



**Golder Associates Inc.**  
CONSULTING ENGINEERS

INTERIM REPORT ON SYMS AREA  
MODEL CITY TSDR FACILITY  
Volume I OF III

Submitted to:

CWM Chemical Services, Inc.  
1135 Balmer Road  
Model City, New York 14107

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## Golder Associates Inc.

CONSULTING ENGINEERS

January 4, 1991

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Ms. Rebecca Coker  
Project Manager  
CWM Chemical Services, Inc.  
Model City TSDR Facility  
1135 Balmer Road  
Model City, New York 14107

RE: INTERIM REPORT  
SYMS AREA INVESTIGATION  
MODEL CITY TSDR FACILITY

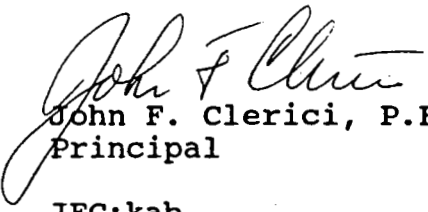
Dear Ms. Coker:

Attached is the Interim Report on the Syms Area Investigation. This investigation was performed as part of the ongoing RCRA Facility Investigation. This report includes the data obtained and our conclusions and recommendations from the review of these data. Also, included is an evaluation performed by ICF of potential DOD impacts. The ICF letter report was utilized, along with our understanding of the history of site industrial usage, to evaluate potential contamination in the Syms Area.

Golder Associates appreciates the opportunity to work with CWM Chemical Services on this project. Please call if you have any questions.

Very truly yours,

GOLDER ASSOCIATES INC.

  
John F. Clerici, P.E.  
Principal

JFC:kab

Attachment

TABLE OF CONTENTS  
Volume I of III

Cover Letter

Table of Contents

i

<u>SECTION</u>	<u>PAGE</u>
1.0 INTRODUCTION .....	1
2.0 BACKGROUND .....	4
2.1 Site Background .....	4
2.2 Hydrogeology .....	5
3.0 SWMU DESCRIPTIONS AND BACKGROUND .....	7
3.1 General .....	7
3.2 Houghson Pit (Syms Lagoon).....	7
3.3 Acid Pit (Syms Lagoon).....	8
3.4 Oil/Water Pit (Syms Lagoon) .....	8
3.5 Syms Property Underground Tanks .....	8
3.6 Syms Tank Area .....	9
4.0 INVESTIGATION .....	10
4.1 General .....	10
4.2 Sample Designations and Tracking .....	11
4.3 Drilling Procedures .....	12
4.4 Air Monitoring Procedures .....	12
4.5 Soil Sample Collection Procedures .....	13
4.6 Well Installation Procedures .....	15
4.7 Groundwater Sample Collection .....	15
4.8 Lagoon Sludge Sample Collection.....	17
4.9 Lagoon Water Sample Collection .....	18
4.10 Sample Containers .....	19
4.11 Field Analyses .....	19
4.12 Laboratory Analyses .....	21
4.13 Quality Assurance/Quality Control Procedures.....	21
4.13.1 General .....	21
4.13.2 Decontamination .....	22
4.13.3 Sampling Quality Control .....	23
4.13.4 Field Quality Control .....	24
4.13.5 Laboratory Quality Control .....	25
4.13.6 Sample Tracking .....	26
4.13.7 Data Validation and Checks .....	27
5.0 RESULTS .....	29
5.1 Soils and Geology .....	29
5.2 Field GC Results .....	30
5.2.1 Field GC Soil Sample Results .....	30
5.2.2 Field GC QA/QC Results .....	30
5.3 Analytical Laboratory Results .....	31
5.3.1 General .....	31

TABLE OF CONTENTS  
(CONT'D)

5.3.2	Organics .....	33
5.3.3	Inorganics .....	36
5.3.4	Laboratory QA/QC.....	37
5.3.5	QA/QC Results.....	38
5.3.6	Recalculation Results.....	39
5.4	Health and Safety.....	39
5.5	ICF Report on Possible DOD Activities .....	39
6.0	EVALUATION OF RESULTS .....	41
6.1	Acid Neutralization Pit Area .....	41
6.2	Houghson Lagoon Area .....	41
6.3	Syms Tank Area .....	43
6.4	Oil/Water Separator Area .....	43
6.5	Chemical Waste Lift Station 7 .....	43
6.6	Chemical Waste Lift Station 7A .....	44
6.7	Chemical Waste Lift Station 8 .....	45
6.8	QA/QC Evaluation .....	45
6.8.1	General .....	45
6.8.2	Blanks .....	46
6.8.3	Shuttle Temperature and Holding Times .....	47
6.8.4	Spikes, Duplicates and Surrogates .....	47
6.9	Evaluation Summary .....	48
7.0	CONCLUSIONS AND RECOMMENDATIONS .....	50
REFERENCES	.....	53

In Order  
Following  
Page 53

TABLE 1	- Summary of Samples Required and Obtained, Syms Area, Model City TSDR Facility
TABLE 2	- Priority Pollutant Parameter List
TABLE 3	- Summary of Compounds Detected by the Field GC
TABLE 4	- Radian Results, Summary of Compounds Detected in DA-22 Soil Samples
TABLE 5	- Radian Results, Summary of Compounds Detected in the DA-34 Soil Samples
TABLE 6	- Radian Results, Summary of Compounds Detected in DA36 Soil Samples
TABLE 7	- Radian Results, Summary of Compounds Detected in Acid Neutralization Pit, Water and Sludge Samples
TABLE 8	- Radian Results, Summary of Compounds Detected CWLS Number 7, Water and Sludge Samples
TABLE 9	- Radian Results, Summary of Compounds Detected CWLS Number 7A, Water and Sludge Samples

---

TABLE OF CONTENTS  
(CONTINUED)

TABLE 10 - Radian Results, Summary of Compounds Detected  
CWLS Number 8, Water and Sludge Samples

TABLE 11 - Radian Results, Summary of Compounds Detected  
Houghson Pit, Water and Sludge Samples

TABLE 12 - Radian Results, Summary of Compounds Detected,  
Decontamination and Municipal Water Samples

TABLE 13 - Radian Results, Summary of Compounds Detected,  
Field Blanks and Trip Blanks

TABLE 14 - Radian Results, Summary of Compounds Detected,  
Method Blanks

TABLE 15 - Chemicals Related to Past DOD Activities

TABLE 16 - QA/QC Blank Evaluation Results

FIGURE 1 - Site Location Map

FIGURE 2 - Site Layout

FIGURE 3 - Glaciolacustrine Silt/Sand Potentiometric Contours

FIGURE 4 - Upper Glacial Till Potentiometric Contours

FIGURE 5 - Designated Area Locations

FIGURE 6 - Syms Area SWMU Locations

FIGURE 7 - Syms Area Sample Locations

FIGURE 8 - Overview of Analytes Detected

Volume II of III

APPENDIX A - Sample Designations and Cross References

APPENDIX B - Soil Boring Logs, Well Installation Logs, Well  
Development Records, and Hydraulic Conductivity  
Results

APPENDIX C - Laboratory Certifications

APPENDIX D - Chain-of-Custody Forms for the Syms Area Investigation

APPENDIX E - Blank Field Forms

APPENDIX F - Field GC Validation Checklists

APPENDIX G - Laboratory Validation Check Sheets and Data  
Acceptability Narratives

APPENDIX H - Summary of Field GC Headspace Analyses for the  
Syms Area Investigation

APPENDIX I - Field GC Chromatograms

APPENDIX J - Radian Analytical Reports (W.O.#P9-09-095 end)

---

TABLE OF CONTENTS  
(CONTINUED)

Volume III of III

APPENDIX J - Radian Analytical Reports (start pg.1. P9-09-107)  
APPENDIX K - Summary of Radian Results  
    K-1 - Acid Pit  
    K-2 - Houghson Pit  
    K-3 - Syms Tank  
    K-4 - Oil/Water Pit  
    K-5 - Syms Property Underground Tanks  
    K-6 - QA/QC Samples  
APPENDIX L - Detailed QA/QC Results Discussion  
APPENDIX M - Air Monitoring Data  
APPENDIX N - ICF Kaiser Engineers Letter Report

## 1.0 INTRODUCTION

CWM Chemical Services, Inc. (CWM) is conducting a RCRA Facility Investigation (RFI) at the CWM Model City Facility in Model City, New York. The Administrative Order on Consent, USEPA Docket No. II RCRA-3008h-88-0207 (Consent Order) to perform the RFI was signed August 30, 1988. The Consent Order was superseded by the site HSWA Permit, effective date September 1, 1989. Attachment A of the Corrective Action Modules of the site Permits (HSWA and 6 NYCRR 373-2) delineates solid waste management units (SWMUs) at the Model City Facility and includes requirements for evaluating potential releases from each unit.

The SWMUs were grouped primarily based on geographic areas to facilitate the investigations required by the site Permits. The SWMUs in the Group F include the following areas or units:

- Syms Property Underground Tanks;
- Acid Neutralization Lagoon;
- Houghson Lagoon;
- Oil/Water Separator; and
- Syms Tank Area (former location).

These areas are addressed in the interim report included herein.

The initial SWMU investigation of the Group F SWMUs was initiated in August 1989 in accordance with the requirements of the RFI. The investigative procedures and protocols in the RFI Work Plan (Reference 1) were submitted to and approved by both the New York State Department of Environmental Conservation (DEC) and Region II of the United States Environmental Protection Agency (EPA). The RFI Work Plan procedures and protocols were followed during this investigation.

The Group F investigation plan, as outlined in the Corrective Action Modules of the site Permits, included the installation and sampling of three shallow wells, the collection of two near-surface soil samples from natural material, six lagoon water samples and six sludge samples for analytical laboratory analyses. Soil samples from the borings drilled for well installation and the soil samples from natural materials were collected for geologic identification and select chemical analyses in the field, namely field gas chromatographic (GC) analyses. The results of the field GC analyses were evaluated prior to installation of the wells. As previously agreed by the NYDEC and EPA (in a meeting with CWM on July 27, 1989), because field GC results for one well location indicated the need for additional investigation, the installation of that well was deferred pending additional investigation.

In addition to the investigation required in the RFI Work Plan, a study was conducted by ICF Kaiser Engineers (ICF) for CWM which included an evaluation of the types and extent of contamination potentially attributable to past Department of Defense (DOD) operations at the Model City Facility. A letter report on this study prepared by ICF was reviewed by Golder Associates for possible correlation between the analytical results and the use of the Syms Area by the DOD.

This interim report presents the details of this investigation. Included is a description of the SWMUs investigated, the investigation procedures utilized, the data collected, and an evaluation of the data. The QA/QC program included qualifying much of the analytical data. Although the qualified data are, in some instances, very different from the analytical laboratory reported data, the evaluation shows that ultimately, the qualified data accomplished the basic goals of the investigations:

1. Identify the potential presence of residual contamination; and



2. Delineate the nature of the potential contamination identified.

These data were also reviewed based on the types of constituents detected and the historic use of the property to help ascertain potential sources.

## 2.0 BACKGROUND

### 2.1 Site Background

The Model City TSDR Facility is located in Niagara County, New York, near the Niagara River and Lake Ontario (see Figure 1). The facility has been a waste treatment, storage, and disposal facility since 1972. Current operations at the facility include storage, treatment, recovery, disposal, and transfer of hazardous and industrial wastes. The operations are comprised of waste receiving areas, storage and mixing tanks, metal hydroxide ponds (currently out of service), chemical treatment facilities, biological treatment impoundments, and secure landfills. The general site layout is shown on Figure 2.

Prior to 1972, the site was used for a variety of industrial purposes other than commercial hazardous waste disposal (Reference 2). These include the following:

1942 - 1943: As part of the Lake Ontario Ordnance Works, areas of the site were used for the manufacture of trinitrotoluene (TNT). During this period, highly acidic and toxic effluents were generated and stored at the site. The TNT facility consisted of three dual production lines with an extensive system of underground service and waste pipelines.

1944 - 1946: As part of the Northeast Chemical Warfare Depot, areas of the site were used for the temporary storage and transshipment of munitions and chemicals. The site was concurrently used in conjunction with the Manhattan Project.

1946 - 1954: The site was used by the Atomic Energy Commission for the storage and/or burial of radioactive materials. Considerable effort has been made by the U.S.

Government to locate radioactive areas at the site and to remove excessively radioactive soils and wastes.

1958 - 1959: The site was used by the U.S. Air Force and U.S. Navy for a project to develop high energy fuels. In addition to process areas, the fuels plant included chemical waste treatment lagoons and a series of underground sewer lines. Areas of the site were used to bury and burn wastes.

Information exists to indicate that these previous industrial uses by the federal government may have been responsible for contamination at the site prior to the use of the site as a commercial hazardous waste treatment and disposal facility.

## 2.2 Hydrogeology

The hydrogeology at the Model City site was evaluated in detail in the "Hydrogeologic Characterization" report (Reference 3) and again in the "Hydrogeologic Characterization Update" report (Reference 4). The upper portion of the site consists of an Upper Till sequence (Upper Clay Till and Upper Silt Till) underlain by a Glaciolacustrine Clay. The clay is underlain by a Glaciolacustrine Silt/Sand unit which forms the uppermost aquifer at the site. A lodgement till (Basal Red Till) underlies the aquifer, which in turn is underlain by shale bedrock of the Queenston Formation. In the northwest portion of the site, a Middle Silt Till exists either between the Glaciolacustrine Clay and the Glaciolacustrine Silt/Sand or between an upper and lower Glaciolacustrine Clay. Surficial post-glacial alluvial deposits exist discontinuously across the site.

Monitoring wells have been placed in the Glaciolacustrine Silt/Sand aquifer and the Upper Tills. The potentiometric contours for water levels measured in November 1989 for the Glaciolacustrine Silt/Sand aquifer are shown on Figure 3. Flow in this aquifer was in the

north and northwest direction, with an estimated lateral flow rate on the order of one foot per year (Reference 5). The potentiometric contours for the Upper Tills for water levels measured in November 1989 are shown on Figure 4. Figure 4 reflects an overall flow direction to the north-northwest; however, the local flow directions were greatly influenced by open unlined ponds (i.e., FAC Ponds) and drainage ditches. Calculated lateral flow rates in this unit were about 0.3 feet per year (Reference 5).

### 3.0 SWMU DESCRIPTIONS AND BACKGROUND

#### 3.1 General

Each SWMU has been identified in the RFI as a Designated Area (DA \_). Figure 5 shows the location of all the designated areas. The SWMUs discussed in this report are collectively referred to as the Syms Area. The majority of the units in the Syms Area are still intact, although not utilized. The tank identified for the Syms Tank Area has been removed. The Syms Property Underground Tanks are actually lift stations associated with underground chemical waste pipelines. These pipelines, at least at one time, were connected to the Acid Neutralization Lagoon and the Oil/Water Separator and possibly other units in the area, and are still in place. The DOD conducted a preliminary study of this portion of the property in 1988 (Reference 6) which indicated the likelihood of numerous residuals of the former Air Force Plant 68 operation. Figure 6 shows the locations of the units in the Syms Area included in the RFI, including the Syms Tank Area and the chemical waste lift stations in the area. The following sections describe each unit addressed in this report.

#### 3.2 Houghson Pit (Syms Lagoon)

The Houghson Pit (Houghson Lagoon), identified in the RFI as DA-34, is a concrete impoundment which was constructed in the early 1950s as part of the Air Force Plant 68 (Lake Ontario Chemical Works, North Plant). The Houghson Lagoon is suspected to have been used for wastewater storage by the U.S. Government during the 1950s as part of the U.S. Air Force and U.S. Navy project to develop high energy fuels. In the early 1970s, Chem-Trol and SCA Chemical Services, Inc. (SCA) used the Houghson Lagoon for wastewater storage. Wastewater similar to those received at Lagoons 1 through 5 were reportedly stored in the Houghson Lagoon (as well as the Acid Neutralization Lagoon and Oil/Water Separator, as discussed below). The Houghson Lagoon was reportedly emptied of wastes and cleaned (sandblasted) in 1976. SCA and, subsequently, CWM have not used this unit since it was cleaned.

### 3.3 Acid Pit (Syms Lagoon)

The Acid Pit, also known as the Acid Neutralization Lagoon, is identified in the RFI as DA-35. The Acid Neutralization Lagoon is a concrete impoundment which was constructed in the 1950s as part of the Air Force Plant 68 (Lake Ontario Chemical Works, North Plant). The Acid Neutralization Lagoon was used for wastewater storage by the U.S. Government during the 1950s as part of the U.S. Air Force and U.S. Navy project to develop high energy fuels. In the early 1970s, Chem-Trol and SCA also reportedly used the Acid Neutralization Lagoon for wastewater storage. Wastewater similar to those received at Lagoons 1 through 5 were reportedly stored in the Acid Neutralization Lagoon. The Acid Neutralization Lagoon was reportedly emptied of wastes and cleaned (sandblasted) in 1976. SCA and, subsequently, CWM have not used this unit since it was cleaned.

### 3.4 Oil/Water Pit (Syms Lagoon)

The Oil/Water Pit, also known as the Oil/Water Separator, is identified in the RFI as DA-36. The Oil/Water Separator is a concrete impoundment which was constructed in the 1950s as part of the Air Force Plant 68 (Lake Ontario Chemical Works, North Plant). The Oil/Water Separator was used for wastewater storage by the U.S. Government during the 1950s as part of the U.S. Air Force and U.S. Navy project to develop high energy fuels. In the early 1970s, Chem-Trol and SCA used the Oil/Water Separator for wastewater storage. The Oil/Water Separator was reportedly emptied of wastes and cleaned (sandblasted) in 1976. SCA and, subsequently, CWM have not used this unit since it was cleaned.

### 3.5 Syms Property Underground Tanks

The on-site DEC monitors named three underground tanks located on the former Syms property to be included in the RFI. These tanks are actually chemical waste lift stations associated with an underground piping network in the area. This piping system was used by the U.S. Government for transferring waste chemicals during

the 1950s (as part of the high energy fuels development project for the U.S. Air Force and U.S. Navy). This piping system was reportedly not used by Chem-Trol, SCA, or CWM.

### 3.6 Syms Tank Area

The Syms Tank Area, identified in the RFI as DA-22, is an area which contained a 500,000 gallon, 40-foot diameter tank. This area was initially identified in the RFI in an incorrect location (immediately northeast of DA-34). This area, as shown on Figure 6, is actually located approximately 500 feet north of the Acid Neutralization Lagoon and west of the north-south running railroad tracks. The tank was contained within a diked area, also shown on Figure 6. This tank reportedly contained #2 Fuel Oil prior to its decommissioning (some DOD records indicate the tank contained #6 Fuel Oil).

#### 4.0 INVESTIGATION

##### 4.1 General

The initial Syms Area investigation was started in August 1989 as part of the RFI. The sample collection, analyses, and QA/QC procedures followed during the investigation were in accordance with those presented in the RFI Work Plan. The RFI Work Plan includes requirements for sample type, location, collection methods, and analysis type and methods. Table 1 is a summary of the required samples, according to the RFI Work Plan, and the actual samples obtained during the initial RFI program at the Syms Area. Select samples were sent to the analytical laboratory for analysis of the priority pollutant constituents listed in Table 2, or priority pollutant analyses (PPA).

