REMEDIAL INVESTIGATION/FEASIBILITY STUDY PROJECT

RI/FS WORK PLAN

WORK ASSIGNMENT D003825-29

CHEM-CORE
CITY OF BUFFALO (C)

SITE NO. 9-15-176
ERIE COUNTY, NY

Prepared for:
NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
50 Wolf Road, Albany, New York

Erin M. Crotty, Commissioner

DIVISION OF ENVIRONMENTAL REMEDIATION

URS Corporation Group Consultants
282 Delaware Avenue
Buffalo, New York 14202

Final
May 2001

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WORK PLAN

CHEM-CORE SITE
SITE #9-15-176
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FINAL

Prepared By:

URS CORPORATION
282 DELAWARE AVENUE
BUFFALO, NEW YORK 14202

MAY 2001

TABLE OF CONTENTS

Page No.

PART A - FIELD SAMPLING PLAN

TABLE OF CONTENTS (Continued)

PART B - QUALITY ASSURANCE PROJECT PLAN

TABLE OF CONTENTS (Continued)

Page No.

TABLE OF CONTENTS (Continued)

APPENDICES

PART C - HEALTH AND SAFETY PLAN

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

TABLES

TABLE OF CONTENTS (Continued)

FIGURES

APPENDICES

PART A

FIELD SAMPLING PLAN
(FSP)

TABLE OF CONTENTS

Page No.

PART A - FIELD SAMPLING PLAN

TABLE OF CONTENTS (Continued)

TABLES

FIGURES

A1.0 INTRODUCTION

This Field Sampling Plan (FSP) is designed to provide detailed, step-by-step procedures for the field activities outlined in the Project Management Plan for the Remedial Investigation (RI) / Feasibility Study (FS) at the Chem-Core Site. It will serve as the field procedures manual to be strictly followed by all URS personnel. Adherence to these procedures will ensure the quality and defensibility of the data collected in the field. In addition to the field procedures outlined in this document, all personnel performing field activities must do so in compliance with: (1) the Quality Assurance/Quality Control measures outlined in Part B; (2) the appropriate Health and Safety guidelines found in the Health and Safety Plan (Part C); and (3) the scope of work and schedule, outlined in the Project Management Work Plan.

A2.0 MOBILIZATION

A mobile, temporary decontamination pad will be constructed near the site entrance to decontaminate vehicles/heavy equipment/drill rigs entering and leaving the site. The decontamination area will be large enough to allow the storage of cleaned equipment and materials prior to use. Drums of decontamination fluids and investigation-derived wastes will be stored on pallets covered with plastic sheeting near the decontamination area. A bulk 1500-gallon high density polyethylene (HDPE) tank also will be used to store decontamination and well development water.

Proposed well and sampling locations will be marked with paint or staked, labeled, and flagged prior to drilling. Utilities in areas designated for intrusive activities will be cleared through the Underground Facilities Protective Organization (UFPO). The New York State Thruway Authority (NYSTA) will be contacted to assist in locating the former Erie Canal wall in the vicinity of the proposed well location near the Black Rock Channel. URS and the drilling subcontractor will complete the required work permits for working in the NYSTA right-of-way (ROW).

A3.0 SUBSURFACE INVESTIGATION

A3.1 General Drilling Program

The subsurface investigation program will provide information which will assist in geologic, geotechnical, hydrogeological, and chemical site interpretations. Two phases of drilling will be conducted. During each phase, both geoprobe borings and monitoring wells will be advanced/installed as part of the subsurface program. During the Phase I drilling, approximately twenty-four Geoprobe soil boring locations will be advanced at the proposed locations depicted in Figure A3-1. To define the area and limit of contamination, twenty soil borings will be advanced in a grid pattern across the whole property. Four additional borings will be advanced in the sidewalk along Niagara Street. Borings will be advanced to the bedrock interface, estimated to be approximately 15 to 20 feet below ground surface (bgs). Eight monitoring wells will be installed. Proposed monitoring well locations are depicted in Figure A3-2. Two bedrock monitoring well pairs will be installed at one upgradient location and one downgradient location. Each pair will consist of one shallow (approximately 35 feet deep) and one deep (approximately 50 feet deep)well. Four additional shallow bedrock wells will be installed at two downgradient and two crossgradient locations. During the Phase II drilling, up to ten additional Geoprobe soil borings will be advanced at the site at locations to be determined after the Phase I RI is completed. Up to three (3) additional bedrock monitoring wells also will be installed at locations to be determined. It is anticipated that these wells will be approximately 35 feet deep.

After completion of the RI field investigation, it is anticipated a pilot study will be conducted at the site. The pilot study will involve a Soil Vapor Extraction (SVE) test. The test will be conducted in a 4-inch SVE well installed somewhere inside the building. The location will be determined as part of the RI and will depend upon the soil analytical data. SVE monitoring will be conducted in a series of four vacuum observation wells installed near the SVE well.

