Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

9103773

MAY 15 1991

91-ERB-099

Mr. Daniel Drais
Stoel Rives Boley Jones & Grey
600 University Street
Seattle, Washington 98101-3197

Dear Mr. Drais:

REQUEST FOR INFORMATION RELATED TO 1100-EM-1 OPERABLE UNIT (HORN RAPIDS LANDFILL AREA)

In response to your letter requesting information related to the 1100-EM-1 Operable Unit (Horn Rapids Landfill Area) and referencing telephone conversations between yourself and Mr. Bob Stewart of the Environmental Restoration Division, the information is enclosed. The information is prefaced by a summary of the U.S. Department of Energy's response for each of the requested items.

If you have any questions regarding this information, please call Mr. Stewart at (509) 376-6192.

Sincerely,

Steven H. Wisness
Hanford Project Manager

ERD:RKS

Enclosure

cc w/encl:
D. Einan, EPA
R. Hibbard, Ecology
Administrative Record - 1100-EM-1

cc w/o encl:
John Stewart, USACE
Wendell Greenwald, USACE
Steve Clark, WHC
Frank Calapristi, WHC

Enclosure

INFORMATION REQUESTED BY STOEL RIVES BOLEY JONES & CREY

In the letter from Stoel Rives Boley Jones and Crey dated April 5, 1991, five groups of information were requested. These requests are shown below with the requested information following each group:

1. A summary of the type, extent, location, and custodian(s) of information (documents, maps, photographs, names of witnesses to dumping, personnel lists, etc.) known or thought to be in Battelle's possession, and indicating which (if any) of those documents have been reviewed by DOE or Westinghouse Hanford Company (WHC).

   Response: A description of past practices at the 1100-EM-1 and references documenting these activities are included in a Battelle, Pacific Northwest Laboratory report (see Attachment 1). Attachment 2 is a letter from Battelle referencing that report and noting some of its weaknesses. Sources of information regarding past practices, cited in the Battelle report, could not be located, but a reference thought to contain similar information is included in Attachment 3. This report was not finalized; consequently, DOE and WHC's knowledge of this report is limited. Other miscellaneous Battelle correspondence are contained in Attachment 4. Based upon conversation with Mr. Terry Liikala of the Battelle Environmental Characterization and Restoration Office, there is no additional information (of any significance) available from Battelle.

2. A summary like the one described in Paragraph 1 of information known or thought to be in the possession of the Corps of Engineers.

   Response: This information does not exist.

3. Information concerning any photographs (including aerial maps) of the 1100-EM-1 site, whether current or historical. If possible, of course, an index to the available photographs would be very helpful. I am advised that Mr. Steve Clark may have knowledge of what photographs and maps might be stored in Richland.

   Response: Aerial photographs of the Horn Rapids Landfill (from the Environmental Protection Agency (EPA) report, "Aerial Photographic Analysis of Rockwell Hanford Operations, Area 1100 Northwest") are as follows:

Date Flown	May 24, 1948	Nov. 2, 1964	Apr. 24, 1973
Source	EROS	EROS	EROS
Picture #	90754	90754	90754
Frame #	2-22	1019	136

Aerial photographs of the remaining portions of the 1100-EM-1 area (from the EPA report, "Aerial Photographic Analysis of Rockwell Hanford Operations, Area 1100") are as follows:

Date Flown	May 23, 1948	Nov. 2, 1964	June 29, 1973
Source	EROS	EROS	EROS
Picture #	89713	89713	89713
Frame #	126	1000	2-28

These photographs cannot be provided to your office because there are no surplus copies and their size (approximately 2-1/2 by 2-1/2 feet) makes them difficult to reproduce. Arrangements can be made to view these photographs at the WHC 450 Hills office by contacting Mr. Wendell Greenwald at (509) 376-9698, or Mr. Clark at (509) 376-1513. Copies of these photographs can be ordered from:

U.S. Environmental Protection Agency
Environmental Monitoring Systems Laboratory
Las Vegas, Nevada 89193-3478

4. Information regarding the anecdotal evidence that seems to have played such a large part in site characterization (see, for example, page 4-1 of the Work Report). Much of the information obtained to date is based on interviews with motor pool and maintenance department workers. Who reported the alleged 200 drums of carbon tetrachloride mentioned on page 4-6 of the Work Report? Are there lists of people who were interviewed, or who were known to be knowledgeable, about activities at the site? If the sources of this and similar information are not in Waste Information Data System (WIDS), as appears to be the case, where are they?

   Response: The majority of the anecdotal information is provided in the Phase 1 Remedial Investigation Report. All other documentation of the anecdotal information is provided in Attachment 5. Additional interviews with individuals involved with disposal work in the 1100-EM-1 Operable Unit is planned for future time. The most reliable information regarding past practices at Horn Rapids Landfill was provided by Mr. M. E. Clark who was the General Foreman of the Transportation Section. This Section was responsible for transporting Hanford waste material and disposing of this material at the Horn Rapids Landfill. The information regarding the 200 drums of carbon tetrachloride was provided by Mr. Herschal Lane who was a crane operator working for the Transportation Section. The conversation with Mr. Lane was not documented and it may not be possible to reinterview him because of his health problems.

5. Any information, including but not limited to final reports, relating to surveys of the South Pit performed during the initial part of the Phase II RI.

Response: Soil gas surveys of the South Pit were reported in the "Soil Gas Sampling and Analysis at the 1100-EM-1 Operable Unit", February 28, 1991, report and was previously provided to Advanced Nuclear Fuels. The geophysical results of surveys at the South Pit were reported in "Geophysical Surveys at the 1100-EM-1 South Pit" (see Attachment 6). Radiation survey results are reported in a WHC Technical Memorandum (see Attachment 7).

SUMMARY

July 18 thru July 25, 1986 Eleven wells on and near the 1100 and 3000 Areas on the Hanford site were sampled for petrochemicals, herbicides, pesticides and various cations and ions. This was to determine if the ground water beneath the areas was contaminated by past and/or present activities on or near the Hanford site. This was a pilot project and sampling was very limited. Although some chemicals were found in the samples at generally low levels, many others were either not present or present at levels below the detection limits. Further sampling is needed to determine concentration levels and sources.

INTRODUCTION

The following ground-water quality study was undertaken by Pacific Northwest Laboratory (PNL) for the U.S. Department of Energy (DOE). The "1100 and 3000 Area Study" was identified as Task 8 under the Hazardous Materials Monitoring Project. The objective of this pilot study were primarily to determine which, if any hazardous chemicals are present in the ground water beneath the study area and secondarily to better define the local hydrology. Figure one is a map of the study area indicating sites of potential contamination and potential sampling wells.

Since this was a pilot project, only one samoling for chemicals was done in each well. While this is enough to

detect the presents of chemicals in measurable quantities, it is not enough to make conclusive determinations concerning the concentrations of those chemicals. Those determinations will be left to follow-up studies.

BACKGROUND

Since the 1940's various locations within the 1100 and 3000 Areas of the Hanford Site have been used as sites for collection, storage and disposal of potentially hazardous chemicals. Equipment maintenance shops and gasoline stations presently operated by J. A. Jones Construction Company (JAJ) and Rockwell Hanford Operations (RHO) (Figure One) have generated waste oils, battery acid and cleaning solvents. Gasoline and other fuels have been stored in underground tanks.

From 1954 to 1984, disposal practices have included collecting waste oils and either dumping them on the ground or spraying small quantities in the air (letter #R85-0795 to Dr. Don Elle of SGA from HA Haerer of RHO, dated 3-26-85). Other chemicals, such as those used in the radiography-photography lab in the 3000 Area, have been disposed of through the city sewer system (Krupin 1985).

Agricultural activities within the 3000 Area may have allowed pesticides and herbicides to escape into the ground water. The agricultural sites, primarily used for alfalfa hay production, have been cultivated for a number of years.

The old Army Corps of Engineers dump and Exxon-Nuclear facilities also have the potential to chemically contaminate the ground water under the study area.

While past land usage in the study area proper may have provided sources of potential ground-water contamination, other sources peripheral to the 1100 and 3000 Areas may also have introduced hazardous chemicals to the area's ground water. These include a site which adjoins JAJ and the North Richland Well Field where the City of Richland currently stores herbicides and pesticides. The Richland sanitary landfill, located to the west of the study area, is a potential source of a variety of chemical contaminants. The Lamb-Weston potato processing plant, southwest of the study area, is another potential source of chemical contamination, as are abandoned landfills which are also located to the southwest. Figure one shows locations of all the above except the abandoned landfills whose exact locations were not identified.

HYDROLOGY SETTING

The geologic formations which underlie the study area are, in ascending order, the Columbia River Basalt Group, the Ringold Formation, the Hanford formation and eolian sediments. The Columbia River Basalt Group, which is at least several thousand feet thick, is bedrock. Overlying the basalts is the Ringold Formation, that consists of semi-consolidated sediments including bedded silts, quartz-rich

sands and quartzite gravels. Thickness of the Ringold Formation under the 1100 and 3000 Areas is approximately 150 feet (Lindberg and Bond 1979). The Hanford formation, consisting of unconsolidated glaciofluvial sands and gravels, overlies the Ringold Formation. Its thickness in the study area varies considerably but is not greater than 150 feet. Surface sediments, generally less than ten feet thick, are composed of eolian sands that have been stabilized by vegetation and recent alluvium.

Ground water in the North Richland and 1100 and 3000 study area is naturally recharged by the Yakima River and generally flows eastward to discharge into the Columbia River (Lindberg and Bond 1979). Water levels in both rivers affect the elevation of the water table. This elevation is also greatly influenced by artificial recharge.

In the study area the two most significant sources of artificial recharge are irrigation water and the City of Richland's infiltration system. The water level in well 699-S36-E13A (Figure 1) was monitored for most of June and August and all of July with a continuous water-stage recorder. During this time the water-table elevation increased 3.31 ft. This increase seems to be of a regional nature as indicated by increases in other nearby wells. It is attributable, at least in part, to irrigation.

The City of Richland's infiltration system operates by pumping water from the Columbia River into infiltration

ponds and allowing it to percolate into the aquifer. Pumping from the river is regulated to limit mounding of the ground water beneath the ponds. Subsequently, the water is pumped from the aquifer and added to the Richland water supply.

Lawn irrigation in North Richland significantly influences the regional water table by adding in excess of 360 million gallons per 1000 acre area during irrigation season (Myers and Thorne 1982). Waste water from industrial sources such as the Lamb-Weston potato plant also increases the ground-water level (Myers and Thorne 1982). In parts of North Richland, the water table surfaces and drains into a river-channel scar (Newcomb et al. 1972).

METHODS

The objectives of this study were achieved by organizing the task into six major phases: 1) preliminary survey of existing wells, 2) establishment of a sampling network, 3) collection of ground-water samples, 4) biweekly water-table measurements, 5) analysis of results, and 6) preparation of a reviewed letter report.

Survey of Existing Wells

Many of the 1100 and 3000 Area wells, drilled in the 1940's and 1950's at Hanford, were either covered and unused or destroyed. Since many Hanford wells no longer exist, city and private wells were sampled and/or measured to supplement

the data set. Private wells became especially useful for measuring the water table.

Establishment of Sampling Network

To establish a sampling network, several factors were considered: 1) well location, 2) completion depth, 3) accessibility, and 4) suitability for sampling. Figure 2 shows the locations of the eleven wells in the sampling network.

Care was taken to include wells adjacent to and upgradient from the study area so that chemicals present in the ground water prior to its reaching the 1100 and 3000 Areas could be identified. The Off Road Vehicle Park (ORV) well was included in the sampling network even though it did not meet all of the above parameters. Although only marginally acceptable for sampling purposes, it was used in the absence of other accessible wells in that area. This well taps ground water from several zones in the confined aquifer within the basalts. Therefore, data from this well are of limited value since comparison with data obtained from the unconfined aquifer is inappropriate.

Sample Collection

Specific chemicals sought in ground-water analysis were selected by considering primary drinking water standards (40 CFR 141), ground-water quality parameters (40 CFR 141), by evaluation of historical and current chemical use, and by

advice from chemists and scientists who have studied ground water in the Hanford area. In general, samples were analyzed for anions, organics, metals, herbicides, pesticides, and petrochemicals.

The eleven wells sampled varied from those with no pumps to those with large turbine pumps (Table 1). Wells without pumps were purged using a 1/2 horse-power Peabody Barnes submersible pump with a garden hose for discharge. The pump, washed prior to installation, was lowered by hand into each of the five wells without pumps (wells 699-S31-E13, 699-S32-E13A, 3000-G, 699-S36-E13B and 3000D-1). A 30 minute standard purge time was selected. As each well was purged, pH, temperature and conductivity readings were taken every five minutes to ensure ground-water stabilization in each well before sampling began. For most city wells with turbine pumps pumping at rates in excess of 1,000 gpm, several minutes running time was considered sufficient for stabilization. Stabilization was achieved in all wells with the exception of 699-S36-E13B.

Ground-water sampling commenced July 18, 1986 and continued through July 25, 1986. Except for the stabilization method described above, sampling was done in accordance with the Procedures for the Hazardous Materials Monitoring Project as documented in PNL-MA-580 (Earth Science Dept. 1986). In accordance with these procedures, a

depth-to-water measurement was taken with a graduated steel tape prior to purging.

After purging was completed and the pump removed from the five wells (Table 1), a clean teflon bailer was lowered into each well and rinsed twice with well water before samples were drawn. Samples were collected from the top of the water column where many contaminants have been found at the Hanford site (Eddy, Myers and Raymond 1978). Sample bottles were filled from the bailer according to the previously mentioned procedures. Well 699-S31-1 was purged with its permanently installed submersible pump and sampled using the bailer following the procedures outlined above.

After obtaining permission, samples were gathered from the five city wells (3000-D, 3000-N, Athletic Park Complex well, 1100-B and ORV) using the samoling port provided because no direct access to the water down the borehole exists.

Samples were analyzed by U.S. Testing Laboratory (UST) and Hanford Environmental Health Foundation (HEHF). Table 2 is a listing of chemicals analyzed by each laboratory along with the detection limits. Samples were delivered to the labs on the day of collection. Because sampling for this project was done at the same time as the Resource Conservation Recovery Act (RCRA) compliance sampling and analysis was done at the RCRA program labs, quality control samples done specifically for the RCRA compliance sampling

were considered sufficient to ensure analysis integrity. Analysis results on blanks, spikes, and interlab comparisons indicated a high level of quality control.

Water-table Measurement

Depth-to-water measurements were taken twice, about two weeks apart. This data was used to construct water-table maps (figures 3 and 4). Effort was made to take water-table elevations in all wells on the same day. However, many of the private wells were accessible only during evening hours and, therefore, were measured up to several days following measurement of Hanford and city wells.

Measurements were taken using a graduated steel tape except in city wells and some private wells. Getting an accurate depth-to-water measurement in city wells was difficult since the measurement is calculated from pressure in an air line that extends down the casing. The length of these lines were unknown and some were thought to be leaking pressure. Some of the data collected by pressure measurement were not used in water-table map preparation. To improve water-table measurement accuracy in the southern part of the study area, measurements were made in private wells. Most of the private wells were measured with an electric tape because its small probe avoided problems associated with the larger steel tape. Surface elevations for private well locations were extrapolated from a topographic map with a 10 foot interval.

DISCUSSION OF RESULTS

Table 3 shows wells grouped by similar location and lists their chemical concentrations. Well 699-S31-1 was assumed to supply background information characterizing the water coming into the study area. Five other wells made up two more groupings from which rough estimates of variation within the ground water were obtained. These were 699-S31-E13 and 699-S32-E13A in one group and 3000-G, 3000-D and 3000-N (3000 group) in the other.

The sample concentrations indicate that the 3000 group, which included two wells from the North Richland well field (3000-D and 3000-N) respond differently for some chemical constituents than the other wells in the study. Analysis results for most chemical components in this group were either below detection limits or present in very small amounts. This probably reflects the introduction of Columbia River water into ground water that has its origin in the Yakima River.

The one sampling from well 699-S36-E13B appeared to be atypical resulting from high sediment concentrations. As per EPA guidance, samples were not filtered in order to obtain total "recoverable" results. When compared with the rest of the data, metal values in this well were generally in the high range. It is probable that these values resulted from the high sediment concentration in the ground-water sample. This sample was not considered valid and its

results will not be discussed further. To ensure this problem does not reoccur, sampling procedures are being changed so that two samples are collected for metal analysis--one filtered and preserved, the other nonfiltered and preserved.

All wells were sampled for nitrate, sulfate, fluoride, chloride and phosphate. Of the remaining ten wells, fluoride (in 6 of 10 samples), chloride (10 of 10), nitrate (8 of 10), and sulfate (8 of 10) were found in the ground water samples (Figure 5). Concentrations were generally low reflecting Hanford background levels (reference needed). Chloride was found in higher ( ).0005 ppm) concentrations in the southern part of the study area (1100-8 and the Athletic Complex well) ranging from 26 to 50 ppm, with a median value of 38 ppm. For the northern part of the study area (ORV, 699-S31-E13, 699-S32-E13A wells), the range was 2.3 to 5.5 ppm with a median of 4.65 ppm. Concentrations in the 3000 group ranged from 0.8 to 1.1 ppm with a median of 0.85 ppm.

Higher nitrate concentrations formed a band (wells 699-S31-1, 3000D-1, Athletic Complex, and 1100-8) tending from the northwest to southeast through the study area. Outside of the band (wells 699-S31-E13, 699-S32-E13A, the 3000 group, and ORV) concentrations ranged from not detectable ((.02) to 2.4 ppm. Within the band nitrates ranged from 12.5 to 165 ppm. The median was 27 ppm. Further sampling and analysis is necessary to refine the estimate of the

distribution of the concentration levels and to establish the source or sources.

Fluoride concentrations in all wells except ORV ranged from undetectable (<0.1) to .34 ppm. Among the samples, the ORV sample was high with 1.3 ppm.

Sulfate concentrations vary throughout the study area. Concentrations range from undetectable (<.1) low to a high of 40 ppm. No spatial pattern was evident.

All wells were sampled for volatile organics (VOC), acid/base/neutral (semi-volatile) organics (ABN) and/or herbicides and pesticides. The VOA and ABN are indicators of the presence of petrochemicals. Methylene chloride (30 ppb) was found in the ground-water sample from 3000D-1, and bis(2-ethylhexyl) phthalate (22 ppb) was present in the sample from S31-1. Otherwise no petrochemicals, herbicides or pesticides were detected in any of the samples. Total Organic Halogen (TOX) and Total Organic Carbon (TOC) generally fell within acceptable ranges (< ppm) (reference needed).

Samples were tested for the following metals: barium, cadmium, chromium, silver, copper, mercury, sodium, nickel, manganese, vanadium, aluminum, iron, lead and potassium. Of these, barium (in 9 of 10 samples), cadmium (5 of 10), manganese (4 of 10), sodium (10 of 10), potassium (10 of 10), and iron (5 of 10) were found to be present in the

ground-water samples (figure 6). Concentrations for all other metals were below detection limits.

The higher barium concentrations were located in the same band that the higher nitrate values were found. Within the band, barium values ranged from 0.47 ppm to 0.83 ppm with a median of .53 ppm. Outside the band, barium values ranged from undetectable (<0.1 ppm) to 0.23 ppm with a median of .15 ppm.

Samples from three wells (S32-E13A, 3000D-1 and 3000-G) had the highest cadmium levels. These wells are located in the northern half of the study area. Values range from undetectable (<.005 ppm) to a high of 0.035 ppm with a median of .0137 ppm.

Lead traces were found on the northern perimeter of the study area. Concentrations ranged from undetectable (<.0005 ppm) to 0.047 ppm with a median of 0.017 ppm. Throughout most of the study area, lead concentrations were at levels too low to detect.

Although potassium is present throughout the study area, concentrations are thought to be Hanford background levels. The "Hanford average" is about 5 ppm (Price, K.R. 1985). Potassium ranged from 5.1 to 13.2 ppm with a median of 8.5 ppm. Within the 3000 group the range was .95 to 1.82 ppm with a median of 1.10 ppm.

Concentrations of sodium were found to be significantly lower in the 3000 group also, ranging from 3.5 to 4.1 ppm. Sodium concentrations in other parts of the area ranged from 17 to 72 ppm with a median value of 31.0 ppm. which reflects the higher sodium concentrations found in the Yakima River and therefore the ground water (Newcomb and others 1972).

Along the northern perimeter of the study area, manganese was detected ranging from .055 to 1.0 ppm in the samples. It was not detectable in samples from most of the other wells.

Samples for coliform bacteria were drawn from six wells. Well 3000-D tested positive at 2.2 total coliform/100 mL which is the detection limit; all others were negative.

