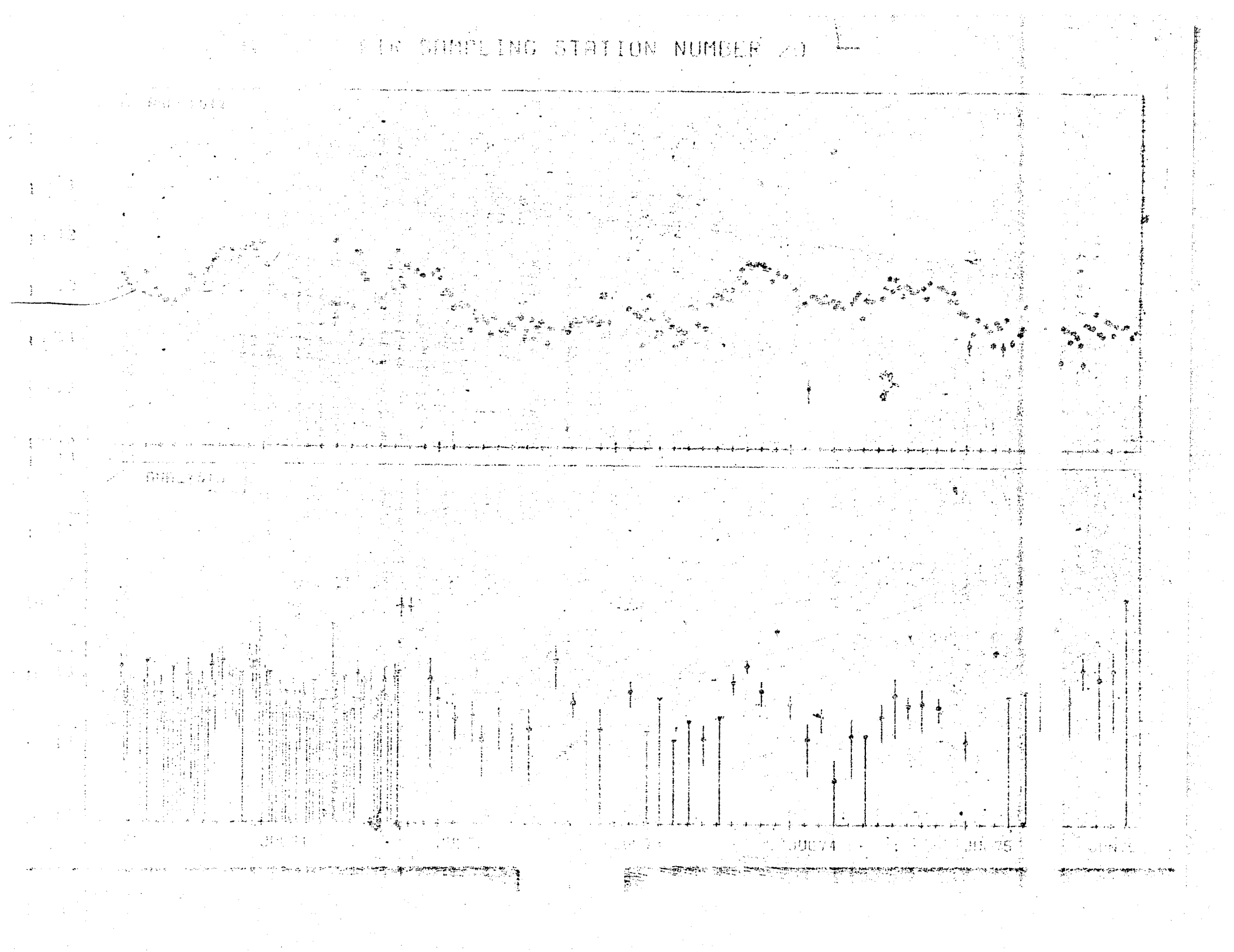


AIR SAMPLING STATION NUMBER 18

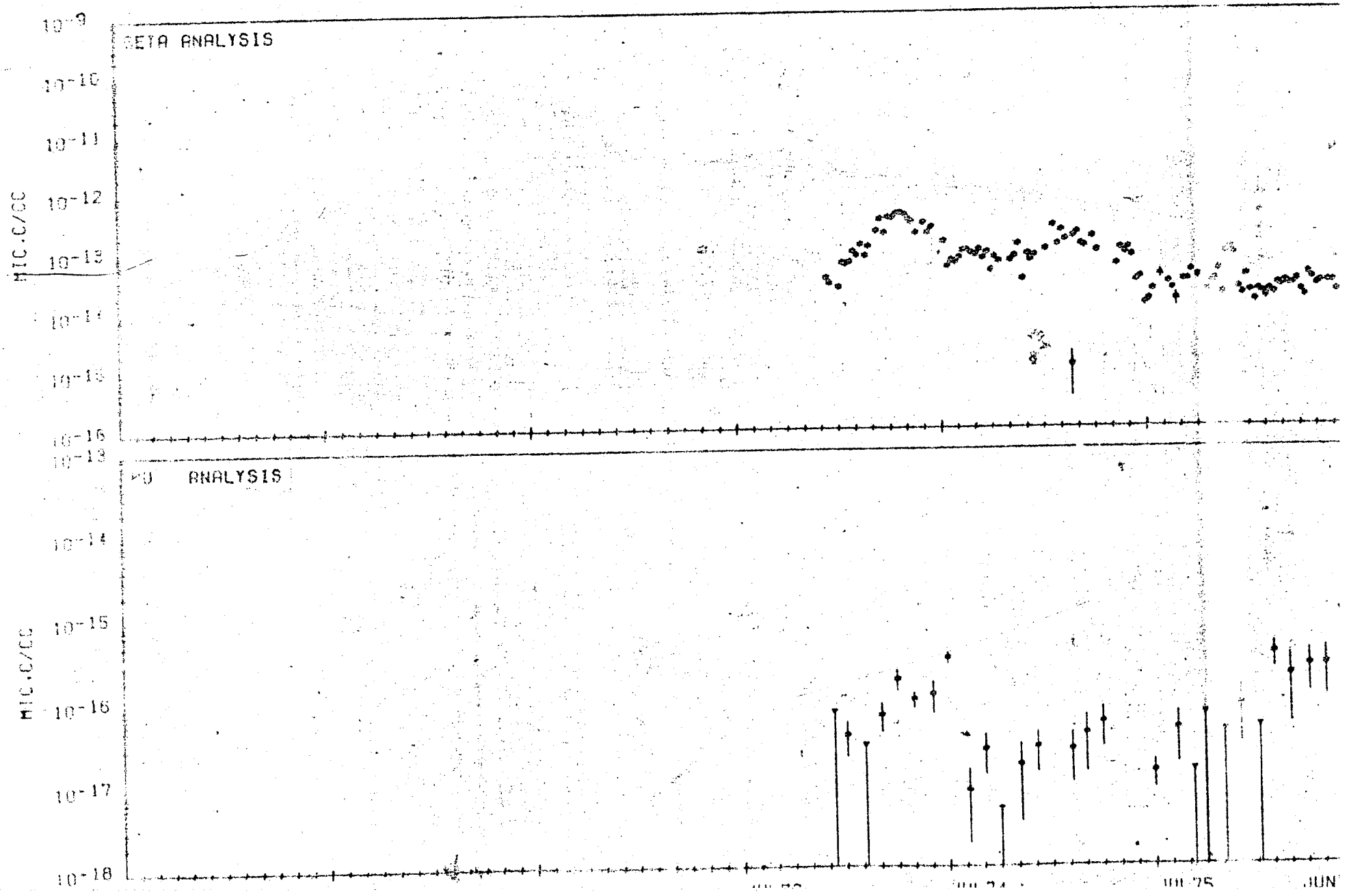


AIR SAMPLING STATION NUMBER 19-

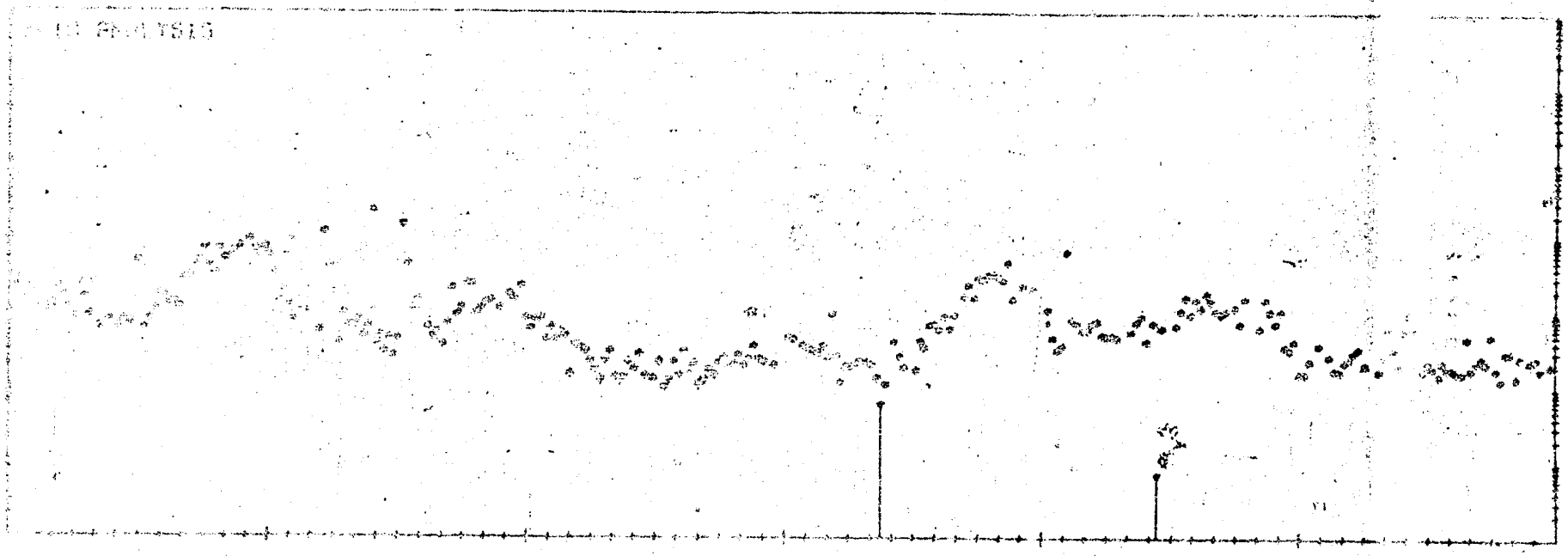


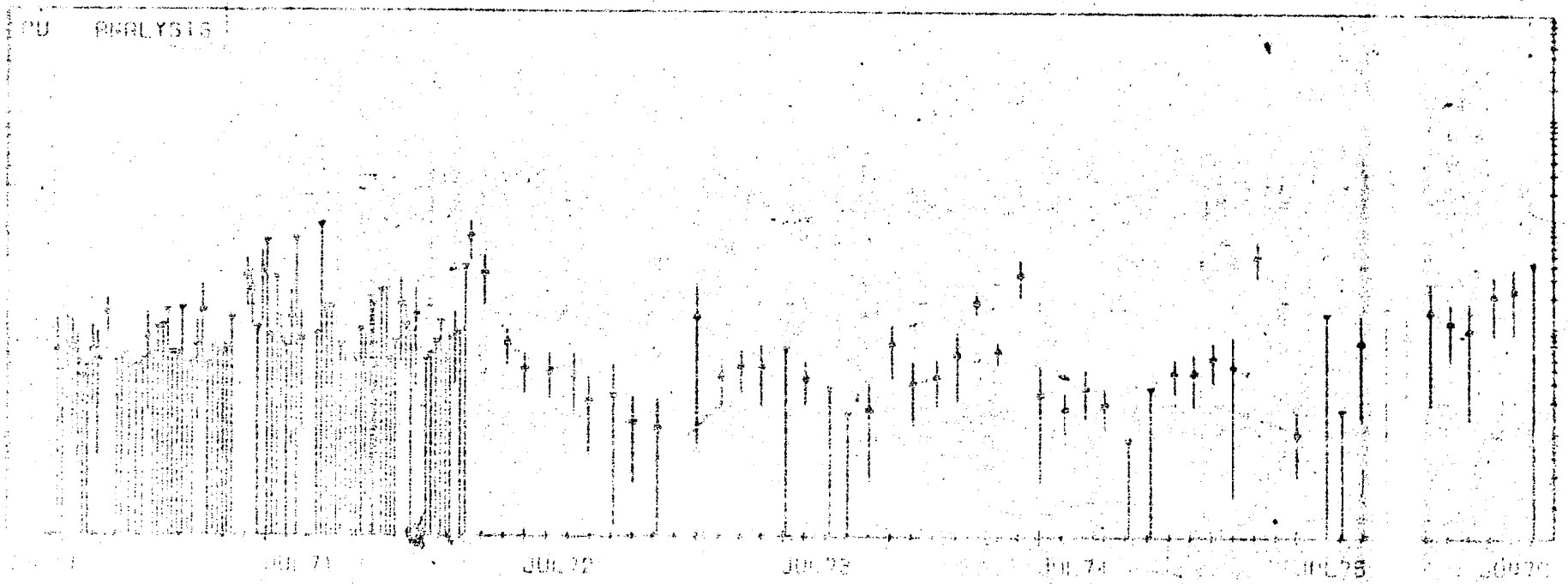

SAMPLING STATION NUMBER 20
JUL 74
JUL 75

AIR SAMPLING STATION NUMBER 21

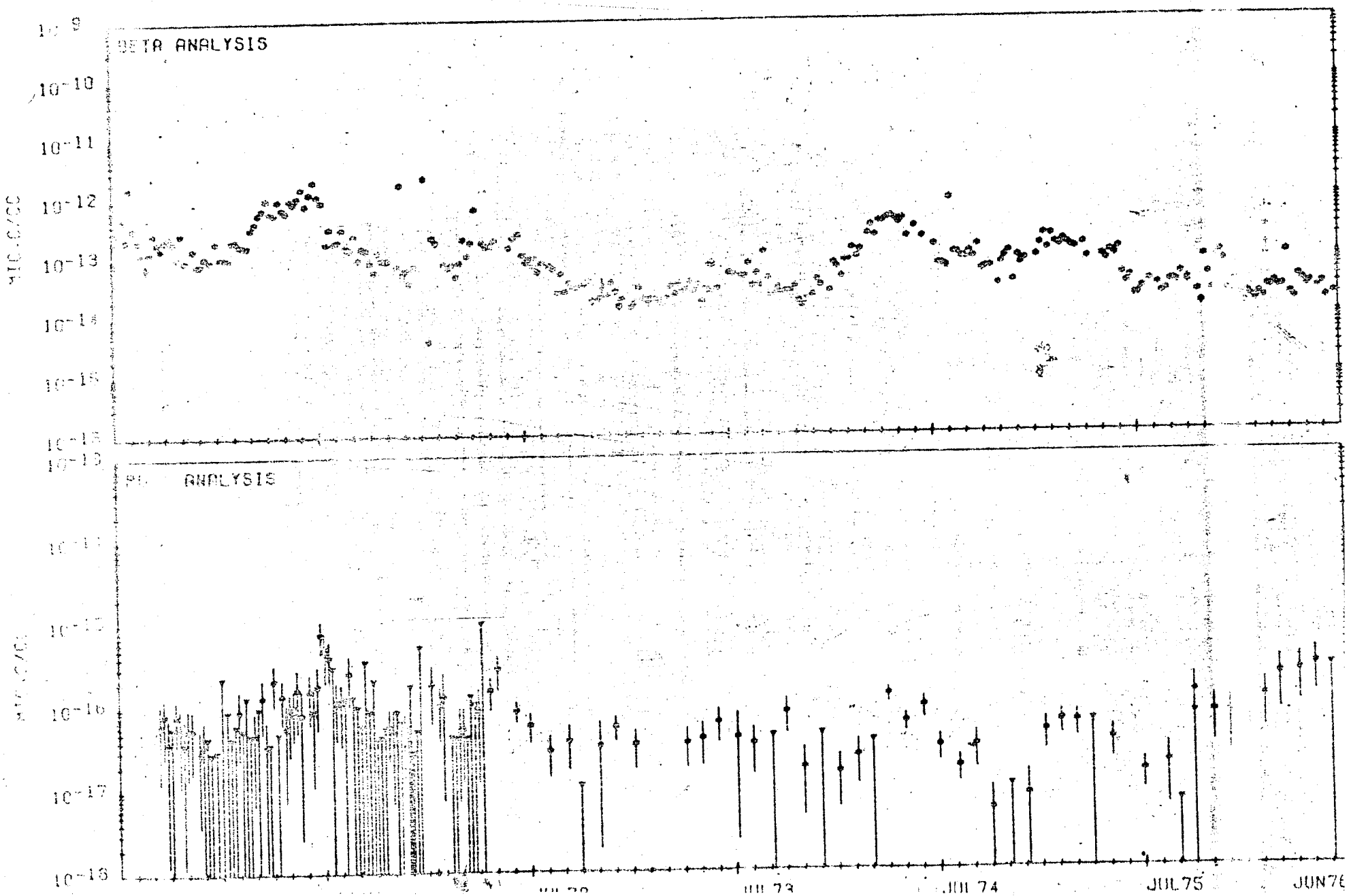


AIR SAMPLING STATION NUMBER 22

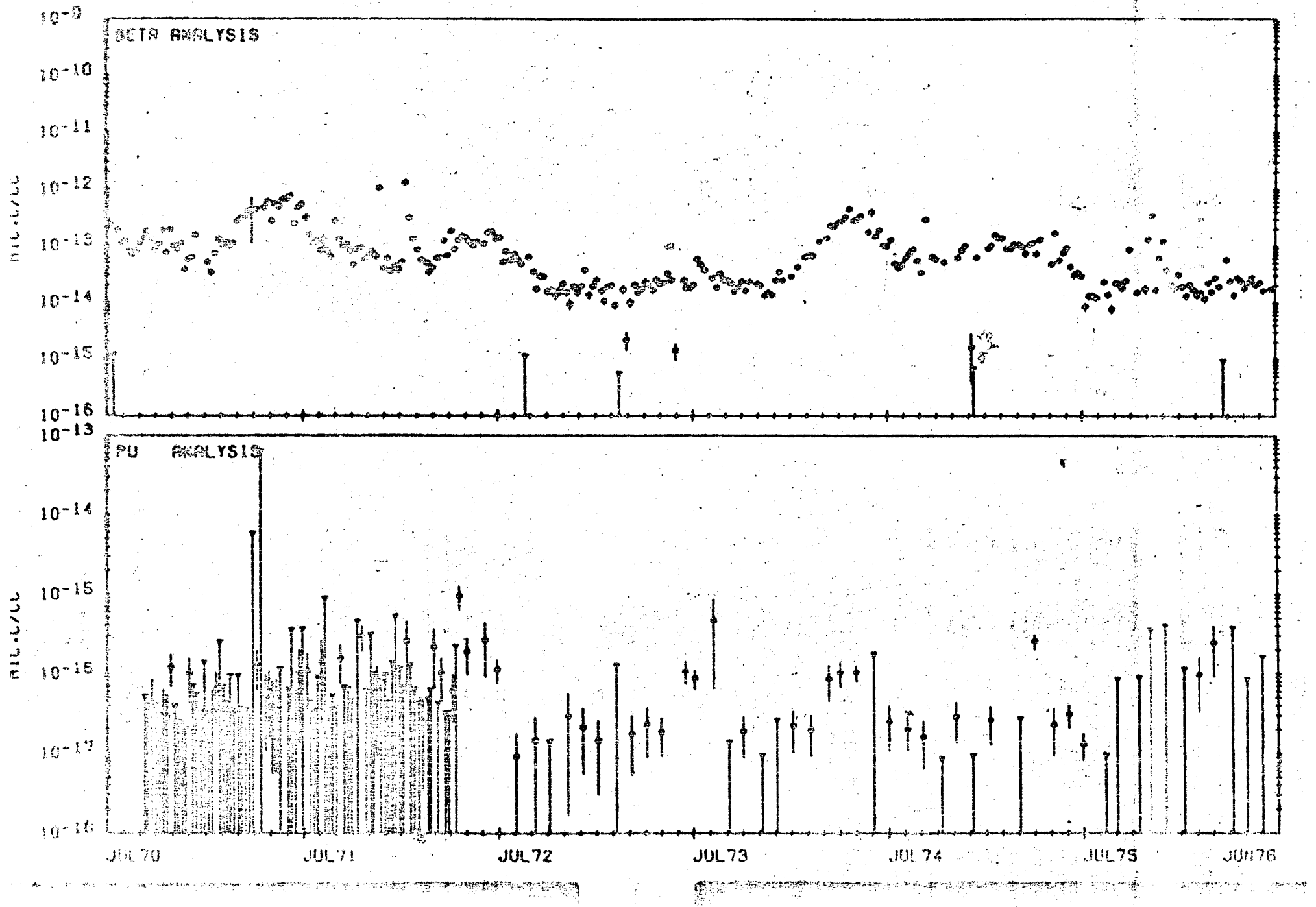




AIR SAMPLING STATION NUMBER 23



AIR SAMPLING STATION NUMBER 24



APPENDIX B

NTS Environmental Surveillance

Supply Wells Locations and Plots

Several symbols are used in Appendix B to denote the data points. In the first two pages of plots, the supply well network averages, a square represents the geometric mean of all values at that point in time, and the vertical line is the range.

The remaining plots of Appendix B show the gross beta data of each station. The data symbols for the plots are as follows:

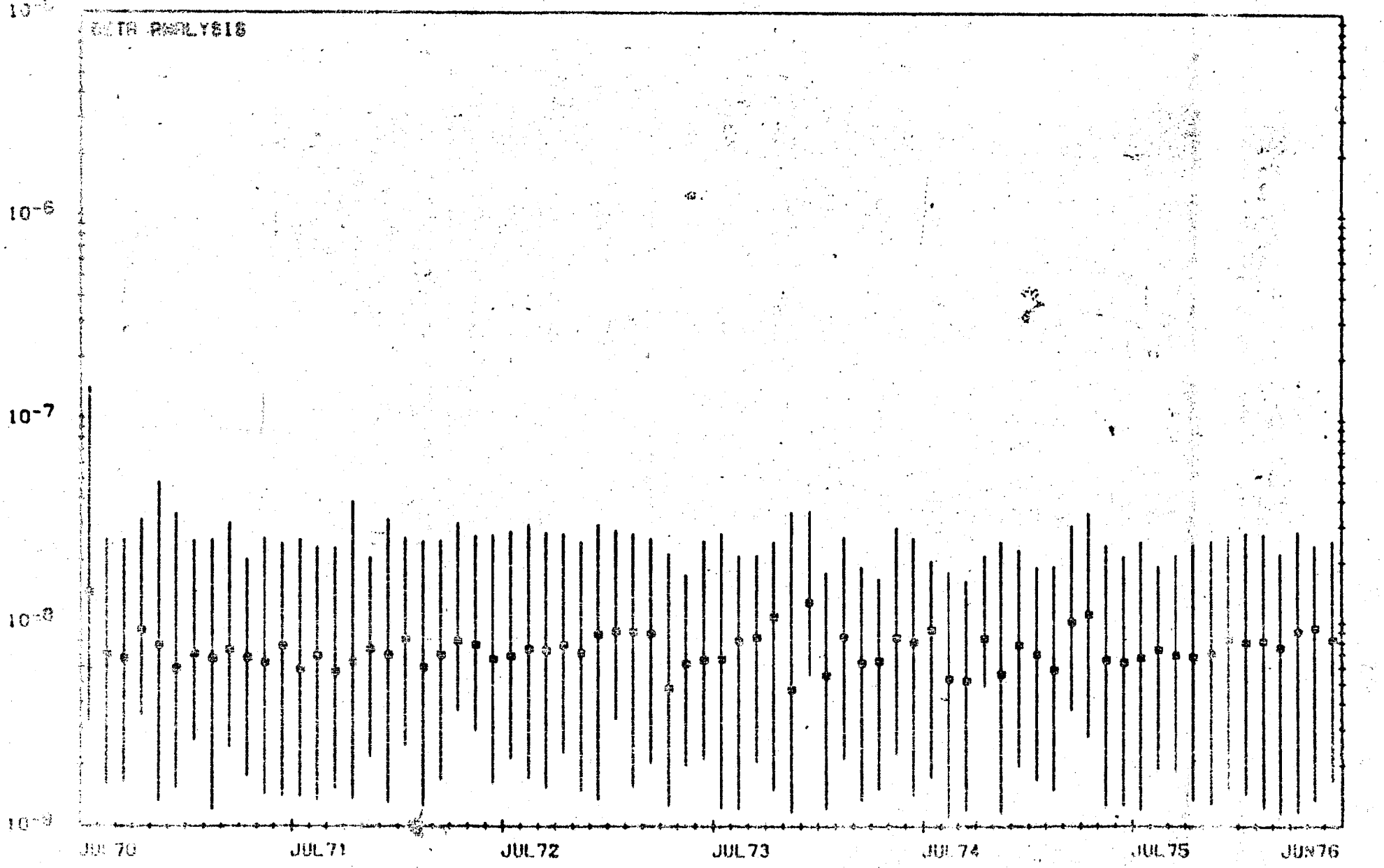
Plot #	Symbol
1-10	X
11-18	◇

A two-sigma error bar is also added to the data points, and, in all plots, a delta with the line to the bottom of the plot means below detection limit.

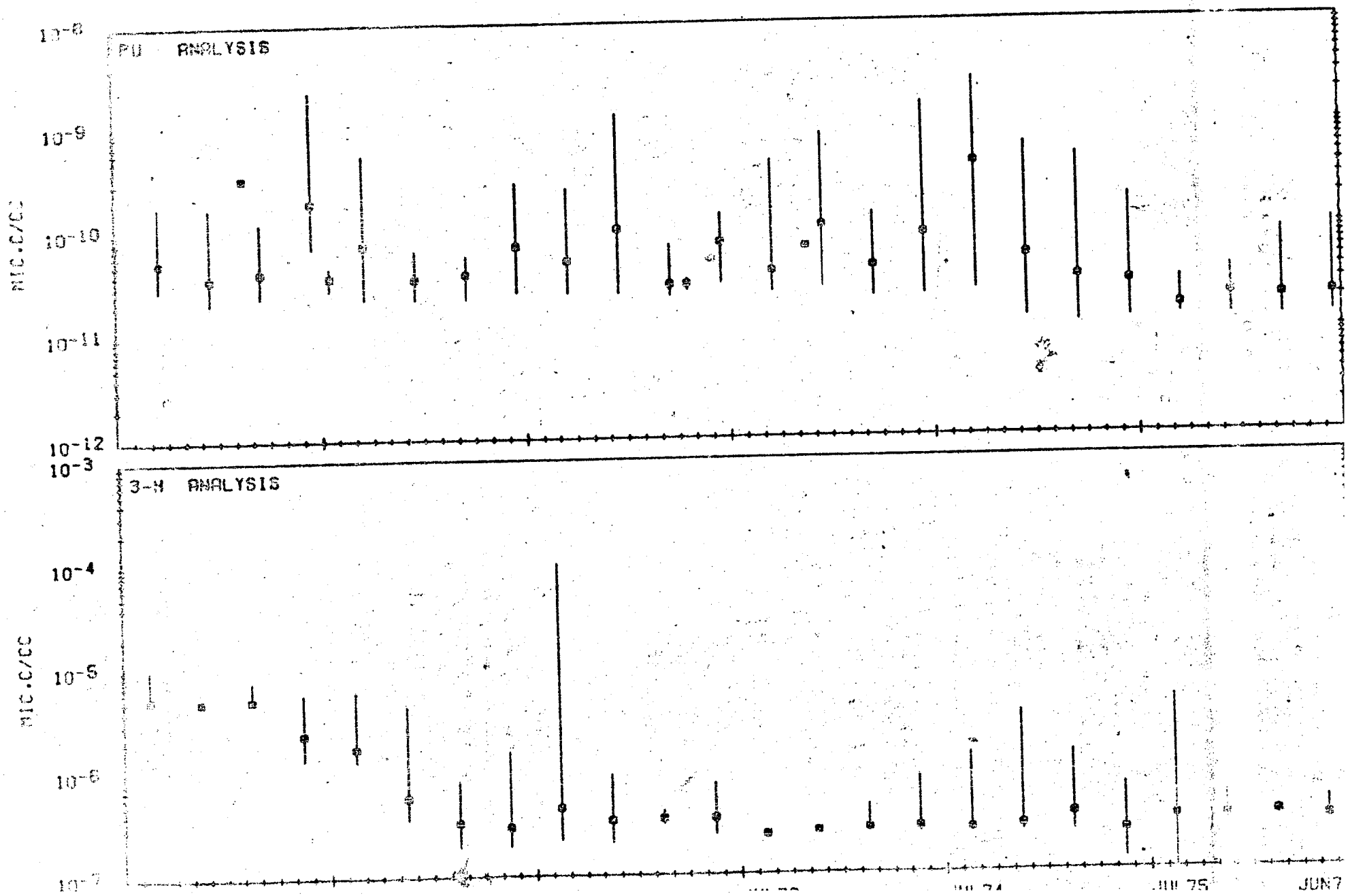
NTS ENVIRONMENTAL SURVEILLANCE
SUPPLY WELLS SAMPLING LOCATIONS

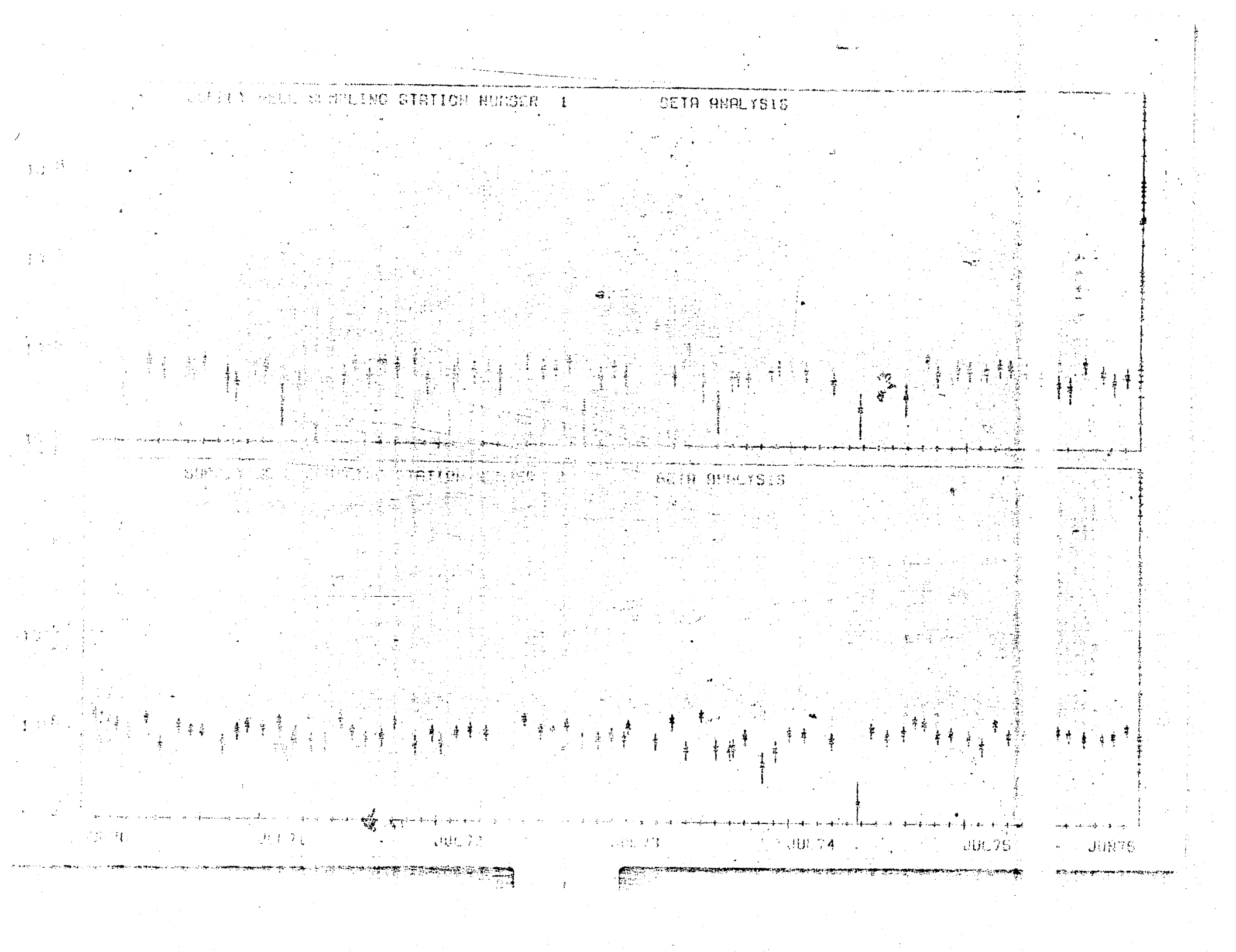
Number	Location	Map Code Figure 3)
1	Area 2 Well 2	2A
2	Area 3 Well A	3A
3	Area 5 Well 5B	5A
4	Area 5 Well 5C	5B
5	Area 5 Well Ue5c	5C
6	Area 6 Well C	6A
7	Area 6 Well C1	6B
8	Area 15 Well Ue15d	15A
9	Area 18 Well 8	18A
10	Area 19 Well Ue19gs	19A
11	Area 19 Well Ue19e	19B
12	Area 20 Well U20a	20A
13	Area 22 Army Well #1	22A
14	Area 25 Well J12	25A
15	Area 25 Well J13	25B
16	Groom Lake Well 3	00A
17	Groom Lake Well 4	00B
18	Area 19 Well U19c	19c

