N62604.AR.001768
NCBC GULFPORT
5090.3a

LETTER REGARDING RECOMMENDATION OF FULL SCALE DEMO PROJECT NCBC GULFPORT MS

11/25/1985

IDAHO NATIONAL ENGINEERING LABORATORY

Idaho National Engineering Laboratory

Hazardous Waste Program

November 25, 1985

4.7.8.2

Captain T. L. Stoddart
HQ AFESC/RDVW
Tyndall AFB, Florida 32403

RECOMMENDATION OF FULL SCALE DEMO PROJECT SITE -THS-257-85

Dear Captain Stoddart:

As requested, Hazardous Waste Programs has evaluated two former Herbicide Orange storage sites, Johnston Island (JI) and the Naval Construction Battalion Center (NCBC), for the Full Scale Demo Project. The evaluations include the costs of the full scale demo for each location, the schedule for the project based on obtaining an RD&D permit, the feasibility of project success due to logistics and site support, and analysis of site sampling data for the amount of material to be excavated and treated to achieve a 1 ppb, TCDD standard. The results of these evaluations are presented in this correspondence. Our conclusion and recommendation is that the full scale demo has the highest degree of success and the lowest cost at the Naval Construction Battalion Center (NCBC).

I. COMPARISON OF COSTS BETWEEN JOHNSTON ISLAND AND NCBC

Attachment III is a tabular listing of activities associated with the full scale demo and the estimated costs at Johnston Island and NCBC. It must be noted that all costs are estimates and not supported by written commitment, with the exception of a Memo of Agreement between EG&G Idaho, Inc. and ENSCO for a $2,600K contract for Johnston Island. NCBC costs for utilities, site setup, and fuel are based on industrial standards and not a commitment from NCBC. However, they are useful for comparison purposes between the two sites.

The major differences between the two sites are a savings at NCBC of approximately $1,000K in transportation, fuel, utilities, site support, and travel offset by an increase in ENSCO's contract of approximately $400K for increased per diem and miscellaneous costs at NCBC. This results in a saving of $600K in performing the demo at NCBC. This amount does not include the additional costs at JI of taking an additional 300 samples in the grid and outlying areas. This cost is estimated at $225,000 (300 samples x $750/sample).

Discussions have been held with ENSCO management and they are willing to go with a "hard dollar" (fixed price) contract if the demonstration is at NCBC. Overall budget amount is estimated to be the same, but costs for non-performance would be assumed by ENSCO.

There is no cost assessment provided for the following possible events associated with JI:

1) Longer than 90 days operation on JI to achieve clean site,

2) Eight months longer to obtain permit from Region IX plus delisting uncertainty on existing site sampling data,

3) Delays due to equipment repair/obtaining parts (minimum one week),

4) Reduced site support due to higher priority activities,

5) Effect of working/living conditions on morale and job performance.

It is concluded that from cost considerations, it is less expensive to perform the demo at NCBC. A conservative savings value of $800K is realized by performing the demo at NCBC. Consideration of the above listed adverse events at JI could mean a savings of as much as $1,000K.

II. COMPARISON OF PERMITTING/DELISTING ACTIVITIES

During recent conversations with Region IX, EPA, in San Francisco, concerning the on-going small scale demo at JI, it was stated by Region IX that the full scale demo permit would take at least a year to obtain. This is certainly credible considering the small scale permit application was submitted May 9, 1985, and since initial review/comment, Region IX has promised a draft permit in October, then November, and now mid-January 1986. Allowing for a public hearing of 45 days, this may result in a final permit as late as March 1986. This is a total of 10 months for 3,000 lbs of soil containing less than 0.25 g of TCDD.

In addition, it appears that Region IX is not interested in either small or full scale demo at a level higher than the permit writer. This was recently validated when the permit writer was removed from working on the small scale permit and placed on a compliance problem within the State of California.

Following the statement of one year permiting time by Region IX, discussions were initiated with Region IV, Atlanta, GA. It became immediately apparent that Region IV is interested in supporting the full scale demo and to a level of an assistant Regional Administrator. It was also stated by Region IV that a permit could be obtained in a maximum of four months. Region IV has a very good record in issuing permits in less than six months.

Prior to, and during, the small scale demo at NCBC, Region IV was fully supportive. A representative was on-site during the press conference to assist and answer questions as needed. Previous to that, a commitment was made by Region IV to be present and assist as necessary when the small scale demo project was presented to the State of Mississippi. This level of support and interest has not been shown by Region IX.

Finally, an assessment of the politics involved in each regional office is evaluated. Certainly, Region IV has a higher degree of interest in a nationally recognized dioxin site located within a city adjacent to a high use gulf coast beach area than Region IX in an obscure site, located 3,000 miles out in the Pacific Ocean, whose only population is employed under military orders.

In conclusion, it is recommended that the permit for the full scale demo be submitted to Region IV for the demo at NCBC. If this occurs, then it is feasible to meet the original schedule of a July 1986 start for a 90 day operational full scale demo.

III. LOGISTICS AND SITE SUPPORT

A recent visit to JI revealed that the Defense Nuclear Agencies project of plutonium cleanup was second priority to the congressional mandated, U.S. Army, JACADS project (nerve gas cleanup). The Defense Nuclear Agency (DNA) has operational control of the island and since their plutonium cleanup project is of lower priority than the JACADS project, it can be assumed that any activity associated with the HO site would be given lower priority.

At NCBC, higher priority projects are not of concern. During the small scale demo at NCBC, site support was superb and it appeared that this effort had the highest priority. Considering the activities of a U.S. Navy Seabee Base (NCBC) over the next year, it is estimated that no foreseeable activity will impact the base and therefore, there is no foreseeable impact to the full scale demo. It is concluded that the full scale demo will receive more effective and efficient site support at NCBC.

Evaluation of the logistics is very simple. Any requirement at JI will take a minimum of one week with a reasonable expectation of two weeks. At NCBC, any requirement will take less than two days and in most cases only one day.

It is concluded that site support and logistics are much more supportive of a demo at NCBC.

IV. SAMPLING DATA AND MATERIAL EXCAVATION

Attachments I and II present the evaluation of unvalidated sampling data for NCBC and JI, respectively. Evaluation of the data to obtain an estimate of the volume of material to be excavated was accomplished in two ways: 1) the number of grids > 1 ppb TCDD was multiplied times the fraction of grids contaminated at each depth; and 2) an estimate including consideration for actual field transport of material was made. The results of these evaluations for each method and site are:

Site	Method 1 (yd^3)	Method 2 (yd^3)
NCBC	10,183	7,786
JI	3,042	8,888

The evaluation of each site by Method 1 resulted in values that for NCBC are high and for JI are suspected to be low. This evaluation at NCBC was performed at 0.1 ft. intervals and resulted in higher value than Method 2 which removed material at one-half foot intervals and estimated additional excavations based on the below surface data. The Method 1 evaluation at JI resulted in a total suspected to be low since there is little, if any, correlation between surface and subsurface data. As a result, additional sampling will be required and the volume of material resulting from this additional sampling is not included in the Method 1 total and is estimated to be 3158 yd^3. Since the capacity of the ENSCO incinerator is 8,640 yd^3 (4 yd^3/hr for 90 days continuous operation), it is estimated that both sites are near the capacity of the machine.

The NCBC site has been more extensively sampled outside the original HO storage site than has the JI HO site, and therefore the area involved is better defined. At JI the data indicates that the west and possibly the north side of the site are contaminated. If additional sampling confirmed contamination at the sea wall, it would have to be removed to excavate the material beneath it. Also the dedrumming area to the southwest of the original HO site is contaminated. Additional sampling would be required and it is suspected that the area would expand.

In addition, there is a lack of correlation between surface data and subsurface data at the JI site, most likely caused by recontouring the site after contamination occurred. As discussed in Attachment II, this results in 300 plots requiring initial subsurface sampling to determine the presence of TCDD to at least a 12 inch depth. The assessment of this cost is presented in Section II. The impact on permitting and delisting is discussed in Section III. It should be noted that these estimates are based on preliminary data and are hand calculations. A more detailed formal estimate will be provided when the data is finalized.

It is concluded, that from a volume of material to be excavated consideration, the NCBC site has a greater potential of achieving 1 ppb TCDD in 90 days operation than does the JI site because of the greater certainty in the estimates reflected in the Method 2 calculation for NCBC.

This concludes this evaluation of the NCBC versus Johnston Island as a site for the full scale demo. It is the recommendation of Hazardous Waste Program, EG&G Idaho, that the full scale demo be accomplished at the NCBC. Any questions or comments on the above should be addressed to myself, or Kathy Falconer (208) 526-1559, or Harry Williams (208) 526-1763.

Very truly yours,

T. H. Smith, Manager
Waste Technology Programs

HDW:ag

Attachments:
As Stated

cc: I. Aoki, DOE-ID
J. O. Zane, EG&G Idaho (w/o Attach.)