As shown in Table 1, there were several differences between the initial work plan and the actual investigation conducted:

- Two split spoon soil samples not required in the RFI Work Plan were collected north of DA-34. These samples were collected as a result of recommendations from an aerial photographic interpretation study performed in late 1988 and early 1989 (Reference 7). This study indicated a disturbed area located north of the Houghson Lagoon (DA-34) which collected liquids.
- An additional sludge sample was collected from the Acid Neutralization Lagoon. A sample was obtained from each side of the divided pit to obtain a representative sample from each side.
- The requirements for DA-36, the Oil/Water Separator, included a groundwater sample from a well installed north of the unit. As a result of the field GC analyses of soil samples obtained from soil boring DA36-1 (intended to be the well location), which indicated the presence of VOCs in the soil, a well was not constructed and so a groundwater sample was not collected for laboratory analysis. However, a soil sample from this boring was collected for analysis at the laboratory because of the presence of staining on the soil.



- Sludge was not present in the Oil/Water Separator, therefore no sludge samples were obtained from this unit.
- Additionally, two samples of the water in the Oil/Water Separator were obtained, one from each side of a division in the unit.
- The initial sampling locations for the Syms Tank Area (DA-22) were incorrect and as a result the samples, DA22-1-3 and DA22-2-3-1B, were collected at the wrong location. The correct locations were identified and two additional samples, DA22-3-1B and DA22-4-1, were then collected. Therefore, four samples were collected for this designated area, but only two are located within the former tank area.

#### 4.2 Sample Designations and Tracking

Unique designations were assigned to all samples obtained during the RFI program. Soil samples collected for field analyses were designated based on the following system:

- Designated Area number;
- Area boring number; and
- Sample number from each boring, sequentially.

Therefore, for these SWMU investigations, the sample designations are, for example:

DA22            Designated Area 22  
DA22-2        Boring 2  
DA22-2-2      Second sample from the boring

The above sample designation system was utilized throughout the RFI program for identification of both field and laboratory soil samples. Groundwater samples were also taken from two monitoring wells and were identified by well designation. The sludge and

lagoon samples collected from the units in the Syms Area were designated based on the name of the unit and sequential numbers of the samples collected.

In addition to the sample numbers assigned in the field, different numbers were assigned at the laboratory for tracking the samples through the analytical process. Radian Corporation (Radian) assigned a unique Work Order number to each batch of samples received. Furthermore, a suffix was assigned to the Work Order number to distinguish each sample in the batch. For example, P909027 is the Work Order number for a batch and P909027-03 is the third sample within that batch. Appendix A provides a complete list of sample designations as assigned in the field and by Radian for the initial SWMU investigations. Appendix A also provides cross references for the samples to identify associated QC samples.

#### 4.3 Drilling Procedures

The Syms Area investigation included drilling at locations, designated by DA-34, DA-35, and DA-36, as shown on Figure 7. The borings were drilled at the approximate locations specified in Attachment A of the Corrective Action Modules of the site Permits. Drilling was performed using a track mounted CME 55 drill rig with 2 1/4-inch or 4 1/4-inch inside diameter (I.D.) hollow stem augers. Split spoon samples were taken continuously in each boring from the ground surface into natural material, and/or through the Upper Tills unit into the Glaciolacustrine Clay. A detailed description of drilling procedures can be found in Attachment H-3 of the RFI Work Plan.

#### 4.4 Air Monitoring Procedures

A portable field Organic Vapor Monitor (OVM), equipped with a photoionization detector (PID), was used to monitor organic vapors during the field program. The OVM was used to monitor air quality in the breathing zone above the boring and inside the borehole. Readings were recorded on a form designated Air Monitoring During

Drilling. The OVM was calibrated at least once a day before use, and typically after use in the field. Protocols for use of the instrument are similar to those for the HNU PI-101 and the Photovac Tip, described in Attachment F in the RFI Work Plan.

The air monitoring data was used during the field program to determine appropriate levels of respiratory protection. RFI procedures required half-face cartridge respirators with organic vapor/acid gas filters to be worn if air monitoring indicated concentrations of organic vapors above background levels in the breathing zone. If air monitoring indicated concentrations greater than 5 ppm in the breathing zone, then work was to be stopped until further evaluation could be made.

#### 4.5 Soil Sample Collection Procedures

Soil sampling was performed by driving a 24-inch long, 1 1/2-inch I.D. split spoon sampler into the ground using a 140-pound hammer with a 30-inch drop. Borings were logged in the field and, at a minimum, the logs included boring designation, depths, standard penetration resistance<sup>1</sup>, and sample description. Soil boring logs are included in Appendix B to this report.

The soil samples were visually examined to identify fill and natural soils. Samples from the natural soils were sent to Radian for PPA from the DA-22 and DA-34 sample locations. Also, as required for the RFI, if visual contamination was observed in a sample, (i.e. DA36-1-4) additional samples were collected for laboratory analyses. A portion of the soil from each split spoon sample was placed in a one-pint glass jar, unless there was insufficient soil to obtain jar samples. The soil in each jar was stored for geologic identification purposes, with no further analyses performed.

---

<sup>1</sup>Standard penetration resistance, designated N or blow count, is the number of blows required to drive a standard split spoon sampler from 6 inches to 18 inches using a 140-lb. hammer free falling 30 inches.

A portion of the soil from the following samples were collected for PPA:

DA22-1-3	DA34-2-4/5
DA22-2-3	DA34-2-4/5DUP
DA22-3-1B	DA34-3-1
DA22-4-1	DA36-1-4
DA34-1-4	DA36-1-4DUP

The following is a summary of the number, size, and type of containers used for soil sample collection, the order in which the containers were filled, and the type of analysis to be performed:

<u>Priority</u>	<u>Type</u>	<u>Size</u>	<u>Number of Containers</u>	<u>Analysis</u>
1	Vial	40 mL	3	Volatile Organics
2	Jar	250 mL	1	Semivolatile Organics
3	Jar	500 mL	1	Pesticides and PCBs
4	Jar	250 mL	1	Cyanide
5	Jar	500 mL	1	Metals

Approximately 30 grams of soil were placed in each jar, while the 40 mL vials were filled to minimize headspace. The soil samples were collected from clean split spoons using spoonulas dedicated to each split spoon. The samples were packed in insulated shuttles, with either blue ice or bagged ice packed around the samples to maintain the samples at approximately 4 degrees Celsius (°C) during shipment. Shuttles were then sent by overnight courier to Radian. Upon receipt at the laboratory, Radian placed the samples under refrigeration for preservation until analysis of the samples.

Soil samples from each split spoon were also collected for volatile organic analyses in the field. Approximately 10 grams of soil were taken from the interior of each split spoon sample and placed in a 40 mL vial which contained 10 mL of HPLC-grade water. The vials were sealed with Teflon-lined septa caps to minimize the escape of

VOCs prior to analysis. Headspace analyses using field GCs were performed after the vials were returned to the field trailer (see Section 4.11 for further discussion of the field analyses).

#### 4.6 Well Installation Procedures

The RFI Work Plan specified that a well be constructed in the Upper Tills unit at each of three specified boring locations. Wells were installed at two locations (DA34-1 and DA35-1) and were designated HP01S and ANL01S, respectively (see Figure 7).

The wells were constructed of 2-inch diameter PVC screen and riser pipe with No.1-Q sand installed around the screen. The sand was installed through the annulus of the augers while the augers were being pulled up. A bentonite pellet seal was installed above the sand and concrete grout was poured at the surface for installation of the locking protective casing. A detailed description of the well installation procedures is in Attachment H-5 of the RFI Work Plan. The well installation logs for wells HP01S and ANL01S are included in Appendix B. The results of the grain size tests performed on the soils collected from the screened intervals are also included in Appendix B.

Also included in Attachment H-5 are the well development and hydraulic conductivity testing procedures which were used for these wells. Well development was conducted soon after installation and the hydraulic conductivity testing was performed after development was complete. The well development record and the results of the hydraulic conductivity tests performed on wells HP01S and ANL01S are also included in Appendix B. The hydraulic conductivity results indicate typical values (as compared to other wells at the site) for the Upper Tills unit.

#### 4.7 Groundwater Sample Collection

In addition to the soil samples collected for field GC analyses, three groundwater samples were collected from the open borings for

analysis in the field; one sample each from the DA34-1, DA35-1 and DA36-1 borings. These samples were obtained using a decontaminated PVC bailer. The bailer was lowered into the boring and a 15 mL sample of the groundwater was collected and placed in a 40 mL vial. Headspace analyses were performed on these groundwater samples at the field trailer (see Section 4.11).

Groundwater samples were collected from the wells for PPA by an analytical laboratory (Radian). One groundwater sample was collected from each of the two newly installed wells (HP01S and ANL01S). The following is a summary of the number, size, and type of containers used for groundwater sample collection, the order in which the containers were filled, and the type of analyses performed:

<u>Priority</u>	<u>Type</u>	<u>Size</u>	<u>Number of Containers</u>	<u>Analysis</u>
1	Vial	40 mL	3	Volatile Organics
2	Bottle	1L	2	Semivolatile Organics
3	Bottle	1L	2	Pesticides and PCBs
4	Bottle	500 mL	1	Cyanide
5	Bottle	500 mL	1	Metals
6	Bottle	500 mL	1	Mercury

The samples were packed in insulated shuttles, with either blue ice or bagged ice packed around the samples to maintain them at approximately 4 degrees Celsius (°C) during shipment. Shuttles were then sent by overnight courier to Radian. Upon receipt at the laboratory, Radian placed the samples under refrigeration for preservation until analysis could be performed.

#### 4.8 Lagoon Sludge Sample Collection

Sludge samples were obtained from the bottom of the lagoons and chemical waste lift stations (if sludge was present). Samples were collected with a dedicated plastic sampling scoop attached to a dedicated section of galvanized steel conduit. The sludge samples were collected from the lagoons by using the scoop to remove materials at several locations in the lagoon. The sludge samples were collected from the lift stations by lowering the scoop into the unit until enough sludge for the analyses was collected. The sludge samples were not composited before sample analyses. The following are the sample designations for the sludge samples collected from the Syms Area units:

AN-1	CWLS7-1	CWLS7A-1
AN-2	CWLS7-1 DUP	CWLS8-1
HP-1		

The following is a summary of the number, size, and type of containers used for sludge sample collection:

<u>Priority</u>	<u>Type</u>	<u>Size</u>	<u>Number of Containers</u>	<u>Analysis</u>
1	Vial	40 mL	3	Volatile Organics
2	Jar	250 mL	1	Semivolatile Organics
3	Jar	500 mL	1	Pesticides and PCBs
4	Jar	250 mL	1	Cyanide
5	Jar	500 mL	1	Metals

The samples were packed in insulated shuttles, with either blue ice or bagged ice packed around the samples to maintain them at approximately 4 degrees Celcius (°C) during shipment. Shuttles were then sent by overnight courier to Radian. Upon receipt at the laboratory, Radian placed the samples under refrigeration for preservation until analysis could be performed.

#### 4.9 Lagoon Water Sample Collection

Water samples were obtained from each of the lagoons and chemical waste lift stations. Samples were collected by submerging a dedicated one-gallon bottle to near the bottom of the lagoon or chemical waste lift station. The one-gallon bottle was rinsed with the lagoon or chemical waste lift station water prior to sample collection. The following samples were collected from the Syms Area units:

AN-3	OWS-4	CWLS7-2
AN-4	HP-2	CWLS7A-2
OWS-3	HP-2 DUP	CWLS8-2

Samples were then transferred to the sample jars listed below. Care was taken in transferring the water samples to avoid introduction of air into the sample.

<u>Priority</u>	<u>Type</u>	<u>Size</u>	<u>Number of Containers</u>	<u>Analysis</u>
1	Vial	40 mL	3	Volatile Organics
2	Bottle	1L	2	Semivolatile Organics
3	Bottle	1L	2	Pesticides and PCBs
4	Bottle	500 mL	1	Cyanide
5	Bottle	500 mL	1	Metals
6	Bottle	500 mL	1	Mercury

The samples were packed in insulated shuttles, with either blue ice or bagged ice packed around the samples to maintain them at approximately 4 degrees Celcius (°C) during shipment. Shuttles were then sent by overnight courier to Radian. Upon receipt at the laboratory, Radian placed the samples under refrigeration for preservation until analysis could be performed.



#### 4.10 Sample Containers

Soil, groundwater, sludge, and lagoon water samples taken for chemical analyses were placed in jars, bottles, or 40 mL vials, as discussed above. The samples were placed in new 300-Series I-Chem containers provided by Radian, as required in the RFI Work Plan. Vials used for soil or groundwater samples for field GC analyses were generally new 300-Series I-Chem containers; new 200-Series I-Chem containers were used when shipment/sampling times were too short to obtain 300-Series vials. Two hundred-series and 300-Series containers are cleaned in the same manner; however, QA/QC documentation is only maintained for the 300-Series containers. I-Chem 300-Series cleaning procedures are described in Attachment I-8 of the RFI Work Plan. Soil samples for geologic identification were placed in new standard one-pint jars.

#### 4.11 Field Analyses

Samples of soil were collected from the Syms Area borings for selected chemical analyses in the field. About 10 grams of soil were placed in 40 mL vials containing 10 mL of HPLC water. Three groundwater samples were also collected in 40 mL vials for field analyses, one sample each from borings DA34-1, DA35-1 and DA36-1. The samples were generally analyzed in the field by a Photovac 10S70 Gas Chromatograph (10S70) and a Foxboro Century 128 Organic Vapor Analyzer (OVA) in the gas chromatography mode. These two instruments are herein collectively referred to as the field GCs. Target compounds for the 10S70 were:

- 1,1,1-trichloroethane (1,1,1-TCA);
- trans-1,2-dichloroethene (trans-DCE);
- 1,1-dichloroethene (1,1-DCE);
- tetrachloroethene (PERC);
- trichloroethene (TCE);
- benzene; and
- toluene.

Target compounds for the OVA were carbon tetrachloride and chloroform. Procedures for performing analyses with the field GCs are included in Attachment H-8 of the RFI Work Plan.

The field trailer was set up for performing the analyses with the field GCs, and contained a refrigerator, an isothermal bath, and a computer. For the Syms Area investigation, a field chemist performed headspace analyses on all soil and groundwater samples from each boring. Each vial containing soil or groundwater designated for headspace analysis was brought into the field trailer and immediately logged onto various tracking forms. The samples were stored in the refrigerator at approximately 4°C until preparation for analysis. Samples were generally analyzed within 24 hours of collection.

Prior to sample analysis, standards were prepared for both GCs. The 10S70 standard contained all seven of the target compounds for the 10S70, plus 2-chloroethylvinyl ether as the internal standard. The OVA standard contained the two target compounds for the OVA. After preparation, the standards were placed in a 30°C water bath for 30 minutes to allow the standards to reach thermal equilibrium. Headspace from each standard was then collected from the vials and injected into the appropriate GC using a gas-tight syringe. As a calibration check, both standards were reinjected following analysis of approximately 10 samples. For the 10S70, the results were stored in a library or, alternately, used to calibrate an existing library. For the OVA, the retention times and peak areas were measured and a response factor calculated.

Each sample for analysis was spiked with the internal standard and placed in the water bath. Samples remained in the isothermal bath for at least 30 minutes, then the headspace in the vial was sampled and injected into the 10S70 and the OVA. Additional details of the procedures used to perform the field analyses are included in Attachment H-8 of the RFI Work Plan.

#### 4.12 Laboratory Analyses

Groundwater, soil, lagoon water and sludge samples were collected for specific analyses by Radian. The following laboratory analytical methods were used by Radian for sample analyses (PPA included performing all of the following analyses):

SW 846 Third Edition Method Numbers		
<u>RFI Parameter</u>	<u>Extraction</u>	<u>Analysis</u>
Volatile Organics (VOA)	5030	8240
Semivolatile Organics	3520, 3550	8270
Pesticides/PCBs	3520, 3550	8080
Cyanide		9010
Metals	7060, 3050, 3005, 7470, 3020, 7471	6010, 7060, 7421, 7470, 7471, 7041, 7841

Details for these analytical methods are presented in Attachment I of the RFI Work Plan. Compounds analyzed for by Radian are listed in Table 2. Boron and lithium were included for analysis of the sludge samples collected from the chemical waste lift stations. The methods of analysis for these compounds are the same as the metals methods listed above.

#### 4.13 Quality Assurance/Quality Control Procedures

##### 4.13.1 General

Quality Assurance/Quality Control (QA/QC) procedures were implemented as described in the RFI Work Plan for sampling, analyzing, and tracking the soil, sludge, lagoon water, and groundwater samples. These methods were utilized so that the data collected were technically sound, statistically valid, and properly documented. The following subsections summarize the QA/QC procedures.

#### 4.13.2 Decontamination

The drill rig was decontaminated prior to mobilization to each designated area. All drill tools and drilling equipment were decontaminated prior to use for each borehole. Generally, the drill rig, drill rod, augers, and tools were steam cleaned until all visible signs of grease, oil or mud were removed. The drilling equipment (such as augers and drill rods) was wrapped in plastic until ready for use at the borehole. Only vegetable oil was used for lubrication of the drill rig fittings and only when necessary.

Split spoon samplers and spoonulas<sup>2</sup> for obtaining soil samples for field GC analyses were decontaminated prior to use. The procedures used for decontamination of the split spoon samplers and the spoonulas, as presented in the RFI Work Plan, were:

- wash withalconox;
- rinse with municipal water;
- rinse with 1% HNO<sub>3</sub>;
- another municipal water rinse;
- rinse with acetone;
- rinse with HPLC-grade water;
- air dry; and
- wrap in aluminum foil until used.

Drilling and sampling equipment decontamination procedures are further detailed in Attachment H-9 of the RFI Work Plan.

Potential residual constituents on the drilling or sampling equipment after decontamination were evaluated as part of the

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<sup>2</sup>Stainless steel utensils used to slice and transfer soil from the split spoon sampler to the container.

quality control program. Rinse and municipal water samples were obtained periodically during the field program and sent to Radian for PPA. Rinse samples were also collected from the dedicated sampling equipment used for sludge and lagoon water sample collection. Rinse samples were collected by rinsing a randomly chosen piece of equipment with HPLC-grade water, after decontamination, and collecting the water in the appropriate sample containers. The decontamination quality control samples collected during the Syms Area investigation were:

- Auger Rinse Samples 1, 6 and 7;
- Split Spoon Rinse Samples 1 and 7;
- Utensil Rinse Samples 2 and 7 (spoonulas);
- Scoop; and
- Dipper Bottle.

A municipal water sample was also taken at least once a week to assess potential constituents in the municipal water supply used for equipment decontamination. Municipal Water Samples 1, 6 and 7 were collected as part of the Syms Area investigation.

#### 4.13.3 Sampling Quality Control

The objective of the soil and groundwater sampling quality control procedures was to maintain the integrity of the sample. To achieve this objective, the soil was sampled from the inner core section of the split spoon sample, to the extent possible. Also, soil, groundwater, lagoon water, and sludge samples collected for chemical analyses were placed into precleaned I-Chem containers to minimize the potential for contamination of the samples by the containers. Seals placed on the containers sent to Radian were inspected upon receipt at the laboratory to check that the integrity of the samples was maintained during shipping.

In addition, field blanks were taken to identify potential contaminants introduced from the field environment or artifacts of the sampling process. Field blank samples 2, 5, and the field blank from work order number P9-09-057 were taken during the weeks that the Syms Area samples were collected. Field blank sample 2 and the field blank from work order number P9-09-057 were collected in the Syms Area next to a soil boring and a unit, respectively. Also, all samples were carefully tracked from the time of sampling through the analyses. Samples sent to Radian were transferred using strict Chain-of-Custody procedures as defined in the RFI Work Plan, and these transfers were documented accordingly.

#### 4.13.4 Field Quality Control

Field GC quality control was maintained using:

- instrument calibration;
- internal standard spikes; and
- chemical standards.

The field GCs were calibrated at least daily, before use, and after approximately every 10 samples and/or the end of the working day. Each sample was spiked with the internal standard before analysis and the instrument response to the spike was used to evaluate the acceptability of the analysis. Standards were made using on-site soils as the matrix for the soil analyses and HPLC water as the matrix for water analyses. New standards were made as necessary when responses were not within specification. Details of the field GC analyses procedures are in Attachment H-8 of the RFI Work Plan.