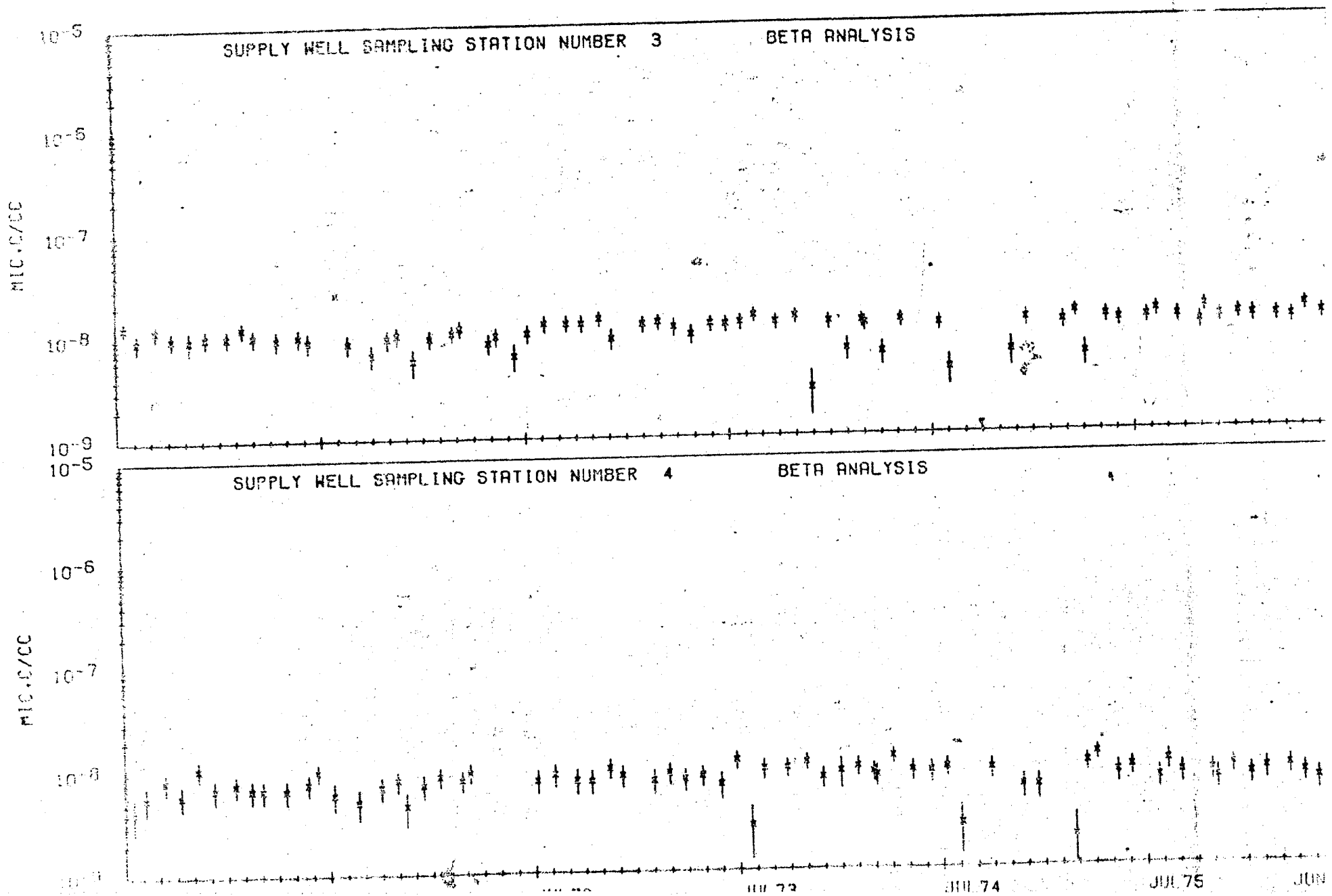
SUPPLY WELL NETWORK AVERAGES

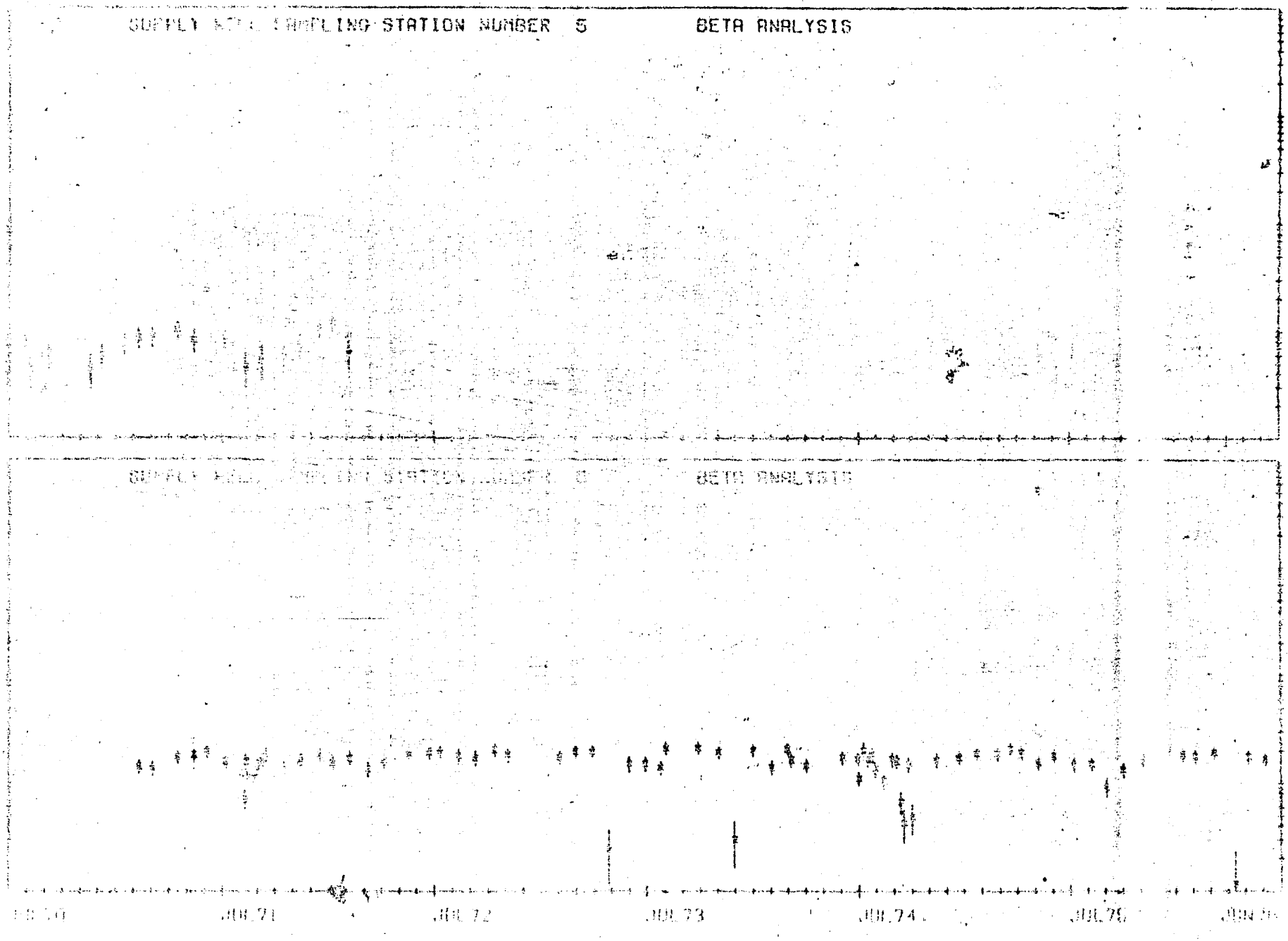


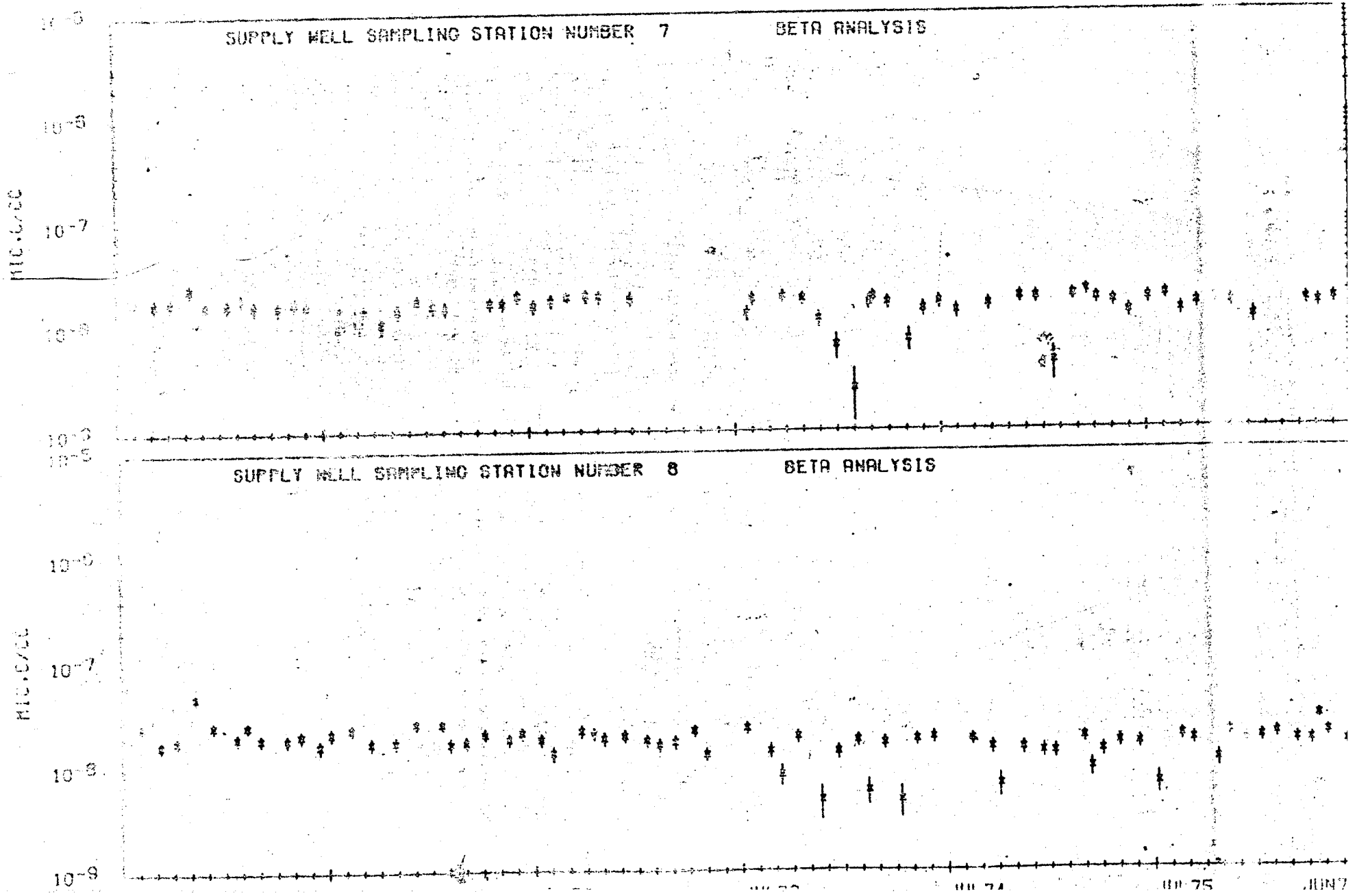
SUPPLY WELL NETWORK AVERAGES

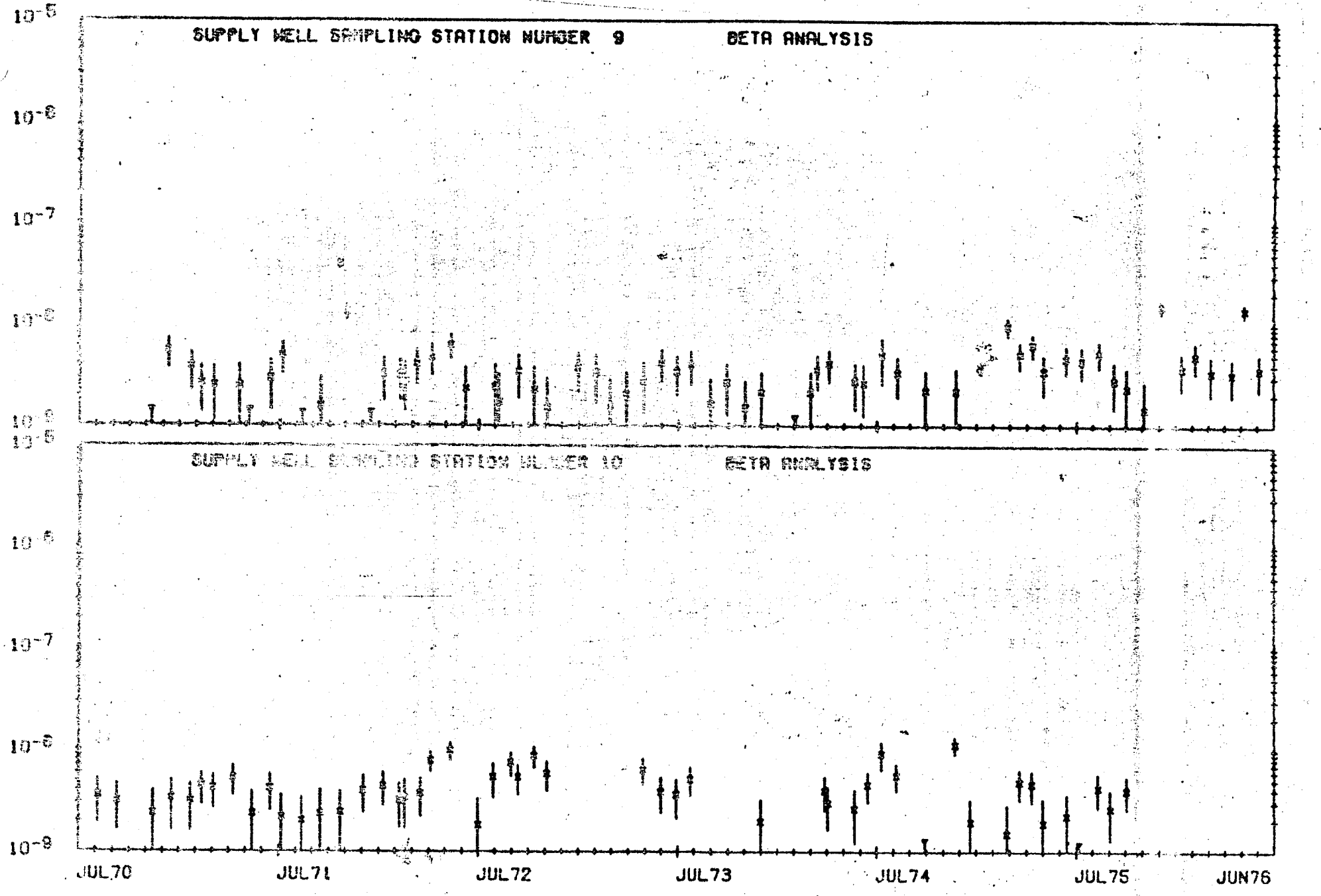



DETA ANALYSIS
JUL74
JUL75

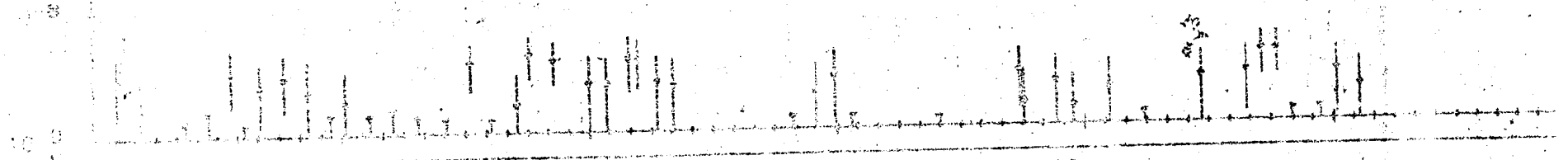

SUPPLY WELL SAMPLING STATION NUMBER 3
BETA ANALYSIS
MIC.C/CC
10-5
10-6
10-7
10-8
10-9
SUPPLY WELL SAMPLING STATION NUMBER 4
BETA ANALYSIS
MIC.C/CC
10-5
10-6
10-7
JUL 74
JUL 75
JUN


SUPPLY WELL SAMPLING STATION NUMBER 5
BETA ANALYSIS
JUL 72
JUL 73
JUL 74

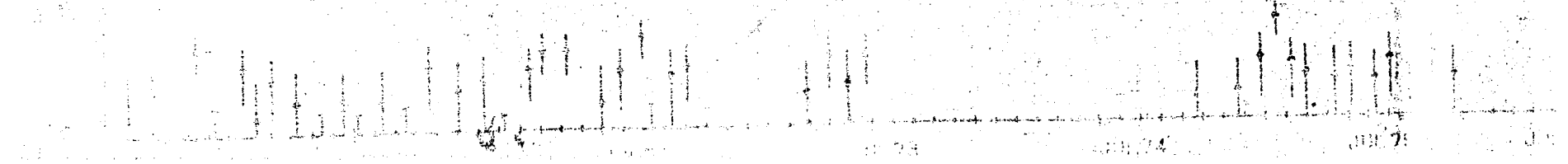

SUPPLY WELL SAMPLING STATION NUMBER 7
BETA ANALYSIS
10^{-6}
10^{-7}
10^{-8}
SUPPLY WELL SAMPLING STATION NUMBER 8
BETA ANALYSIS
10^{-6}
10^{-7}
10^{-8}
JUN7

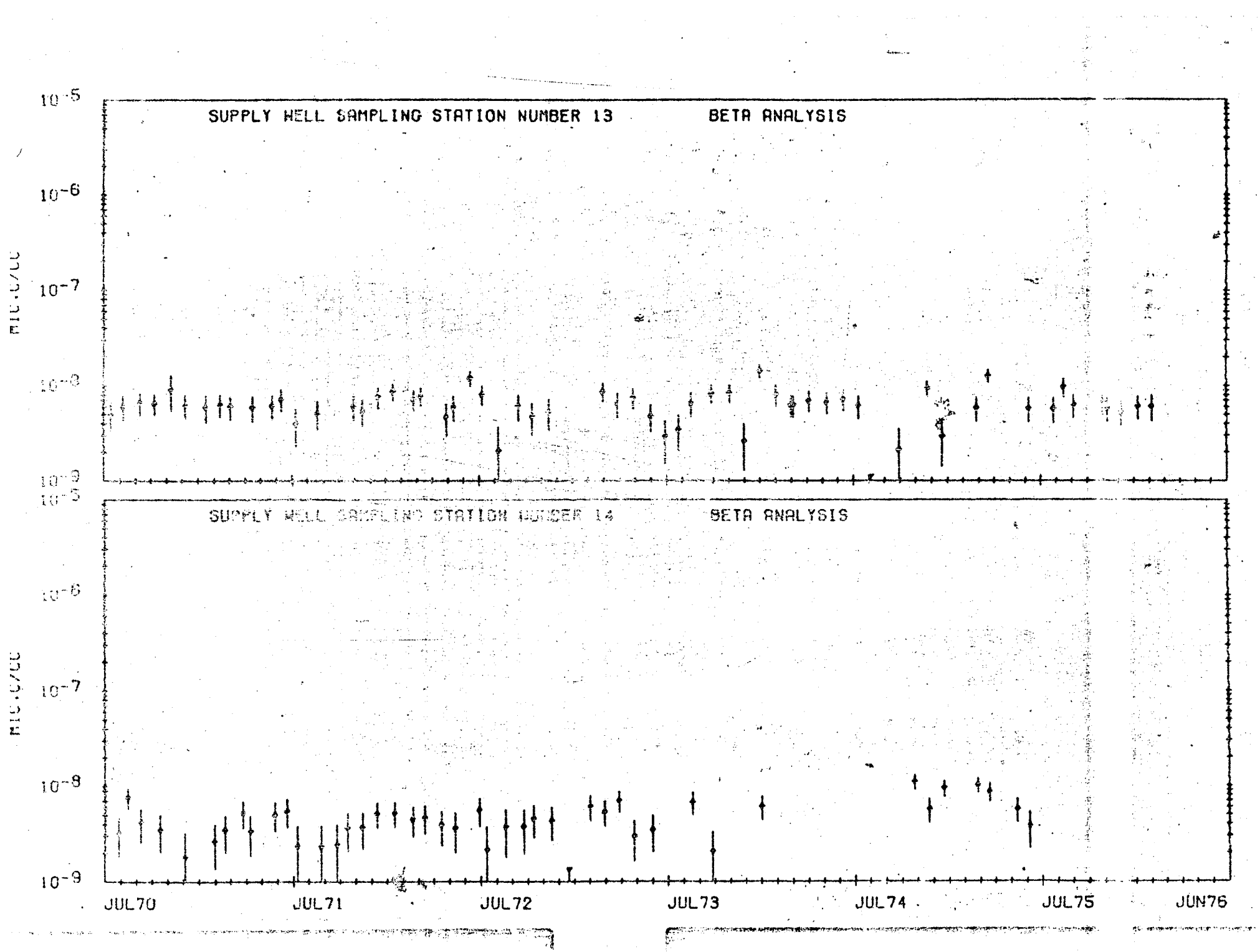

SUPPLY WELL SAMPLING STATION NUMBER 9
BETA ANALYSIS
SUPPLY WELL SAMPLING STATION NUMBER 10
BETA ANALYSIS
10-5
10-6
10-7
10-8
JUL70
JUL71
JUL72
JUL73
JUL74
JUL75
JUN76

SUPPLY WELL SAMPLING STATION NUMBER 11 BETA ANALYSIS

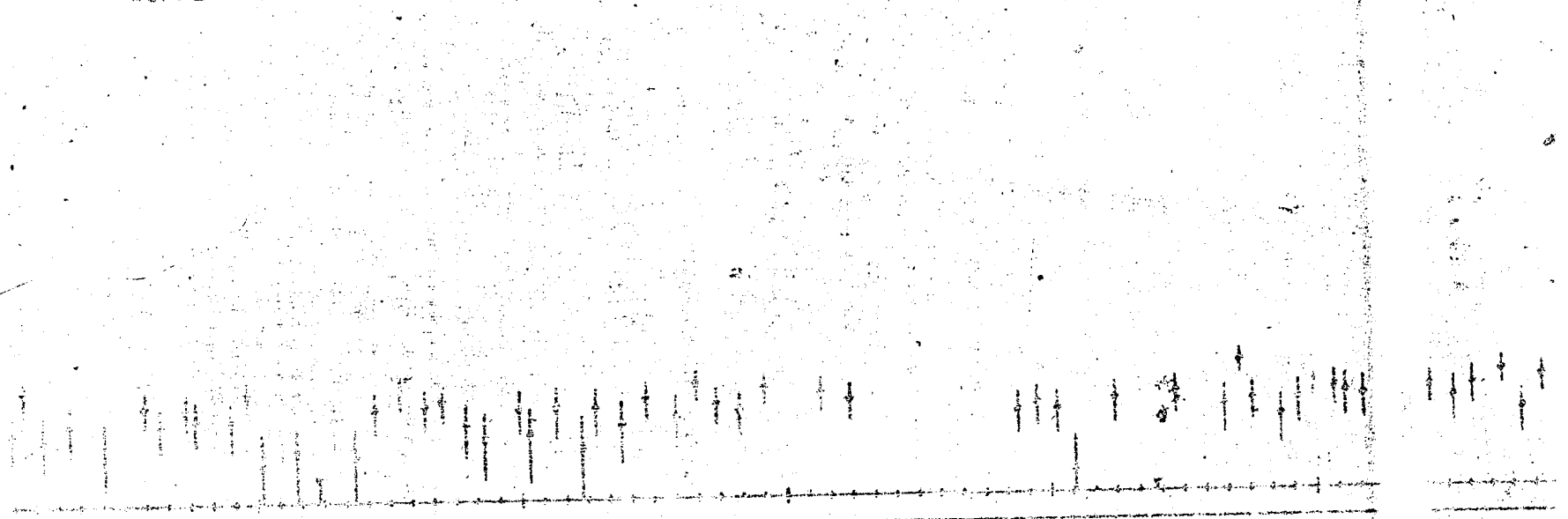


SUPPLY WELL SAMPLING STATION NUMBER 12 BETA ANALYSIS

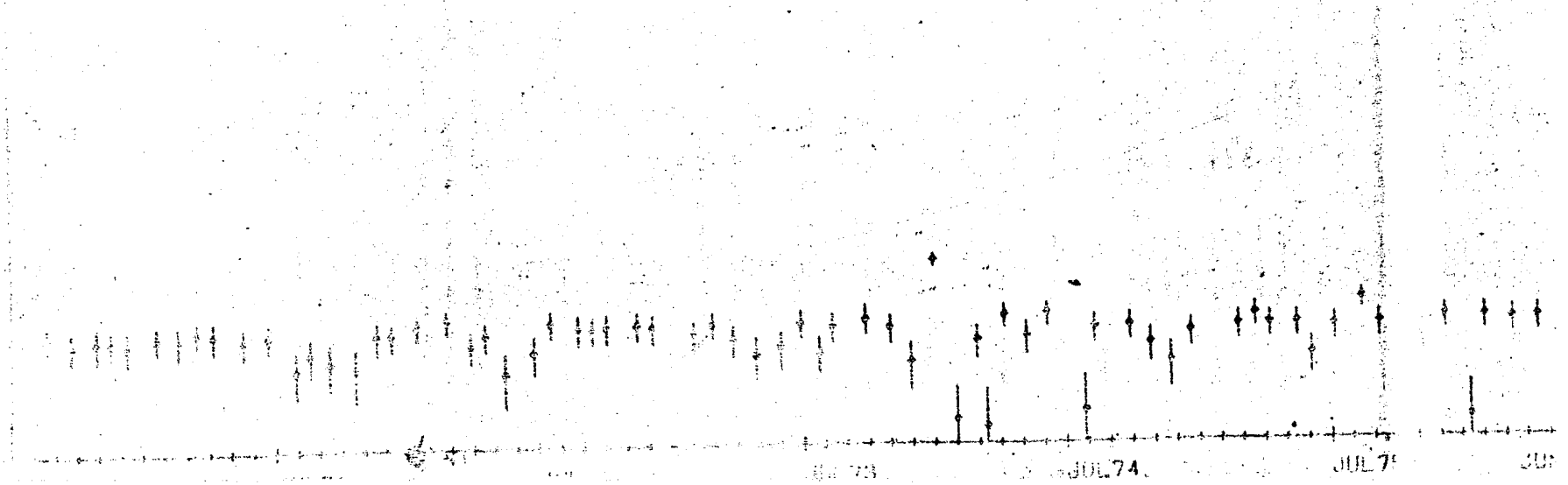


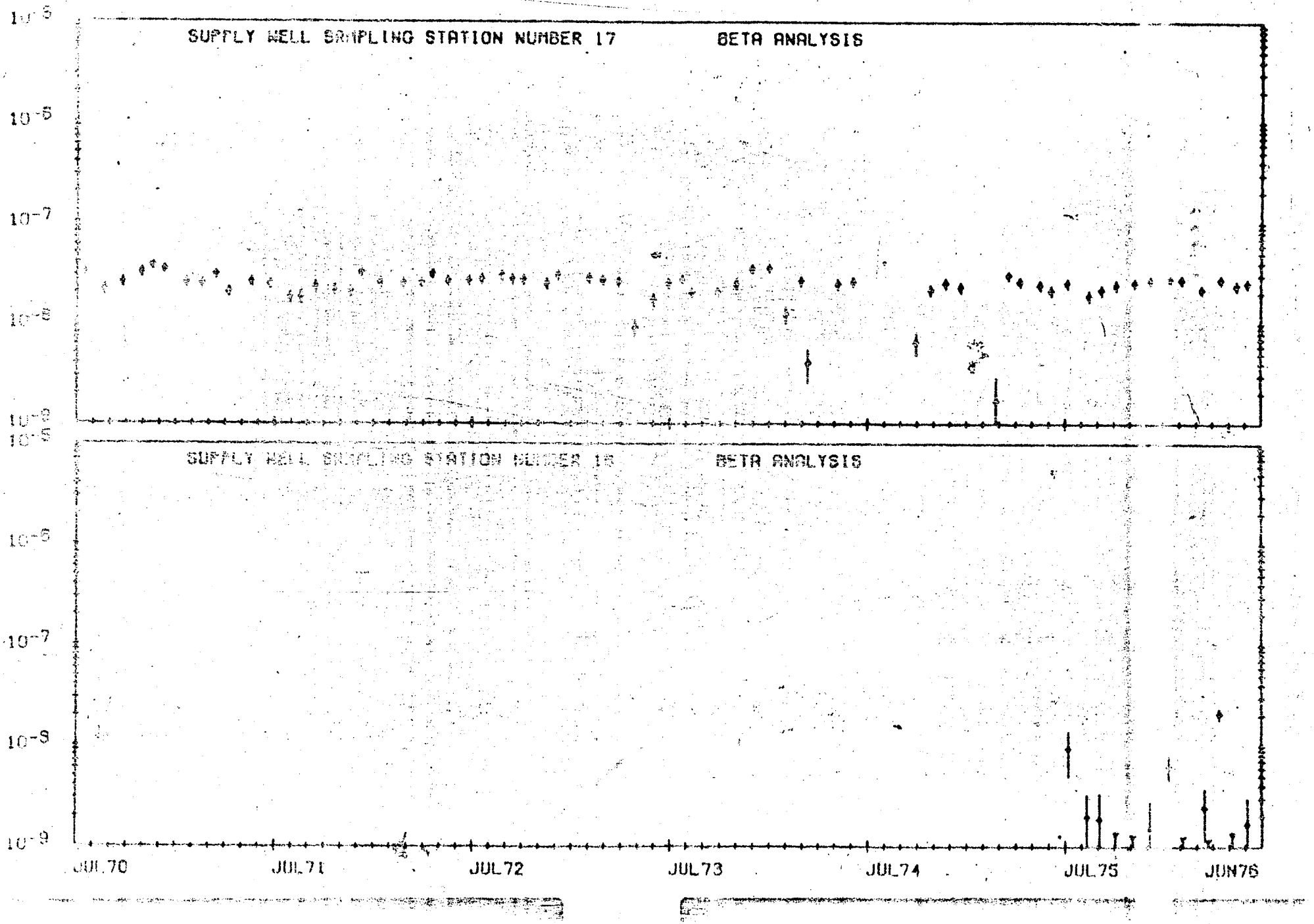

SUPPLY WELL SAMPLING STATION NUMBER 13
BETA ANALYSIS
10^{-5}
10^{-6}
10^{-7}
10^{-8}
10^{-9}
SUPPLY WELL SAMPLING STATION NUMBER 14
BETA ANALYSIS
10^{-5}
10^{-6}
10^{-7}
10^{-8}
10^{-9}
JUL70
JUL71
JUL72
JUL73
JUL74
JUL75
JUN76