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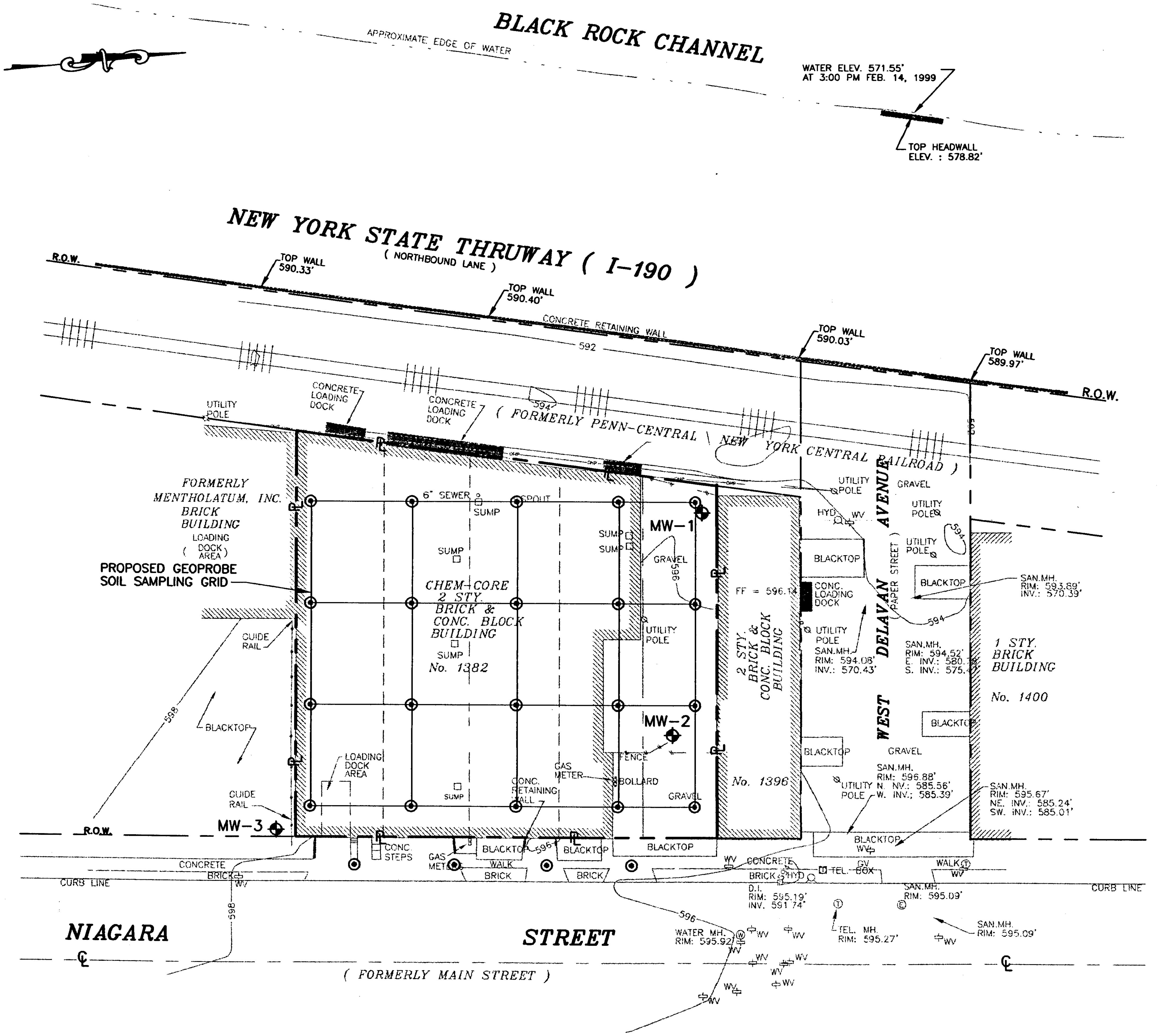

LEGEND

⊕	MONITORING WELL – NYSDEC 1999
⌀	UTILITY POLE
□	SUMP LOCATION (APPROXIMATE)
▬	HEADWALL
—863—	GROUND CONTOUR
—×—×—	CHAIN LINK FENCE
—℘—	PROPERTY LINE
⊙	PROPOSED GEOPROBE SOIL BORINGS

40' 0 40'

SCALE: 1"= 40'

PROPOSED SOIL BORING LOCATIONS

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FIGURE A3-1

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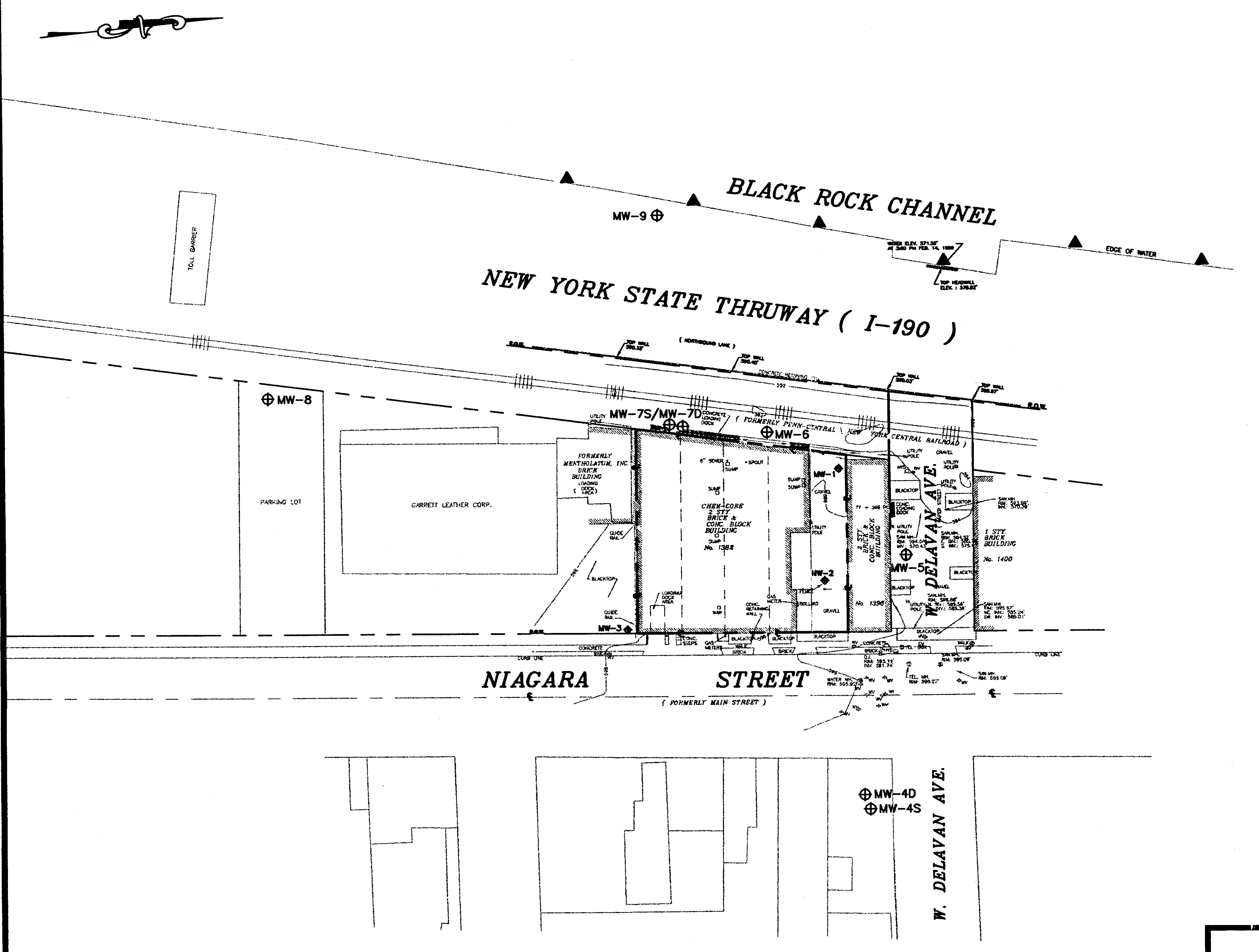

