Preliminary Assessment

Past Practices in the Vicinity of the Poligen Facility

Port of Tacoma, Washington

Prepared for

Sol-Pro/Lilyblad

May 1, 1986
J-1615-04

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J-1615-04

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PRELIMINARY ASSESSMENT
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PORT OF TACOMA, WASHINGTON

INTRODUCTION

This report presents the results of our evaluation of existing data regarding past waste disposal practices within the Poligen facility at the Port of Tacoma (Figure 1). The report may be used as partial fulfillment of requirements necessary to meet requirements of Section 3004(u) of the 1984 RCRA amendments in order to obtain a final RCRA permit. The purpose of our work was twofold:

1) To assess whether the release of hazardous substances is occurring due to past practices at the site, and

2) To recommend remedial investigation work designed to provide information for development of corrective measures.

Our scope of work included contact with federal, state, and county agencies and a search of existing government files on Poligen, Occidental Petroleum, Chemical Processors, Acology Oil, and Puget Sound Industrial Petroleum. Available historical photography was used in conjunction with the files to assess the past practices.

This report is prepared for the exclusive use of Sol-Pro/Lilyblad for specific application to the Poligen facility. Our work was performed according to accepted hydrogeologic practices. No other warranty, expressed or implied, is made.

POLIGEN SITE HISTORY

The Poligen facility is located within a former tidal marsh of Commencement Bay between Alexander Avenue and Taylor Way on the west and east, respectively, and 11th Street and Lincoln Avenue to the north and south, respectively. Historical photos from the 1930s indicate that much of the property was originally a swampy area with ponded water. Use of the property required filling of portions of the wetland resulting in ponds as the wetland shifted. These ponds were subsequently filled in. The fill materials are estimated to be roughly 8 to 10 feet thick at the site and composed of "pit run" sand and gravel, dredge sand, and various waste materials. Figure 2 presents a conceptual drawing of the subsurface conditions at the Poligen facility showing sequences of fill materials placed on the original tideflat topography. The figure is not intended to be representative of any particular location on site but rather general application of fills.

The history of past activities at the Poligen site indicates that chemically contaminated and potentially hazardous materials were used as fill at the site. In some areas these materials were removed to facilitate new construction. The precise location of the current waste fills and clean soil fills was difficult to determine using existing data. Historical photographs provided the best information on time and location of wetlands and pond filling, while the Washington State Department of Ecology (WDOE) inspection reports provided insight to the specific activities and materials disposed of in the vicinity. Based on our evaluation of these data a chronology of the past land use and waste disposal activities is presented below. See Figure 1 for depiction of approximate areas of suspected waste disposal and pond filling.

Site Chronology

1965 - 1970: Don Oline acquires west half of current Poligen facility property (OCC report).

1967: An unknown fill material is placed to the west of the Poligen site (December 13, 1967 photo). The northeast quarter of the present Poligen property is a swamp. A swamp also exists along the west property boundary. The area between swamps (south central and northwest areas of the current facilities property) appears naturally vegetated.

1970: Aero Oil Company moves oil storage/refining operation to west side of Taylor Way in southwest Poligen property area (current Chempro lease area, Area 1 on Figure 1). Site is messy and oil is allowed to spill onto ground. (Inspection reports July 16, 1970 and September, 1970).

1971: Aero Oil Company uses pond located in current Chempro lease area for oil storage. (Inspection report February 3, 1971).

1972: Former Aero Oil now named as Acology Oil. Considerable oil is being dumped onto the ground. Communication with Bruce Smith (Acology Oil) indicates some dumping is occurring at the site when no one is around. (Inspection report June 15, 1972). Northeast quarter of current Poligen property is still wet area and appears to extend further south thus occupying the north half of the east side of the property (photo August 30, 1972).

1973: Stu Springer with Puget Sound Industrial Petroleum, Inc. has taken over Acology Oil's operation and the pond is still being used for holding oil. Unknown fill placed in northeast corner of Poligen site eliminates much of wet area in northeast corner (photo July 13, 1973).

1974: The pond areas that were holding oil are gradually being filled in; one pond is in the Chempro lease area of the Poligen facility and the other is just north along the west Poligen property boundary. Puget Sound Industrial Petroleum is linked to Chempro of Oregon and Inspection reports now refer to Entity as Chempro. Chempro pond areas (formerly Puget Sound Industrial) are being filled in with General Metals ground-up auto interiors (Inspection report September 4, 1974). Also, oil is occasionally being pumped from the ponds. There is new fill in east-central Poligen

property area, and it appears that a small pond may now occur in the center of the current Poligen area (March 20, 1974 photo).