SUPPLY WELL SAMPLING STATION NUMBER 15 BETA ANALYSIS



SUPPLY WELL SAMPLING STATION NUMBER 18 BETA ANALYSIS




SUPPLY WELL SAMPLING STATION NUMBER 17
BETA ANALYSIS
10-6
10-7
10-8
10-9
SUPPLY WELL SAMPLING STATION NUMBER 18
BETA ANALYSIS
10-6
10-7
10-8
10-9
JUL70
JUL71
JUL72
JUL73
JUL74
JUL75
JUN76

APPENDIX C

NTS Environmental Surveillance

Potable Water Locations and Plots

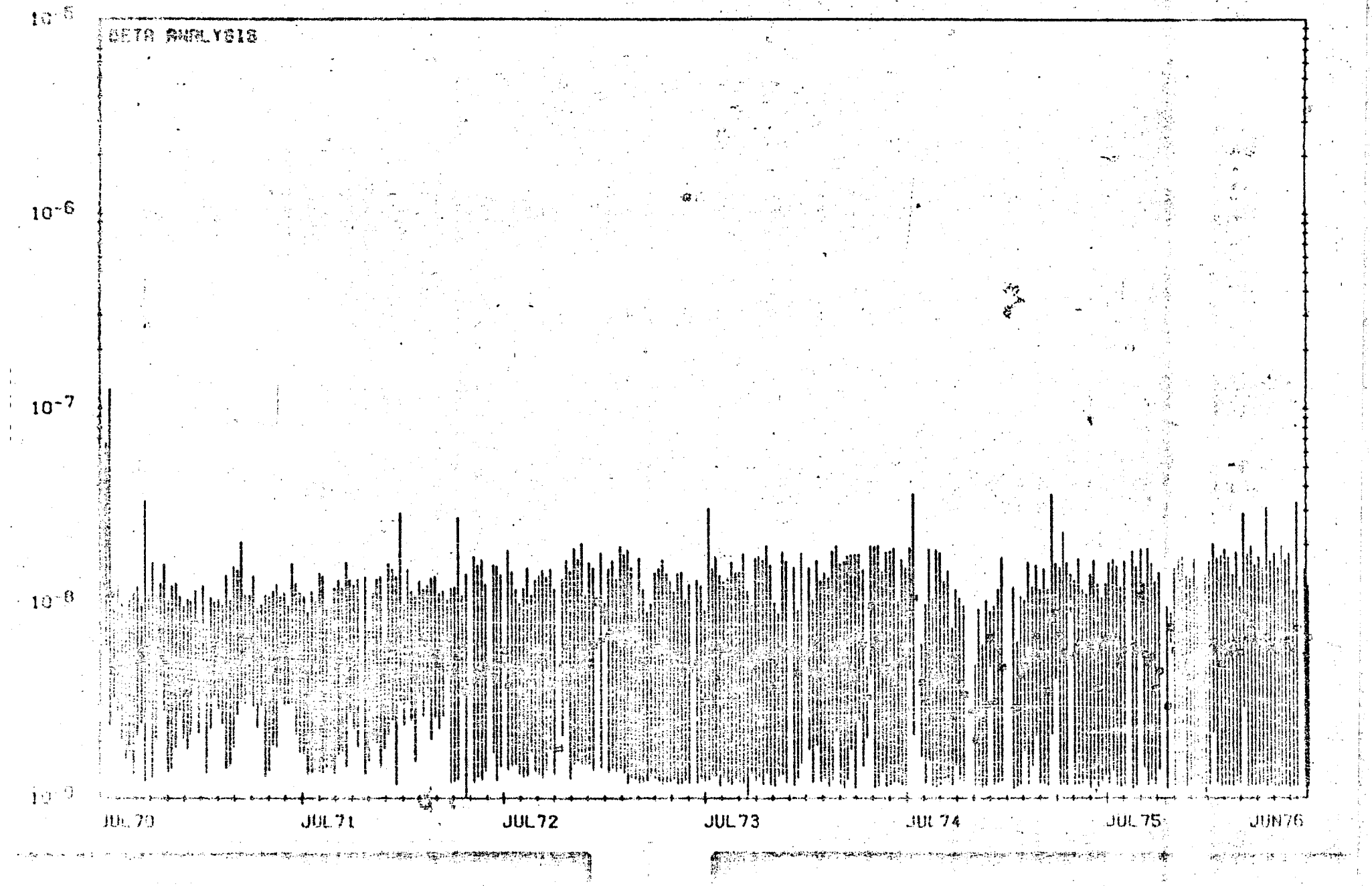
In the first two pages of plots in Appendix C, the potable water network averages, a square is used to represent the geometric mean of all values at that point in time, and the vertical line is the range.

The remaining plots show the gross beta data of each station utilizing the symbol, X, as the data point. A two-sigma error bar is also added to the data points, and, in all plots, a delta with a line to the bottom of the plot means below detection limit.

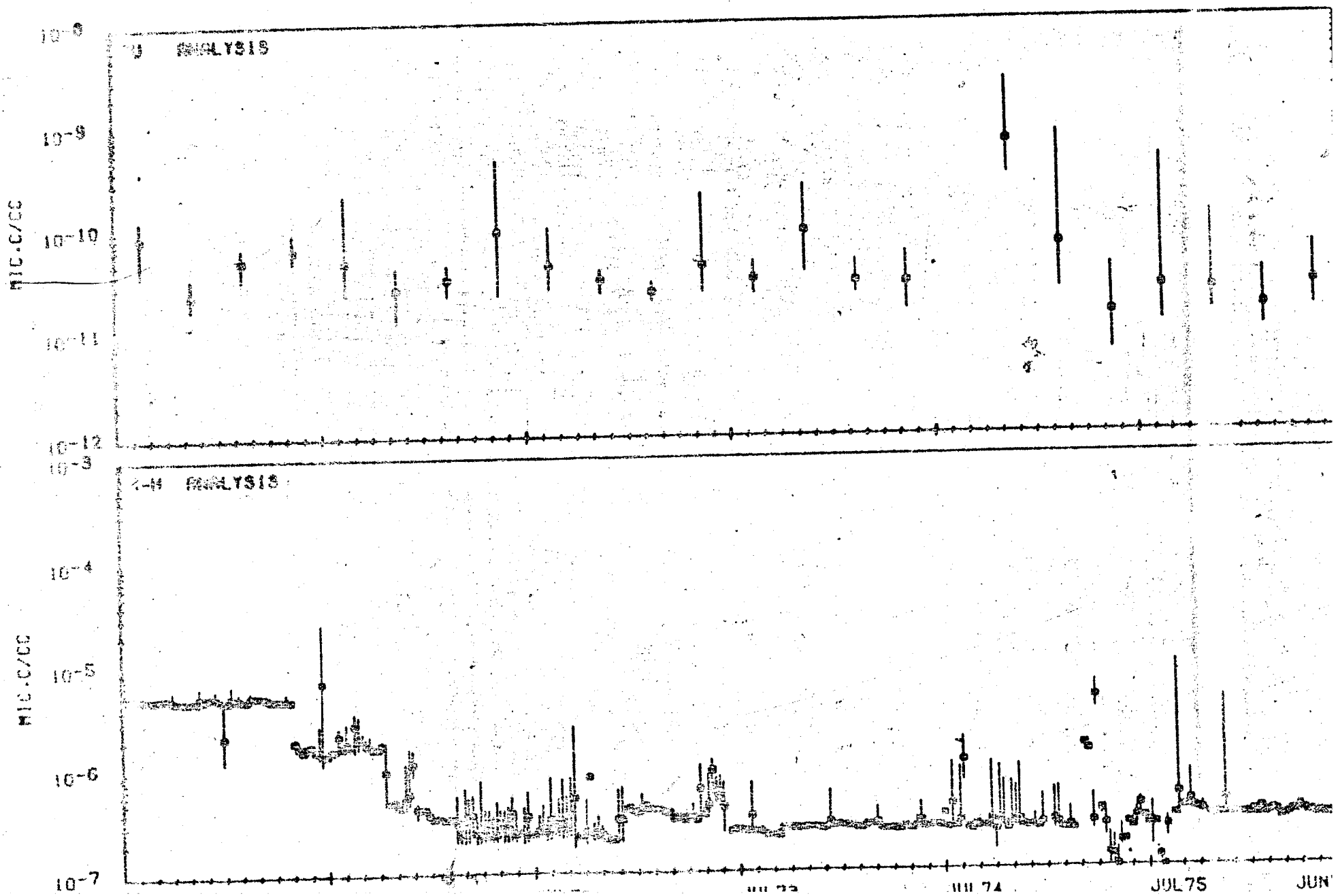
NTS ENVIRONMENTAL SURVEILLANCE
POTABLE WATER SAMPLING LOCATIONS

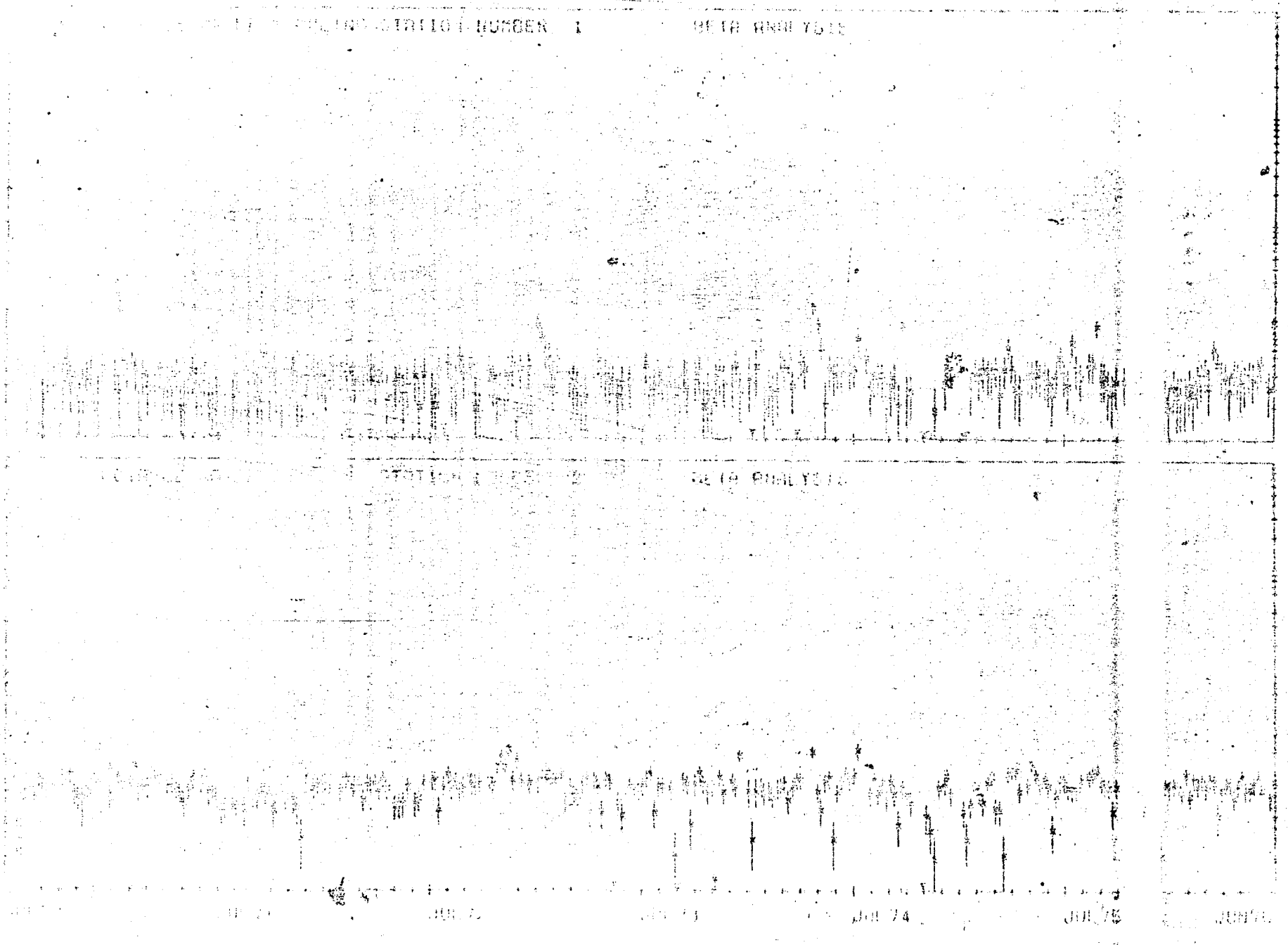
Number	Location	Map Code (Figure 4)
1	Area 2 Men's Rest Room	2A
2	Area 3 Cafeteria	3A
3	Area 6 Cascade	6A
4	Area 6 Cafeteria	6B
5	Area 12 Cafeteria	12A
6	Area 18 Fire Station	18A
7	Area 23 Cafeteria	23A
8	Area 27 Cafeteria	27A
9	Groom Lake Cafeteria	00A

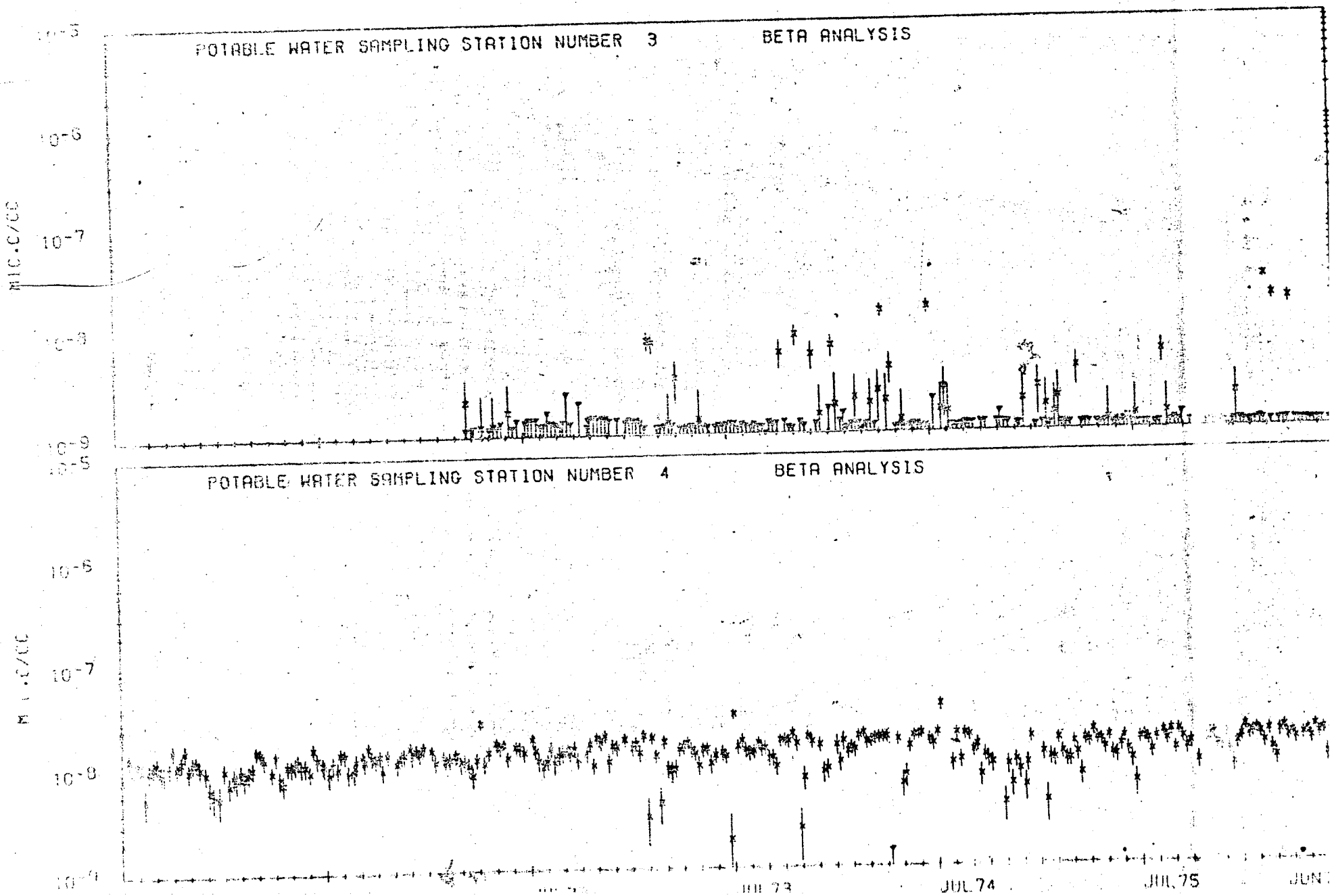
POTABLE WATER NETWORK AVERAGES

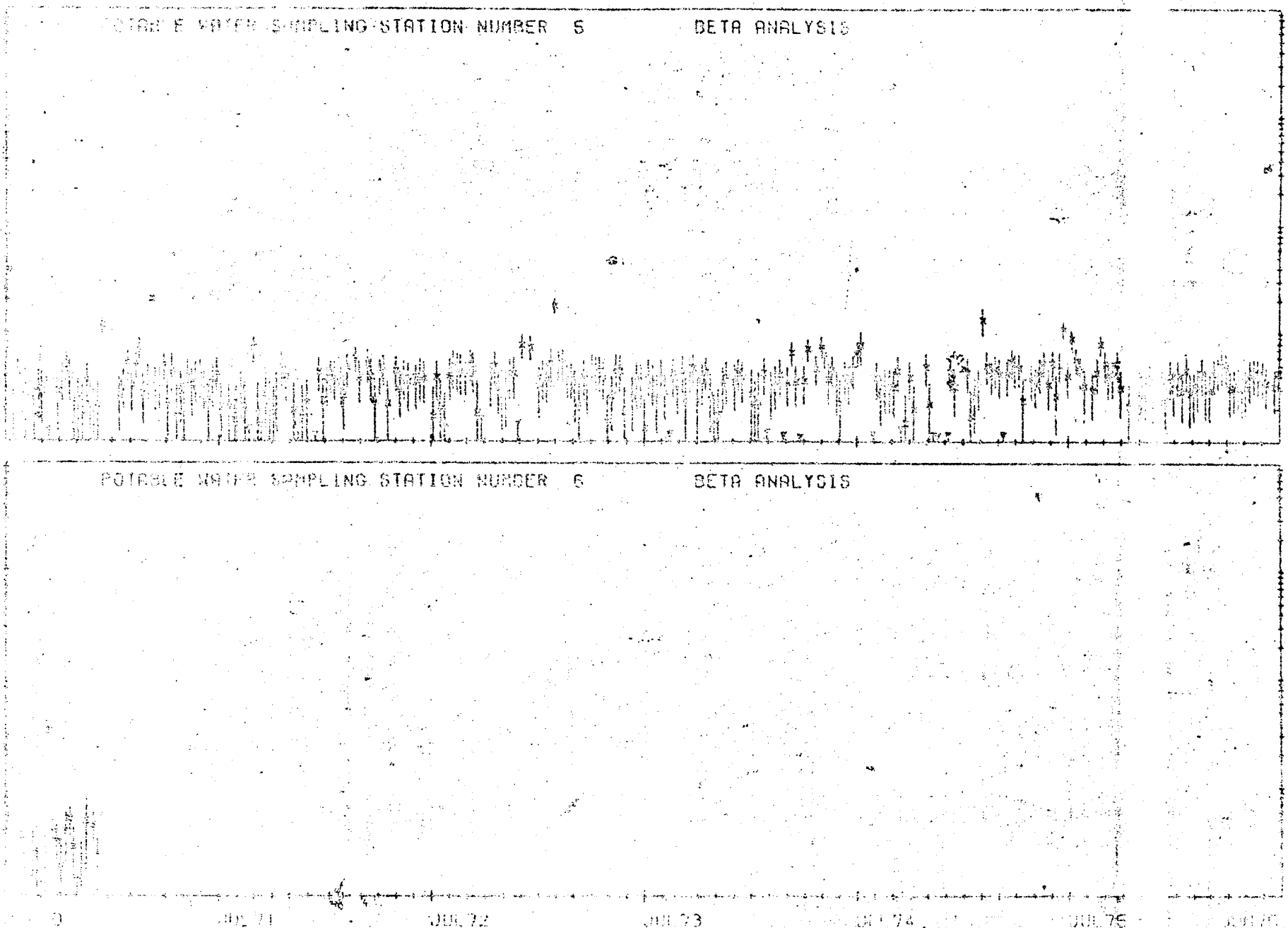


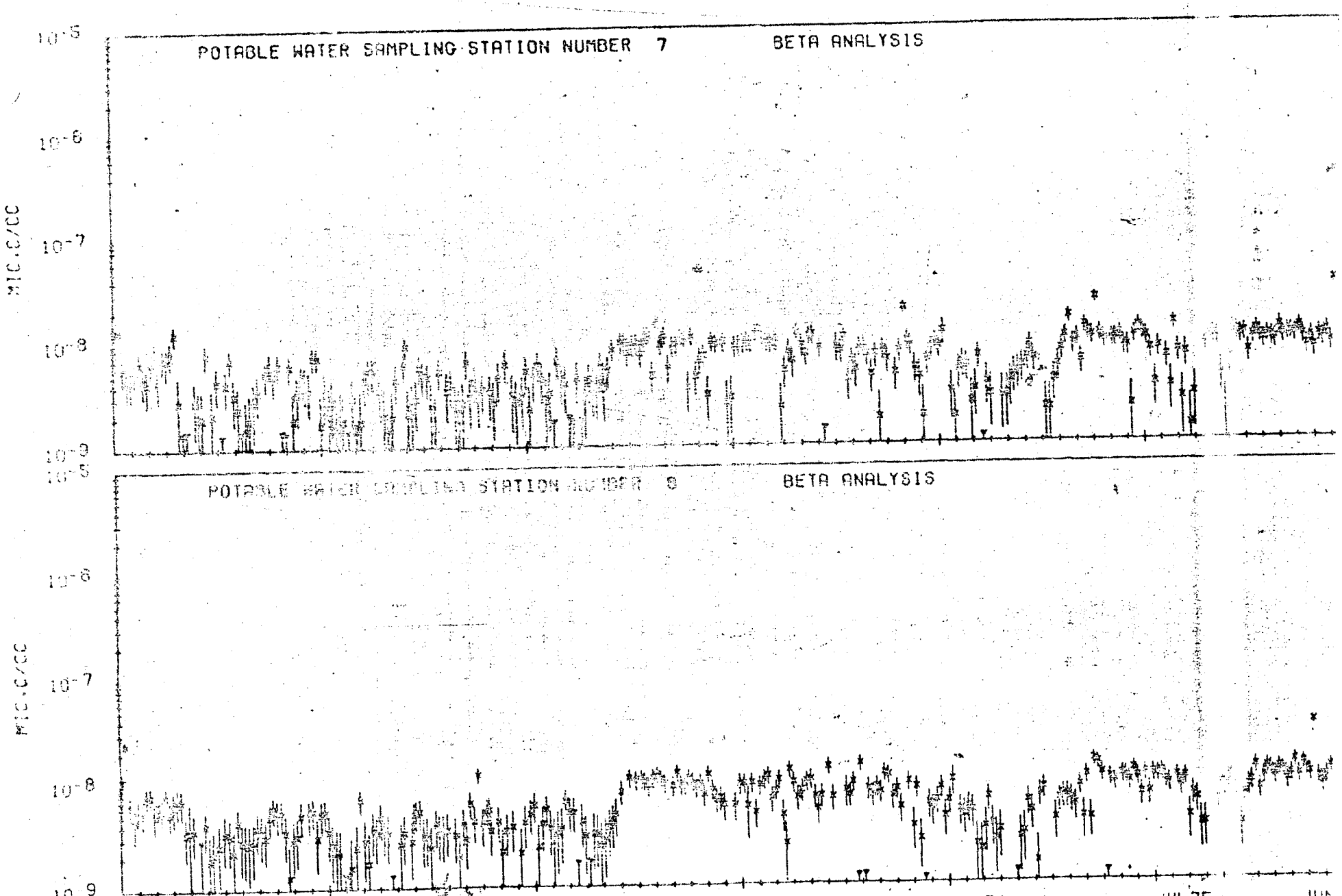
POTABLE WATER NETWORK AVERAGES

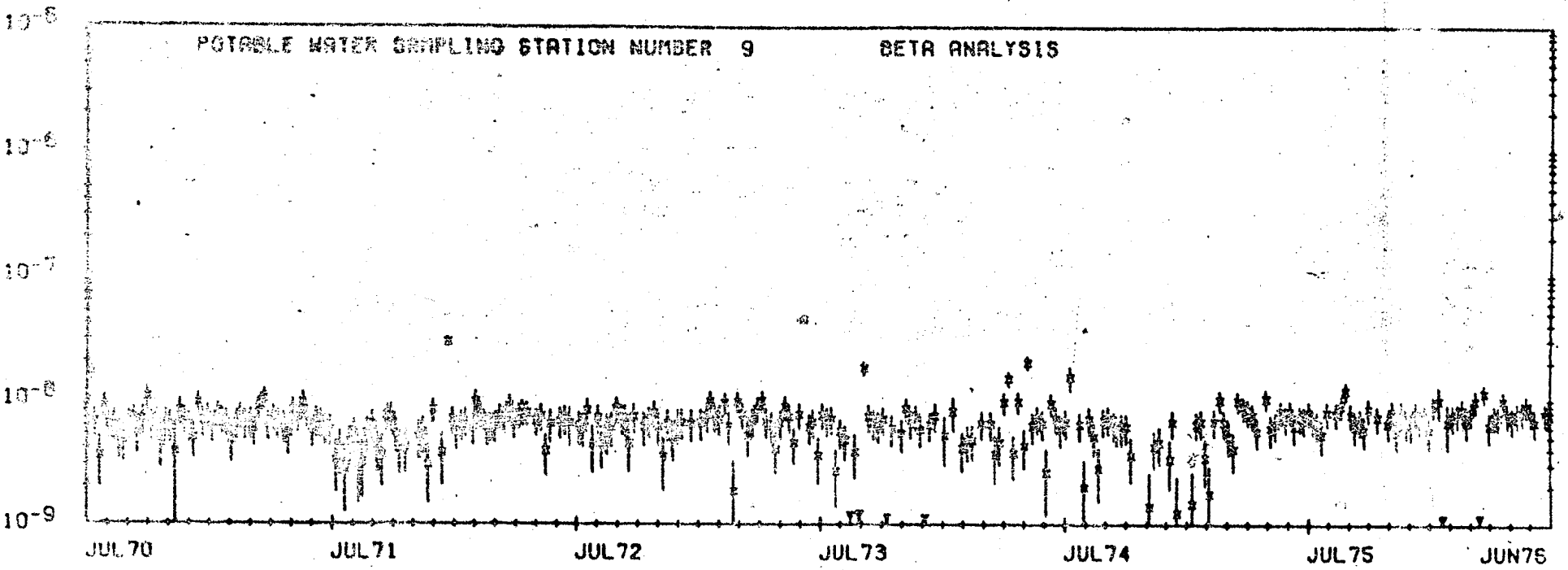





POTABLE WATER SAMPLING STATION NUMBER 3
BETA ANALYSIS
MIC.C/CC
10-6
10-7
10-8
10-9
POTABLE WATER SAMPLING STATION NUMBER 4
BETA ANALYSIS
10-6
10-7
10-8
JUL 73
JUL 74
JUL 75