LEGEND

⊕	MONITORING WELL – NYSDEC 1999
∅	UTILITY POLE
□	SUMP LOCATION (APPROXIMATE)
▬	HEADWALL
—863—	GROUND CONTOUR
—•—•—	CHAIN LINK FENCE
—℄—	PROPERTY LINE
▲	PROPOSED SURFACE WATER/ SEDIMENT SAMPLING LOCATIONS
⊕	PROPOSED PHASE I RI MONITORING WELL LOCATIONS
S	SHALLOW MONITORING WELL
D	DEEP MONITORING WELL

80' 0 80'

SCALE: 1"= 80'

PROPOSED WELL AND SURFACE WATER/SEDIMENT SAMPLING LOCATIONS

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A3–2

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Required investigation and monitoring well installation procedures are discussed in the following sections:

- Geoprobe direct push procedure (Section A3.2)
- Hollow-stem auger drilling procedure (Section A3.3)
- Split-spoon sampling procedure (Section A3.4)
- NX -coring procedure (Section A3.5)
- Wash-rotary drilling procedure (Section A3.6)
- Disposal of drill cuttings (Section A3.7)
- Plugging/abandonment of borehole procedures (Section A3.8)
- Bedrock well construction procedures (Section A3.9)
- Soil vapor extraction well/vacuum observation well construction procedures (Section A3.10)
- Well development procedures (Section A3.11)
- Documentation (Section A3.12)

A3.2 Geoprobe Direct Push Procedure

Procedure

1) Inspect the sampling equipment to ensure proper working condition.

2) Select additional components for the sampler as required (i.e., leaf spring core retainer for clays, or a sand trap for non-cohesive sands).

3) Lower the sampler to the ground surface, or bottom of the hole previously made by the sampler, and check the depth against length of the rods and the sampler.

4) Attach the drive head assembly to the sample rods.

5) Push the sampler in 4-foot increments into the subsurface up to the desired depth with a hydraulic press.

6) Rotate the sampling rods clockwise and remove the sampler.

7) Sample selection will conform to the program and specifications set forth in the Project Management Work Plans. Extrude the sample, describe the soil, and collect any necessary samples into appropriate containers and label the containers (Section A8.0). Two samples will be collected for chemical analysis (Section A3.2.2) from each boring based on the highest reading of the samples collected from each boring.

8) Document all soil descriptions and sample information in the field notebook.

9) Sample containers will be labeled as described in Section A8.0 and shipped to the laboratory under the chain-of-custody as described in Section A9.0

10) Abandon the Geoprobe hole by backfilling with bentonite pellets and hydrate with potable water or use concrete patch in impervious areas.

A3.2.1 Headspace Screening Procedures

Geoprobe soil macrocores will be field-screened for the presence of dense non-aqueous phase liquids (DNAPLs) and light non-aqueous phase liquids (LNAPLs). Soil cores will be characterized in discrete 2-foot increments. For each depth increment, the soil will be visually characterized for textural classification (USCS), screened with an HNu PID/FID, and monitored for headspace gases. Procedures for these field techniques are described in section A3.4.1 for USCS classification, and below for the HNu PID/FID screening and headspace screening.

Procedure

1) Follow procedure for Geoprobe sampling (Section A3.2) up to step 7.0.

2) Cut acetate macrocore liner open.

3) Slowly scan the soil core with the HNu PID/FID.

4) For each 2-foot increment record the reading in the notebook.

5) Divide the soil core in 2-foot increments.

6) Classify the soil core by USCS and record in the notebook.

7) Place each soil increment into a ziplock freezer bag and seal tightly. Set the baggie aside for 30 minutes and allow the samples to equilibrate to ambient temperature and then measure the headspace in the baggie using the HNu PID/FID.

8) Record the readings in the field notebook.

A3.2.2 Soil Sampling Procedures for Chemical Analysis

Subsurface soil samples will be collected from Geoprobe soil boring locations to determine the extent of soil contamination at the Chem-Core facility. Two soil samples will be collected from approximately twenty-four (24) Geoprobe borings. All samples will be analyzed for Target Compound List (TCL) volatiles (VOCs). Four selected samples will be analyzed for TCL semivolatiles (SVOCs), TCL pesticides and PCBs, and Target Analyte List (TAL) inorganics. Soil samples from each boring will be field-screened with an HNu PID/FID and described using a detailed soil classification system (Section A3.4.1). DNAPL screening will be conducted on soil samples that exhibit HNu PID/FID readings or olfactory evidence of contamination (Section A3.2.1). Soil samples for chemical analysis will be selected from soil macro-cores which exhibit DNAPLs, positive HNu PID/FID readings, or other evidence of contamination.

Procedure

1) Follow procedure for Geoprobe sampling (Section A3.2) up to Step 7.

2) Scan the soil core with the HNu PID/FID and record the readings. Inspect the soil core closely for olfactory evidence of contamination including staining, DNAPL/LNAPL presence, and sheen.

3) After selecting which soil macro-core to sample, collect the sample for volatile organic compounds (VOCs) first using a stainless-steel pre-cleaned scoop. Fill the sample jars directly from the soil core without mixing. Label the sample jars as described in Section A8.0.