1972 - 1975: Suspected period of disposal of Hooker sludge and dredge spoil wastes in previous mentioned ponds in the Chempro area. Another small disposal area of Hooker wastes is indicated in the northwest Poligen facility area (see Figure 1 for approximate disposal areas). Reports indicate the disposal material may contain small amounts of chlorinated hydrocarbons, heavy metals, and asbestos (OCC report).

February, 1975: D.O.E. Enforcement Notice to Puget Sound Industrial to fill in ponds as they are still holding some oil. Large amounts of sodium chromate spillage also noted in an Inspection report submitted during this month.

April 14, 1975: Oil is being dumped on the ground next to the Lilyblad fence. Also, ponds still hold about 8 inches of oil.

July 28, 1975: Puget Sound Industrial (Chempro) pond now completely filled in. Filling is continuing on Oline's large pond (Oline's pond apparently refers to the pond to the north that borders on the west boundary of the Poligen facility) (D.O.E. Inspection report).

1975 - 1976: Lilyblad using small tank farm (two tanks) in the northwest corner of the present Poligen property. It appears most of the west area within the Poligen property is now filled in (from OCC photos file). A WDOE telephone report (August 2, 1982) indicates that Buffalo Don Murphy was responsible for filling in the Poligen area.

1978: Three additional smaller tanks noted on Lilyblad tank farm (Figure 1) (WDOE January 13, 1978 letter).

1978 - 1981: Several spills and leaks from the Chempro chemical processing unit (Chempro lease area). Predominantly chromic or nitric acid spills noted. Some other materials handled at the site that may be included in

the spillage and leakage include cyanide sludges, solvent still bottoms, electroplating waste acids (primarily chromic acid), phenols, chelating agents, and paint sludges (WDOE telephone report February 22, 1978, Inspection reports February 14, 1979, June 30, 1981, and letter July 6, 1981).

1978 - 1981: Oil recycling facilities are found to be inadequate, spillage and leakage to the ground were noted. Chempro was required to upgrade contaminant (Personnel communication with Frank C. Monahan).

March, 1981: WDOE Inspection reports on March 17, 1981 and March 30, 1981 observed large area of ground-up car interiors and large area of dredge spoils north of the Chempro lease area (the map included with inspection report is not to scale and the boundaries of these fills are difficult to determine). Also, some asphalt, concrete, wood and lime fills are noted but not located. Leachate from car parts was observed entering swamp to west northwest of Poligen property.

July, 1981: Solidus acquires some properties in this area including area now referred to as Chempro lease area.

January, 1982: Site vicinity is being investigated as Hooker dump site and WDOE performs site investigation (25 test pits dug on the east side of the current Poligen facility, WDOE letter June 11, 1982). Bruce Smith says that Acology Oil dumped lime used in their oil treatment system in the Chempro lease area, also Domtar may have dumped lime. Indication that methylmercuric phosphate sludge may also have been dumped in the area but no specific location given (Inspection report January 6, 1982). Oil sheen is observed in pond located in center of current facility. Oil on pond appears to be due to drainage from Lilyblad tank farm, as drain pipes and dike breach were observed to be running stormwater from tank farm area (WDOE Inspection report January 27, 1982).

December, 1981 - January, 1982: Waste water discharge from Chempro facility indicated release of metals, cyanide, and oil to sewer (Chempro letter to WDOE February 10, 1982).

March 5, 1982: Reports that Lilyblad's plans to develop site result in removal of some contaminated fills. Indication that site work possibly exposed pond in center of facilities property (see WDOE test pit data and letter report June 11, 1982).

May 19, 1982: Pond in center of current property, and DOE test holes have been filled in with clean backfill.

May, 1982: Proceed to obtain RCRA permit to move facilities to Poligen site.

August, 1982 - October, 1982: Removed loads of white sludge (presumably lime and Hooker wastes) from site to Coski landfill (Inspection report 10/15/82 and communication with Glen Tegen, 4/86). It is presumed that this removal occurred primarily in the central and east site areas as a result of the WDOE site investigation.

August, 1983 - October, 1983: Chemical spillage around tanks and from lab test wastes being dumped out window to a holding container noted in Chempro area. Considerable spillage noted within diked area with tire dragout occurring from equipment operation (Inspection reports August 16, 1983 and October 5, 1983).

October 3, 1985: Nitric acid spill from Chempro lease area. Acid neutralized within a few hours and contaminated soil removed within one week.