POTABLE WATER SAMPLING STATION NUMBER 5
BETA ANALYSIS
10-5
POTABLE WATER SAMPLING STATION NUMBER 6
BETA ANALYSIS
10-6
10-7
JUL 72
JUL 73
JUL 75


POTABLE WATER SAMPLING STATION NUMBER 7
BETA ANALYSIS
MICRO C/CC
10-5
10-6
10-7
10-8
10-9
POTABLE WATER SAMPLING STATION NUMBER 8
BETA ANALYSIS
MICRO C/CC
10-5
10-6
10-7
10-8
10-9
JUL 74
JUL 75


POTABLE WATER SAMPLING STATION NUMBER 9
BETA ANALYSIS
10-5
10-6
10-7
10-8
10-9
JUL70
JUL71
JUL72
JUL73
JUL74
JUL75
JUN76

APPENDIX D

NTS Environmental Surveillance

Natural Springs Locations and Plots

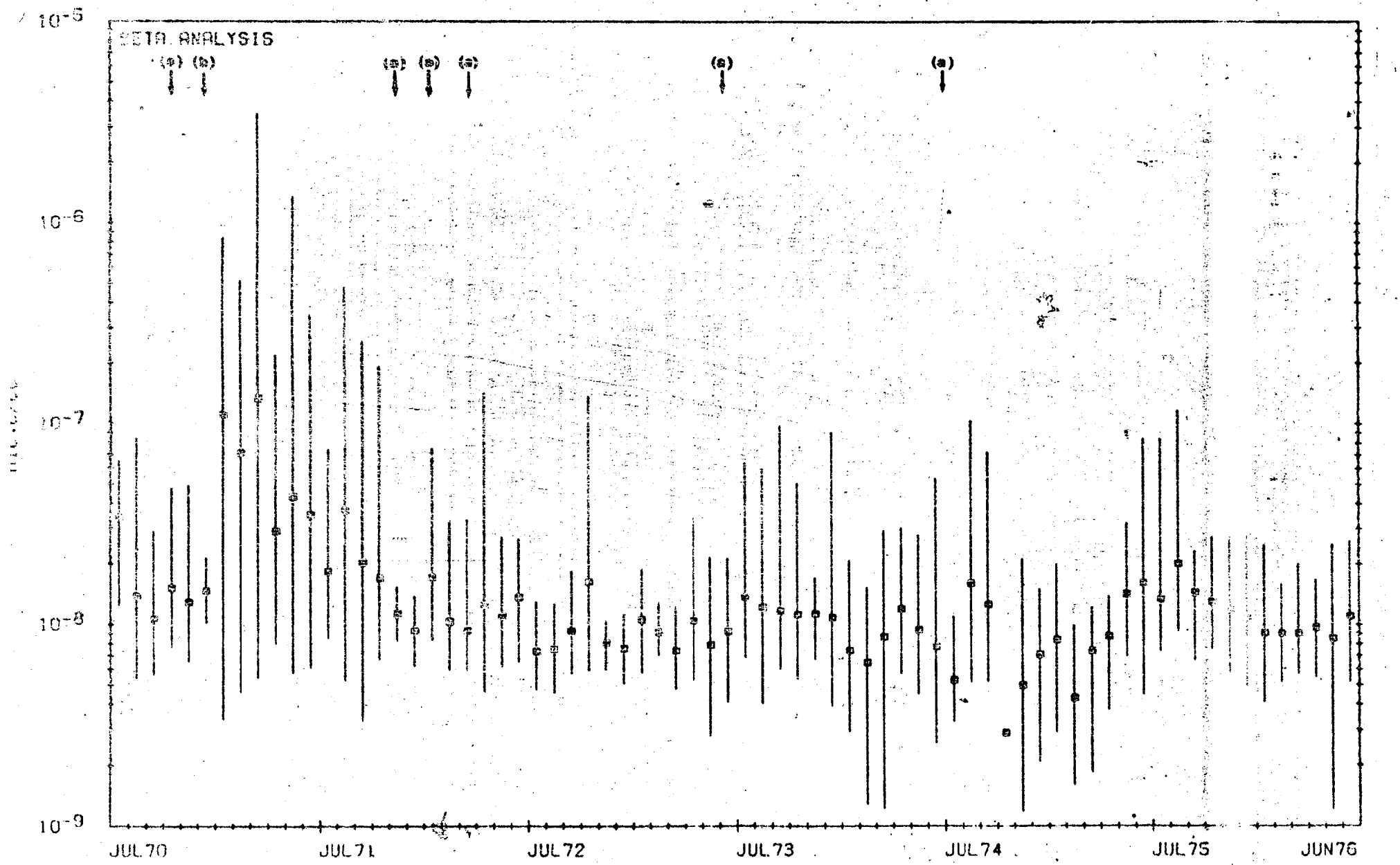
In the first two pages of plots in Appendix D, the natural springs network averages, a square is used to represent the geometric mean of all values at that point in time, and the vertical line is the range. The notations (a) and (b) depict significant events that may perturb the data. The symbol (a) represents foreign atmospheric testing and (b) denotes the Baneberry Test at the NTS.

The remaining plots show the gross beta data of each station utilizing the symbol, X, as the data point. A two-sigma error bar is also added to the data points, and, in all plots, a delta with a line to the bottom of the plot means below detection limit.

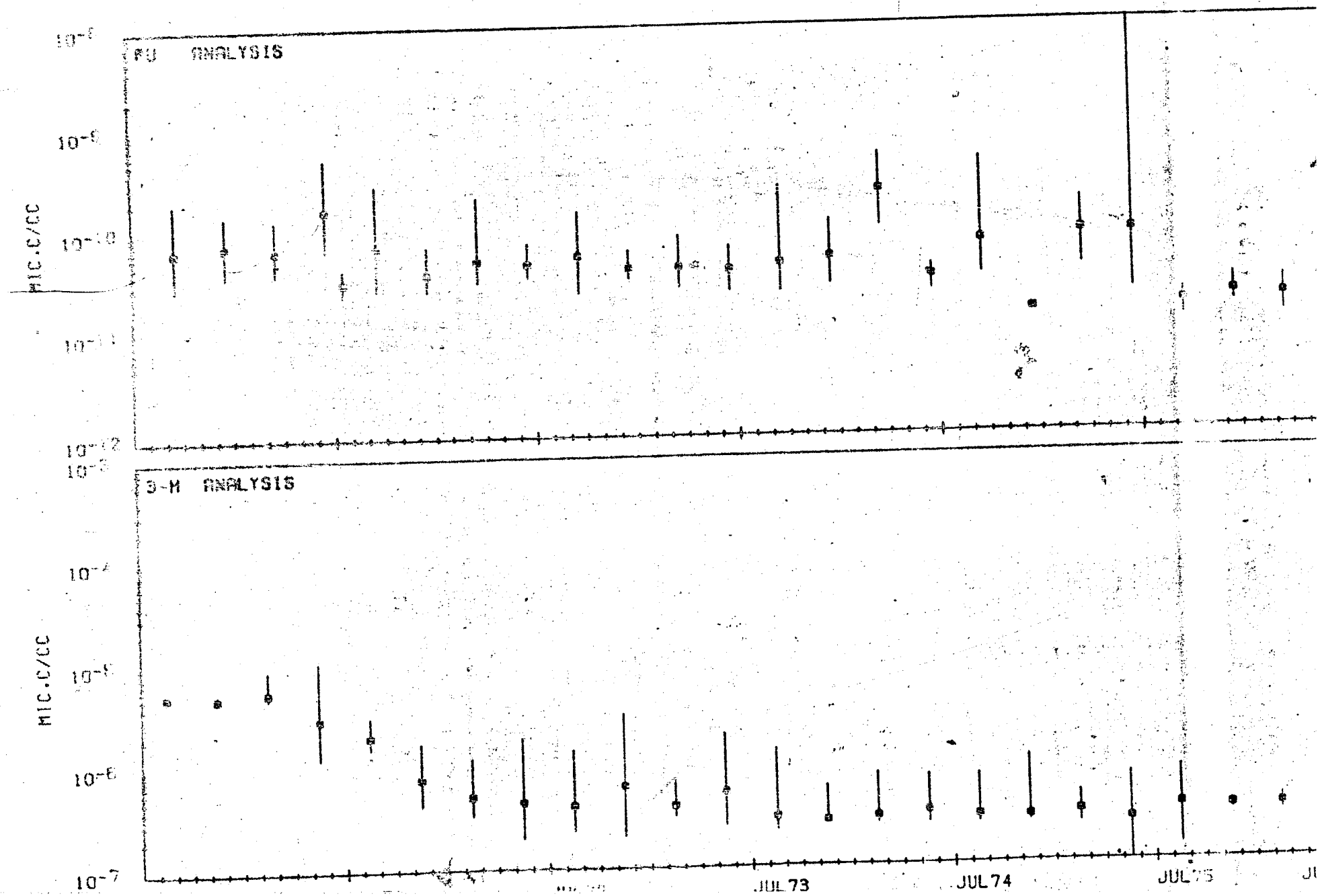
NTS ENVIRONMENTAL SURVEILLANCE
NATURAL SPRINGS SAMPLING LOCATIONS

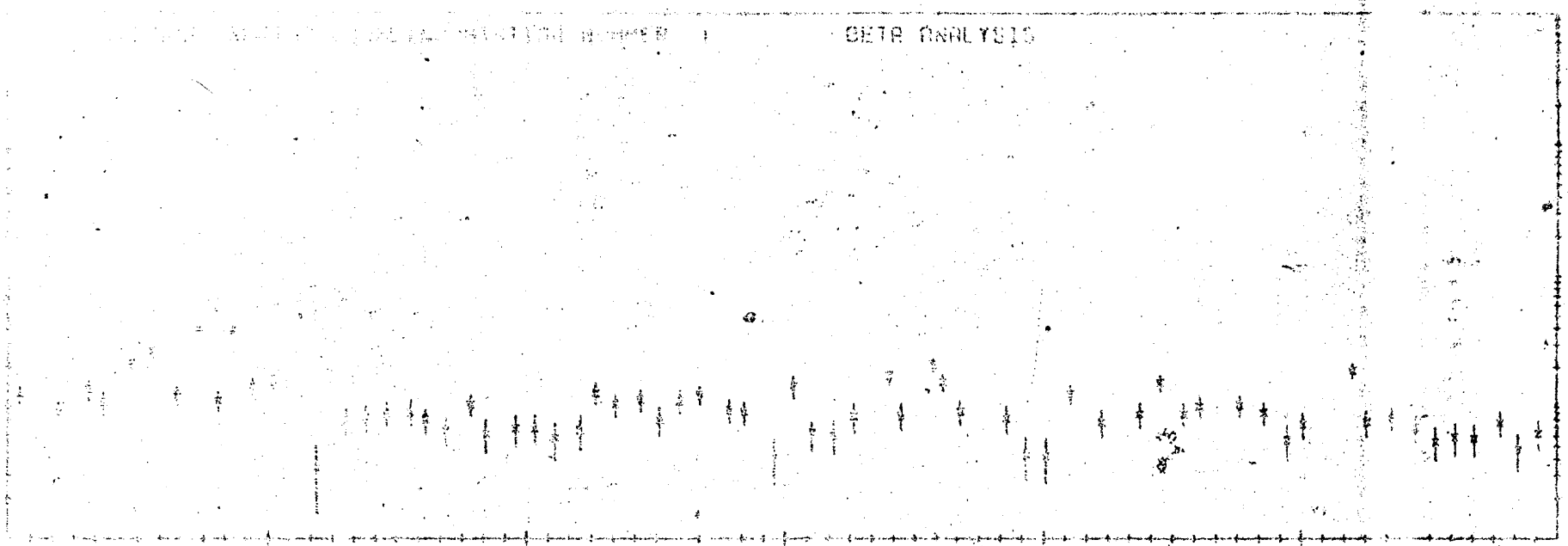
Number	Location	Map Code (Figure 5)
1	Area 5 Cane Springs	5A
2	Area 12 White Rock Spring	12A
3	Area 12 Captain Jack Spring	12B
4	Area 12 Gold Meadows Pond	12C
5	Area 15 Oak Butte Spring	15A
6	Area 15 Tub Spring	15B
7	Area 29 Topopah Spring	29A

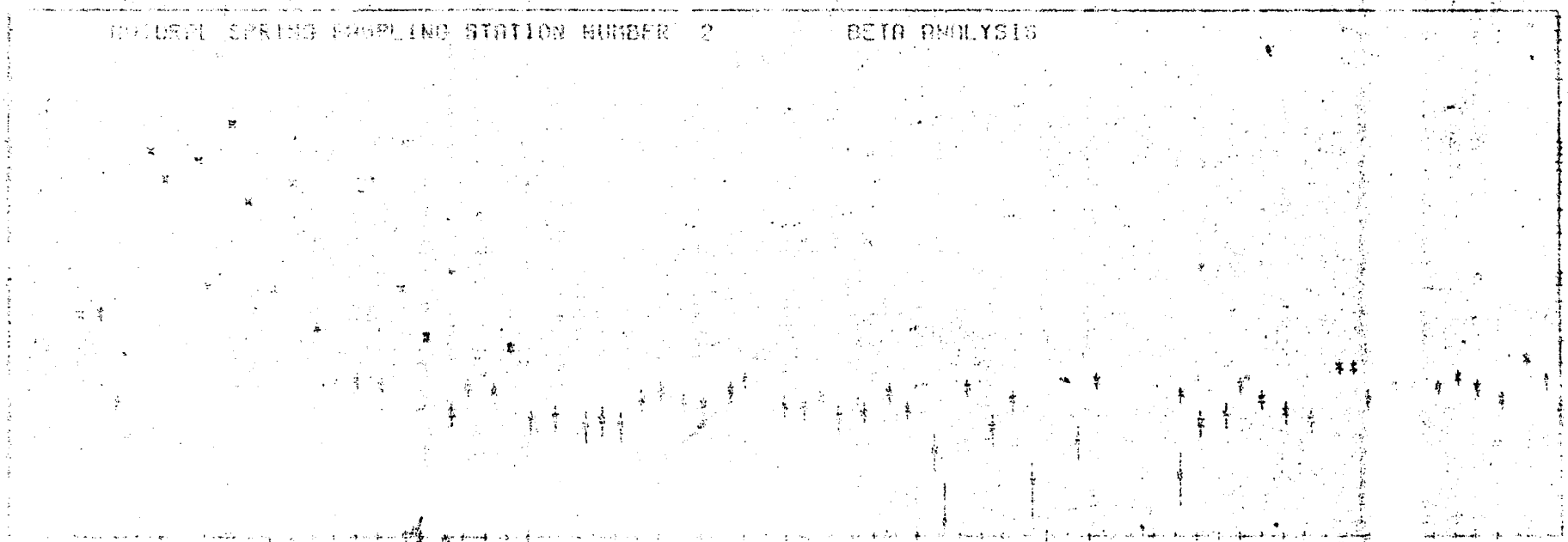
NATURAL SPRING NETWORK AVERAGES

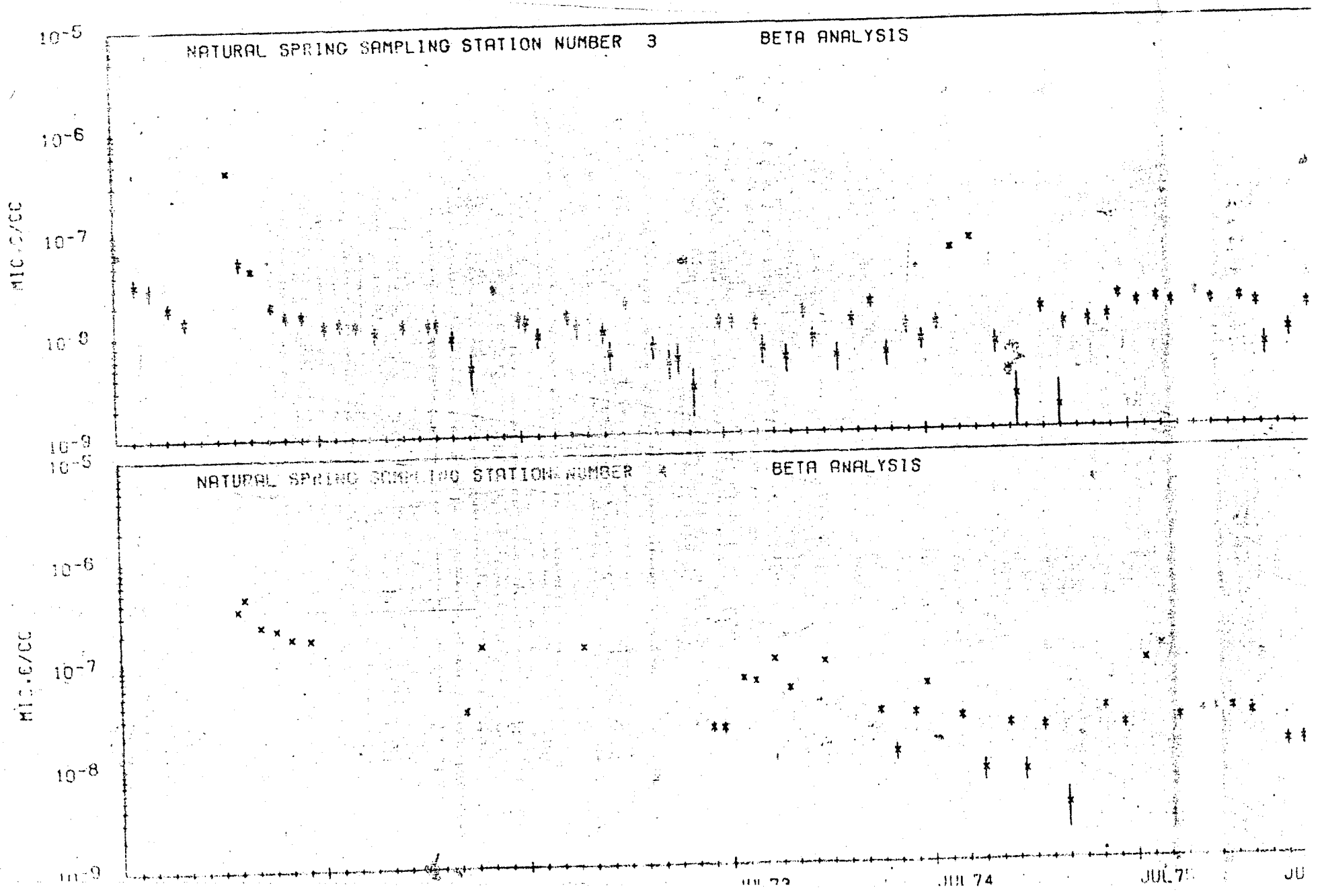


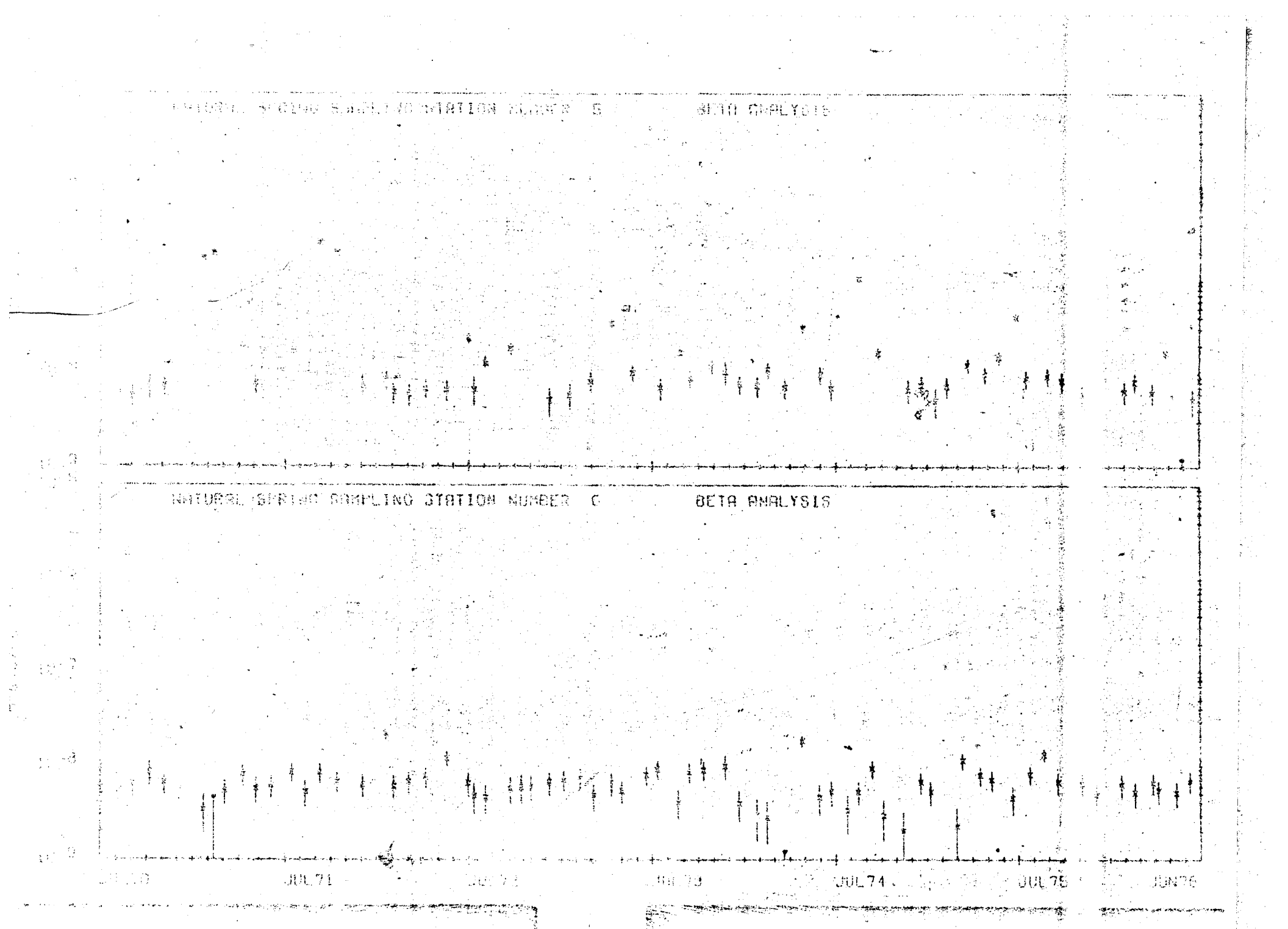
NATURAL SPRING NETWORK AVERAGES

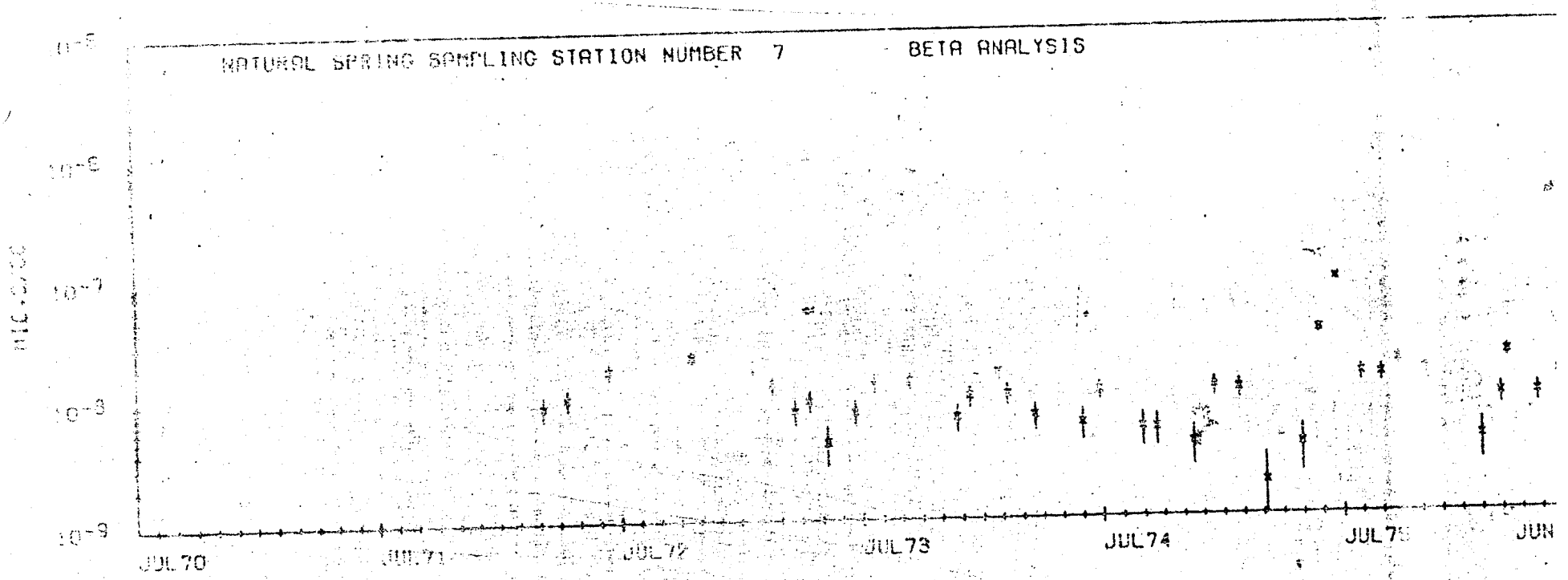



BETA ANALYSIS


BETA ANALYSIS


NATURAL SPRING SAMPLING STATION NUMBER 3
BETA ANALYSIS
10^{-5}
10^{-6}
10^{-7}
10^{-8}
10^{-9}
MIC.C/CC
NATURAL SPRING SAMPLING STATION NUMBER 4
BETA ANALYSIS
10^{-5}
10^{-6}
10^{-7}
10^{-8}
10^{-9}
MIC.C/CC
JUL 74
JUL 75


BETA ANALYSIS
NATURAL SPRING SAMPLING STATION NUMBER 6
BETA ANALYSIS
JUL71
JUL74
JUL75
JUN76


NATURAL SPRING SAMPLING STATION NUMBER 7
BETA ANALYSIS
10-8
10-7
10-6
10-5
JUL70
JUL71
JUL72
JUL73
JUL74
JUL75
JUN

APPENDIX E

NTS Environmental Surveillance

Open Reservoirs Locations and Plots

Several symbols are used in Appendix E to denote the data points. In the first two pages of plots, the open reservoir network averages, a square represents the geometric mean of all values at that point in time, and the vertical line is the range. The notations (a) and (b) depict significant events that may perturb the data. The symbol (a) represents foreign atmospheric testing, and (b) denotes the Baneberry test at the NTS.

The remaining plots of Appendix E show the gross beta data of each station. The data symbols for the plots are as follows:

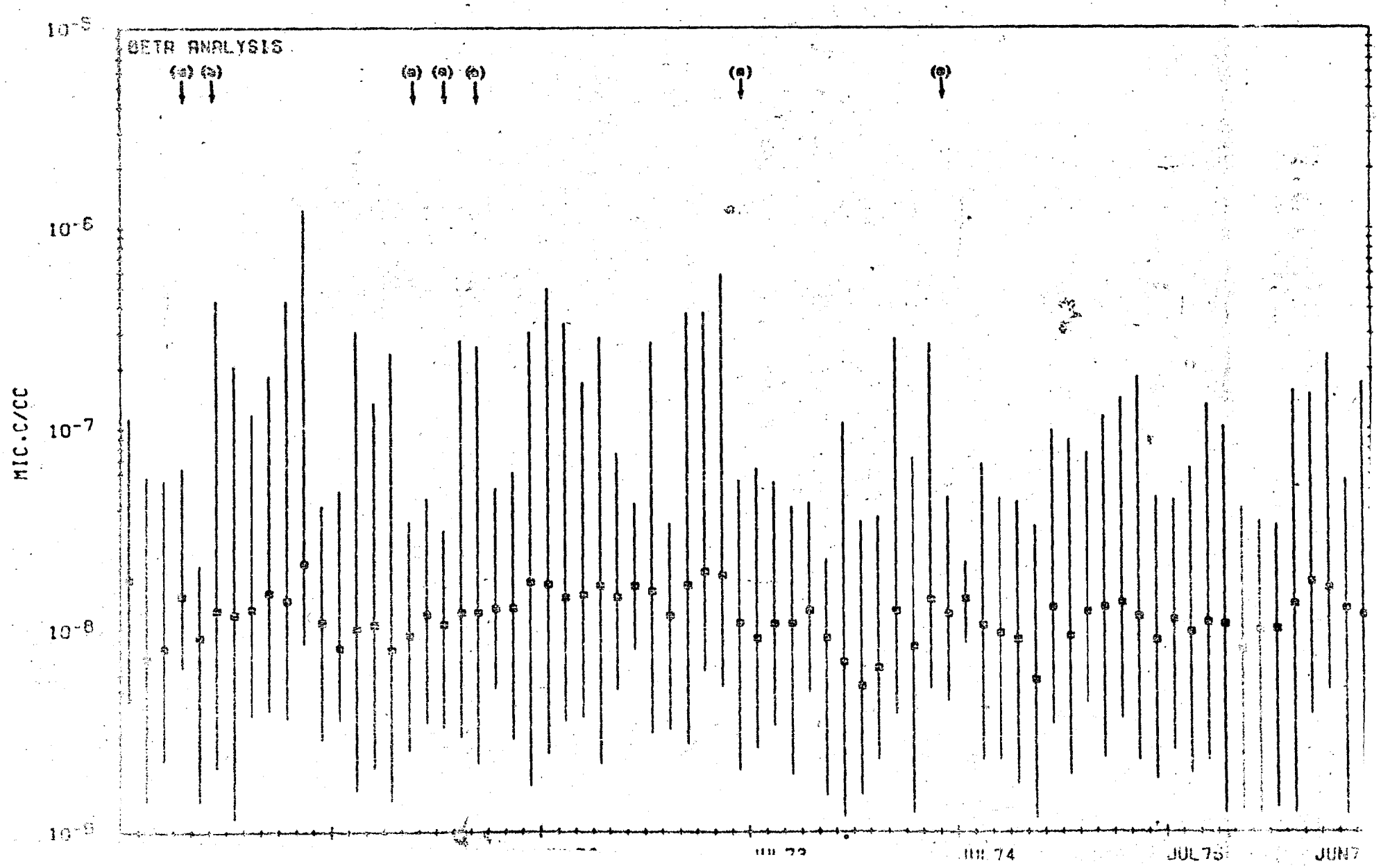
Plot #	Symbol
1-10	λ
11-16	◇

A two-sigma error bar is also added to the data points, and, in all plots, a delta with the line to the bottom of the plot means below detection limit.

