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Y-12

Y/TS-600 PART 1

OAK RIDGE
Y-12
PLANT

MARTIN MARIETTA

RESULTS OF THE OUTDOOR RADIOLOGICAL AND CHEMICAL SURFACE SCOPING SURVEY OF THE Y-12 PLANT SITE

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FIELD SURVEY COMPLETED: MAY 1987
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BY
IARIETTA ENERGY SYSTEMS, INC.
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ENVIRONMENTAL MANAGEMENT DEPARTMENT
HEALTH, SAFETY, ENVIRONMENT
AND ACCOUNTABILITY DIVISION

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Date of Issue: November 1989 Y/TS-600 Part 1

Results of the Outdoor Radiological and Chemical Surface Scoping Survey of the Y-12 Plant Site

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Field Survey Completed: May 1987
Draft Report Submitted: November 1987

Prepared
for the
Environmental Management Department
Health, Safety, Environment
and Accountability Division

Oak Ridge Y-12 Plant
Oak Ridge, Tennessee 37831
operated by
MARTIN MARIETTA ENERGY SYSTEMS, INC.
for the
U. S. DEPARTMENT OF ENERGY
Under Contract No. DE-AC05-84OR21400

FOREWORD

The Oak Ridge Y-12 facility, located in Bear Creek Valley, Oak Ridge, Tennessee, was built for the U.S. Army Corps of Engineers in 1943 as part of the Manhattan Project. The initial task performed by the Y-12 Plant was the separation of ^{235}U from normal uranium by an electromagnetic process. Although changes have occurred over the years in the production and fabrication procedures carried out at the plant, uranium was, and is, a major process material at Y-12. As such, its presence is pervasive throughout the plant site. Furthermore, past lithium isotope production operations resulted in area source contamination by mercury and its deposit in regions of environmental concern through process discharges.

This is the first of three documents that address the results of a comprehensive survey conducted between September, 1985, and May, 1987, of the outdoor surface environment of Y-12 Plant site. The second document will contain all of the raw data and the third document will discuss the results, possible mitigation procedures, and recommendations on the scope and need for a second survey that focuses on sites showing the higher contamination levels.

L. L. McCauley
November 8, 1989

RESULTS OF THE OUTDOOR RADIOLOGICAL AND CHEMICAL SURFACE SCOPING SURVEY OF THE Y-12 PLANT SITE

At the request of Y-12 management, the Measurement Applications and Development Group of the Health and Safety Research Division (HASRD), Oak Ridge National Laboratory (ORNL), conducted a preliminary scoping survey of the outdoor surface environment of the Y-12 Plant site. The survey site includes the ~800 acres of which the plant is comprised, as well as adjacent areas where stack emissions are deposited. Its purpose was to establish trends in the surface environment over the entire site, locating and prioritizing areas of concern both from a worker health/safety and environmental standpoint. Specifically, the objectives of the survey were to assess the gamma status of the site and to analyze surface soil samples for the presence of selected radionuclides and mercury. The Y-12 master grid plan was used as the basis for measurement and sample location. The results of the survey were entered into a computerized relational database which permits a detailed scrutiny of the site according to specific queries.

Initially, the entire survey site was partitioned into 22 "priority areas" by Y-12 management (Figures 1, 2, and 3). Five of these areas were subsequently either expanded or divided to form additional priority areas labeled "A" (2A, 3A, 6A, 7A, and 8A). The order of priority was based on tentative construction schedules with initial activity expected in Priority Area 1. Projected plans suggested that work would next proceed in other regions of the exclusion area before beginning elsewhere within the plant boundaries, followed lastly by construction around the plant perimeter. The areas were designed to encompass logical units and provide practicable grid sizing. Barring unusual circumstances, such as a request from Y-12 management to reorder priorities, the areas were surveyed in order from 1 to 22. The entire area to be surveyed was further divided into grid blocks according to the Y-12 master grid plan. Those areas suspected of having extensive contamination, or those areas having closely spaced buildings, were divided into 100- by 100-ft grid blocks. Those regions where little contamination was expected, or where spaces were less confined, were divided into 200- x 200-ft blocks.

The scoping survey included the following measurements which were obtained throughout the site: (1) gamma exposure rates at ground surface at grid point locations; (2) gamma scan ranges for individual grid blocks; and (3) collection of systematic and biased surface soil samples. Systematic and biased soil samples, 0 to 5 cm (0-2 in.) deep and ~10 cm (4 in.) in diameter, were collected from areas of accessible soil surface throughout the site. Systematic samples are those selected from systematically designated locations without respect to gamma exposure rates and were collected from every grid block in which there was available soil An effort was made to collect the sample from a location as close as possible to the center of the block (numerous obstructions were encountered on the site). Samples taken from a gravel surface included as much soil as could be obtained along with the gravel. Sediments were collected from concrete or asphalt surfaces where attainable and were labelled as biased sediment samples. Note: A single sample taken in a 100- x 100-ft (10,000 ft^2) or larger block is insufficient to determine the degree of contamination; however, soil sample results for several blocks, or groups of blocks, can be used as the basis for indicating trends.

Biased samples were taken in all grid blocks where anomalies were observed and were collected at the point of maximum gamma exposure rate. Where it was apparent that the anomaly was associated with uranium metal, the sample was alternatively taken from the location of the next highest exposure rate. The biased samples were used to identify the contaminating radionuclide(s) responsible for the anomaly. Approximately 1,400 soil samples were analyzed to determine the concentrations (dry wt) of ^{137}Cs, ^{40}K, ^{226}Ra, ^{232}Th, and all samples (~1,890) were analyzed for ^{238}U and mercury. A limited number of samples were analyzed for ^{233}U, ^{234}U, ^{235}U, and ^{236}U to identify possible contamination by enriched uranium.

Tables 1 through 8 have been generated to help quantify the number of systematic (S) and biased (B) soil samples taken in each priority area based on parameter concentration. The concentration ranges incorporate the mercury and radionuclide acceptance limits that have been established for the Y-12 Centralized Sanitary Landfill. If materials do not exceed 12 parts per million (ppm) mercury and a radionuclide sum of 32 picocuries per gram (pCi/g), disposal restrictions are not applicable. Data Plots 1 through 6 reflect systematic and biased soil sample locations based on parameter concentrations which exceed the 12 ppm and 32 pCi/g limits. Each parameter and its associated table and/or data plot is shown below.

Parameter	Table #	Data Plot #
Mercury	1	1
^{238}U	2	2,3
^{235}U	3	4
^{137}Cs	4	5
^{232}Th	5	6
^{226}Ra	6	--
^{40}K	7	--
*Nuclide Sum	8	--

*Nuclide Sum is the summation of a sample's individual ^{238}U, ^{235}U, ^{137}Cs, ^{232}Th, and ^{225}Ra values that are less than 32 pCi/g.

The data and commentary presented is intended as a general overview of the project, pursuant to a more detailed and complete account of the survey forthcoming in subsequent documents.

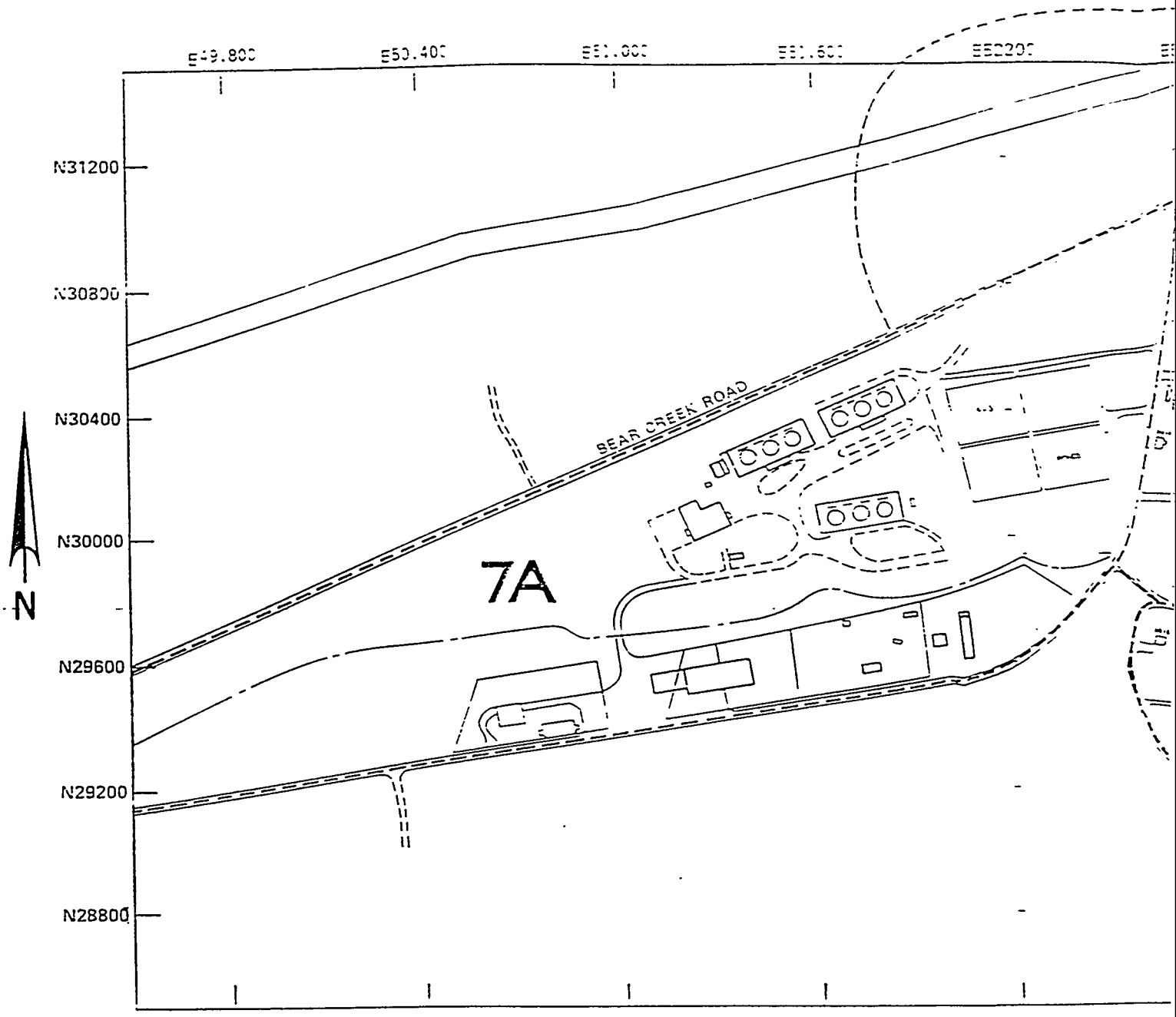
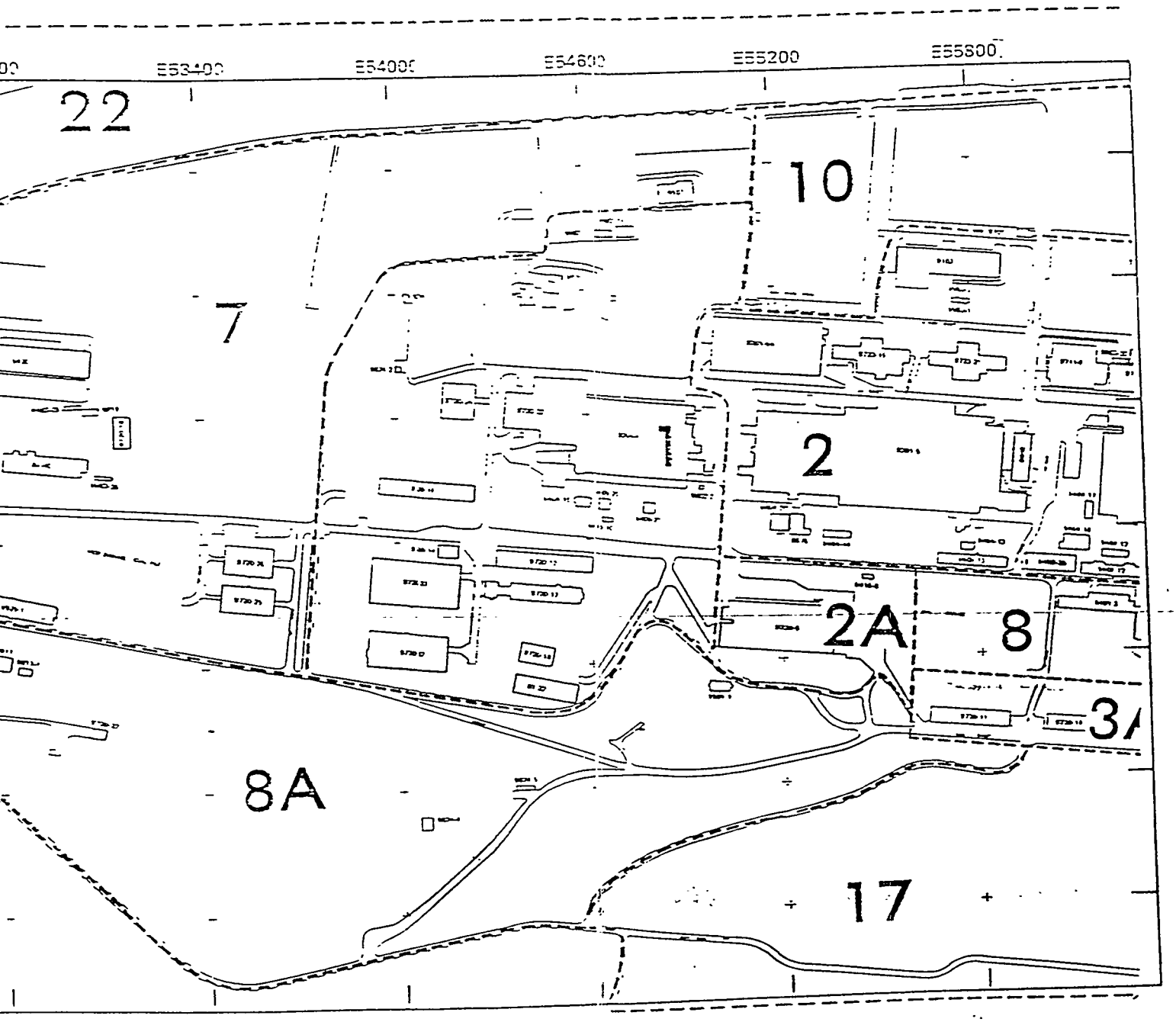