SUBSURFACE CONDITIONS

The chronology of past activities at the site indicates that potentially hazardous materials are most likely to exist in the subsurface beneath the

Chempro lease area and along the west side of the facilities property (in the suspected Hooker sludge disposal areas). If present, infiltrating precipitation and groundwater flow through these materials could result in release of hazardous waste constituents to the environment. The Poligen facility has been broken into three areas based on the waste materials that are expected to occur within these areas. Figure 1 presents the approximate boundaries of the areas. Discussion of the respective anticipated subsurface conditions is presented below.

AREA 1

Area 1 occupies the portion of the property currently leased to Chempro and the former site of operations for Acology Oil and Puget Sound Industrial Petroleum. Assessment of the past practices at this site indicates the following waste materials may occur in this area (no documentation on clean-up from past disposal in this area was found).

- Waste oils and associated products were processed and/or stored in a pond located in the center of this area for roughly three years. Although the oil was pumped from the pond several times prior to filling, oily sand and water were encountered during drilling of a monitoring well located southwest of the lease area (this direction was also determined at the time to be the downgradient groundwater flow direction) (Hart-Crowser report March 19, 1986).

- Lime wastes related to disposal practices of the waste oil operations, Domtar lime, and possibly Hooker sludge may have been used to fill in the pond in varying amounts not expected to be thicker than 1 to 2 feet in some portions of the former pond area. Minor amounts of chlorinated hydrocarbons, heavy metals, and asbestos may occur in these materials.

- Possible metals including chromium, copper, nickel, and lead, and cyanide and phenols related to spillage and leakage from existing facilities may be present in the soil and/or groundwater.

AREA 2

Area 2 includes the west half of the Poligen facility property, north of the Chempro lease area, formerly part of the Don Oline property. Some removal of waste fills was accomplished prior to construction of the current Poligen facilities. The areas which still include waste materials and those areas cleaned-up by soil removal cannot be specifically identified with the existing data. Figure 1 shows the estimated original occurrence of these waste fills. A list of the probable waste materials disposed of in this area is given below, although the areas in which these materials still occur is unknown.

- Lime material from the Hooker lime ponds and dredged material from the Hylebos waterway adjacent the Hooker plant was used to fill in some wet areas. The fill material is suspected of containing small amounts of chlorinated hydrocarbons, heavy metals, and asbestos. These waste materials are reported to be about 1 to 2 feet thick. It is believed this was the material observed in a monitoring well installed in January, 1986 in the southeast corner of Area 2.

- Automobile fluff consisting of ground-up car interiors from General Metals was used to fill in areas generally in the north Poligen facility area, but the specific area is not known. Car parts were also encountered during drilling of the monitoring well in the southwest corner of Area 2. It is estimated the auto fluff fill may be 3 to 8 feet thick where it occurs.

AREA 3

Area 3 includes the east half of the Poligen facility. In contrast to the other areas no specific waste disposal was identified for this area from the reviewed files. The historical photographs indicated the area was largely wetland prior to filling which occurred in various stages through this area. A WDOE site investigation provided data into the nature of the

fills in this area. The possible waste materials identified primarily from the WDOE files are listed below.

- Wood waste and demolition/construction debris fills were uncovered during the WDOE investigation primarily in the north half of this area. These types of fill materials are not expected to release hazardous substances.

- Lime wastes from Hooker Chemical were reported to occur adjacent to a pond which existed in 1981 in the central portion of this area. The files are unclear as to whether these materials were excavated during clean-up and removal at the Poligen facility.

As mentioned, the site is located within a former tidal marsh of Commencement Bay. The fill materials which overlie the tidal sediments are estimated to be 8 to 10 feet thick. Dredge sand fill is the most common material likely to be found overlying the tidal sediments. This sand fill is not in itself contaminated. In terms of groundwater flow, the dredge sand and the material above it, comprise the "upper aquifer" at the site.

The natural tideflat sediments generally include an upper silt to silty clay layer ("upper aquitard"). The silt is underlain by a sand layer that consists of clean to silty sand. The deeper sand layer is referred to as the "second aquifer".

RECOMMENDATIONS

This section outlines our recommendations for work to meet RCRA part B permit application requirements regarding continued releases (EPA Draft Statutory Interpretation of 1984 RCRA Amendments on Corrective Action for Releases from Hazardous Waste Facilities dated January 30, 1985). The recommended scope of work is largely field work, and is complementary to the analysis of existing data presented in the previous section. The recommended level of effort is such that:

- impacts from Hooker waste and the site currently occupied by Chempro will be quantified,

- a groundwater monitoring system may be designed and would largely or wholly be in-place,

- potential sources of contamination will be characterized in relatively high detail,

- offsite migration of contaminants in groundwater (the major pathway of migration) will be quantified in relatively high detail,

- the need for remedial action to reduce off-site migration may be assessed, and

- if removal of contaminated material is required, whether the material will likely be classified dangerous or extremely hazardous waste.