Field quality control procedures also included field trip blanks to evaluate potential contamination due to container preparation, transport, or the field trailer environment. Field trip blanks designated DA22-1/DA22-2 TBlank, DA22-3 TBlank, DA22-4 TBlank, DA34-1 TBlank, DA34-2 TBlank, DA34-3 TBlank, DA35-1 TBlank, and

DA36-1 TBlank were analyzed as part of the field QA/QC. The field trip blanks were assigned designations which corresponded to each boring sampled during a "trip" to and from the field trailer. The field trip blanks were analyzed by the field chemist for the target volatile organics listed in Section 4.11.

#### 4.13.5 Laboratory Quality Control

Radian followed the QA/QC procedures specified in Attachment I-4 of the RFI Work Plan. These procedures included analyzing:

- laboratory trip blanks;
- duplicates;
- matrix spikes;
- matrix spike duplicates;
- method spikes; and
- method blanks.

QA/QC procedures also included performing calibrations as internal checks of lab equipment and performance. The quality control samples were collected and/or analyzed for the following purposes:

- Laboratory trip blanks were analyzed to evaluate potential contamination due to container preparation, transport to and from the field, or the laboratory environment. Laboratory trip blanks were initiated at the laboratory and were returned to the laboratory, one with each shipment of shuttles.
- Duplicate samples were collected to evaluate overall accuracy of the sampling and analysis process. Duplicate samples were taken and analyzed, one for every 20 samples taken in the field.
- Matrix spikes were used to evaluate potential analysis interferences due to the makeup of the samples. Matrix spike duplicates were used with the matrix spikes to evaluate the precision and accuracy of the analysis. Matrix spikes and matrix spike duplicates (MS/MSD) were

taken and analyzed, one for every 20 samples taken in the field.

- Method blanks were analyzed to determine the presence of laboratory contamination or artifacts of analysis. Method spikes were used to evaluate potential analysis interferences due to causes other than the sampling process or the matrix.

The laboratory trip blanks were analyzed by Radian for VOCs and the remaining QC samples were analyzed for priority pollutants. Laboratory trip blanks numbered 1, 2, 3, 4, 24, 25 and trip blanks from work order numbers P9-09-056, P9-09-107, and P9-11-001 were included in the shuttles containing samples from the Syms Area investigation.

The data report package submitted by Radian was consistent with DEC requirements and SW 846 Third Edition. Radian performed internal checks, calibrations, and analyses to ascertain the reliability of the sample analyses. In addition, Radian reviewed the analyses and sample handling procedures and histories for each batch of analyses. These reviews of the equipment performance and other terms and conditions of the contract following SW 846 protocol are documented by the laboratory. Also, as required by the RFI Work Plan, laboratory certifications have been prepared by Radian stating that the procedures, checks, and reviews have been performed. The laboratory certifications for the analyses associated with Syms Area investigation are presented in Appendix C.

#### 4.13.6 Sample Tracking

Tracking of samples through the sampling and analysis process was accomplished using several different forms. During sampling, pertinent information was recorded on the following forms, as appropriate:



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- Soil Boring Log;
  - Well Installation Log;
  - Air Monitoring During Drilling Form;
  - Chain-of-Custody Form;
  - Sample Pak Custody Form;
  - Sample Tracking Record; and
  - Area Sample Summary.

The original Chain-of-Custody Form and Sample Pak Custody Form (both originated at the laboratory) were sent to Radian along with the samples and were completed by laboratory personnel upon receipt of each shuttle. A copy of the completed Chain-of-Custody Form and Sample Pak Form are included in the data report package provided by Radian for each sample analysis. Chain-of-Custody Forms for the Syms Area samples are included in Appendix D.

Forms documenting field GC analyses were also completed. These Forms included a 10S70 GC Sample Analysis Record, an OVA GC Sample Analysis Record, and a Preliminary Results sheet. Blank copies of all field forms used during the RFI are provided for reference in Appendix E; completed forms are on file at the Golder Associates' Atlanta office.

#### 4.13.7 Data Validation and Checks

All analytical results were reviewed as a check that the approved QC requirements were met and to ascertain the overall reliability of the data. Field GC data were reviewed and validation forms completed. Field GC validation forms for the Syms Area samples are included in Appendix F.

Validation of the Radian data was performed using the check sheets in Attachment I-6 of the RFI Work Plan. Narratives were completed after review of the laboratory data package and the completed check

sheets. The validation check sheets and narratives prepared by Golder Associates for the Syms Area samples are provided in Appendix G.

Recalculation of five percent of the samples analyzed by Radian from the initial SWMU sampling was required. Generally, however, 10 percent of organic results and 15 percent of inorganic results were recalculated. The required recalculation was performed for the samples collected from the Syms Area. This involved recalculation of the following:

- all organic and inorganic results from HP-1, OWS-3, and CWLS8-2;
- the pesticide/PCB results from AN-2; and
- the organic results from the Dipper Bottle rinse.

## 5.0 RESULTS

### 5.1 Soils and Geology

The required initial investigation program for Syms Area included soil drilling and sampling at two locations and well installation (if appropriate) at three locations. Soil samples were collected from nine boring locations for geologic identification and field analyses. Three borings were sampled through fill material and the Upper Tills unit, and into the Glaciolacustrine Clay unit. These three borings indicated approximately four feet to six feet of fill material at each location. The fill was underlain by 14 feet to 16 feet of Upper Tills, which was underlain by Glaciolacustrine Clay. The Glaciolacustrine Clay was identified at 16 feet, 22 feet and 19 feet bgs in borings DA34-1, DA35-1 and DA36-1, respectively. Boring logs are included in Appendix B.

Samples of natural material were collected for PPA just below the fill at the following eight sample locations and depths:

- DA22-1 from 4 feet to 6 feet bgs;
- DA22-2 from 4 feet to 6 feet bgs;
- DA22-3 from 1 to 2 feet bgs;
- DA22-4 from 0 feet to 2 feet bgs;
- DA34-1 from 6 feet to 8 feet bgs;
- DA34-2 from 6 feet to 10 feet bgs;
- DA34-3 from 0 feet to 2 feet bgs; and
- DA36-1 from 6 feet to 8 feet bgs.

All the sample intervals listed above are within the Upper Clay Till unit. Soil samples were also collected from the interval in which the well screen was installed for grain size analysis. The results, as shown in Appendix B, indicate the soil classification for both samples as (generally) silty clay, some coarse to fine

sand; which is the general classification for the Upper Clay Till unit at the site. The hydraulic conductivity testing which was conducted also reflects the identification of the soil in the screened interval as the Upper Clay Till unit. Generally the hydraulic conductivity of the unit is  $1 \times 10^{-6}$  cm/sec., as shown in Appendix B.

## 5.2 Field GC Results

### 5.2.1 Field GC Soil Sample Results

Soil samples were collected from nine locations in the Syms Area and analyzed using the field GCs. Six of the sample locations (DA22-1, DA22-2, DA22-3, DA22-4, DA34-2 and DA34-3) were sampled from ground surface through the fill until natural soils were encountered. Borings were continuously sampled and completed to the Glaciolacustrine Clay unit at the remaining three sample locations (DA34-1, DA35-1 and DA36-1). All soil samples and a sample of groundwater from each boring completed to the Glaciolacustrine Clay were analyzed using the field GCs.

Only one soil sample location, DA36-1, was reported to contain VOCs, based on the field GC analyses of the soils and groundwater. Benzene, 1,1-DCE, PERC and TCE were reported in soil sample DA36-1-4. Benzene was also reported in sample DA36-1-5. VOCs were not reported in any of the other soil samples collected from DA36-1. PERC and benzene were also reported in the groundwater sample collected from DA36-1. The compounds detected by the field GC in the samples collected for the Syms Area investigation, and their concentrations, are listed in Table 3. The field GC results are included in Appendix H and the chromatograms are included in Appendix I.

### 5.2.2 Field GC QA/QC Results

A Field GC Data Validation Checklist (based on CLP Data Validation forms) was completed by a chemist for each sample by area or group

of areas, or by batch of sample results as received in the Golder Associates' Atlanta office. The validation involved examining:

- boring logs;
- chromatograms;
- sample spike recoveries;
- GC sample analysis records;
- preliminary results;
- spreadsheet summaries of results; and
- calibration information.

Validation of the field GC data from the Syms Area samples did not delineate any procedural discrepancies. The Field GC Data Validation Checklists which include the Syms Area samples are included in Appendix F.

The field GC results were also compared to the Radian results to determine if they were consistent for the nine field GC target compounds. Field analysis results compared well to the analytical results for the Syms Area samples.

Eight field trip blanks, as listed in Section 4.13.4, were analyzed in the field as part of the Syms Area investigation. The analyses did not indicate the presence of any of the target compounds above the detection limit.

### 5.3 Analytical Laboratory Results

#### 5.3.1 General

Chemical analyses for priority pollutant organic and inorganic compounds were performed by Radian on 8 soil, 2 groundwater, 7 sludge and 9 pond water samples from the Syms Area. The 8 soil samples were all collected from below the fill. The 2 groundwater samples were collected from wells ANL01S and HP01S. Sludge (when present) and/or lagoon water samples were collected from the Houghson Lagoon, three chemical waste lift stations, the Acid

Neutralization Lagoon, and the Oil/Water Separator. All of these samples were sent to Radian for PPA. The Radian reports are presented in Appendix J and the results are summarized (and divided into subsets of the data) in Appendix K.

As discussed in Section 4.13, numerous QA/QC samples associated with the Syms Area samples were analyzed. The QA/QC samples analyzed include rinse blanks, municipal water samples, field blanks, trip blanks, MS/MSD/DUPs, method spikes and method blanks. The sampling of the units/areas in the Syms Area involved four different matrices collected at several different time periods in the RFI program. These differences resulted in a large number of QA/QC samples with varying results and applicability.

The qualifications made as a result of evaluations of the QA/QC sample results are presented in the tables summarizing the compound detections, as referenced in the following sections. The tables present, for each investigation sample and each QA/QC sample, the following:

- the sample designation and date sampled;
- the laboratory (reported) value and applicable units;
- the laboratory detection limit;
- a designation for each data qualification; and
- the qualified data.

The revised data set representing qualified data was interpreted by a chemist using the sample and the laboratory QA/QC data. Sample results are discussed in the following sections, but only the qualified data results are included in the discussion. A detailed discussion of the QA/QC data used to qualify the results is presented in Appendix L.

### 5.3.2 Organics

Priority pollutant organic (PPO) compounds were reported by the analytical laboratory to be present in near-surface soil samples DA22-4-1, DA34-2-4/5 and DA36-1-4. Two organic compounds, were reported in sample DA22-4-1, PCB-1242 was reported at 120  $\mu\text{g/Kg}$  and PCB-1260 was reported at 14  $\mu\text{g/Kg}$ . Sample DA34-2-4/5 analyses indicated 1,2-DCA at greater than 2.8  $\mu\text{g/Kg}$ . Sample DA36-1-4 had four reported organic compounds, including PERC at greater than 10,000  $\mu\text{g/Kg}$ , hexachlorobenzene at 7,600  $\mu\text{g/Kg}$ , phenanthrene at 7,000  $\mu\text{g/Kg}$ , and bis-2(ethylhexyl)phthalate at 6,400  $\mu\text{g/Kg}$ . Summaries of the compounds detected in the above listed near-surface soil samples (DA22-4-1, DA34-2-4/5 and DA36-1-4) are presented in Tables 4, 5 and 6, respectively. The Radian reports from the PPA are included in Appendix J and summaries of the PPA results are included in Appendix K.

Only one of the two groundwater monitoring well samples was reported to contain PPO compounds. The groundwater sample collected from the well north of the Houghson Lagoon (DA-34), HP01S, was reported to contain 1,1-DCA at greater than 2.8  $\mu\text{g/L}$ , 1,2-DCA at greater than 2.8  $\mu\text{g/L}$ , vinyl chloride at greater than 5.0  $\mu\text{g/L}$ , and trans-1,2-DCE at greater than 1.6  $\mu\text{g/L}$ , as shown in Table 11. All PPOs were reported below the detection limits for the groundwater sample collected from monitoring well ANL01S (Acid Neutralization Lagoon, DA-35).

The seven sludge samples - two from the Acid Neutralization Lagoon, one from chemical waste lift station number 7 (CWLS7), two from CWLS number 7A (CWLS7A), one from CWLS number 8 (CWLS8) and one from the Houghson Lagoon - were all reported to contain PPO compounds. Summaries of all the compounds detected in the sludge samples collected from the units listed above are presented in Tables 7, 8, 9, 10 and 11, respectively, and are discussed below. The Radian reports from the PPA are included in Appendix J and summaries of the PPA results are included in Appendix K.

All the organic compounds reported in the two Acid Neutralization Lagoon sludge samples (AN-1 and AN-2) were VOCs, except for the detections of PCB-1242 and PCB-1260 in sample AN-2 and bis(2-ethylhexyl)phthalate in sample AN-1. Seven VOCs were reported in sample AN-1 ranging from 13  $\mu\text{g/Kg}$  of trans-1,2-DCE to 230  $\mu\text{g/Kg}$  of xylenes. Bis(2-ethylhexyl) phthalate, a semi-volatile compound, was reported at 690  $\mu\text{g/Kg}$  in sludge sample AN-1. Nine VOCs were reported in sample AN-2 ranging from 7.3  $\mu\text{g/Kg}$  of benzene to 163  $\mu\text{g/Kg}$  of xylenes. The lagoon water samples collected from the Acid Neutralization Lagoon, AN-4 and AN-3, were not reported to contain any organic compounds. A summary of the compounds detected in samples AN-1, AN-2, AN-3 and AN-4 is presented in Table 7.

The two sludge samples collected from CWLS7 (CWLS7-1 and CWLS7-1DUP) were both reported to contain one VOC, PCB-1260, and two semi-volatile organic compounds. The concentrations reported in the duplicate were generally less than those reported in the sample. The VOC reported in CWLS7-1 was xylenes at a concentration of 11  $\mu\text{g/Kg}$ . Hexachlorobutadiene and bis(2-ethylhexyl)phthalate, both semi-volatile organic compounds, were detected in the sample CWLS7-1 at concentrations of 5900  $\mu\text{g/Kg}$  and greater than 660  $\mu\text{g/Kg}$ , respectively. PCB-1260 was reported at a concentration of greater than 0.066  $\mu\text{g/Kg}$ . PPO compounds were not reported in the water sample collected from CWLS7 (sample CWLS7-2). A summary of the compounds detected in samples from CWLS7 is presented in Table 8.

Coal tar<sup>3</sup> related compounds (anthracene, phenanthrene, chrysene, etc.) were detected in the sludge sample collected from CWLS7A (sample CWLS7A-1). Six VOCs ranging from 54  $\mu\text{g/Kg}$  of benzene to 2800  $\mu\text{g/Kg}$  of xylenes were also detected in the sludge sample from CWLS7A. TCE and vinyl chloride, at concentrations of greater than 1.9  $\mu\text{g/L}$  and greater than 5.0  $\mu\text{g/L}$ , respectively, were reported in

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<sup>3</sup> Coal tar compounds are a subset of the class of compounds referred to as polynuclear aromatics (PNAs).



the water sample collected from CWLS7A (sample CWLS7A-2). A summary of the compounds detected in samples collected from CWLS7A is presented in Table 9.

The sludge sample collected from CWLS8 (CWLS8-1) was reported to contain six VOCs with concentrations ranging from 50,000  $\mu\text{g/Kg}$  of TCE to 160,000,000  $\mu\text{g/Kg}$  of carbon tetrachloride. Three semi-volatile compounds (hexachlorobenzene at 69,000  $\mu\text{g/Kg}$ , hexachloroethane at 28,000  $\mu\text{g/Kg}$ , and phenanthrene at 24,000  $\mu\text{g/Kg}$ ) and two PCBs (PCB-1248 at 710,000  $\mu\text{g/Kg}$  and PCB-1260 at 150,000  $\mu\text{g/Kg}$ ) were also reported in sample CWLS8-1. The water sample collected from CWLS8 (CWLS8-2) was reported to contain six VOCs at concentrations greater than their respective detection limits. A summary of the compounds detected in samples from CWLS8 is presented in Table 10.

A sludge sample (HP-1) and a water sample (HP2) were collected from the Houghson Lagoon and analyzed for priority pollutants. No VOCs were reported in sludge sample HP-1. However, sixteen semi-volatile compounds were reported in HP-1, most of which are coal tar related compounds. The concentrations of the semi-volatile compounds range from 1000  $\mu\text{g/Kg}$  of 2-chlorophenol to 220,000  $\mu\text{g/Kg}$  of phenanthrene. Two PPO compounds were reported in lagoon water sample HP2 - 1,2-DCA was reported at a concentration greater than 2.8  $\mu\text{g/L}$  and bis(2-ethylhexyl)phthalate was reported at greater than 10  $\mu\text{g/L}$ . A summary of the compounds detected in the samples collected from the Houghson Lagoon is presented in Table 11.

Two lagoon water samples (OWS-3 and OWS-4) were collected from the Oil/Water Separator and analyzed for priority pollutants. There were no PPO compounds reported in either of the water samples. Sludge samples were not taken from the Oil/Water Separator due to the lack of sludge.

### 5.3.3 Inorganics

The inorganics analyses results of the soil samples are all reported at concentrations consistent with background levels (established using site wide soil data<sup>4</sup>), with the following exceptions:

- copper was reported in sample DA36-1-4 which may be above soil background levels at a concentration which could range from 1.4 µg/Kg to 349 µg/Kg, and in sample DA36-1-4 DUP at a concentration which could range from 1.5 µg/Kg to 443 µg/Kg,
- chromium was reported in samples DA36-1-4 and DA36-1-4 DUP at concentrations of 20 µg/Kg and 21 µg/Kg, respectively. These detections are very close to background levels; and
- cyanide was reported in sample DA22-4-1 at a concentration of 5.9 mg/Kg.

The metals results for the sludge samples from the Acid Neutralization Lagoon, CWLS7, CWLS7A, CWLS8, and the Houghson Lagoon all contain some metals at concentrations greater than background levels in soil. Specifically, the reported concentrations of:

- copper in samples CWLS7-1, CWLS7-1DUP, CWLS7A-1 and HP-1 ranges in concentration from 360 mg/Kg to 3000 mg/Kg (samples AN-1 and AN-2 may also contain elevated levels of copper);
- lead was reported in sample CWLS7A-1 at 220 mg/Kg, and in sample HP-1 at 48 mg/Kg (lead may also be present at elevated levels in samples AN-1 and AN-2);
- chromium in samples CWLS7-1DUP, CWLS7A-1, and HP-1 ranges in concentration from 71 mg/Kg to 410 mg/Kg (samples AN-1 and AN-2 may also contain elevated levels of chromium);
- boron in sample CWLS8-1 was reported at 780 mg/Kg.
- cadmium in samples CWLS7A-1 and HP-1 is reported at concentrations (above soil background) of 25 mg/Kg and 3 mg/Kg, respectively (samples AN-1 and AN-2 may also

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<sup>4</sup>A review and evaluation of all the RFI metals data for soils has been conducted. This evaluation will be presented as part of the Site Areas Interim Report to be submitted mid-January 1991.

contain elevated levels of cadmium);

- nickel in samples CWLS7-1DUP, CWLS7A-1, and HP-1 ranges in concentration (above soil background) from 30 mg/Kg to 60 mg/Kg; and
- zinc was reported in samples CWLS7A-1 and HP-1 at concentrations above soil background of 850 mg/Kg and 160 mg/Kg, respectively.