ATTACHMENT I

Evaluation of NCBC Data

There were 829, 20, x 20 foot sample grids in the original HO storage area, excluding ditches, building 411, and a concrete slab. An additional 459 grids outside this area breakdown as: 243 grids in the equipment laydown area; 140 grids in the expansion area; and 76 grids in the 9th Street and road areas. The total grids sampled at NCBC are 1288. A surface sample is a composite of five samples taken in an X-pattern within the grid. Each of the five samples is taken from the top three-inches of material. They are composited and sieved to provide one sample for analysis. These results are numbered 01000 in the attached table. Surface samples from these grids resulted in 1935 analyses including duplicates, replicates, and QA/QC. Preliminary, unvalidated TCDD results ranged from non-detected (DL = 0.1 ppb) to a maximum of 646 ppb TCDD for these surface samples.

In addition, 50 grids were sampled using a bore hole technique to provide below surface data. All 50 grids were sampled at the surface and within the concrete. Thirty-five (35) near surface grids were sampled to 0.8 ft below the concrete and fifteen (15) grids were sampled to a depth of 5 feet below the concrete. The analysis of the samples taken at the 2, 3, 4, and 5 ft depths in these 15 grids have not been completed as of this date. The 209 reported results vary from non-detected (DL = 0.1 ppb) to a maximum of 998 ppb, TCDD. In the attached table, the 02000 samples are those surface and below concrete samples to a depth of 0.8 feet below the concrete. The 04000 samples are within the concrete, and the 03000 samples are those surface and below concrete samples to a depth of 5.0 feet below the concrete.

The following criteria is used for evaluation:

1. Excavation of a grid for incinerator feedstock will be based on surface data of 1 ppb TCDD or greater.

2. Compare the below surface data with the surface data. Indicate differences to the 1 ppb TCDD standard and note those grids whose surface data is < 1 ppb TCDD but below surface data is > 1 ppb TCDD.

3. It is estimated from the sampling project that the average depth of concrete is six (6) inches. From the below surface data, determine the maximum depth required to reach a 1 ppb TCDD level. Determine the ratio of < 1 ppb to > 1 ppb data at each depth.

4. It costs $2600 to treat a 20 x 20 foot grid to a depth of six (6) inches. It costs $750 to sample and analyze the same grid, or approximately 30%. Estimate the depth where 70% of the below surface samples are < 1 ppb TCDD.

5. Evaluate the below surface data versus the surface data to determine if a breakpoint value can be given to the surface value such that at less than that breakpoint value, the depth required to achieve < 1 ppb TCDD is correct approximately 70% of the time. Assess the data from a practical, field standpoint of heavy equipment removing and transporting material.

Evaluation results are:

1. There are 677 grids contaminated at > 1 ppb TCDD based on surface (01000) data. The surface data from the 02000 and 03000 samples were compared to the 01000 samples. There is agreement when assessment of 02000 and 03000 surface data to the 01000 data is made at 1 ppb. That is 01000 data > 1 ppb is supported by the 02000/03000 surface data except in two cases, sample 2381 and 2528. In both cases the 02000/03000 surface data is < 1 ppb, while the 01000 data is greater than 1 ppb. This is probably due to the 02000 sample being a composite over the grid while the 02000/03000 sample was taken from a point within the grid. Since the criteria for excavation is based on 01000 data, and there is no 02000/03000 surface data showing a grid > 1 ppb when 01000 data is < 1 ppb, this criteria is considered complete.

2. A comparison of 01000 data to below surface 02000/03000 data is made to the excavation limit of 1 ppb. There are no grids whose 01000 data is < 1 ppb, but have > 1 ppb in the 02000/03000 data.

3. There are four of the fifteen 03000 samples that show levels > 1 ppb at 0.8 ft below the concrete. They are 0639, 2372, 2470, and 2571, with a maximum value of 12 ppb for 2470, a level of 2 ppb for 2571, and levels of 1 ppb for 0639 and 2372. This total depth is 0.8 ft below the concrete, 0.5 ft of concrete and 0.1 ft of surface material or 1.4 ft. The ratio at this depth of 1.4 ft is 4 of 15. If this ratio is applied to the total grids > 1 ppb the result is

$$\frac{\frac{4}{15} \text{ X } 677 \text{ X } 20 \text{ ft X } 20 \text{ ft X } 1.4 \text{ ft}}{27 \text{ ft}^3/\text{yd}^3} = 3744 \text{ yd}^3$$

For the evaluation at 0.4 ft below the concrete, data is available for all fifty 02000/03000 samples. There are 23 of the fifty 02000/03000 samples that have levels > 1 ppb at 0.4 ft below the concrete. These values range from 1 ppb to 315 ppb with nine of the data < 10 ppb. The total depth is 0.4 ft below the concrete, 0.5 ft of concrete and 0.1 ft of surface material or 1.0 ft. The data ratio at this depth of 1.0 ft is 23 of 50. However, 4 of the 23 have already been considered at the depth of 0.8 ft below concrete. Therefore, the ratio for determining excavation is 19 of 50.

$$\frac{\frac{19}{50} \text{ X } 677 \text{ X } 20 \text{ ft X } 20 \text{ ft X } 1.0 \text{ ft}}{27 \text{ ft}^3/\text{yd}^3} = 3811 \text{ yd}^3$$

At a depth of 0.1 ft below the concrete there are 9 of the fifty 02000/03000 samples that have levels > 1 ppb at 0.1 ft below the concrete and are not included in the 0.4 ft and 0.8 ft numbers. The ratio at this depth of 0.1 ft below the concrete is 9 of 50. The total depth is 0.1 ft below the concrete, 0.5 ft of concrete and 0.1 ft of surface material, or 0.7 ft.

$$\frac{\frac{9}{50} \text{ X } 677 \text{ X } 20 \text{ ft X } 20 \text{ ft X } 0.7}{27 \text{ ft}^3/\text{yd}^3} = 1264 \text{ yd}^3$$

Consideration of the concrete data (04000 samples) shows 10 grids > 1 ppb that are not included in the above. The ratio is 10 of 50 and the depth is that of the concrete, 0.5 ft plus the surface of 0.1 ft, or 0.6 ft.

$$\frac{\frac{10}{50} \times 677 \times 20\ \text{ft} \times 20\ \text{ft} \times 0.6\ \text{ft}}{27\ \text{ft}^3/\text{yd}^3} = 1204\ \text{yd}^3$$

The remaining eight samples have surface values > 1 ppb but < 1 ppb in the concrete (04000) and therefore only would require removal of the surface material, 0.1 ft.

$$\frac{\frac{8}{50} \times 677 \times 20\ \text{ft} \times 20\ \text{ft} \times 0.1\ \text{ft}}{27\ \text{ft}^3/\text{yd}^3} = 160\ \text{yd}^3$$

The total of the above excavations is 10,183 yd^3.

4. This criteria is evaluated using the 02000 and 3000 data below the concrete. There are 15 (03000) data points at 0.8 ft of which 11 are < 1 ppb or 73%. Combining the 02000 and 03000 data points at 0.4 ft results in a total of 50 points of which 27 are < 1 ppb, or 54%. Likewise, the 02000 and 03000 data points at 0.1 ft show 24 < 1 ppb, or 48%. This indicates a value between 0.4 ft and 0.8 ft at which 70% of the data would be < 1 ppb.

5. It is anticipated that a Model D6 or larger caterpillar using 6-inch ripper tines will be required to break up the cement stabilized soil. Thus from a practical standpoint, either the surface (down to concrete) would be scraped or material would be removed in approximately 6-inch intervals.

An assessment of the eight 02000/03000 samples whose 04000 value is < 1 ppb shows a range of the 01000 numbers of 1 to 241 ppb, and 02000/03000 values range from 0.6 to 49 ppb. Therefore there is no correlation between surface (01000) data and clean concrete (< 1 ppb) and consequently, any contaminated surface (01000) grid will have to be excavated to a minimum of the bottom of the concrete, or 6 inches, and one pass of the caterpillar.

If the surface (01000) values of 20 ppb, or less, are compared to the 02000, 03000, and 04000 data the following results. There are 11 (01000) values of 20 ppb or less. Of these, 7 are less than 1 ppb at the bottom of the concrete, or 64%. Similar comparison of 01000 values at 50 ppb gives 11 of 27, or 41%, and comparison at 100 ppb gives 8 of 34 or 24%. Thus, if a breakpoint of 20 ppb is utilized, it would mean approximately 36% of the < 20 ppb grids would require an additional 6 inches of material removed after sampling.