4) If other chemical fractions (i.e., SVOCs, PST/PCBs, TAL metals) are to be sampled also, composite the remaining contents of the sample into a stainless-steel mixing bowl and place adequate volume into the appropriate sample bottles.

5) Secure a Teflon-lined cap onto each bottle and place the samples on ice in a cooler for transport/shipment to the laboratory (Section A9.0).

6) Label the sample bottles with the appropriate tag and complete all chain-of-custody documents.

7) Decontaminate sampling equipment after each use as described in Section A7.0.

8) Record all field data in the field notebook.

A3.3 Hollow-Stem Auger Drilling Procedures

A hollow-stem auger (HSA) drilling is a standard method of subsurface drilling which enables the recovery of representative subsurface samples for identification and laboratory testing.

Procedure

1) Advance the boring by rotating and advancing the augers the desired distance into the subsurface. The borings will be advanced incrementally to permit continuous or intermittent sampling as required.

2) Remove center plug from augers and sample subsurface per method stipulated by the project geologist or hydrogeologist. Sampling methods are presented in Section A3.4.

Reference: American Society of Testing Materials (ASTM), "Standard Practice for Soil Investigation and Sampling by Auger Borings," Standard D1452-80.

A3.4 Split-Spoon Sampling Procedures

Split-spoon sampling is a standard method of soil sampling to obtain representative samples for identification and laboratory testing as well as to serve as a measure of resistance of soil to sampler penetration.

Procedure

1) Measure the sampling equipment lengths to ensure that they conform to specifications. Confirm the weight of the hammer (140 pounds).

2) Clean out the auger flight to the bottom depth prior to sampling. Select additional components as required (i.e., leaf spring core retainer for clays or a sand trap for non-cohesive sands).

3) Lower the sampler to the bottom of the auger column and check the depth against length of the rods and the sampler.

4) Attach the drive head sub and hammer to the drill rods without the weight resting on the rods.

5) Lower the weight and allow the sampler to settle up to 6 inches. If it settles more, consider using another sampler.

6) Mark four 6-inch intervals on the drill rods relative to a drive reference point on the rig. With the sampler resting on the bottom of the hole, drive the sampler with the 140 pound hammer falling freely over its 30-inch fall until 24 inches have been penetrated or 100 blows applied.

7) Record the number of blows per 6 inches. Determine the "N" value by adding the blows for the 6- to 12-inch and 12- to 18-inch interval of each sample attempt.

8) After penetration is complete, remove the sample.

9) Open sampler and describe the soil.

10) Document all properties and sample locations in the field notebook and later on the Boring Log form (Figure A3-3).

Reference: ASTM “Standard Method for Penetration Test and Split Barrel Sampling of Soils, Standard D1586-84.

A3.4.1 Unified Soil Classification System

Soils are classified for engineering purposes according to the Unified Soil Classification System (USCS) adopted by the United States Army Corps of Engineers and United States Department of the Interior Bureau of Reclamation. Soil properties which form the basis for the USCS are:

- Percentage of gravel, sand, and fines
- Shape of the grain-size distribution curve
- Plasticity and compressibility characteristics

FIGURE A3-3
BORING LOG FORM

URS Corporation	**TEST BORING LOG**
	BORING NO:
PROJECT:	SHEET:
CLIENT:	JOB NO.:
BORING CONTRACTOR:	BORING LOCATION:

GROUNDWATER:					CAS.	SAMPLER	CORE	TUBE	GROUND ELEVATION:
DATE	TIME	LEVEL	TYPE	TYPE					DATE STARTED:
				DIA.					DATE FINISHED:
				WT.					DRILLER:
				FALL					GEOLOGIST:
				* POCKET PENETROMETER READING					REVIEWED BY:

	SAMPLE						DESCRIPTION				
DEPTH FEET	STRATA	NO.	TYPE	BLOWS PER 6"		REC% RQD%	COLOR	CONSIST HARD	MATERIAL DESCRIPTION	USCS	REMARKS
5											
10											
15											
20											
25											
30											
35											

Comments:	PROJECT NO.
	BORING NO.

According to this system, all soils are divided into three major groups: coarse-grained, fine-grained, and highly-organic (peaty). The boundary between coarse-grained and fine-grained soils is taken to be the 200-mesh sieve (0.074 millimeters). In the field, the distinction is based on whether the individual particles can be seen with the unaided eye. If more than 50 percent of the soil by weight is judged to consist of grains that can be distinguished separately, the soil is considered to be coarse-grained.

The coarse-grained soils are divided into gravelly (G) or sandy (S) soils, depending on whether more or less than 50 percent of the visible grains are larger than the No. 4 sieve (3/16 inch). They are each divided further into four groups:

W: Well graded; fairly clean (less than 5 percent finer than 0.074 mm)
P: Poorly graded; fairly clean (less than 5 percent finer than 0.074 mm)
C: Clayey (greater than 12 percent finer than 0.074mm); plastic (clayey) fines. Fine fraction above the A-line with plasticity index above 7.
M: Silty (greater than 12 percent finer than 0.074 mm); nonplastic or silty fines. Fine fraction below the A-line and plasticity index below 4.

The soils are represented by symbols such as GW or SP. Borderline materials are represented by a double symbol, as GW-GC.

The fine-grained soils are divided into three groups: inorganic silts (M), inorganic clays (C), and organic silts and clays (O). The soils are further divided into those having liquid limits lower than 50 percent (L), or higher than 50 percent (H). The distinction between the inorganic silts (M), the inorganic clays (C), and organic soils (O) is made on the basis of a modified plasticity chart. Soils CH and CL are represented by points above the A-line, whereas soils OH, OL, and MH correspond to positions below the A-line. Soils ML, except for a few clayey fine sands, are also represented by points below the A-line. The organic soils O are distinguished from the inorganic soils M and C by their characteristic odor and dark color.