A summary of the inorganic detections for the above samples are presented in the tables associated with each unit/area, as referenced in the organics discussion section.

#### 5.3.4 Laboratory QA/QC

Laboratory QA/QC involved three aspects:

- Data validations;
- Control samples for analyses; and
- Internal laboratory checks and analyses.

Laboratory Analysis Check Sheets were completed by Golder Associates for each full data package submitted by Radian. Completing the Check Sheets involved examining the Chain-of-Custody Forms, holding times, and sample identifications. Attachment I-6 of the RFI Work Plan presents a copy of the Check Sheets and a data acceptability narrative outline. Data Acceptability Narratives were prepared by Golder Associates for each SWMU after the Analysis Check Sheets were completed. The narratives contain information obtained from the Analysis Check Sheets and the Radian full data reports. The Laboratory Analysis Check Sheets and Data Acceptability Narratives which include the Syms Area samples are included in Appendix G.

Validation of data from the Syms Area investigation identified several procedural discrepancies. CWLS7-1, CWLS7-1 MS, and CWLS7-1 MSD, were received at the laboratory at 10.4°C. Golder Associates was notified of the shuttle temperature, which was above the recommended temperature of 4°C. Golder Associates instructed

Radian to proceed with the analyses. The volatile fractions of HP-1, AN-2, AN-3, CWLS7-1, CWLS7-1 DUP, CWLS7-1 MS, CWLS7-1 MSD, and CWLS7A-1 exceeded the holding time by 1 day. The volatile fraction of CWLS7-2 MSD exceeded the holding time by 2 days. For the pesticide/PCB fractions of HP-1, AN-1, AN-2, CWLS7A-1, CWLS7-1, and CWLS8-1, both surrogates DBC and TMX were outside of their surrogate limits and the results for these fractions are considered quatitative (they are flagged with a Z on the tables of results).

Radian performed internal checks, calibrations, and analyses to ascertain the reliability of the sample analyses. In addition, Radian reviewed the analyses and sample handling procedures and histories for each batch of analyses. These reviews of the equipment performance and other terms and conditions of the contract following SW 846 protocol are documented by the laboratory. Also, as required in the RFI Work Plan, laboratory certifications have been prepared by Radian stating that the procedures, checks and reviews have been performed. The laboratory certifications for the analyses associated with the Syms Area investigation are presented in Appendix C.

The following section discusses the control sample analyses results.

#### 5.3.5 QA/QC Results

As discussed in Section 5.3.1, a detailed discussion of the QA/QC sample results is presented in Appendix L. The results for the QA/QC samples have also been qualified based on QA/QC and sample evaluations.

The detections in each of the decontamination, municipal water, and rinse samples are presented in Table 12. The field blank and trip blank detections are summarized in Table 13. The detections from the method blanks which were analyzed with the Syms Area samples are summarized in Table 14. The method spike, matrix spike and matrix spike duplicate recoveries are all included in the QA/QC

section of Appendix K (K-6). The compounds detected in the duplicate samples are included in the tables which include the sample for which the duplicate was collected and analyzed. Radian reports from the PPA of the QA/QC samples are included in Appendix J and summaries of the PPA results are included in Appendix K.

#### 5.3.6 Recalculation Results

Recalculations performed at the required frequency included the pesticide/PCB results of AN-2 the organic results of the Dipper Bottle rinse, and all organic and inorganic results of CWLS8-2, OWS-3, and HP-1. All results remained unchanged after the recalculations were performed.

#### 5.4 Health and Safety

The Health and Safety Plan used for the RFI is included in the RFI Work Plan as Attachment J. Air monitoring was performed as required, as discussed in Section 4.4. The air monitoring data obtained during drilling of the Syms Area borings did not indicate VOCs in the breathing zone. The protective equipment utilized during all drilling and sampling included hard hat, safety glasses, Tyvek suit, latex gloves, steel-toed boots, and ear plugs. Air monitoring data obtained during the Syms Area investigation are provided in Appendix M.

#### 5.5 ICF Report on Possible DOD Activities

A letter report discussing the past DOD operations at the Model City facility was submitted by ICF to CWM on December 17, 1990. This report is included in Appendix N for reference. The letter report describes the processes most likely used for the production of 2,4,6-trinitrotoluene (TNT), the chemicals and activities associated with the Chemical Warfare Services Facilities and activities associated with the Air Force Plant 68 (pilot plant production of high energy fuels). The following paragraphs summarize the potential chemicals associated with these activities as described in the ICF report.

The reaction used for the production of TNT is basically the nitration of toluene by the addition of mixed acid (nitric and sulfuric) to toluene. The reaction eventually yields the desired product 2,4,6-TNT and several by-products, including the undesirable isomers of TNT, mono and di nitrated toluenes, benzoic acid, and others. Chemicals associated with the production of TNT are listed in Table 15. The benzenes and xylenes are associated with impurities in industrial grade toluene. Metals, such as iron and copper, may be present in waste streams associated with the TNT production as a result of the corrosive action of the acids on holding vessels and transfer lines.

The Chemical Warfare Service Facilities reportedly used the Model City site for the storage of products such as chemical warfare agents, defensive chemicals, decontaminating agents, riot control agents, signalling and screening smokes, and pesticides. Compounds associated with these activities include impregnite (N,N-bis(2,4,6-trichlorophenyl)urea), PERC, hexachloroethane, chloroform, carbon tetrachloride and benzene. Pesticides and herbicides may also have been stored at this site as part of the Chemical Warfare Service Facilities. Table 15 includes a list of some of the chemicals associated with the Chemical Warfare Service Facilities and potential uses of these chemicals.

The Air Force Plant 68 was a pilot scale facility for the production of high energy fuels that never went into full production. However, several compounds are associated with the experimental production of high energy fuels including boron, lithium, PCBs, freons, other refrigerants, copper, lead, fire suppressants (carbon tetrachloride) and polynuclear aromatics. Many of the compounds used with the production of the high energy fuels were used to suppress fires. Table 15 includes a list of some of the chemicals associated with Air Force Plant 68 and potential uses of these chemicals.

## 6.0 EVALUATION OF RESULTS

### 6.1 Acid Neutralization Lagoon Area

The sludge samples from the Acid Neutralization Lagoon may contain elevated (above typical site soil background) levels of cadmium, chromium, copper, and lead. The lagoon water collected from the Acid Neutralization Lagoon was reported to contain only trace amounts of nickel. Copper and lead could have resulted from the corrosive nature of the chemicals used in the TNT production facility. Also, copper was a common catalyst used in the Air Force Plant 68 operations. Therefore, the possible presence of some metals reported in the sludge strongly suggests that some of the contamination may be associated with past DOD activities.

PCBs (1242 and 1260) and VOCs were also detected in the sludge samples from the Acid Neutralization Lagoon. The concentration of the PCBs in AN-2 are above the CWM action level of 10 mg/Kg for soils (Reference 8). The VOCs are present at relatively low concentrations (maximum reported concentration was 230 µg/Kg). The PCBs and the volatiles detected could be associated with the DOD activities or the Chem-Trol/SCA waste handling activities. The high concentrations of PCBs could have been from the transformers used at the Air Force Plant 68. PCB wastes are also known to have been handled by Chem-Trol/SCA.

The well installed downgradient of the Acid Neutralization Lagoon, ANL01S, was sampled and the groundwater sample was analyzed for PPA. Results indicated that the groundwater at this location has not been impacted by the contaminants detected within the Acid Neutralization Lagoon.

### 6.2 Houghson Lagoon Area

The sludge sampled from the Houghson Lagoon did not indicate the presence of VOCs or PCBs. The sludge sample was reported to contain elevated (above soil background) concentrations of cadmium, chromium, copper, lead, nickel and zinc, and high concentrations of

polynuclear aromatics (PNAs). The PNAs are coal tar related and may be residuals from a lagoon lining system installed by the DOD or the PNAs may be related to the burning of organic waste by the DOD. It is also possible that these compounds have, over time, leached from concrete materials used to construct the lagoon. Three phenolics were also reported at elevated concentrations in the sludge sample, which may be consistent with a bituminous coating material.

The lagoon water samples collected from the Houghson Lagoon were reported to contain trace amounts of nickel, 1,2-DCA, and bis(2-ethylhexyl)phthalate. The water and sludge samples have dissimilar constituent make ups. This suggests that the water in the lagoons is basically rain water.

The well installed down gradient of the Houghson Lagoon, HP01S, was sampled and the results indicated relatively low concentrations of 1,1-DCA, 1,2-DCA, vinyl chloride, and trans-1,2-DCE. A soil sample collected from a location north of the Houghson Lagoon (sample DA34-2-4/5) indicated the presence of 1,2-DCA at a relatively low concentration. Other soil samples collected from north of the Houghson Lagoon (DA34-3-1, DA22-1-3, and DA22-2-3) did not indicate the presence of organic compounds nor were the metals reported at levels above background in soil. Because the groundwater outside the lagoon indicated the presence of several VOCs, only one of which (1,2-DCA) was also detected in the sludge from the lagoon. The contamination identified in the soil and groundwater does not indicate that the Houghson Lagoon is a source of the contamination.

The class of compounds found in the Houghson Lagoon, PNAs, and the high levels of cadmium, chromium, copper, lead, nickel, and zinc could be residuals of the burning of organic wastes and evaporation of waste water by the DOD or residuals from a bituminous type lining. The source of the relatively low levels of volatiles reported in the groundwater and the soil samples downgradient of



the lagoon are more likely residuals of spills due to mishandling of chemicals in the area.

### 6.3 Syms Tank Area

The soil samples collected from the former location of the Syms Tank Area, DA22-3-1B and DA22-4-1, were reported to contain metals at concentrations below background levels in soils. PPO compounds were not reported above detection limits. However, cyanide was reported at 5.9 mg/Kg in sample DA22-4-1. A potential source for the cyanide has not been identified.

### 6.4 Oil/Water Separator Area

Neither PPOs, nor metals above background, were detected in either of the water samples collected from the Oil/Water Separator. However, a soil sample, DA36-1-4, was collected downgradient from the Oil/Water Separator and was reported to contain elevated levels (above soil background) of chromium and copper, and high concentrations of PERC, hexachlorobenzene, phenanthrene, and bis(2-ethylhexyl)phthalate. No sludge sample was taken from the Oil/Water Separator because sludge was not present.

The presence of copper, hexachlorobenzene and phenanthrene at the DA36-1-4 location outside the Oil/Water Separator could have been the result of surface spills of waste produced by DOD activities or waste handling by Chem-Trol/SCA. Bis(2-ethylhexyl)phthalate is a common artifact of sampling and analysis.

### 6.5 Chemical Waste Lift Station 7

A sludge sample and a water sample were collected from CWLS7. The sludge sample, and its duplicate, was reported to contain high concentrations (above soil background) of chromium and copper. Nickel was also reported at a level slightly above background for soils. Volatiles, semi-volatiles and one PCB were also reported in the sludge sample CWLS7-1. The water sample collected from CWLS7 (CWLS7-2) did not indicate the presence of any constituents above

their respective detection limits. Soil and groundwater samples were not obtained from the area around the CWLS7.

The source of the contamination in CWLS7 cannot be determined based on the reported detections of organics and inorganics in the sludge. Hexachlorobutadiene, one of the compounds with the highest reported concentrations, was not specifically mentioned in the ICF report as a component in any of the DOD activities. Hexachlorobutadiene has, however, been associated with use as a transformer liquid, heat transfer liquid, and/or a high temperature hydraulic fluid. These uses potentially point to the high energy fuels production plant, which was part of the DOD activities in the area. Therefore, DOD use of the chemical waste sewer and lift station is a likely source. Also, the lift station was reportedly not used by Chem-Trol/SCA.

#### 6.6 Chemical Waste Lift Station 7A

The compounds reported in the sludge sample from CWLS7A include high levels of cadmium, chromium, copper, lead, nickel, zinc, several VOCs and several semi-volatile organic compounds. The water sample from CWLS7A contained vinyl chloride. Samples of soil or groundwater were not obtained from the area around CWLS7A.

Some or all of the volatiles may be the result of past DOD activities involving the manufacturing of TNT (toluene and xylene), chemical warfare storage (benzene and TCE), and/or Air Force Plant 68 activities. The elevated concentrations of metals can also be associated with DOD activities. The semi-volatile compounds are all coal tar related compounds and may have resulted from the burning of organic waste by the DOD. It is also possible that these compounds have been leached from materials used to line the lift station or the pipelines.

### 6.7 Chemical Waste Lift Station 8

The sludge sample collected from CWLS8 was reported to contain high concentrations of boron, VOCs, semi-volatiles and PCBs. The water sample from CWLS8 was also reported to contain relatively high levels of VOCs. Soil and groundwater samples were not obtained from the area around CWLS8.

The high concentration of boron relates directly to the production of high energy fuels at Air Force Plant 68, as discussed in the ICF letter report. Also, the high levels of chlorinated solvents could be related to the use of fire suppressants (carbon tetrachloride) by the DOD in the TNT plants, high energy fuels pilot-plant and the chemical warfare service facilities. One of the three semi-volatiles reported (phenanthrene) is a PNA and may be related to the burning of organic waste by the DOD. It is also possible that this compound has been leached from materials used to line the lift station or the pipelines. The high levels of PCBs may be related to the use of transformers by the high energy fuels pilot-plant for the production of sodium and lithium through chemical electrolysis.

### 6.8 QA/QC Evaluation

#### 6.8.1 General

The results of the QA/QC samples are summarized in Section 5.3.4 and in Tables 12, 13, and 14. There are five types of QA/QC samples that may affect different aspects of the sample results: blanks, rinse samples (including municipal water samples), method spikes, MS/MSDs, and duplicates. An extensive evaluation of all of the QA/QC samples and their affect on each investigation sample result has been performed by qualified chemists. The outcome of the evaluation is shown on the tables of sample results as those detections flagged and the qualified concentration column. As an example of the iterations, a brief discussion of the evaluation of the blanks associated with this investigation is provided below.

### 6.8.2 Blanks

The evaluation of the blanks includes evaluation of method blanks, trip blanks, and field blanks. The EPA states that "no positive sample results should be reported unless the concentration of the compound in the sample exceeds 10 times the amount in any blank for the following contaminants: methylene chloride, acetone, toluene, 2-butanone, and common phthalate esters." For all other compounds, "no positive sample results should be reported unless the concentration of the compound in the sample exceeds 5 times the amount in any blank." (Reference 9).

Table 16 presents a summary of the compounds detected in the blanks which were analyzed in conjunction with the Syms Area samples. This table includes the detected compound, the highest concentration at which it was reported, and the concentration limit for evaluating which detections in the samples can be discounted. The limits presented are based on a dilution factor of 1. If a sample was diluted for analysis and has a dilution factor greater than 1, the limits shown should be multiplied by the dilution factor to obtain the limit for that sample.

Table 16 has been divided into two sections, organics and inorganics, because of the differences between the inorganic blank results for the soils and water. The organic compounds detected in both soil and water blanks were similar in concentration and were, therefore, evaluated without the distinction between soil and water. The inorganic compounds detected, however, indicated a significant difference in concentration between the soil and water blank samples. This difference is attributed to the common, and expected, presence of inorganics in soil at a higher concentrations than in water. The table, therefore, presents the organic compound detections with units of parts per billion (ppb), which can be applied to both soil and water samples, and the inorganic compound detections with units of  $\mu\text{g/L}$  for water (lagoon or groundwater) and  $\mu\text{g/Kg}$  for soil or sludge. As a result of these distinctions, discounting inorganic detections in the Syms Area samples was

performed relative to sample matrix. The samples affected by the blanks evaluation are shown in the results tables (Tables 4 through 14 as referenced in Section 5.3) as less than the detection limit in the qualified data column.

#### 6.8.3 Shuttle Temperature and Holding Times

One shuttle (containing samples CWLS7-1, CWLS7-1 MS and CWLS7-1 MSD) was received at the laboratory at a temperature greater than 4°C. The elevated temperature (10.4°C) was not considered to have had an impact on the quality of the analytical results.

The missed holding times by 1 and 2 days for the volatile fraction of several samples were not considered to have had an impact on the quality of the analytical results.

#### 6.8.4 Spikes, Duplicates and Surrogates

Samples with qualified concentrations reported as greater than the detection limit are not quantitative because the laboratory was unable to reproduce the spike results for the applicable MS/MSD and DUP analyses. These sample results are flagged in the description column on the tables of results with a Y.

Samples with qualified concentrations reported as ranges (flagged with an X) are associated with MS/MSD samples in which the spike recoveries were above control limits. That is, the reported concentration is considered to be a maximum. Samples associated with MS/MSD analyses for which the spike recoveries were below control limits are flagged with a W and the laboratory value is considered to be the minimum concentration that may be present. No range is given with the W flags because the result is considered semi-quantitative.

Sample results for which the surrogates were all out of control limits are considered estimated and are flagged in the description column as Z.

### 6.9 Evaluation Summary

The evaluation of the Syms Area samples involved samples of four different matrices from various sources. The QA/QC evaluation was complicated by the different matrices, some of which proved to be difficult to reproduce accurately. A visual representation of some aspects of the findings is provided on Figure 8 which summarizes the data based on the results of the QA/QC program.

Figure 8 indicates the presence or absence of four general classes of analytes - VOCs, PNAs, PCBs and metals. The data illustrated is for each sampling location with detected constituents at selected concentration levels. The concentrations for the figure are:

- VOCs greater than 100 ppb;
- PNAs greater than 100 ppb;
- PCBs greater than 10 ppm; and
- metals greater than background levels for soils.

The figure also lists the presence of two compounds which are not one of the four general classes of analytes, but were present at elevated concentrations.

Figure 8 shows that the soil and groundwater, where investigated, have not been impacted by the high levels of contamination inside the Houghson Lagoon or the Acid Neutralization Lagoon. Only one soil sample location, outside the Oil/Water Separator, indicated contamination above the levels specified in Figure 8.

The two lagoons (Houghson Lagoon and Acid Neutralization Lagoon) which indicated high levels of contamination in their respective sludges are different from each other. The only class of analyte that they have in common is the metals. In addition, phenols were detected in the Houghson Lagoon and they were not reported at any other location in the Syms Area.

The chemical waste lift stations, although connected at one time via a pipeline system (see Figure 6), also have different constituent make ups. Although CWLS7A and CWLS8 both have high concentrations of VOCs, PNAs and metals, a closer inspection of the constituent make up of each shows several differences:

- the VOCs in CWLS7A (although above 100 ppb) are, relative to CWLS8, not extremely high (1 to 5 orders of magnitude difference);
- the sludge sample from CWLS7A indicated five PNAs at high concentrations while CWLS8 only indicates one PNA (phenanthrene);
- the only metals detection at a high level in CWLS8 is boron, while CWLS7A includes several metals at high levels (and boron is not one of them); and
- PCBs were reported in CWLS8 at high concentrations (one order of magnitude greater than the CWM action level for soils (Reference 8), but were not reported at all in CWLS7A.

The constituent make up in CWLS7 is very different from the other two lift stations. Metals were detected at high levels (as in the other lift stations), but none of the other classes of analytes were detected at high concentrations. Additionally, hexachlorobutadiene was reported in the CWLS7 sludge at a high concentration, but was not reported at any other location in the Syms Area.

In summary, five of the six existing units investigated appear to be impacted by former use. From the data collected, several different types of production or waste handling activities have apparently occurred at these locations. This would be expected based on the variety of process steps involved in the high energy fuels production/waste handling process (Reference 6). Similar waste streams are not indicated, as expected from the CWM use of the lagoons which could have resulted in similar residuals from lagoon to lagoon.