Two water-table maps (Figures 2 and 3) of the 1100 and 3000 Study Areas and part of North Richland were prepared from the water-level measurements taken during this study. Both maps support the eastward flow of the ground water. Both maps have cones of depression centered under the North Richland well field indicating that water is being withdrawn from some of the wells. The first map was constructed from data collected during the two week period of July 21 thru August 1, 1986 (figure 2). The second map (figure 3) was drawn from data collected during the August 4 to August 15, 1986 period.

RECOMMENDATIONS

Even though the chemicals found in the ground-water samples from the 1100 and 300 study area were in what generally appeared to be low concentrations, a follow-up study is recommended. The objective of the follow-up study should be to estimate concentration levels for chemical constituents found in this study. If sources can be established, that should also be an objective.

The following recommendations should considered if the proposed study is conducted. 1) Well S36-138 should be purged only until it has stabilized or allowed to recover after being evacuated to avoid sediment collection with the sample; 2) to obtain better control effort should be made to sample and measure the monitoring wells around the Exxon-Nuclear facilities; 3) if city wells are included in future studies, another means should be found to measure depth-to-water. Perhaps a canyon tape could be used for calibration facilitating more accurate measurements; 4) more background wells especially to the south and west of the 1100 and 3000 should be found or drilled; 5) if private wells are used, a more accurate method of obtaining surface elevations needs to be employed and well completion schedules need to be obtained.

REFERENCES

Eddy, P.A., Myers, D.A., and Rsaymond, J.R. 1978. Vertical contamination in the unconfined groundwater at the Hanford Site, Washington: PNL-2724, Pacific Northwest Laboratory,

Haerer, H.A. letter #r85-0795 to Dr. Don Elle of SQA 12-26-85

Krupin, P.J. memo thru Dr. D.R. Elle of SQA 12-14-85

Lindberg, J.W., and Bond, F.W. 1979. Geohydrology and ground-water quality beneath the 300 area, Hanford Site, Washington: PNL-EY-76-c-06-1830, Pacific Northwest Laboratory

Myers, D.A. and Thorne, P.D. letter to Stan Arlt, City of Richland 8-11-1982

Newcomb, R.C., Strnad, R.C., and Frank, 1972, Geology and ground water characteristics of the Hanford Reservation of the U.S. Atomic Energy Commission, Washington: U.S. Geol. Survey Prof. Paper 716

PNL-MA-580 Earth Science Department 1986

Price, K.R. 1986. Environmental Monitoring at Hanford for 1985: PNL-5817, Pacific Northwest Laboratory

40 CFR 141

UST	DETECTION LIMIT	HEHF	DETECTION LIMIT
TOX		Coliform	
TOC		Ions	
Petrochemicals		----	
----------		Fluoride	
VOC		Chloride	
ABN		Nitrate	
Pesticides		Phosphate	
Herbicides		Sulfate	
		Metals	

		Barium	
		Cadmium	
		Chromium	
		Silver	
		Copper	
		Mercury	
		Sodium	
		Nickel	
		Manganese	
		Vanadium	
		Aluminum	
		Iron	
		Lead	
		Potassium	

WELL	3000B	3000D	3000N	S3I E13	S3E E13A	DRY	S3I-1	ATH C	1100-D	3000D1	E13B
EMA#	4903	4904	4907	4902	4906	4898	4606	4899	4901	4900	4905
TOX	0.0004	0.0006	0.0002	0.0065	0.0008	0.0006	0.0034	0.0144	0.0124	0	19.6
TOC	4.206	5.762	3.748	1.38	1.001	-0.0855	1.608	2.499	1.278	2.786	9736
F	(0.1	(0.1	(0.1	(0.1	0.28	1.3	0.94	0.34	0.1	0.16	0.27
Cl	0.85	0.8	1.1	5.5	4.5	2.3	4.8	50	26	6	4.2
NO3	0.45	0.35	1.5	2.4	21	(0.2	(0.2	165	33	12.5	(0.2
SO4	20.5	9.1	10	4.4	20.5	(1	(1	5.9	40	16	13.8
Ba	0.11	0.1	0.15	0.2	0.47	(0.10	0.21	0.83	0.53	0.23	1.2
Cd	0.01	(0.0005	(0.0005	0.0072	0.0046	(0.0005	0.035	(0.0005	(0.0005	0.012	(0.0005
Mn	(0.1	(0.01	(0.01	1	0.16	(0.01	0.055	(0.01	(0.01	0.19	1.63
Na	3.5	3.7	4.1	20	20	42.8	43.7	72	31	17	25.4
K	1.1	0.95	1.82	7	9.8	9.6	7.8	13	8.5	5.1	13.2
Fe	(0.03	(0.03	(0.03	32.8	6.7	(0.03	1.67	(0.03	0.068	1.69	16.8
Pb	(0.005	(0.005	(0.005	0.017	0.008	(0.005	0.047	(0.005	(0.005	(0.005	(0.005
Al	(0.5	(0.5	(0.5	(0.5	(0.5	(0.5	(0.5	(0.5	(0.5	(0.5	4.9
Cr	(0.005	(0.005	(0.005	(0.005	(0.005	(0.005	(0.005	(0.005	(0.005	(0.005	(0.005
Ag	(0.005	(0.005	(0.005	(0.005	(0.005	(0.005	(0.005	(0.005	(0.005	(0.005	(0.005
Cu	(0.05	(0.05	(0.05	(0.05	(0.05	(0.05	(0.05	(0.05	(0.06	(0.05	(0.05
Ni	(0.1	(0.1	(0.1	(0.1	(0.1	(0.1	(0.1	(0.1	(0.1	(0.1	(0.1
V	(0.04	(0.04	(0.04	(0.04	(0.04	(0.04	(0.04	(0.04	(0.04	(0.04	(0.04
Hg	(0.0005	(0.0005	(0.0005	(0.001*	(0.0005	(0.0005	(0.001*	(0.0005	(0.0005	(0.0005	(0.0005
ABN				ND	ND**		NT	NT			
VOA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND***	ND
HERB	NT	NT	NT	(0.001	(0.001	(0.0016**	(0.001	(0.001	(0.001	(0.001	(0.001
PEST	NT	NT	NT	(0.001	(0.001		(0.001			(0.001	(0.001
PO4	(0.5	(0.5	(0.5	(0.5	(0.5	(0.5	(0.05	(0.5	(0.5	(0.5	(0.5
COLIFORM	NEG	POS	NEG	NT	NT	NEG	NEG	NEG	NT	NT	NEG

* Inadequate sample volume

** B40 22ppb

*** Methylene Chloride A93 20ppb

**** Inadequate sample

NT= Not taken

ND= None detected

Units in parts per million

WELL	3000G	3000D	3000N	S31-E13	S32-E13A	ORV	S31-1	ATH C	1100-D	3000D1	S36-13B
EMA#	4903	4904	4907	4902	4906	4898	4606	4899	4901	4900	4905
TOX	0.4	0.6	0.2	6.5	0.8	0.6	9.4	14.4	12.4	0	19.6
TOC	4206	5762	3748	1380	1001	-85.5	1608	2499	1278	2786	9736
F	<100	<100	<100	<100	280	1300	940	340	100	160	270
Cl	850	800	1100	5500	4500	2300	4800	50000	26000	6000	4200
NO3	450	350	1500	2400	12000	<200	<200	165000	33000	12500	<200
SO4	20500	9100	10000	4400	20500	<1000	<1000	5900	40000	16000	13800
Ba	110	100	150	200	470	<100	210	830	530	230	1200
Cd	10	<0.5	<0.5	7.2	4.6	<0.5	35	<0.5	<0.5	12	<0.5
Mn	<100	<10	<10	1000	160	<10	55	<10	<10	190	1630
Na	3500	3700	4100	20000	20000	42800	43700	72000	31000	17000	25400
K	1100	950	1820	7000	9800	9600	7800	13000	8500	5100	13200
Fe	<30	<30	<30	32800	6700	<30	1670	<30	68	1690	16800
Pb	<5	<5	<5	17	8	<5	47	<5	<5	<5	<5
Al	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500	4900
Cr	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Ag	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Cu	<50	<50	<50	<50	<50	<50	<50	<50	<60	<50	<50
Ni	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
V	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40
Hg	<0.5	<0.5	<0.5	<1*	<0.5	<0.5	<1*	<0.5	<0.5	<0.5	<0.5
ABN				ND	ND**		NT	NT			
VOA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND***	ND
HERB	NT	NT	NT	<1	<1	<1.6****	<1	<1	<1	<1	<1
PEST	NT	NT	NT	<1	<1		<1			<1	<1
PO4	<500	<500	<500	<500	<500	<500	<50	<500	<500	<500	<500
COLIFORM	NEG	POS	NEG	NT	NT	NEG	NEG	NEG	NT	NT	NEG

* Inadequate sample volume

** 640 22ppb

*** Methylene Chloride A93 20ppb

**** Inadequate sample

Units in parts per billion

NT= Not taken

ND= None detected

50 ppb

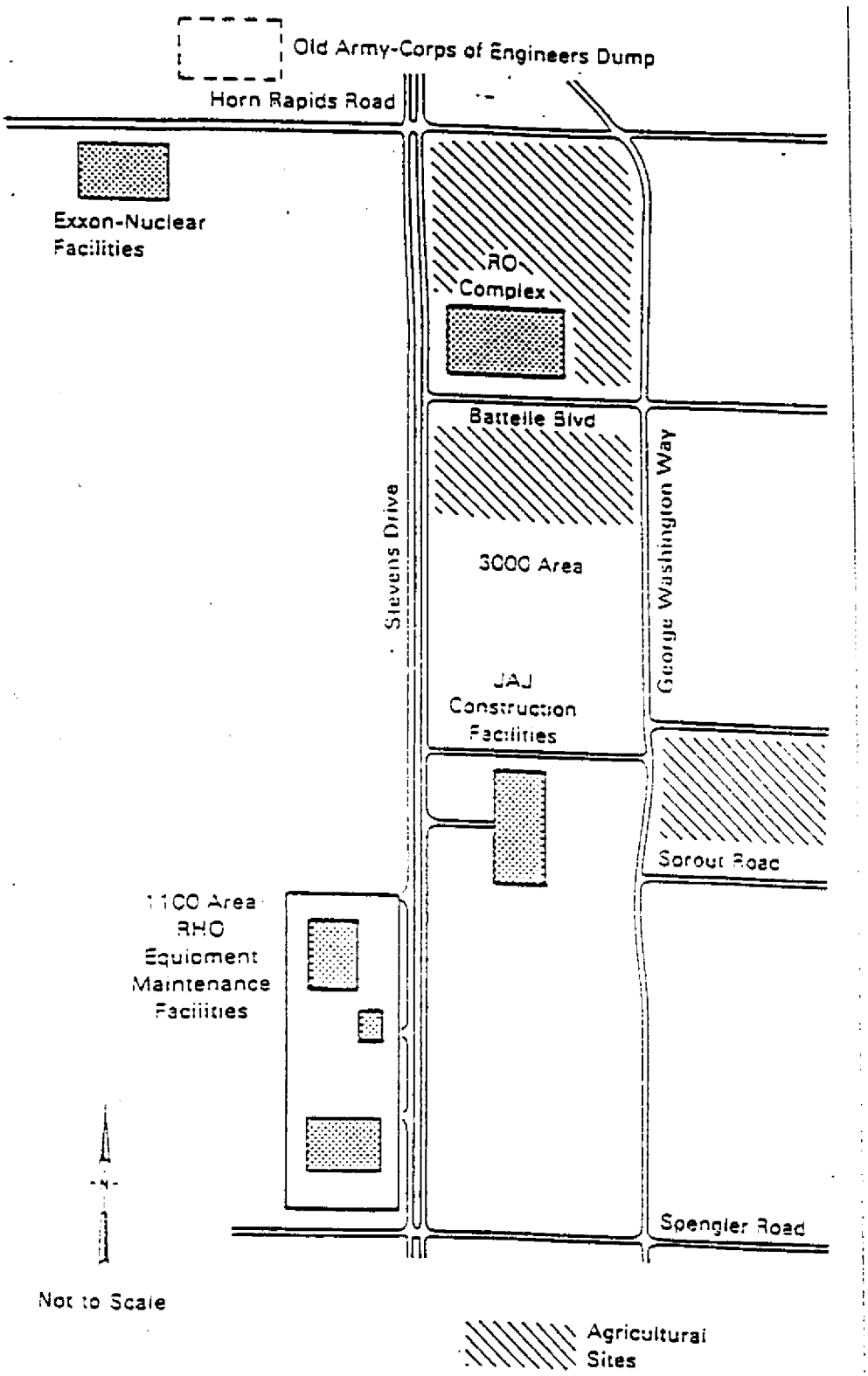
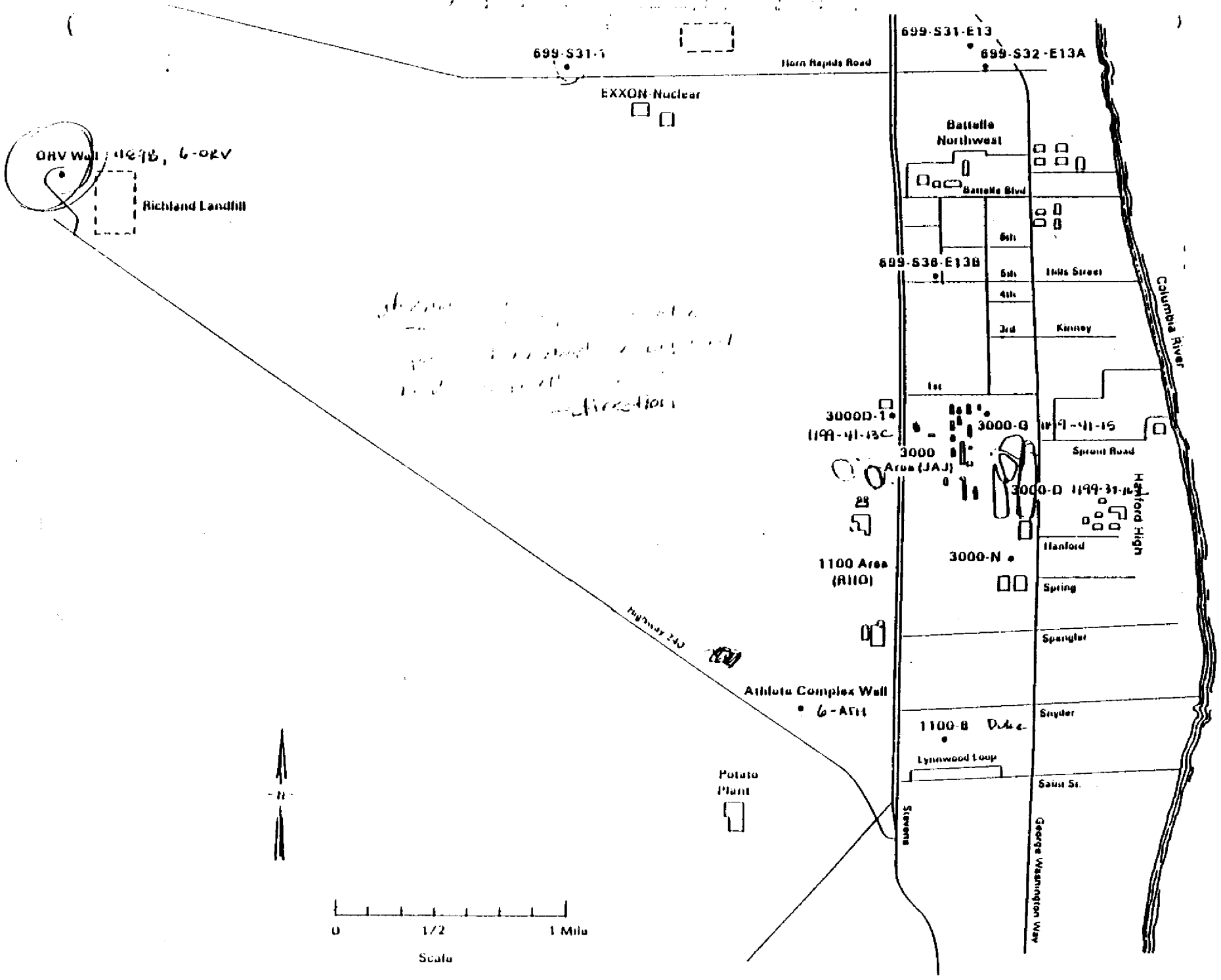


Figure 1. Study Area


699-S31-1
699-S31-E13
699-S32-E13A
Horn Rapids Road
EXXON-Nuclear
Battelle Northwest
Battelle Blvd
ORV Wall
Richland Landfill
699-S36-E13B
6th
5th
Hills Street
4th
3rd
Kinney
1st
Columbia River
3000D-1
1199-41-13C
3000-B
1199-41-15
Sprout Road
3000 Area (JAJ)
3000-D
1199-31-
Hanford High
Hanford
1100 Area (A110)
3000-N
Spring
Highway 240
Spengler
Athlete Complex Wall
6-ATH
1100-B
Snyder
Lynnwood Loop
Saint St.
Potato Plant
Stevens
George Washington Way
N
0
1/2
1 Mile
Scale

Battelle
Pacific Northwest Laboratories
P.O. Box 999
Richland, Washington U.S.A. 99352
Telephone (509) 376-2781
Telex 15-2874

June 28, 1988

bcc: RW Bryce
MD Freshley
CA Geffen
MJ Graham
MS Hanson
PE Long
PJ Mitchell
RM Smith
File/Lb

Dr. Kenneth A. Gasper
Manager, Environmental
Restoration Programs
450 Hills Street, H4-53
Westinghouse Hanford Company
Richland, WA 99352

Dear Ken:

DRAFT REPORT ON 1100 AREA GROUND-WATER ANALYSES

Recently, it came to my attention that in July 1986, eleven wells in or near the 1100 and 3000 Areas of Hanford were sampled for a variety of cations, anions, and organics. This study was undertaken by a summer NORCUS student at PNL and was for the purpose of making an initial assessment of the ground water quality beneath the study area using existing facilities. The resultant water analyses were assembled into a draft report. This memo is to inform your office of the draft report's existence.

Apparently, the draft report was never critically reviewed, edited, nor released from PNL. In my discussions with PNL staff and line management, a number of limitations were noted in the report that made it difficult to confirm the usefulness of its information. These included: unknown sampling intervals for several wells, use of multiple sampling methods, collection of single (versus multiple) samples, and the lack of duplicate analyses. These limitations raise questions about the representativeness of data. Therefore, while it is recommended that the 1100 Area Work Plan authors be aware of this preliminary information (they have copies) as they plan future sampling activities, it is also recommended that they recognize its weaknesses.

To remedy the report's shortcomings and to better establish water quality information in the 1100 and 3000 Areas, I have spoken with staff from the Geosciences Department of PNL about a recommended plan of action. During this or next fiscal year, it is proposed that the sitewide ground-water monitoring project at PNL re-sample existing wells and have new wells drilled to resolve questions about local ground-water quality. Any such activities could also provide very useful information for WHC and PNL staff planning Environmental Restoration Program activities in the southern portion of the Hanford Site. A FY-1989 budget proposal for accomplishing the above activities is being written for the sitewide project.

Battelle

If there are any questions, please contact Robert W. Bryce at 376-8345 or me.

Very truly yours,

Roy E. Gephart, Manager
Environmental Characterization
and Restoration
Office of Hanford Environment

REG:cj

cc:

WHC
MR Adams
PS Peacock
RG McCain
TM Wintczak

DOE-RL
JJ Broderick
KW Thompson
MW Tiernan

To: D.R. Elle, Chief, RESB
From: P.J. Krupin, RESB 2/22/85

SUBJECT: JAJ 3000 Area Hazardous Waste Inspection

Date of Inspection: 2/20/85 1 pm to 2:30 pm

Participants: P.J. Krupin DOE-RL
Ed Rose JAJ
Tim Lovett JAJ

Purpose: Evaluate existing facilities and historic facility sites and locations for existing or potential contamination to the ground water, in response to the 1/11/85 City of Richland letter to Dr. Lorenzini.

FACILITIES EVALUATED:

Old gas station/Underground storage tanks: There are 4 underground storage tanks at an old gas station located about 300 feet west of the vehicle maintenance shops. One of the tanks has collapsed under the weight of the cement and overburden. JAJ does not know if the tanks are completely empty but will find out in the next few days.

New gas station/underground storage tanks: There is a recently used gas station facility which was also just recently taken out of service, on the south end of the 3000 area. JAJ will also check to see if the tanks are completely empty in the next few days.

Warehouse/Vehicle Maintenance Shops: A walk-through of these facilities indicated that JAJ safety personnel have been very effective in getting procedures revised and implemented to ensure that hazardous chemicals are not released to the sewer, or dumped on the ground, or otherwise disposed of improperly. Chemicals on shelves were properly labeled, 55 gallon drums were regularly placed and marked appropriately for disposal of hazardous chemicals.