The calculations of the above for excavated material are:

$$\frac{534 \text{ grids } X \ 20 \text{ ft } X \ 20 \text{ ft } X \ .5 \text{ ft}}{27 \text{ ft}^3/\text{yd}^3} = 3956 \text{ yd}^3$$

An additional 36% (of 534) or 192 grids will require an additional 6 inch excavation or

$$\frac{192 \ X \ 20 \text{ ft } X \ 20 \text{ ft } X \ .5\text{ft}}{27 \text{ ft}^3/\text{yd}^3} = 1422 \text{ yd}^3$$

If the grids that are greater than 20 ppb are excavated to 1 foot (2 passes of the caterpillar) the results are

$$\frac{143 \ X \ 20 \text{ ft } X \ 20 \text{ ft } X \ 1 \text{ ft}}{27 \text{ ft}^3/\text{yd}^3} = 2119 \text{ yd}^3$$

Since 4 of the 15 (0300) data indicates contamination at greater than 1 foot, an additional 27% (4/15) of these plots will require another 6 inch excavation or 39 grids (27% of 143).

$$\frac{39 \ X \ 20 \text{ ft } X \ 20 \text{ ft } X \ .5 \text{ ft}}{27 \text{ ft}^3/\text{yd}^3} = 289 \text{ yd}^3$$

The total of the above calculations is 7786 yd^3.

Therefore the amount of material to be excavated is estimated to be in the range of 7800 yd^3 to 10,200 yd^3 to meet a 1 ppb TCDD standard.

The attached grid map of the NCBC site shows all the areas sampled, including the expansion areas and laydown area. It also shows the results of the evaluation of criteria No. 5 with those grids greater than 20 ppb TCDD blackened and those grids less than 20 ppb TCDD having a slash. An observation can be made when observing the gird layout showing blackened and slashed plots. It appears that the major spill areas were along Goodier and Groundwood Avenues and around building 411. The grid plot also shows that these spills drained toward the drainage ditches since the concrete soil matrix provided for this horizontal movement while also adsorbing the contaminant. This observation lends credibility to the method of estimating excavation quantities used in the evaluation of criteria No. 5.

NC NEAR SURFACE (Above Concrete) SUBSURFACE (Below Concrete) DATA

SAMPLE	Surface (01000)	02000 SERIES ABOVE	02000 SERIES BELOW		Concrete (04000)	03000 SERIES ABOVE	03000 SERIES BELOW		
		0.0	0.1	0.4		0.0	0.1	0.4	0.8
0639	242				438	162	0	1	1
0642	18	365	145	96	123				
0643	148				6	646	0	NA	.2
2027	16	12	0	.1	5				
2030	1				0	2	.4	NA	NA
2115	10	8	8	8	.2				
2215	205	425	95	75	9				
2218	14	14	8	.3	6				
2227	51	17	0	.2	.9				
2317	88				2	118	1	.3	0
2328	114				13	14	0	.3	.2
2330	37	3	0	0	.3				
2331	31	37	.7	3	3				
2364	13	12	0	0	0				
2369	100				.2	16	.2	.2	0
2371	58	78	17	3	152				

(10) (6)

N… NEAR SURFACE (Above Concre… & SUBSURFACE (Below Concrete) D…

SAMPLE	Surface (01000)	02000 SERIES ABOVE 0.0	02000 SERIES BELOW 0.1	02000 SERIES BELOW 0.4	Concrete (04000)	03000 SERIES ABOVE 0.0	03000 SERIES BELOW 0.1	03000 SERIES BELOW 0.4	03000 SERIES BELOW 0.8
2372	95				22	26	8	3	1
2374	48	105	.8	.4	2				
2376	179	[illegible]			1	13	.6	.1	0
2377	73	48	1	.2	2				
2378	31	12	.1	.5	1				
2379	15	7	6	.3	2				
2381	26	.6	.3	0	.2				
2383	25	18	4	.6	8				
2384	241	12	.2	.3	.2				
2420	29	131	3	.6	2				
2421	20	5	.4	7	.2				
2424	27	21	0	.1	15				
2428	164				4	200	46	12	0
2431	35	192	4	315	154				
2450	17	49	.2	4	.2				
2458	101				5	74	1	.7	0

(22) (16)

N'L NEAR SURFACE (Above Concrete & SUBSURFACE (Below Concrete) D

SAMPLE	Surface (01000)	02000 SERIES ABOVE 0.0	BELOW 0.1	0.4	Concrete (04000)	03000 SERIES ABOVE 0.0	BELOW 0.1	0.4	0.8
2462	29	102	76	39	94				
2470	260				310	21	4	7	12
2472	243	432	7	4	998				
2482	87	88	2	18	2				
2527	106				2	2	NA	9	.3
2528	182				.5	.7	.2	.2	0
2539	51	411	4	4	230				
2544	19	4	9	.5	2				
2549	101	227		9	139				
2550	43	165	13	2	284				
2553	29	137	8	18	312				
2561	13	12	8	.6	5				
2564	26	36	0	0	3				
2567	106				7	58	26	12	.4
2571	122				482	593	122	78	2
2573	24	.15	.2	.2	9				

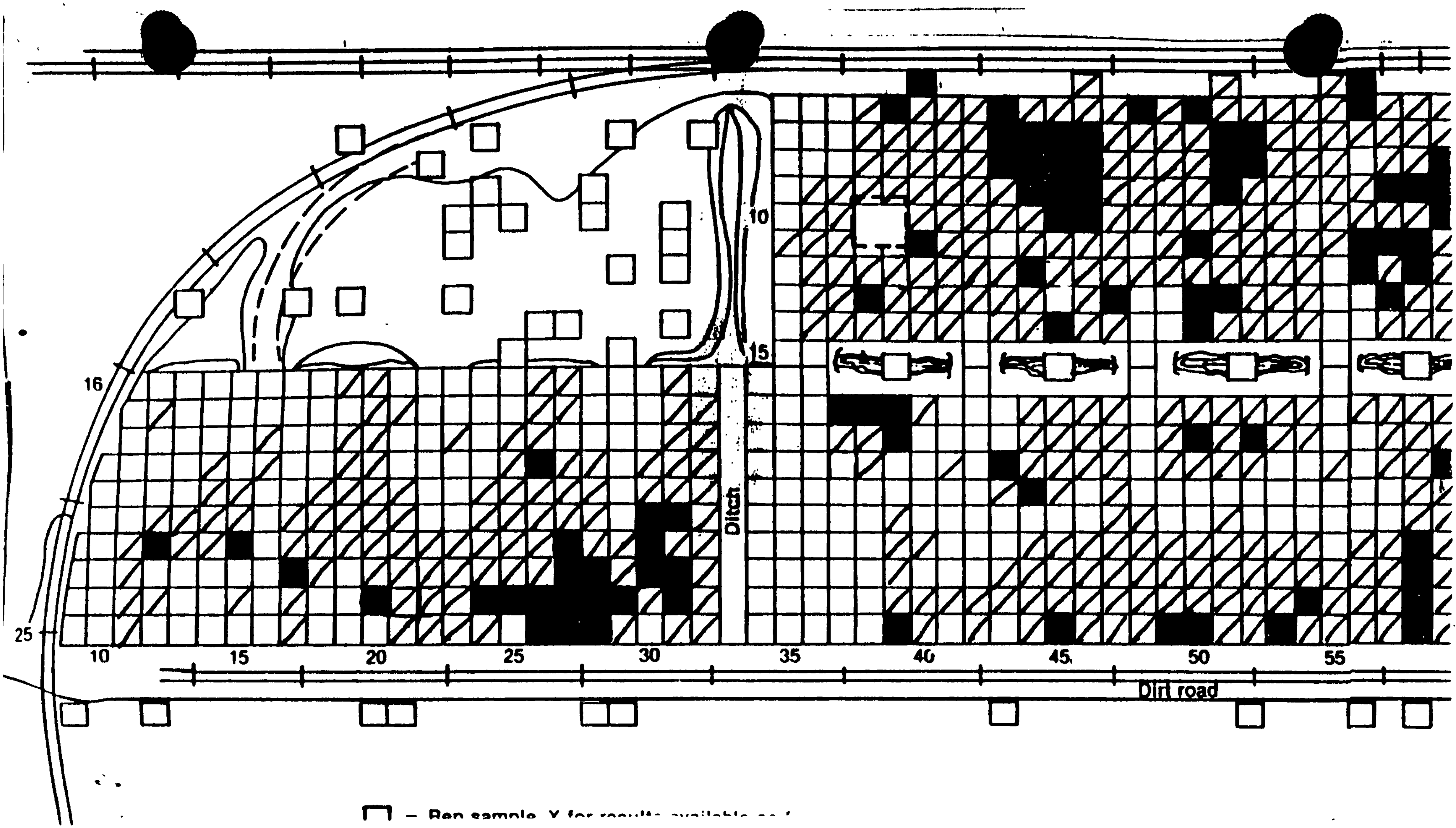
(33) (15)

N NEAR SURFACE (Above Concrete) SUBSURFACE (BELOW CONCRETE)