## 7.0 CONCLUSIONS AND RECOMMENDATIONS

The analytical laboratory results of soil, groundwater, sludge, and lagoon water samples from several units/areas in the Syms Area have indicated relatively high concentrations of both organic and inorganic compounds. However, the findings for each of the individual units/areas which indicated contamination are different with respect to constituents present, relative concentrations, and historical use.

The analytical results for most of the soil samples from around the existing unit/areas and from the former Syms Tank Area have not indicated an apparent impact. Generally, some evidence indicates that spills during waste handling activities may have impacted the soil and/or groundwater around the existing units, but migration was not indicated, and no impact at all was indicated at the Syms Tank Area. The soil and groundwater samples collected directly downgradient from the two lagoon units generally did not contain the same constituents as were reported in the units and, therefore, do not indicate that the contaminants within the units have migrated from the unit itself. Soil and/or groundwater samples were not collected in the area of the chemical waste lift stations; therefore, an evaluation of the potential impact from these units is unknown.

The source(s) of the compounds identified in the soil and/or groundwater samples from outside the Houghson Lagoon and the Oil/Water Separator cannot be definitely associated with one or more activities. Some of the compounds identified could have been used or handled by either the DOD and Chem-Trol/SCA.

Past DOD production related and waste handling activities are strongly suspected as a source of the elevated concentrations of some of the organics and inorganics (metals) in the sludge samples from the Acid Neutralization Lagoon, the Houghson Lagoon, CWLS7, CWLS7A and CWLS8. The potential use of the units by the DOD to burn organic wastes and/or evaporation of waste water is also a



suspected source of the PNAs and some of the volatiles and metals reported in these samples. Much of the data, however, is somewhat inconclusive with respect to identifying a specific source and/or the activity which resulted in the contamination because the sampling program was not designed to provide this information. Additional investigations would be necessary to evaluate more completely the source and extent of the potential contamination identified in the Syms Area.

The DOD has issued a report (Reference 6) indicating the potential for a number of residuals associated with the high energy fuels production plant (Air Force Plant 68). CWM has previously provided comments to DOD (and EPA and DEC) regarding additional investigations by the DOD which are necessary to address the former government activities on this portion the facility.

The recommended investigations should include additional soil sampling around the units, including the chemical waste lift stations. Also, the additional investigations should include analyses for constituents which are more closely related to the known DOD activities which may have taken place in this area. The ICF letter report (Appendix N) has suggested several analyses which could better identify DOD related activities. Each area should have the investigation tailored to the potential sources to more accurately evaluate the extent associated with each area. This recommendation was also suggested in the DOD Field Reconnaissance

Report (Reference 6). An investigation plan should be prepared which would specify additional analyses and how/what would be indicated as a result of these analyses.

GOLDER ASSOCIATES INC.

*K. Michael Gay*

K. Michael Gay  
Project Chemist

*Wendy D. Morris*

Wendy D. Morris  
Project Engineer

*John F. Clerici*

John F. Clerici, P.E.  
Principal

WDM/JFC:kb

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TABLE 1  
SUMMARY OF SAMPLES REQUIRED AND OBTAINED  
SYMS AREA  
MODEL CITY TSDR FACILITY

DESIGNATED AREA	REQUIRED SAMPLE(S) (1)		SAMPLE(S) OBTAINED (2)		
	TYPE	NUMBER	TYPE	NUMBER	DESIGNATION
DA-34	GW (3)	1	GW	1	HP01S
DA-34	SLUDGE	1	SLUDGE	1	HP-1
DA-34	POND WATER	1	POND WATER	2	HP-2
DA-34	--	--	SS SOIL (4)	4	HP-2DUP DA34-1-4 DA34-2-4/5 DA34-2-4/5DUP DA34-3-1
DA-35	GW	1	GW	1	ANL01S
DA-35	SLUDGE	1	SLUDGE	2	AN-1
DA-35	POND WATER	1	POND WATER	2	AN-2 AN-3 AN-4
DA-36	GW	1	--	--	--
DA-36	SLUDGE	1	--	--	--
DA-36	POND WATER	1	POND WATER	2	OWS-3 OWS-4
DA-36	--	--	SS SOIL	2	DA36-1-4 DA36-1-4DUP
DA-22	SS SOIL	2	SS SOIL	4	DA22-1-3 DA22-2-3 DA22-3-1B DA22-4-1
SYMS UNDER- GROUND TANKS	SLUDGE	3	SLUDGE	4	CWLS7-1 CWLS7-1DUP CWLS8-1 CWLS7A-1
SYMS UNDER- GROUND TANKS	POND WATER	3	POND WATER	3	CWLS7-2 CWLS8-2 CWLS7A-2

NOTES: (1) The required samples shown are those required in the RFI Work Plan (Reference 1) for analytical laboratory analyses.

(2) All samples obtained were analyzed by an analytical laboratory for priority pollutants, with one exception. Sample DA36-1-4DUP was analyzed for metals only.

(3) GW = groundwater

(4) SS Soil = split spoon soil samples collected from below the fill

## PRIORITY POLLUTANT PARAMETER LIST

VOLATILES	PESTICIDES/PCBs	SEMIVOLATILES		INORGANICS
Benzene	Aldrin	2-Chlorophenol	Chrysene	Arsenic
Bromoform	Alpha-BHC	2,4-Dichlorophenol	Dibenzo(a,h)anthracene	Cadmium
Carbon tetrachloride	Beta-BHC	2,4-Dimethylphenol	1,2-Dichlorobenzene	Chromium
Chlorobenzene	Gamma-BHC	4,6-Dinitro-o-cresol	1,3-Dichlorobenzene	Lead
Chlorodibromomethane	Delta-BHC	2,4-Dinitrophenol	1,4-Dichlorobenzene	Mercury
Chloroethane	Chlordane	2-Nitrophenol	3,3-Dichlorobenzidine	Selenium
Chloroform	4,4'-DDT	4-Nitrophenol	Diethyl phthalate	Silver
Dichlorobromomethane	4,4'-DDE	p-Chloro-m-cresol	Dimethyl phthalate	Antimony
1,1-Dichloroethane	4,4'-DDD	Pentachlorophenol	Di-n-butyl phthalate	Beryllium
1,2-Dichloroethane	Dieldrin	Phenol	2,4-Dinitrotoluene	Copper
1,1-Dichloroethylene	Endosulfan I	2,4,6-Trichlorophenol	2,6-Dinitrotoluene	Zinc
1,2-Dichloropropane	Endosulfan II	Acenaphthene	Di-n-octyl phthalate	Nickel
cis-1,3-Dichloropropylene	Endosulfan sulfate	Acenaphthylene	Fluoranthene	Thallium
Ethylbenzene	Endrin	Benzo(a)anthracene	Fluorene	Total Cyanide
Methyl bromide	Endrin aldehyde	Benzo(a)pyrene	Hexachlorobenzene	
Methyl chloride	Heptachlor	3,4-Benzofluoranthene	Hexachlorobutadiene	
Methylene chloride	Heptachlor epoxide	Benzo(ghi)perylene	Hexachlorocyclopentadiene	
1,1,2,2-Tetrachloroethane	PCB-1242	Benzo(k)fluoranthene	Hexachloroethane	
Tetrachloroethylene	PCB-1254	bis(2-Chloroethoxy)methane	Indeno(1,2,3-c,d)pyrene	
Toluene	PCB-1221	bis(2-Chloroethyl)ether	Isophorone	
1,2-trans-Dichloroethylene	PCB-1232	bis(2-Chloroisopropyl)ether	Naphthalene	
1,1,1-Trichloroethane	PCB-1248	bis(2-Ethylhexyl)phthalate	Nitrobenzene	
1,1,2-Trichloroethane	PCB-1260	4-Bromophenyl phenyl ether	N-Nitrosodi-n-propylamine	
Trichloroethylene	PCB-1016	Butyl benzyl phthalate	N-Nitrosodiphenylamine	
Vinyl chloride	Toxaphene	2-Chloronaphthalene	Phenanthrene	
Xylenes (Total)		4-Chlorophenyl phenyl ether	Pyrene	
			1,2,4-Trichlorobenzene	

JANUARY 1991

TABLE 3

893-3809

## SUMMARY OF COMPOUNDS DETECTED BY THE FIELD GC

BOREHOLE ID....	SAMPLE ID	DATE		DEPTH (FEET)		REPORTED TARGET COMPOUND CONCENTRATIONS (ug/kg)										TCE	STRATIGRAPHY
		SAMPLED	ANALYZED	TOP	BOTTOM	1,1,1-T	TRANS-DCE	BENZENE	TOLUENE	1,1-DCE	CCL4	CHCL3	PERC ..				
DA36-1	4	8/18/89	8/21/89	6	8	<100	<10	104	<10	33	<200	<200	1690			38	UCT
DA36-1	5	8/18/89	8/21/89	8	10	<100	<10	14	<10	<10	<200	<200	<10			<10	UCT
DA36-1	DA36-1	8/21/89	8/22/89	NA	NA	<100	<10	11	<10	<10	<200	<200	414			<10	GW
DA36-1	DA36-1DUP	8/21/89	8/22/89	NA	NA	<100	<10	<10	<10	<10	<200	<200	361			<10	GW

## ABBREVIATIONS:

1,1,1-T = 1,1,1-TRICHLOROETHANE

PERC = TETRACHLOROETHENE

CCL3 = CHLOROFORM

CCL4 = CARBON TETRACHLORIDE

NA = NOT APPLICABLE

TCE = TRICHLOROETHENE

TRANS-DCE = TRANS-1,2-DICHLOROETHENE

1,1-DCE = 1,1-DICHLOROETHENE

TB = TRIP BLANK

UCT = UPPER CLAY TILL

GW = GROUNDWATER

GC = GLACIOLACUSTRINE CLAY

JANUARY 1991

TABLE 4  
(2 OF 2)

893-3809

RADIAN RESULTS  
SUMMARY OF COMPOUNDS DETECTED  
DA-22 SOIL SAMPLES

.....LOCATION ID .....	DATE SAMPLED.	CHEMICAL NAMES.....	DESCRIPTION....	LAB VALUE	UNITS..	DETECTION LIMITS	QUALIFIED CONCENTRATION:
DA22-4-1	890928	Cyanide		5.9	ug/kg	0.49	5.9
DA22-4-1	890928	Methylene chloride	B	32	ug/Kg	2.8	(2.8
DA22-4-1	890928	Toluene	*B	6	ug/Kg	6.0	(6.0
DA22-4-1	890928	Trichloroethene	*B	4	ug/Kg	1.9	(1.9
DA22-4-1	890928	PCB-1242		170	ug/Kg	0.033	170
DA22-4-1	890928	PCB-1260		14	ug/Kg	0.066	14

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RADIAN RESULTS  
SUMMARY OF COMPOUNDS DETECTED  
DA-34 SOIL SAMPLES

.....LOCATION ID .....	DATE SAMPLED.	CHEMICAL NAMES.....	DESCRIPTION....	LAB VALUE UNITS..	DETECTION LIMITS	QUALIFIED CONCENTRATION
DA34-1-4	890821	Arsenic		17 mg/kg	0.35	17
DA34-1-4	890821	Cadmium		0.66 <sup>a</sup> mg/kg	0.46	66
DA34-1-4	890821	Chromium		12 mg/kg	0.91	12
DA34-1-4	890821	Copper	X	26 mg/kg	1.8	1.8-26
DA34-1-4	890821	Lead	X	3.5 mg/kg	0.17	.17-3.5
DA34-1-4	890821	Nickel		15 mg/kg	1.8	15
DA34-1-4	890821	Zinc		37 mg/kg	1.8	37
DA34-1-4	890821	Methylene chloride	"B	11 ug/kg	2.8	(2.8
***						
DA34-2-4/5	890822	Arsenic		18 mg/kg	0.62	18
DA34-2-4/5	890822	Cadmium		0.50 <sup>a</sup> mg/kg	0.37	.50
DA34-2-4/5	890822	Chromium		13 mg/kg	0.74	13
DA34-2-4/5	890822	Copper		21 mg/kg	1.5	21
DA34-2-4/5	890822	Lead		6.2 mg/kg	0.31	6.2
DA34-2-4/5	890822	Nickel		17 mg/kg	1.5	17
DA34-2-4/5	890822	Selenium		22 <sup>a</sup> mg/kg	22	22
DA34-2-4/5	890822	Silver		1.7 <sup>a</sup> mg/kg	0.74	1.7
DA34-2-4/5	890822	Zinc		390 mg/kg	1.5	39
DA34-2-4/5	890822	1,2-Dichloroethane	Y	120 ug/kg	2.8	(2.8
DA34-2-4/5	890822	Carbon tetrachloride	"B	6.1 ug/kg	2.8	(2.8
DA34-2-4/5	890822	Methylene chloride	B	15 ug/kg	2.8	(2.8
DA34-2-4/5	890822	Trichloroethene	"B	2.7 ug/kg	1.9	(1.9
DA34-2-4/5 DUP	890822	Methylene chloride	"B	5.7 ug/kg	2.8	(2.8
DA34-2-4/5 duplicate	890822	Arsenic		19 mg/kg	0.65	19
DA34-2-4/5 duplicate	890822	Chromium		12 mg/kg	0.81	12
DA34-2-4/5 duplicate	890822	Copper	B	16 mg/kg	1.6	(1.6
DA34-2-4/5 duplicate	890822	Lead		5.2 mg/kg	0.33	5.2
DA34-2-4/5 duplicate	890822	Nickel		16 mg/kg	1.6	16
DA34-2-4/5 duplicate	890822	Silver		1.7 <sup>a</sup> mg/kg	0.81	1.7
DA34-2-4/5 duplicate	890822	Zinc		42 mg/kg	1.6	42
***						
DA34-3-1	890927	Arsenic	Y	8.0 mg/kg	0.74	1.74
DA34-3-1	890927	Beryllium		0.56 <sup>a</sup> mg/kg	0.19	.56
DA34-3-1	890927	Chromium		12 mg/kg	0.97	12
DA34-3-1	890927	Copper		22 mg/kg	1.9	22
DA34-3-1	890927	Lead		5.9 mg/kg	0.37	5.9
DA34-3-1	890927	Nickel	Y	17 mg/kg	1.9	11.9
DA34-3-1	890927	Silver		3.2 <sup>a</sup> mg/kg	0.97	3.2
DA34-3-1	890927	Zinc		32 mg/kg	1.9	32
DA34-3-1	890927	Methylene chloride	B	16 ug/kg	2.8	(2.8



JANUARY 1991

TABLE 6

893-3809

RADIAN RESULTS  
SUMMARY OF COMPOUNDS DETECTED  
DA-36 SOIL SAMPLES

.....LOCATION ID .....	DATE SAMPLED.	CHEMICAL NAMES.....	DESCRIPTION....	LAB VALUE	UNITS..	DETECTION LIMITS	QUALIFIED CONCENTRATION
DA36-1-4	890818	Arsenic		13	mg/kg	0.33	13
DA36-1-4	890818	Beryllium		0.60 <sup>2</sup>	mg/kg	0.14	.60
DA36-1-4	890818	Chromium		20	mg/kg	0.71	20
DA36-1-4	890818	Copper	X	3490	mg/kg	1.4	1.4-349
DA36-1-4	890818	Lead	X	110	mg/kg	0.71	.71-11
DA36-1-4	890818	Nickel		16	mg/kg	1.4	16
DA36-1-4	890818	Selenium		78 <sup>2</sup>	mg/kg	21	78
DA36-1-4	890818	Zinc		54	mg/kg	1.4	54
DA36-1-4	890818	Methylene chloride	B	45000	ug/Kg	7000	<7000
DA36-1-4	890818	Tetrachloroethene	Y	110000	ug/Kg	10000	>10000
DA36-1-4	890818	Hexachlorobenzene		7600	ug/Kg	660	7600
DA36-1-4	890818	Phenanthrene		7000	ug/Kg	660	7000
DA36-1-4	890818	bis(2-Ethylhexyl)phthalate		6400	ug/Kg	660	6400
DA36-1-4 DUP	890818	Arsenic		13	mg/kg	0.28	13
DA36-1-4 DUP	890818	Beryllium		0.57 <sup>2</sup>	mg/kg	0.15	.57
DA36-1-4 DUP	890818	Chromium		21	mg/kg	0.77	21
DA36-1-4 DUP	890818	Copper	X	443	mg/kg	1.5	1.5-443
DA36-1-4 DUP	890818	Lead	X	8.7	mg/kg	0.28	.28-8.7
DA36-1-4 DUP	890818	Nickel		16	mg/kg	1.5	16
DA36-1-4 DUP	890818	Selenium		75 <sup>2</sup>	mg/kg	23	75
DA36-1-4 DUP	890818	Zinc		59	mg/kg	1.5	59

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RADIAN RESULTS  
SUMMARY OF COMPOUNDS DETECTED  
ACID NEUTRALIZATION PIT WATER & SLUDGE SAMPLES

.....LOCATION ID .....	DATE SAMPLED.	CHEMICAL NAMES.....	DESCRIPTION....	LAB VALUE UNITS.	DETECTION LIMITS	QUALIFIED CONCENTRATION
W-ANL01S	891031	Arsenic		0.013 mg/L	0.0020	.013
W-ANL01S	891031	Chromium		0.086 mg/L	0.010	.086
W-ANL01S	891031	Copper	B	0.087 <sup>a</sup> mg/L	0.020	(0.2
W-ANL01S	891031	Lead	B	0.012 mg/L	0.0020	(.002
W-ANL01S	891031	Nickel		0.13 mg/L	0.020	.13
W-ANL01S	891031	Zinc	*	0.083 mg/L	0.020	.083
***						
AN2	890913	Antimony	Y	0.77 <sup>a</sup> mg/kg	0.60	>0.4
AN2	890913	Arsenic	Y	2.2 mg/kg	0.14	>0.14
AN2	890913	Cadmium	Y	1.6 <sup>a</sup> mg/kg	0.50	>0.50
AN2	890913	Chromium	Y	120 mg/kg	1.0	>1.0
AN2	890913	Copper	Y	340 mg/kg	2.0	>2.0
AN2	890913	Lead	Y	830 mg/kg	28	>28
AN2	890913	Mercury	Y	0.14 <sup>a</sup> mg/kg	0.045	>0.045
AN2	890913	Nickel	Y	15 mg/kg	2.0	>2.0
AN2	890913	Silver	Y	1.0 <sup>a</sup> mg/kg	1.0	>1.0
AN2	890913	Zinc	Y	69 mg/kg	2.0	>2.0
AN2	890913	Cyanide		0.73 <sup>a</sup> mg/kg	0.43	0
***						
AN-1	890913	Antimony	Y	0.60 <sup>a</sup> mg/kg	0.38	>.38
AN-1	890913	Arsenic	Y	1.7 mg/kg	0.14	>.14
AN-1	890913	Cadmium	Y	2.2 <sup>a</sup> mg/kg	0.48	>.48
AN-1	890913	Chromium	Y	85 mg/kg	0.96	>.96
AN-1	890913	Copper	Y	820 mg/kg	1.9	>1.9
AN-1	890913	Lead	Y	460 mg/kg	27	>27
AN-1	890913	Mercury	Y	0.080 <sup>a</sup> mg/kg	0.045	>.045
AN-1	890913	Nickel	Y	13 mg/kg	1.9	>1.9
AN-1	890913	Zinc	Y	64 mg/kg	1.9	>1.9
AN-1	890913	1,1-Dichloroethane	*	26 ug/Kg	5.6	26
AN-1	890913	Benzene		110 ug/Kg	8.8	110
AN-1	890913	Chlorobenzene		79 ug/Kg	12	79
AN-1	890913	Ethylbenzene		97 ug/Kg	14	97
AN-1	890913	Methylene chloride	*B	24 ug/Kg	5.6	(5.6
AN-1	890913	Toluene	*B	56 ug/Kg	12	(12
AN-1	890913	Trichloroethene	B	28 ug/Kg	3.8	(3.8
AN-1	890913	Vinyl chloride	*	30 ug/Kg	10	30
AN-1	890913	Xylenes		230 ug/Kg	10	230
AN-1	890913	trans-1,2-Dichloroethene	*	13 ug/Kg	3.2	13
AN-1	890913	bis(2-Ethylhexyl)phthalate	*	690 ug/kg	660	690