Fig. 1. Diagram of the western portion



the Y-12 Plant site with designated Priority Areas.

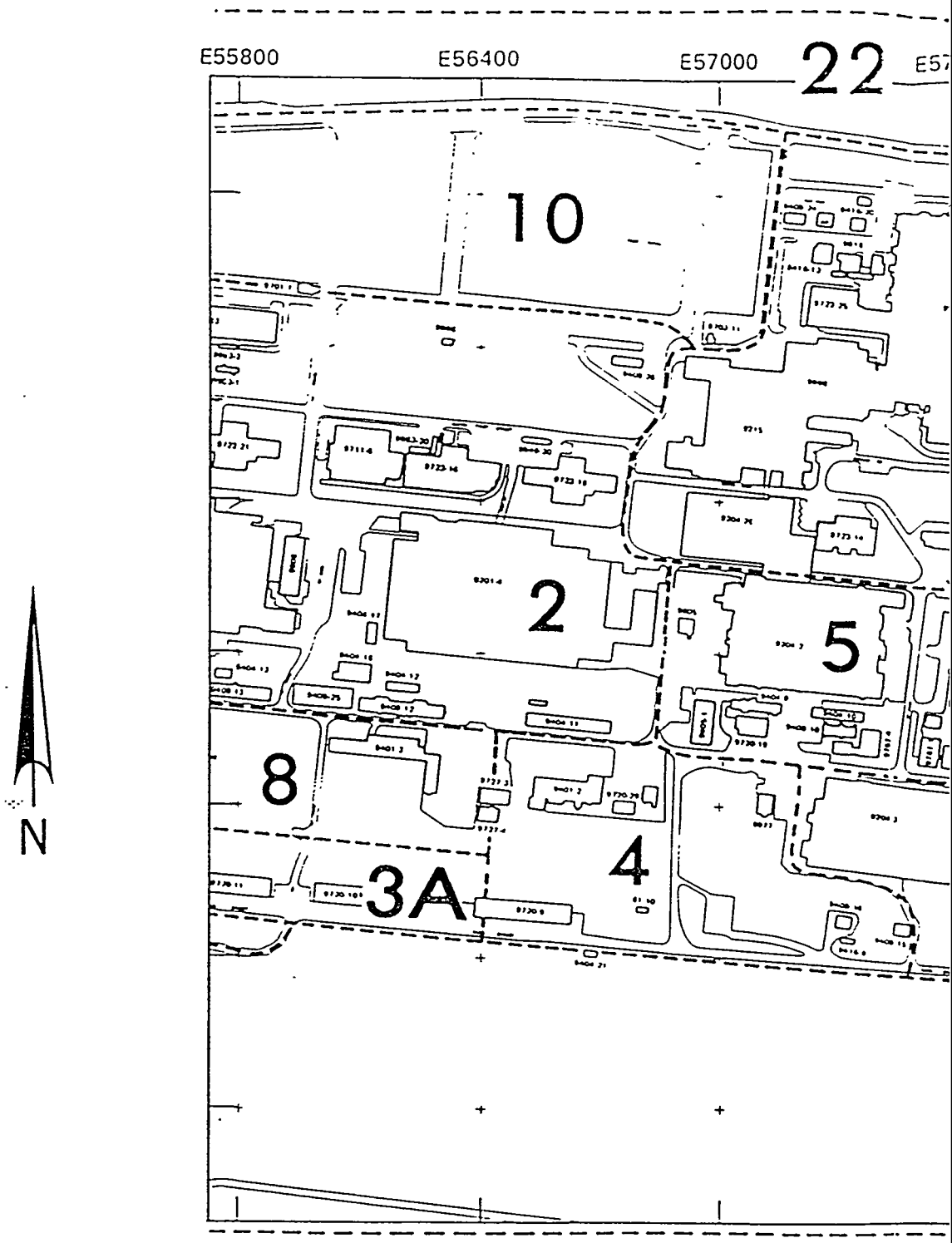
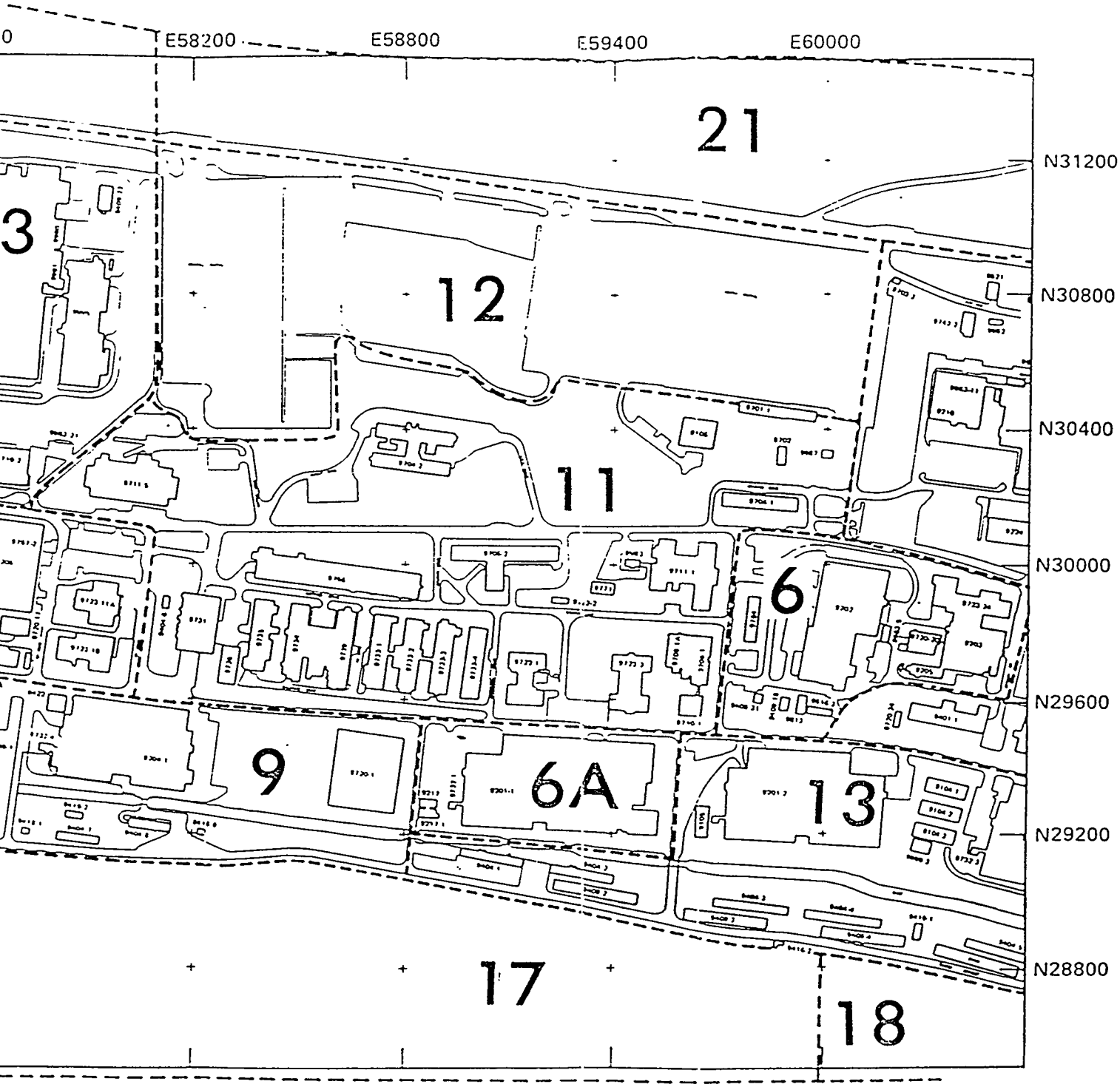


Fig. 2. Diagram of the



entral portion of the Y-12 Plant site with designated Priority Areas.