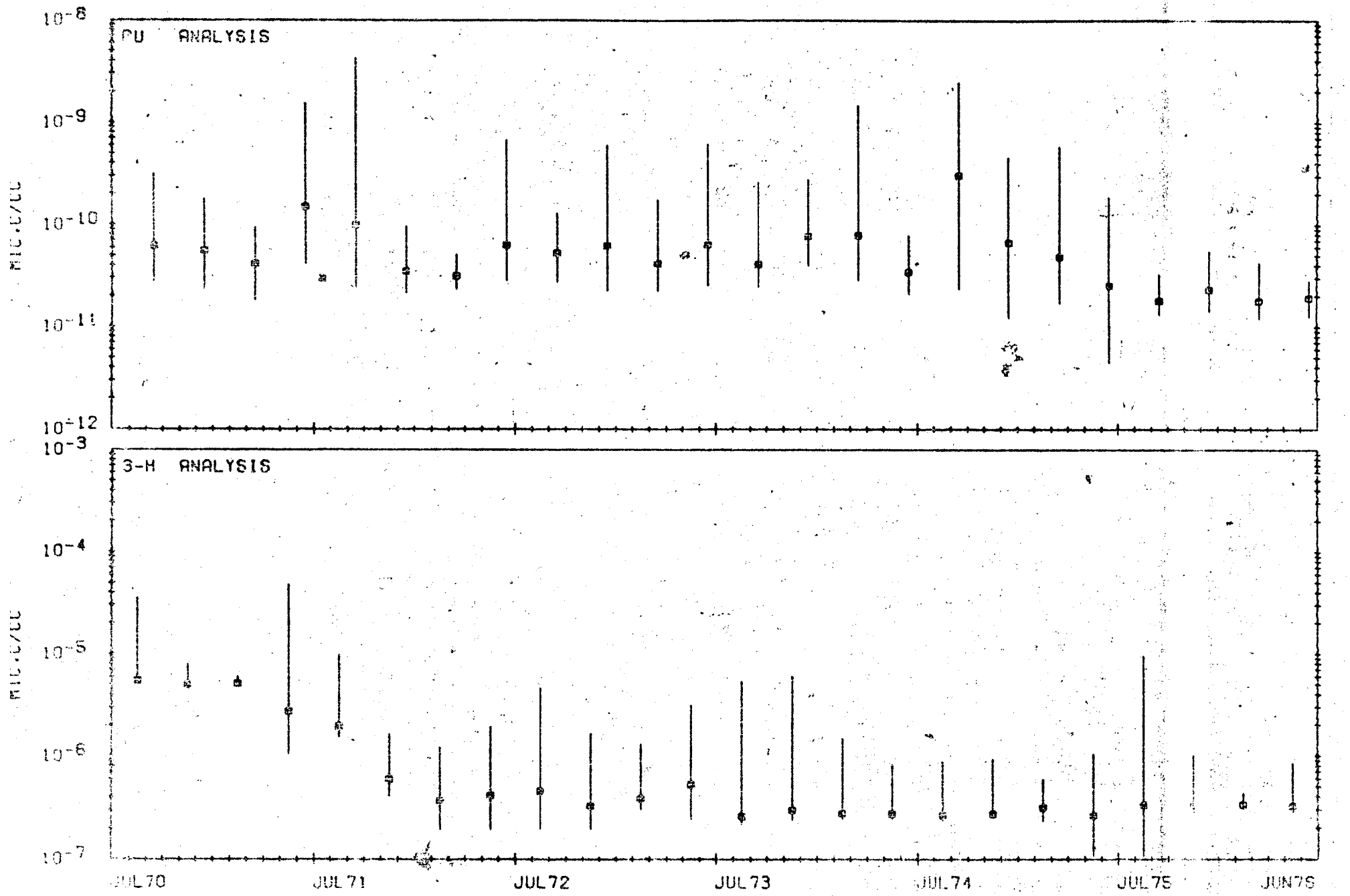
NTS ENVIRONMENTAL SURVEILLANCE
OPEN RESERVOIRS SAMPLING LOCATIONS

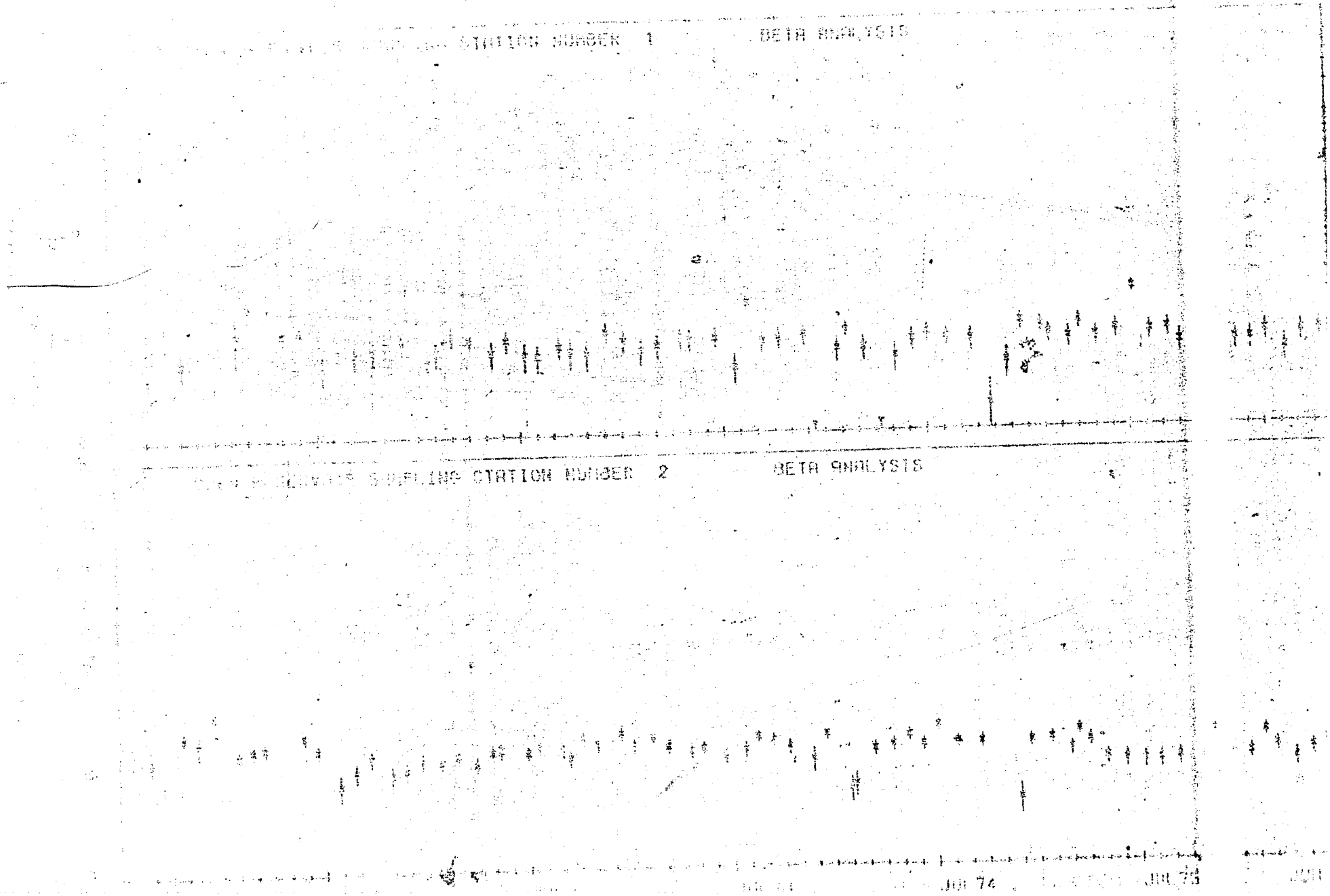
Number	Location	Map Code (Figure 6)
1	Area 2 Well 2 Reservoir	2A
2	Area 3 Well A Reservoir	3A
3	Area 5 Well 5B Reservoir	5A
4	Area 5 Well Ue5c Reservoir	5B
5	Area 6 Well 3 Reservoir	6A
6	Area 6 Well C1 Reservoir	6B
7	Area 15 Well Ue15d Reservoir	15A
8	Area 18 Camp 17 Reservoir	18A
9	Area 19 Well Ue19gs Reservoir	19A
10	Area 19 Well Ue19e Reservoir	19B
11	Area 20 Well U20a Reservoir	20A
12	Area 23 Swimming Pool	23A
13	Groom Lake Well 4 Reservoir	00A
14	Groom Lake Papoose Reservoir	00B
15	Groom Lake Swimming Reservoir	00C
16	Area 19 Well U19c Reservoir	19c

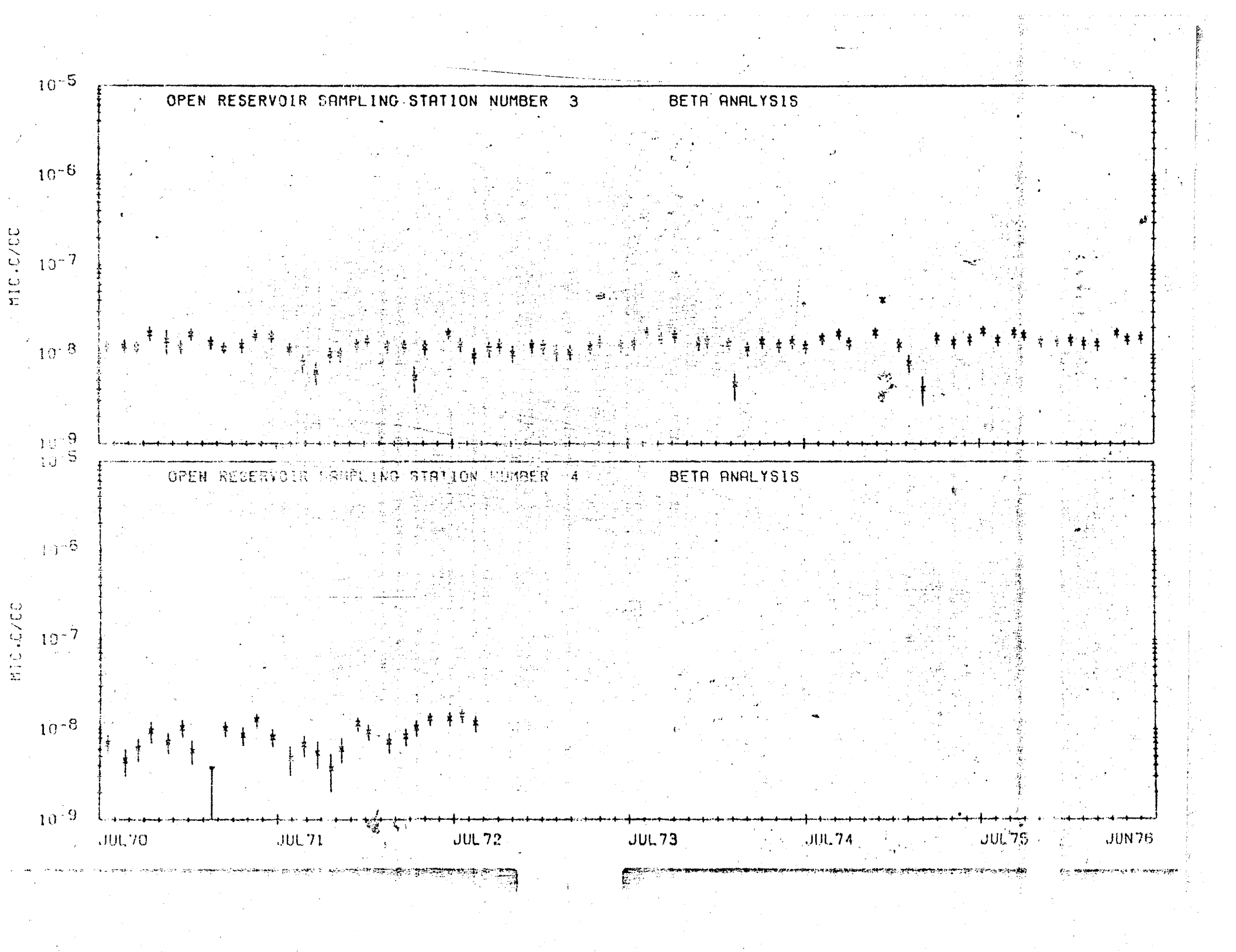
OPEN RESERVOIR NETWORK AVERAGES



OPEN RESERVOIR NETWORK AVERAGES




STATION NUMBER 1
BETA ANALYSIS
SAMPLING STATION NUMBER 2
BETA ANALYSIS
JUL 74
JUL 75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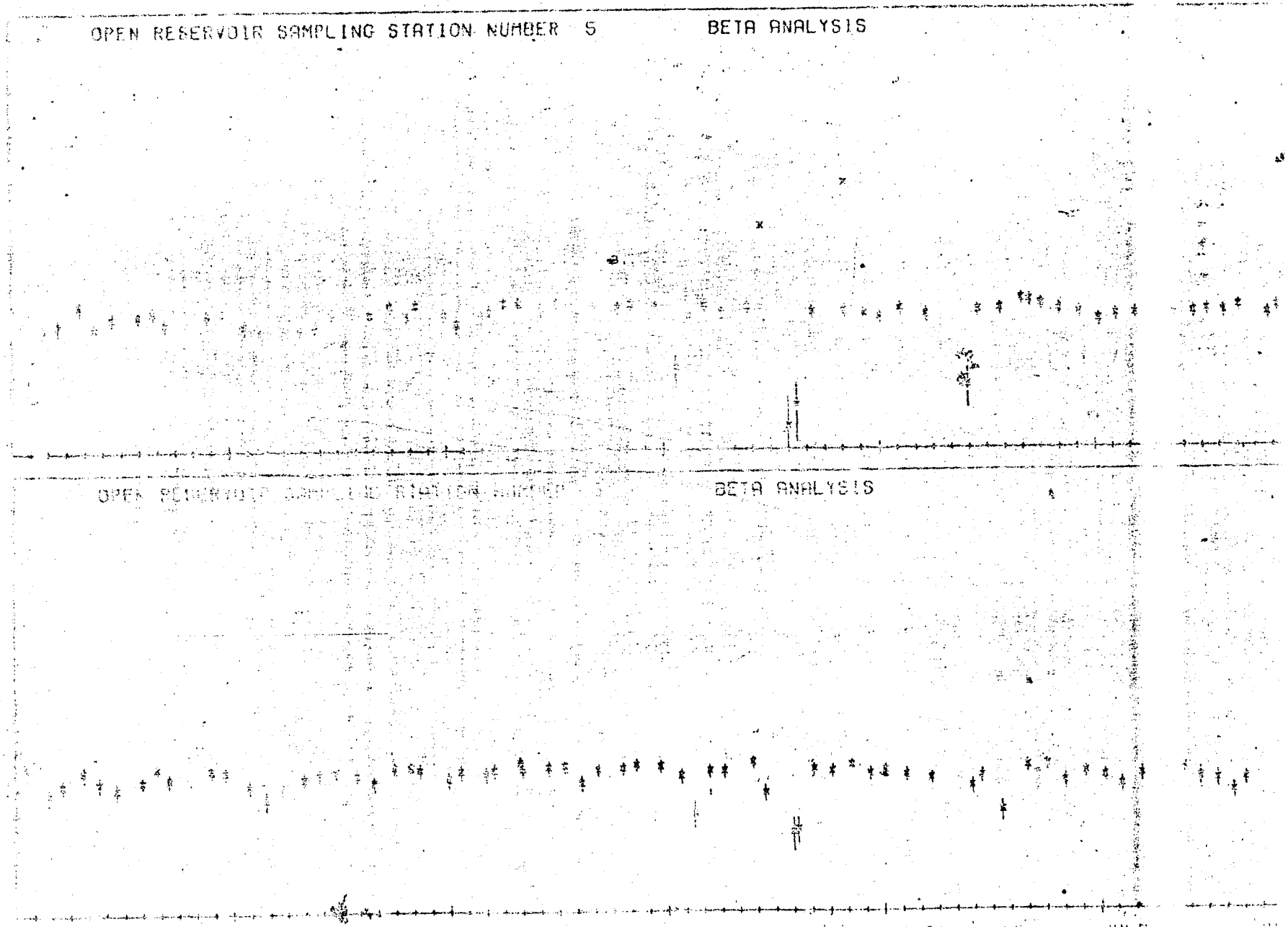
BETA ANALYSIS
10^{-5}
10^{-6}
10^{-7}
10^{-8}
10^{-9}
OPEN RESERVOIR SAMPLING STATION NUMBER 4
BETA ANALYSIS
10^{-6}
10^{-7}
10^{-8}
10^{-9}
JUL70
JUL71
JUL72
JUL73
JUL74
JUL75
JUN76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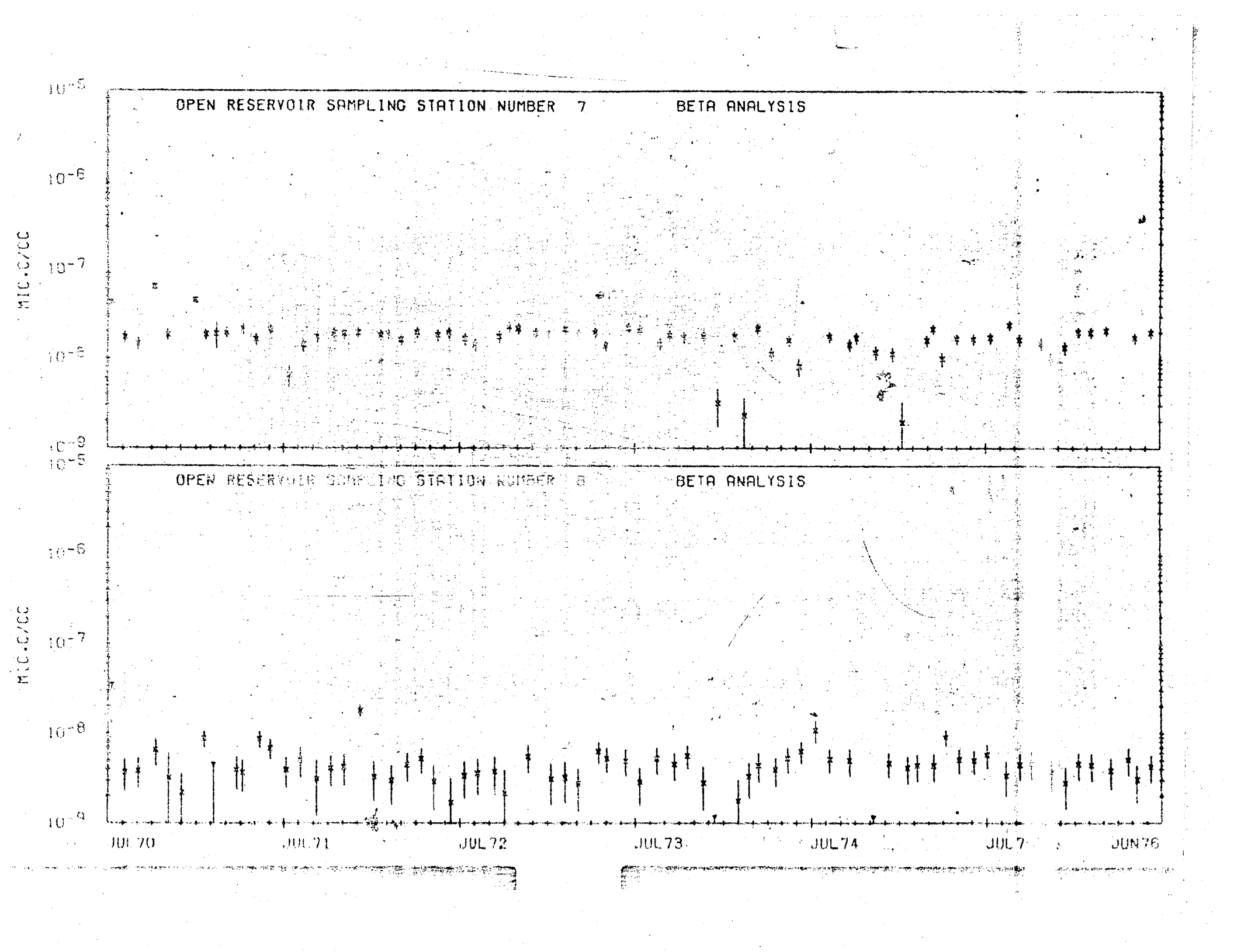
BETA ANALYSIS
JUL74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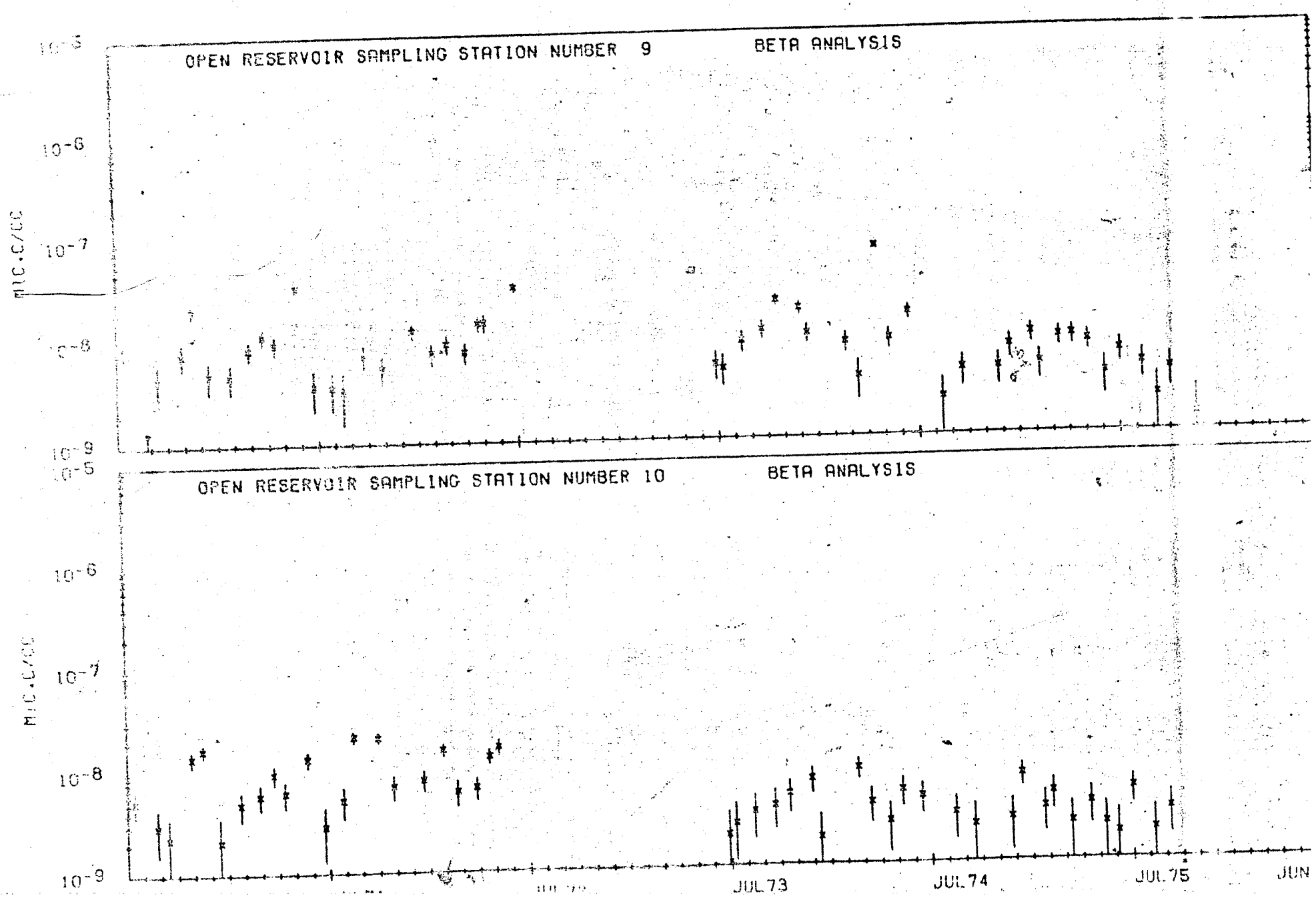
BETA ANALYSIS
MIC.C/CC
OPEN RESERVOIR SAMPLING STATION NUMBER 8
BETA ANALYSIS
MIC.C/CC
JUL 70
JUL 71
JUL 72
JUL 73
JUL 74
JUL 7
JUN 76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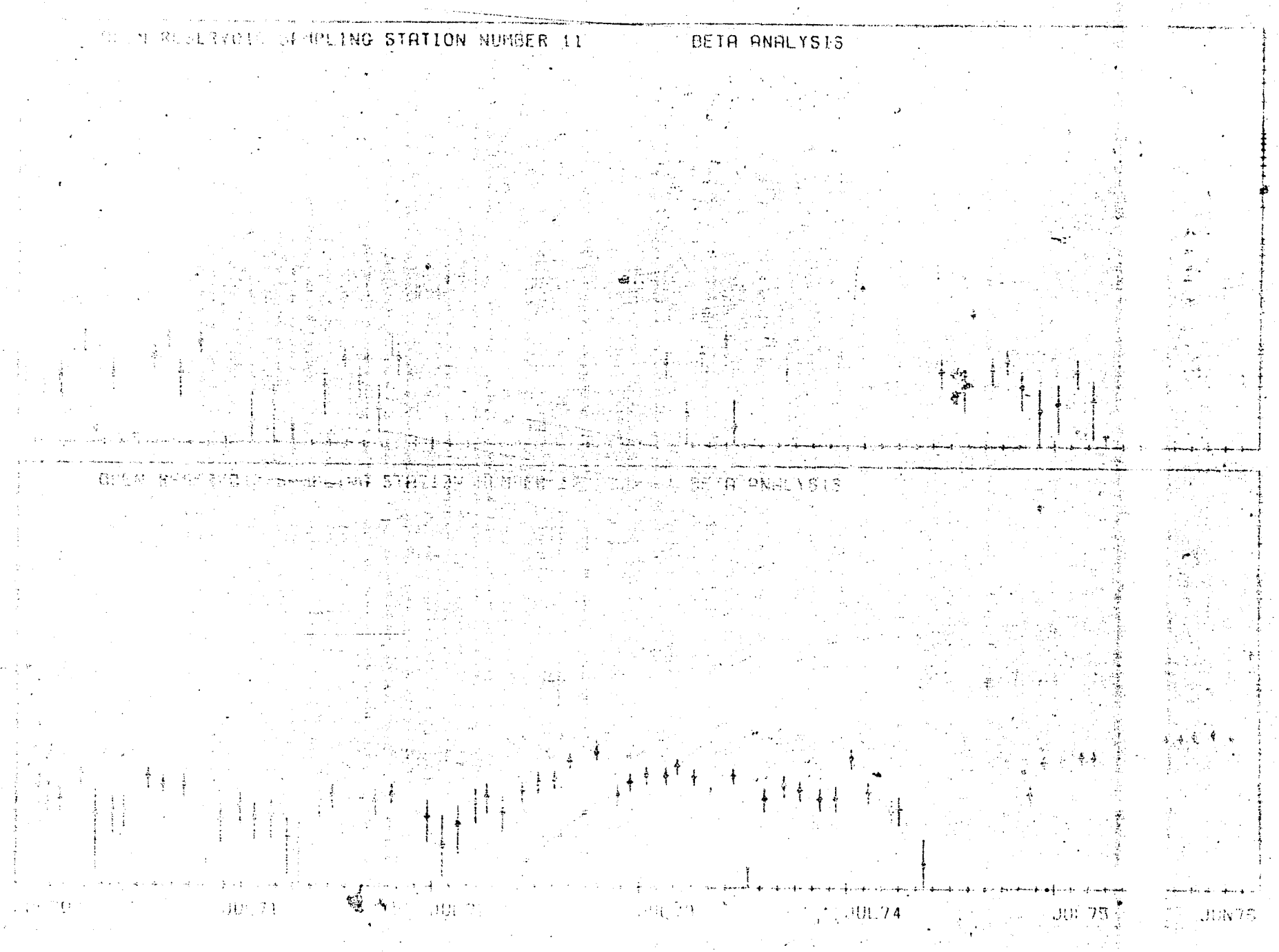
BETA ANALYSIS
10-6
10-7
10-9
OPEN RESERVOIR SAMPLING STATION NUMBER 10
BETA ANALYSIS
10-6
10-7
10-8
10-9
JUL73
JUL74
JUL75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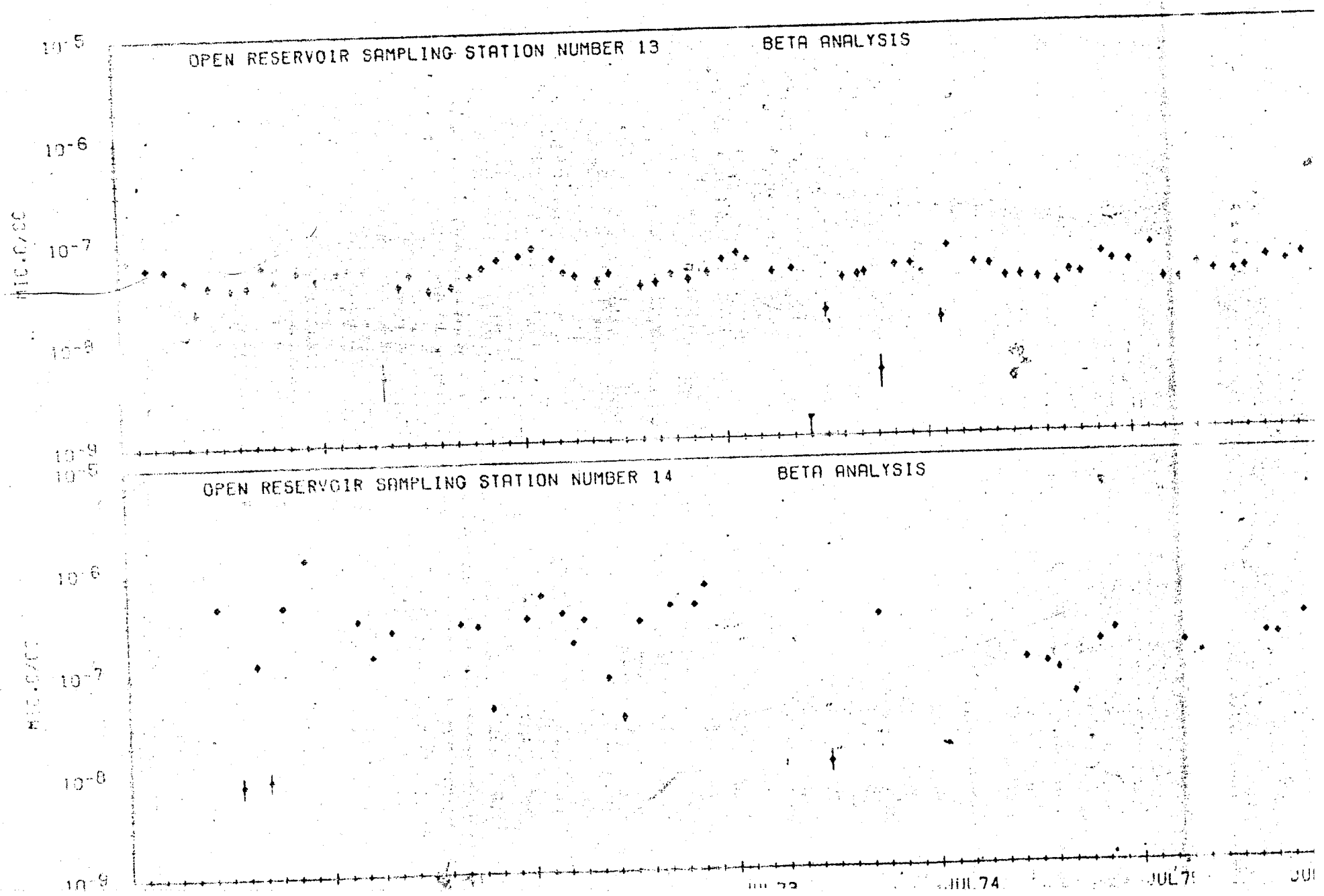
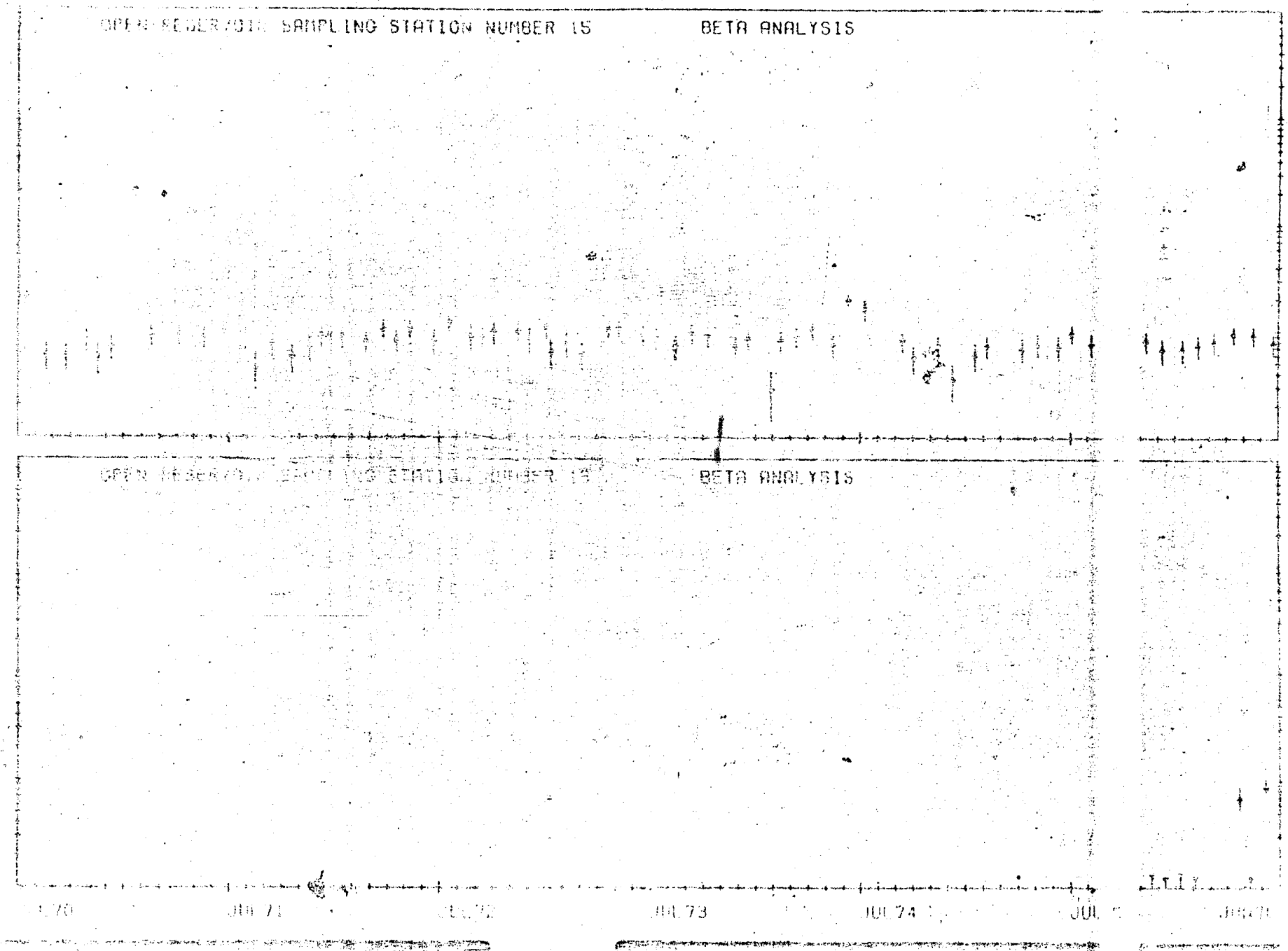
BETA ANALYSIS
JUL74
JUN75