RADIAN RESULTS  
SUMMARY OF COMPOUNDS DETECTED  
ACID NEUTRALIZATION PIT WATER & SLUDGE SAMPLES

....LOCATION ID .....	DATE SAMPLED.	CHEMICAL NAMES.....	DESCRIPTION....	LAB VALUE UNITS.	DETECTION LIMITS	QUALIFIED CONCENTRATION
***						
AN-2	890913	1,1-Dichloroethane		24 ug/Kg	2.8	2.4
AN-2	890913	Benzene	*	7.3 ug/Kg	4.4	7.3
AN-2	890913	Chlorobenzene		37 ug/Kg	6.0	37
AN-2	890913	Ethylbenzene		130 ug/Kg	7.2	130
AN-2	890913	Methylene chloride	B	82 ug/Kg	2.8	(2.8
AN-2	890913	Tetrachloroethene		37 ug/Kg	4.1	37
AN-2	890913	Toluene	B	44 ug/Kg	6.0	(6.0
AN-2	890913	Trichloroethene		45 ug/Kg	1.9	45
AN-2	890913	Vinyl chloride		97 ug/Kg	5.0	97
AN-2	890913	Xylenes		163 ug/Kg	5.0	163
AN-2	890913	trans-1,2-Dichloroethene		16 ug/Kg	1.6	16
AN-2	890913	PCB-1242	Z	190000 ug/Kg	33	190000
AN-2	890913	PCB-1260	Z	27000 ug/Kg	67	27000
***						
AN-3	890913	Arsenic	B	0.0023* mg/L	2.0	(2.0
AN-3	890913	Beryllium	*	0.0030* mg/L	0.0020	.003
AN-3	890913	Lead	B	0.019 mg/L	0.0020	(2.0
AN-3	890913	Carbon tetrachloride	*B	3.2 ug/L	2.8	(2.8
***						
AN-4	890926	Lead	B	0.011* mg/L	0.0020	(.002
AN-4	890926	Nickel	*	0.036* mg/L	0.020	.036
AN-4	890926	Trichloroethene	*B	2.0 ug/L	1.9	(1.9
***						

RADIAN RESULTS  
SUMMARY OF COMPOUNDS DETECTED  
CALS NUMBER 7 WATER & SLUDGE SAMPLES

....LOCATION ID .....	DATE SAMPLED.	CHEMICAL NAMES.....	DESCRIPTION...	LAB VALUE UNITS.	DETECTION LIMITS	QUALIFIED CONCENTRATION
CALS7-1	890913	Arsenic		8.30 mg/kg	0.62	8.3
CALS7-1	890913	Beryllium		0.25 <sup>2</sup> mg/kg	0.16	0.25
CALS7-1	890913	Chromium		3.4 <sup>2</sup> mg/kg	0.82	3.4
CALS7-1	890913	Copper	W	15000 mg/kg	1.6	1500
CALS7-1	890913	Lead		120 mg/kg	0.67	12
CALS7-1	890913	Lithium		2.6 <sup>2</sup> mg/kg	1.6	2.6
CALS7-1	890913	Mercury		0.050 <sup>2</sup> mg/kg	0.045	.05
CALS7-1	890913	Nickel	W	100 mg/kg	1.6	10
CALS7-1	890913	Selenium		50 <sup>2</sup> mg/kg	25	50
CALS7-1	890913	Silver		2.9 <sup>2</sup> mg/kg	0.82	2.9
CALS7-1	890913	Zinc	W	290 mg/kg	1.6	29
CALS7-1	890913	Methylene chloride	B	58 ug/Kg	2.8	2.8
CALS7-1	890913	Xylenes		11 ug/Kg	5.0	11
CALS7-1	890913	Hexachlorobutadiene		5900 ug/kg	660	5900
CALS7-1	890913	bis(2-Ethylhexyl)phthalate	*Y	2100 ug/kg	660	1660
CALS7-1	890913	PCB-1260	Z,Y	130 ug/Kg	0.066	1.066
CALS7-1 DUP	890913	Methylene chloride	B	23 ug/Kg	2.8	(2.8
CALS7-1 DUP	890913	Toluene	*B	28 ug/Kg	6.0	(6.0
CALS7-1 DUP	890913	Xylenes		7.7 ug/Kg	5.0	7.7
CALS7-1 DUP	890913	Hexachlorobutadiene		5600 ug/kg	660	5600
CALS7-1 DUP	890913	bis(2-Ethylhexyl)phthalate	Y	7500 ug/kg	660	7500
CALS7-1 DUP	890913	PCB-1260	Y	190 ug/Kg	0.066	
CALS7-1 Dup	890913	Antimony		0.71 <sup>2</sup> mg/kg	0.30	.71
CALS7-1 Dup	890913	Arsenic		9.1 mg/kg	0.65	9.1
CALS7-1 Dup	890913	Beryllium		0.23 <sup>2</sup> mg/kg	0.15	.23
CALS7-1 Dup	890913	Chromium		410 mg/kg	0.76	410
CALS7-1 Dup	890913	Copper		3000 mg/kg	1.5	3000
CALS7-1 Dup	890913	Lead		31 mg/kg	3.1	31
CALS7-1 Dup	890913	Lithium		9.4 mg/kg	1.5	9.4
CALS7-1 Dup	890913	Mercury		0.18 <sup>2</sup> mg/kg	0.045	1.8
CALS7-1 Dup	890913	Nickel		30 mg/kg	1.5	30
CALS7-1 Dup	890913	Selenium		94 <sup>2</sup> mg/kg	23	94
CALS7-1 Dup	890913	Silver		5.5 mg/kg	0.76	5.5
CALS7-1 Dup	890913	Zinc		69 mg/kg	1.5	69
***						
CALS7-2	890913	Copper	B	0.11 mg/L	0.020	(0.02
CALS7-2	890913	Lead	B	0.012 mg/L	0.0020	(0.002
***						

RADIAN RESULTS  
SUMMARY OF COMPOUNDS DETECTED  
CMLS NUMBER 7A WATER & SLUDGE SAMPLES

.....LOCATION ID .....	DATE SAMPLED.	CHEMICAL NAMES.....	DESCRIPTION....	LAB VALUE UNITS..	DETECTION LIMITS	QUALIFIED CONCENTRATION
CMLS7A-1	890913	Antimony		3.0 mg/kg	0.34	3.0
CMLS7A-1	890913	Arsenic		12 mg/kg	0.60	12
CMLS7A-1	890913	Beryllium	*	0.43* mg/kg	0.17	.43
CMLS7A-1	890913	Cadmium		25 mg/kg	0.43	25
CMLS7A-1	890913	Chromium		71 mg/kg	0.86	71
CMLS7A-1	890913	Copper	W	360 mg/kg	1.7	360
CMLS7A-1	890913	Lead		220 mg/kg	12	220
CMLS7A-1	890913	Lithium		8.3* mg/kg	1.7	8.3
CMLS7A-1	890913	Nickel	W	39 mg/kg	1.7	39
CMLS7A-1	890913	Selenium	*	64* mg/kg	26	64
CMLS7A-1	890913	Silver	*	3.7* mg/kg	0.86	3.7
CMLS7A-1	890913	Zinc	W	850 mg/kg	1.7	850
CMLS7A-1	890913	Benzene	*	54 ug/Kg	44	54
CMLS7A-1	890913	Chlorobenzene	*	63 ug/Kg	60	60
CMLS7A-1	890913	Ethylbenzene		1700 ug/Kg	72	1700
CMLS7A-1	890913	Methylene chloride	B	240 ug/Kg	28	128
CMLS7A-1	890913	Tetrachloroethene	*	90 ug/Kg	41	90
CMLS7A-1	890913	Toluene	B	670 ug/Kg	60	160
CMLS7A-1	890913	Trichloroethene	*B	50 ug/Kg	19	119
CMLS7A-1	890913	Vinyl chloride		560 ug/Kg	50	560
CMLS7A-1	890913	Xylenes		2800 ug/Kg	50	2800
CMLS7A-1	890913	Anthracene		8700 ug/kg	1300	8700
CMLS7A-1	890913	Chrysene		13000 ug/kg	1300	13000
CMLS7A-1	890913	Fluoranthene		12000 ug/kg	1300	12000
CMLS7A-1	890913	Phenanthrene		70000 ug/kg	1300	70000
CMLS7A-1	890913	Pyrene		60000 ug/kg	1300	60000
***						
CMLS7A-2	890913	Lead	B	0.0072* mg/L	0.0020	0.002
CMLS7A-2	890913	Trichloroethene	Y	34 ug/L	1.9	11.9
CMLS7A-2	890913	Vinyl chloride	Y	50 ug/L	5.0	15.0
***						

RADIAN RESULTS  
SUMMARY OF COMPOUNDS DETECTED  
CMLS NUMBER 7A WATER & SLUDGE SAMPLES

.....LOCATION ID .....	DATE SAMPLED.	CHEMICAL NAMES.....	DESCRIPTION....	LAB VALUE UNITS..	DETECTION LIMITS	QUALIFIED CONCENTRATION
CMLS7A-1	890913	Antimony		3.0 mg/kg	0.34	3.0
CMLS7A-1	890913	Arsenic		12 mg/kg	0.60	12
CMLS7A-1	890913	Beryllium	"	0.43* mg/kg	0.17	.43
CMLS7A-1	890913	Cadmium		25 mg/kg	0.43	25
CMLS7A-1	890913	Chromium		71 mg/kg	0.86	71
CMLS7A-1	890913	Copper	W	360 mg/kg	1.7	360
CMLS7A-1	890913	Lead		220 mg/kg	12	220
CMLS7A-1	890913	Lithium		8.3* mg/kg	1.7	8.3
CMLS7A-1	890913	Nickel	W	39 mg/kg	1.7	39
CMLS7A-1	890913	Selenium	"	64* mg/kg	26	64
CMLS7A-1	890913	Silver	"	3.7* mg/kg	0.86	3.7
CMLS7A-1	890913	Zinc	W	850 mg/kg	1.7	850
CMLS7A-1	890913	Benzene	"	54 ug/kg	44	54
CMLS7A-1	890913	Chlorobenzene	"	63 ug/kg	60	60
CMLS7A-1	890913	Ethylbenzene		1700 ug/kg	72	1700
CMLS7A-1	890913	Methylene chloride	B	240 ug/kg	28	128
CMLS7A-1	890913	Tetrachloroethene	"	90 ug/kg	41	90
CMLS7A-1	890913	Toluene	B	670 ug/kg	60	160
CMLS7A-1	890913	Trichloroethene	"B	50 ug/kg	19	119
CMLS7A-1	890913	Vinyl chloride		560 ug/kg	50	560
CMLS7A-1	890913	Xylenes		2800 ug/kg	50	2800
CMLS7A-1	890913	Anthracene		8700 ug/kg	1300	8700
CMLS7A-1	890913	Chrysene		13000 ug/kg	1300	13000
CMLS7A-1	890913	Fluoranthene		12000 ug/kg	1300	12000
CMLS7A-1	890913	Phenanthrene		70000 ug/kg	1300	70000
CMLS7A-1	890913	Pyrene		60000 ug/kg	1300	60000
***						
CMLS7A-2	890913	Lead	B	0.0072* mg/L	0.0020	(0.002
CMLS7A-2	890913	Trichloroethene	Y	34 ug/L	1.9	11.9
CMLS7A-2	890913	Vinyl chloride	Y	50 ug/L	5.0	15.0
***						

RADIAN RESULTS  
SUMMARY OF COMPOUNDS DETECTED  
HOUGHSON PIT WATER & SLUDGE SAMPLES

.....LOCATION ID .....	DATE SAMPLED.	CHEMICAL NAMES.....	DESCRIPTION....	LAB VALUE UNITS..	DETECTION LIMITS	QUALIFIED CONCENTRATION
HP-1	890913	Antimony		0.48 <sup>a</sup> mg/kg	0.34	.48
HP-1	890913	Arsenic		1.8 mg/kg	0.16	1.8
HP-1	890913	Cadmium		3.0 mg/kg	0.43	3.0
HP-1	890913	Chromium		180 mg/kg	0.85	180
HP-1	890913	Copper		1200 mg/kg	1.7	1200
HP-1	890913	Lead		48 mg/kg	1.6	48
HP-1	890913	Mercury		0.064 <sup>a</sup> mg/kg	0.045	.064
HP-1	890913	Nickel		60 mg/kg	1.7	60
HP-1	890913	Selenium		50 <sup>a</sup> mg/kg	26	50
HP-1	890913	Silver		1.9 <sup>a</sup> mg/kg	0.85	1.9
HP-1	890913	Zinc		160 mg/kg	1.7	160
HP-1	890913	Methylene chloride	B	33 ug/Kg	2.8	(2.8
HP-1	890913	2-Chlorophenol	"	1000 ug/kg	660	1000
HP-1	890913	4-Nitrophenol	"	4000 ug/kg	3300	4000
HP-1	890913	Acenaphthene		44000 <sup>a</sup> ug/kg	17000	44000
HP-1	890913	Anthracene		59000 <sup>a</sup> ug/kg	17000	59000
HP-1	890913	Benzo(a)anthracene		75000 <sup>a</sup> ug/kg	17000	75000
HP-1	890913	Benzo(a)pyrene		39000 <sup>a</sup> ug/kg	17000	39000
HP-1	890913	Benzo(ghi)perylene	"	1900 ug/kg	660	1900
HP-1	890913	Benzo(k)fluoranthene		70000 <sup>a</sup> ug/kg	17000	70000
HP-1	890913	Chrysene		67000 <sup>a</sup> ug/kg	17000	69 <sup>a</sup>
HP-1	890913	Fluoranthene		150000 ug/kg	17000	15
HP-1	890913	Fluorene		47000 <sup>a</sup> ug/kg	17000	47000
HP-1	890913	Indeno(1,2,3-cd)pyrene		3600 ug/kg	660	3600
HP-1	890913	Naphthalene		41000 <sup>a</sup> ug/kg	17000	41000
HP-1	890913	Phenanthrene		220000 ug/kg	17000	220000
HP-1	890913	Phenol	"	2800 ug/kg	660	2800
HP-1	890913	Pyrene		130000 ug/kg	17000	130000
***						
HP2	890926	Nickel		0.038 <sup>a</sup> mg/L	0.020	.038
HP2	890926	1,2-Dichloroethane	Y <sup>a</sup>	6.0 ug/L	2.8	12.8
HP2	890926	bis(2-Ethylhexyl)phthalate	Y <sup>a</sup>	28 ug/L	10	110
HP2 DUP	890926	Lead		0.0040 <sup>a</sup> mg/L	0.0020	(0.002
HP2 DUP	890926	Nickel	B	0.034 <sup>a</sup> mg/L	0.020	.034
***						
W-HP01S	891031	Arsenic		0.014 mg/L	0.0020	.014
W-HP01S	891031	Chromium		0.082 mg/L	0.010	.082
W-HP01S	891031	Copper	B	0.049 <sup>a</sup> mg/L	0.020	(0.20
W-HP01S	891031	Lead	B	0.013 mg/L	0.0020	(0.002
W-HP01S	891031	Nickel		0.12 mg/L	0.020	.12

JANUARY 1991

TABLE 11  
(2 OF 2)

893-3809

RADIAN RESULTS  
SUMMARY OF COMPOUNDS DETECTED  
HOUGHSON PIT WATER & SLUDGE SAMPLES

....LOCATION ID .....	DATE SAMPLED.	CHEMICAL NAMES.....	DESCRIPTION....	LAB VALUE UNITS..	DETECTION LIMITS	QUALIFIED CONCENTRATION
W-HP01S	891031	Zinc	*	0.095 mg/L	0.020	.095
W-HP01S	891031	1,1-Dichloroethane	Y	12.4 ug/L	2.8	12.8
W-HP01S	891031	1,2-Dichloroethane	Y	149 ug/L	2.8	12.8
W-HP01S	891031	Vinyl chloride	Y	55 ug/L	5.0	15.0
W-HP01S	891031	trans-1,2-Dichloroethene	Y*	4.3 ug/L	1.6	11.6

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JANUARY 1991

TABLE 12  
(1 OF 2)

893-3809

RADIAN RESULTS  
SUMMARY OF COMPOUNDS DETECTED  
DECONTAMINATION AND MUNICIPAL WATER SAMPLES

LOCATION ID....	SAMPLED DATE...	CHEMICAL NAMES.....	DESCRIPTION....	LAB VALUE	UNITS..	DETECTION LIMITS	QUALIFIED CONCENTRATION
AUGER RINSE1	890817	Methylene chloride	"B	3.4 ug/L		2.8	(2.8
***							
Auger Rinse1	890817	Lead	B	0.0096 <sup>u</sup> mg/L		0.0020	(.002
Auger Rinse6	890921	Cadmium	"	0.024 <sup>u</sup> mg/L		0.0050	.024
Auger Rinse6	890921	Lead	B	0.0046 <sup>u</sup> mg/L		0.0020	(.002
***							
DIPPER BOTTLE	890913	Lead	B	0.016 mg/L		0.0020	(.002
***							
MUNICIPAL WATER1	890821	Chlorodibromomethane	"	7.4 ug/L		3.1	7.4
MUNICIPAL WATER1	890821	Chloroform		25 ug/L		1.6	25
MUNICIPAL WATER1	890821	Dichlorobromomethane		15 ug/L		2.2	15
MUNICIPAL WATER1	890821	Methylene chloride	B	18 ug/L		2.8	(2.8
MUNICIPAL WATER6	890920	Chlorodibromomethane	"	6.0 ug/L		3.1	6.0
MUNICIPAL WATER6	890920	Chloroform		25 ug/L		1.6	25
MUNICIPAL WATER6	890920	Dichlorobromomethane	"	13 ug/L		2.2	13
MUNICIPAL WATER6	890920	alpha-BHC		0.42 ug/L		0.010	.42
MUNICIPAL WATER6	890920	gamma-BHC (lindane)		0.16 ug/L		0.010	.16
MUNICIPAL WATER7	890928	Chlorodibromomethane	"	5 ug/L		3.1	5
MUNICIPAL WATER7	890928	Chloroform		25 ug/L		1.6	25
MUNICIPAL WATER7	890928	Dichlorobromomethane	"	11 ug/L		2.2	11
MUNICIPAL WATER7	890928	Trichloroethene	"B	7 ug/L		1.9	(1.9
MUNICIPAL WATER7	890928	alpha-BHC		0.36 ug/L		0.010	.36
MUNICIPAL WATER7	890928	gamma-BHC (lindane)		0.117 ug/L		0.010	.117
***							
Municipal Water6	890922	Lead	B	0.0048 <sup>u</sup> mg/L		0.0020	(0.002
Municipal Water6	890922	Zinc	"	0.044 <sup>u</sup> mg/L		0.020	.044
Municipal Water7	890928	Lead	B	0.0034 <sup>u</sup> mg/L		0.0020	(.002
Municipal water1	890821	Lead	B	0.078 mg/L		0.0020	(.002
***							
SCOOP	890913	Lead	B	0.015 mg/L		0.0020	(.002
SCOOP	890913	Methylene chloride	"B	3.8 ug/L		2.8	(2.8
***							

JANUARY 1991

TABLE 12  
(2 OF 2)