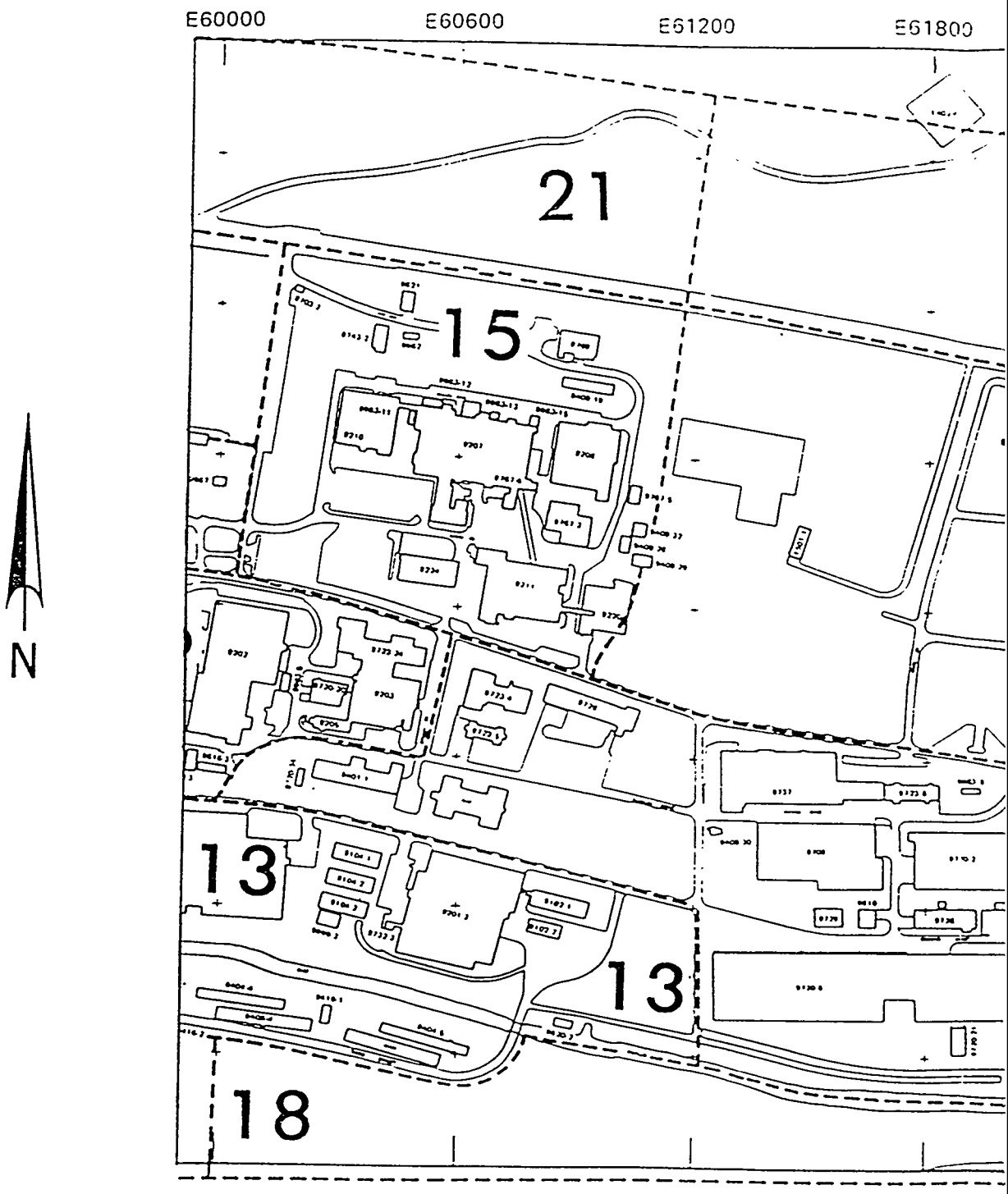
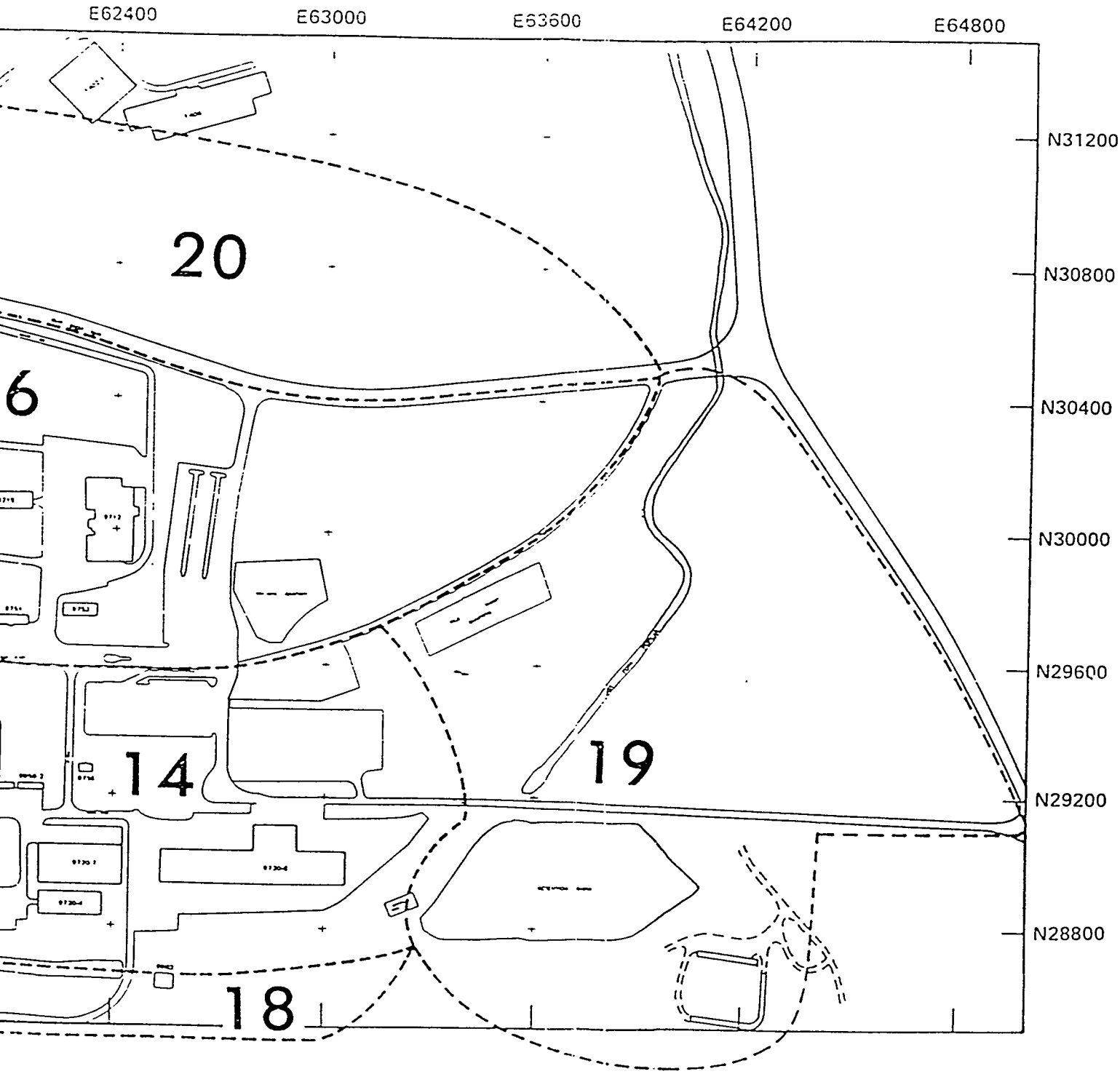


Fig. 3. Diagram of the eastern po



on of the Y-12 Plant site with designated Priority Areas.

STYPE=SYSTEMATIC

MERCURY(-PPM)	TOT-AL	PRIORITY AREA																											
		0	AREA 7A	AREA 7	AREA 22	AREA 1	AREA 8A	AREA 10	AREA 2	AREA 2A	AREA 8	AREA 3A	AREA 4	AREA 3	AREA 5	AREA 12	AREA 11	AREA 9	AREA 6A	AREA 15	AREA 6	AREA 13	AREA 16	AREA 14	AREA 17	AREA 18	AREA 19	AREA 20
	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.
HERCTYPE																													
NOT ANALYZED	1	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12 PPM OR BLW	1471	48	104	134	29	147	104	13	154	14	4	29	25	88	37	27	40	46	21	30	57	30	63	52	55	38	67	7
12-75 PPM	59	1	3	21	.	11	2	.	6	.	.	1	3	1	.	.	.	1	1	.	.	.	.	4	.	.	4	.
75-150 PPM	10	1	1	2	.	1	.	.	3	.	.	.	.	.	.	.	.	1	.	.	.	.	.	1	.	.	.	.
150-500 PPM	7	.	2	.	.	1	.	.	1	.	.	.	1	.	.	.	.	1	.	.	.	.	.	.	.	.	1	.
500 PPM	2	.	.	1	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

STYPE=BIASED

MERCURY(-PPM)	TOT-AL	PRIORITY AREA																			
		0	AREA 7A	AREA 7	AREA 1	AREA 8A	AREA 2	AREA 3A	AREA 4	AREA 3	AREA 5	AREA 12	AREA 11	AREA 9	AREA 15	AREA 6	AREA 13	AREA 16	AREA 14	AREA 19
	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.
HERCTYPE																				
NOT ANALYZED	8	.	8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
12 PPM OR BLW	252	2	23	27	90	2	22	6	3	35	7	2	2	2	2	6	4	4	6	7
12-75 PPM	68	2	5	23	14	.	11	.	1	.	2	.	2	.	.	1	.	1	1	5
75-150 PPM	11	.	2	2	1	.	1	1	.	.	.	.	.	1	.	.	1	.	1	1
150-500 PPM	10	2	1	.	1	1	2	.	.	.	.	.	.	.	.	.	.	.	2	1
>500 PPM	2	.	.	.	1	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.