OPEN RESERVOIR SAMPLING STATION NUMBER 13
BETA ANALYSIS
10^{-5}
10^{-6}
10^{-7}
10^{-8}
10^{-9}
OPEN RESERVOIR SAMPLING STATION NUMBER 14
BETA ANALYSIS
10^{-5}
10^{-6}
10^{-7}
10^{-8}
10^{-9}
JUL74


SAMPLING STATION NUMBER 15
BETA ANALYSIS
JUL 73
JUL 74

APPENDIX F

NTS Environmental Surveillance

Contaminated Ponds Locations and Plots

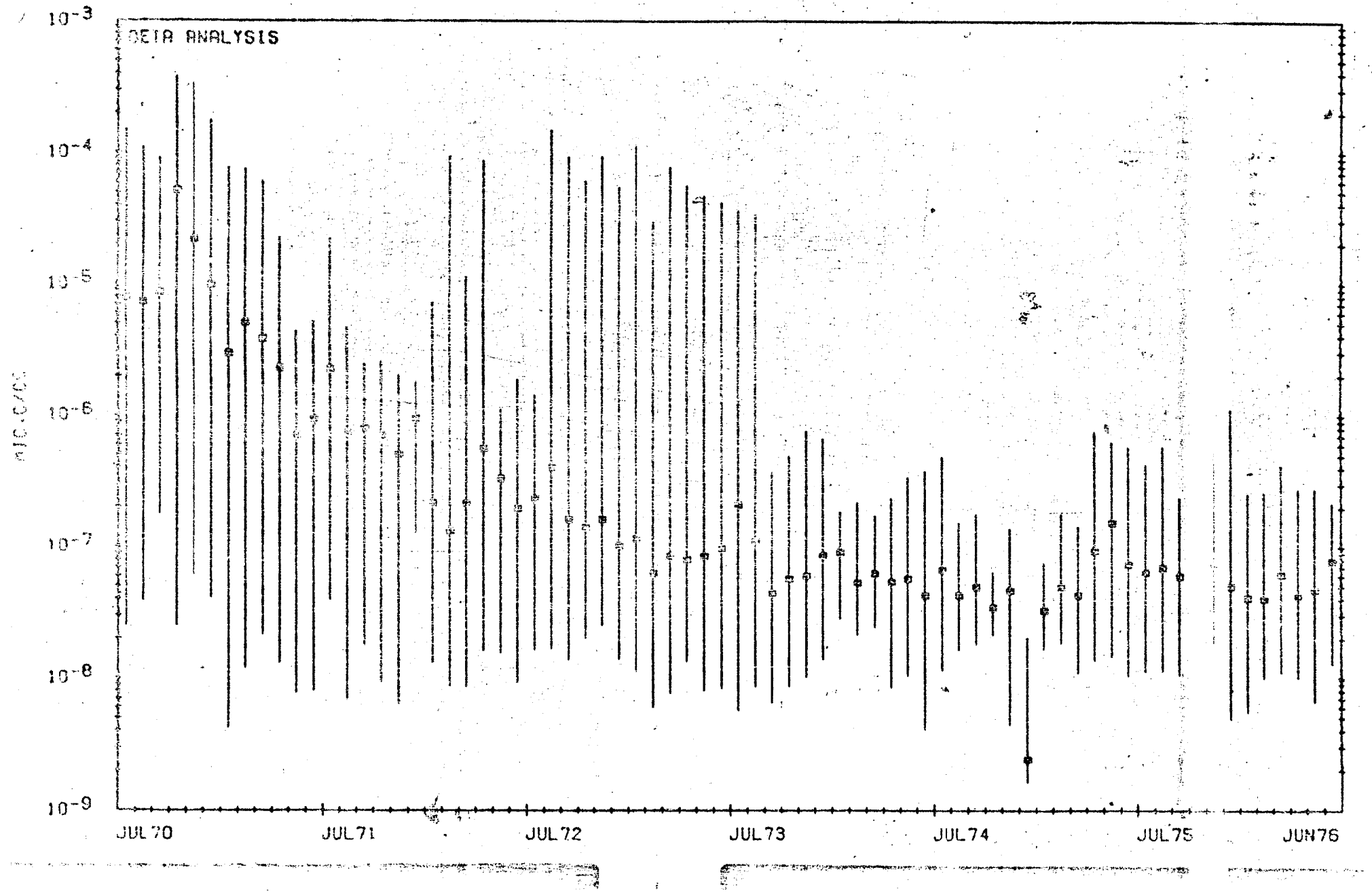
In the first two pages of plots in Appendix F, the contaminated pond network averages, a square is used to represent the geometric mean of all values at that point in time, and the vertical line is the range.

The remaining plots show the gross beta data of each station utilizing the symbol, X, as the data point. A two-sigma error bar is also added to the data points, and, in all plots, a delta with a line to the bottom of the plot means below detection limit.

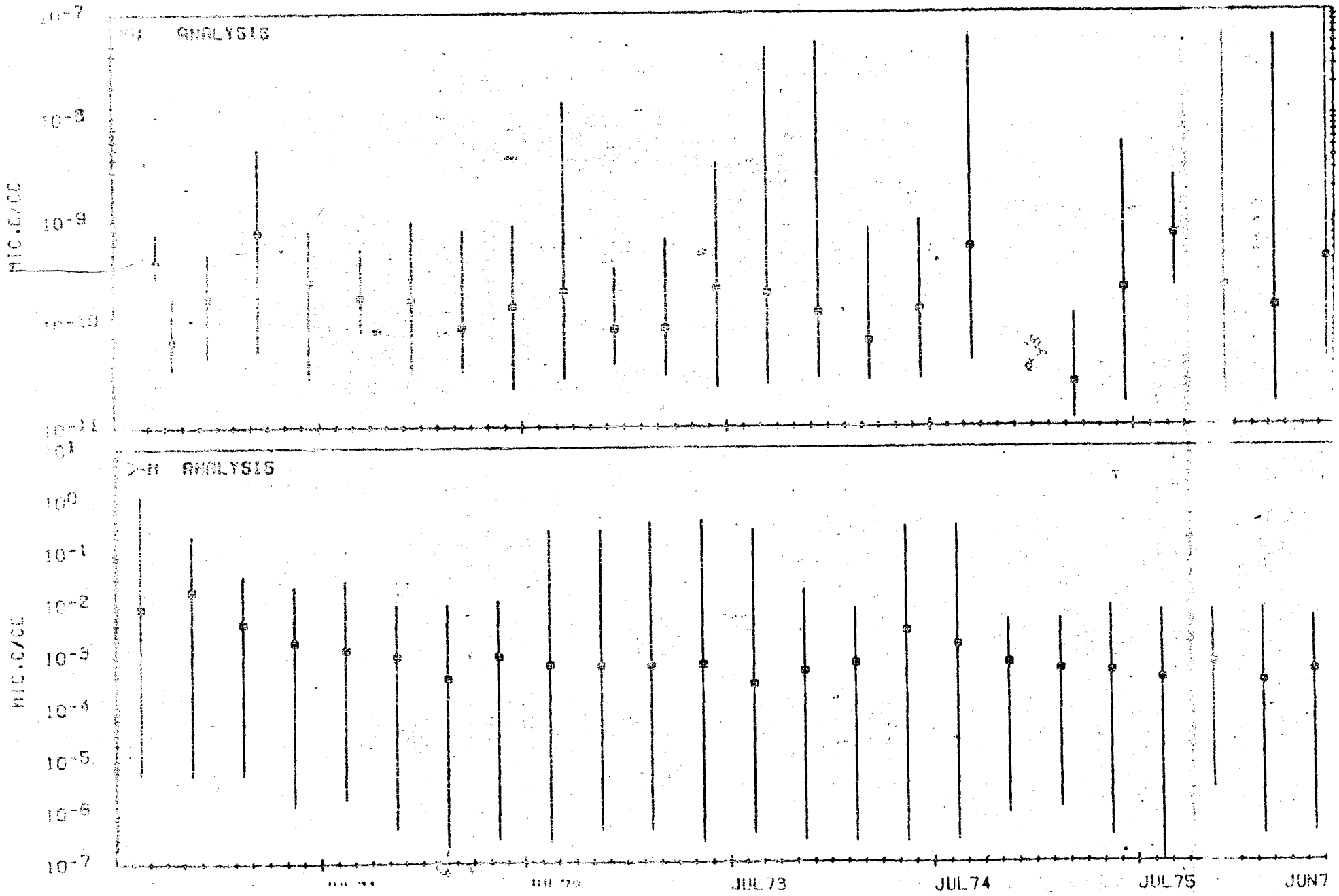
NTS ENVIRONMENTAL SURVEILLANCE
CONTAMINATED PONDS SAMPLING LOCATIONS

Number	Location	Map Code (Figure 7)
1	Area 12 Haines Upper	A
2	Area 12 Haines #2	B
3	Area 12 Haines #3	C
4	Area 12 Haines Lower	D
5	Area 12 Mint Upper	E
6	Area 12 Mint Mid	F
7	Area 12 Mint Lower	G
8	Area 12 N Upper	H
9	Area 12 N Mid	I
10	Area 12 N Lower	J
11	Area 12 G Tunnel	K
12	Area 12 H&S Sump	23A

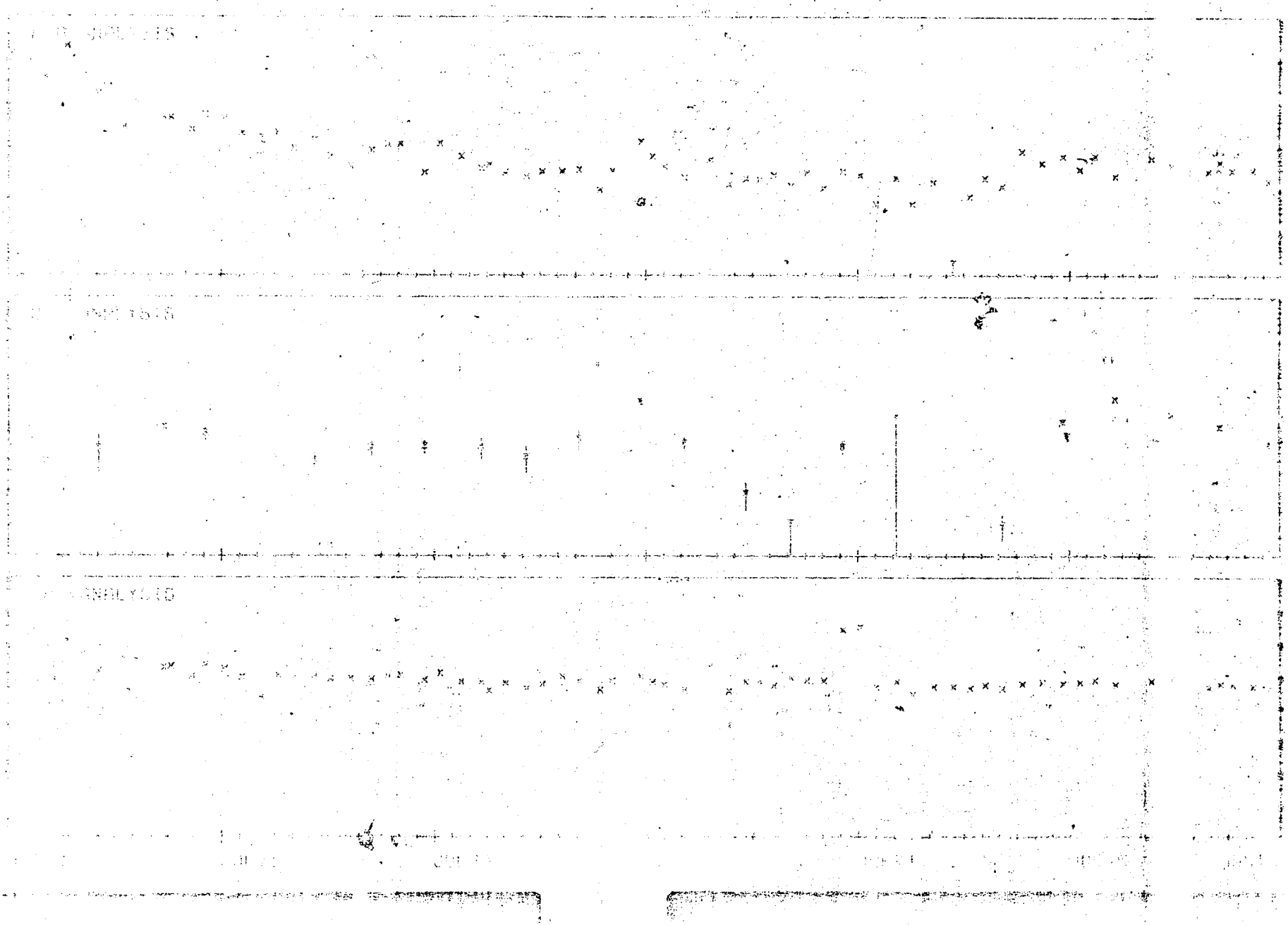
CONTAMINATED POND NETWORK AVERAGES



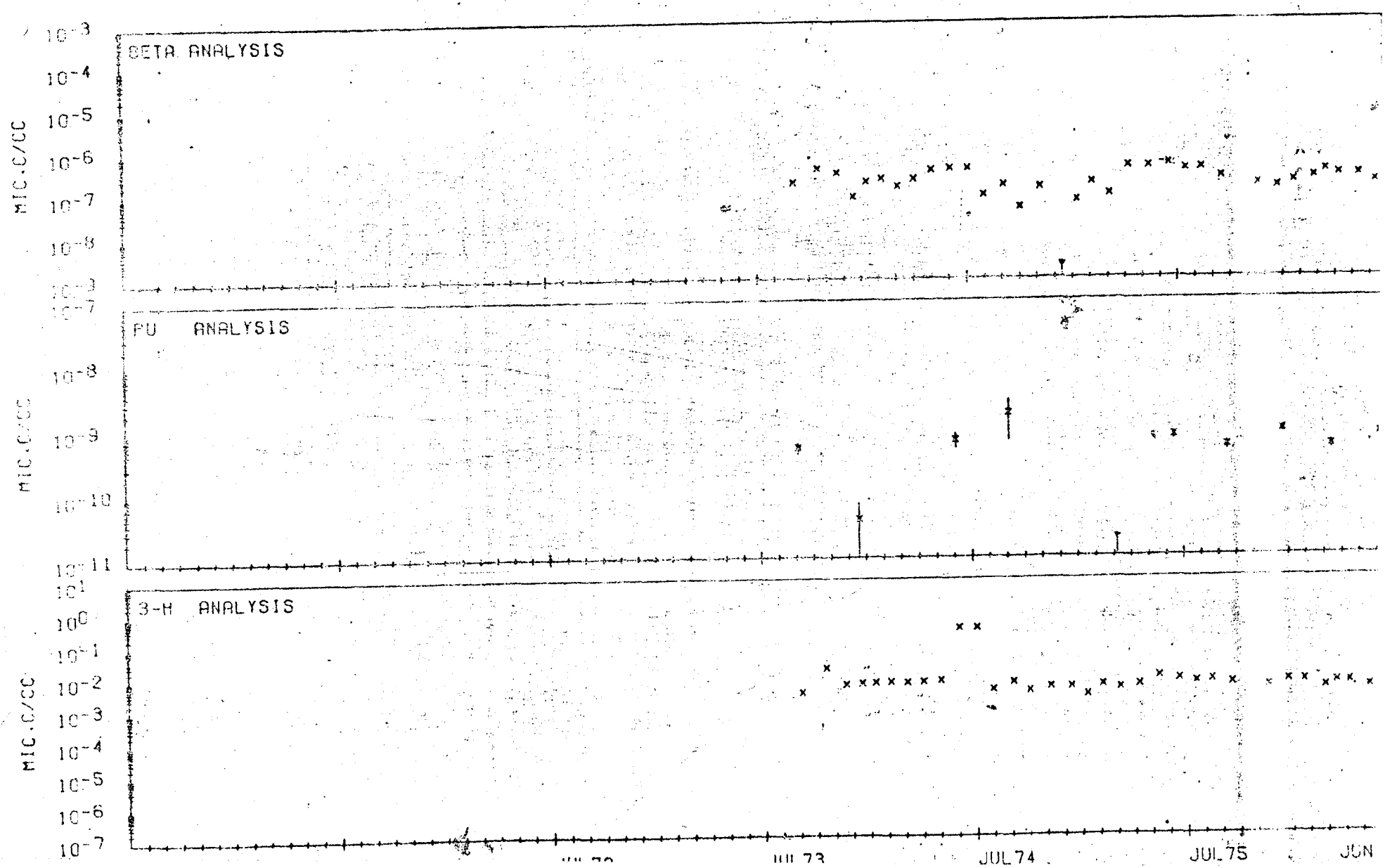
CONTAMINATED POND NETWORK AVERAGES



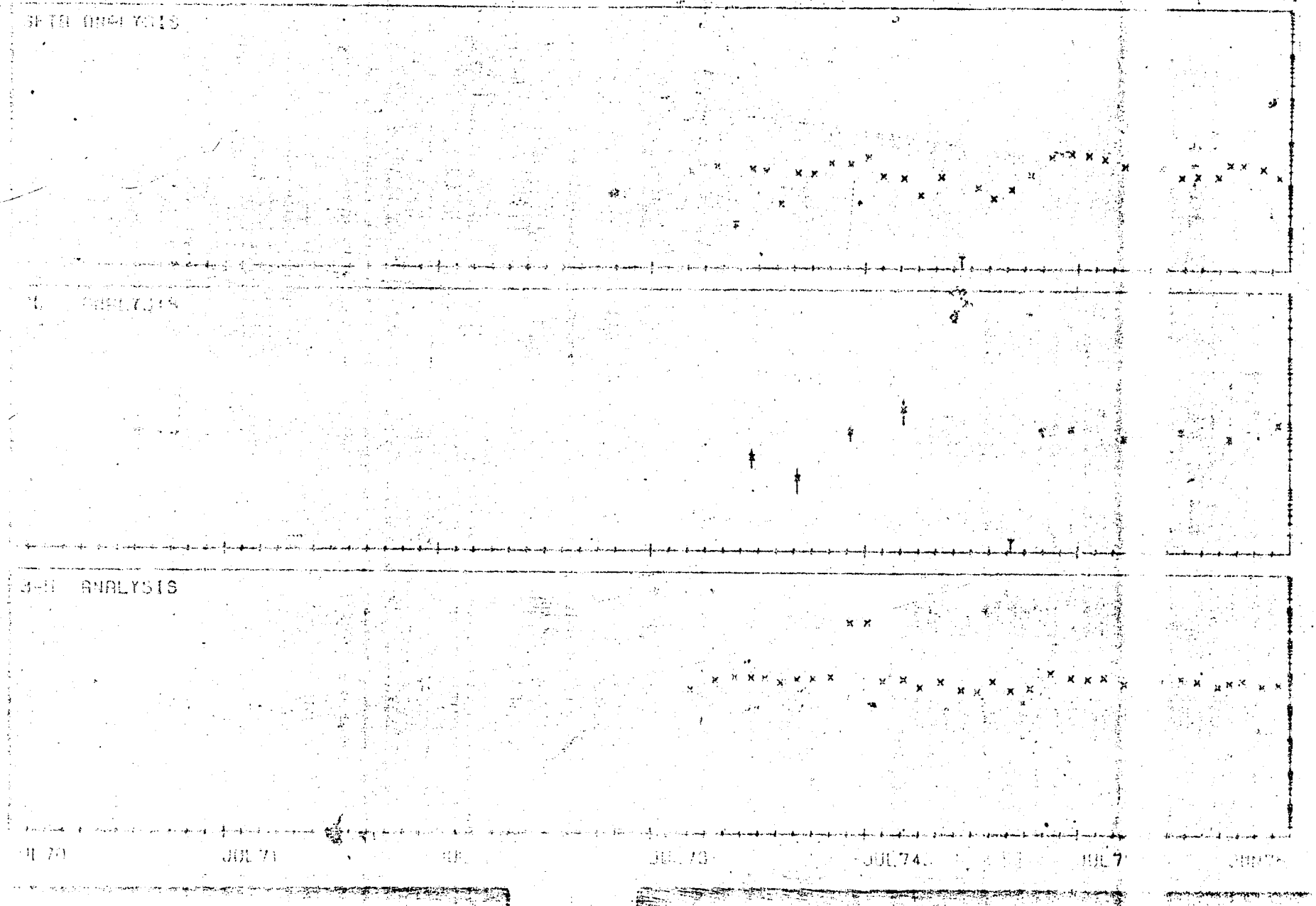
CONTAINMENT POND SAMPLING STATION NUMBER 1



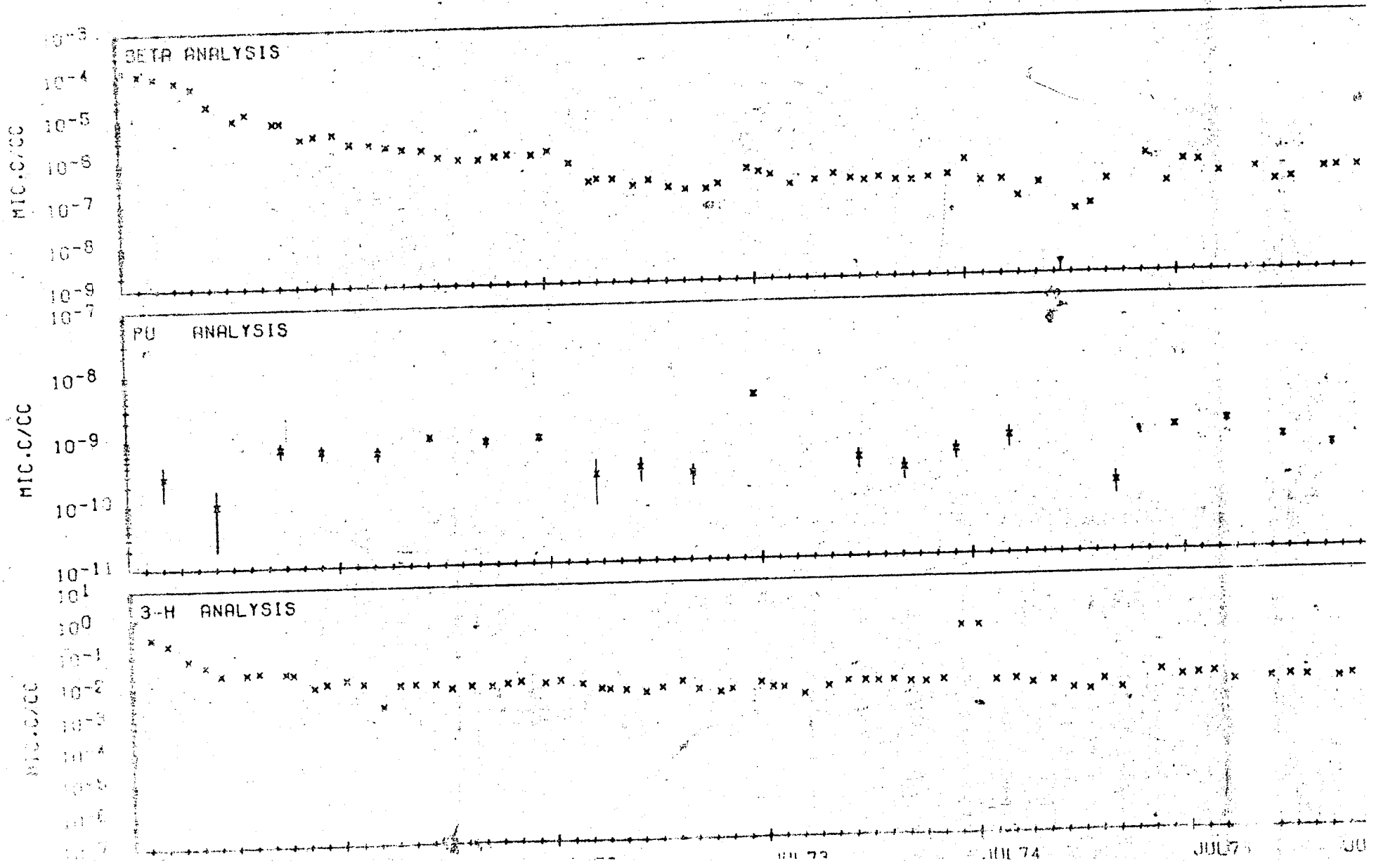
CONTAMINATED POND SAMPLING STATION NUMBER 2