The recommended work is divided into 4 parts and many tasks. The parts refer to divisions of the work by areas, with part 1 being common to all as follows:

- Part 1 - Prepare for Field Work
- Part 2 - Scope of Work for Area 1 (Chempro Lease Area)
- Part 3 - Scope of Work for Area 2 (Northwest Portion)
- Part 4 - Scope of Work for Area 3 (East Half)

We recommend that all of the parts be performed during a single mobilization to allow maximum efficiency. Individual parts could be performed separately but in this case additional time and analyses may be required to meet the objectives of any single part.

PART 1 - Prepare for Field Work

Task 1.1 - Site Reconnaissance and Health and Safety Plan

A health and safety plan should be developed to minimize any potential hazards to field personnel. It should include identification of potential hazards, necessary monitoring, protective measures for various field activities, planned flexibility, and identification of persons responsible for supervising health aspects of field work.

Also, prior to field work, a site reconnaissance should be conducted to locate boring sites and utilities.

Task 1.2 - Finalize Sampling Plan

Before field work begins, the details of how and where samples should be taken and analyzed should be finalized. This should include review of additional aerial photographs not available within the time frame of the current project and incorporation of your knowledge of the past activities at the site. Field personnel should develop equipment lists and prepare field equipment for use.

Task 1.3 - Project Management

Time should be budgeted for communications and performing analyses of project status. Time should be budgeted in this task for project meetings.

PART 2 - Scope of Work Area 1 (CHEMPRO LEASE AREA)

Task 2.1 - Install Groundwater Monitoring Wells

Because the Chempro site will probably not be accessible for exploration and sampling of actual waste products, the contributions from possible waste buried below the site or leaching from the soils should be measured

by comparing upgradient versus downgradient groundwater quality. The wells installed thus far have confirmed the general groundwater flow directions but do not provide:

- o enough areal coverage of the downgradient side of the site, and
- o monitoring of the second aquifer.

The monitoring wells discussed for this task are designed to provide the coverage necessary for assessing potential contaminant contributions from the Poligen area currently occupied by Chempro. The assessment will be performed by comparing water quality to the chemistry of spills, leaks, or other contamination events that can be identified in the records. Sufficient borings are recommended such that no additional installations should be necessary for the overall continued releases assessment.

Figure 3 indicates the recommended locations for the PART 2 borings and monitoring wells. The 4 existing shallow wells would be augmented by 2 additional shallow wells and 5 deeper wells.

We recommend that the wells be installed by the cable tool method as described below:

Deeper Wells

- o Drill and drive 10-inch-diameter casing 2 to 3 feet into the silt aquitard, take continuous drive soil samples and clean sampler as described for test pit soil samples.
- o Install 8-inch-diameter casing within 10-inch casing and extract the 10-inch casing as a cement-bentonite slurry is tremied into the annual space between the casings.
- o When the grout has set for 12 hours, resume drilling with 6-inch casing to total depth expected to be 25 feet with continuous soil sampling.

- Take Shelby tube samples of silt aquitard for permeability testing.

- Install 2-inch-diameter schedule 40 threaded PVC casing and well screen into the natural sand aquifer, place sand pack around the screen, a bentonite pellet seal above the sand pack, and seal to 3 feet from ground surface with cement-bentonite grout; seal from 3 feet to ground surface with class C concrete and install a 4-inch lockable steel protective casing.

Shallower Wells

- Drill and drive 6-inch temporary steel casing to a predetermined depth based on the soil profile disclosed in the nearby deeper well.

- Take one soil sample at the intended screen interval (driven sample).

- Set PVC casing and short (2 to 5 foot) well screen, sand pack, bentonite pellet seal, cement-bentonite grout seal, concrete, and protective surface casing as described for the deeper wells.

Minimum decontamination precautions should include hot water washing of drill bits, bailers, and temporary steel casing lengths if they are reused between locations. Washing with methane or acetone may also be required. After installation, the wells should be developed by pumping. An H-Nu organic vapor analyzer or equivalent should be used to monitor during explorations (test pit and borings).

Task 2.2 - Survey, Sample, and Analyze Groundwater

Water levels in wells should be measured and the well elevations should be surveyed to allow calculation of groundwater flow directions. Four sets of water levels should be taken to assess tidal affects. Selected wells should be tested to allow calculation of hydraulic conductivity and the rate of groundwater flow.