MERCURY

TABLE 1

STYPE=SYSTEMATIC

U238 (PCI/G)	TOTAL	PRIORITY AREA																										
		0	AREA 7A	AREA 7	AREA 22	AREA 1	AREA 8A	AREA 10	AREA 2	AREA 2A	AREA 8	AREA 3A	AREA 4	AREA 3	AREA 5	AREA 12	AREA 11	AREA 9	AREA 6A	AREA 15	AREA 6	AREA 13	AREA 16	AREA 14	AREA 17	AREA 18	AREA 19	AREA 20
	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.
URANIUM 238																												
BELOW DETECTION	82	7	25	6	.	4	2	.	22	.	.	1	1	.	2	1	.	4	.	.	.	2	2	1	.	1	1	.
<32	1352	37	72	137	29	117	104	13	134	14	4	28	28	74	31	26	39	43	22	30	54	36	60	53	55	37	69	6
32-75	42	3	10	8	.	15	.	.	6	.	.	1	.	8	4	.	.	2	.	.	2	.	1	1	.	.	1	.
75-150	22	2	3	4	.	5	.	.	2	.	.	.	.	2	.	.	1	.	.	.	1	.	.	1	.	.	.	1
150-500	23	1	.	2	.	16	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	1	.	.	1	.
>500	9	.	.	1	.	5	.	.	.	.	.	.	.	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.

STYPE=BIASED

U238 (PCI/G)	TOTAL	PRIORITY AREA																				
		0	AREA 7A	AREA 7	AREA 1	AREA 8A	AREA 2	AREA 3A	AREA 4	AREA 3	AREA 5	AREA 12	AREA 11	AREA 9	AREA 15	AREA 6	AREA 13	AREA 16	AREA 14	AREA 19
	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.
URANIUM 238																				
NOT ANALYZED	8	.	8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
BELOW DETECTION	3	.	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<32	97	1	12	13	34	.	9	1	2	5	2	.	1	1	.	.	2	3	2	9
32-75	27	2	.	7	3	1	.	.	.	9	1	.	.	.	.	.	.	.	1	3
75-150	26	1	1	8	4	.	6	.	.	3	1	.	.	.	.	1	.	.	.	1
150-500	49	.	5	8	12	.	4	.	.	9	2	.	2	2	.	1	1	1	1	1
>500	141	2	10	16	54	2	17	6	2	9	3	2	1	1	2	5	2	1	6	.

URANIUM 238

TABLE 2

STYPE=SYSTEMATIC

U235 (PCI/G)	TOT-AL	PRIORITY AREA 0	AREA 7A	AREA 7	AREA 22	AREA 1	AREA 8A	AREA 10	AREA 2	AREA 2A	AREA 8	AREA 3A	AREA 4	AREA 3	AREA 5	AREA 12	AREA 11	AREA 9	AREA 6A	AREA 15	AREA 6	AREA 13	AREA 16	AREA 14	AREA 17	AREA 18	AREA 19	AREA 20
	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.
URANIUM 235																												
NOT ANALYZED	105	15	40	.	.	22	1	.	1	2	.	.	.	14	1	.	.	.	.	.	.	.	.	.	1	.	.	.
<32	1437	35	62	158	29	139	105	13	163	12	4	30	29	68	36	27	40	49	22	30	57	38	63	57	54	38	72	7
32-75	5	.	.	.	.	1	.	.	.	.	.	.	.	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.
75-150	2	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.
150-500	1	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.

STYPE=BIASED

U235 (PCI/G)	TOT-AL	PRIORITY AREA 0	AREA 7A	AREA 7	AREA 1	AREA 8A	AREA 2	AREA 3A	AREA 4	AREA 3	AREA 5	AREA 12	AREA 11	AREA 9	AREA 15	AREA 6	AREA 13	AREA 16	AREA 14	AREA 19
	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.
URANIUM 235																				
NOT ANALYZED	68	.	15	17	31	.	.	.	.	3	.	.	.	.	.	1	.	.	.	1
<32	196	5	20	20	53	1	26	5	2	15	4	1	3	3	.	4	3	4	6	13
32-75	22	.	2	4	5	1	3	.	1	.	1	1	.	.	1	1	1	.	1	.
75-150	29	.	2	2	12	.	2	1	1	4	2	.	.	.	1	1	.	.	1	.
150-500	29	1	.	.	6	1	3	1	.	10	2	.	1	1	.	.	1	1	1	.
>500	7	.	.	1	.	.	2	.	.	3	.	.	.	.	.	.	.	.	1	.

URANIUM 235

TABLE 3

STYPE=SYSTEMATIC

CS137 (PCI/G)	TOTAL	PRIORITY AREA																										
		0	AREA 7A	AREA 7	AREA 22	AREA 1	AREA 8A	AREA 10	AREA 2	AREA 2A	AREA 8	AREA 3A	AREA 4	AREA 3	AREA 5	AREA 12	AREA 11	AREA 9	AREA 6A	AREA 15	AREA 6	AREA 13	AREA 16	AREA 14	AREA 17	AREA 18	AREA 19	AREA 20
	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.
CESIUM 137																												
NOT ANALYZED	518	22	92	27	6	38	48	.	38	3	3	9	9	7	5	7	7	26	.	4	4	24	14	20	43	19	39	4
BELOW DETECTION	562	12	9	88	13	86	34	7	88	8	1	9	17	44	17	13	7	11	5	7	30	5	11	13	1	1	22	1
32	466	14	9	41	10	37	24	6	38	3	.	12	3	35	15	7	26	12	17	19	23	9	30	24	11	10	11	.
32-75	1	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
75-150	1	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
150-500	2	.	.	1	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.

STYPE=BIASED

CS137 (PCI/G)	TOTAL	PRIORITY AREA																				
		0	AREA 7A	AREA 7	AREA 1	AREA 8A	AREA 2	AREA 3A	AREA 4	AREA 3	AREA 5	AREA 12	AREA 11	AREA 9	AREA 15	AREA 6	AREA 13	AREA 16	AREA 14	AREA 19
	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.
CESIUM 137																				
NOT ANALYZED	82	1	22	3	18	.	8	.	.	4	1	2	3	3	2	.	5	2	4	4
BELOW DETECTION	127	2	3	10	66	2	14	6	2	12	5	.	.	.	.	3	.	.	2	.
<32	117	3	14	24	19	1	13	1	1	19	3	.	1	1	.	4	.	3	3	7
32-75	8	.	.	5	1	.	1	.	.	.	.	.	.	.	.	.	.	.	1	.
75-150	4	.	.	3	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
150-500	6	.	.	3	2	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.
>500	7	.	.	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3

CESIUM 137

TABLE 4

STYPE=SYSTEMATIC

TH232 (PCI/G)	TOT-AL	PRIORITY AREA																											
		0	AREA 7A	AREA 7	AREA 22	AREA 1	AREA 8A	AREA 10	AREA 2	AREA 2A	AREA 8	AREA 3A	AREA 4	AREA 3	AREA 5	AREA 12	AREA 11	AREA 9	AREA 6A	AREA 15	AREA 6	AREA 13	AREA 16	AREA 14	AREA 17	AREA 18	AREA 19	ARLA 20
	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.
THORIUM 232																													
NOT ANALYZED	463	22	92	27	6	25	48	.	5	2	3	8	9	7	5	7	7	26	.	4	4	24	14	20	42	1	39	.
BELOW DETECTION	[illegible]	1	6	54	1	56	3	.	51	7	1	7	10	12	8	3	2	6	6	.	2	4	3	12	.	.	.	.
<32	831	27	12	77	22	81	55	13	108	5	.	15	10	70	24	17	31	17	16	26	51	10	46	25	13	2	32	3
32-75	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.

STYPE=BIASED

TH232 (PCI/G)	TOT-AL	PRIORITY AREA																			
		0	AREA 7A	AREA 7	AREA 1	AREA 8A	AREA 2	AREA 3A	AREA 4	AREA 3	AREA 5	AREA 12	AREA 11	AREA 9	AREA 15	AREA 6	AREA 13	AREA 16	AREA 14	AREA 19
	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.
THORIUM 232																					
NOT ANALYZED	80	1	22	3	17	.	8	.	.	4	1	2	3	3	2	.	5	.	3	6
BELOW DETECTION	87	2	2	7	51	.	2	4	3	11	.	.	.	.	.	2	.	.	2	1
<32	152	3	13	33	36	3	15	3	1	20	5	.	1	1	.	4	.	4	4	6
32-75	12	.	1	2	2	.	3	.	.	.	.	.	.	.	.	1	.	1	1	1
75-150	5	.	.	3	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.
150-500	6	.	.	1	1	.	2	.	.	.	2	.	.	.	.	.	.	.	.	.
>500	9	.	1	3	.	.	4	.	.	.	1	.	.	.	.	.	.	.	.	.

THORIUM 232

TABLE 5

STYPE=SYSTEMATIC

RA226 (PCI/G)	TOTAL	PRIORITY AREA																									
		0	AREA 7A	AREA 7	AREA 22	AREA 1	AREA 8A	AREA 10	AREA 2	AREA 2A	AREA 8	AREA 3A	AREA 4	AREA 3	AREA 5	AREA 12	AREA 11	AREA 9	AREA 6A	AREA 15	AREA 6	AREA 13	AREA 16	AREA 14	AREA 17	AREA 18	AREA 19	AREA 20
	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.
RADIUM 226																												
NOT ANALYZED	459	22	92	27	6	23	48	.	3	2	3	8	9	7	5	7	7	26	.	4	4	24	14	20	42	13	39	4
BELOW DETCTION	263	1	6	58	1	60	1	.	63	4	.	7	10	13	11	1	1	3	3	.	1	3	4	12	.	.	.	.
<32	825	27	12	72	22	79	57	13	98	8	1	15	10	69	21	18	32	20	19	26	52	11	45	25	12	25	33	3
75-150	2	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.
150-500	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.

STYPE=BIASED

RA226 (PCI/G)	TOTAL	PRIORITY AREA																			
		0	AREA 7A	AREA 7	AREA 1	AREA 8A	AREA 2	AREA 3A	AREA 4	AREA 3	AREA 5	AREA 12	AREA 11	AREA 9	AREA 15	AREA 6	AREA 13	AREA 16	AREA 14	AREA 19
	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.
RADIUM 226																					
NOT ANALYZED	82	1	22	3	19	.	8	.	.	4	1	2	3	3	2	.	5	.	3	6
BELOW DETCTION	89	2	1	5	49	1	9	4	3	7	2	.	.	.	.	1	.	1	4	.
<32	178	3	16	43	39	1	19	3	1	24	6	.	1	1	.	6	.	4	3	8
32-75	1	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
75-150	1	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.