893-3809

RADIAN RESULTS  
SUMMARY OF COMPOUNDS DETECTED  
DECONTAMINATION AND MUNICIPAL WATER SAMPLES

LOCATION ID....	SAMPLED DATE...	CHEMICAL NAMES.....	DESCRIPTION....	LAB VALUE	UNITS..	DETECTION LIMITS	QUALIFIED CONCENTRATION
SS RINSE1	890817	Methylene chloride	B	26	ug/L	2.8	(2.8
SS Rinse1	890817	Lead	B	0.0029*	ug/L	0.0020	(.002
***							
Split-Spoon Rinse7	890921	Cadmium	*	0.018*	ug/L	0.0050	.018
Split-Spoon Rinse7	890921	Lead	B	0.011	ug/L	0.0020	(.002
***							
UTENSIL RINSE2	890818	Methylene chloride	*B	8.2	ug/L	2.8	(2.8
UTENSIL RINSE7	890914	Toluene	*B	10	ug/L	6.0	(2.8
***							
Utensil Rinse7	890914	Lead	B	0.020	ug/L	0.0020	(0.002
Utensil rinse2	890822	Lead	B	0.0035*	ug/L	0.0020	(0.002
***							

JANUARY 1991

TABLE 13

893-3809

RADIAN RESULTS  
SUMMARY OF COMPOUNDS DETECTED  
FIELD BLANKS AND TRIP BLANKS

LAB SAMP ID LOCATION ID..... SAMPLED DATE... CHEMICAL NAMES..... DESCRIPTION.... CONCENTRATION UNITS.. DETECTION LIMITS

890827102A	FIELD BLANK2	890822	Lead		0.0063 <sup>a</sup> mg/L	0.0020
P90905707A	FIELD BLANK	890913	Methylene chloride	*	12 ug/L	2.8
P90908401A	FIELD BLANK5	890919	Methylene chloride	*B	3.0 ug/L	2.8

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P90805003A	TRIP BLANK	999999	Methylene chloride	*B	6.7 ug/L	2.8
P90807107A	TRIP BLANK4	890822	Methylene chloride	*B	7.5 ug/L	2.8
P90911603A	TRIP BLANK24	890927	Trichloroethene	*	4.0 ug/L	1.9
P91100104A	TRIP BLANK	999999	Trichloroethene	*	1.9 ug/L	1.9

\*\*\*

RADIAN RESULTS  
SUMMARY OF COMPOUNDS DETECTED  
METHOD BLANKS

LAB SAMP ID	LOCATION ID	DATE SAMPLED	CHEMICAL NAMES	DESCRIPTION	CONCENTRATION UNITS	DETECTION LIMITS
P90805004A	METHOD BLANK	999999	Methylene chloride	*	3.1 ug/L	2.8
***						
P90805702A	METHOD BLANK	999999	Methylene chloride	*	9.5 ug/L	2.8
***						
P90805904A	METHOD BLANK	999999	Methylene chloride	*	6.9 ug/Kg	2.8
***						
P90905606A	METHOD BLANK	999999	Methylene chloride	*	3.2 ug/L	2.8
***						
P90906005A	METHOD BLANK	999999	Methylene chloride	*	6.0 ug/L	2.8
***						
P90906205A	METHOD BLANK	999999	Methylene chloride	*	5.0 ug/Kg	2.8
***						
P90908403A	METHOD BLANK	999999	Methylene chloride	*	4.0 ug/L	2.8
***						
P90909504A	METHOD BLANK	999999	Methylene chloride	*	4.0 ug/L	2.8
***						
P90910706A	METHOD BLANK	999999	Methylene chloride	*	9.0 ug/L	2.8
***						
P90911605A	METHOD BLANK	999999	Methylene chloride	*	17 ug/Kg	2.8
***						
P90912004A	METHOD BLANK	999999	Methylene chloride	*	9 ug/L	2.8
***						
P90908908A	METHOD BLANK (WATER)	999999	Methylene chloride	*	4.0 ug/Kg	2.8
***						

RADIAN RESULTS  
SUMMARY OF COMPOUNDS DETECTED  
METHOD BLANKS

LAB SAMP ID	LOCATION ID	DATE SAMPLED	CHEMICAL NAMES	DESCRIPTION	CONCENTRATION UNITS	DETECTION LIMITS
P90807108A	METHOD BLANK1	999999	Methylene chloride	*	8.0 ug/kg	2.8
***						
P90906107A	METHOD BLANK1	999999	Methylene chloride	*	8.7 ug/Kg	2.8
P90906107A	METHOD BLANK1	999999	Toluene	*	7.0 ug/Kg	6.0
***						
P91001605A	METHOD BLANK1	999999	Carbon tetrachloride	*	3.0 ug/Kg	2.8
P91001605A	METHOD BLANK1	999999	Trichloroethene	*	3.0 ug/Kg	1.9
***						
P90805005A	METHOD BLANK2	999999	Methylene chloride	*	3.9 ug/L	2.8
***						
P90805904D	METHOD BLANK2	999999	Methylene chloride	*	3.9 ug/Kg	2.8
***						
P90906108A	METHOD BLANK2	999999	Methylene chloride	*	12 ug/Kg	2.8
***						
891102104A	Method Blank	999999	Arsenic	*	0.0021 mg/L	0.0020
891102104A	Method Blank	999999	Lead	*	0.0029 mg/L	0.0020
***						
891003010A	Method Blank-soil	999999	Copper		3.3* mg/kg	0.020
891003010A	Method Blank-soil	999999	Lead		0.33* mg/kg	0.20
***						
891000706A	Method Blank-water	999999	Copper		0.025* mg/L	0.020
***						
P90806606A	Method BlankSoil	999999	Methylene chloride	*	6.9 ug/L	2.8
***						
P90806607A	Method BlankWater	999999	Methylene chloride	*	3.1 ug/L	2.8
***						

JANUARY 1991

893-3809

TABLE 15  
CHEMICALS RELATED TO PAST DOD ACTIVITIES •  
PAGE 2 OF 2

AIR FORCE PLANT 68

CHEMICAL NAME	USE OR OCCURRENCE
BORANES (BH <sub>4</sub> )	HIGH ENERGY FUEL PRODUCTION
TOLUENE DIETHYL ETHER PENTANE	HYDROPHOBIC SOLVENTS USED TO KEEP WASTE FROM CONTACTING THE ACTIVE METALS: SODIUM, LITHIUM, AND BORANE
CARBON TETRACHLORIDE CHLOROBROMOMETHANES FREONS	FIRE FIGHTING CHEMICALS
POLYNUCLEAR AROMATICS (COAL TAR RELATED COMPOUNDS)	RESULT OF BURNING ORGANIC WASTES
BORON SODIUM SOLVENTS AND FIRE SUPPRESSANTS	LITHIUM PLANT AND BURN AREA WASTES
PCBs	INSULATOR USED IN TRANSFORMERS AT THE ELECTROLYSIS PLANT FOR THE PRODUCTION OF LITHIUM AND SODIUM METALS
FREONS OTHER REFRIGERANTS	MAINTAINS THE TEMPERATURE OF LIQUID NITROGEN
COPPER LEAD	CATALYST AND/OR CONTAINER LINER

NOTE : • AS DISCUSSED IN THE ICF REPORT DATED DEC. 17, 1990.  
REPORT IS INCLUDED IN APPENDIX N.

TABLE 15  
CHEMICALS RELATED TO PAST DOD ACTIVITIES \*  
PAGE 1 OF 2

TNT MANUFACTURINGCHEMICAL NAMEUSE OR OCCURRENCE

SULFURIC ACID  
SULFUR TRIOXIDE  
NITRIC ACID

TOLUENE  
SODIUM SULFITE

PRODUCTION OF TNT FROM TOLUENE  
MIXED ACIDS

NITRATED TOLUENES (UNDESIRABLE ISOMERS)  
NITROXYLENES  
XYLENES

BY-PRODUCTS OF TNT PRODUCTION

PHENOLS  
TETRANITROMETHANE  
MONO-, DI-, AND TRINITROBENZOIC ACID

NITROPHENOLS  
BENZOIC ACID

OXIDATION OF TNT PRODUCTS

IRON  
COPPER  
LEAD

NICKEL  
CHROMIUM

RESULT OF THE CORROSIVE ACTION  
OF THE ACID MIXTURES

CHEMICAL WARFARE SERVICE FACILITIESCHEMICAL NAMEUSE OR OCCURRENCE

IMPREGNITE

DEFENSE AGAINST CHEMICAL WARFARE  
AGENTS (GASES)

TETRACHLOROETHENE

ORGANIC SOLVENT FOR CLEANING  
METAL CONTAINERS

HEXACHLOROETHANE

COMPONENT OF HC WHITE SMOKE MIX

CHLOROFORM  
CARBON TETRACHLORIDE  
BENZENE

SOLVENTS USED FOR DISSOLVING RIOT-  
CONTROL AGENTS

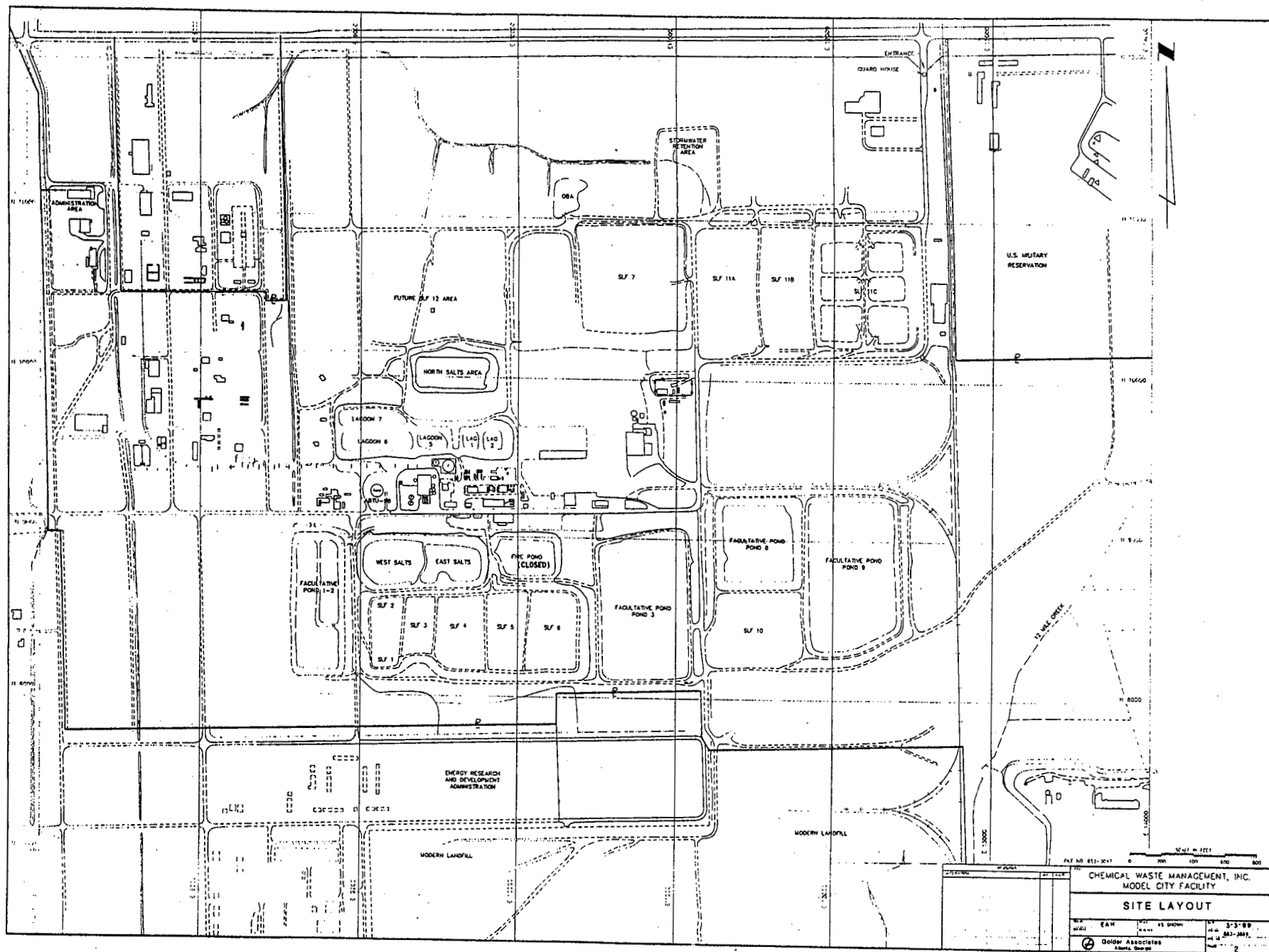
TABLE 16

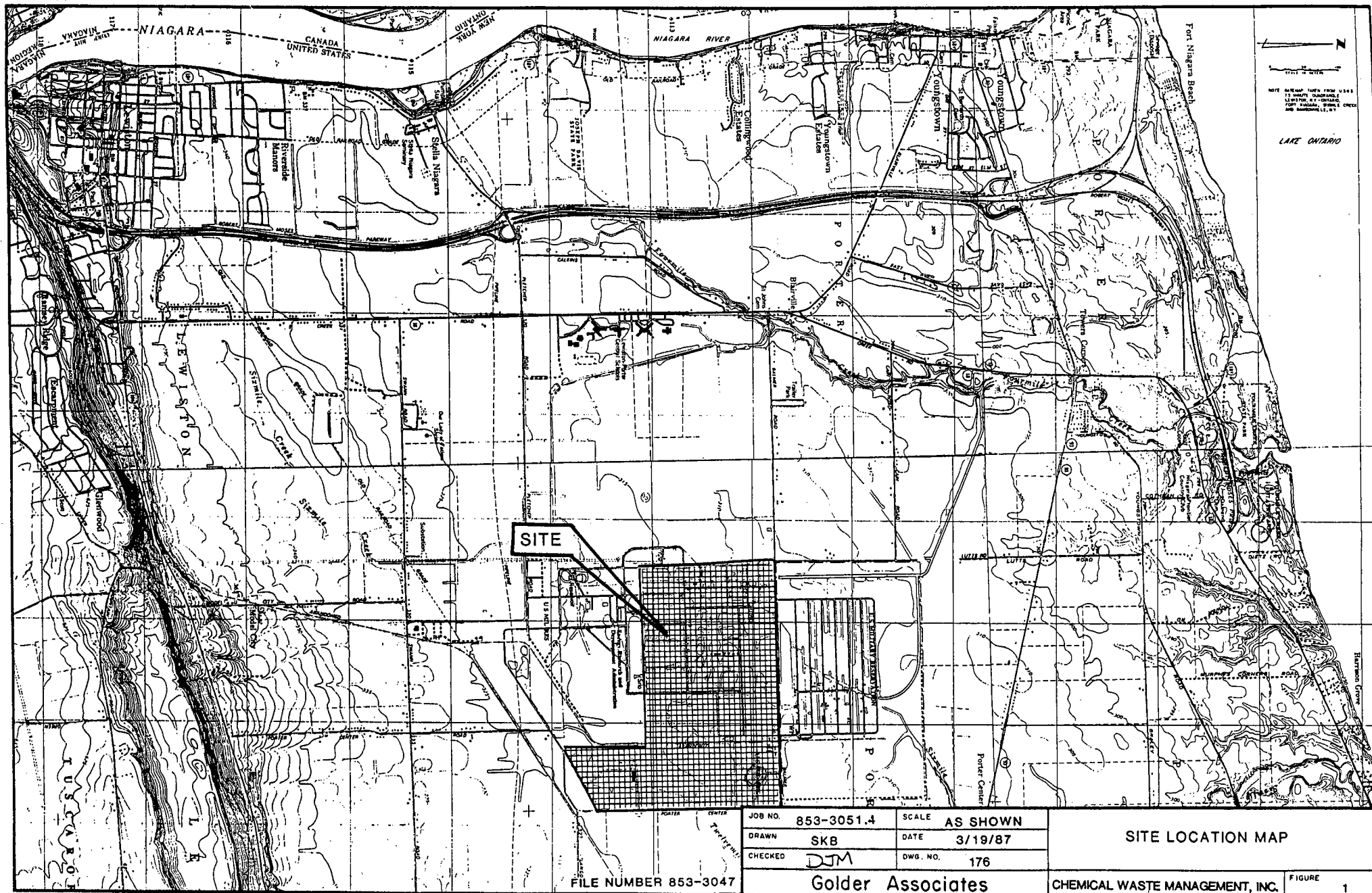
## QA/QC BLANK EVALUATION RESULTS

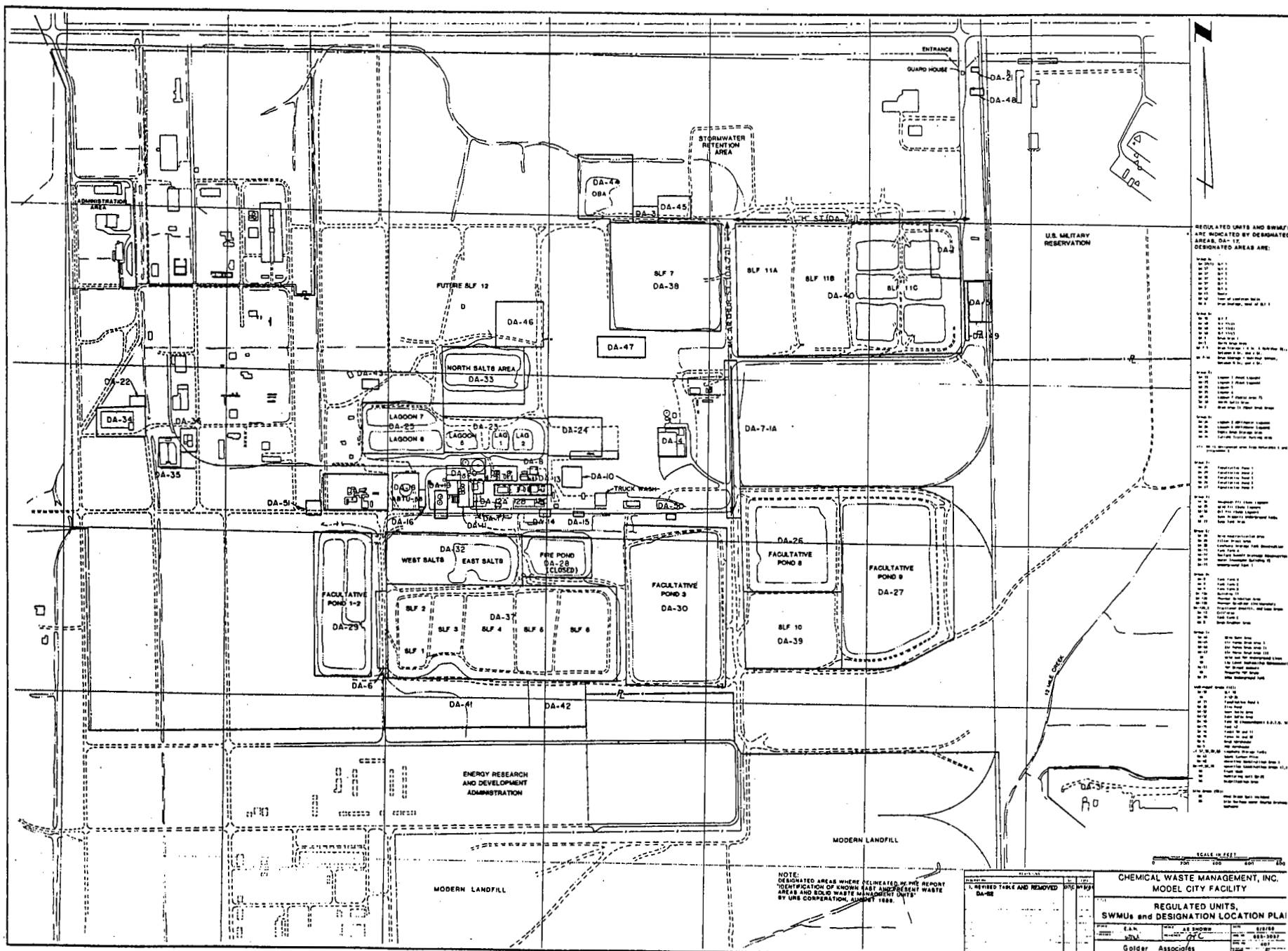
COMPOUND	CONCENTRATION	MULTIPLIER	LIMIT OF CONCERN
ORGANICS			
METHYLENE CHLORIDE	17 ppb	X10	170 ppb
TOLUENE	7 ppb	X10	70 ppb
TCE	3 ppb	X5	15 ppb
CARBON TETRACHLORIDE	3 ppb	X5	15 ppb
INORGANICS			
LEAD	0.0063 mg/L	X5	0.032 mg/L
	0.33 mg/Kg	X5	1.65 mg/Kg
COPPER	0.025 mg/L	X5	0.13 mg/L
	3.3 mg/Kg	X5	16.5 mg/Kg
ARSENIC	0.0021 mg/L	X5	0.011 mg/L