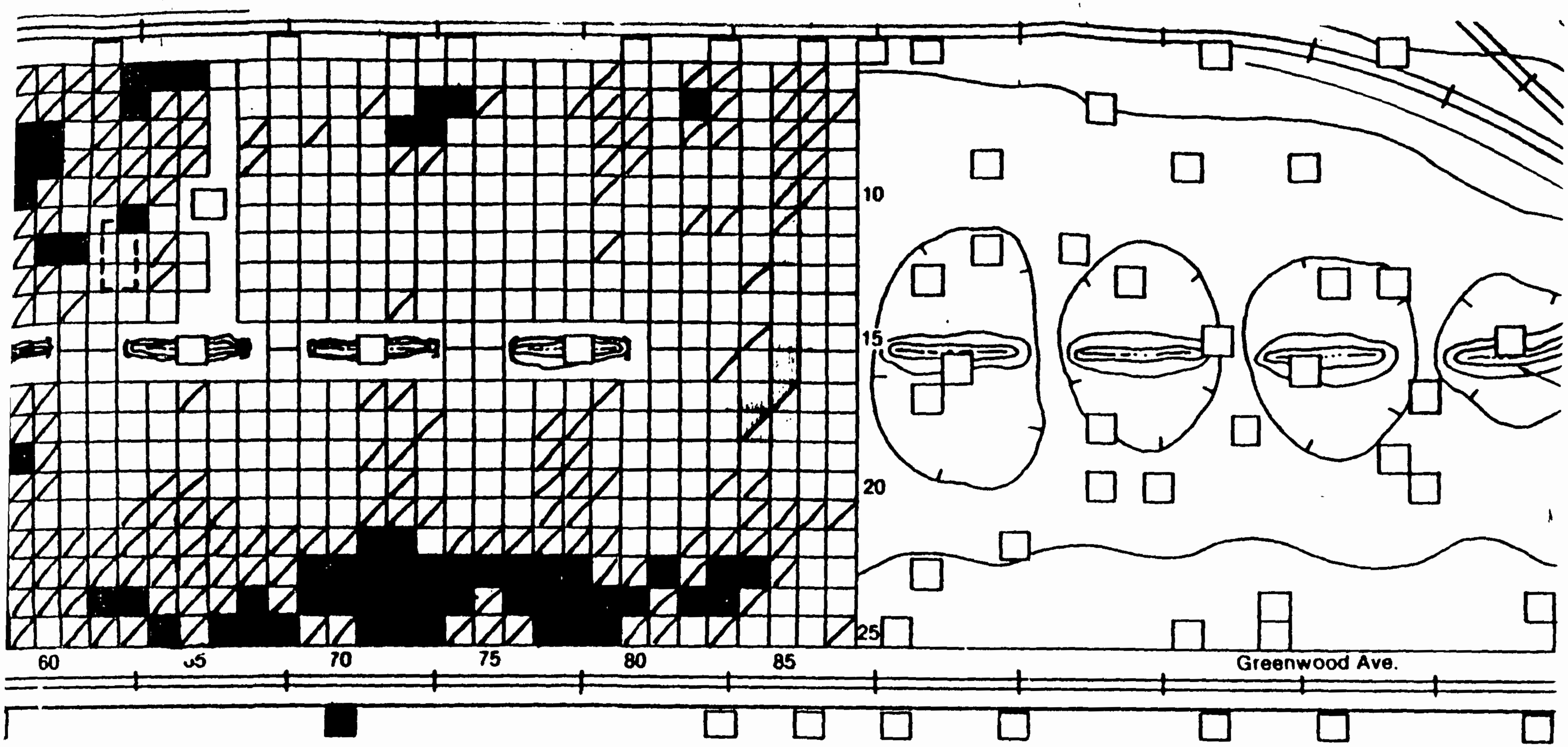
SAMPLE	Surface (01000)	02000 SERIES ABOVE	02000 SERIES BELOW		Concrete (04000)	03000 SERIES ABOVE	03000 SERIES BELOW		
		0.0	0.1	0.4		0.0	0.1	0.4	0.8
2579	45	8	.7	.2	3				
2870	31	6	.1	1	1				