RADIUM 226

TABLE 6

STYPE=SYSTEMATIC

K40 (PCI/G)	TOTAL	PRIORITY AREA																											
		0	AREA 7A	AREA 7	AREA 22	AREA 1	AREA 8A	AREA 10	AREA 2	AREA 2A	AREA 8	AREA 3A	AREA 4	AREA 3	AREA 5	AREA 12	AREA 11	AREA 9	AREA 6A	AREA 15	AREA 6	AREA 13	AREA 16	AREA 14	AREA 17	AREA 18	AREA 19	AREA 20
	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.
POTASSIUM 40																													
NOT ANALYSED	714	23	98	81	7	79	51	.	54	9	4	15	19	19	13	10	9	32	6	4	6	28	17	32	42	13	39	4
<32	831	27	12	77	22	82	55	13	109	5	.	15	10	70	23	17	30	17	16	26	51	10	46	24	13	25	33	3
32-75	4	.	.	.	.	1	.	.	1	.	.	.	.	.	1	.	.	.	.	.	.	.	.	1	.	.	.	.
>500	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.

STYPE=BIASED

K40 (PCI/G)	TOTAL	PRIORITY AREA																				
		0	AREA 7A	AREA 7	AREA 1	AREA 8A	AREA 2	AREA 3A	AREA 4	AREA 3	AREA 5	AREA 12	AREA 11	AREA 9	AREA 15	AREA 6	AREA 13	AREA 16	AREA 14	AREA 19
	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.
POTASSIUM 40																						
NOT ANALYSED	166	3	24	10	69	.	10	4	3	15	1	2	3	3	2	2	5	.	5	5
<32	104	3	15	42	37	3	26	3	1	20	8	.	1	1	.	5	.	5	5	9
32-75	1	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

POTASSIUM 40

TABLE 7

NUCLIDE SUM BY PRIORITY AREA

STYPE=SYSTEMATIC

NUCL. SUM	TOTAL	PRIORITY AREA																											
		0	AREA 7A	AREA 7	AREA 22	AREA 1	AREA 8A	AREA 10	AREA 2	AREA 2A	AREA 8	AREA 3A	AREA 4	AREA 3	AREA 5	AREA 12	AREA 11	AREA 9	AREA 6A	AREA 15	AREA 6	AREA 13	AREA 16	AREA 14	AREA 17	AREA 18	AREA 19	AREA 20
	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.
NUCL. SUM NO VALUES	7	7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<32	1416	47	97	139	29	118	106	13	154	14	4	28	29	68	31	26	38	48	22	30	53	38	62	54	54	38	70	6
32-75	16	.	.	2	.	4	.	.	2	.	.	1	.	3	2	.	1	.	.	.	1	.	.	.	.	.	.	.

NUCLIDE SUM BY PRIORITY AREA

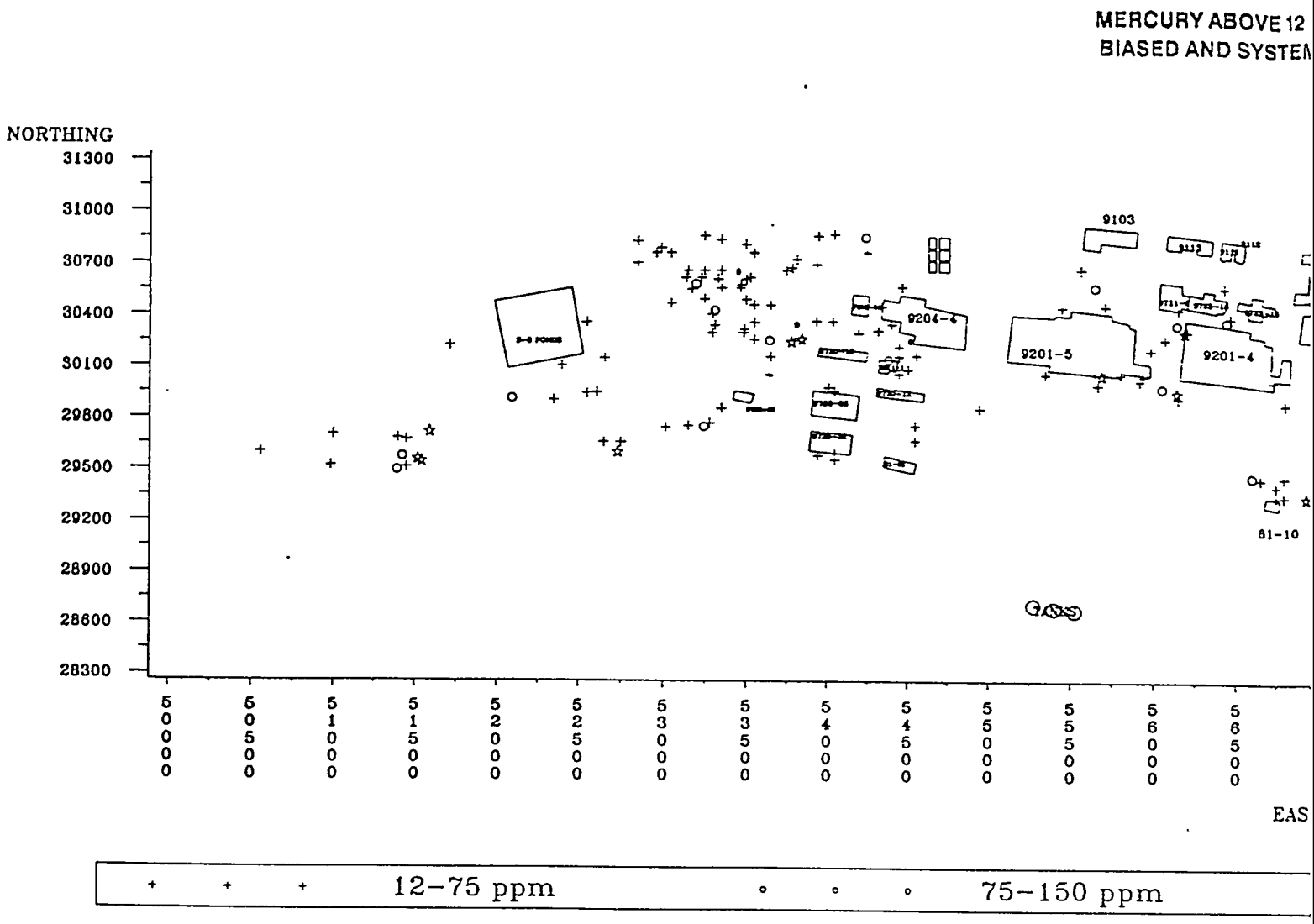
STYPE=BIASED

NUCL. SUM	TOT-AL	PRIORITY AREA														
		0	AREA 7A	AREA 7	AREA 1	AREA 2	AREA 3A	AREA 4	AREA 3	AREA 11	AREA 9	AREA 13	AREA 16	AREA 14	AREA 19
	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.	NO.
NUCL. SUM NO VALUES	8	.	8	.	.	.	.	.	.	.	.	.	.	.	.
<32	68	4	12	5	27	5	1	.	2	1	1	2	2	1	5
32-75	8	.	1	1	2	.	.	1	3	.	.	.	.	.	.

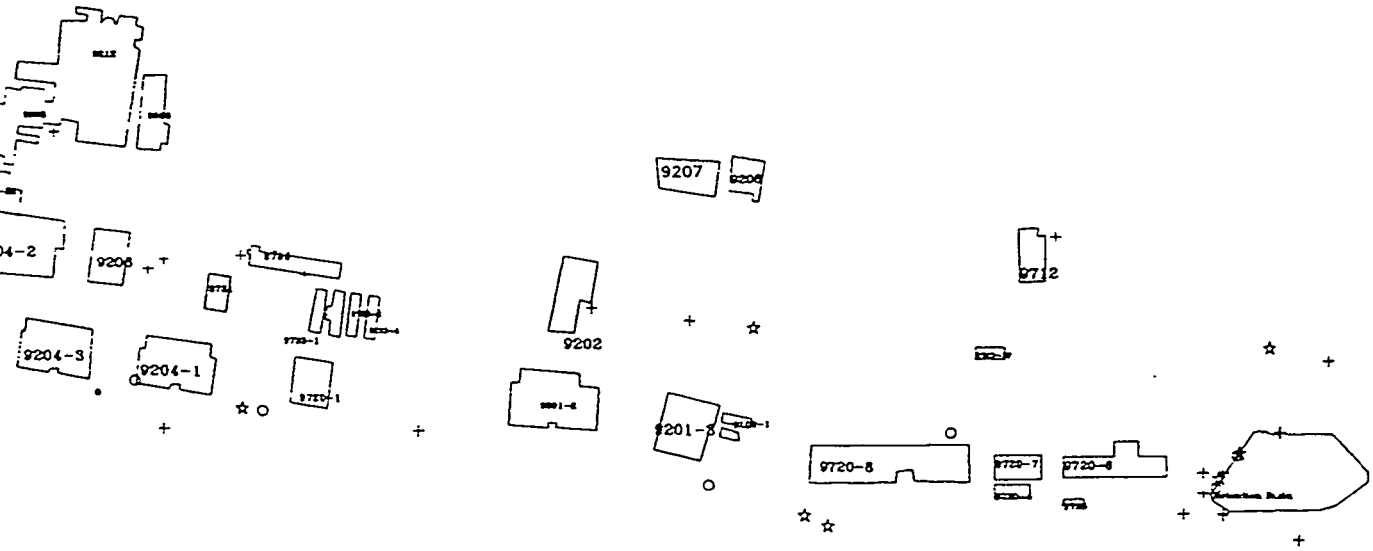
SUM INCLUDES U238, U235, CS137, TH232, AND RA226. K40 NOT INCLUDED

TABLE 8

Data Plot 1


MERCURY ABOVE 12
BIASED AND SYSTEM
NORTHING
31300
31000
30700
30400
30100
29800
29500
29200
28900
28600
28300
9103
9204-4
9201-5
9201-4
81-10
50000
50500
51000
51500
52000
52500
53000
53500
54000
54500
55000
55500
56000
56500
EAS
12-75 ppm
75-150 ppm
Scale: 1" =
DATA PL