CONTAMINATED POND SAMPLING STATION NUMBER 3



CONTAMINATED POND SAMPLING STATION NUMBER 4



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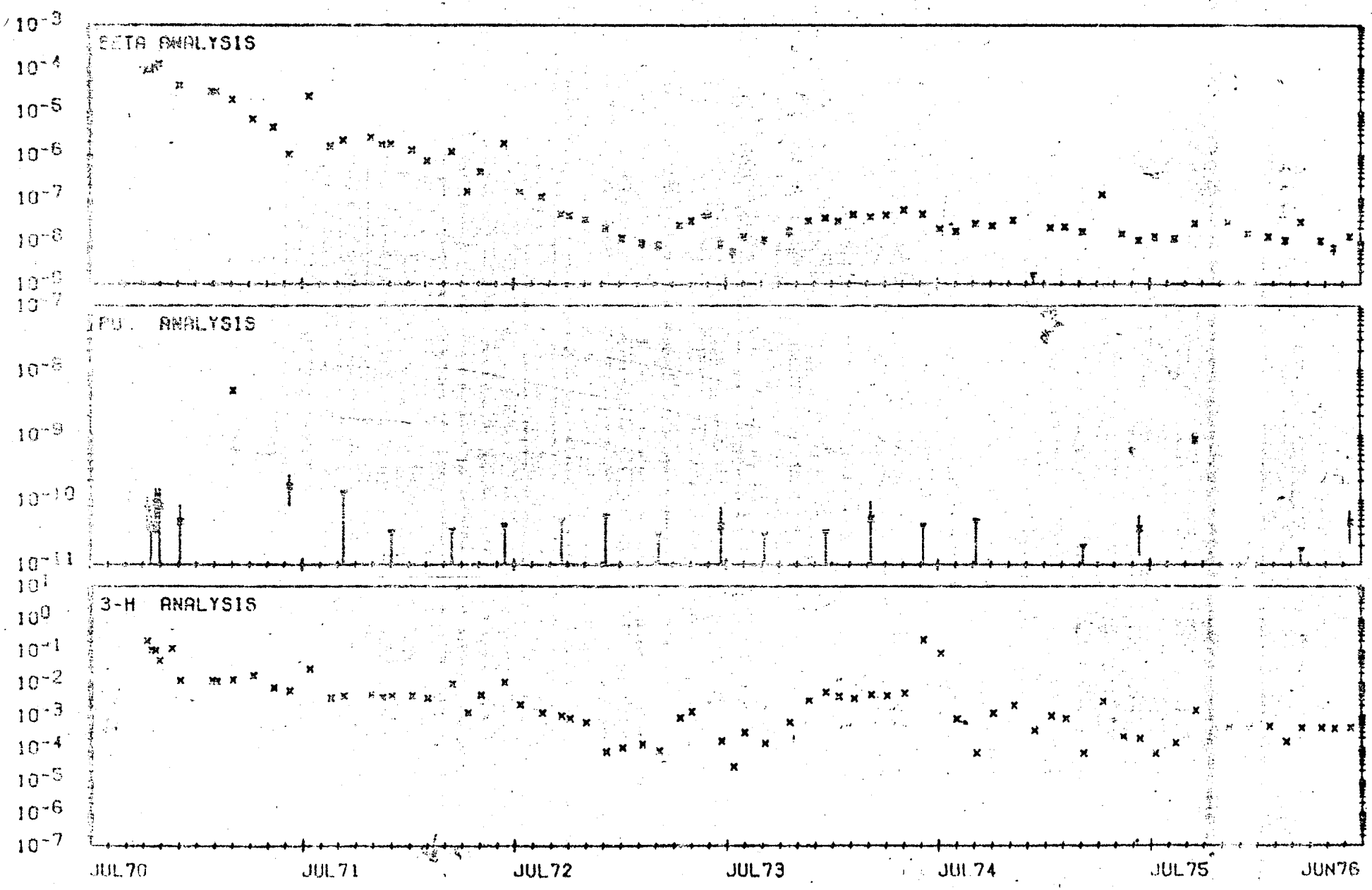
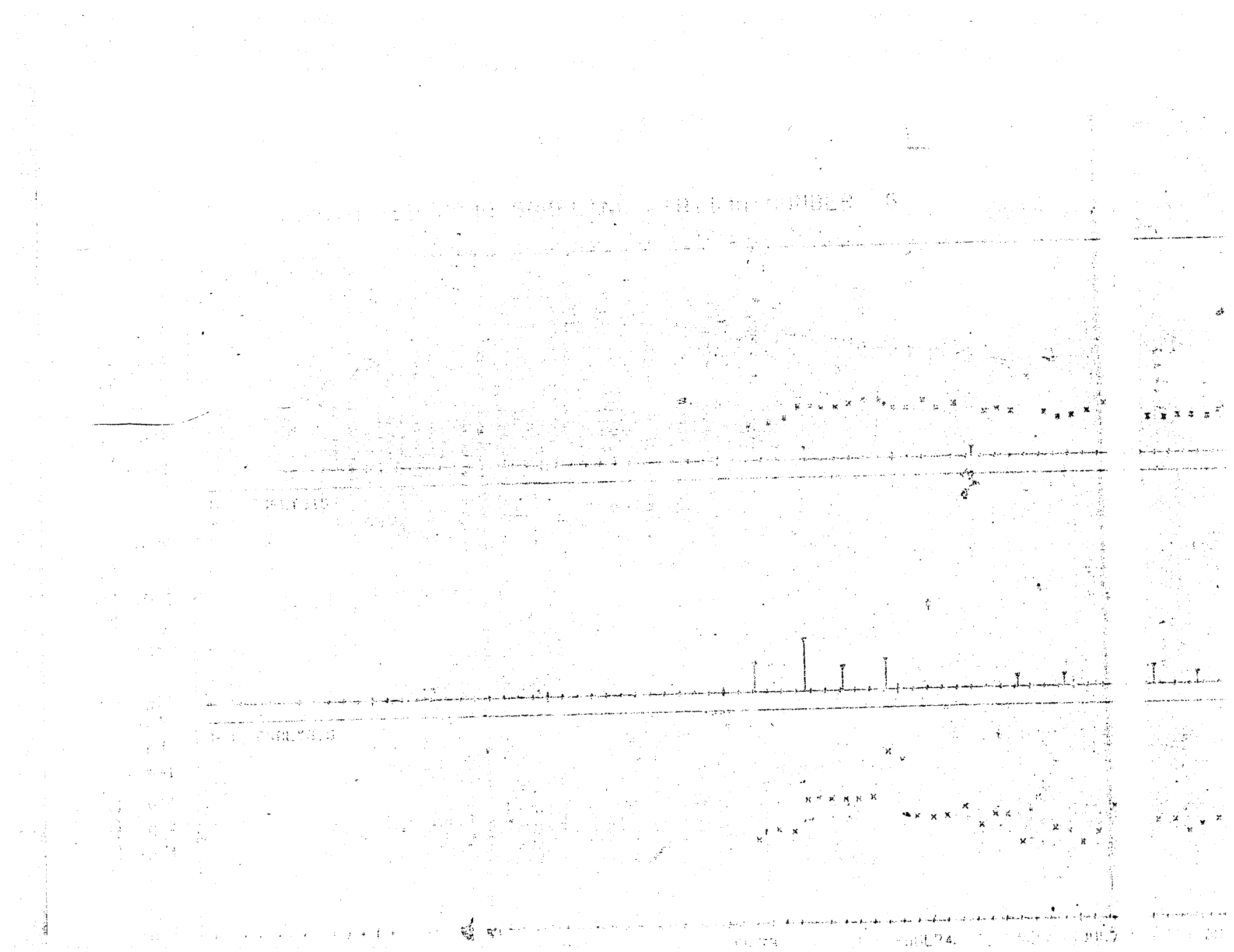
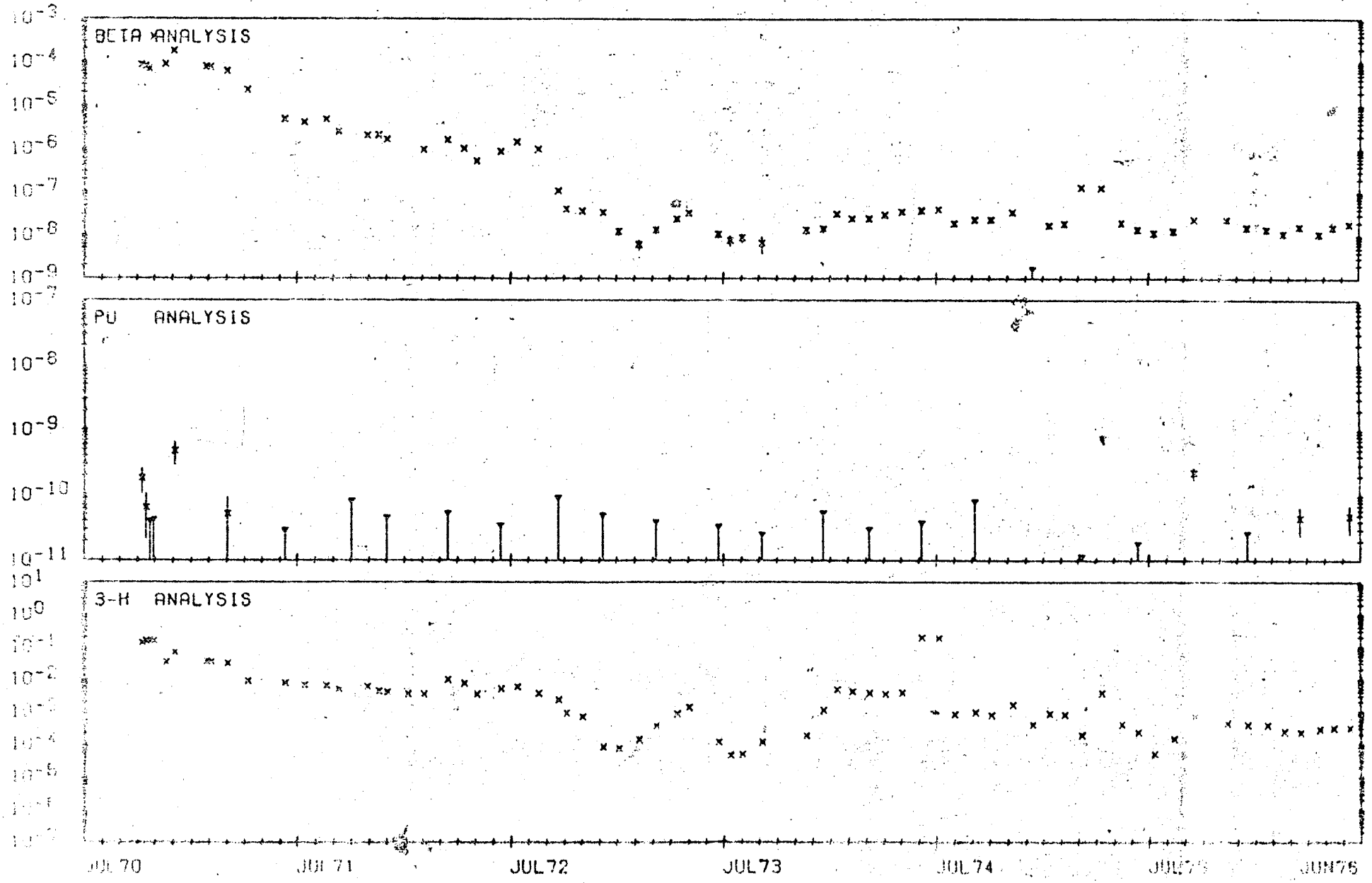
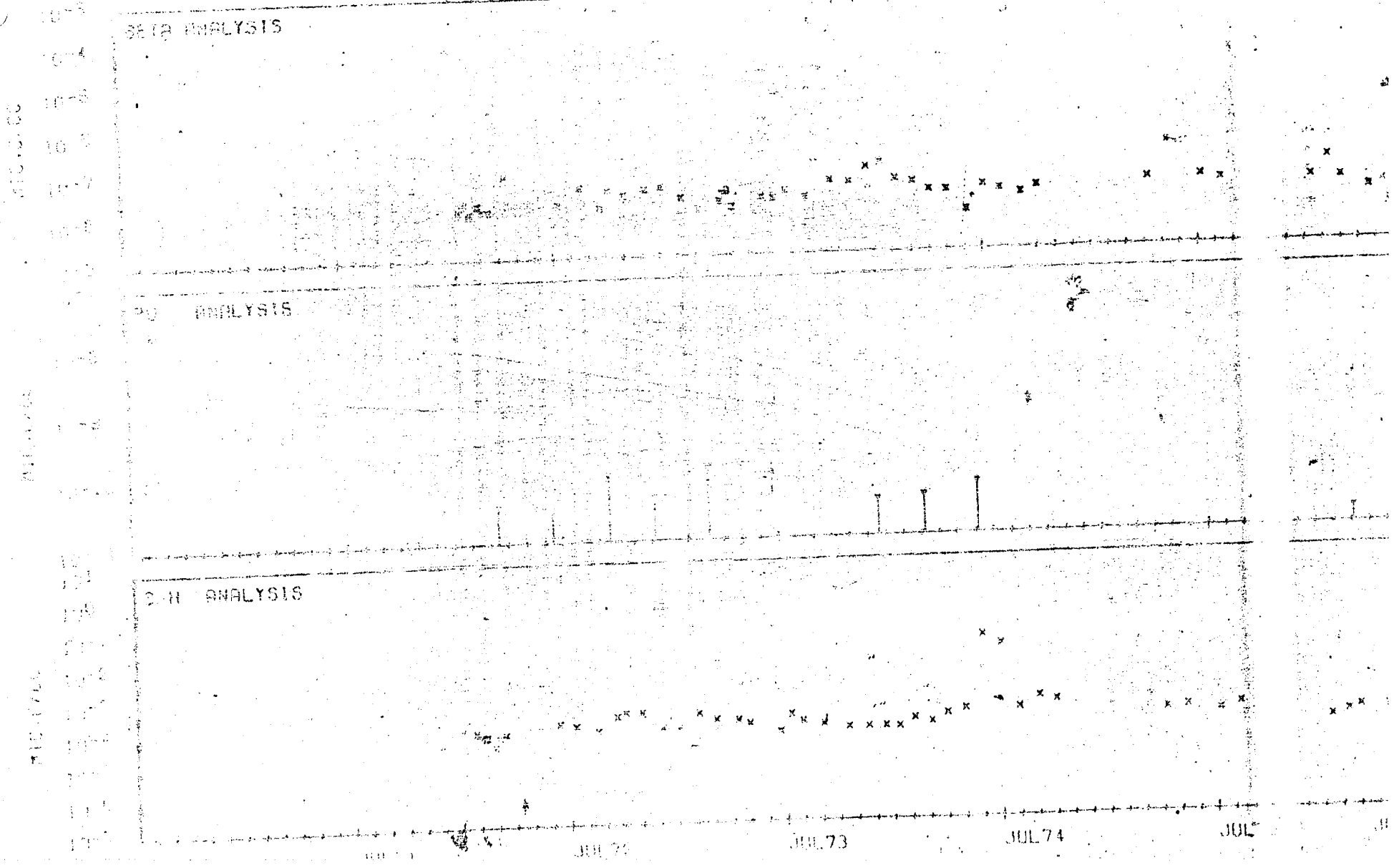




CONTAMINATED POND SAMPLING STATION NUMBER 7



CONTAMINATED POND SAMPLING STATION NUMBER 8



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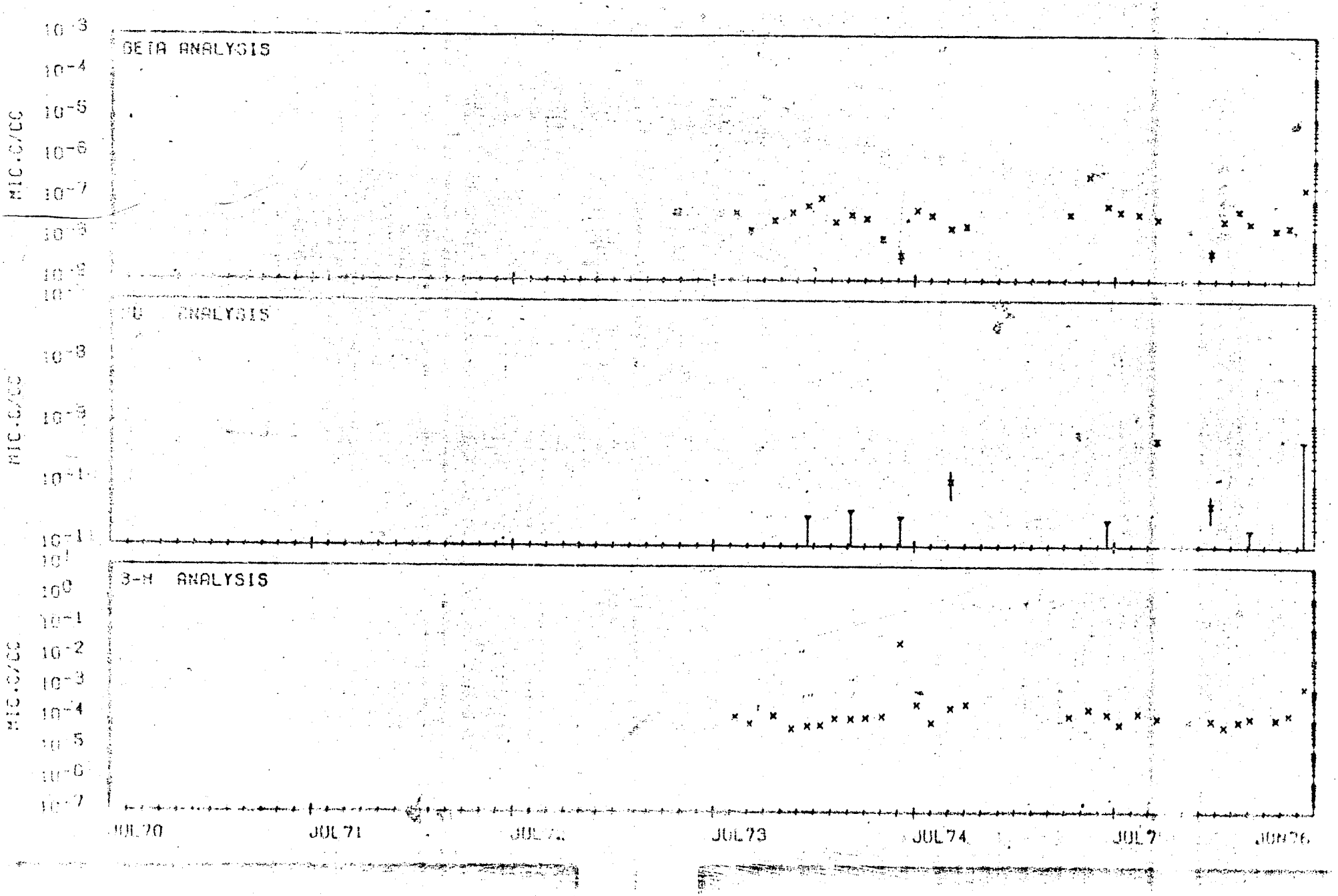

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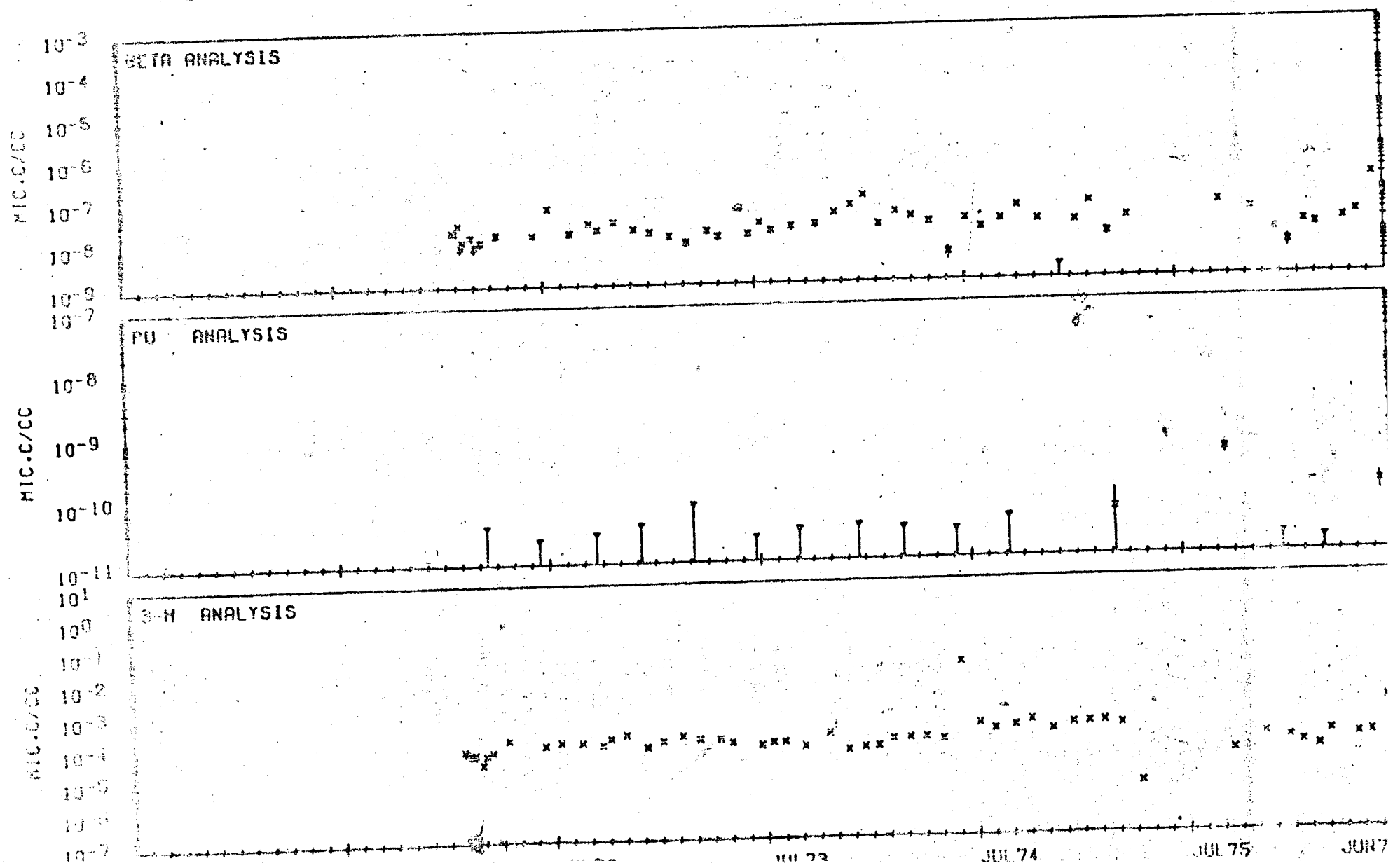
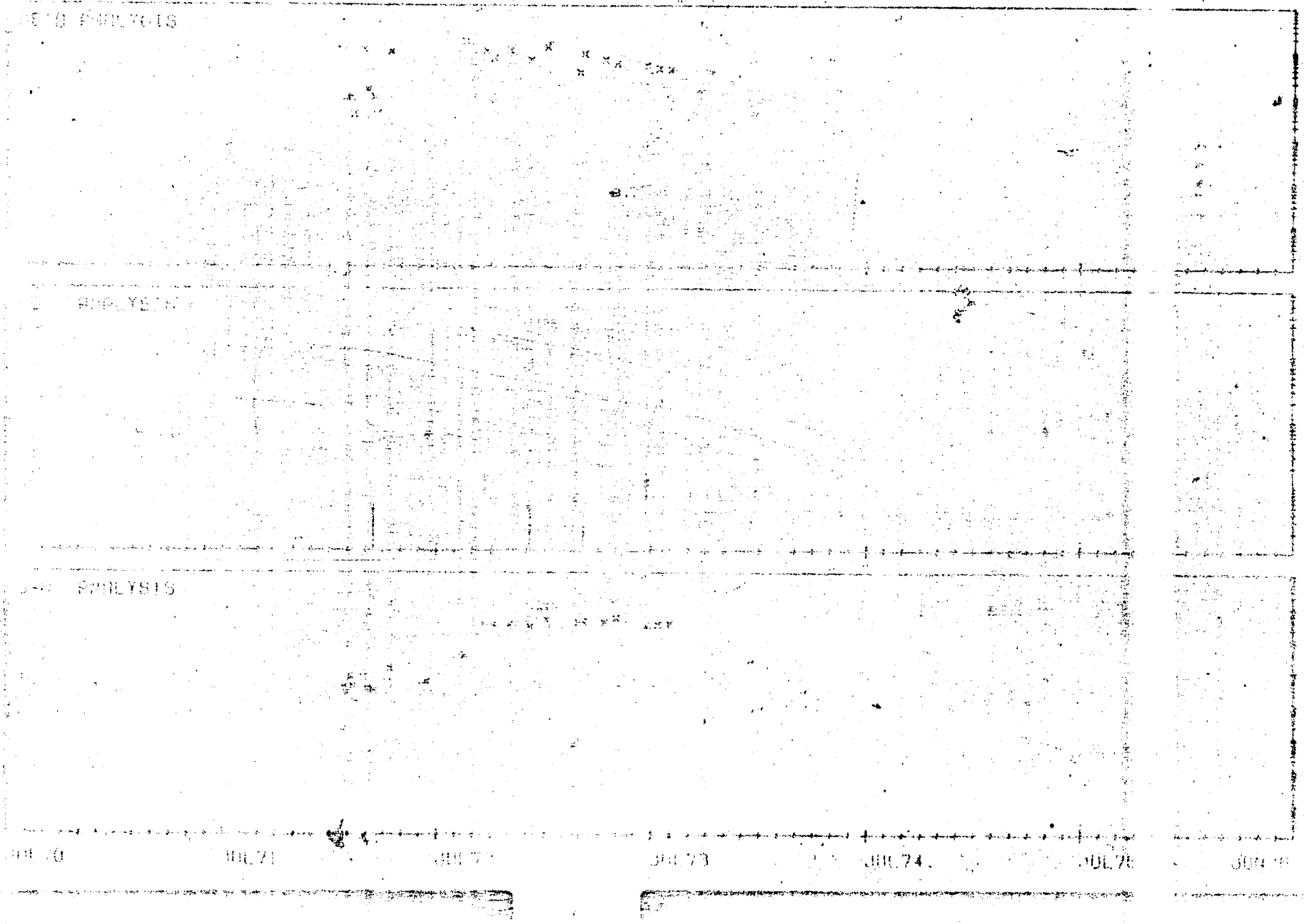
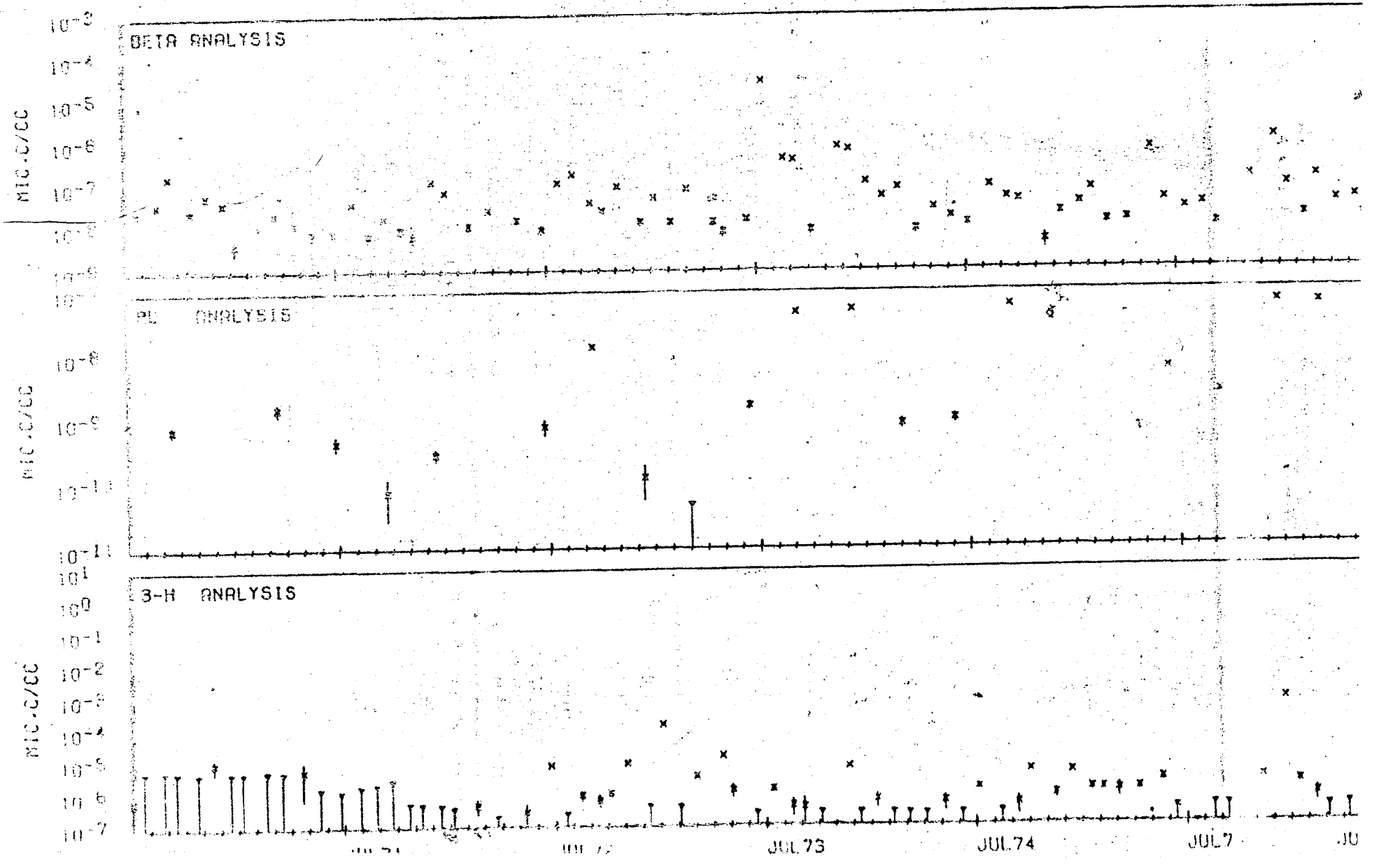


[illegible] POND SAMPLING STATION NUMBER 11



CONTAMINATED POND SAMPLING STATION NUMBER 12



APPENDIX G

NTS Environmental Surveillance

Effluent Ponds Locations and Plots

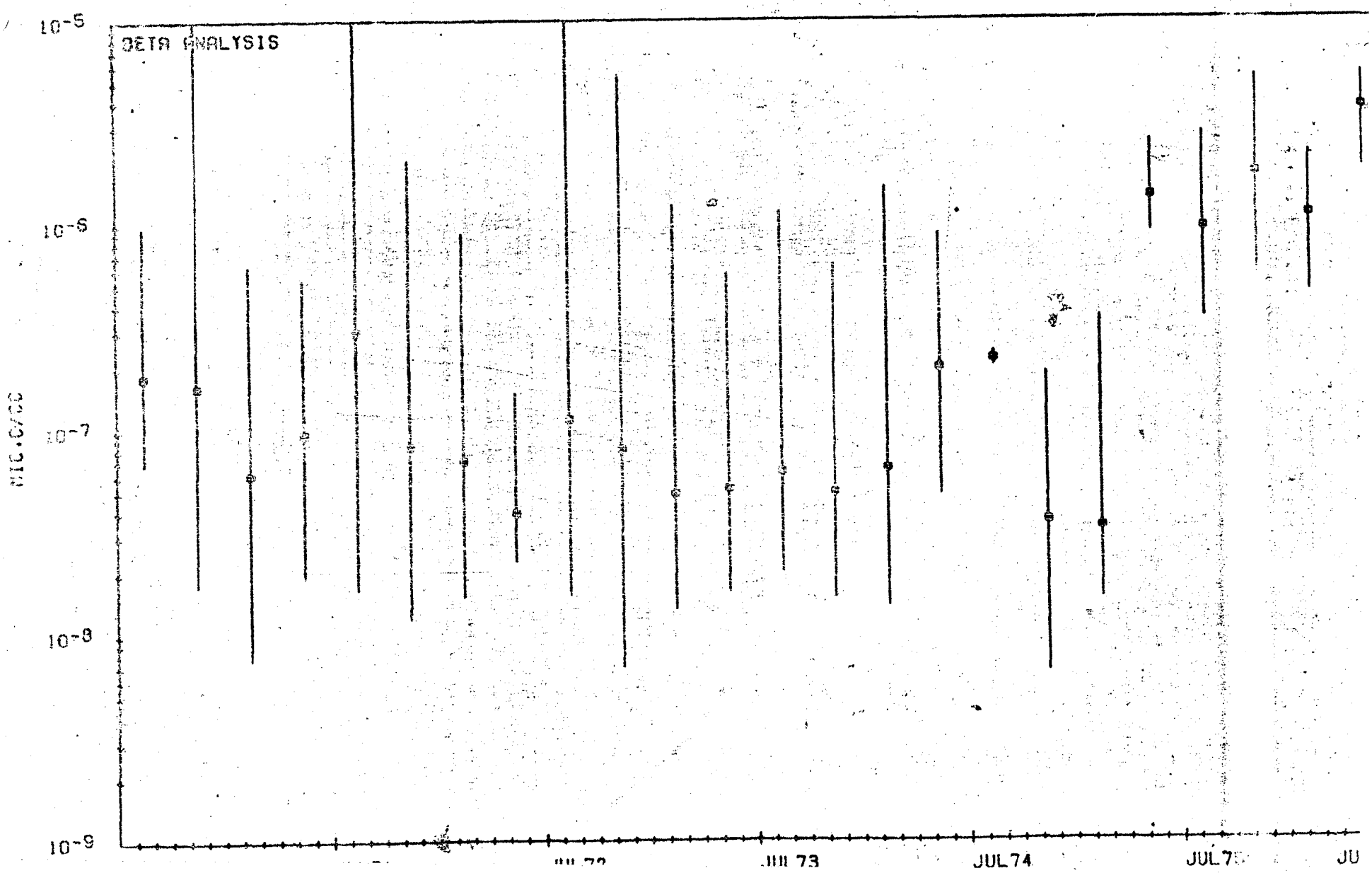
In the first two pages of plots in Appendix G, the effluent ponds network averages, a square is used to represent the geometric mean of all values at that point in time, and the vertical line is the range.