1234 Building: PNL stores laboratory chemicals in this facility. Chemicals observed included oxidizers, corrosives, bulk liquids, bulk solids, and numerous other small quantity materials. The facility appeared clean , well-maintained, ventilated, and organized. There was no evidence that a hazardous materials tracking system was in place and operating at this facility. I have asked PNL to status this effort.

Oil and Grease Pit/Tank: There is a buried 300 gallon tank with a funnel-input in the center of the 3000 area compound on the east side of the vehicle maintenance shops. JAJ plans to replace the tank, in the next few months, as it has been in place since the site was

originally constructed. They plan to inspect the soils beneath the tank when they remove it and replace it, and will notify RESB whe the work is about to begin so that we can be there. The 300 gallon tank is usually pumped every 3-4 months, and does not appear to leak.

Waste Drums/Hazardous Waste Disposal: Hazardous wastes from JAJ facilities and operations are placed in 55 gallon drums in the buildings and shops When filled they are moved to an outside storage location next to the solvent/paint storage facility to await transport by Rockwell. The present drum storage area is un-lined and open, but JAJ has plans to build a cement or steel pad with curbs for spill control and protective rain cover.

Radiography/Photo Lab: This building is on the east side of the 3000 area compound , is fenced and has automatic bright red warning lights to indicate when radiographic operations are in progress. Photographic chemicals, formerly [illegible] to the city sewer, are now sent to [illegible].

Historic disposal along fence line: We spoke with a JAJ employee who had worked for the company when the operations started. He said that the most significant amount of disposal to the groung occurred in 1951-52, pointed to the fence line along the east side of the compound, and referred to the old Army Corps of Engineers dump at the present Exxon facility location as places where paints and solvents were regularly taken.

Hazardous Materials/Hazardous Waste tracking System: Tim Lovett has single-handedly programmed a very effective tracking system on an IBM PC and implemented a very comprehensive program. Hazardous chemicals will not be accepted by JAJ unless the manufacturer or supplier identifies the materials as such and labels the delivered items additional checks on the tracking system exist in procurement, the warehouse, and at the point of use. Safety also performs inspections, audits and inventories. DOE-RL inspections and appraisals are an additional mechanism by which quality control is maintained.

Hazardous Materials/Hazardous Waste Training: JAJ has acquired several slide tapes on hazardous waste management, specific safety training programs (ie. Methyl Ethyl Ketone, etc.), and conducts 1 -2 hour sessions for company employees regularly. Employee training includes tests which must be passed before certification and training completion is granted. Employee training records are maintained on the IBM PC, and appeared to be up-to-date and comprehensive. Safety personnel continue

to expand the training program and have been succesful at gaining both the recognition and wholehearted support of the higher management and the hundreds of employees in the company. The effectiveness of the efforts is readily surmised and observed when walking around the facility and buildings.("Here comes Safety!")

SPCC Plans: JAJ is in the process of writing plans and procedures on a facility specific basis. Manuals have been revised and are available for inspection.

Control over subcontractors: JAJ has revised the standard sub-contract form.
Page 5 of the contract states:
"The Contractor shall comply with the following health and safety regulations:
6.Washington Department of Ecology(WDOE 173-303)."
Page 7 of the contract states:
"The contractor shall comply with and be responsible for controlling Contractor hazardous materials and hazardous wastes as directed by JAJ and in compliance with Federal, State, local and DOE regulations."

Summary: JAJ Safety has done an excellent job in recognizing the companies responsibilities in hazardous material/waste management. Present practices and conditions assure that contamination of the ground water does not occur. Historic practices and older facilities have been evaluated and represent a potential source of contamination. Underground storage tanks at two gas station sites also represent a potential source of contamination and are in the process of being assessed for leaks.

Battelle
Pacific Northwest Laboratories

Project Number _____

Internal Distribution

RW Bryce
MD Freshley
PJ Mitchell
RM Smith
File/LB

Date June 7, 1988

To R. E. Gephart

From T. L. Liikala TLL 6-8322

Subject 1100 AND 3000 AREA STUDY

As requested, a summary of the 1100 and 3000 Area Study is provided below to support planning for the hydrogeologic investigation in the 1100/3000 Area. This study was conducted by C. W. Bishop, NORCUS, during the summer of 1986 as part of the Hazardous Materials Monitoring Project. This summary contains information from the detailed task plan, methods, sampling results, and limitations of the study. Additional details will be provided in a PNL report to be completed this summer.

The objective of this study was to make an initial assessment of the potential hazardous constituents which may be present in the groundwater beneath the 1100 and 3000 Area (Attachment 1). Monitoring efforts were concentrated in those areas which are hydraulically downgradient from the WHC equipment maintenance facilities, service station(s), chemical storage area, and KEH construction facilities.

A total of 11 Hanford Site and City of Richland wells were sampled between July 18 and 23, 1986 (Attachment 2). To the extent applicable, groundwater samples were collected in accordance with established procedures in PNL-MA-580, Environmental Monitoring Procedures. The samples were selectively analyzed for VOAs, ABNs, pesticides, herbicides, metals, anions, TOC, TOX, and coliform by UST and HEHF. Results of these analyses are shown in Attachments 3 and 4.

A preliminary report on this study was prepared by C. W. Bishop. However, this report has not received formal technical or editorial review and caution should be exercised when using these data. The scope of this study was very limited and the data should not be used to determine the groundwater quality in the 1100/3000 Area without additional sampling and research. Limitations noted during the study include: completion intervals for several of the wells were not known, three different sampling devices were used, all wells were sampled only once, and results were obtained from two separate analytical laboratories.

If you have any questions or need additional information, please contact me at 376-0117.

TLL:cac

Attachments

Battelle
Pacific Northwest Laboratories

Project Number _____

Internal Distribution

DJ Bates
PE Bramson
PA Eddy
CE Elderkin
MR Fuchs (RHO)
RO Gilbert
MJ Graham
HA Haerer
PJ Krupin (OOE)
GV Last
TL Liikala
T Lovatt (JAJ)
TJ McLaughlin
DA Myers
JR Raymond
JA Stottlemyre
File/LB

Date July 1, 1986

To LS Prater

From CW Bishop CB

Subject 1100 and 3000 Area Study

Attached is the final detailed task plan for the 1100 and 3000 Area study. Comments were received and incorporated from those individuals on the distribution list. I will be working on this project intensively for the next two months under my NORCUS appointment.

CWB:rt

ATTACHMENT 1

TASK 8. 1100 AND 3000 AREA STUDY

INTRODUCTION

Chemicals and petroleum products have been stored, used, transported, and possibly released to the ground in the southern part of the Hanford Site, near the 1100 and 3000 Areas. Chemicals that may have been discharged include battery acid, paints and solvents, and photographic chemicals. Gasoline may have leaked from underground storage tanks; also waste oil, including transmission and hydraulic oils, may have been released. Little or no research has been done to determine if the ground-water in this area has been contaminated and, if so, to what extent. Facilities in these areas with potential for creating ground-water contamination problems include Rockwell Hanford Operations (RHO) equipment maintenance facilities, service station(s), and chemical storage area, and J. A. Jones Construction Services Company (JAJ) facilities. Figure 1 is a map of the study area which shows the location of these facilities.

OBJECTIVES

The objective of this task is to make an initial assessment of the potential hazardous constituents which may have entered the ground-water near the 1100 and 3000 Areas. In the event ground-water contamination is detected, follow-up studies will be recommended to determine the possible extent of contamination. If no contamination is found, continued periodic monitoring may be recommended.

SCOPE

Ground-water monitoring efforts in this study will be concentrated in those areas which are hydraulically downgradient from the RHO equipment maintenance facilities, service station(s), and chemical storage area, and JAJ construction facilities. For the purposes of comparison, some upgradient wells will be included. Other areas of potential ground-water contamination within the study area, including the old Army Corps of Engineers dump, Exxon Nuclear facilities, Camp Hanford (3000 Area), agricultural sites, and sewers from 3000 Area users, will be monitored as closely as existing controls allow.

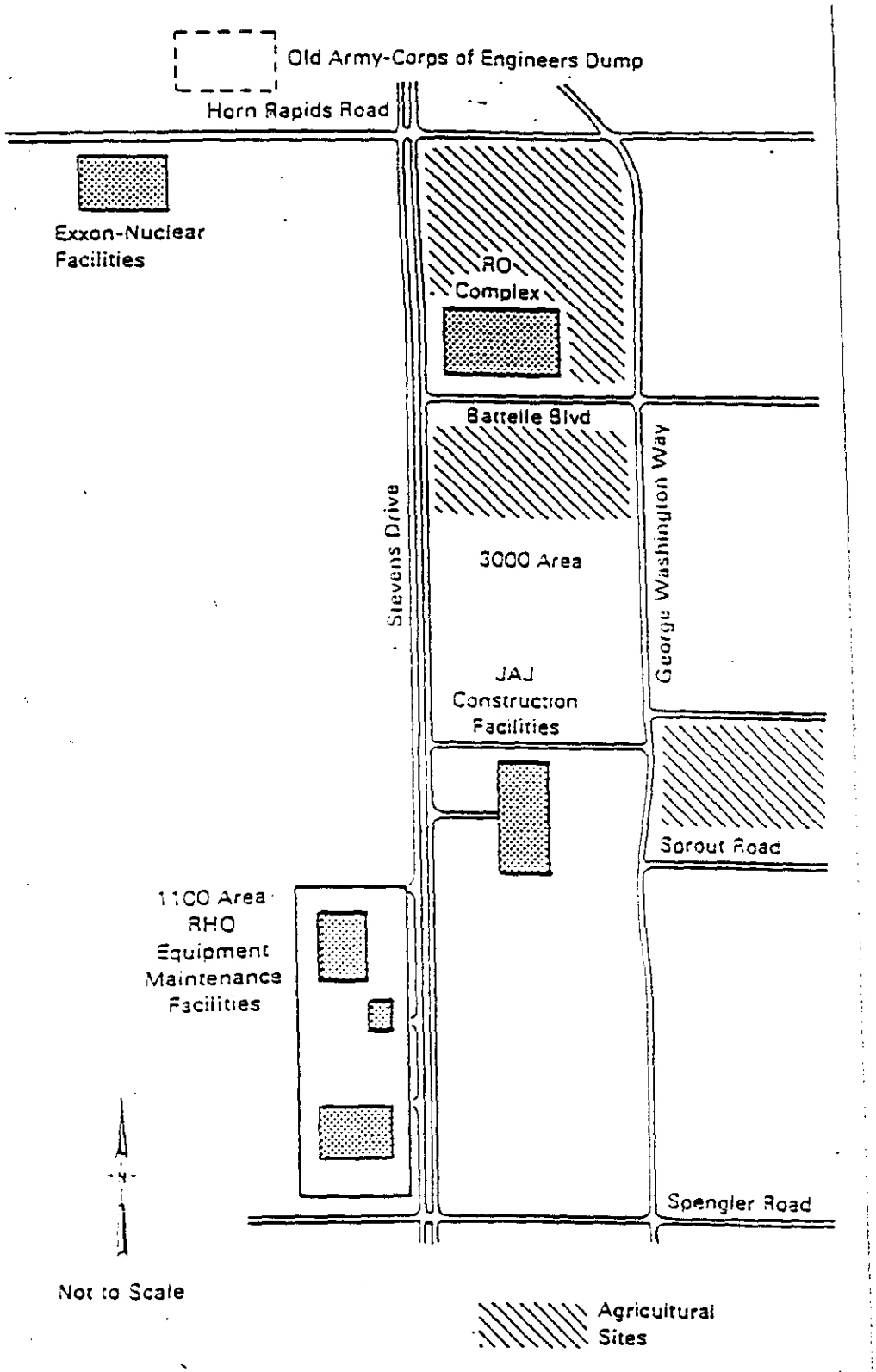


Figure 1. Study Area

METHODS

This study will consist of two parts: 1) defining the local hydrology, and 2) collecting and analyzing ground-water samples. Details of each part are described below.

Initially, existing data on the 1100 and 3000 areas will be located and analyzed to help define the local hydrology. Each well in this area will be individually examined to determine its suitability a) for collecting hydraulic head data and b) as a sampling structure. A detailed map showing locations of pertinent facilities and existing wells within the study area will be produced from this information.

From these existing wells a monitoring network will be established. Wells included in this network will be selected primarily on the basis of their location within or adjacent to the study area. The network will be used for gathering hydraulic head data and collecting ground-water samples. Water level measurements will be made biweekly throughout the study period. Water table maps will be generated from these measurements to determine ground-water flow directions and hydraulic gradients within the study area.

Once a monitoring network has been established, ground-water samples will be collected from these wells on a monthly basis. These samples along with those used for quality control will be selectively analyzed for the following:

- primary drinking water parameters
- ground-water quality parameters
- ground-water contamination indicators
- site specific chemicals (i.e., petroleum products, solvents).

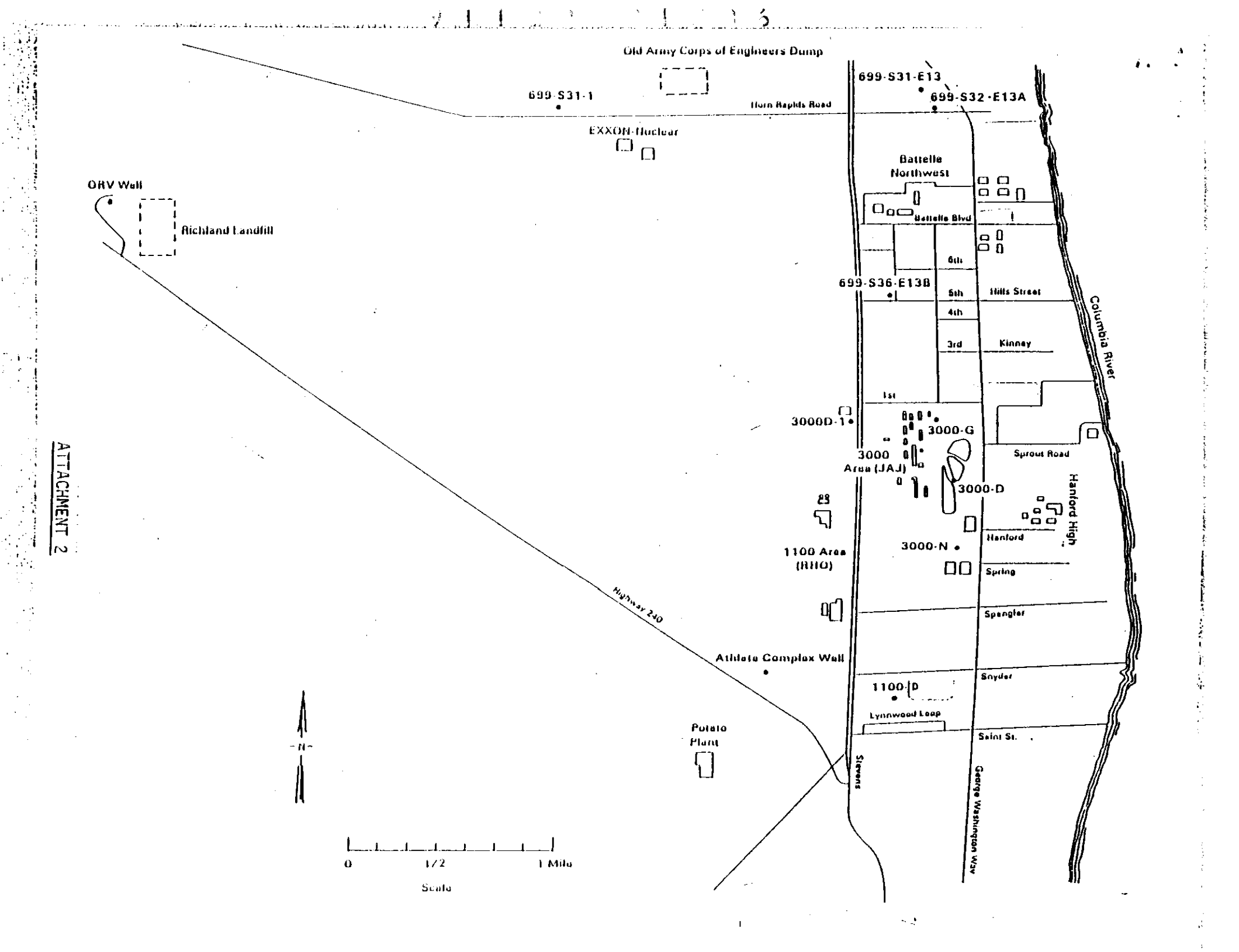
REPORTING

The monitoring data gathered from this network will be statistically evaluated and reported in the form of a letter report. Recommendations may be made for either further monitoring or more detailed studies of the ground-water in the 1100 and 3000 Areas.

Table 1 contains dates which may be considered milestones for the 1100 and 3000 Area study.

TABLE 1. Milestone Summary

Submit Final Detailed Task Plan	July 3, 1986
Construct Detailed Map of Study Area	July 11, 1986
Establish Monitoring Network	July 11, 1986
Biweekly Water Level Measurements	Ongoing
Construct Water Table Maps	Ongoing
Monthly Sample Collection	Ongoing
Completion of Sample Collection	August 15, 1986
Oral Presentation of Results to Contractors and DOE-RL	September 1986
Submit Final Letter Report	September 1986



ATTACHMENT 2

22-Aug-8 01:04 PM UNITED STATES TESTING COMPANY INC.
2000 GEORGE WASHINGTON WAY, RICHLAND, WA
HAZARDOUS SUBSTANCE ANALYSIS REPORT Contract no. B-B2472-A-I
Results reported on 860822