M AT Y12 SITE
TIC SAMPLES



5750	5800	5850	5900	5950	6000	6050	6100	6150	6200	6250	6300	6350	6400

NG

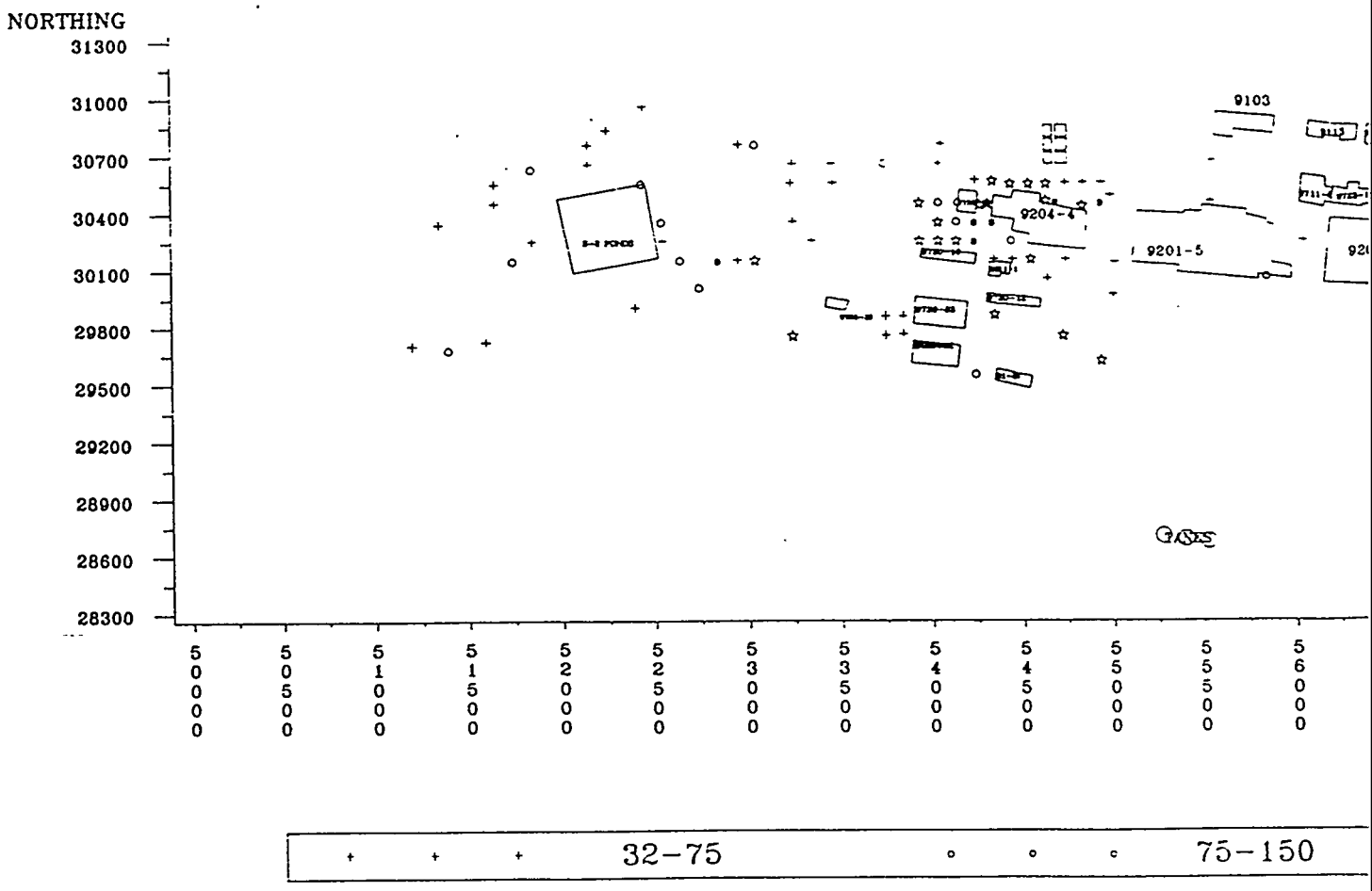
150–500 ppm >500 ppm

0 ft

1

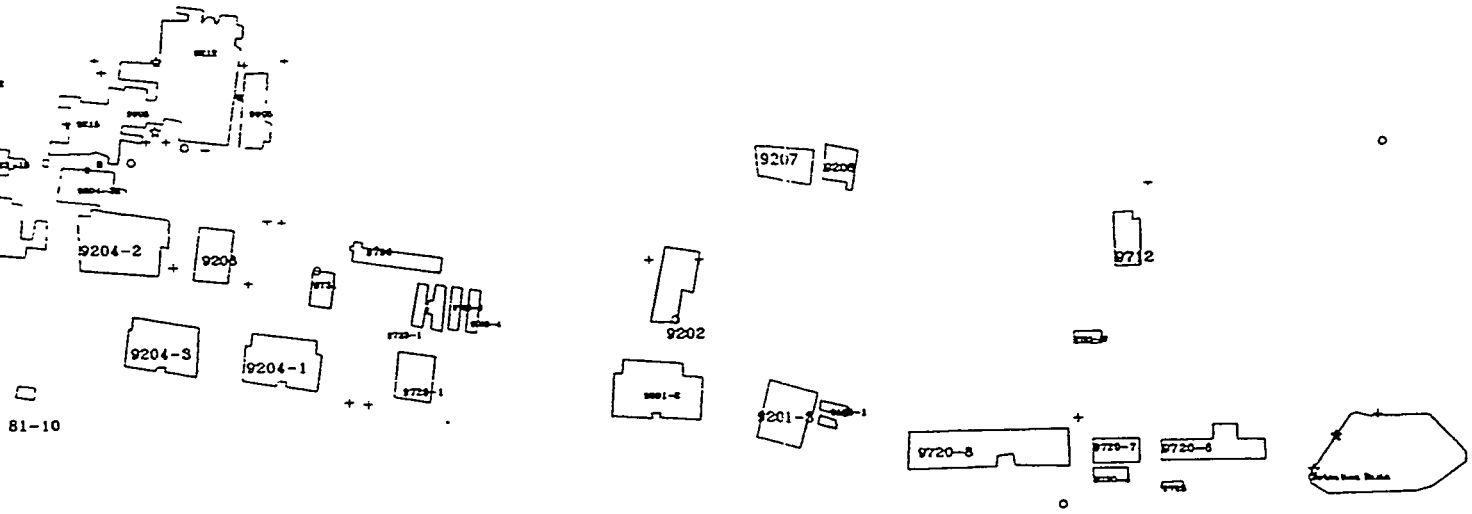
Data Plot 2

U238 >
SYST



D

oCi/g AT Y12 SITE
ATIC SAMPLES



57000	57500	58000	58500	59000	59500	60000	60500	61000	61500	62000	62500	63000	63500	64000