All wells should be sampled in accordance with current EPA guidance and tested for parameters that may be moving off-site with groundwater from on-site contamination sources. Also, these data are needed to identify possible migration of contaminated groundwater onto the site.

We recommend that samples be collected with a peristaltic pump and that they be stored and transported in accordance with EPA and laboratory recommendations. We recommend that the analyses listed in Table 1 be performed on groundwater samples.

The wells selected for the priority pollutant scan should be selected based on evaluation of the groundwater flow systems in the upper and lower aquifers (water level measurements, surveying, and evaluation of groundwater flow direction should precede sampling).

The 3004(u) interpretation available from EPA references 40 CFR 264 Appendix VIII parameters on the baseline list of constituents for which analyses should be performed. For the project site we recommend avoiding use of this list of parameters because it is long and expensive to run. In this case, it appears unnecessary because of the amount of information available on the nature of past practices. The EPA priority pollutant list, augmented by the other indicated parameters, should be sufficient to assess continued releases.

Task 2.3 - Analyze Soil Samples and Characterize Waste

We recommend that soil and waste samples be analyzed to allow assessing the relationship between groundwater quality and possible contamination sources, to evaluate the extent of chemical contamination across the site, and to provide preliminary evaluation of the waste classification should removal of the material be necessary.

Samples to be analyzed should be selected based on the results of field explorations, the types and number of analyses recommended for PART 2 are indicated in Table 1. The limited PART 2 level of effort in soil analyses

is based on the difficulty in placing explorations in the likely contaminant source areas.

The major waste classification test excluded from the above list is bioassay. The bioassay test has been used in the past largely as the test of last resort at the discretion of the WDOE. It has come under considerable criticism and we recommend getting input from WDOE personnel and/or your legal counsel before using the bioassay test.

Task 2.4 - Evaluate Data

The following analyses are recommended:

Hydrogeologic Characterization: The hydrogeology of the site needs to be characterized to identify groundwater flow directions and contaminant migration pathways. This evaluation should also serve as the basis for RCRA Part B Subpart F groundwater monitoring. The analysis should include both explored aquifers, an evaluation of groundwater-surface water interaction, recharge, sources, sinks, flow rates, and tidal effects.

Contaminant Migration Analysis: An evaluation of the rate, flux, and direction of contaminant migration should be performed to satisfy the RCRA 3004(u) requirements. The major receptors of possible migration will likely be marine and benthic organisms in Blair Waterway, and thus an evaluation of potential impacts to health, welfare, and the environment should be based largely on those organisms. This analysis should stress the contributions from other potential sources in the Port of Tacoma also.

Assess Waste Classification: The probable classification of wastes tested should be assessed based on chemical analysis data.

Task 2.5 - Produce Report

The field data, chemical data, analyses and conclusions resulting from the work should be presented in a project report. The report should

specifically address site requirements under RCRA 3004(u) and 264 Subpart F. Also, the report should, to the extent possible, correlate potential water contamination with specific activities, spills, or leaks and the dates and operators of the facilities at the time of the activity. The results of the analyses performed under Task 2.4 should be presented with appropriate sections, maps, and calculations.

PART 3 - Scope of Work Area 2 (NORTHWEST PORTION)

We recommend that the approach to assessing continued releases from the northwest portion of the facility, consist of excavating test pits, installing monitoring wells in borings, and water and soil chemical analyses. The area designated for the effort is based on the area of the major potential waste deposit of Hooker line sludges and General Metals automobile fluff as indicated by the records search (although we understand considerable clean-up effort has occurred in this area). Insufficient chemical characterization data are available for the sludge to allow narrowly focused analyses at this stage. The recommended program is outlined over the following paragraphs.

Task 3.1 - Excavate Test Pits

We recommend that approximately 10 to 15 backhoe test pits be excavated in AREA 2 to assess the distribution of possible wastes remaining after Lilyblad's clean-up efforts. These should be located in a regular grid pattern at approximately 100-foot centers.

The soils disclosed in the pits should be described by a geologist or engineer experienced in the description of soils and identification of typical Port of Tacoma fills and waste products. The various soil layers should be sampled in accordance with possible chemical analyses of the samples. For instance, any potentially contaminated soil or waste layer should be sampled, preserved, and shipped in accordance with current EPA guidance for sampling soils intended for chemical analyses. This includes minimizing potential cross contamination by cleaning the backhoe bucket

with a hot-water power wash between test pits, and cleaning sampling implements (stainless steel spoons, etc.) with detergent, water, and acetone, and finally rinsing with distilled water between each sample.