SAMPLE TYPE	CUST#	ISOTOPE	RESULT	DIL #	C C	OVERALL ERROR	ANALYSIS SIZE	SAMPLE DATE	SAMPLE TIME	ANALYSIS DATE	R C	GROUP	UST#
699-S31-1	4606	4606	ENDRIN	A33	* 1.00E+00 PPB	0.00E+00(S)	1.00E+03 ML	860718	0810	860730	I	103	060797
699-S31-1	4606	4606	METHLOR	A34	* 1.00E+00 PPB	0.00E+00(S)	1.00E+03 ML	860718	0810	860730	I	103	060797
699-S31-1	4606	4606	TOXAENE	A35	* 1.00E+00 PPB	0.00E+00(S)	1.00E+03 ML	860718	0810	860730	I	103	060797
699-S31-1	4606	4606	A-BHC	A36	* 1.00E+00 PPB	0.00E+00(S)	1.00E+03 ML	860718	0810	860730	I	103	060797
699-S31-1	4606	4606	B-BHC	A37	* 1.00E+00 PPB	0.00E+00(S)	1.00E+03 ML	860718	0810	860730	I	103	060797
699-S31-1	4606	4606	G-BHC	A38	* 1.00E+00 PPB	0.00E+00(S)	1.00E+03 ML	860718	0810	860730	I	103	060797
699-S31-1	4606	4606	D-BHC	A39	* 1.00E+00 PPB	0.00E+00(S)	1.00E+03 ML	860718	0810	860730	I	103	060797
699-S31-1	4606	4606	TETRANE	A61	* 1.00E+01 PPB	0.00E+00(S)	5.00E+00 ML	860718	0810	860724	I	103	060797
699-S31-1	4606	4606	BENZENE	A62	* 1.00E+01 PPB	0.00E+00(S)	5.00E+00 ML	860718	0810	860724	I	103	060797
699-S31-1	4606	4606	DIOXANE	A63	* 5.00E+02 PPB	0.00E+00(S)	5.00E+00 ML	860718	0810	860724	I	103	060797
699-S31-1	4606	4606	METHONE	A64	* 1.00E+01 PPB	0.00E+00(S)	5.00E+00 ML	860718	0810	860724	I	103	060797
699-S31-1	4606	4606	PYRIDIN	A65	* 5.00E+02 PPB	0.00E+00(S)	5.00E+00 ML	860718	0810	860724	I	103	060797
699-S31-1	4606	4606	TOLUENE	A66	* 1.00E+01 PPB	0.00E+00(S)	5.00E+00 ML	860718	0810	860724	I	103	060797
699-S31-1	4606	4606	1,1,1-T	A67	* 1.00E+01 PPB	0.00E+00(S)	5.00E+00 ML	860718	0810	860724	I	103	060797
699-S31-1	4606	4606	1,1,2-T	A68	* 1.00E+01 PPB	0.00E+00(S)	5.00E+00 ML	860718	0810	860724	I	103	060797
699-S31-1	4606	4606	TRICENE	A69	* 1.00E+01 PPB	0.00E+00(S)	5.00E+00 ML	860718	0810	860724	I	103	060797
699-S31-1	4606	4606	PERCENE	A70	* 1.00E+01 PPB	0.00E+00(S)	5.00E+00 ML	860718	0810	860724	I	103	060797
699-S31-1	4606	4606	OPXYLEN	A71	* 1.00E+01 PPB	0.00E+00(S)	5.00E+00 ML	860718	0810	860724	I	103	060797
699-S31-1	4606	4606	M+XYLE	B14	* 1.00E+01 PPB	0.00E+00(S)	5.00E+00 ML	860718	0810	860724	I	103	060797
699-S31-1	4606	4606	BIS2EPH	B40	2.20E+01 PPB	0.00E+00(S)	1.00E+03 ML	860718	0810	860819	I	103	060797
699-S31-1	4606	4606	12-DBEN	B61	* 1.00E+01 PPB	0.00E+00(S)	1.00E+03 ML	860718	0810	860819	I	103	060797
699-S31-1	4606	4606	13-DBEN	B62	* 1.00E+01 PPB	0.00E+00(S)	1.00E+03 ML	860718	0810	860819	I	103	060797
699-S31-1	4606	4606	14-DBEN	B63	* 1.00E+01 PPB	0.00E+00(S)	1.00E+03 ML	860718	0810	860819	I	103	060797
699-S31-1	4606	4606	HEXCBEN	B09	* 1.00E+01 PPB	0.00E+00(S)	1.00E+03 ML	860718	0810	860819	I	103	060797
699-S31-1	4606	4606	PENTCHB	C26	* 1.00E+01 PPB	0.00E+00(S)	1.00E+03 ML	860718	0810	860819	I	103	060797
699-S31-1	4606	4606	TETRCHB	C37	* 1.00E+01 PPB	0.00E+00(S)	1.00E+03 ML	860718	0810	860819	I	103	060797
699-S31-1	4606	4606	TRICHCB	C43	* 1.00E+01 PPB	0.00E+00(S)	1.00E+03 ML	860718	0810	860819	I	103	060797
699-S31-1	4606	4606	HEXACHL	C54	* 1.00E+01 PPB	0.00E+00(S)	1.00E+03 ML	860718	0810	860819	I	103	060797
699-S31-1	4606	4606	NAPHTHA	C55	* 1.00E+01 PPB	0.00E+00(S)	1.00E+03 ML	860718	0810	860819	I	103	060797
699-S31-1	4606	4606	123TRI	C56	* 1.00E+01 PPB	0.00E+00(S)	1.00E+03 ML	860718	0810	860819	I	103	060797
699-S31-1	4606	4606	PHENOL	C57	* 1.00E+01 PPB	0.00E+00(S)	1.00E+03 ML	860718	0810	860819	I	103	060797
699-S31-1	4606	4606	135TRI	C58	* 1.00E+01 PPB	0.00E+00(S)	1.00E+03 ML	860718	0810	860819	I	103	060797
699-S31-1	4606	4606	1234TE	C59	* 1.00E+01 PPB	0.00E+00(S)	1.00E+03 ML	860718	0810	860819	I	103	060797
699-S31-1	4606	4606	1235TE	C60	* 1.00E+01 PPB	0.00E+00(S)	1.00E+03 ML	860718	0810	860819	I	103	060797
699-S31-1	4606	4606	TOX	C68	* 8.00E-01 PPB	0.00E+00(S)	1.00E+02 ML	860718	0810	860813	I	103	060797
699-S31-1	4606	4606	TOC	C69	1.00E+03 PPB	0.00E+00(S)	2.50E+02 ML	860718	0810	860801	I	103	060797
699-S31-1	4606	4606	FORMALN	C71	* 5.00E+02 PPB	0.00E+00(S)	5.00E+00 ML	860718	0810	860724	I	103	060797
699-S31-1	4606	4606	KEROSEN	C79	* 1.00E+04 PPB	0.00E+00(S)	1.00E+03 ML	860718	0810	860819	I	103	060797
699-S31-1	4606	4606	2,4-D	H13	* 1.00E+00 PPB	0.00E+00(S)	1.00E+03 ML	860718	0810	860811	I	103	060797
699-S31-1	4606	4606	2,4,5TP	H14	* 1.00E+00 PPB	0.00E+00(S)	1.00E+03 ML	860718	0810	860811	I	103	060797
699-S31-1	4606	4606	2FLPHEN	X01	7.17E-01	0.00E+00(S)	1.00E+03 ML	860718	0810	860819	I	103	060797
699-S31-1	4606	4606	PHEND6	X02	6.51E-01	0.00E+00(S)	1.00E+03 ML	860718	0810	860819	I	103	060797
699-S31-1	4606	4606	NITRN2	X03	8.94E-01	0.00E+00(S)	1.00E+03 ML	860718	0810	860819	I	103	060797
699-S31-1	4606	4606	2FLBIPH	X04	7.70E-01	0.00E+00(S)	1.00E+03 ML	860718	0810	860819	I	103	060797
699-S31-1	4606	4606	246TRI	X05	7.65E-01	0.00E+00(S)	1.00E+03 ML	860718	0810	860819	I	103	060797

* Denotes a result less than the detection limit

ATTACHMENT 3

HAZARDOUS SUBSTANCE ANALYSIS REPORT Contract no. B-02472-A-1
Results reported on 860822

SAMPLE TYPE	CUST#	ISOTOPE		RESULT		DIL #	C C	OVERALL ERROR	ANALYSIS SIZE	SAMPLE DATE	TIME	ANALYSIS DATE	H C	GROUP	UST#
699-S31-1	4606	4606	TERD14	X06	7.84E-01			0.00E+00 (S)	1.00E+03 ML	860718	0810	860819	I	103	060797
699-S31-1	4606	4606	12DCAD4	X07	9.60E-01			0.00E+00 (S)	5.00E+00 ML	860718	0810	860724	I	103	060797
699-S31-1	4606	4606	12DCAD4	X07	9.60E-01			0.00E+00 (S)	5.00E+00 ML	860718	0810	860724	I	103	060797
** Duplicates															
699-S31-1	4606	4606	TOLUDB	X08	1.01E+00			0.00E+00 (S)	5.00E+00 ML	860718	0810	860724	I	103	060797
699-S31-1	4606	4606	TOLUDB	X08	1.01E+00			0.00E+00 (S)	5.00E+00 ML	860718	0810	860724	I	103	060797
** Duplicates															
699-S31-1	4606	4606	BFB	X09	1.05E+00			0.00E+00 (S)	5.00E+00 ML	860718	0810	860724	I	103	060797
699-S31-1	4606	4606	BFB	X09	1.04E+00			0.00E+00 (S)	5.00E+00 ML	860718	0810	860724	I	103	060797
** Duplicates															
699-S31-1	4606	4606	DBC	X10	2.19E+00			0.00E+00 (S)	1.00E+03 ML	860718	0810	860730	I	103	060797
699-S31-E13	4902	4902	ENDRIN	A33	* 1.00E+00 PPB			0.00E+00 (S)	1.00E+03 ML	860718	1026	860730	I	103	060798
699-S31-E13	4902	4902	METHLOR	A34	* 1.00E+00 PPB			0.00E+00 (S)	1.00E+03 ML	860718	1026	860730	I	103	060798
699-S31-E13	4902	4902	TOXAENE	A35	* 1.00E+00 PPB			0.00E+00 (S)	1.00E+03 ML	860718	1026	860730	I	103	060798
699-S31-E13	4902	4902	A-BHC	A36	* 1.00E+00 PPB			0.00E+00 (S)	1.00E+03 ML	860718	1026	860730	I	103	060798
699-S31-E13	4902	4902	B-BHC	A37	* 1.00E+00 PPB			0.00E+00 (S)	1.00E+03 ML	860718	1026	860730	I	103	060798
699-S31-E13	4902	4902	G-BHC	A38	* 1.00E+00 PPB			0.00E+00 (S)	1.00E+03 ML	860718	1026	860730	I	103	060798
699-S31-E13	4902	4902	D-BHC	A39	* 1.00E+00 PPB			0.00E+00 (S)	1.00E+03 ML	860718	1026	860730	I	103	060798
699-S31-E13	4902	4902	TETRANE	A61	* 1.00E+01 PPB			0.00E+00 (S)	5.00E+00 ML	860718	1026	860724	I	103	060798
699-S31-E13	4902	4902	BENZENE	A62	* 1.00E+01 PPB			0.00E+00 (S)	5.00E+00 ML	860718	1026	860724	I	103	060798
699-S31-E13	4902	4902	DIOXANE	A63	* 5.00E+02 PPB			0.00E+00 (S)	5.00E+00 ML	860718	1026	860724	I	103	060798
699-S31-E13	4902	4902	METHONE	A64	* 1.00E+01 PPB			0.00E+00 (S)	5.00E+00 ML	860718	1026	860724	I	103	060798
699-S31-E13	4902	4902	PYRIDIN	A65	* 5.00E+02 PPB			0.00E+00 (S)	5.00E+00 ML	860718	1026	860724	I	103	060798
699-S31-E13	4902	4902	TOLUENE	A66	* 1.00E+01 PPB			0.00E+00 (S)	5.00E+00 ML	860718	1026	860724	I	103	060798
699-S31-E13	4902	4902	1,1,1-T	A67	* 1.00E+01 PPB			0.00E+00 (S)	5.00E+00 ML	860718	1026	860724	I	103	060798
699-S31-E13	4902	4902	1,1,2-T	A68	* 1.00E+01 PPB			0.00E+00 (S)	5.00E+00 ML	860718	1026	860724	I	103	060798
699-S31-E13	4902	4902	TRICENE	A69	* 1.00E+01 PPB			0.00E+00 (S)	5.00E+00 ML	860718	1026	860724	I	103	060798
699-S31-E13	4902	4902	PERCENE	A70	* 1.00E+01 PPB			0.00E+00 (S)	5.00E+00 ML	860718	1026	860724	I	103	060798
699-S31-E13	4902	4902	OPXYLEN	A71	* 1.00E+01 PPB			0.00E+00 (S)	5.00E+00 ML	860718	1026	860724	I	103	060798
699-S31-E13	4902	4902	M-XYLE	B14	* 1.00E+01 PPB			0.00E+00 (S)	5.00E+00 ML	860718	1026	860724	I	103	060798
699-S31-E13	4902	4902	12-DBEN	B61	* 1.00E+01 PPB			0.00E+00 (S)	1.00E+03 ML	860718	1026	860819	I	103	060798
699-S31-E13	4902	4902	13-DBEN	B62	* 1.00E+01 PPB			0.00E+00 (S)	1.00E+03 ML	860718	1026	860819	I	103	060798
699-S31-E13	4902	4902	14-DBEN	B63	* 1.00E+01 PPB			0.00E+00 (S)	1.00E+03 ML	860718	1026	860819	I	103	060798
699-S31-E13	4902	4902	HEXCBEN	B89	* 1.00E+01 PPB			0.00E+00 (S)	1.00E+03 ML	860718	1026	860819	I	103	060798
699-S31-E13	4902	4902	PENTCHB	C26	* 1.00E+01 PPB			0.00E+00 (S)	1.00E+03 ML	860718	1026	860819	I	103	060798
699-S31-E13	4902	4902	TETRCHB	C37	* 1.00E+01 PPB			0.00E+00 (S)	1.00E+03 ML	860718	1026	860819	I	103	060798
699-S31-E13	4902	4902	TRICHLB	C43	* 1.00E+01 PPB			0.00E+00 (S)	1.00E+03 ML	860718	1026	860819	I	103	060798
699-S31-E13	4902	4902	HEXACHL	C54	* 1.00E+01 PPB			0.00E+00 (S)	1.00E+03 ML	860718	1026	860819	I	103	060798
699-S31-E13	4902	4902	NAPHTHA	C55	* 1.00E+01 PPB			0.00E+00 (S)	1.00E+03 ML	860718	1026	860819	I	103	060798
699-S31-E13	4902	4902	123TRI	C56	* 1.00E+01 PPB			0.00E+00 (S)	1.00E+03 ML	860718	1026	860819	I	103	060798
699-S31-E13	4902	4902	PHENOL	C57	* 1.00E+01 PPB			0.00E+00 (S)	1.00E+03 ML	860718	1026	860819	I	103	060798
699-S31-E13	4902	4902	135TRI	C58	* 1.00E+01 PPB			0.00E+00 (S)	1.00E+03 ML	860718	1026	860819	I	103	060798
699-S31-E13	4902	4902	1234TE	C59	* 1.00E+01 PPB			0.00E+00 (S)	1.00E+03 ML	860718	1026	860819	I	103	060798
699-S31-E13	4902	4902	1235TE	C60	* 1.00E+01 PPB			0.00E+00 (S)	1.00E+03 ML	860718	1026	860819	I	103	060798
699-S31-E13	4902	4902	TOX	C68	* 6.50E+00 PPB			0.00E+00 (S)	1.00E+02 ML	860718	1026	860813	I	103	060798

* Denotes a result less than the detection limit

UNITED STATES TESTING COMPANY INC.
2000 GEORGE WASHINGTON WAY, RICHLAND, WA

HAZARDOUS SUBSTANCE ANALYSIS REPORT Contract No. B-B2472-A-I
Results reported on 860822

SAMPLE TYPE	CUST#	ISOTOPE		RESULT		DIL #	C C	OVERALL ERROR	ANALYSIS SIZE	SAMPLE DATE	TIME	ANALYSIS DATE	H C	GROUP	UST#
699-S31-E13	4902	4902	TOC	C69	1.38E+03 PPB			0.00E+00 (S)	2.50E+02 ML	860718	1026	860801	I	103	060798
699-S31-E13	4902	4902	FORMALN	C71	* 5.00E+02 PPB			0.00E+00 (S)	5.00E+00 ML	860718	1026	860724	I	103	060798
699-S31-E13	4902	4902	KEROSEN	C79	* 1.00E+04 PPB			0.00E+00 (S)	1.00E+03 ML	860718	1026	860819	I	103	060798
699-S31-E13	4902	4902	2,4-D	H13	* 1.00E+00 PPB			0.00E+00 (S)	1.00E+03 ML	860718	1026	860811	I	103	060798
699-S31-E13	4902	4902	2,4,5TP	H14	* 1.00E+00 PPB			0.00E+00 (S)	1.00E+03 ML	860718	1026	860811	I	103	060798
699-S31-E13	4902	4902	2FLPHEN	X01	7.07E-01			0.00E+00 (S)	1.00E+03 ML	860718	1026	860819	I	103	060798
699-S31-E13	4902	4902	PHEND6	X02	4.66E-01			0.00E+00 (S)	1.00E+03 ML	860718	1026	860819	I	103	060798
699-S31-E13	4902	4902	NITBN2	X03	9.52E-01			0.00E+00 (S)	1.00E+03 ML	860718	1026	860819	I	103	060798
699-S31-E13	4902	4902	2FLBIPH	X04	9.56E-01			0.00E+00 (S)	1.00E+03 ML	860718	1026	860819	I	103	060798
699-S31-E13	4902	4902	246TRI	X05	6.59E-01			0.00E+00 (S)	1.00E+03 ML	860718	1026	860819	I	103	060798
699-S31-E13	4902	4902	TERD14	X06	7.16E-01			0.00E+00 (S)	1.00E+03 ML	860718	1026	860819	I	103	060798
699-S31-E13	4902	4902	12DCAD4	X07	1.00E+00			0.00E+00 (S)	5.00E+00 ML	860718	1026	860724	I	103	060798
699-S31-E13	4902	4902	TOLUD8	X08	1.02E+00			0.00E+00 (S)	5.00E+00 ML	860718	1026	860724	I	103	060798
699-S31-E13	4902	4902	BFB	X09	1.05E+00			0.00E+00 (S)	5.00E+00 ML	860718	1026	860724	I	103	060798
699-S31-E13	4902	4902	DBC	X10	1.30E+00			0.00E+00 (S)	1.00E+03 ML	860718	1026	860730	I	103	060798
1199-41-13C	4900	4900	ENDRIN	A33	* 1.00E+00 PPB			0.00E+00 (S)	1.00E+03 ML	860721	0746	860730	I	103	060807
1199-41-13C	4900	4900	METHLOR	A34	* 1.00E+00 PPB			0.00E+00 (S)	1.00E+03 ML	860721	0746	860730	I	103	060807
1199-41-13C	4900	4900	TOXAENE	A35	* 1.00E+00 PPB			0.00E+00 (S)	1.00E+03 ML	860721	0746	860730	I	103	060807
1199-41-13C	4900	4900	A-BHC	A36	* 1.00E+00 PPB			0.00E+00 (S)	1.00E+03 ML	860721	0746	860730	I	103	060807
1199-41-13C	4900	4900	B-BHC	A37	* 1.00E+00 PPB			0.00E+00 (S)	1.00E+03 ML	860721	0746	860730	I	103	060807
1199-41-13C	4900	4900	G-BHC	A38	* 1.00E+00 PPB			0.00E+00 (S)	1.00E+03 ML	860721	0746	860730	I	103	060807
1199-41-13C	4900	4900	D-BHC	A39	* 1.00E+00 PPB			0.00E+00 (S)	1.00E+03 ML	860721	0746	860730	I	103	060807
1199-41-13C	4900	4900	TETRANE	A61	* 1.00E+01 PPB			0.00E+00 (S)	5.00E+00 ML	860721	0746	860725	I	103	060807
1199-41-13C	4900	4900	BENZENE	A62	* 1.00E+01 PPB			0.00E+00 (S)	5.00E+00 ML	860721	0746	860725	I	103	060807
1199-41-13C	4900	4900	DIOXANE	A63	* 5.00E+02 PPB			0.00E+00 (S)	5.00E+00 ML	860721	0746	860725	I	103	060807
1199-41-13C	4900	4900	METHONE	A64	* 1.00E+01 PPB			0.00E+00 (S)	5.00E+00 ML	860721	0746	860725	I	103	060807
1199-41-13C	4900	4900	PYRIDIN	A65	* 5.00E+02 PPB			0.00E+00 (S)	5.00E+00 ML	860721	0746	860725	I	103	060807
1199-41-13C	4900	4900	TOLUENE	A66	* 1.00E+01 PPB			0.00E+00 (S)	5.00E+00 ML	860721	0746	860725	I	103	060807
1199-41-13C	4900	4900	1,1,1-T	A67	* 1.00E+01 PPB			0.00E+00 (S)	5.00E+00 ML	860721	0746	860725	I	103	060807
1199-41-13C	4900	4900	1,1,2-T	A68	* 1.00E+01 PPB			0.00E+00 (S)	5.00E+00 ML	860721	0746	860725	I	103	060807
1199-41-13C	4900	4900	TRICENE	A69	* 1.00E+01 PPB			0.00E+00 (S)	5.00E+00 ML	860721	0746	860725	I	103	060807
1199-41-13C	4900	4900	PERCENE	A70	* 1.00E+01 PPB			0.00E+00 (S)	5.00E+00 ML	860721	0746	860725	I	103	060807
1199-41-13C	4900	4900	OPXYLEN	A71	* 1.00E+01 PPB			0.00E+00 (S)	5.00E+00 ML	860721	0746	860725	I	103	060807
1199-41-13C	4900	4900	METHYCH	A93	2.00E+01 PPB			0.00E+00 (S)	5.00E+00 ML	860721	0746	860725	I	103	060807
1199-41-13C	4900	4900	M-XYLE	B14	* 1.00E+01 PPB			0.00E+00 (S)	5.00E+00 ML	860721	0746	860725	I	103	060807
1199-41-13C	4900	4900	TOX	C68	* 1.00E+02 PPB			0.00E+00 (S)	1.00E+02 ML	860721	0746	860813	I	103	060807
1199-41-13C	4900	4900	TOC	C69	2.79E+03 PPB			0.00E+00 (S)	2.50E+02 ML	860721	0746	860804	I	103	060807
1199-41-13C	4900	4900	FORMALN	C71	* 5.00E+02 PPB			0.00E+00 (S)	5.00E+00 ML	860721	0746	860725	I	103	060807
1199-41-13C	4900	4900	2,4-D	H13	* 1.00E+00 PPB			0.00E+00 (S)	1.00E+03 ML	860721	0746	860811	I	103	060807
1199-41-13C	4900	4900	2,4,5TP	H14	* 1.00E+00 PPB			0.00E+00 (S)	1.00E+03 ML	860721	0746	860811	I	103	060807
1199-41-13C	4900	4900	12DCAD4	X07	1.03E+00			0.00E+00 (S)	5.00E+00 ML	860721	0746	860725	I	103	060807
1199-41-13C	4900	4900	TOLUD8	X08	1.03E+00			0.00E+00 (S)	5.00E+00 ML	860721	0746	860725	I	103	060807
1199-41-13C	4900	4900	BFB	X09	1.03E+00			0.00E+00 (S)	5.00E+00 ML	860721	0746	860725	I	103	060807
1199-41-13C	4900	4900	DBC	X10	9.80E-01			0.00E+00 (S)	1.00E+03 ML	860721	0746	860730	I	103	060807
699-S36-13B	4905	4905	ENDRIN	A33	* 1.00E+00 PPB			0.00E+00 (S)	1.00E+03 ML	860721	0848	860730	I	103	060808

* Denotes a result less than the detection limit

UNITED STATES TESTING COMPANY INC.
2000 GEORGE WASHINGTON WAY, RICHLAND, WA

HAZARDOUS SUBSTANCE ANALYSIS REPORT Contract no. B-82472-A-1
Results reported on 860822