50 Samples

(35) NEAR Surface (15) Subsurface



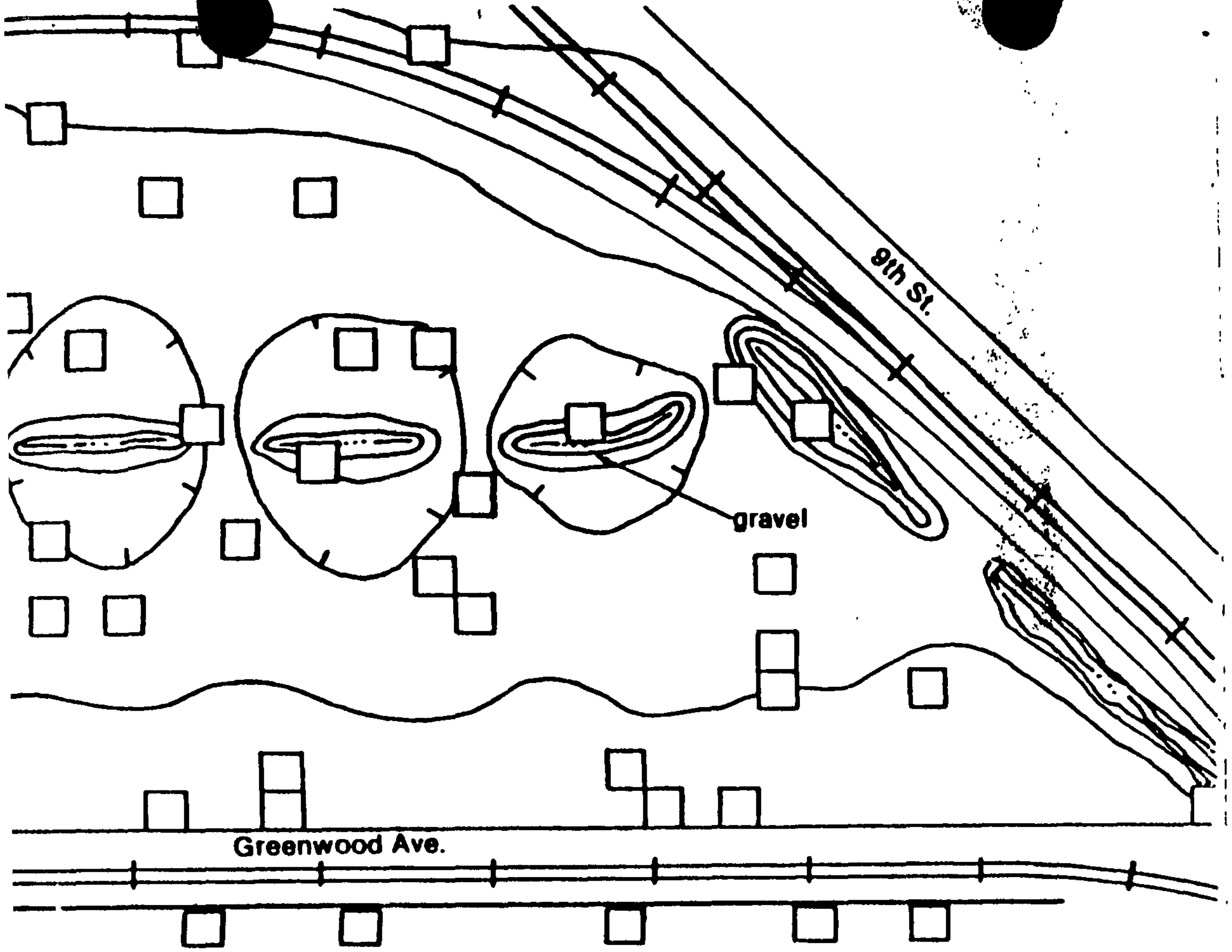
☐ – Rep sample. X for results available



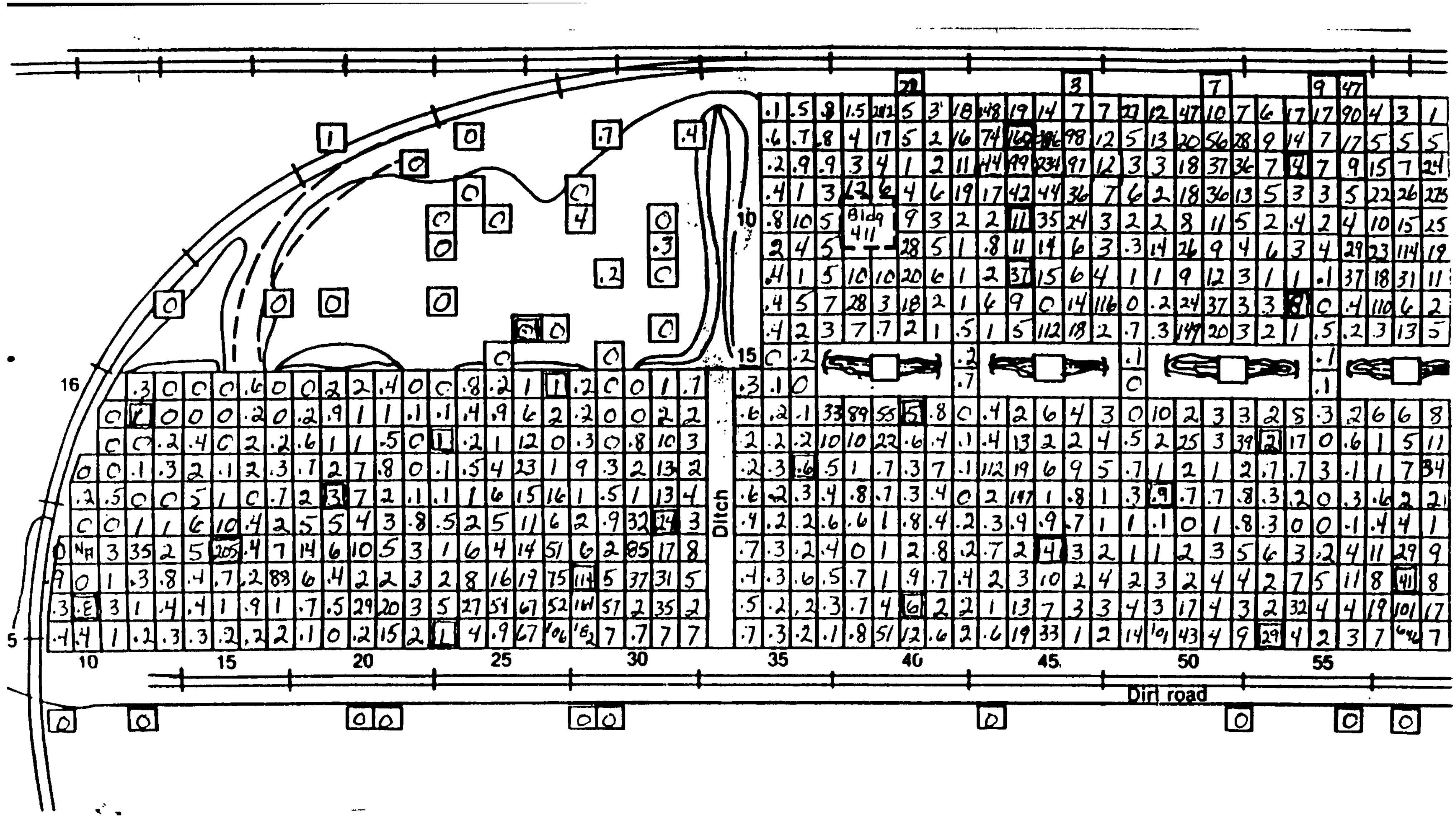
Unvalidated data (not corrected for moisture)

■ - Concentration 20ppb 143 plots @ 12in deep

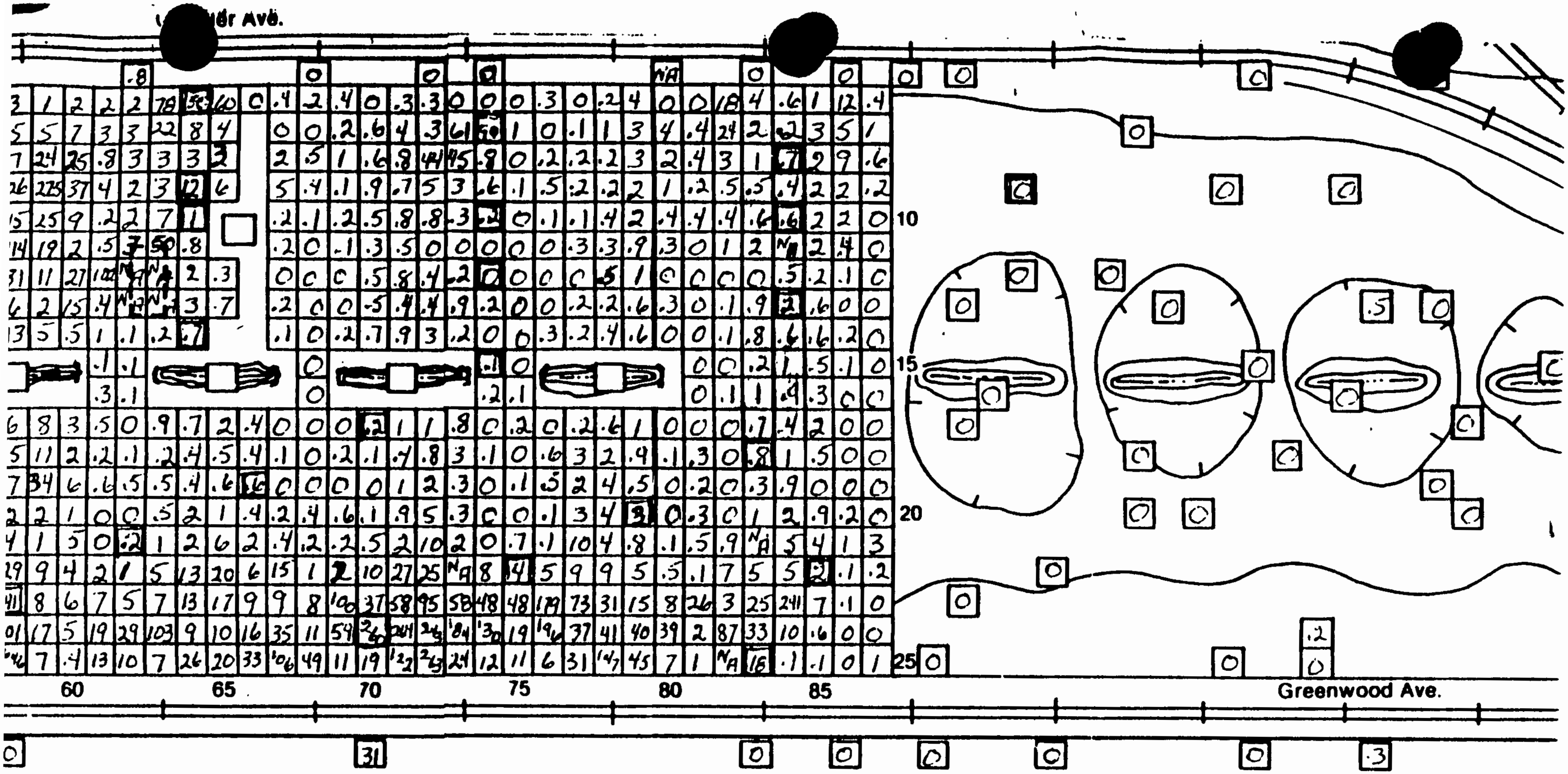
▨ - Concentration < 20 ppb 534 plots @ 6 inch deep



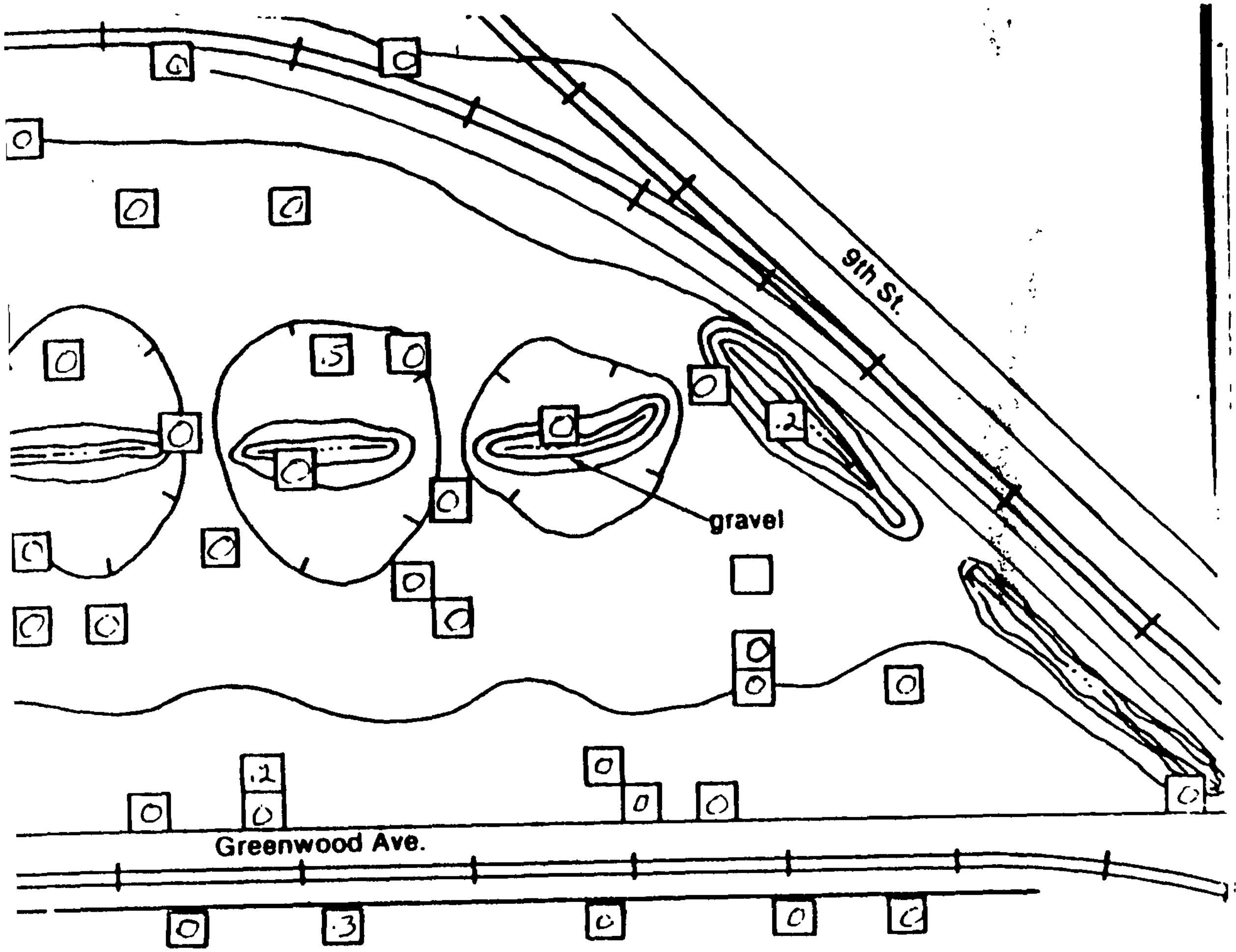
ncentration < 20 ppb
34' plots @ 6 inch deep