Task 3.2 - Install Monitoring Wells

The same approach to performing borings and installing monitoring wells is recommended here as for PART 2, Task 2.1. Figure 3 indicates the 4 additional sets of wells that should be installed for PART 3 if PART 2 is conducted simultaneously or if PART 2 precedes PART 3. If PART 3 precedes PART 2 then the deep well located just north of the Chempro lease area should be installed for PART 3. The wells placed on the northeast side of the site (entire Poligen site) are recommended for indications of background conditions. Other upgradient wells (on the north side of the site) appear to be in areas of sludge disposal and may not be good indicators of uncontaminated water quality.

Task 3.3 - Survey, Sample, and Analyze Groundwater

The same work outlined for PART 2 should be performed for the PART 3 wells. Table 1 indicates the water analyses recommended for PART 3.

Task 3.4 - Analyze Soil Samples and Characterize Waste

The analyses indicated in Table 1 should be performed on soil and waste samples from PART 3 to achieve the same goals as expressed for PART 2.

Task 3.5 - Evaluate Data

The same analyses recommended for PART 2 are recommended here for PART 3. The orientation of the analyses, however, should be towards identifying contaminant contributions from Hooker sludge. The overall objective of assessing the potential for significant continued releases should also be addressed.

Task 3.6 - Produce Report

The report elements indicated for PART 2 should also be produced for PART 3. In addition, a map of remaining sludge should be produced to the extent possible.

PART 4 - Scope of Work Area 3 (REMAINDER OF SITE)

The recommended PART 4 scope of work parallels the work recommended above for PART 3. Tasks corresponding to PART 3 tasks 3.1 through 3.6 should be conducted as tasks 4.1 through 4.6. We recommend that:

- 15 to 20 test pits be excavated for PART 4,
- three additional well sites be developed for Task 4.2 (see Figure 3 for further additional wells recommended if PART 4 is not preceded by PARTS 2 and 3), and
- the chemical analyses indicated on Table 1 be performed for tasks 4.3 and 4.4.

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TABLE 1 - DISTRIBUTION OF CHEMICAL ANALYSES

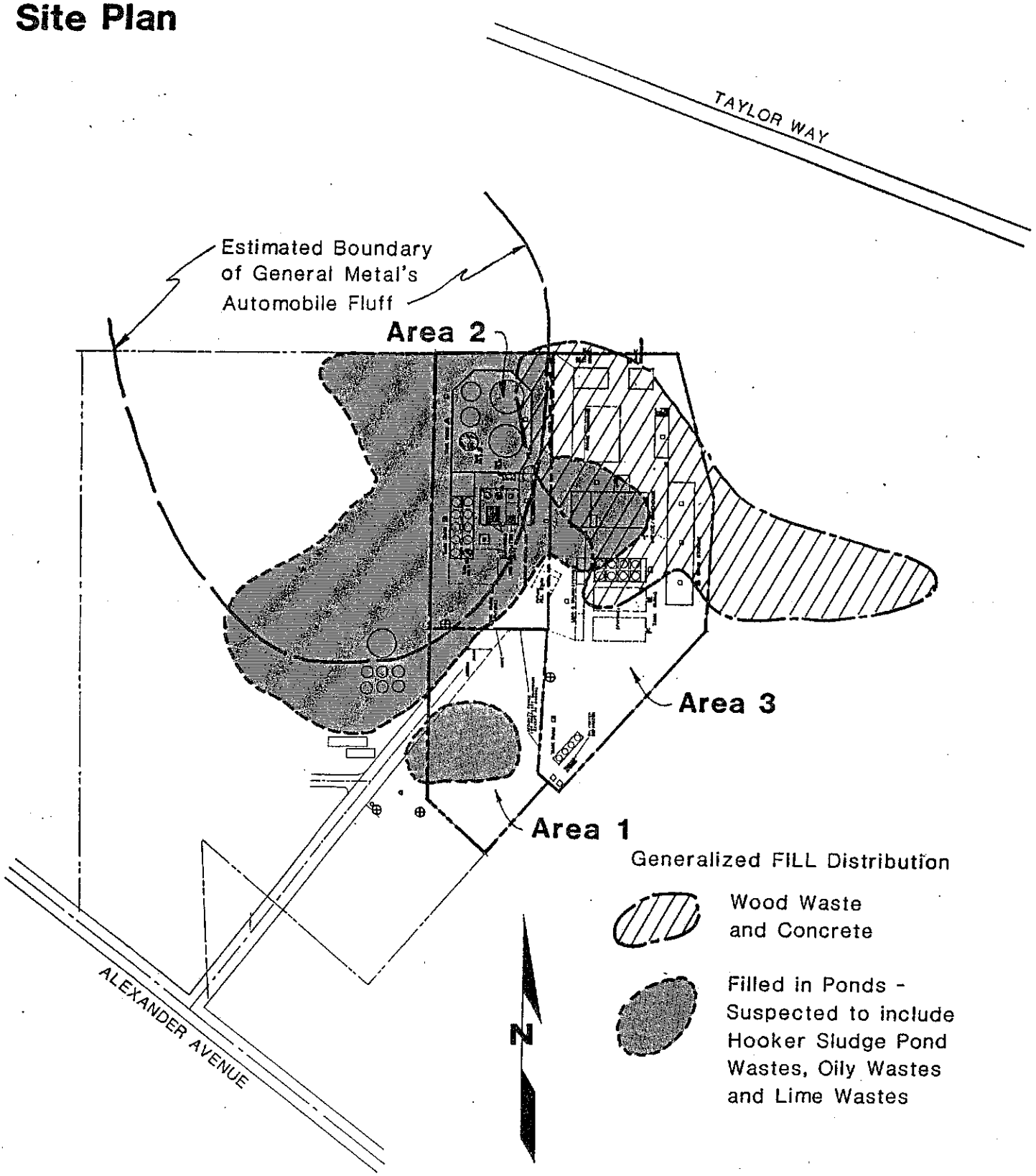
PART	TASK	WATER ANALYSES							
		FIELD	TOC	TOX	N+CN	VOA	BAN	METLS	PCB-PEST
2	2	11	11	11	11	6	6	6	6
3	3	8	8	8	8	6	6	6	6
4	3	4	4	4	4	3	3	3	3
		SOIL ANALYSES							
		H.H.	PAH	VOA	BAN	METLS	PCB-PEST	CN	
2	3	3	3	4	4	3	3	3	
3	4	4	3	5	4	3	3	3	
4	4	3	3	4	4	3	3	3	
TOTALS									
WATER		23	23	23	23	15	15	15	15
SOIL		10	9	13	12	9	9	9	_