SAMPLE TYPE	CUST#	ISOTOPE		RESULT		DIL B	C C	OVERALL ERROR	ANALYSIS SIZE		SAMPLE DATE	TIME	ANALYSIS DATE	H C	GROUP	UST#
699-S36-13B	4905	4905	METHLOR	A34	* 1.00E+00	PPB		0.00E+00	(S) 1.00E+03	ML	860721	0848	860730	I	103	060808
699-S36-13B	4905	4905	TOXAENE	A35	* 1.00E+00	PPB		0.00E+00	(S) 1.00E+03	ML	860721	0848	860730	I	103	060808
699-S36-13B	4905	4905	A-BHC	A36	* 1.00E+00	PPB		0.00E+00	(S) 1.00E+03	ML	860721	0848	860730	I	103	060808
699-S36-13B	4905	4905	B-BHC	A37	* 1.00E+00	PPB		0.00E+00	(S) 1.00E+03	ML	860721	0848	860730	I	103	060808
699-S36-13B	4905	4905	G-BHC	A38	* 1.00E+00	PPB		0.00E+00	(S) 1.00E+03	ML	860721	0848	860730	I	103	060808
699-S36-13B	4905	4905	D-BHC	A39	* 1.00E+00	PPB		0.00E+00	(S) 1.00E+03	ML	860721	0848	860730	I	103	060808
699-S36-13B	4905	4905	TETRANE	A61	* 1.00E+01	PPB		0.00E+00	(S) 5.00E+00	ML	860721	0848	860725	I	103	060808
699-S36-13B	4905	4905	BENZENE	A62	* 1.00E+01	PPB		0.00E+00	(S) 5.00E+00	ML	860721	0848	860725	I	103	060808
699-S36-13B	4905	4905	DIOXANE	A63	* 5.00E+02	PPB		0.00E+00	(S) 5.00E+00	ML	860721	0848	860725	I	103	060808
699-S36-13B	4905	4905	METHONE	A64	* 1.00E+01	PPB		0.00E+00	(S) 5.00E+00	ML	860721	0848	860725	I	103	060808
699-S36-13B	4905	4905	PYRIDIN	A65	* 5.00E+02	PPB		0.00E+00	(S) 5.00E+00	ML	860721	0848	860725	I	103	060808
699-S36-13B	4905	4905	TOLUENE	A66	* 1.00E+01	PPB		0.00E+00	(S) 5.00E+00	ML	860721	0848	860725	I	103	060808
699-S36-13B	4905	4905	1,1,1-T	A67	* 1.00E+01	PPB		0.00E+00	(S) 5.00E+00	ML	860721	0848	860725	I	103	060808
699-S36-13B	4905	4905	1,1,2-T	A68	* 1.00E+01	PPB		0.00E+00	(S) 5.00E+00	ML	860721	0848	860725	I	103	060808
699-S36-13B	4905	4905	TRICENE	A69	* 1.00E+01	PPB		0.00E+00	(S) 5.00E+00	ML	860721	0848	860725	I	103	060808
699-S36-13B	4905	4905	PERCENE	A70	* 1.00E+01	PPB		0.00E+00	(S) 5.00E+00	ML	860721	0848	860725	I	103	060808
699-S36-13B	4905	4905	OPXYLEN	A71	* 1.00E+01	PPB		0.00E+00	(S) 5.00E+00	ML	860721	0848	860725	I	103	060808
699-S36-13B	4905	4905	M-XYLE	B14	* 1.00E+01	PPB		0.00E+00	(S) 5.00E+00	ML	860721	0848	860725	I	103	060808
699-S36-13B	4905	4905	TOX	C68	* 1.96E+01	PPB		0.00E+00	(S) 1.00E+02	ML	860721	0848	860814	I	103	060808
699-S36-13B	4905	4905	TOC	C69	9.74E+03	PPB		0.00E+00	(S) 2.50E+02	ML	860721	0848	860804	I	103	060808
699-S36-13B	4905	4905	FORMALN	C71	* 5.00E+02	PPB		0.00E+00	(S) 5.00E+00	ML	860721	0848	860725	I	103	060808
699-S36-13B	4905	4905	2,4-D	H13	* 1.00E+00	PPB		0.00E+00	(S) 1.00E+03	ML	860721	0848	860811	I	103	060808
699-S36-13B	4905	4905	2,4,5TP	H14	* 1.00E+00	PPB		0.00E+00	(S) 1.00E+03	ML	860721	0848	860811	I	103	060808
699-S36-13B	4905	4905	12DCAD4	X07	9.60E-01			0.00E+00	(S) 5.00E+00	ML	860721	0848	860725	I	103	060808
699-S36-13B	4905	4905	TOLUD8	X08	1.05E+00			0.00E+00	(S) 5.00E+00	ML	860721	0848	860725	I	103	060808
699-S36-13B	4905	4905	DFB	X09	1.04E+00			0.00E+00	(S) 5.00E+00	ML	860721	0848	860725	I	103	060808
699-S36-13B	4905	4905	DBC	X10	5.40E-01			0.00E+00	(S) 1.00E+03	ML	860721	0848	860730	I	103	060808
1199-41-15	4903	4903	TETRANE	A61	* 1.00E+01	PPB		0.00E+00	(S) 5.00E+00	ML	860722	0744	860728	I	103	060817
1199-41-15	4903	4903	METHONE	A64	* 1.00E+01	PPB		0.00E+00	(S) 5.00E+00	ML	860722	0744	860728	I	103	060817
1199-41-15	4903	4903	1,1,1-T	A67	* 1.00E+01	PPB		0.00E+00	(S) 5.00E+00	ML	860722	0744	860728	I	103	060817
1199-41-15	4903	4903	1,1,2-T	A68	* 1.00E+01	PPB		0.00E+00	(S) 5.00E+00	ML	860722	0744	860728	I	103	060817
1199-41-15	4903	4903	TRICENE	A69	* 1.00E+01	PPB		0.00E+00	(S) 5.00E+00	ML	860722	0744	860728	I	103	060817
1199-41-15	4903	4903	PERCENE	A70	* 1.00E+01	PPB		0.00E+00	(S) 5.00E+00	ML	860722	0744	860728	I	103	060817
1199-41-15	4903	4903	OPXYLEN	A71	* 1.00E+01	PPB		0.00E+00	(S) 5.00E+00	ML	860722	0744	860728	I	103	060817
1199-41-15	4903	4903	CHLFORM	A80	* 1.00E+01	PPB		0.00E+00	(S) 5.00E+00	ML	860722	0744	860728	I	103	060817
1199-41-15	4903	4903	METHYCH	A93	* 1.00E+01	PPB		0.00E+00	(S) 5.00E+00	ML	860722	0744	860728	I	103	060817
1199-41-15	4903	4903	M-XYLE	B14	* 1.00E+01	PPB		0.00E+00	(S) 5.00E+00	ML	860722	0744	860728	I	103	060817
1199-41-15	4903	4903	TOX	C68	* 4.00E-01	PPB		0.00E+00	(S) 1.00E+02	ML	860722	0744	860818	I	103	060817
1199-41-15	4903	4903	TOC	C69	4.21E+03	PPB		0.00E+00	(S) 2.50E+02	ML	860722	0744	860805	I	103	060817
1199-41-15	4903	4903	12DCAD4	X07	1.00E+00			0.00E+00	(S) 5.00E+00	ML	860722	0744	860728	I	103	060817
1199-41-15	4903	4903	TOLUD8	X08	1.02E+00			0.00E+00	(S) 5.00E+00	ML	860722	0744	860728	I	103	060817
1199-41-15	4903	4903	DFB	X09	1.02E+00			0.00E+00	(S) 5.00E+00	ML	860722	0744	860728	I	103	060817
699-S32-E13A	490	4906	ENDRIN	A33	* 1.00E+00	PPB		0.00E+00	(S) 1.00E+03	ML	860722	0852	860730	I	103	060818
699-S32-E13A	490	4906	METHLOR	A34	* 1.00E+00	PPB		0.00E+00	(S) 1.00E+03	ML	860722	0852	860730	I	103	060818
699-S32-E13A	490	4906	TOXAENE	A35	* 1.00E+00	PPB		0.00E+00	(S) 1.00E+03	ML	860722	0852	860730	I	103	060818

* Denotes a result less than the detection limit

2000 GEORGE WASHINGTON WAY, RICHLAND, WA

HAZARDOUS SUBSTANCE ANALYSIS REPORT Contract No. B=02472=A=1

Results reported on 860822

SAMPLE TYPE	CUST#	ISOTOPE		RESULT	DIL #	C C	OVERALL ERROR	ANALYSIS SIZE	SAMPLE DATE	TIME	ANALYSIS DATE	H C	GROUP	UST#
699-S32-E13A	490 4906	A-BHC	A36	* 1.00E+00 PPB			0.00E+00(S)	1.00E+03 ML	860722	0852	860730	I	103	060818
699-S32-E13A	490 4906	B-BHC	A37	* 1.00E+00 PPB			0.00E+00(S)	1.00E+03 ML	860722	0852	860730	I	103	060818
699-S32-E13A	490 4906	G-BHC	A38	* 1.00E+00 PPB			0.00E+00(S)	1.00E+03 ML	860722	0852	860730	I	103	060818
699-S32-E13A	490 4906	D-BHC	A39	* 1.00E+00 PPB			0.00E+00(S)	1.00E+03 ML	860722	0852	860730	I	103	060818
699-S32-E13A	490 4906	TETRANE	A61	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860722	0852	860728	I	103	060818
699-S32-E13A	490 4906	METHONE	A64	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860722	0852	860728	I	103	060818
699-S32-E13A	490 4906	1,1,1-T	A67	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860722	0852	860728	I	103	060818
699-S32-E13A	490 4906	1,1,2-T	A68	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860722	0852	860728	I	103	060818
699-S32-E13A	490 4906	TRICENE	A69	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860722	0852	860728	I	103	060818
699-S32-E13A	490 4906	PERCENE	A70	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860722	0852	860728	I	103	060818
699-S32-E13A	490 4906	OPXYLEN	A71	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860722	0852	860728	I	103	060818
699-S32-E13A	490 4906	CHLFORM	A80	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860722	0852	860728	I	103	060818
699-S32-E13A	490 4906	METHYCH	A93	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860722	0852	860728	I	103	060818
699-S32-E13A	490 4906	M-XYLE	B14	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860722	0852	860728	I	103	060818
699-S32-E13A	490 4906	TOX	C68	* 9.40E+00 PPB			0.00E+00(S)	1.00E+02 ML	860722	0852	860818	I	103	060818
699-S32-E13A	490 4906	TOC	C69	1.61E+03 PPB			0.00E+00(S)	2.50E+02 ML	860722	0852	860805	I	103	060818
699-S32-E13A	490 4906	2,4-D	H13	* 1.00E+00 PPB			0.00E+00(S)	1.00E+03 ML	860722	0852	860811	I	103	060818
699-S32-E13A	490 4906	2,4-5TP	H14	* 1.00E+00 PPB			0.00E+00(S)	1.00E+03 ML	860722	0852	860811	I	103	060818
699-S32-E13A	490 4906	12DCAD4	X07	1.02E+00			0.00E+00(S)	5.00E+00 ML	860722	0852	860728	I	103	060818
699-S32-E13A	490 4906	TOLUDB	X08	1.01E+00			0.00E+00(S)	5.00E+00 ML	860722	0852	860728	I	103	060818
699-S32-E13A	490 4906	BFB	X09	1.01E+00			0.00E+00(S)	5.00E+00 ML	860722	0852	860728	I	103	060818
699-S32-E13A	490 4906	DBC	X10	0.80E-01			0.00E+00(S)	1.00E+03 ML	860722	0852	860730	I	103	060818
699-39-16C	4904 4904	TETRANE	A61	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860723	0920	860728	I	103	060819
699-39-16C	4904 4904	METHONE	A64	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860723	0920	860728	I	103	060819
699-39-16C	4904 4904	1,1,1-T	A67	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860723	0920	860728	I	103	060819
699-39-16C	4904 4904	1,1,2-T	A68	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860723	0920	860728	I	103	060819
699-39-16C	4904 4904	TRICENE	A69	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860723	0920	860728	I	103	060819
699-39-16C	4904 4904	PERCENE	A70	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860723	0920	860728	I	103	060819
699-39-16C	4904 4904	OPXYLEN	A71	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860723	0920	860728	I	103	060819
699-39-16C	4904 4904	CHLFORM	A80	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860723	0920	860728	I	103	060819
699-39-16C	4904 4904	METHYCH	A93	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860723	0920	860728	I	103	060819
699-39-16C	4904 4904	M-XYLE	B14	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860723	0920	860728	I	103	060819
699-39-16C	4904 4904	TOX	C68	* 6.00E+01 PPB			0.00E+00(S)	1.00E+02 ML	860723	0920	860816	I	103	060819
699-39-16C	4904 4904	TOC	C69	5.76E+03 PPB			0.00E+00(S)	2.50E+02 ML	860723	0920	860805	I	103	060819
699-39-16C	4904 4904	12DCAD4	X07	9.90E-01			0.00E+00(S)	5.00E+00 ML	860723	0920	860728	I	103	060819
699-39-16C	4904 4904	TOLUDB	X08	1.00E+00			0.00E+00(S)	5.00E+00 ML	860723	0920	860728	I	103	060819
699-39-16C	4904 4904	BFB	X09	1.01E+00			0.00E+00(S)	5.00E+00 ML	860723	0920	860728	I	103	060819
00N 4907	4907	TETRANE	A61	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860723	0935	860728	I	103	060820
00N 4907	4907	METHONE	A64	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860723	0935	860728	I	103	060820
00N 4907	4907	1,1,1-T	A67	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860723	0935	860728	I	103	060820
00N 4907	4907	1,1,2-T	A68	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860723	0935	860728	I	103	060820
00N 4907	4907	TRICENE	A69	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860723	0935	860728	I	103	060820
00N 4907	4907	PERCENE	A70	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860723	0935	860728	I	103	060820
00N 4907	4907	OPXYLEN	A71	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860723	0935	860728	I	103	060820
00N 4907	4907	CHLFORM	A80	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860723	0935	860728	I	103	060820

Denotes a result less than the detection limit

UNITED STATES TESTING COMPANY INC.
2900 GEORGE WASHINGTON WAY, RICHLAND, WA

HAZARDOUS SUBSTANCE ANALYSIS REPORT Contract no. B-82472-A-T
Results reported on 860822

SAMPLE TYPE	CUST#	ISOTOPE		RESULT	DIL #	C C	OVERALL ERROR	ANALYSIS SIZE	SAMPLE DATE TIME	ANALYSIS DATE	H C	GROUP UST#
3000N 4907	4907	METHYCH	A93	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860723 0935	860728	I	103 060820
3000N 4907	4907	M-XYLE	B14	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860723 0935	860728	I	103 060820
3000N 4907	4907	TOX	C68	* 2.00E-01 PPB			0.00E+00(S)	1.00E+02 ML	860723 0935	860818	I	103 060820
3000N 4907	4907	TOC	C69	3.75E+03 PPB			0.00E+00(S)	2.50E+02 ML	860723 0935	860805	I	103 060820
3000N 4907	4907	12DCAD4	X07	9.70E-01			0.00E+00(S)	5.00E+00 ML	860723 0935	860728	I	103 060820
3000N 4907	4907	TOLUD8	X08	1.02E+00			0.00E+00(S)	5.00E+00 ML	860723 0935	860728	I	103 060820
3000N 4907	4907	BFB	X09	1.01E+00			0.00E+00(S)	5.00E+00 ML	860723 0935	860728	I	103 060820
DRAKE WELL 4901	4901	TETRANE	A61	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860724 0920	860730	I	103 060826
DRAKE WELL 4901	4901	METHONE	A64	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860724 0920	860730	I	103 060826
DRAKE WELL 4901	4901	1,1,1-T	A67	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860724 0920	860730	I	103 060826
DRAKE WELL 4901	4901	1,1,2-T	A68	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860724 0920	860730	I	103 060826
DRAKE WELL 4901	4901	TRICENE	A69	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860724 0920	860730	I	103 060826
DRAKE WELL 4901	4901	PERCENE	A70	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860724 0920	860730	I	103 060826
DRAKE WELL 4901	4901	OPXYLEN	A71	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860724 0920	860730	I	103 060826
DRAKE WELL 4901	4901	CHLFORM	A80	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860724 0920	860730	I	103 060826
DRAKE WELL 4901	4901	METHYCH	A93	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860724 0920	860730	I	103 060826
DRAKE WELL 4901	4901	M-XYLE	B14	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860724 0920	860730	I	103 060826
DRAKE WELL 4901	4901	TOX	C68	* 1.24E+01 PPB			0.00E+00(S)	1.00E+02 ML	860724 0920	860818	I	103 060826
DRAKE WELL 4901	4901	TOC	C69	1.28E+03 PPB			0.00E+00(S)	2.50E+02 ML	860724 0920	860805	I	103 060826
DRAKE WELL 4901	4901	2,4-D	H13	* 1.00E+00 PPB			0.00E+00(S)	1.00E+03 ML	860724 0920	860811	I	103 060826
DRAKE WELL 4901	4901	2,4,5TP	H14	* 1.00E+00 PPB			0.00E+00(S)	1.00E+03 ML	860724 0920	860811	I	103 060826
DRAKE WELL 4901	4901	12DCAD4	X07	1.04E+00			0.00E+00(S)	5.00E+00 ML	860724 0920	860730	I	103 060826
DRAKE WELL 4901	4901	TOLUD8	X08	1.02E+00			0.00E+00(S)	5.00E+00 ML	860724 0920	860730	I	103 060826
DRAKE WELL 4901	4901	BFB	X09	1.03E+00			0.00E+00(S)	5.00E+00 ML	860724 0920	860730	I	103 060826
5-ATH 4897	4899	TETRANE	A61	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860724 1050	860730	I	103 060827
5-ATH 4897	4899	METHONE	A64	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860724 1050	860730	I	103 060827
5-ATH 4897	4899	1,1,1-T	A67	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860724 1050	860730	I	103 060827
5-ATH 4897	4899	1,1,2-T	A68	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860724 1050	860730	I	103 060827
5-ATH 4897	4899	TRICENE	A69	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860724 1050	860730	I	103 060827
5-ATH 4897	4899	PERCENE	A70	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860724 1050	860730	I	103 060827
5-ATH 4897	4899	OPXYLEN	A71	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860724 1050	860730	I	103 060827
5-ATH 4897	4899	CHLFORM	A80	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860724 1050	860730	I	103 060827
5-ATH 4897	4899	METHYCH	A93	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860724 1050	860730	I	103 060827
5-ATH 4897	4899	M-XYLE	B14	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860724 1050	860730	I	103 060827
5-ATH 4897	4899	TOX	C68	* 1.44E+01 PPB			0.00E+00(S)	1.00E+02 ML	860724 1050	860819	I	103 060827
5-ATH 4897	4899	TOC	C69	2.50E+03 PPB			0.00E+00(S)	2.50E+02 ML	860724 1050	860805	I	103 060827
5-ATH 4897	4899	2,4-D	H13	* 1.00E+00 PPB			0.00E+00(S)	1.00E+03 ML	860724 1050	860811	I	103 060827
5-ATH 4897	4899	2,4,5TP	H14	* 1.00E+00 PPB			0.00E+00(S)	1.00E+03 ML	860724 1050	860811	I	103 060827
5-ATH 4897	4899	12DCAD4	X07	1.00E+00			0.00E+00(S)	5.00E+00 ML	860724 1050	860730	I	103 060827
5-ATH 4897	4899	TOLUD8	X08	1.02E+00			0.00E+00(S)	5.00E+00 ML	860724 1050	860730	I	103 060827
5-ATH 4897	4899	BFB	X09	1.03E+00			0.00E+00(S)	5.00E+00 ML	860724 1050	860730	I	103 060827
IV WELL 4898	4898	TETRANE	A61	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860724 1128	860730	I	103 060828
IV WELL 4898	4898	METHONE	A64	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860724 1128	860730	I	103 060828
V WELL 4898	4898	1,1,1-T	A67	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860724 1128	860730	I	103 060828
V WELL 4898	4898	1,1,2-T	A68	* 1.00E+01 PPB			0.00E+00(S)	5.00E+00 ML	860724 1128	860730	I	103 060828

* Denotes a result less than the detection limit

UNITED STATES TESTING COMPANY INC.
2000 GEORGE WASHINGTON WAY, RICHLAND, WA

HAZARDOUS SUBSTANCE ANALYSIS REPORT Contract no. 8=82472=A=1
Results reported on 860822

SAMPLE TYPE	CUST#	ISOTOPE		RESULT		DIL #	C C	OVERALL ERROR	ANALYSIS SIZE	SAMPLE DATE	TIME	ANALYSIS DATE	H C	GROUP	UST#
ORV WELL 4898	4898	TRICENE	A69	* 1.00E+01 PPB				0.00E+00(S)	5.00E+00 ML	860724	1128	860730	I	103	060828
ORV WELL 4898	4898	PERCENE	A70	* 1.00E+01 PPB				0.00E+00(S)	5.00E+00 ML	860724	1128	860730	I	103	060828
ORV WELL 4898	4898	OPXYLEN	A71	* 1.00E+01 PPB				0.00E+00(S)	5.00E+00 ML	860724	1128	860730	I	103	060828
ORV WELL 4898	4898	CHLFORM	A80	* 1.00E+01 PPB				0.00E+00(S)	5.00E+00 ML	860724	1128	860730	I	103	060828
ORV WELL 4898	4898	METHYCH	A93	* 1.00E+01 PPB				0.00E+00(S)	5.00E+00 ML	860724	1128	860730	I	103	060828
ORV WELL 4898	4898	M=XYLE	B14	* 1.00E+01 PPB				0.00E+00(S)	5.00E+00 ML	860724	1128	860730	I	103	060828
ORV WELL 4898	4898	TOX	C68	* 6.00E-01 PPB				0.00E+00(S)	1.00E+02 ML	860724	1128	860819	I	103	060828
ORV WELL 4898	4898	TOC	C69	*-8.55E+01 PPB				0.00E+00(S)	2.50E+02 ML	860724	1128	860805	I	103	060828
ORV WELL 4898	4898	2,4-D	H13	* 1.60E+00 PPB				0.00E+00(S)	6.00E+02 ML	860724	1128	860811	I	103	060828
ORV WELL 4898	4898	2,4,5TP	H14	* 1.60E+00 PPB				0.00E+00(S)	6.00E+02 ML	860724	1128	860811	I	103	060828
ORV WELL 4898	4898	12DCAD4	X07	1.08E+00				0.00E+00(S)	5.00E+00 ML	860724	1128	860730	I	103	060828
ORV WELL 4898	4898	TOLUD8	X08	1.01E+00				0.00E+00(S)	5.00E+00 ML	860724	1128	860730	I	103	060828
ORV WELL 4898	4898	BFB	X09	1.03E+00				0.00E+00(S)	5.00E+00 ML	860724	1128	860730	I	103	060828

280 Records listed

* Denotes a result less than the detection limit

HANFORD ENVIRONMENTAL
HEALTH FOUNDATION

August 20, 1986 CO 10823

Pacific Northwest Laboratory
Sigma 5
3000 Area

Attn: C. Bishop

WATER SAMPLES ANALYSES

The results of the analysis of water samples received during the month of July, 1986, are on the following table. Analyses were done in accordance with Standard Methods for the Analysis of Water and Wastewater, 16th Ed.