Bldg 411
Ditch
Dirt road
16
10
15
5
10
15
20
25
30
35
40
45
50
55



Unvalidated
data
(not corrected for moisture)


9th St.
gravel
Greenwood Ave.

ATTACHMENT II

Evaluation of Johnston Island Data

There were 440, 20 X 20 foot sample grids in the original HO storage area. An additional 98 grids outside this area were likewise sampled, or a total of 538 grids. A surface sample is a composite of five samples taken in an X-pattern within the grid. Each of the five samples is taken from the top 3 inches of material. They are composited and sieved to provide one sample for analysis. These results are numbered 01000 in the attached table. Surface samples from these grids resulted in 760 analyses including duplicates, replicates and QA/QC. Results ranged from non-detected (DL = 0.1) to a maximum of 163 ppb for these surface samples.

In addition, 33 grids were sampled near surface (0.1 to 0.8 ft) and 15 grids were penetration sampled (0.1 to 5.0 ft). The results of these 171 samples varied from non-detected (DL = 0.1) to a maximum of 510 ppb. Of the total 48 grids sampled below the surface, 40 were in the original HO storage site. The results of these samples are shown in the attached table as 02000 for the near surface and 03000 as the penetration to five feet.

The following criteria is used for evaluation:

1. Excavation of a grid for incinerator feed stock will be based on surface data of 1 ppb TCDD or greater.

2. Compare the below surface data with the surface data. Indicate differences to the 1 ppb TCDD standard and note those grids whose surface data is < 1 ppb TCDD, but below surface data is > 1 ppb TCDD.

3. From the below surface data determine the maximum depth required to reach a 1 ppb TCDD level. Determine the ratio of < 1 ppb to > 1 ppb data at each depth.

4. It costs \$2600 to treat a 20 X 20 foot grid to a depth of six (6) inches. It costs \$750 to sample and analyze the same grid, or approximately 30%. Estimate the depth where 70% of the below surface samples are < 1 ppb TCDD.

5. Evaluate the below surface data versus the surface data to determine if a breakpoint value can be given to the surface value such that at less than that breakpoint value, the depth required to achieve < 1 ppb TCDD is correct approximately 70% of the time. Assess the data from a practical, field standpoint of heavy equipment removing and transporting material.

Evaluation results are:

1. There are 199 grids contaminated at > 1 ppb TCDD based on surface (01000) data. The below surface data (02000/03000) was obtained by excavating a trench within the grid and then sampling horizontally the trench wall at the prescribed depths. Since the 0.1 feet analyses are taken within 3 inches of the surface, they will be compared to the surface (01000) data. When the surface data (0.1 ft) of the 02000/03000 samples is compared to the 01000 samples at the 1 ppb excavation limit, there are 18 02000/03000 samples that do not agree with the 01000 result. That is, there are seven 02000/03000 0.1 ft results < 1 ppb when the corresponding 01000 result is > 1 ppb. There are eleven 02000/03000 0.1 ft results > 1 ppb when the corresponding 01000 result is < 1 ppb. The worst case difference is grid 2124 with a 02000 (0.1) result of 345 ppb while the 01000 result is 0.6 ppb. Two of the 48 results were not considered since the 01000 data is not available, or the total 02000/03000 results considered is 46, of which 18 are in disagreement with corresponding 01000 data.

2. A comparison of the 01000 data to 02000/03000 data below surface (i.e., > 0.1 ft) is made to the excavation limit of 1 ppb. There are nineteen 02000/03000 results at the 0.4 ft level that do not agree with the 01000 (surface) value. That is, there are eleven 02000/03000 results that are < 1 ppb with corresponding 01000 values > 1 ppb. There are eight 02000/03000 results that are > 1 ppb with corresponding 01000 values < 1 ppb. A total of forty-six 02000/03000 values were evaluated since 01000 data is not available for two of 02000/03000 results. The worst case difference is grid 2024 with a 02000 (0.4) result of 510 ppb while the 01000 result is 0.1 ppb.

There are twenty of the forty-six 02000/03000 (0.8 ft) results that do not agree with the corresponding 01000 values. That is, there are fourteen 02000/03000 values that are < 1 ppb with 01000 values > 1 ppb. There are six 02000/03000 results that are > 1 ppb with 01000 values < 1 ppb. The worst case difference is grid 2024 with a 02000 value of 251 ppb while the 01000 value is 0.1 ppb.

Evaluation of the 03000 data at the 2.0 to 5.0 ft levels is only made for those 03000 results that are > 1 ppb. There are four of the 15 grids sampled at the 2.0 to 5.0 ft level that show contamination > 1 ppb. Of these four, two are not in agreement with the 01000 value which is < 1 ppb.

Another observation of the 02000/03000 results is that thirteen are in consistent disagreement with the 01000 values at the 0.1, 0.4, and 0.8 foot levels. An additional five grids are in consistent disagreement with the 01000 value at two of the 0.1, 0.4, and 0.8 foot levels. There are seven grids that have increasing 02000/03000 values over the 0.1 to 0.8 levels.

An additional observation is that the subsurface results have concentrations 313% (510/163) higher than the surface even though only 1 subsurface sample was taken for every 11 surface samples, 48:538. This is reasonable due to many actions such as surface photolysis, etc., but most important is that the surface has been contoured to cover residual ash after the removal of the source of the contamination. This assessment, and the above evaluations, preclude a direct relationship between surface and subsurface data.

However, there are ten grids that have agreement; with surface results < 1 ppb, and subsurface results < 1 ppb. These grids would not have to be excavated, and are shown with an "O" on the accompanying grid map. There are a similar number of nine grids that would have to be excavated due to subsurface data > 1 ppb even though the surface data is < 1 ppb. These grids are shown with an "X" on the grid map. All of the girds that have surface data > 1 ppb have been blackened on the grid map. These are 223 grids that are either blackened or have an "X."

3. To evaluate the below surface data, it is grouped according to sample set (02000 or 03000). There are 33 grids sampled at 0.1, 0.4, and 0.8 ft and there are 15 grids sampled at these same values and 2.0, 3.0, 4.0, and 5.0 ft. Of the 15 grids (03000 series) there are no results > 1 ppb at 5.0 ft. There is 1 grid that is equal to 1 ppb at 4.0 ft, however this data is suspect since all other data in this grid is either 0.0 or 0.1 ppb. There are no results > 1 ppb at the 3.0 ft level. At the 2.0 ft level, there are 3 grids > 1 ppb. Therefore, the data ratio is 3 of 15 and the depth is 2.0 ft, or

$$\frac{\frac{3}{15} \times 223 \times 20 \text{ ft} \times 20 \text{ ft} \times 2 \text{ ft}}{27 \text{ ft}^3/\text{yd}^3} = 1321 \text{ yd}^3$$

NOTES:

1. The above and following calculations are made in order to provide comparable evaluation between NCBC and JI for criteria No. 3.