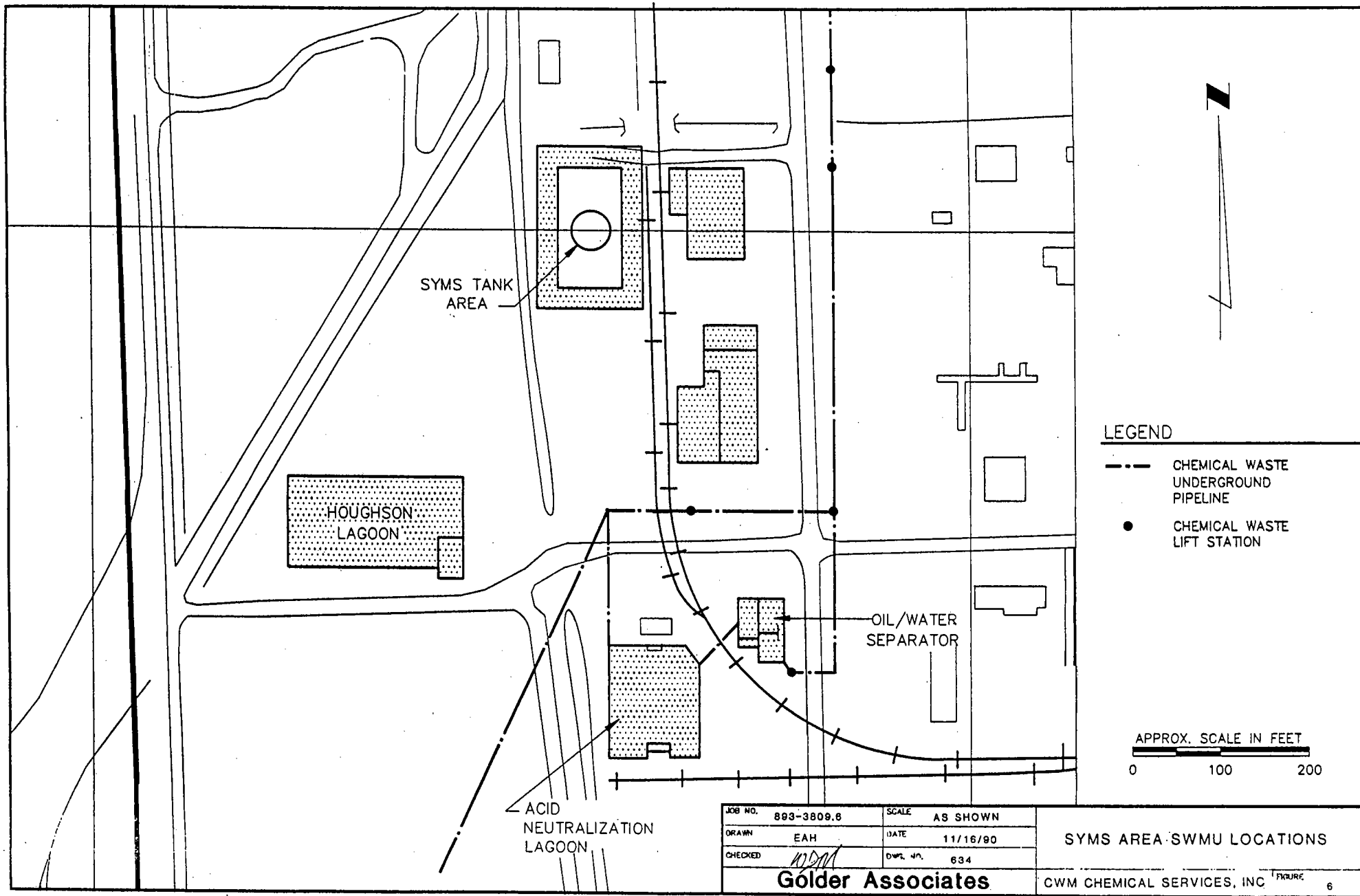
NOTES: THE LIMIT OF CONCERN IS THE CONCENTRATION BELOW WHICH  
THE COMPOUND MAY BE DISREGARDED IN A SAMPLE, PROVIDED  
THE DILUTION FACTOR FOR THE SAMPLE IS 1.



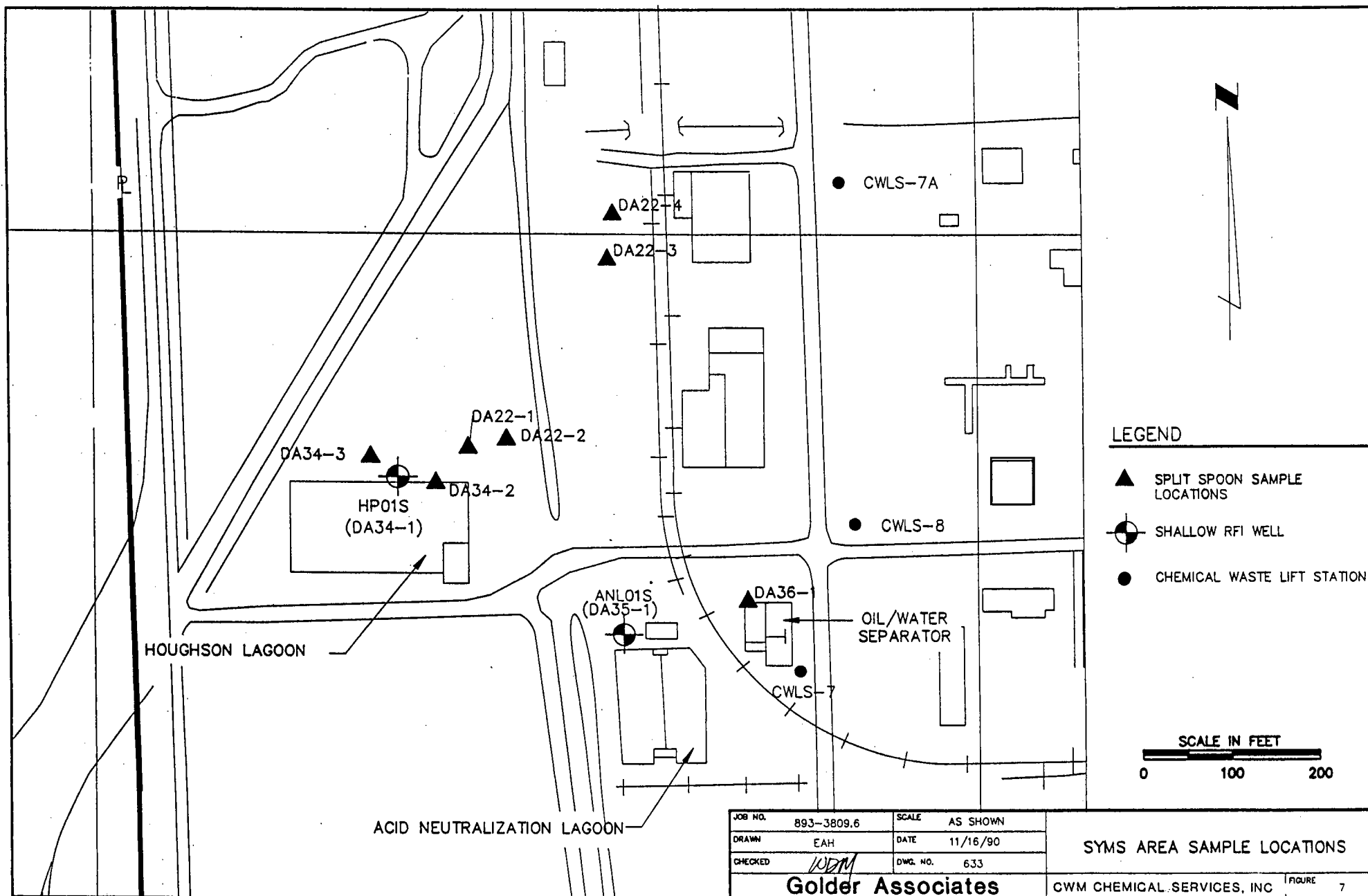




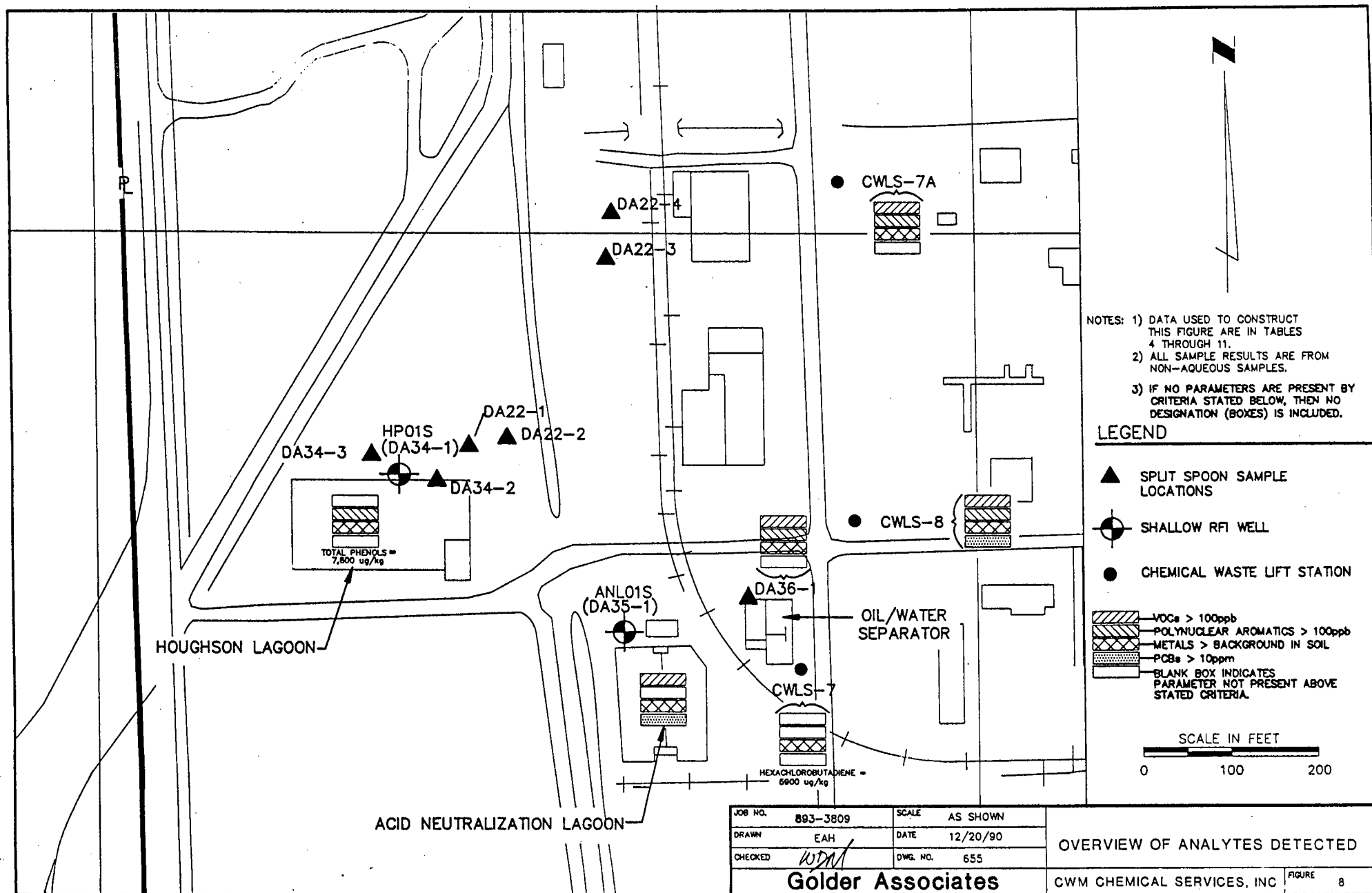




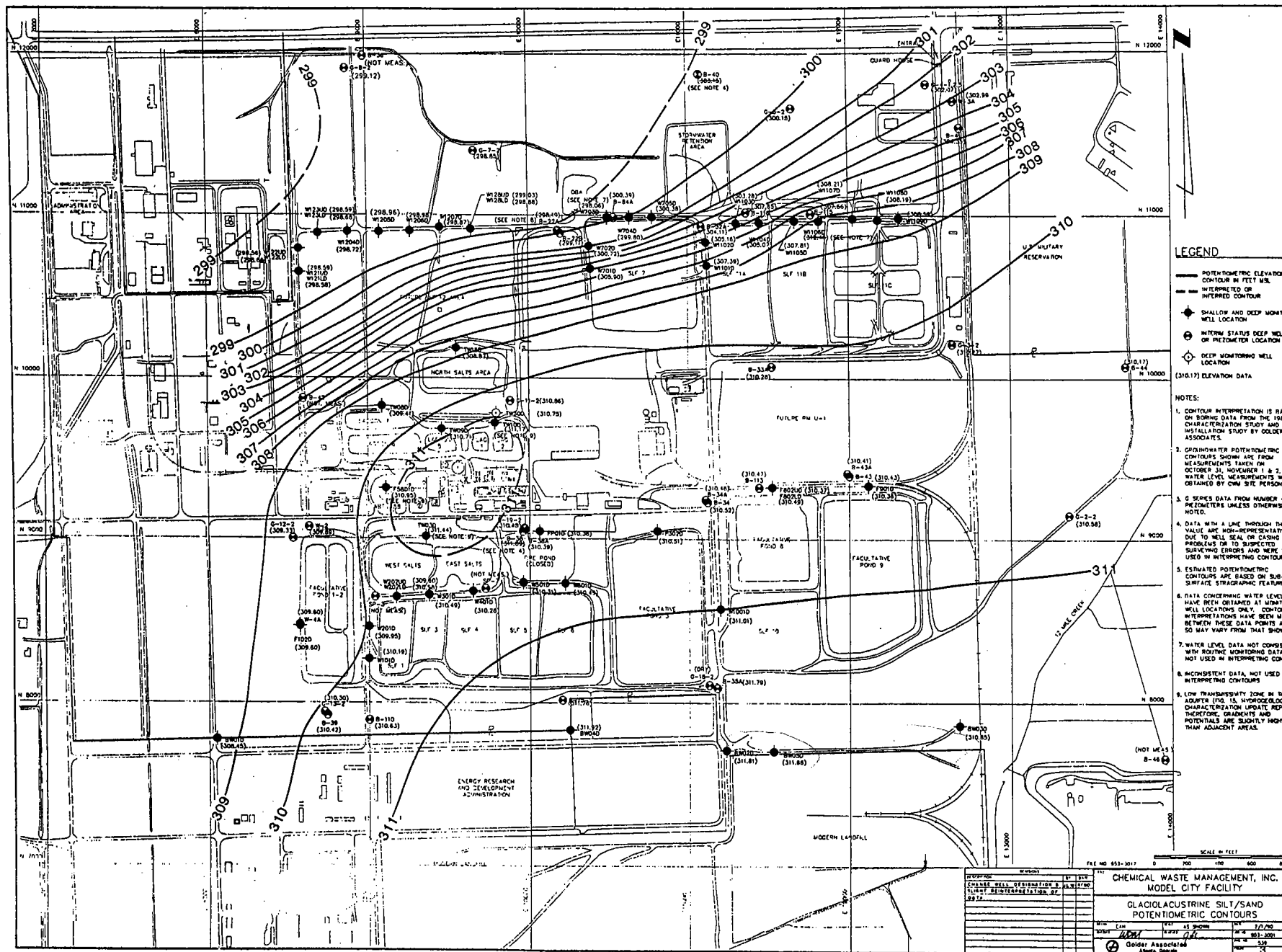
FILE NO. 853-3047



FILE No. 853-3047



FILE No. 853-3047



# LEGEND

- POTENTIOMETRIC ELEVATION CONTOUR IN FEET MSL
- INTERPRETED OR INFERRED CONTOUR
- SHALLOW AND DEEP MONITOR WELL LOCATION
- INTERIM STATUS DEEP WELL OR PIEZOMETER LOCATION
- DEEP MONITORING WELL LOCATION
- (310.17) ELEVATION DATA

## NOTES:

1. CONTOUR INTERPRETATION IS BASED ON BORING DATA FROM THE 1965 CHARACTERIZATION STUDY AND II INSTALLATION STUDY BY GOLDER ASSOCIATES.
2. GROUNDWATER POTENTIOMETRIC CONTOURS SHOWN ARE FROM MEASUREMENTS TAKEN ON OCTOBER 31, NOVEMBER 1 & 2, 1 WATER LEVEL MEASUREMENTS WERE OBTAINED BY CWM SITE PERSONNEL.
3. G SERIES DATA FROM MINOR PIEZOMETERS UNLESS OTHERWISE NOTED.
4. DATA WITH A LINE THROUGH THE VALUE ARE NON-REPRESENTATIVE DUE TO WELL SEAL OR CASING PROBLEMS OR TO SUSPECTED SURVEYING ERRORS AND WERE NOT USED IN INTERPRETING CONTOURS.
5. ESTIMATED POTENTIOMETRIC CONTOURS ARE BASED ON SUB-SURFACE STRATIGRAPHIC FEATURES.
6. DATA CONCERNING WATER LEVELS HAVE BEEN OBTAINED AT MONITOR WELL LOCATIONS ONLY. CONTOUR INTERPRETATIONS HAVE BEEN MADE BETWEEN THESE DATA POINTS AND SO MAY VARY FROM THAT SHOWN.
7. WATER LEVEL DATA NOT COMPATIBLE WITH ROUTINE MONITORING DATA, NOT USED IN INTERPRETING CONTOURS.
8. INCONSISTENT DATA, NOT USED IN INTERPRETING CONTOURS.
9. LOW TRANSMISSIVITY ZONE IN THE ADJACENT FIG. 15, HYDROGEOLOGIC CHARACTERIZATION UPDATE, REPORT THEREON, GRADIENTS AND POTENTIALS ARE SLIGHTLY HIGHER THAN ADJACENT AREAS.

SCALE IN FEET

FILE NO. 851-3017 0 200 400 600 800

PROJECT		REVISION	
CHARGE WELL IDENTIFICATION & DATA		BY DATE	
GLACIOLACUSTRINE SILT/SAND		10/1/78	
POTENTIOMETRIC CONTOURS		10/1/78	
GOLDER ASSOCIATES		GOLDER ASSOCIATES	
Atlanta, Georgia		Atlanta, Georgia	