A3.4.2 Visual Identification

Soil properties required to define the USCS classification of a soil are the primary features to be considered in field identification. These properties and other observed characteristics normally identified in describing a soil are defined below:

- Color
- Moisture conditions
- Grain size
  - Estimated maximum grain size
  - Estimated percent by weight of fines (material passing No. 200 sieve)
- Gradation
- Grain shape
- Plasticity
- Predominant soil type
- Secondary components of soil
- Classification symbol
- Other features such as:
  - organic, chemical, or metallic content
  - compactness
  - consistency
  - cohesiveness near plastic limit
  - dry strength
- source - residual, or transported (aeolian, water borne, glacial deposit, etc.)

A3.5 NX-Coring Procedures

NX-Coring are standard methods of subsurface drilling which enables the recovery of bedrock cores for identification.

Procedure

1) Advance the boring into the bedrock by core drilling using a NX-size, double-tube, swivel-type core barrel. Continue drilling until core blockage occurs or until the net length of the core barrel has been drilled.

2) Remove the core barrel from the hole and disassemble it as necessary to remove the core. Reassemble the core barrel and return it to the hole. Resume coring.

3) Place recovered core in the core box with the upper (surface) end of the core at the upper-left corner of the core box. Fit fractured, bedded, or jointed pieces of core together as they naturally occurred.

4) Label core box with borehole ID, date, time, and depth interval of core.

5) The following observations will be recorded from the rock core:
    - a) Core recovery percent
    - b) Color
    - c) Rock classification
    - d) Rock hardness
    - e) Rock fractures, including descriptions of natural breaks
    - f) Rock Quality Designation (RQD)

$$RQD = \frac{\text{Sum of core lengths} > 4''/\text{run} \times 100}{\text{Total length of core run}}$$

Reference: ASTM, "Standard Practice for Diamond Core Drill for Site Investigation," Standard D2113-83 (1987)

A3.6 Wash Rotary Drilling Procedures

Wash rotary drilling is a method of subsurface drilling wherein a drilling fluid (water in this case) is circulated through the drill string to wash cuttings out of the borehole and lubricate drilling tools.

Procedure

1) Connect drilling water supply pump to drill string.
2) Advance the boring by spinning the drill bit the desired distance into the subsurface.
3) Use a recirculating system to collect and separate cuttings rising out of the borehole.
4) Note rate of drilling and volume of water lost down the borehole.

A3.7 Disposal of Drill Cuttings

Drill cuttings will be disposed of in accordance with New York State Department of Environmental Conservation (NYSDEC) *Technical and Administrative Guidance Memorandum* (TAGM) HWR-89-4032, November 21, 1989.

Procedure

1) Cuttings will be stored/disposed on site in 55-gallon drums and/or 10-cubic yard RCRA boxes.

2) If pure wastes are present in the cuttings, the material shall be sampled and analyzed to ensure chemical compatibility with other cuttings before placing the materials in a common storage or disposal area.

3) Drill cuttings generated near or adjacent to the site will be collected and staged at the site prior to disposal.

4) If materials are found to be hazardous, cuttings will be disposed of off site at a properly permitted treatment, storage or disposal facility.

A3.8 Plugging/Abandoning Borehole and Grout Mixing Procedures

Boreholes that are not completed as monitoring wells will be sealed (plugged) prior to abandonment to prevent downhole contamination. Sealing can be achieved by backfilling the borehole with bentonite below the water table (hole plug or pellets) and/or with a cement/bentonite grout above the water table. The backfill material will be introduced from bottom to top using either a tremie pipe or the drill rods.

Procedure

1) Determine most suitable seal materials. Grout specifications generally have mixture ratios as follows:

Grout Slurry Composition (Percent Weight)

1.5 to 3.0 percent - Bentonite (Quick Gel)
40 to 60 percent - Cement (Portland Type I)
40 to 60 percent - Water

2) Calculate the volume of the borehole based on the bit or auger head diameter plus 10 percent and determine the volume of grout to be emplaced. Generally, the total mixed volume is the borehole volume plus 20 percent.

3) Identify the equipment to be used for preparing and mixing of the grout. Ensure the volume of the tanks to be used for mixing has been measured adequately. Document these volumes.

4) Identify the source of the water to be used for the grout and determine its suitability for use. In particular, water with high sulfate or chloride levels, or heated water, should not be used. These types of waters can cause operational difficulties or modify the set-up for the grout.

5) Identify the equipment to be used for emplacing the grout. Ensure that the pump to be used has adequate pressure to enable complete return to surface.

6) Identify the volumes to be pumped at each stage or in total if only one stage is to be used.

7) Prepare the borehole plugging plan and discuss the plan and activities with the drilling contractor prior to beginning any mixing activities.

8) Begin mixing the grout to be emplaced.

9) Record the type and amount of materials used during the mixing operation. Ensure that the ratios are within specification tolerance.

10) Begin pumping the grout through the return line bypass system to confirm that all pump and surface fittings are secure.

11) Initiate downhole pumping. Record the times and volumes emplaced on the form.

12) Document the borehole is completely filled with grout.

13) Clear and clean the surface near the borehole. Level the ground to about the pre-existing grade. Add grout or cement as necessary to the area near the borehole.

Note: On occasion, there may be some settling of the grout which takes place over several days. If this settling occurs, the natural soil from the immediate vicinity are used to put the level at grade. A follow-up check at each site should be made within one week to 10 days of completion. Document the visit and describe any action taken.

A3.9 Bedrock Well Construction Procedures

The monitoring well network will conform to the program and design specifications set forth in the Project Management Work Plan. Monitoring wells will consist of shallow (approximately 35 feet deep) monitors and deep monitors (approximately 50 feet) at selected locations.

A3.9.1 Shallow Bedrock Well Construction Procedures

During the Phase I RI, six (6) shallow wells will be installed at proposed locations depicted in Figure A3-2. Up to three (3) additional wells will be installed during the Phase II RI at locations to be determined based upon the results of the Phase I RI.

Procedure

1) Collect split-spoon soil samples at two foot increments while advancing 8¼-inch ID HSAs to the top of bedrock. Follow the procedures in Section A3.3 and A3.4. Split-spoon samples will be collected only at the shallow well borings.

2) Remove the center plug from the augers and measure the depth to the top of bedrock from the ground surface using a weighted measuring tape.

3) At these boring locations collect a 3- to 5-foot NX- rock core sample anticipated to be 20 to 25 feet below ground surface.