The remaining plots show the gross beta data of each station utilizing the symbol, X, as the data point. A two-sigma error bar is also added to the data points, and, in all plots, a delta with a line to the bottom of the plot means below detection limit.

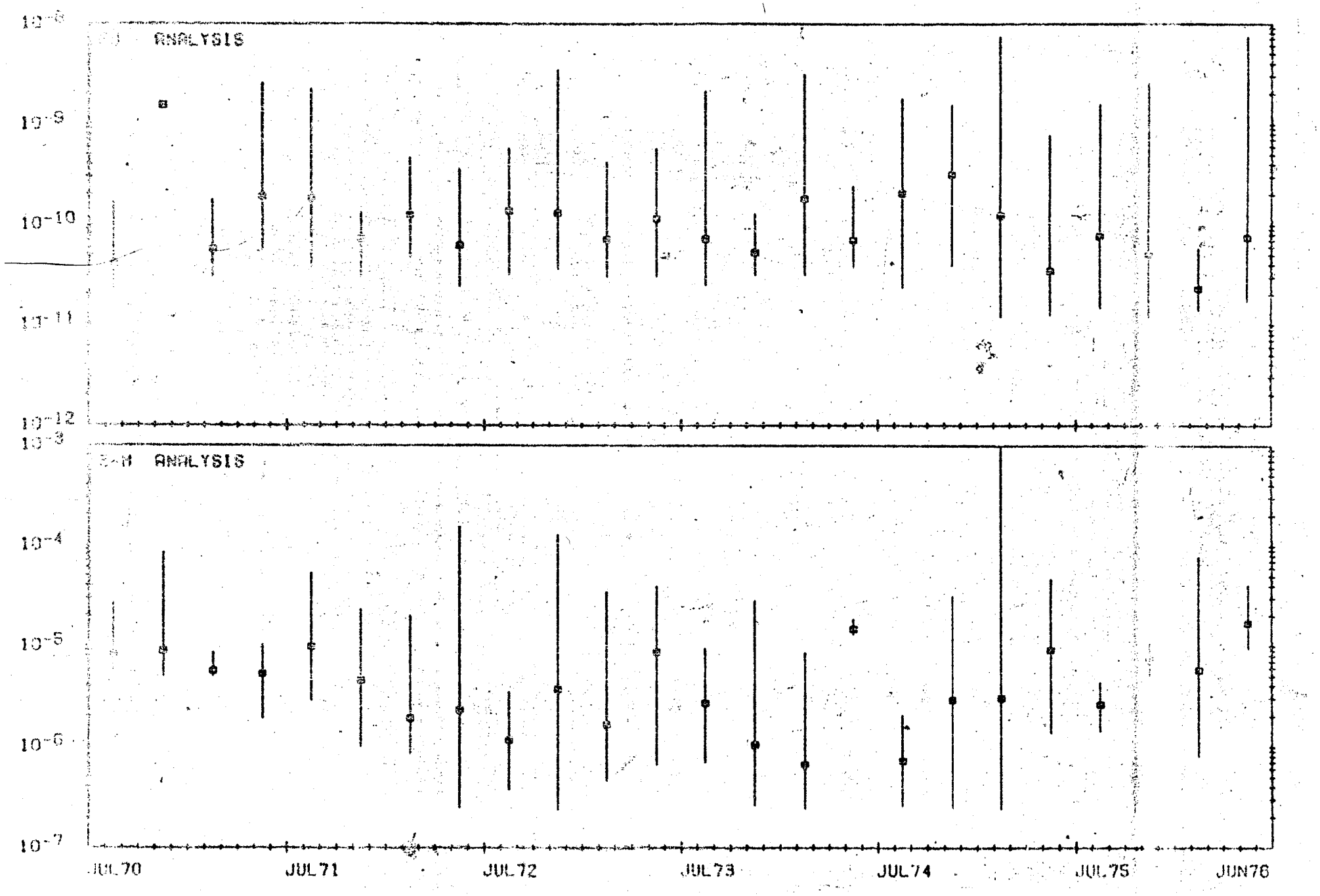
NTS ENVIRONMENTAL SURVEILLANCE
EFFLUENT PONDS SAMPLING LOCATIONS

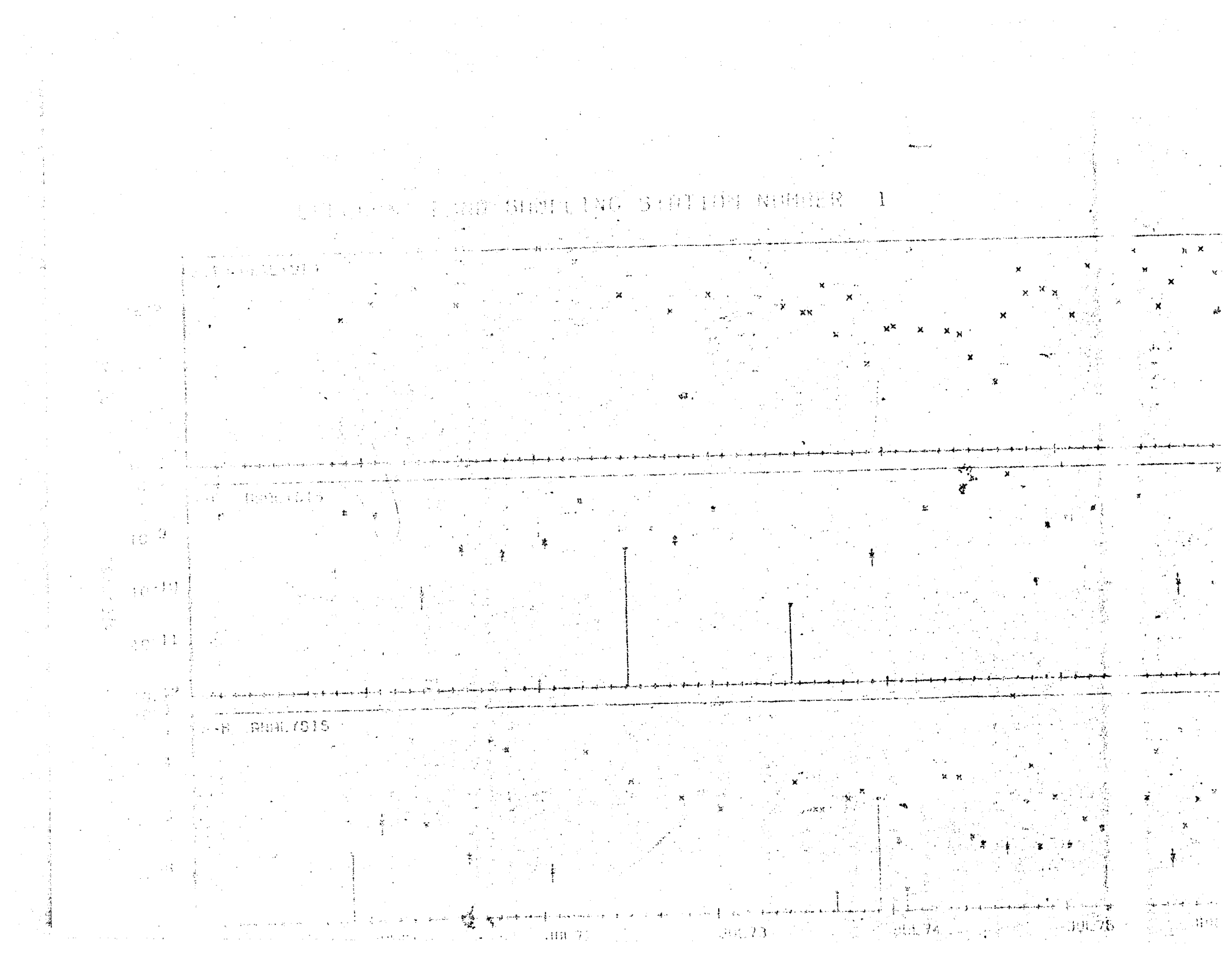
Number	Location	Map Code (Figure 8)
1	Area 6 Yucca Pond	6A
2	Area 6 CP-2 Waste	6B
3	Area 6 Final Effluent Pond	6C
4	Area 12 Final Effluent Pond	12A
5	Area 23 Final Effluent Pond	23A
6	Groom Lake Final Effluent Pond	00A

EFFLUENT POND NETWORK AVERAGES

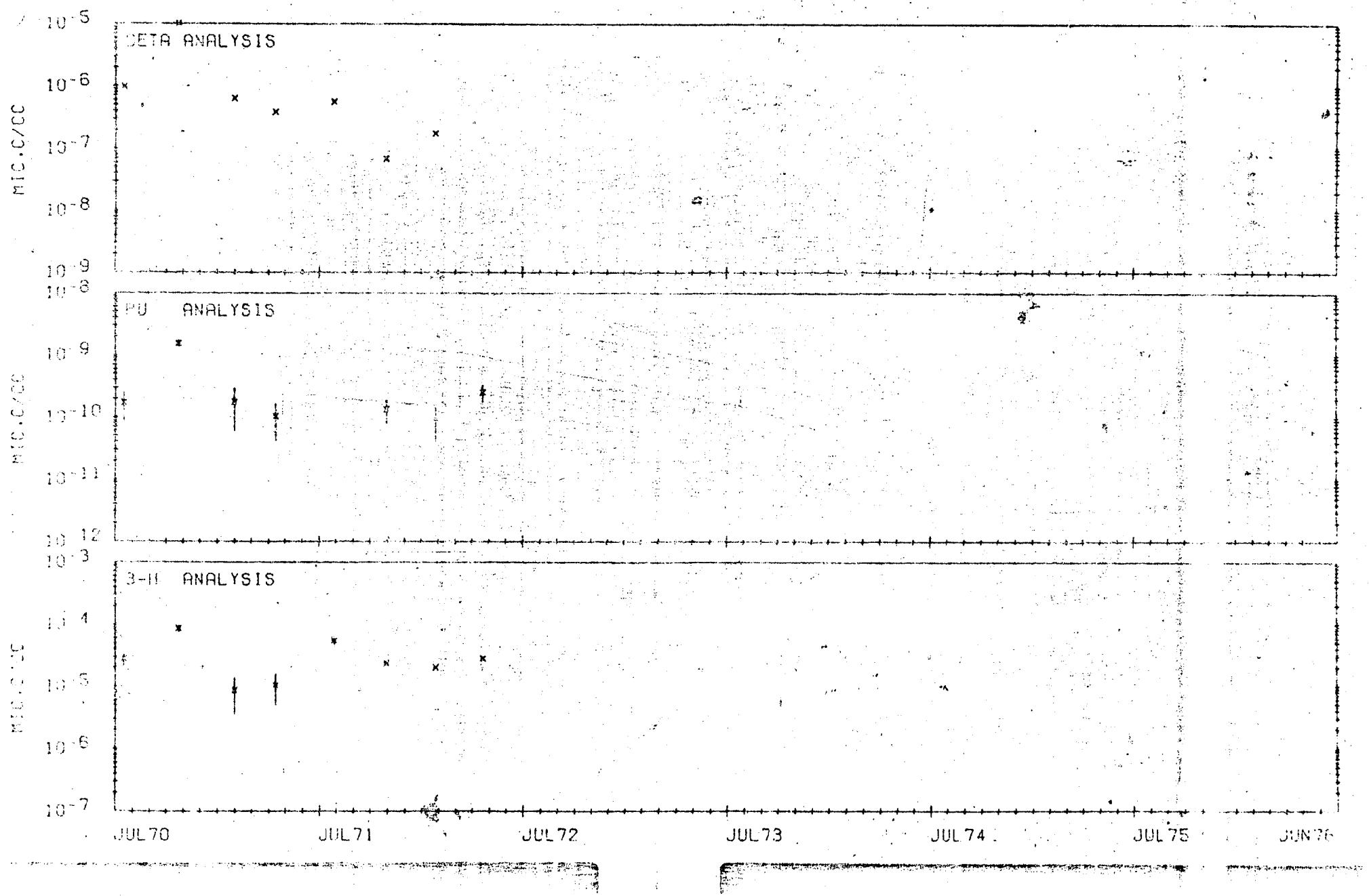


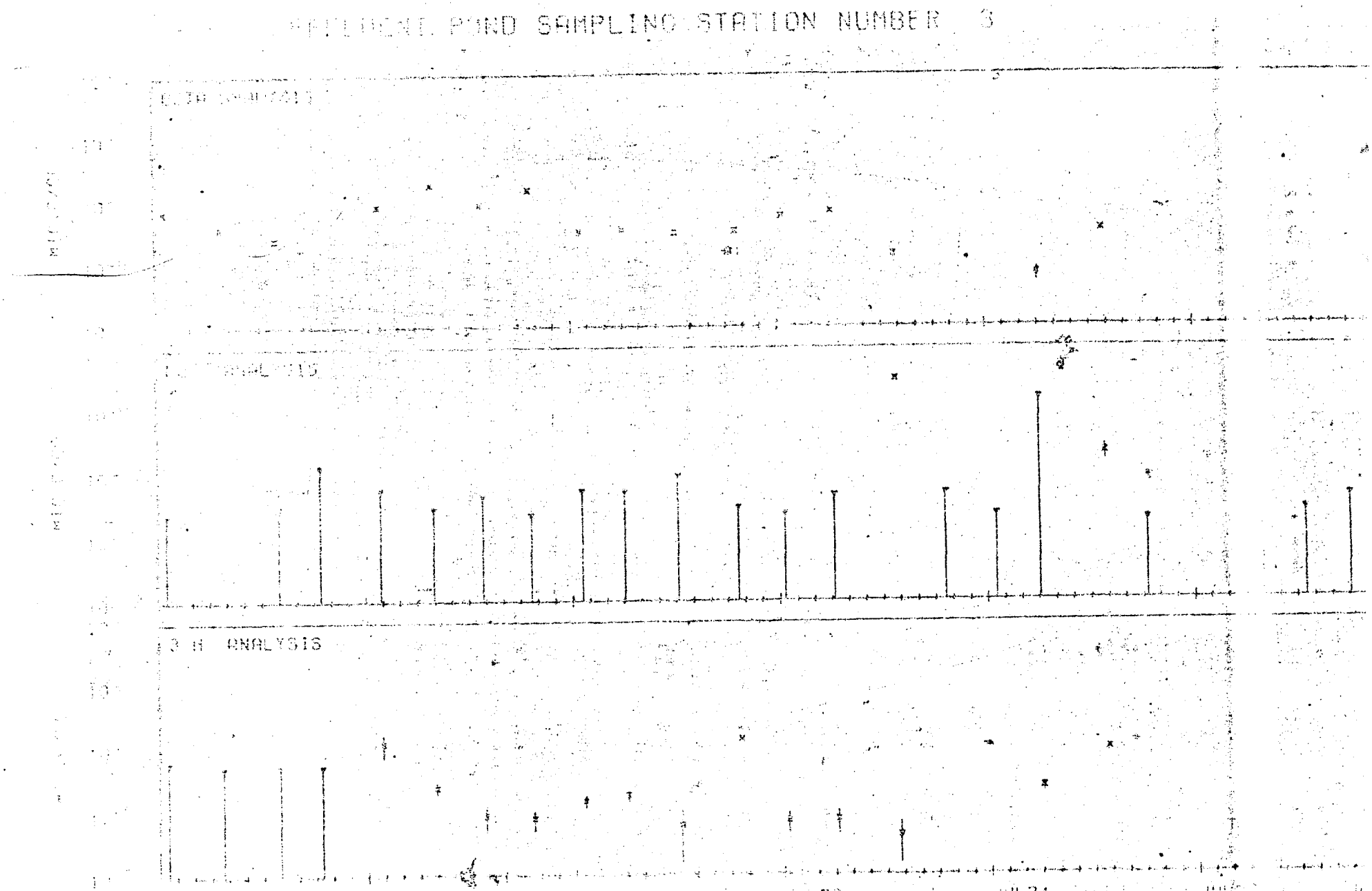
EFFLUENT POND NETWORK AVERAGES



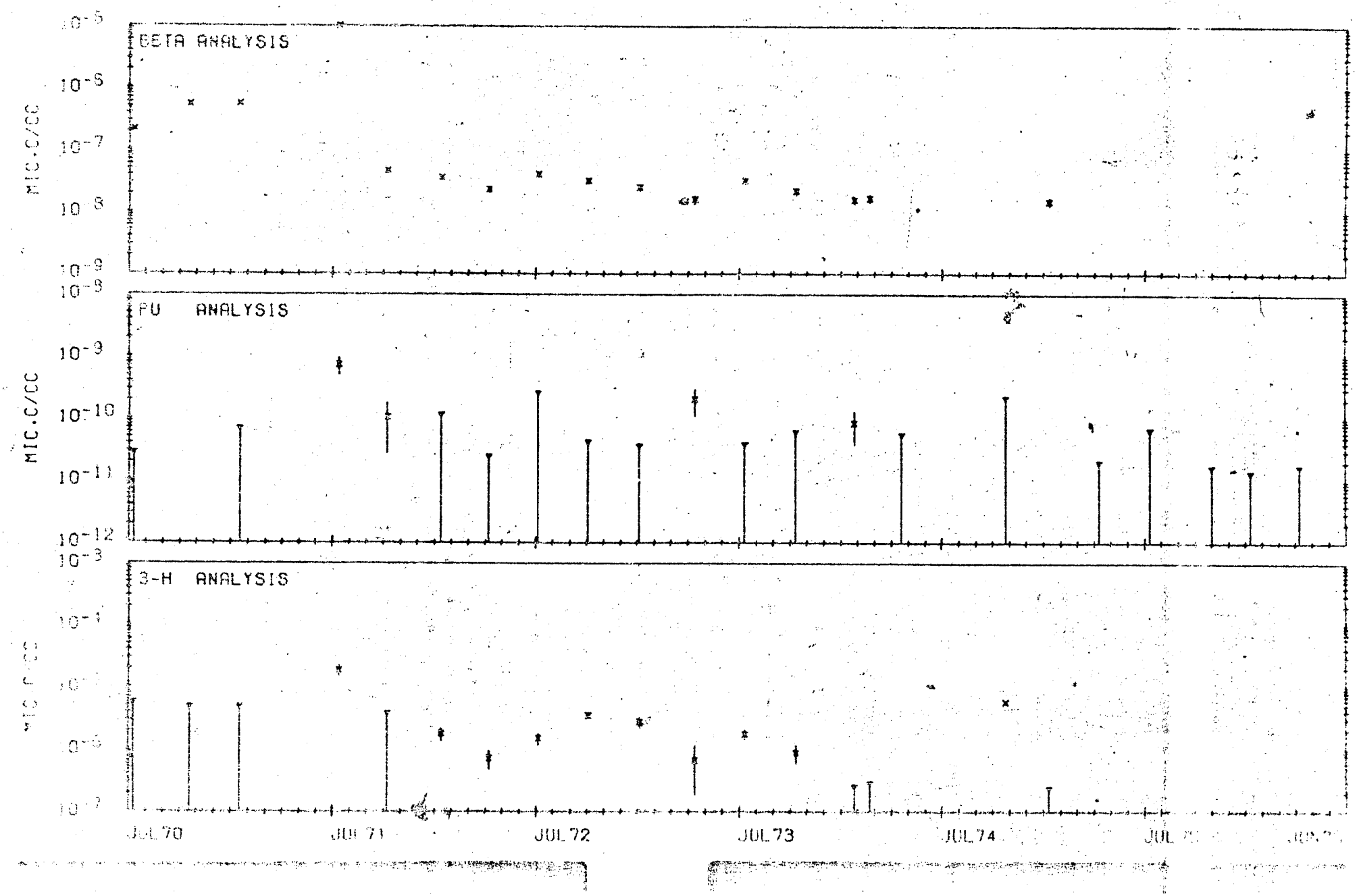


EFFLUENT POND SAMPLING STATION NUMBER 2

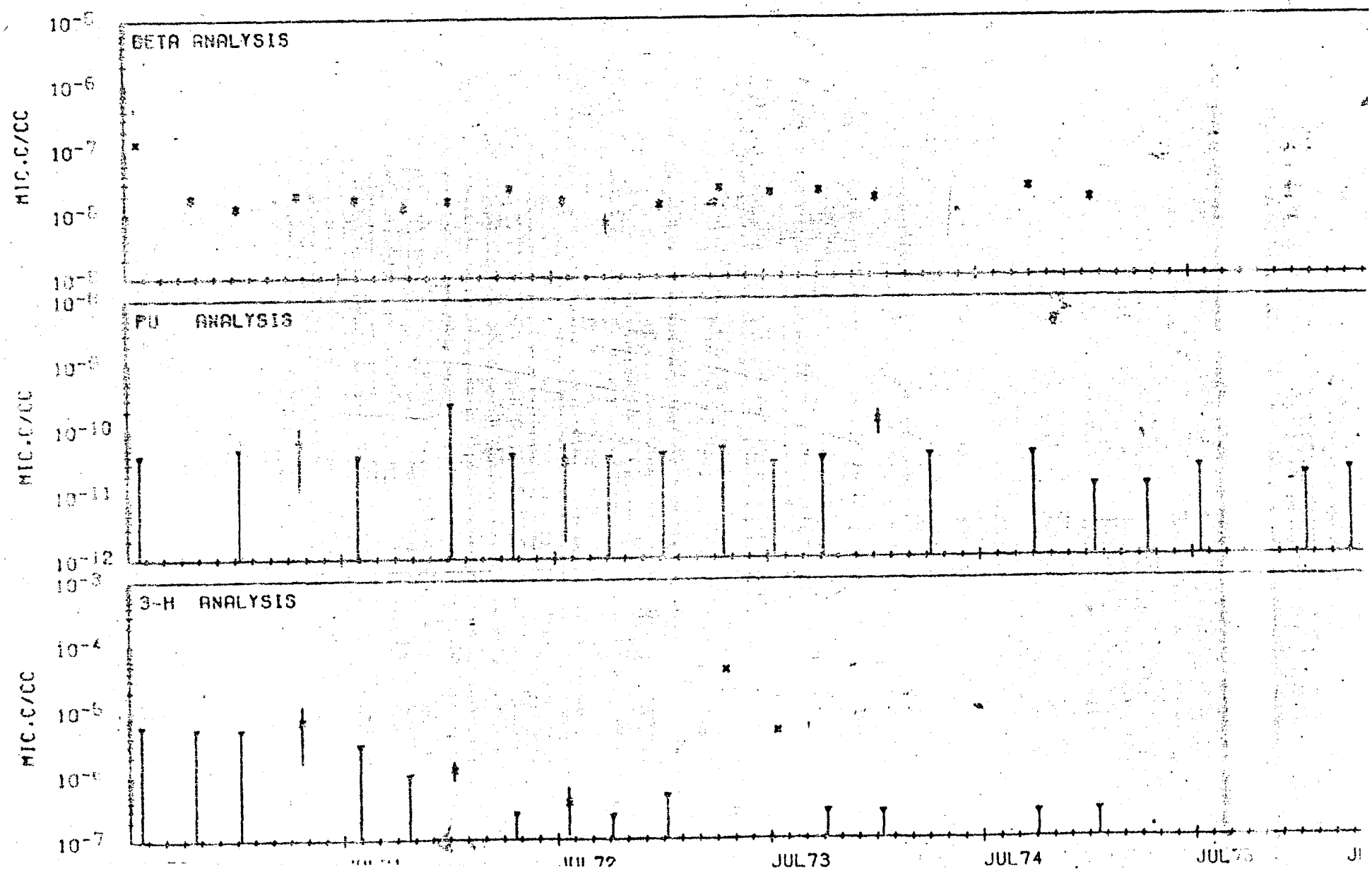


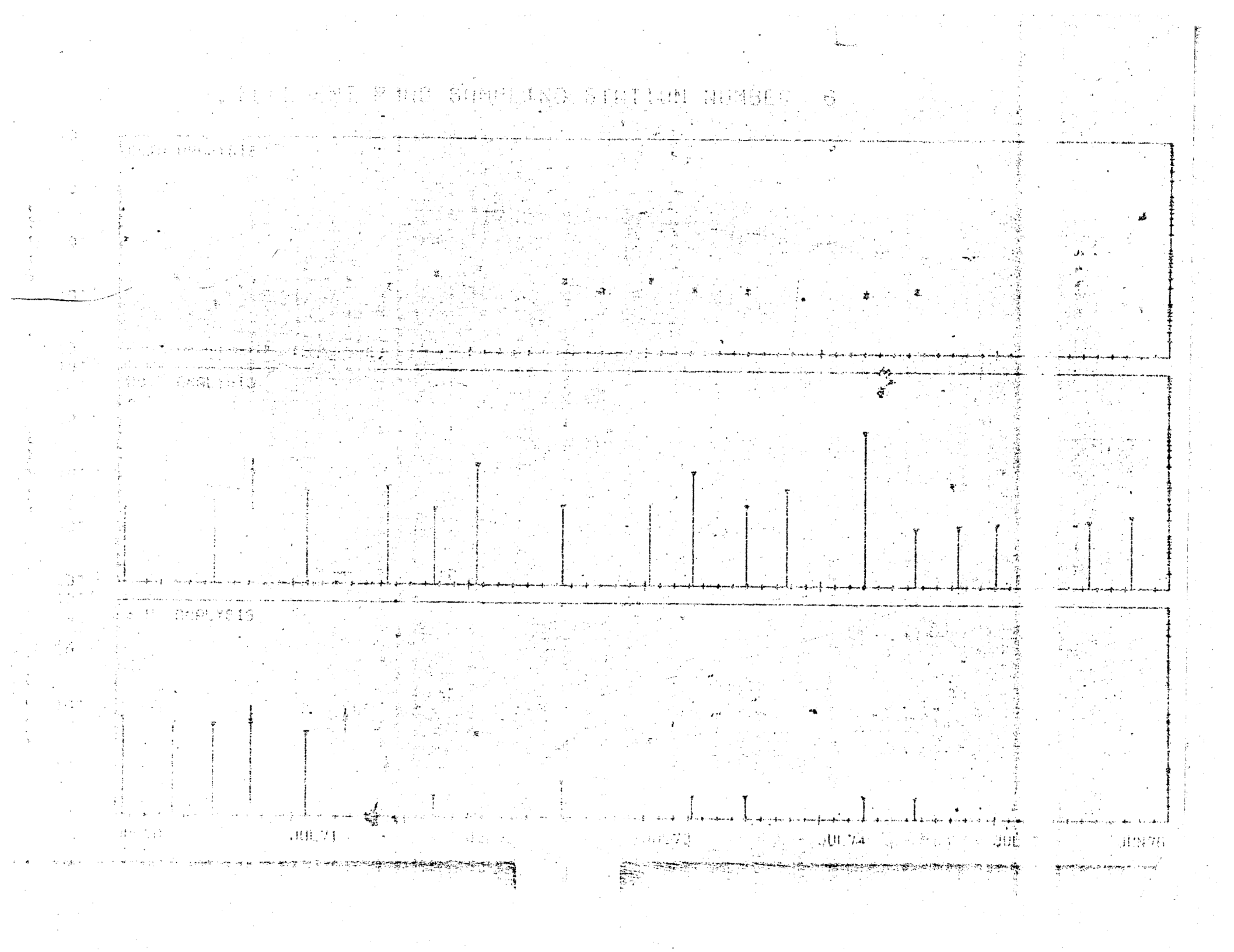

RETENTION POND SAMPLING STATION NUMBER 3
H-3 ANALYSIS
JUL74

EFFLUENT POND SAMPLING STATION NUMBER 4



EFFLUENT POND SAMPLING STATION NUMBER 5





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