2. As discussed previously, there is no correlation between surface and subsurface data.

3. The above 3 grids are 0613, 0814, and 1916. An average of the 0.1, 0.4, and 0.8 ft data for these grids is 5.8 ppb. If the 0.1, 0.4, 0.8 foot data from grids 2024, 2113, and 2124 are averaged, the result is 222 ppb. These three grids are consistently higher, but do not have data at depths > 0.8 ft.

The next depth to be considered in the 15 grids (03000 series) is 0.8 ft level. There are 5 grids > 1 ppb at 0.8 ft, 3 of which are included above, leaving 2, or

$$\frac{\frac{2}{15} \times 223 \times 20 \text{ ft} \times 20 \text{ ft} \times 0.8 \text{ ft}}{27 \text{ ft}^3/\text{yd}^3} = 352 \text{ yd}^3$$

The next depth to be considered in the 15 girds (03000 series) is the 0.4 ft level. There are 8 grids > 1 ppb at 0.4 ft, 5 of which are included above, leaving 3, or

$$\frac{\frac{3}{15} \text{ X } 223 \text{ X } 20 \text{ ft X } 20 \text{ ft X } 0.4 \text{ ft}}{27 \text{ ft}^3/\text{yd}^3} = 264 \text{ yd}^3$$

There are 2 girds > 1 ppb at the 0.1 ft level that have not already been considered, or

$$\frac{\frac{2}{15} \text{ X } 223 \text{ X } 20 \text{ ft X } 20 \text{ ft X } 0.1 \text{ ft}}{27 \text{ ft}^3/\text{yd}^3} = 44 \text{ yd}^3$$

The remaining 5 grids of the 15 (03000 series) have values < 1 ppb.

In considering the 02000 series data, there are 11 of the 33 girds > 1 ppb at the 0.8 ft depth, or

$$\frac{\frac{11}{33} \text{ X } 223 \text{ X } 20 \text{ ft X } 20 \text{ ft X } 0.8 \text{ ft}}{27 \text{ ft}^3/\text{yd}^3} = 881 \text{ yd}^3$$

There are 14 girds > 1 ppb at the 0.4 ft level of which 11 are considered above, or

$$\frac{\frac{3}{33} \text{ X } 223 \text{ X } 20 \text{ ft X } 20 \text{ ft X } 0.4 \text{ ft}}{27 \text{ ft}^3/\text{yd}^3} = 120 \text{ yd}^3$$

There are 6 grids at the 0.1 ft level > 1 ppb that are not included above or

$$\frac{\frac{6}{33} \text{ X } 223 \text{ X } 20 \text{ ft X } 20 \text{ ft X } 0.1 \text{ ft}}{27 \text{ ft}^3/\text{yd}^3} = 60 \text{ yd}^3$$

The remaining 13 grids of the 33 (02000 series) have values < 1 ppb.

The total volume to be excavated based on the above 02000 and 03000 evaluations is 3042 yd^3.

4. In order to evaluate this criteria, only the 15 grids (03000 series) will be used for > 0.8 ft level and both 02000 and 03000 data for 48 grids will be used for levels of 0.1 ft to 0.8 ft.

   There are no 03000 grids > 1 ppb at the 3.0, 4.0, and 5.0 ft levels. At the 20 ft level, there are 3 grids > 1 ppb, or 3 of 15 and 20%. At the 0.8 ft depth, there are 16 grids > 1 ppb or 16 of 48 (33%). At the 0.4 ft depth, there are 22 grids > 1 ppb or 22 of 48 (46%). At the 0.1 ft level, there are 20 grids > 1 ppb or 20 of 48 (42%). There is no level where 70% of the data is > 1 ppb and therefore this criteria cannot be met.

5. It is anticipated that a Model D6 or larger caterpillar using 6-inch ripper tines will be required to break up the compacted coral. Thus from a practical standpoint, material will be removed in approximately 6-inch intervals.

   Due to the lack of correlation between surface and subsurface data and the variance within the subsurface data, it is strictly a judgement of the depth required to excavate material to a 1 ppb standard. It appears from the 03000 data that somewhere between 0.8 ft and 2.0 ft is the excavation depth. From a practical sense, the 0.8 ft level is essentially 1.0 ft (2 passes of the caterpillar). Since there are a number of high values (as much as 251 ppb) in the 0.8 ft level and only 3 results > 1 ppb (all < 10 ppb) at the 2.0 ft level, it is estimated that a depth of 1.5 ft is required.

$$\frac{223 \text{ X } 20 \text{ ft X } 20 \text{ ft X } 1.5 \text{ ft}}{27 \text{ ft}^3/\text{yd}^3} = 4956 \text{ yd}^3$$

Based on the 03000 data at the 2.0 ft level, 3 of 15 grids would have to be excavated an additional 6 inches, or

$$\frac{\frac{3}{15} \text{ X } 223 \text{ X } 20 \text{ ft X } 20 \text{ ft X } 0.5 \text{ ft}}{27 \text{ ft}^3/\text{yd}^3} = 330 \text{ yd}^3$$

This total material is 5,286 yd^3 and is considered the minimum for field application.

There are 19 (01000) values < 1 ppb in the accompanying table. Of these 19, 10 have subsurface data < 1 ppb, and 9 have subsurface data > 1 ppb. For estimating purposes, 9 of 19 grids whose surface data is < 1 ppb would have > 1 ppb under the surface. There are 232 grids < 1 ppb in the original HO site. An additional 60 - 70 grids are suspect along the west side of the HO site and to the southwest of the site which was part of the dedrumming operation. For estimating purposes, 300 additional grids will have to be sampled and therefore,

$$\frac{\frac{9}{19} \text{ X } 300 \text{ X } 20 \text{ ft X } 20 \text{ ft X } 1.5 \text{ ft}}{27 \text{ ft}^3/\text{yd}^3} = 3158 \text{ yd}^3$$

and if 3 of 15 of these grids require an additional 6 inches to be excavated, then

$$\frac{\frac{3}{15} \text{ X } 300 \text{ X } 20 \text{ ft X } 20 \text{ ft X } 0.5 \text{ ft}}{27 \text{ ft}^3/\text{yd}^3} = 444 \text{ yd}^3$$

or a total of 3602 yd^3. When this is added to the value for surface values > 1 ppb the material to be excavated is a total of 8,888 yd^3. Therefore the amount of material to be excavated is estimated to be in the range of 3000 to 8900 yd^3.

The attached grid map shows the blackened, X'd, and O'd grids. It is observed that the grids within the HO site are essentially random, although the larger areas of contaminated grids appear to be on the periphery. It should also be noted that the area on the west side of the HO site is contaminated to the sea wall. Since the sea wall was replaced after the contamination occurred, it is conceivable that further sampling in this area may result in contaminated material beneath the sea wall.

c USTON ISLAND NEAR & BELOW RFACE SAMPLES VS. SURFACE S kes

SAMPLE	Surface (01000)	NEAR SURFACE (02000 Series) ft. 0.1	0.4	0.8	PENETRATION (03000 SERIES) ft. 0.1	0.4	0.8	2.0	3.0	4.0	5.0
0613	9				31.4	54	62	8	0	0	0
0727	20	.2	0	.1							
0728	19				13	8	3	0	0	0	0
0730	1	.4	44	15							
0814	91				280	56	6	2	0	0	0
0816	7	10	.6	0							
0824	0	0	0	0							
0828	0	0	0	0							
1013	26	68	94	109							
1021	.4	.3	0	0							
1026	1.4	.5	0	.2							
1122	N/A	2	.1	0							
1130	5				.4	0	0	0	0	0	0
1316	.3	36	53	55							
1328	43				0	0	0	0	0	0	.2
1410	.1				.1	0	0	0	0	1	.1

(22) (10)