NOTES:

FIELD = TEMPERATURE, ELECTRICAL CONDUCTIVITY, pH
TOC = TOTAL ORGANIC CARBON
TOX = TOTAL ORGANIC HALOGEN
N+CN = NITRATE-NITRITE, CYANIDE
VOA = PRIORITY POLLUTANT VOLATILE ORGANICS
BAN = PRIORITY POLLUTANT EXTRACTIBLES
METLS = PRIORITY POLLUTANT METALS
PCB-PEST = PRIORITY POLLUTANT PCB, PESTICIDES
H.H. = HALOGENTATED HYDROCARBONS
PAH = POLYNUCLEAR AROMATIC HYDROCARBONS

NUMBERS OF ANALYSES ASSUME PARTS ARE PERFORMED SEQUENTIALLY OR ALL TOGETHER. NUMBER OF ANALYSES FOR PARTS PERFORMED OUT OF SEQUENCE OR ALONE SHOULD BE GREATER THAN INDICATED TO ACCOUNT FOR INEFFICIENCY.

Site Plan



Dredge SAND and SAND and GRAVEL Borrow overlay Tideflat Sediments over entire site with specific other Fills as indicated.

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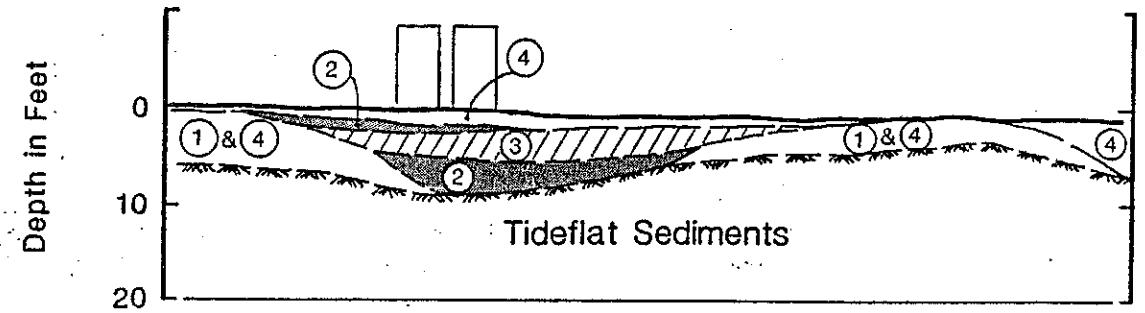
Figure 1

Conceptual Subsurface Profile



Note: Conceptual drawing not intended to represent any specific section of site.