If you have any questions concerning this report, please contact Environmental Health Sciences.

P. A. Thurman
Environmental Health Sciences

lmk

Attachment

P. O. BOX 100, RICHLAND, WASHINGTON 99352

C. Bishop

CO 10823

Parameters (mg/L)	Samples				
	3000N (4907)	3000-D 1199-39-16C (4904-D)	6-08V 4898	6-ATH Horn Rapids Athletic Complex (4899)	1100-B Duke Well (4901)
Fluoride	<0.1	<0.1	1.3	0.34	0.1
Chloride	1.1	0.8	2.3	50	26
Nitrate	1.5	0.35	<0.2	165	33
Phosphate	<0.5	<0.5	<0.5	<0.5	<0.5
Sulfate	10.0	9.1	<1	5.9	40
Barium	0.15	0.10	<0.10	0.83	0.53
Cadmium	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Chromium	<0.005	<0.005	<0.005	<0.005	<0.005
Silver	<0.005	<0.005	<0.005	<0.005	<0.005
Copper	<0.05	<0.05	<0.05	<0.05	0.06
Mercury	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Sodium	4.1	3.7	42.8	72	31
Nickel	<0.1	<0.1	<0.1	<0.1	<0.1
Manganese	<0.01	<0.01	<0.01	<0.01	<0.01
Vanadium	<0.04	<0.04	<0.04	<0.04	<0.04
Aluminum	<0.5	<0.5	<0.5	<0.5	<0.5
Iron	<0.03	<0.03	<0.03	<0.03	0.068
Lead	<0.005	<0.005	<0.005	<0.005	<0.005
Potassium	1.82	0.95	9.6	13	8.5

.. Bishop

Parameters (mg/L)	699-S-31-1 (4606)	699-S-31-E13 (4902)	3000D-1 Samples 1191-41-13C (49000)	699-536-13B (4905)	3000-G 1199-41-15 (4903)	699-S32-E13A (4906)
Fluoride	0.94	<0.1	0.16	0.27	<0.1	0.28
Chloride	4.8	5.5	6.0	4.2	0.85	4.5
Nitrate (NO_3)	<0.2	2.4	12.5	<0.2	0.45	21.0
Phosphate	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sulfate	<1	4.4	16	13.8	20.5	20.5
Barium	0.21	0.20	0.23	1.2	0.11	0.47
Cadmium	0.035	0.0072	0.012	<0.0005	0.010	0.0046
Chromium	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silver	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Copper	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Mercury	<0.001*	<0.001*	<0.0005	<0.0005	<0.0005	<0.0005
Sodium	43.7	20	17	25.4	3.5	20
Nickel	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Manganese	0.055	1.0	0.19	1.63	<0.01	0.16
Vanadium	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Aluminum	<0.5	<0.5	<0.5	4.9	<0.5	<0.5
Iron	1.67	32.8	1.69	16.8	<0.03	6.7
Lead	0.047	0.017	<0.005	<0.005	<0.005	0.008
Potassium	7.8	7.0	5.1	13.2	1.1	9.8

*Not enough sample for normal detection limit.

RECORD OF CONVERSATION DATE: 22 Oct. 1990

Party Calling: Wendell Greenwald COE
Party Called: Thane Weiser Ag Engineering (509) 582-8900

Purpose of Call: Regarding South Pit Near Horn Rapids Landfill

Summary of Telephone Conversation:

Mr. Weiser stated that 3 areas of disposal materials had been encountered during utility excavation on ANF's property:

1) Near Columbia River in the Middle of Horn Rapids Road. Debris material consisting of building debris, glass, tires ,and burnt wood was encountered at the boundary of Port of Benton and DOE property.
2) West of ANF's offices towards Allied Technology. Concrete debris material was encountered in this area. The source of the debris is unknown.
3) 2 miles south of ANF's offices near Horn Rapids Industrial Park. This is an extensive area of military hospital debris, bottles, and miscellaneous materials measuring 30 inches deep and 400 feet long.

No other areas of debris (south pit) are known to him.

Wendell W. Greenwald
Signature of Caller

TELEPHONE CONFERENCE MEMORANDUM

Company: US ARMY CORPS OF ENGINEERS Address: WALLA WALLA DISTRICT
WALLA WALLA, WA.
99362

[] INCOMING [X] OUTGOING DATE: 23 APRIL 1991 TIME: 10:40 AM

WITH: M. E. CLARK OF: 312 E 36 PL. KENN. PHONE: 582-8558

WITH: OF: PHONE:

Copies to:	Name	Address
	STEVE CLARK	H4-55
	Bob Stewart	A5-19

Subject: PAST ACTIVITIES AT HORN RAPIDS LANDFILL

WENDELL L. GREENWALD

Department Telephone #

Summary of Conference

Mr. Clark stated that he would be available for visiting the Horn Rapids Landfill site and discussing the past activities on Thursday 25 April 1991 at 10:00 am. He stated that the former crane operator who had previously accompanied himself, Rick McCain, and Meril Lauterbach to Horn Rapids Landfill was Mr. Herschal Lane (640 Spengler Rd Richland, Tel. 375-0826). Mr. Clark was concerned that Mr. Lane's advanced age (81) and poor health might prevent him from being a useful source of information about past activities at the landfill.

CONVERSATION RECORD

Company: **US Army Corps of Engineers** Address: **Walla Walla Distr. Walla Walla, WA 99362**

Conversation Recorded By: Wendell Greenwald
Wendell Greenwald Tel. **376-9698**

[ ] Incoming Tel. [ ] Outgoing Tel. [x] In Person

Date: **29 April 1991** Time: **9:00 am**

With:	**M. E. Clark**	**C. W. Malody**	**Patrick W. Willison**
Of:	**Retired WHC**	**ANF**	**DOE-RL/OCC**
Phone:	**582-8558**	**375-8537**	**376-2028**

Copies to: **Steve Clark WHC H4-55**
Bob Stewart DOE-RL/ERD A5-19

Subject: **Past Activities at Horn Rapids Landfill, Interview With M. E. Clark**

Summary of Conference

Mr. Clark (retired foreman of the Transportation Section) was interviewed at the Horn Rapids Landfill (HRL) site. He has worked at Hanford from 1954 until his retirement 4 years ago, except for 2-1/2 years during the 1950's.

Mr. Clark believed that he might be personally liable for contamination caused by his former work, and was reluctant to discuss past practices at HRL. Mr. Willison assured him that the intent of the interview was to characterize the site, not to identify persons for prosecution. Mr. Clark emphasized that there were retired Hanford employees who had valuable information regarding wastes disposed of at HRL and that these persons would not be willing to talk about what they had observed unless DOE provided them with immunity from prosecution. He believes that it would be productive to gather several of the former employees together at one time and place to document their observations. This group discussion would overcome some of their timidness and also the observations from one person could help spark the memory of another.

Mr. Clark stated that all types of waste materials were disposed of in the HRL until the 1970's. Most of the wastes came from the 1100 area, with some materials from the 300 area and various other units. Generally, each area had its own landfill, and locally generated wastes were the primary materials disposed of in the landfill. Radioactive wastes from the 300 area were not disposed

of in the HRL. In the early 1970's, DOE directed that hazardous materials should be disposed of in a 200 area landfill and not in landfills such as HRL. It was a slow process of educating people and establishing systems to guard against inadvertent disposal of hazardous materials in HRL. Even after the system was in place, occasional disposal of hazardous materials could occur; although, the landfill equipment operators were conscientious about looking for and removing any hazardous materials that they could see.

Mr. Clark believes that the "asbestos trench" is the primary area, within the HRL, for concern. The north half of the "asbestos trench" was excavated nearly to ground water in the late 1960's. Waste material was spread over the bottom of the trench in thin layers and covered with soil. The trench was enlarged, to the south, as more space was required. The "asbestos trench" was closed after the central landfill was opened.

The other, smaller, trenches were excavated in the 1950's. These trenches are less of a concern than the "asbestos trench" because of the small quantities of materials placed in those trenches. One of the trenches to the northeast and the south pit received waste material from the city of Richland.

WHC-MR-0243

Geophysical Surveys at the 1100-EM-1 South Pit

Prepared for the U.S. Department of Energy
Office of Environmental Restoration and
Waste Management

Westinghouse
Hanford Company Richland, Washington

Hanford Operations and Engineering Contractor for the
U.S. Department of Energy under Contract DE-AC06-87RL10930

Approved for Public Release

WHC-MR-0243

Geophysical Surveys at the 1100-EM-1 South Pit

T. H. Mitchell
J. R. Kunk

Date Published
February 1991

Prepared for the U.S. Department of Energy
Office of Environmental Restoration and
Waste Management

Westinghouse
Hanford Company
P.O. Box 1970
Richland, Washington 99352

Hanford Operations and Engineering Contractor for the
U.S. Department of Energy under Contract DE-AC06-87RL10930

Attachment 6

Internal Memo

From: T. H. Mitchell and J. R. Kunk
Phone: 6-1747 G6-50
Date: February 4, 1991
Subject: TECHNICAL MEMORANDUM DOCUMENTING GEOPHYSICAL SURVEYS AT THE 1100-EM-1 SOUTH PIT.

To: S. W. Clark H4-55

cc: J.W. Fassett G6-50
D.G. Horton H4-56
K.M. Singleton H4-56

SCOPE

This technical memorandum summarizes the results of the geophysical surveys conducted at the 1100-EM-1 Operable Unit, South Pit Sub-operable Unit. These surveys were conducted by the geosciences group, Westinghouse Hanford Company as outlined in the Remedial Investigation Phase II Supplement Work Plan, Draft A, Section 4.8.13. The geophysical methods used included ground penetrating radar (GPR) and electromagnetic induction (EMI). The surface of the site was also mapped.

PURPOSE

The purpose of the geophysical surveys were to determine the depth of fill, the boundary of burial areas, and the location of buried objects at the South Pit. The information gathered will be used in conjunction with all data collected during the site characterization investigations to determine responsibility for this site.

LOCATION

The South Pit is adjacent to the Horn Rapids Landfill along the south side of the landfill, separated only by the Horn Rapids Road, (Figure 1). Figure 2 shows the specific site layout with geophysical grid points surveyed on 15 meter centers. The surveys were initiated on November 6, 1990 and field work were completed on November 27, 1990.

PROCEDURES

The geophysical surveys were conducted following the procedures contained in the Environmental Investigations and Site Characterization Manual, (WHC-CM-7-7); in particular, Section EII 11.2 , Geophysical Survey Work, Rev 1.

The GPR surveys were conducted with an SIR System 8 manufactured by Geophysical Survey Systems, Inc. and a 300 MHz antenna. An EM31 non-contacting terrain conductivity meter manufactured by Geonics Limited was used for the EMI work.

RESULTS

Surface mapping:

Surface features observed by walking over the site are shown in Figure 3. The South Pit has clearly been the site of dumping. Items such as tin cans are delineated on the figure as dense surface metal. Other non-native materials observed on the surface include rock piles with cobbles on the order of several to tens of centimeters in diameter, fibrous shingles, and apparent ash and clinkers possibly from coal fired plants.

EMI surveys:

Figure 4 shows the EMI data in profile form and Figure 5 shows the same data in contour form. The data was collected in line with the grid points, with additional readings at approximate 5 meter intervals between the 15 meter grid points. Along the edge of these figures are the grid line numbers and letters for location. The nominal conductivity for the South Pit area is roughly in the range of 5 to 7 millimhos/meter. The general trend depicts an increasing apparent conductivity in the near surface materials to the west. Topographically, this also is the lowest part of the South Pit area.

The anomalous area, where conductivities vary greatly, is on the north side of the South Pit and extends to and possibly under the Horn Rapids road. The anomalous area, as depicted by EMI methods, is delineated either by the profile or contoured data by departure from generally flat profiles (Figure 4) or by tight, complex contour lines, (Figure 5).

GPR surveys:

Figure 6 shows the anomalies from the GPR data. GPR traverses were run both east-west and north-south along the 15 meter survey grid. Additionally, closer traverses were run in the vicinity of grid point G-6 to try to enhance any data from below the near surface. Data enhancement through filtering and signal averaging did not significantly improve the results or bring out radar reflections from deeper in the section.

The GPR data generally delineates the same anomalous zone on the north side of the South Pit as the EMI data. Unfortunately, the conductivity of the surface materials in this anomalous area are high enough, either from the scattered metal, or from the material in the apparent coal burning waste, that the GPR penetration below the near surface was not possible.

Aerial photography:

Three sets of aerial photographs were examined for this site after the geophysical surveys and preliminary interpretations were complete. They do not offer sufficient resolution or detail to enhance the geophysical results, but do help support some of the observations.

The aerial photos were taken on May 24, 1948, November 2, 1964, and on April 24, 1973. The 1948 photo, copied in part in Figure 7, shows the South Pit and Horn Rapids Landfill at a time of obvious subsurface and surface disturbance. The approximate

burial boundary from geophysics correlates well with the disposal pit and debris on the original 1948 photo. Unfortunately, the amount and type of debris cannot be determined from the photo. Linears we have called "Dozer" tracks in Figure 3 are evident on the aerial photos and are useful for location and scaling. A disturbed area, as seen on the 1948 photo in the southeast corner of the South Pit study area, has been interpreted by others to be a knoll, suggested here as possibly the spoils from digging the disposal pit area of the South Pit. Presently, the interpreted knoll does not exist nor does a significant depression occur at the disposal pit site. The South Pit area has generally been leveled since the 1948 photo and before a 1964 photo, where the ground appears generally level, covered by vegetation. The 1973 photo shows no particular change from the 1964 photo. The reader is referred to the original photographs and overlays for more detail.

Conclusions:

The radar system scans a zone below the antenna and extending sideways to about 45 degrees to each side. Therefore, information about the subsurface is obtained from more than just directly below the 15 meter wide survey tracts. But 100% subsurface coverage of the area was not obtained due to the separation of the survey lines. Additionally, in the northern side of the area, depicted by the wiggly lines on Figure 6, penetration much below the surface was not obtained. With these caveats in mind, no anomalies which would reasonably be interpreted to be buried barrels were observed.

Radar anomalies, scattered primarily over the northern and eastern portion of the south pit area are generally due to isolated pieces of metal, such as tin cans and cables, at and within one foot of the surface. Figure 8 shows the approximate boundary of the interpreted burial area.

A possible analog area to the South Pit is the dump site adjacent to the 618-13 area in the 300-FF-5 Operable Unit. This dump site is a depression on the order of 3 meters deep. This pit has been backfilled with a variety of wastes, including loads of asphalt, rocks, and ash from a coal burning plant. This technical memorandum in no way implies that this "analog site" is what the South Pit once looked like, but surface apearances and the types of materials present at the surface have many similarities between the two sites and offer an interesting comparison.

RECORDS

Logbook WHC-N-306-5 contains information for these surveys.

Submitted by:

J.R. Kunk
T.H. Mitchell

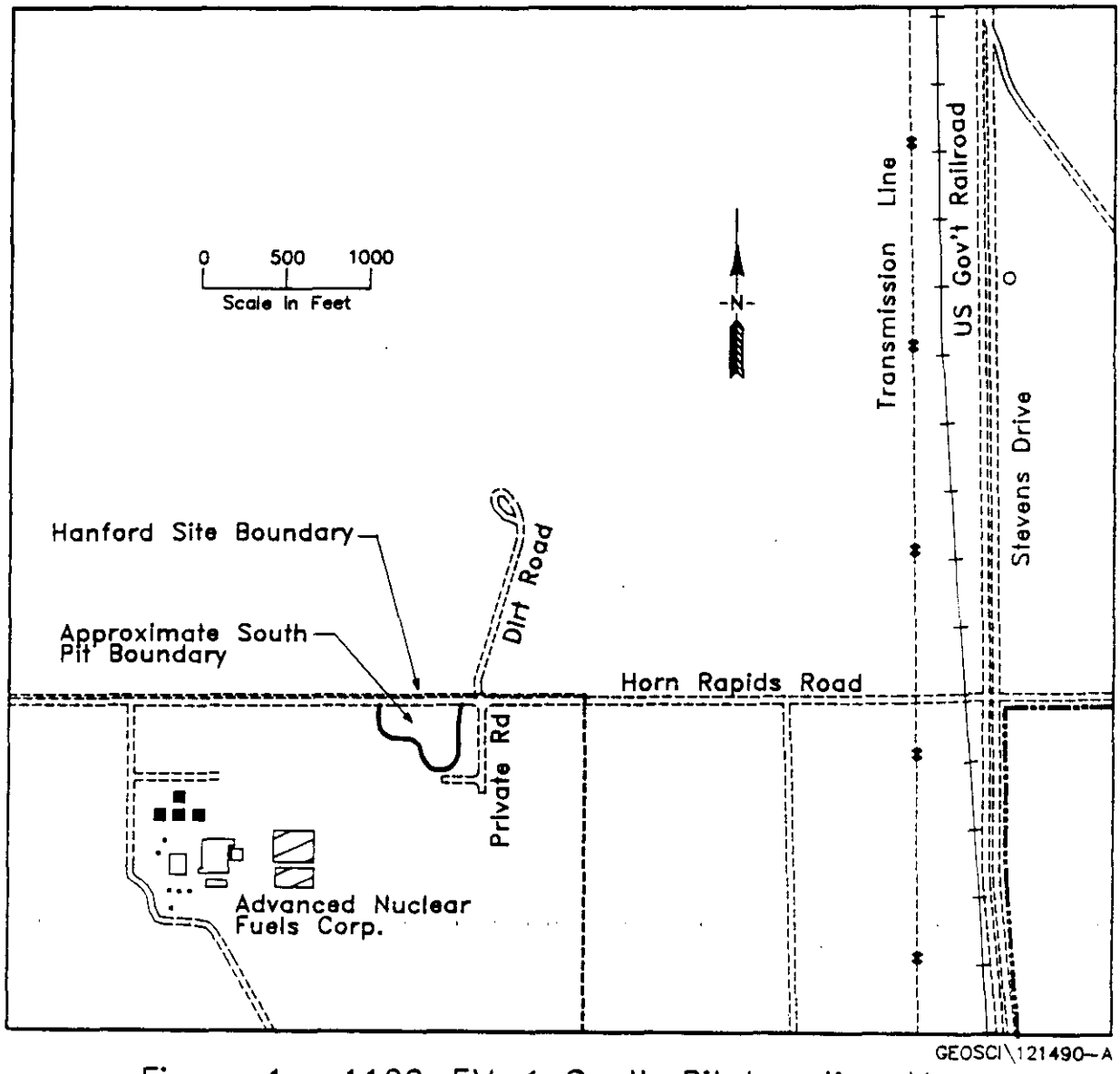


Figure 1. 1100-EM-1 South Pit Location Map

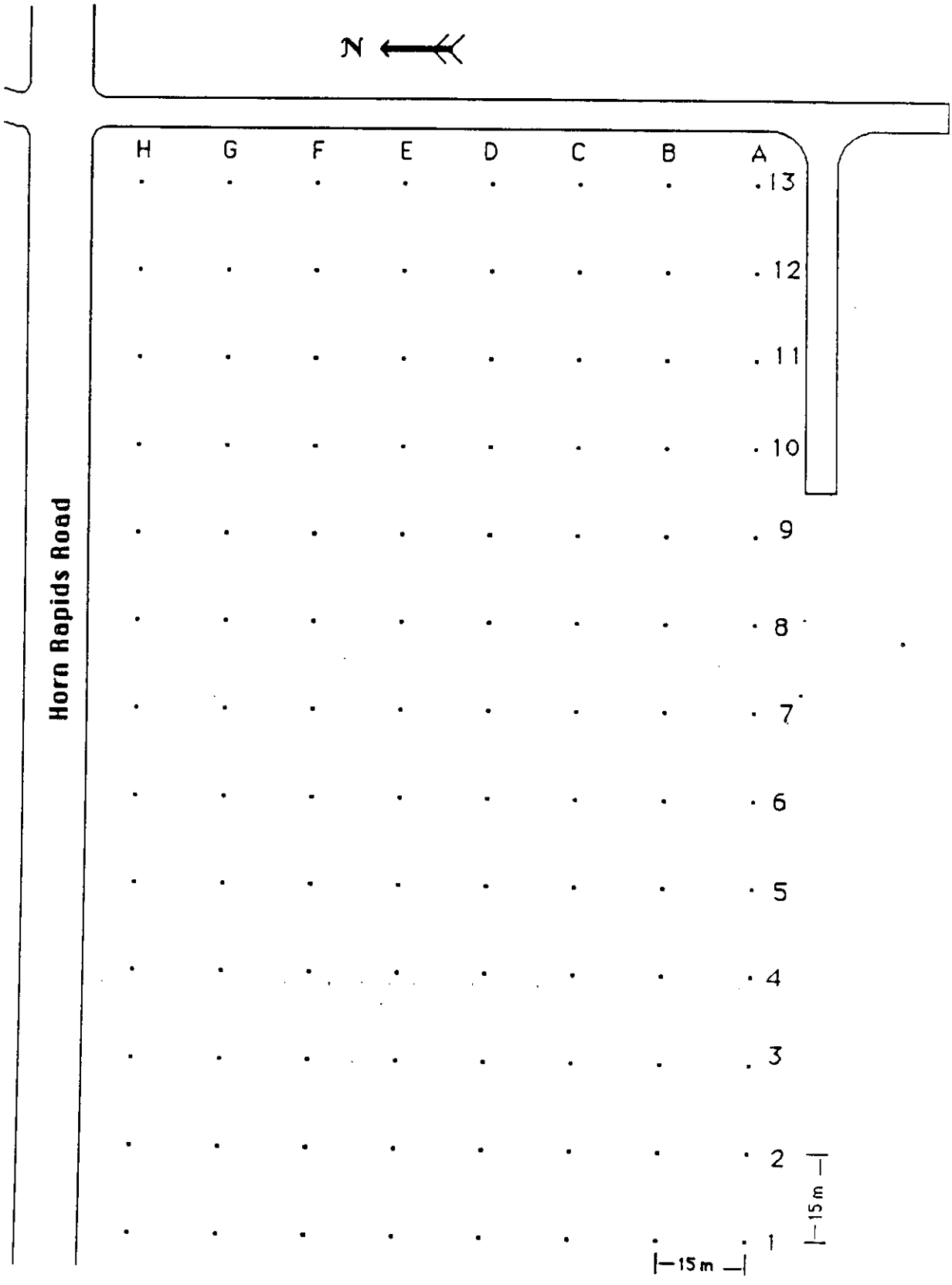


Figure 2. 1100-EM-1 South Pit Survey Grid

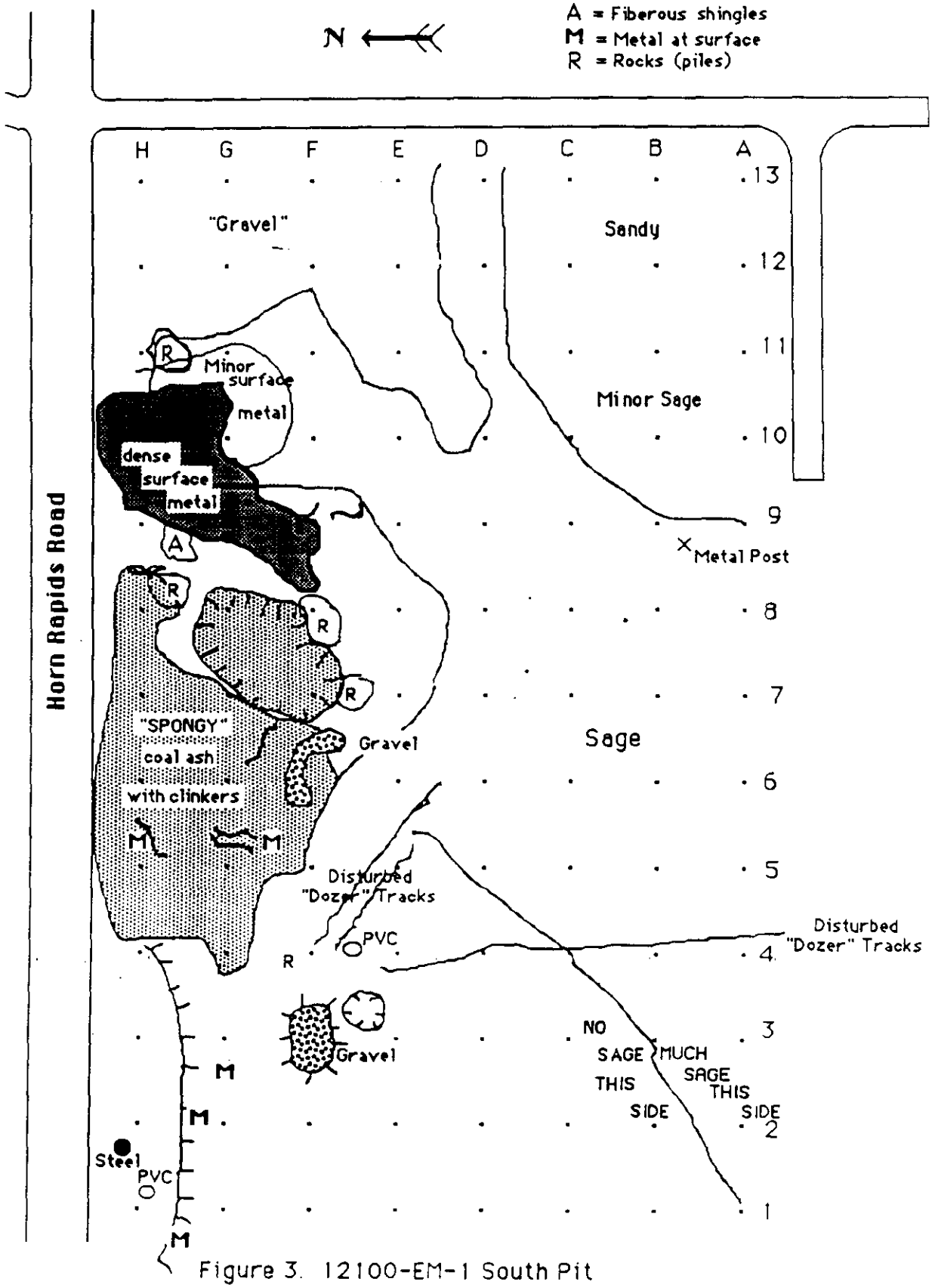


Figure 3. 12100-EM-1 South Pit
Surface Features

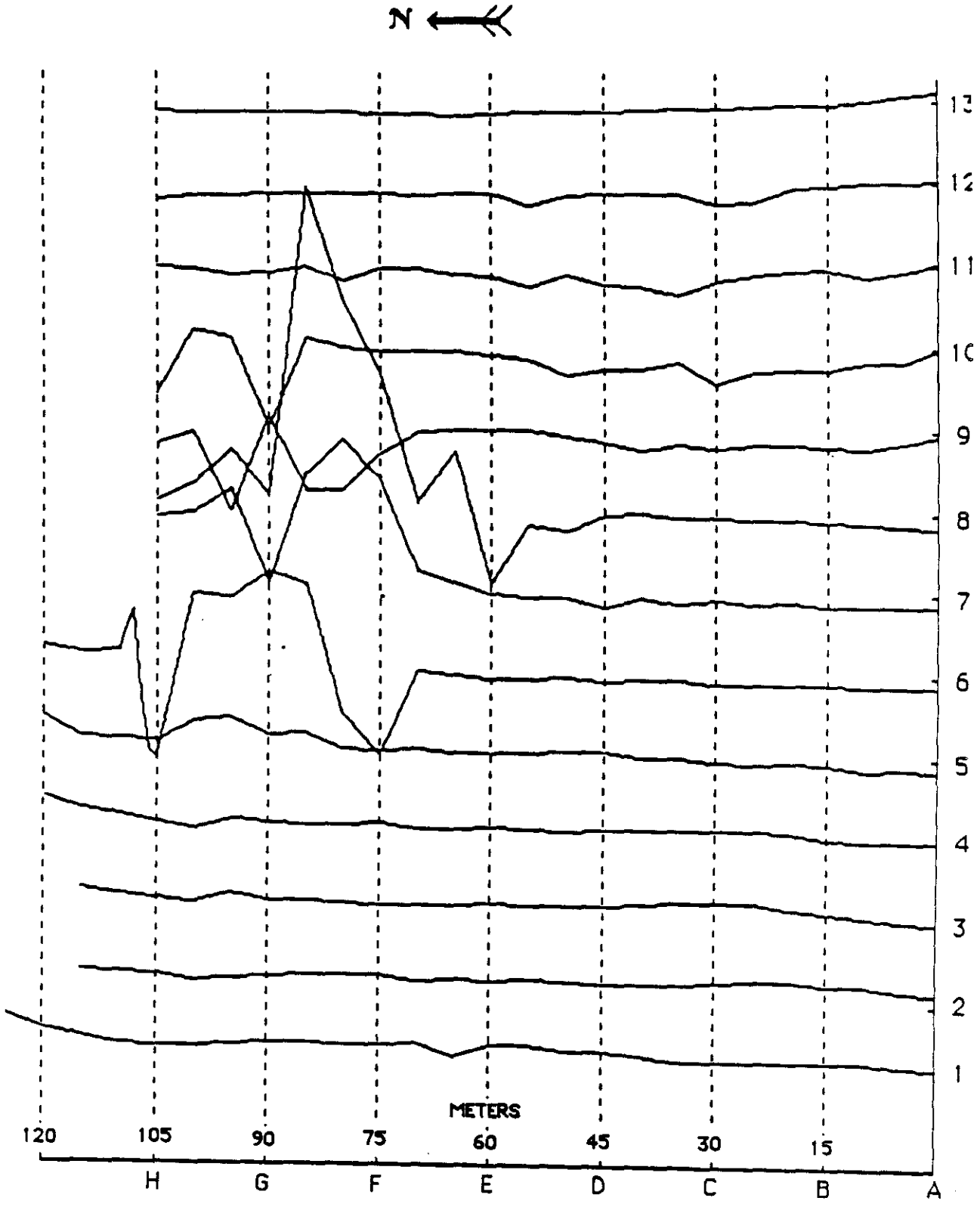


Figure 4. 1100-EM-1 South Pit.
EM1 Profiles

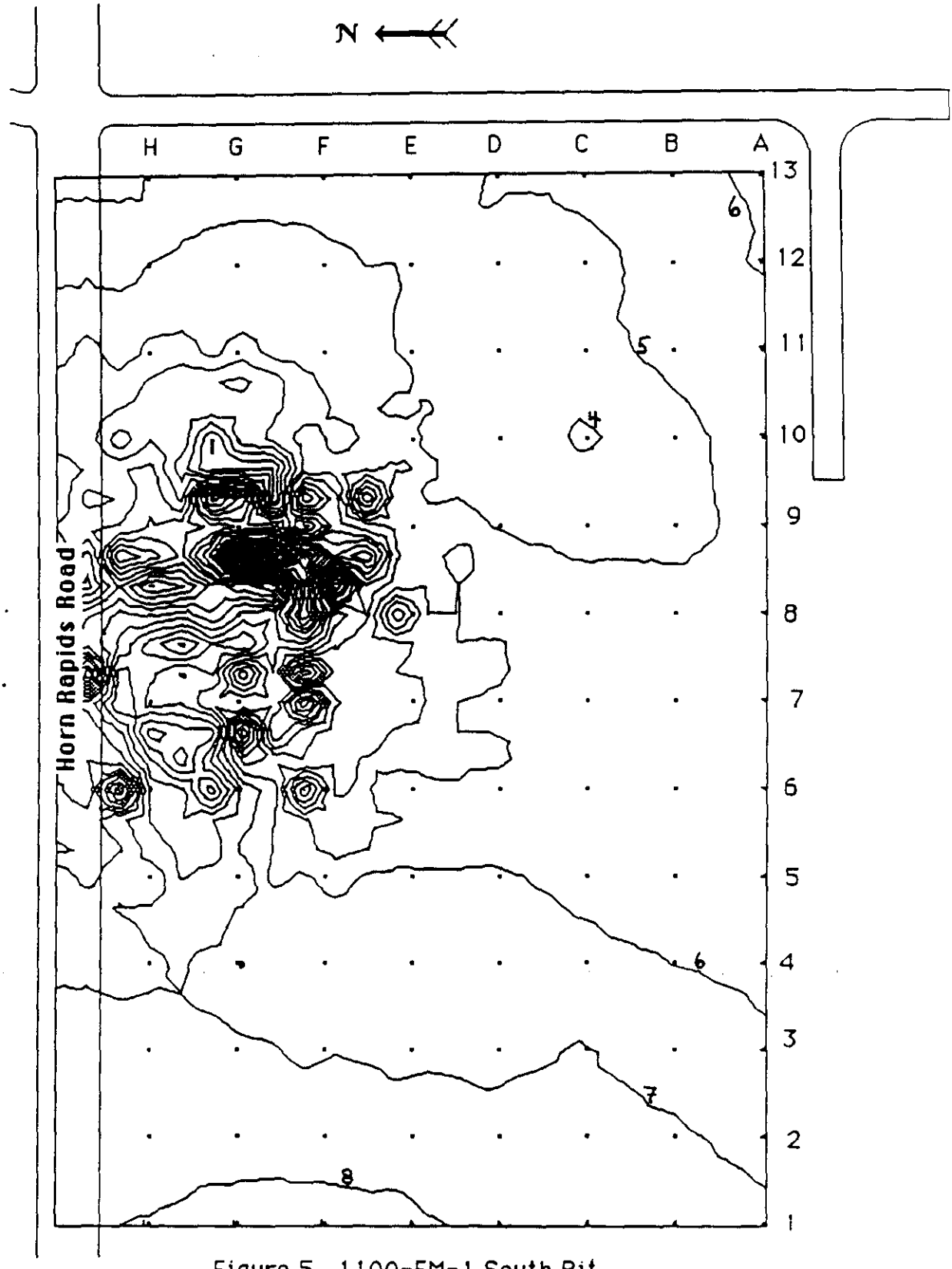


Figure 5. 1100-EM-1 South Pit
EMI Contour Map (1 millimho/meter
Contour interval)

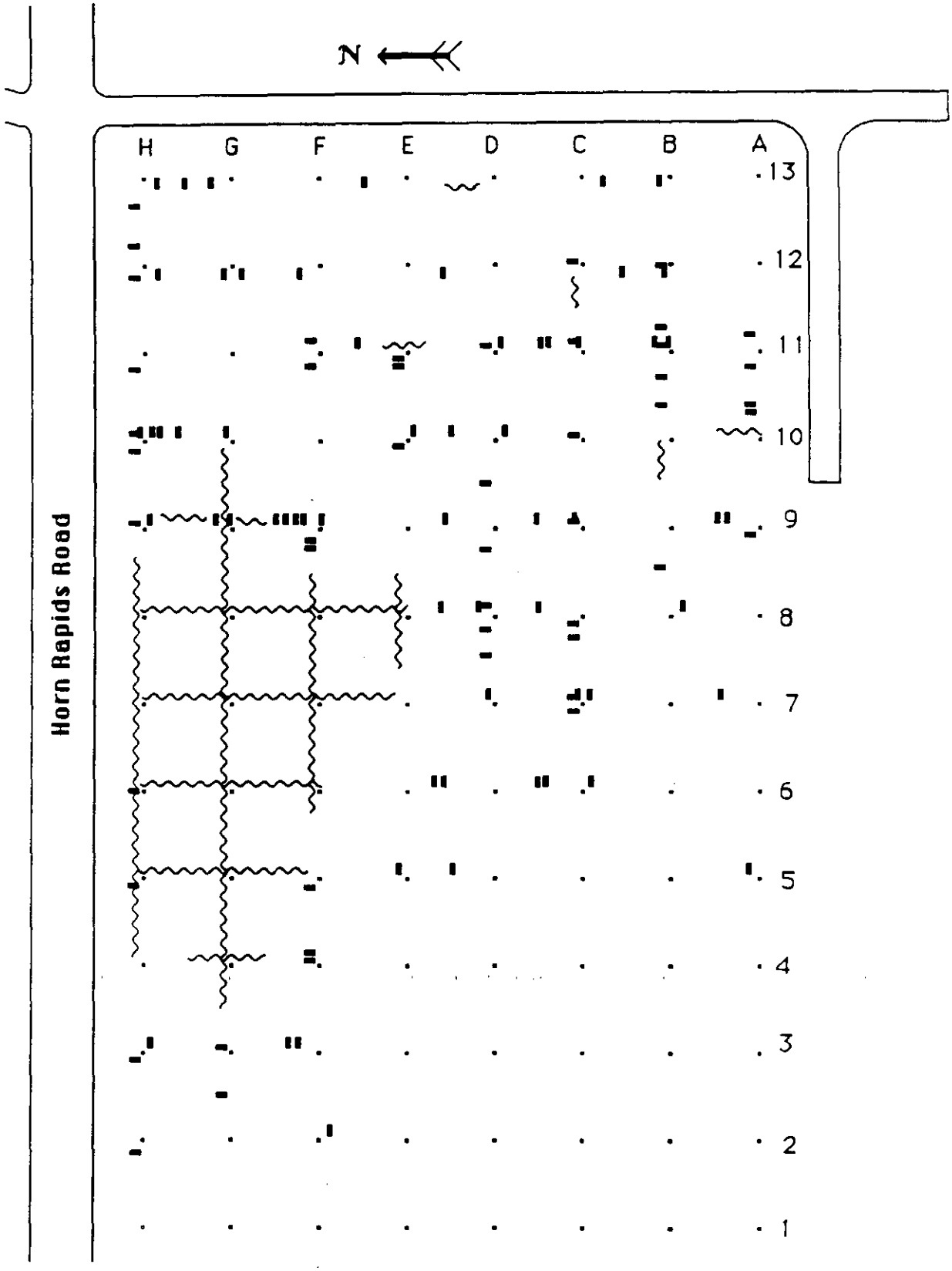


Figure 6. 1100-EM-1 South Pit
Radar Anomalies Map

Figure 7. Aerial photograph of the Horn Rapids Landfill / South Pit area, flown May 24, 1948. Approximate Scale: 1 inch = 320 feet.