4) Attach a 7 ⅞-inch roller bit to the drill rods and ream the core hole.

5) Install a 6-inch carbon steel casing into the borehole and set it at least 3 feet into the bedrock. The casing should extend to the ground surface.

6) Remove the HSAs and grout the annular space between the steel casing and borehole wall. Mix grout following procedures in Section A3.8. Allow grout to cure for at least 24 hours before continuing the boring.

7) Collect NX-rock core samples to approximately 35 feet deep in 5- or 10-foot increments. After coring, attach a 5 ⅞-inch roller bit to the drill rods and ream the cored interval.

8) Insert a riser cap (J-plug) into the well riser. Install an 8-inch curb box around the well casing by cementing the protective curb box around the well casing. Install lock on J-plug and seal the curb box.

9) Document well construction details in the field notebook and transfer the data onto the Shallow Bedrock Monitoring Well Construction Detail form (Figure A3-4A).

A3.9.2 Deep Bedrock Well Construction Procedures

Two deep (approximately 50 feet) bedrock monitoring wells will be installed during the Phase I RI at the proposed locations depicted in Figure A3-2.

Procedure

1) Follow shallow well construction procedures through step 6.

DRILLING SUMMARY

Geologist:

Drilling Company:

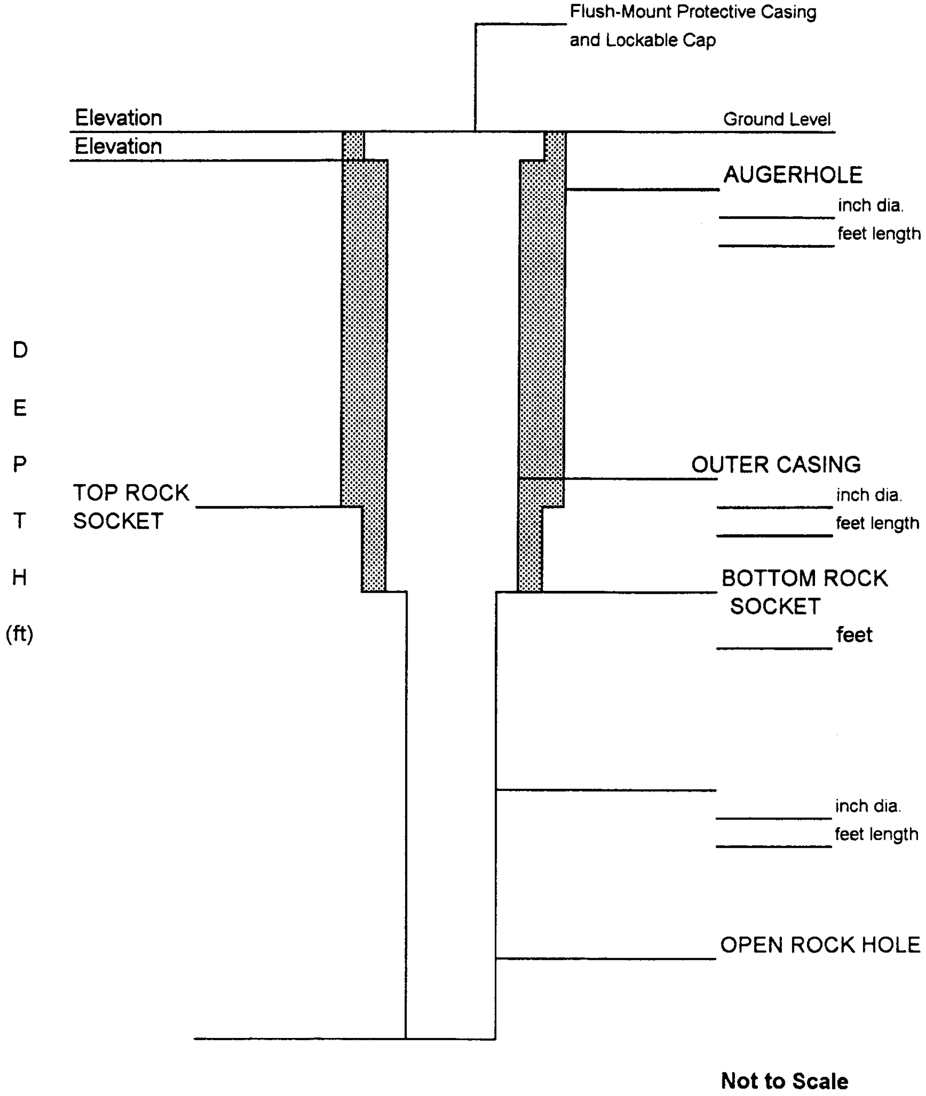
Driller:

Rig Make/Model:

Date:

GEOLOGIC LOG

Depth(ft.)	Description



WELL DESIGN

CASING MATERIAL

Surface:

Well:

Monitor:

SCREEN MATERIAL

Type: Open Rock Hole

FILTER MATERIAL

Type: None Setting:

SEAL MATERIAL

Type: Setting:

COMMENTS:

ROCK CORING

Cored Interval:

Core Diameter:

Reamed Diameter:

LEGEND

▨ Cement/Bentonite Grout

Client:	**Location:**	**Project No.:**
URS Corporation	**BEDROCK MONITORING WELL CONSTRUCTION DETAILS**	**Well Number:**

FIGURE A3-4 A
SHALLOW BEDROCK MONITORING WELL CONSTRUCTION DETAIL FORM

2) Collect NX rock-core samples to approximately 50 feet deep in 5- or 10-foot increments. After coring, attach a 5 ⅞-inch roller bit to drill rods and ream the core hole to approximately 40 feet.

3) Install a 4-inch stainless-steel casing into the borehole and set it to 40 feet. The casing should extend to the ground surface.

4) Grout the annular space between the stainless-steel casing and borehole wall by tremie grouting a mixture prepared as described in Section A3.8. Allow grout to cure for at least 24 hours before continuing the boring.

5) Attach a 3 ⅞-inch roller bit to drill rods and ream the core hole from 40- to 50-feet. Remove all drilling tools.