(1) Dredge SAND

(2) Filled in Ponds Suspected to include Hooker Sludge Pond Wastes, Oily Wastes and Lime Wastes

(3) Wood Waste and Concrete

(4) SAND and GRAVEL Borrow Material

Vertical Exaggeration x 10
Horizontal Scale in Feet
0 200 400
0 20 40
Vertical Scale in Feet

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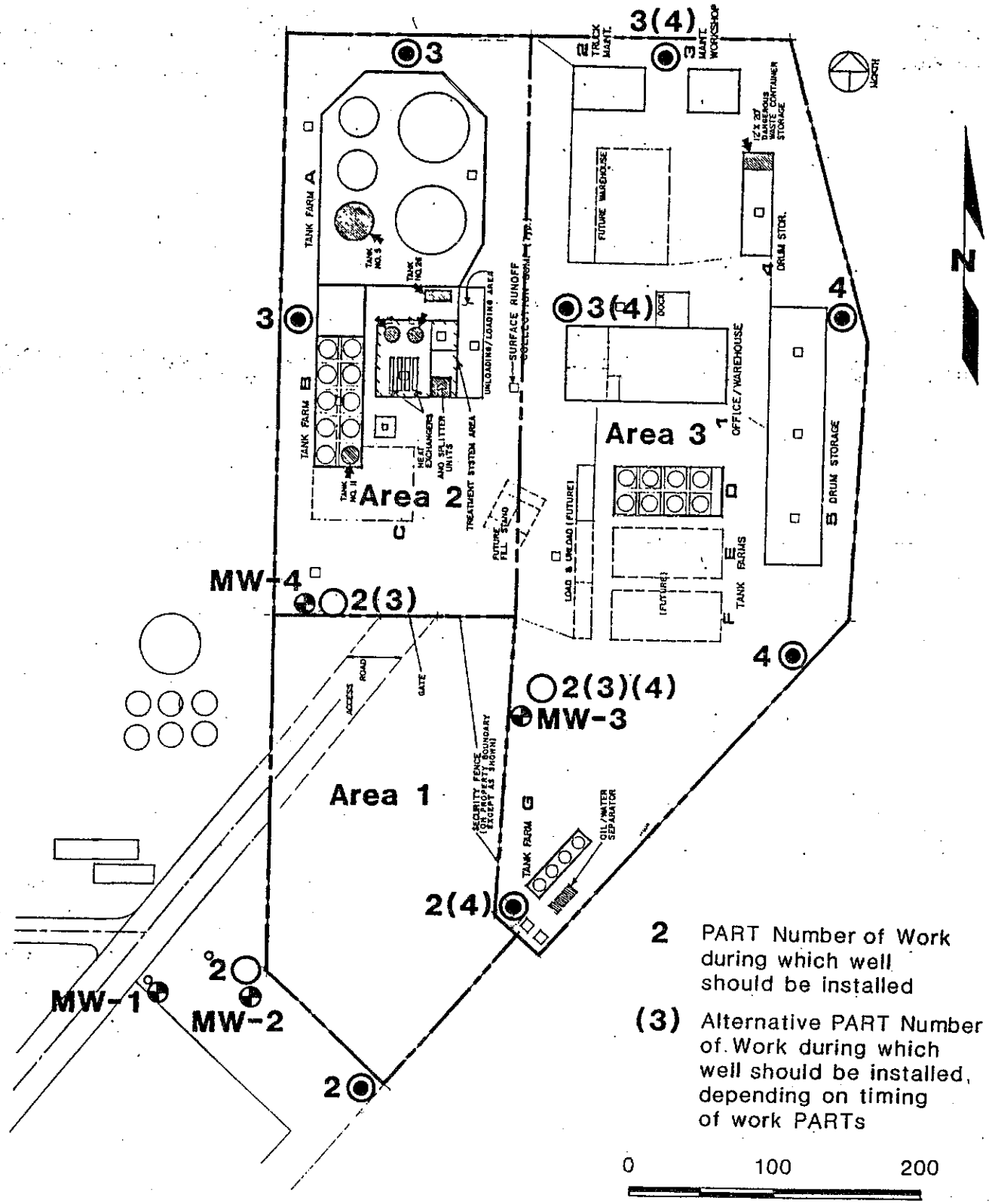
Figure 2

Recommended Exploration Plan



2 PART Number of Work during which well should be installed

(3) Alternative PART Number of Work during which well should be installed, depending on timing of work PARTs

MW-1 Existing Shallow Well Location and Number

Recommended Deep Well Location

Recommended Deep and Shallow Well Location

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Figure 3