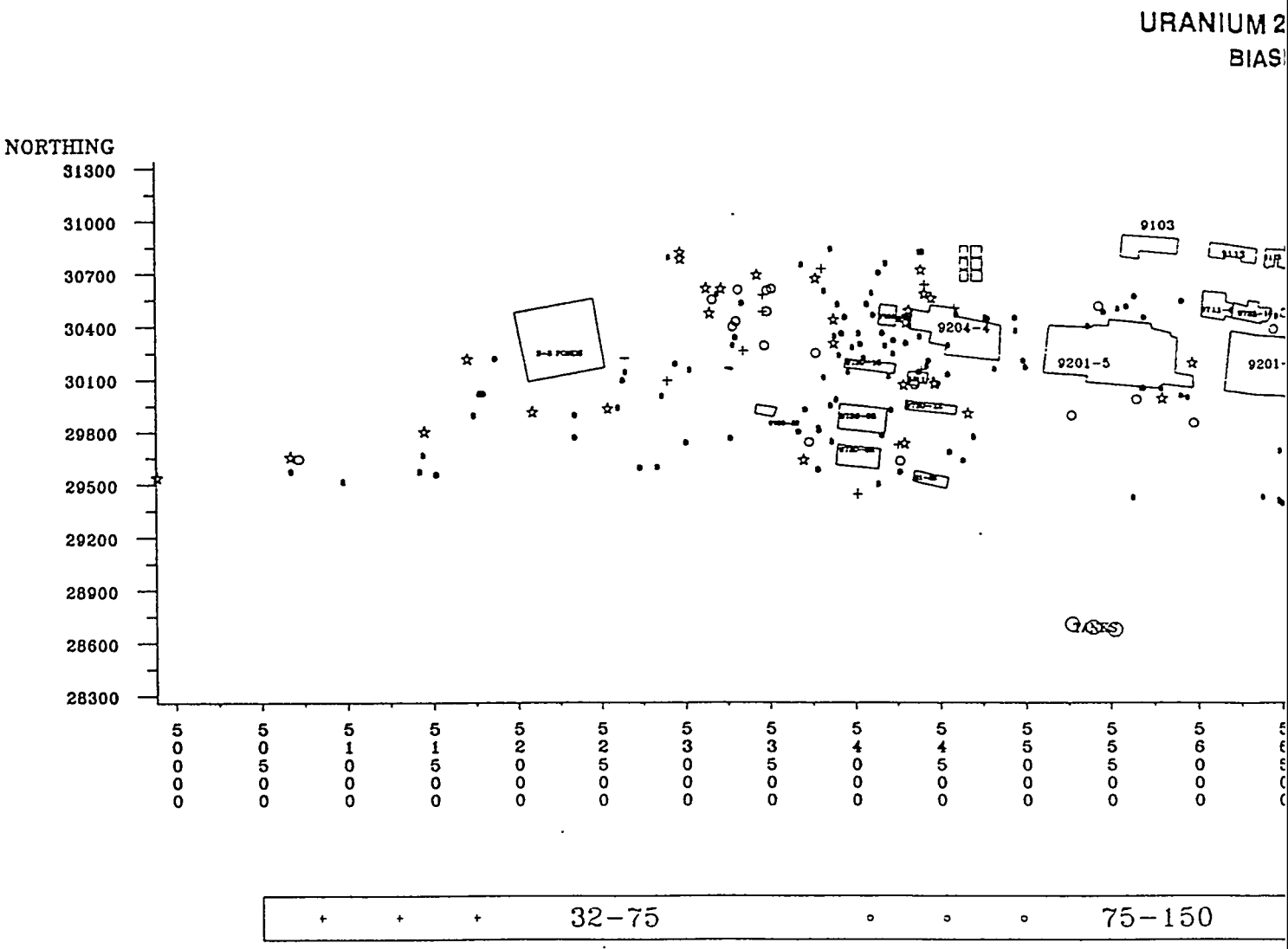
EASTING

150–500 >500

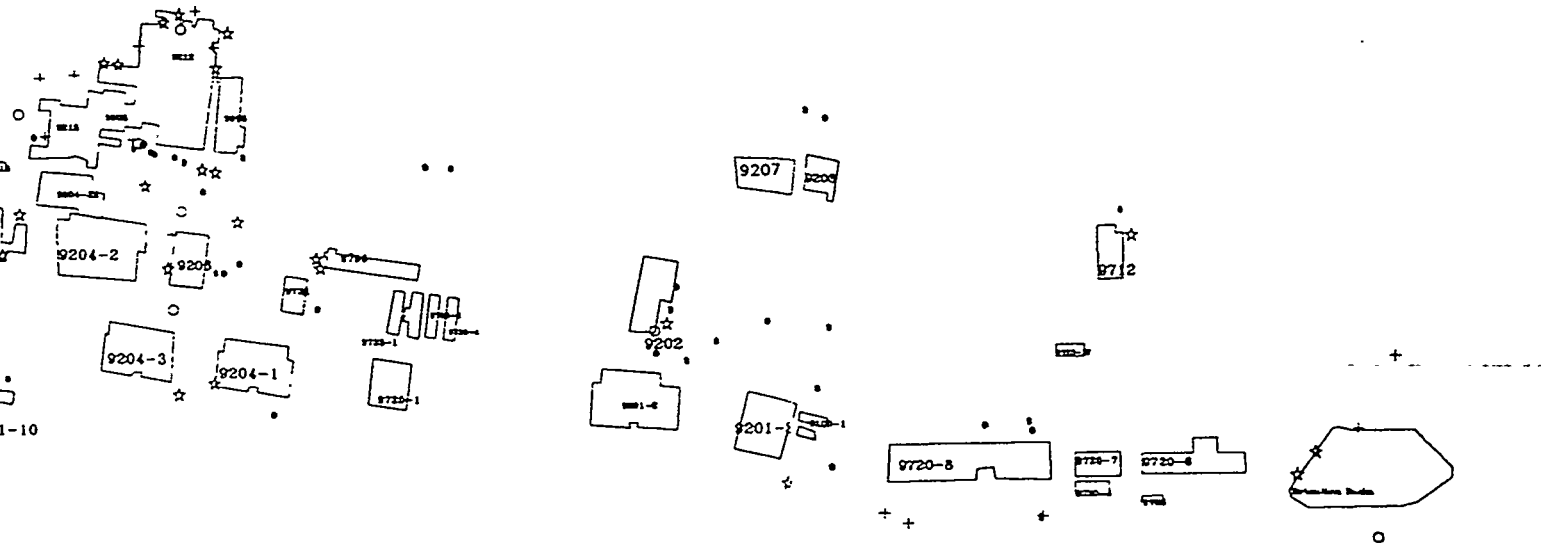
le: 1" = 650 ft

TA PLOT 2

Data Plot 3


URANIUM 2
BIAS
NORTHING
31300
31000
30700
30400
30100
29800
29500
29200
28900
28600
28300
9103
9204-4
9201-5
9201-
50000
50500
51000
51500
52000
52500
53000
53500
54000
54500
55000
55500
56000
32-75
75-150
Sc
DA

ABOVE 32 pCi/g
SAMPLES



570000	575000	580000	585000	590000	595000	600000	605000	610000	615000	620000	625000	630000	635000	640000