6) Follow steps 8 and 9 in Section A3.9.1 to complete well. Document the well construction details onto a deep bedrock monitoring well construction detail form (Figure A3-4B).

A3.10 Soil Vapor Extraction Well / Vacuum Observation Well Construction Procedures

One SVE monitoring well will be installed to allow for a SVE test during the pilot study. The SVE well will be screened from approximately 5 feet to 20 feet below ground surface, and will conform to the construction specification described in the Project Management Work Plan and Section A3.10.1. Four additional vacuum observation wells will be installed to allow for soil vapor test monitoring. The vacuum observation wells will be screened from approximately 5 feet to 20 feet bgs and will conform to the construction specification described in Section A3.10.2.

A3.10.1 Soil Vapor Extraction Well Construction Procedures

One SVE well will be installed inside the building at 1382 Niagara Street. Because of 11- to 14-foot ceiling clearances, a skid rig will be used to install the well.

DRILLING SUMMARY

Geologist:

Drilling Company:

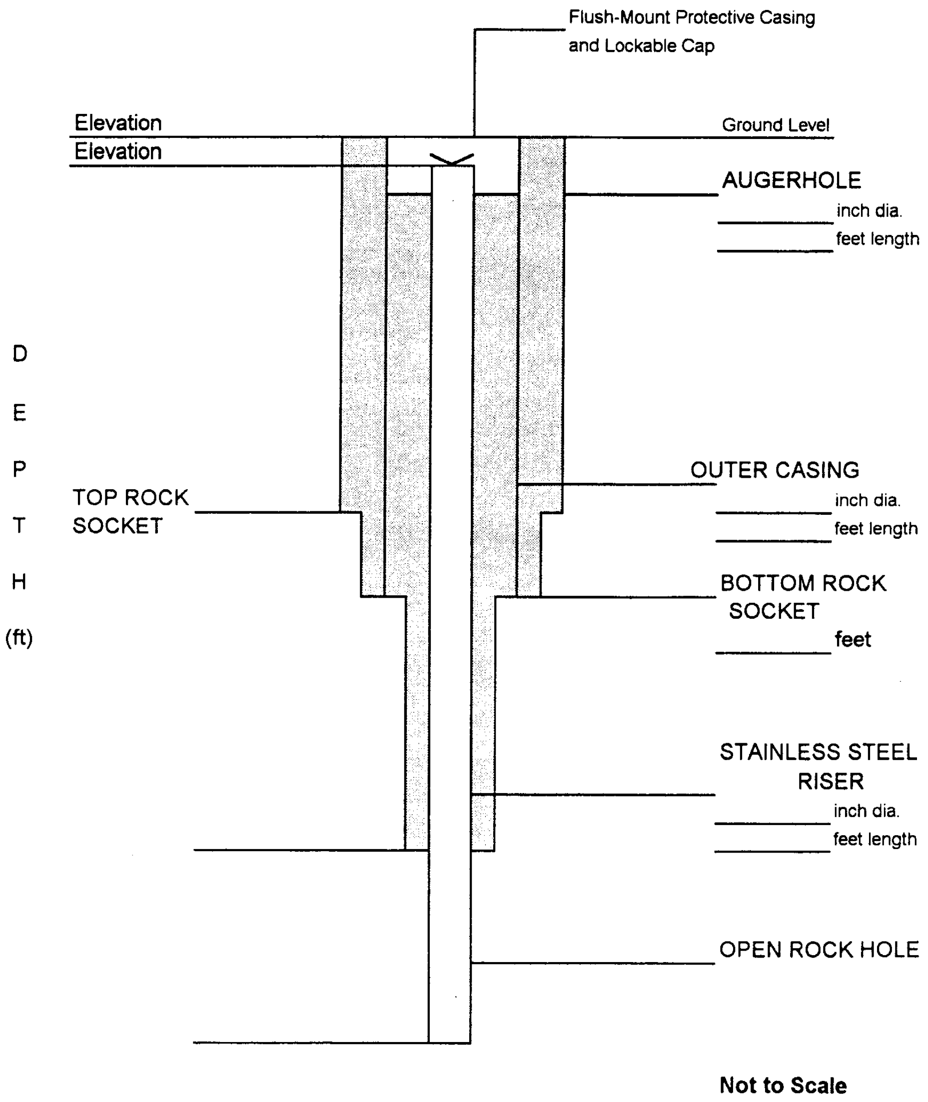
Driller:

Rig Make/Model:

Date:

GEOLOGIC LOG

Depth(ft.)	Description



WELL DESIGN

CASING MATERIAL

Surface:

Well:

Monitor:

SCREEN MATERIAL

Type: Open Rock Hole

FILTER MATERIAL

Type: None Setting:

SEAL MATERIAL

Type: Setting:

COMMENTS:

ROCK CORING

Cored Interval:

Core Diameter:

Reamed Diameter:

LEGEND

▭ Cement/Bentonite Grout

Client:

URS Corporation

Location:

BEDROCK MONITORING WELL CONSTRUCTION DETAILS

Project No.:

Well Number:

FIGURE A3-4 B
DEEP BEDROCK MONITORING WELL
CONSTRUCTION DETAIL FORM

Procedure

1) Cut a 1-foot square hole in the concrete floor using a concrete cutting saw to allow for HSA drilling.

2) Advance 6¼-inch HSAs to the bedrock surface (approximately 20-feet).

3) Collect split-spoon samples at 2-foot increments as described in Section A3.4.

4) Remove the center plug from the augers and measure the depth.

5) Insert a 15-foot section of 4-inch ID .010-inch slotted schedule 40 PVC well screen. Attach sections of 4-inch ID PVC riser pipe through the augers to the floor surface. Cap the riser pipe with a J-plug.

6) Add sand (Morie #2) to the screened section of the well and slowly remove the augers. The sand pack should extend at least 2 feet above the top of the well screen. Measure with a weighted measuring tape to ensure the sand pack has been installed accurately.

7) Slowly add bentonite pellets into the remaining annulus to 1-foot below the concrete floor. Measure with a weighted tape.

8) Hydrate the bentonite pellets with water and let it set for 30 minutes.