...NSTON ISLAND NEAR & BELO... ...RFACE SAMPLES VS. SURFACE ...ks

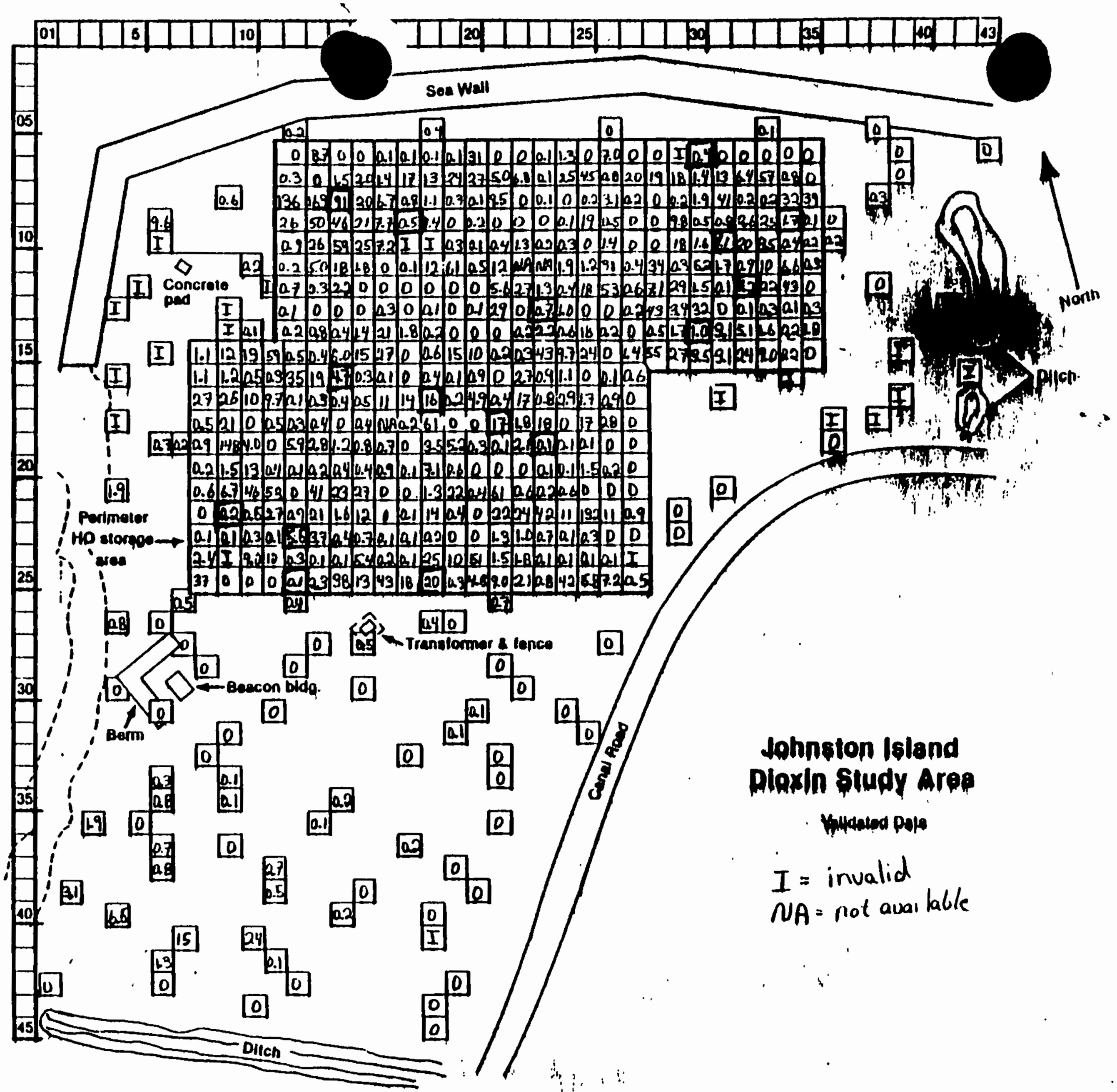
SAMPLE	Surface (01000)	NEAR SURFACE (02000 Series) ft.			PENETRATION (03000 SERIES) ft.						
		0.1	0.4	0.8	0.1	0.4	0.8	2.0	3.0	4.0	5.0
1412	.2	.4	0	0							
1426	.2				.6	0	0	0	0	0	0
1514	8	88	48	35							
1522	.3	85	4	0							
1524	10	5	3	2							
1525	24	.1	0	0							
1531	3	2	.1	0							
1621	0	0	0	0							
1625	0	13	.8	0							
1712	.1	.4	0	0							
1719	.2	0	0	0							
1805	I				16	.4	.1	0	0	0	0
1822	2	15	4	3							
1824	0	.6	0	.1							
1825	1.7				22	3	0	0	0	0	0
1909	148				15	1	.3	0	0	0	.1

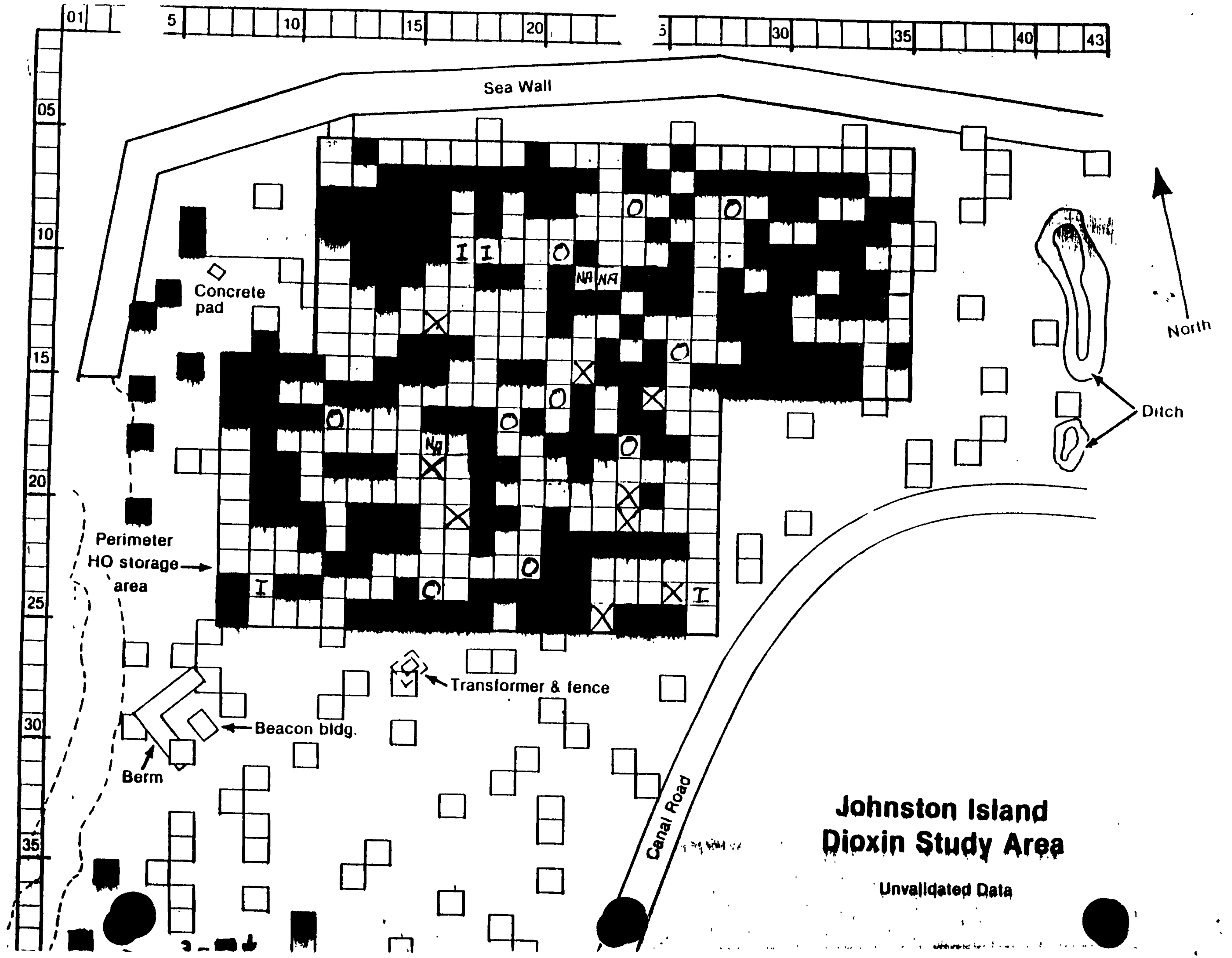
(12) (4)

...NSTON ISLAND NEAR & BELOW ...RFACE SAMPLES VS. SURFACE S...ples

SAMPLE	Surface (01000)	NEAR SURFACE (02000 Series) ft.			PENETRATION (03000 SERIES) ft.						
		0.1	0.4	0.8	0.1	0.4	0.8	2.0	3.0	4.0	5.0
1914	1	2	.5	.1							
1916	.7				28	9	3	3	0	0	0
2009	2	0	0	0							
2024	.1	163	510	251							
2113	41	192	122	95							
2117	0	15	.9	.2	56	26	4	.6	.1	.1	0
2124	.6	345	263	62							
2225	132				2	.2	.1	0	0	0	0
2320	0	.1	0	0							
2408	2	5	1	.2							
2416	.2				.8	2	0	0	0	0	0
2421	2	6	5	4							
2426	.1	16	30	3							
2517	18				.4	0	0	0	0	0	0
2523	.8	4	.1	0							

(33) (15)


Sea Wall
Concrete pad
Perimeter HO storage area
Transformer & fence
Beacon bldg.
Berm
Ditch
Canal Road
North
Ditch
Johnston Island
Dioxin Study Area
Validated Data
I = invalid
NA = not available



01
5
10
15
20
30
35
40
43
05
Sea Wall
Concrete pad
North
Ditch
Perimeter HO storage area
25
Transformer & fence
Beacon bldg.
Berm
Canal Road
Johnston Island
Dioxin Study Area
Unvalidated Data