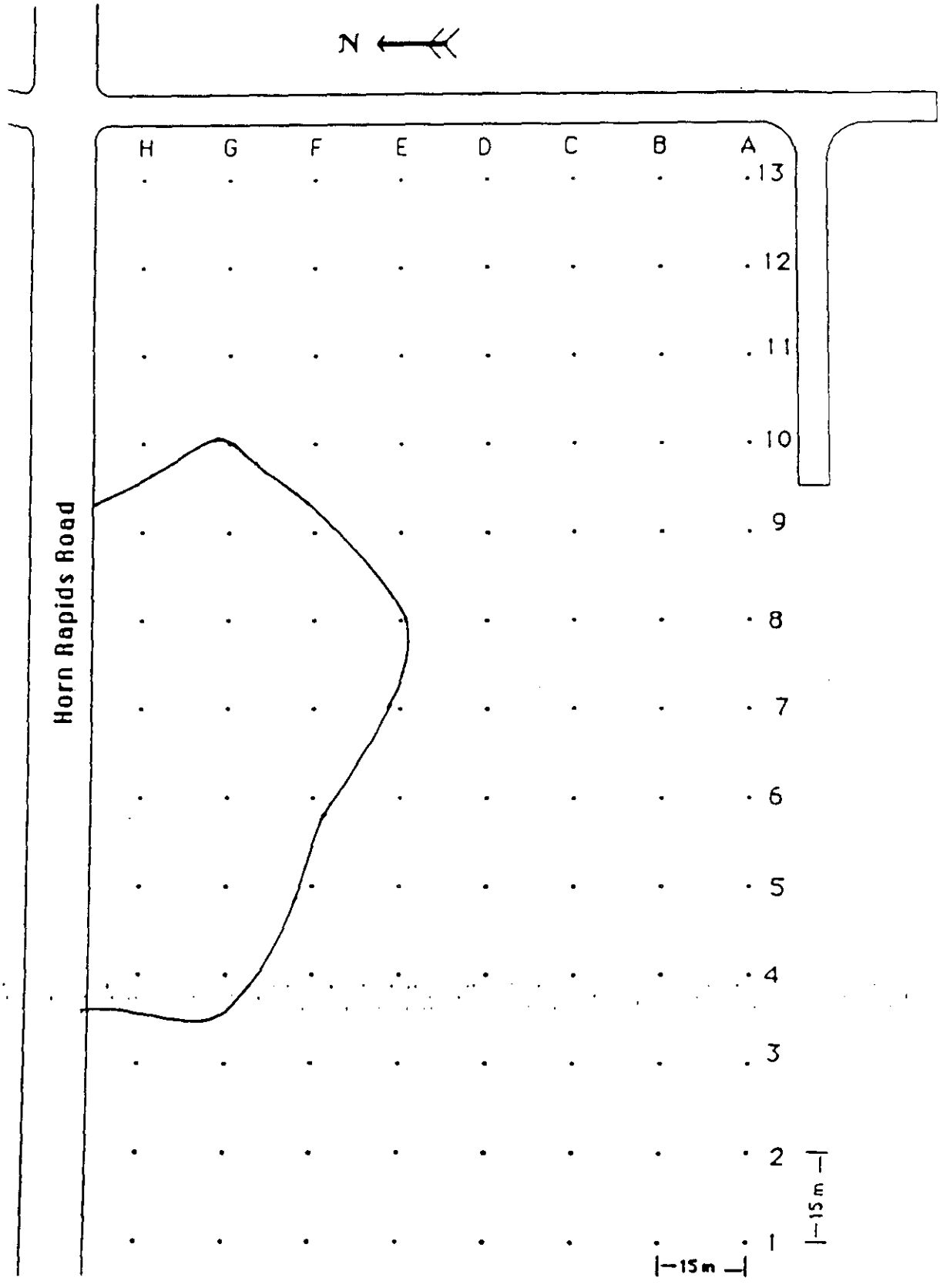


Figure 8. 1100-EM-1 South Pit.
Approximate burial boundary.

Westinghouse Hanford Company

Internal Memo

From: Technical Baseline Section 81223-91-001
Phone: 6-5122 H4-55
Date: January 10, 1991
Subject: TECHNICAL MEMORANDUM DOCUMENTING RESULTS OF RADIATION SURVEYS CONDUCTED IN THE 1100-EM-1 OPERABLE UNIT

To: S. W. Clark H4-55

cc: R. P. Henckel RPH H4-55
M. J. Lauterbach H4-55
S. G. Weiss H4-55
RMM: File/LB

SCOPE

This technical memorandum documents the results of radiation surveys conducted to determine the existence of radiological contamination at disposal sites within the 1100-EM-1 Operable Unit. Radiation surveys were conducted at the 1100-6 (discolored soil site) and the South Pit located on land belonging to Advanced Nuclear Fuels, Inc.

PROCEDURES

A tractor-mounted radiation monitor (Mobile Surface Contamination Monitor) was utilized at the South Pit on October 15, 1991 in all accessible areas. Health Physics Technicians surveyed all other areas on foot. Procedures for the MSCM are included in the technical document entitled, "1100 Area Radiation Surveys" (WHC-MR-0098). The 1100-6 site was surveyed by hand on October 16, 1990.

RESULTS

No radiological contamination above background levels was detected at either of the surveyed sites. A sample of clay pipe was submitted for laboratory analysis. The results of that analysis are attached. All radionuclide values were less than one picocurie per gram.

RECORDS

Copies of the associated Radiation Survey Reports and maps are attached, as well as pertinent pages from logbook WHC-N-293(2). Copies are also stored in files under the supervision of S. W. Clark, Room 24, 450 Hills Street. The logbook is in the custody of R. M. Mitchell. Radiation Survey Reports and other original documentation dealing with task details are in the custody of the Health Physics Technologists.

RM Mitchell

R. M. Mitchell
Principal Scientist

st

Attachments

Westinghouse Hanford Company

RADIATION SURVEY REPORT

Date	Time	Survey Number	F.C.
10-18-90	From NA To NA	72015	

Bldg	Area	Room
NA	1100 Area	NA

Description of Job: Perform Survey of 400'x600' area South of the Horn Rapids Landfill using MSCM. (Mobil Surface Contamination Monitor) JSA Number -1100-90-1 Survey was preformed on 10-15-90

RWP No: NA

Location: South of Horn Rapids landfill

Check if appropriate. When checked, do not place unrelated information on this record

- [ ] Personnel Contamination
- [ ] CAM/Radiation Alarm
- [ ] Establish Dose Rates
- [ ] Radiation/Contamination Incident
- [ ] High Radiation Level Work
- [x] "Special Survey"
- [ ] Property Release
- [ ] RAM Shipment

Item No	PER (1)	Description of Work Performed, Radiation Controls, and Measurements	Meter Deflection W.O	Meter Deflection W/C	Dist	CF	DOSE RATE beta (non pen) mrad/hr	DOSE RATE gamma (pen) mR/hr	DOSE RATE neutron mrem/hr	CONTAMINATION LEVELS Direct (dpm) beta	Direct (dpm) alpha	Smear 100 cm² beta (d/m)	Smear 100 cm² alpha (d/m)	mrad/hr
1		All areas surveyed with MSCM were less than 40 cpm Gamma less than 50 cpm beta.												
2		A sample of some Clay tile was taken and sent to the 222-S Lab 200-W. Sample number -4089. Lab computer number is E-2658.												

1 Check for personnel dose rate ☐ Continued on supplemental report form

Instrument(s) Used	☐ CP	☐ G-M Pancake	☐ PAM	☐	☐	☐
Serial No (s)	—	1523 / 808	—	—	—	—

Respiratory Protection Worn

- [ ] Supplied Air
- [ ] Filter
- [ ] Other
- [x] None

ESTIMATED PERSONNEL DOSE RATES

Phase of Work	Based on Measurement(s)	Average Dose Rate	Limit Applying
			WBP S E
			WBP S E
			WBP S E

RPT Exposure	Work Location Code	Signed / PR No
NA	NA	Signed [signature] PR No 6155

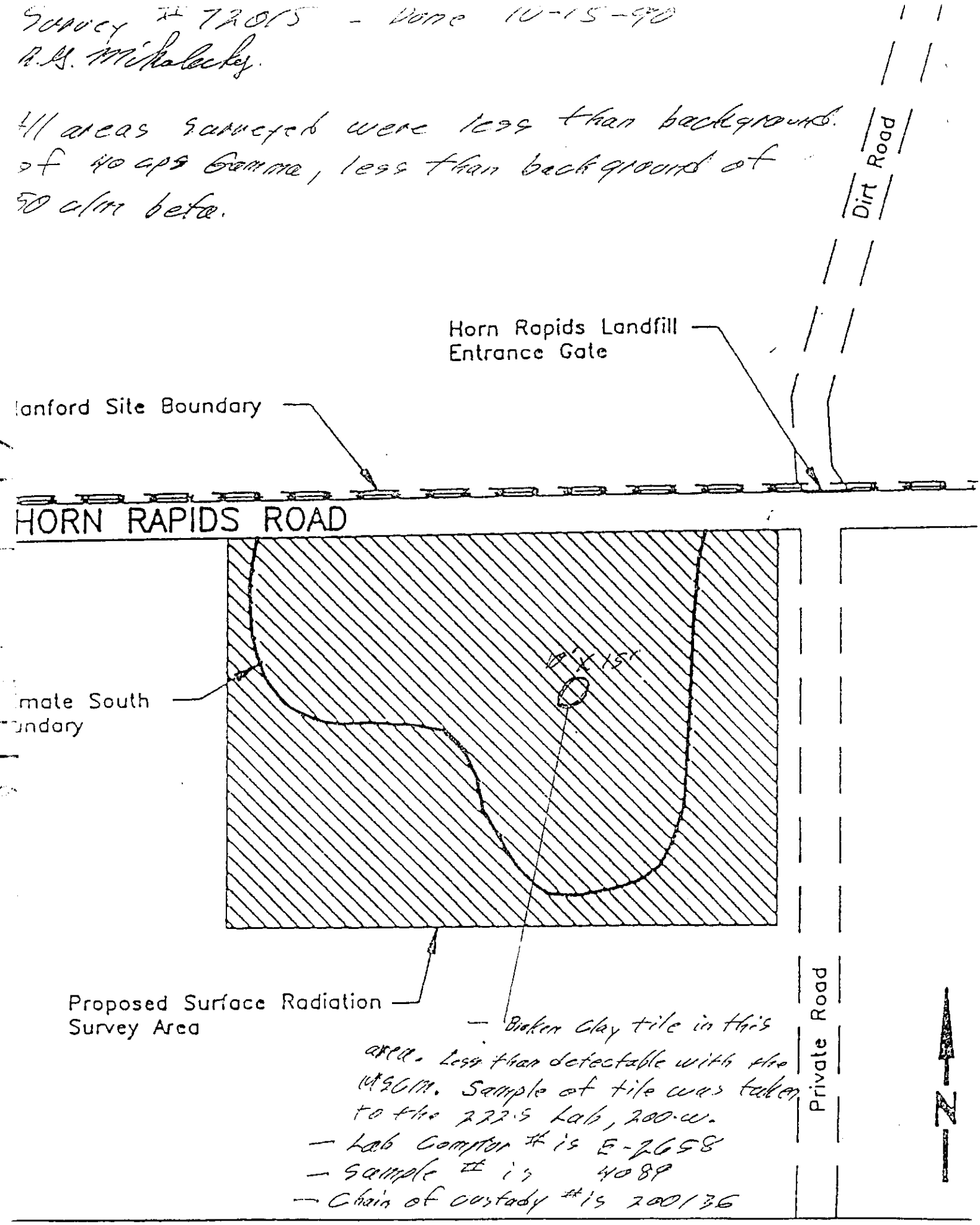
Did you increase or reduce RWP requirements for this work? ☒ No ☐ Yes Explain on reverse side

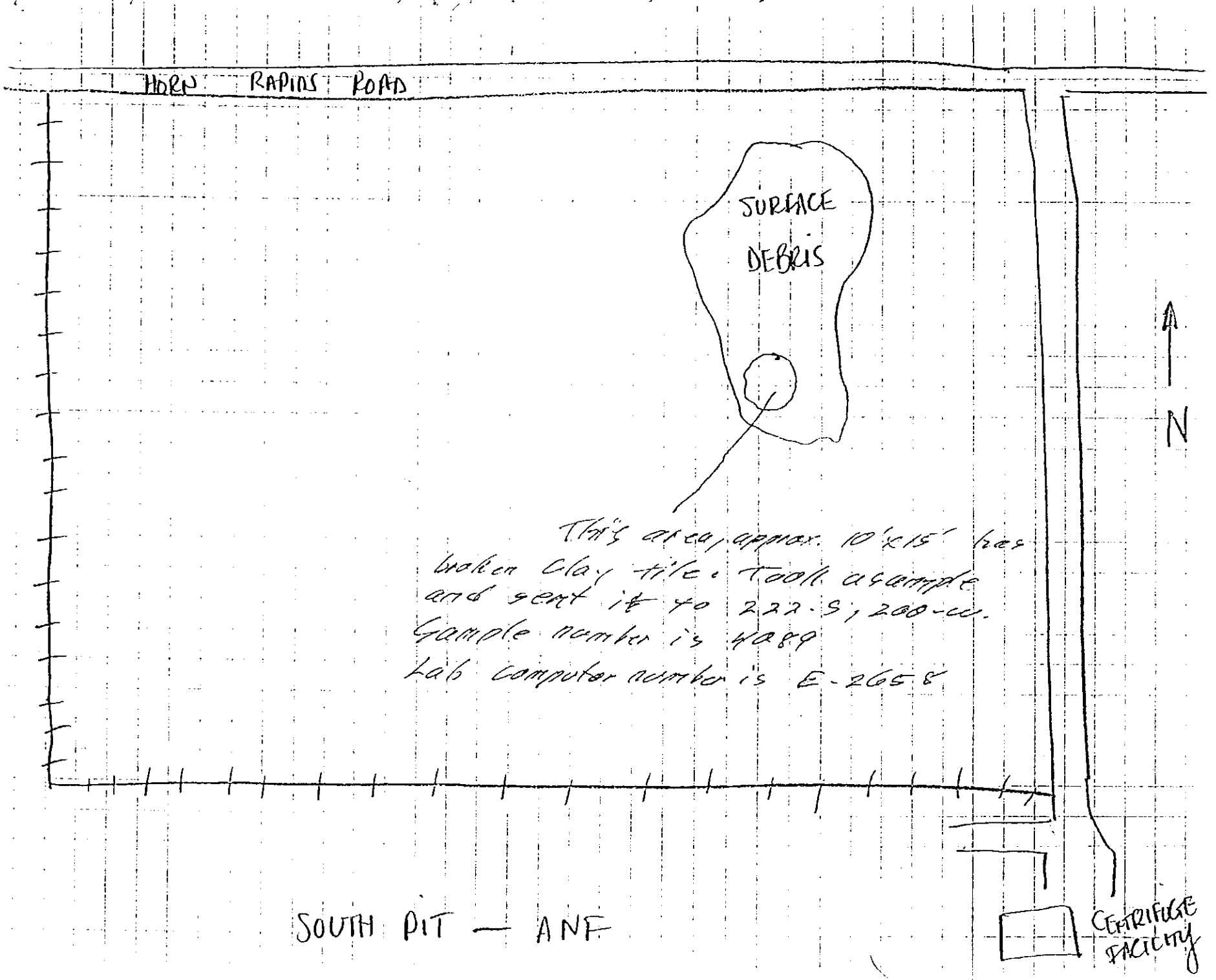
Did you attend a pre-job meeting for this work? ☒ N A ☐ No ☐ Yes

Reviewed By [signature] Date 10-18-90

Survey # 7205 - Done 10-15-90
R.S. Mikalacky.

All areas surveyed were less than background of 40 cps Gamma, less than background of 50 c/m beta.




HORN RAPIDS ROAD
SURFACE DEBRIS
N
This area, approx. 10'x15' has broken clay tile. Took a sample and sent it to 222.5, 200-cc. Sample number is 4089 Lab computer number is E-2658
SOUTH PIT — ANF
CENTRIFUGE FACILITY

Westinghouse Hanford Company

RADIATION SURVEY REPORT

Date	Time	Survey Number	F.C.
10-18-90	From NA To NA	72016	X
Bldg	**Area**	**Room**
NA	1100	NA

Description of Job

Bottom Survey of Area approx 80' x 300' North of the 1171 building, 1100 Area. Survey done on 10-16-90

RWP No	Location
NA	North of 1171 building

Check if appropriate When checked, do not place unrelated information on this record

- ☐ Personnel Contamination
- ☐ CAM/Radiation Alarm
- ☐ Establish Dose Rates
- ☐ Radiation/Contamination Incident
- ☐ High Radiation Level Work
- ☒ "Special Survey"
- ☐ Property Release
- ☐ RAM Shipment

Item No	PER (1)	Description of Work Performed, Radiation Controls, and Measurements	Meter Deflection W/O	Meter Deflection W/C	Dist	CF	DOSE RATE beta (non pen) mrad/hr	DOSE RATE gamma (pen) mR/hr	DOSE RATE neutron mrem/hr	CONTAMINATION LEVELS Direct (dpm) beta	Direct (dpm) alpha	Smear 100 cm² beta (d/m)	Smear 100 cm² alpha (d/m)	Smear 100 cm² mrad/hr
1		All direct surveys performed on this site.	NA	NA	NA		NA	NA	NA	LD	NA	NA	NA	NA

(1) Check for personnel dose rate ☐ Continued on supplemental report form

Instrument(s) Used	☐ CP	☐ G-M Pancake	☐ PAM	☐	☐	☐
Serial No (s)	—	1523 808	—	—	—	—

ESTIMATED PERSONNEL DOSE RATES

Phase of Work	Based on Measurement(s)	Average Dose Rate	Limit Applying
			WBP S E
			WBP S E
			WBP S E

Respiratory Protection Worn

- ☐ Supplied Air
- ☐ Filter
- ☐ Other _____
- ☒ None

RPT Exposure	Work Location Code	Signed / PR No
NA	NA	61552

Did you increase or reduce RWP requirements for this work? ☒ No ☐ Yes Explain on reverse side

Did you attend a pre-job meeting for this work? ~~☒ NA~~ ☐ No ☒ Yes RGO 10-18-90

Reviewed By DL Stark Date 10-18-90

☆ U.S. GOVERNMENT PRINTING OFFICE 1988—593 462

ER 2008-11

KAISER ENGINEERS HANFORD | FIELD SURVEY NOTES | 12-22-88 | 1 of 1

W.O. 11028-047

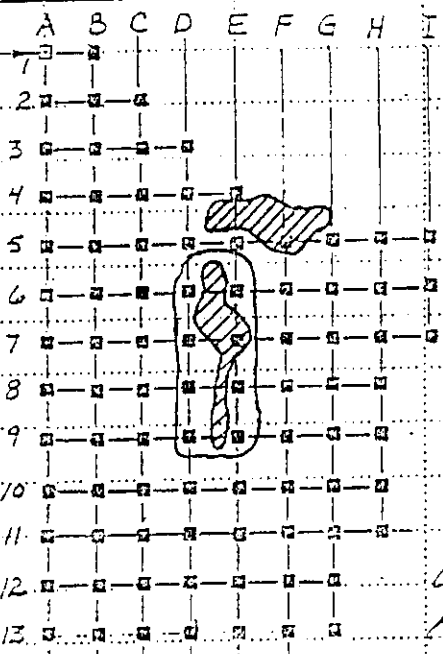
Title 1100-EM-1 OPERABLE UNIT | Book No. 884-382

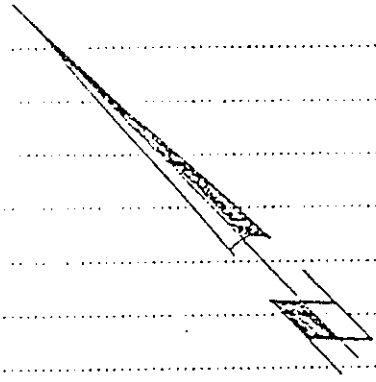
Crew FASTABEND - WRAY - MILLER | Weather OVERCAST, COOL, CALM

Inst. WILD T-1 #53816 | Temp. ≈30°F | Sur. N/A | Corr. N/A

LAYOUT 10' GRID ON "DISCOLORED SOIL SITE" | 4

FND. HIT N.E. COR. FENCE





Surveyed this area with Elev. ≈1623 and P-11 ≈ 908.

All readings observed & Rec'd at 50 GPM.

Area surveyed 10-18-90 Mapped by GHES

SAMPLE STATUS REPORT FOR E 2658. SCHMIDT 4089 TIME: 10/31/90 13:34
DISPATCHED: 10/16/90 S:31 SAMPLE HAS NOT BEEN SLURPED
RECEIVED: 10/18/90 11:10

EXT.	DETER.	RESULTS OR STATUS		OUT OF RANGE?	GOOD ANS?	CHARGE CODE
2182	GEA-V&A	< 4.39000E-01 PICI/G	Cs-137	N	Y	W4A52
3662	Sr-V&A	< 2.96000E-01 PICI/G		N	Y	W4A52
4471	U-VEG	1.25000E-07 G/G		N	Y	W4A52

END OF REPORT

Clay Pipe - 1100 Area

RWS
11-21-90

CORRESPONDENCE DISTRIBUTION COVERSHEET

Author	Addressee	Correspondence No.
S. H. Wisness, RL	D. Drais Stoel Rives Boley Jones & Grey	Incoming 9103773

Subject: REQUEST FOR INFORMATION RELATED TO 1100-EM-1 OPERABLE UNIT (HORN RAPIDS LANDFILL AREA)

INTERNAL DISTRIBUTION

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PLEASE NOTE: This letter is dated May 15, 1991.

ldp, 6-7049