EASTING

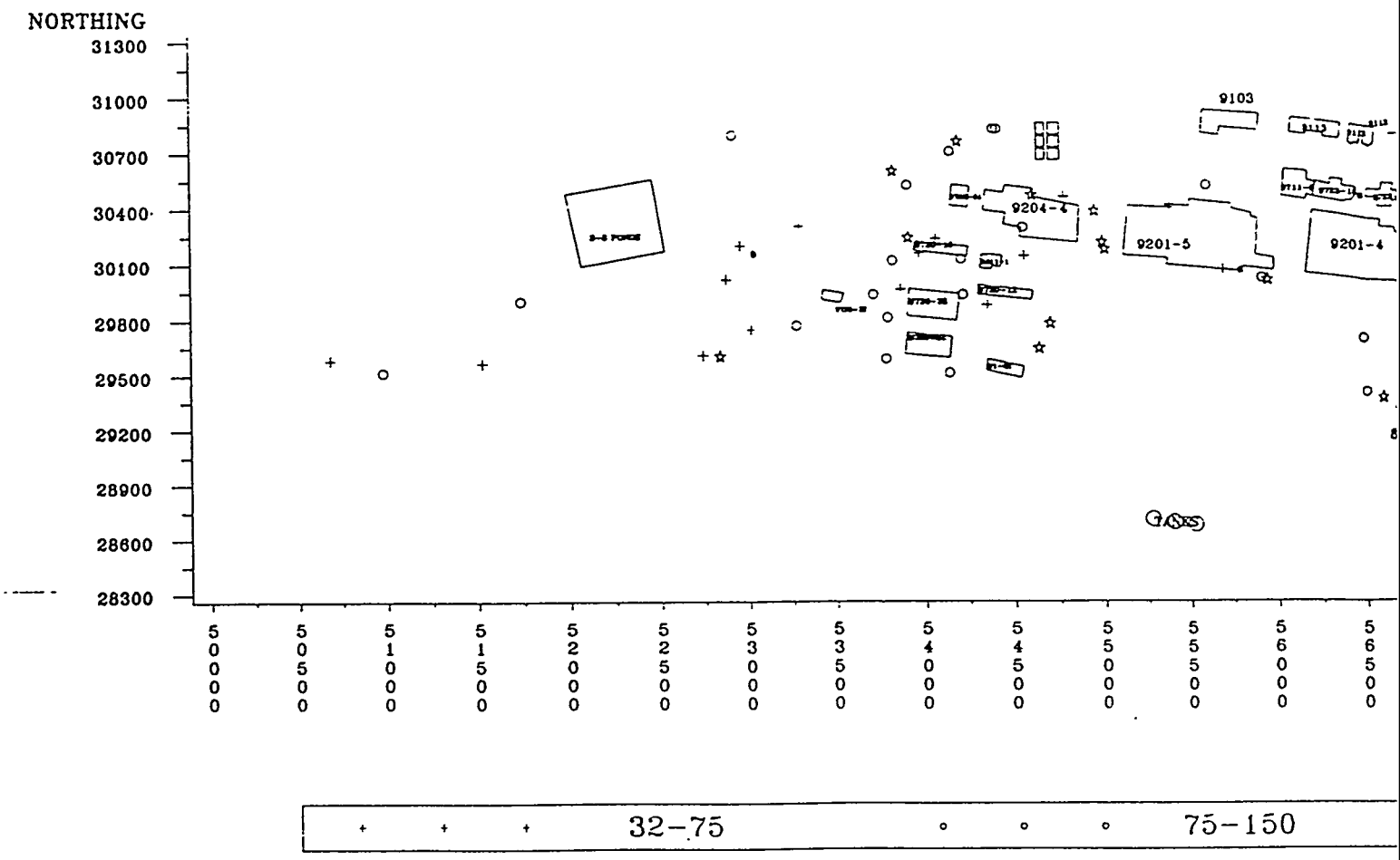
150–500 >500

: 1" = 650 ft

A PLOT 3

Data Plot 4

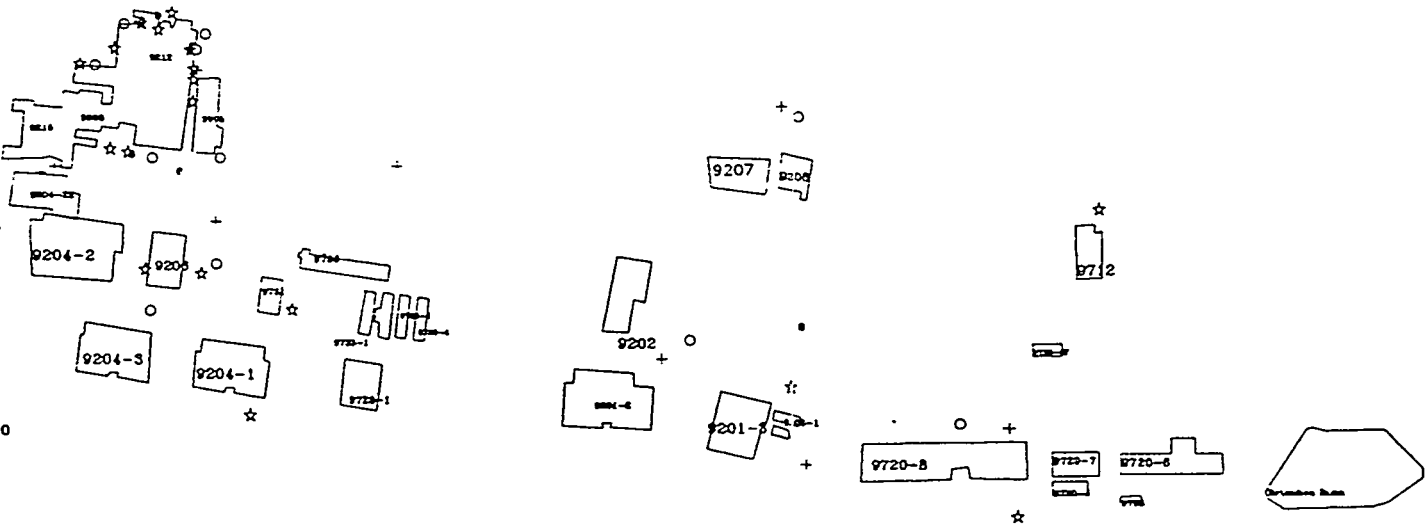
URANIUM 235
BIASED AND SYS



Scale

DAT

BOVE 32 pCi/g
EMATIC SAMPLES



5700	5750	5800	5850	5900	5950	6000	6050	6100	6150	6200	6250	6300	6350	6400

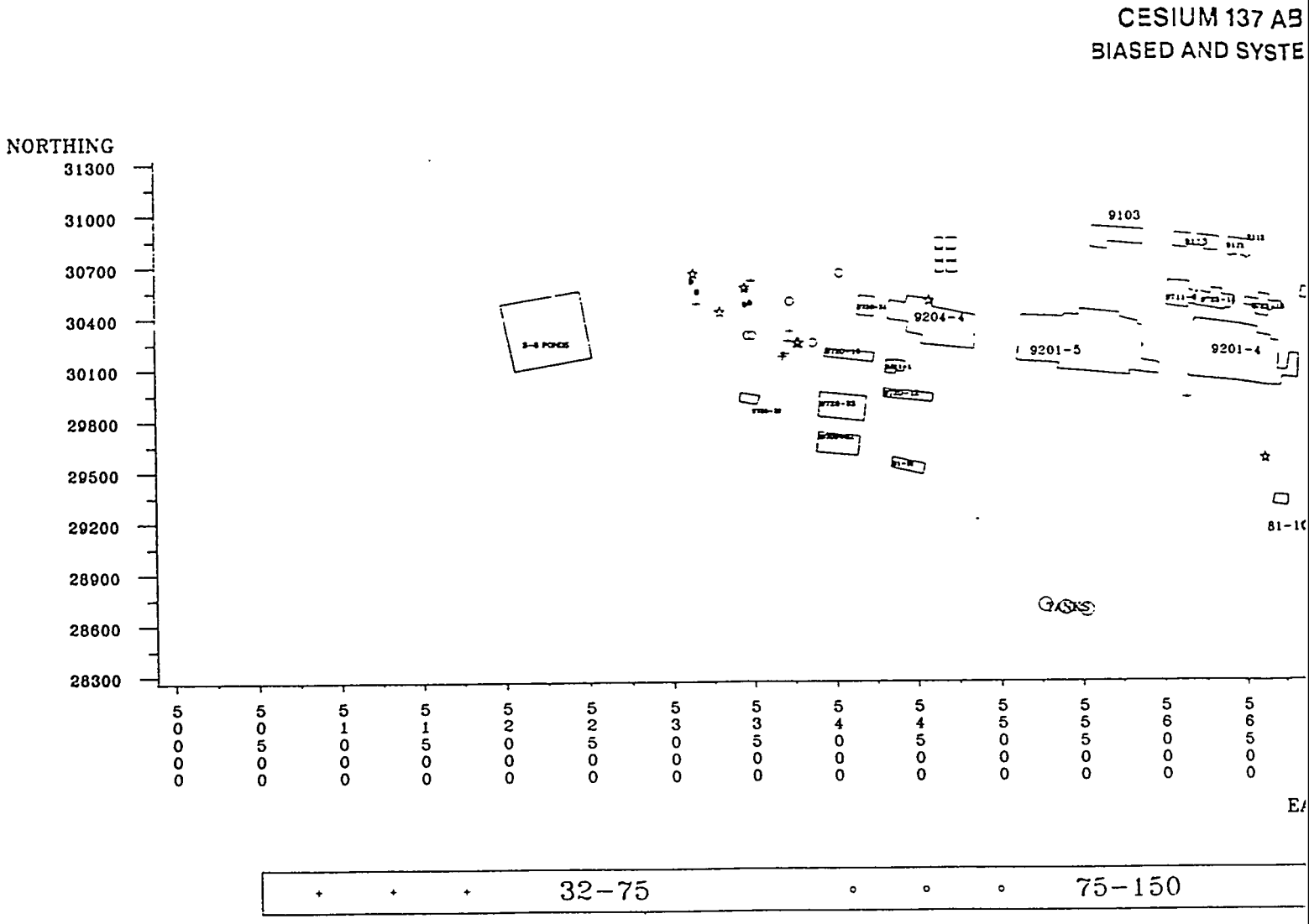
ASTING

150–500 >500

'= 650 ft

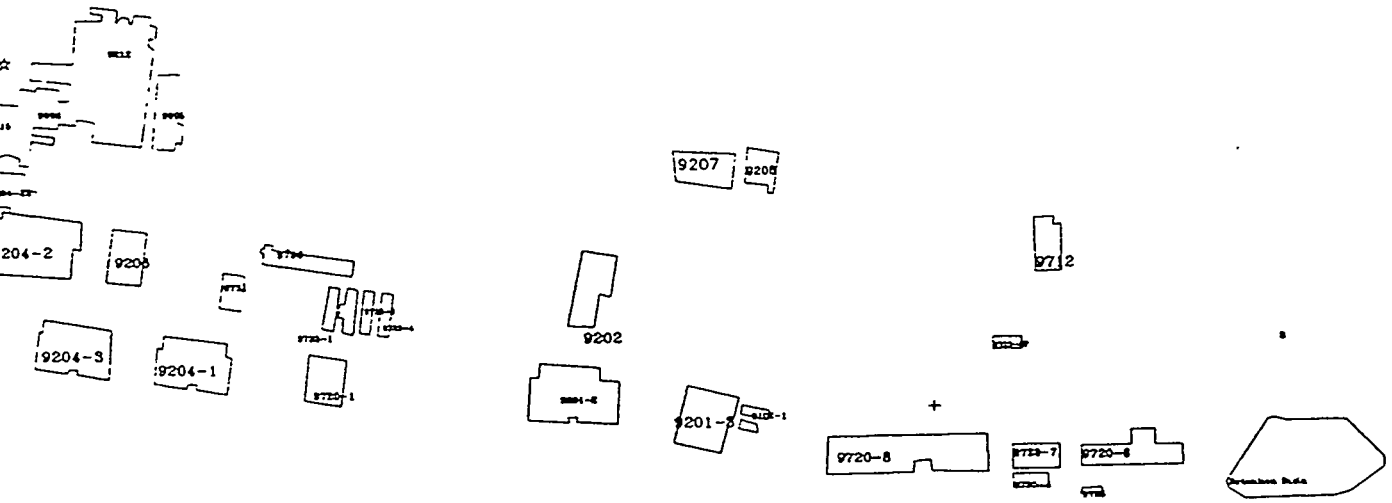
PLOT 4

Data Plot 5



DATA P

VE 32 pCi/g
ATIC SAMPLES



5750	5800	5850	5900	5950	6000	6050	6100	6150	6200	6250	6300	6350	6400

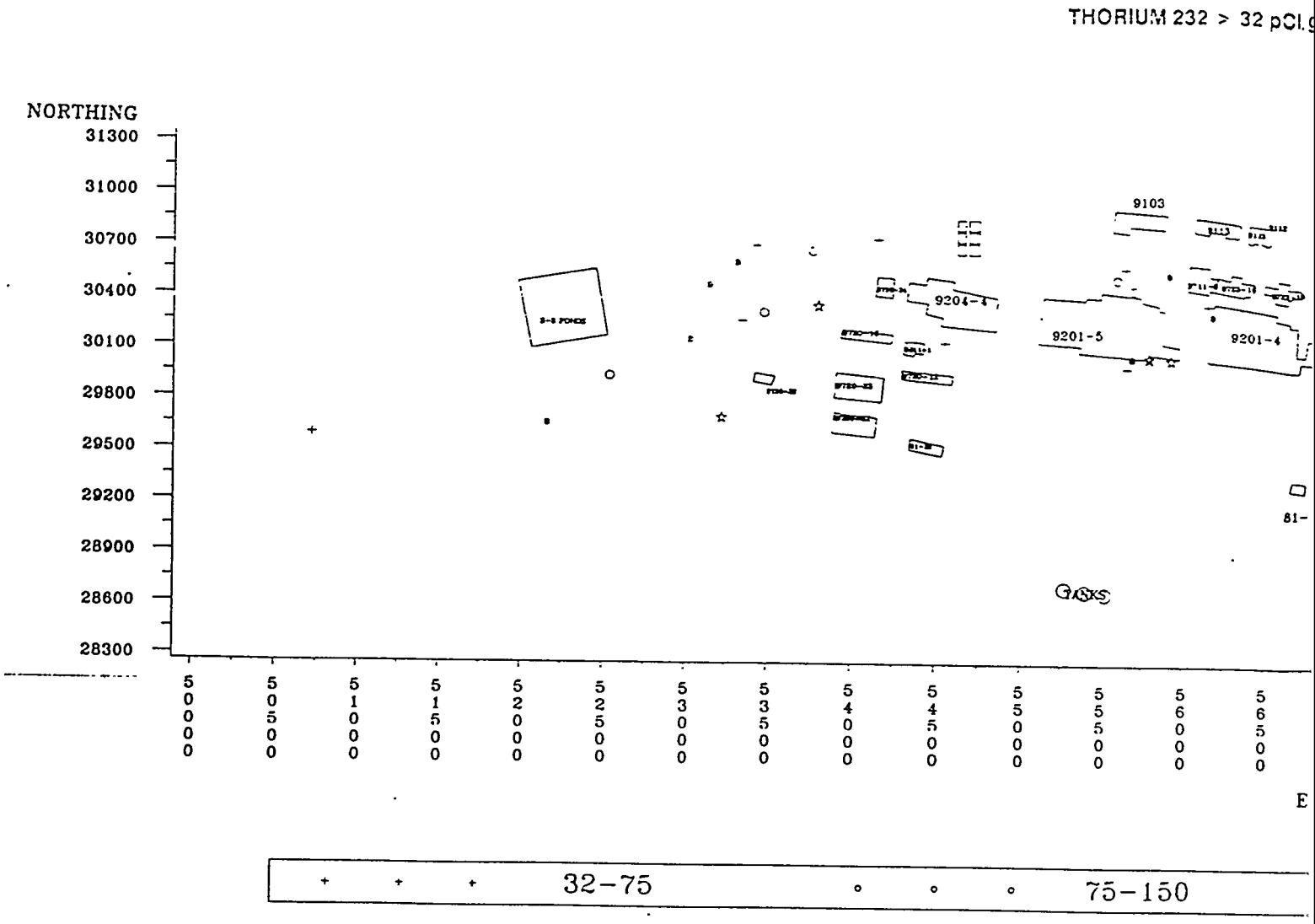
TING

150–500 >500

650 ft

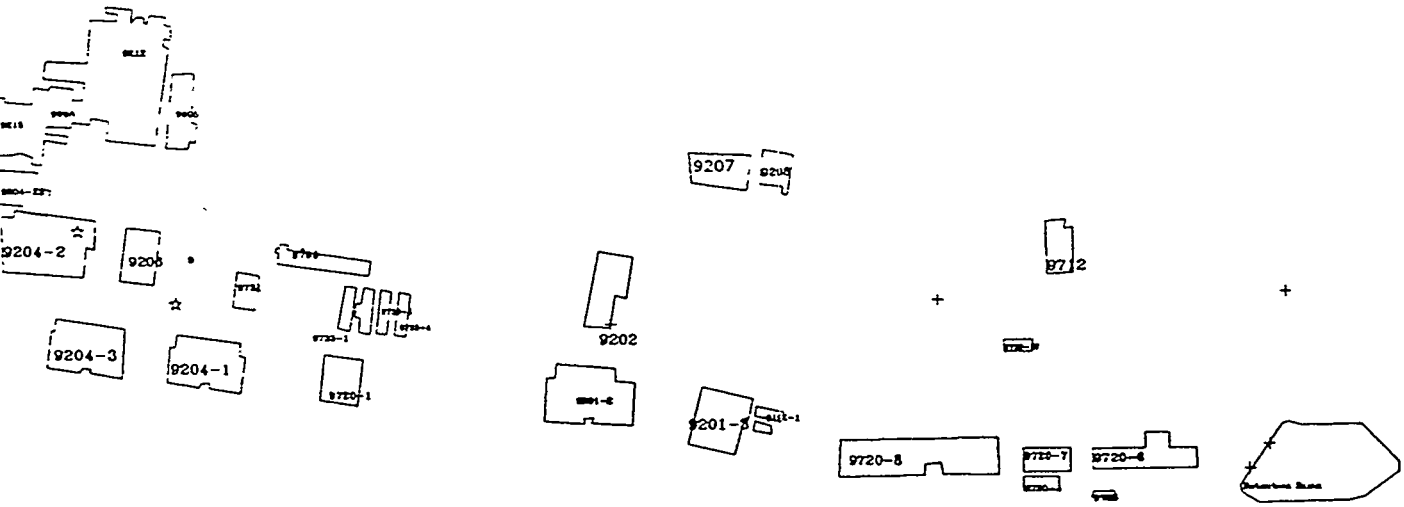
T 5

Data Plot 6



DATA P

Y12 SAMPLE SURVEY



5	5	5	5	5	5	6	6	6	6	6	6	6	6	6
7	7	8	8	9	9	0	0	1	1	2	2	3	3	4
0	5	0	5	0	5	0	5	0	5	0	5	0	5	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TING

150–500 >500

650 ft

OT 6

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