9) Cut the riser pipe just below the ground surface and install an 8-inch protective flush-mount curb box. Cement the curb box around the riser pipe.

10) Lock the J-plug and seal the curb box.

11) Document the well construction details in the field notebook and transfer the data onto an overburden monitoring well construction form (Figure A3-5).

A3.10.2 Vacuum Observation Well Construction Procedures

The vacuum observation wells will conform to the program and design specifications set forth in the Project Management Work Plan.

Four 2-inch vacuum observation wells will be installed to allow for air flow observations during the soil vapor extraction pilot test. The wells will be screened from approximately 5 feet to 20 feet below ground surface, and will conform to the construction specification described below.

Procedure

1) Advance the 4¼-inch diameter (ID) HSAs to the top of the bedrock.

2) Remove the center plug from the augers and measure the depth to the top of bedrock from the ground surface using a weighted measuring tape.

3) Insert a 15-foot section of 2-inch ID 0.010 machine-slotted PVC (Schedule 40) well screen. Attach sections of 2-inch Schedule 40 PVC riser pipe through the augers as necessary. Cap the top of the riser pipe to prevent well construction material from entering the well. The length of well screen may be modified due to the actual depth to bedrock.

4) Add sand to the screened section of the well and slowly remove the augers. The sand pack should extend at least 2 feet above the top of the well screen. Measure with a weighted measuring tape to ensure the sand pack has been installed accurately.

DRILLING SUMMARY

Geologist:

Drilling Company:

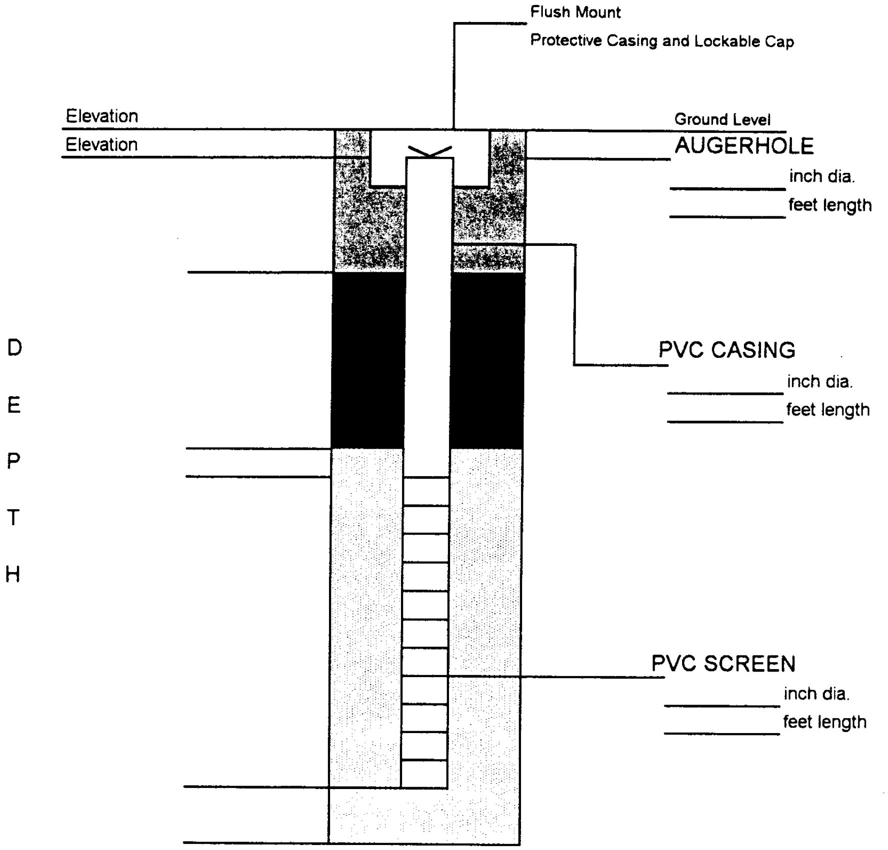
Driller:

Rig Make/Model:

Date:

GEOLOGIC LOG

Depth(ft.)	Description



WELL DESIGN

CASING MATERIAL	*SCREEN MATERIAL*	*FILTER MATERIAL* Type: Setting:
Surface:	Type:	*SEAL MATERIAL*
Monitor:	Slot Size:	Type: Setting:

COMMENTS:

LEGEND

▨	Cement/Bentonite Grout
■	Bentonite Seal
☐	Silica Sandpack

Client:	**Location:**	**Project No.:**
URS Corporation	**OVERBURDEN WELL CONSTRUCTION DETAILS**	**Well Number:**

FIGURE A3-5
SOIL VAPOR EXTRACTION WELL CONSTRUCTION DETAIL FORM

5) Slowly add bentonite pellets into the borehole and continue to slowly remove the augers. The bentonite seal should extend at least 2 feet above the sand pack. Measure with a weighted measuring tape.

Note: The rate of removal of the augers from the borehole should closely follow the rate that the sand pack and bentonite pellets fill the borehole.

6) Hydrate the bentonite pellets with water and let set for 30 minutes.

7) Mix cement/bentonite grout per the specifications presented in Section A3.8.

8) Add the grout to the borehole via a tremie pipe (if necessary). Fill the borehole to 2 feet below the ground surface.

9) Backfill the remaining borehole annulus with concrete.

10) Cut the well riser pipe just below the ground surface and install protective flush-mount casing into the concrete around riser pipe.

11) Insert riser cap (J-plug) into well riser. Lock the protective casing cap.

12) Document well construction details in the field notebook and transfer the data onto the Vacuum Observation Monitoring Well Construction Detail form (Figure A3-6).

A3.11 Well Development Procedures

Following completion of each phase of drilling and well installation, each new monitoring well will be developed by pumping until the discharged water is relatively sediment free and the indicator parameters (pH, temperature, turbidity, dissolved oxygen, and specific conductivity) have reached steady-state. Developing the well not only removes any sediment, but also may improve the hydraulic properties of the formation. The effectiveness of the development measures will be

DRILLING SUMMARY

Geologist:

Drilling Company:

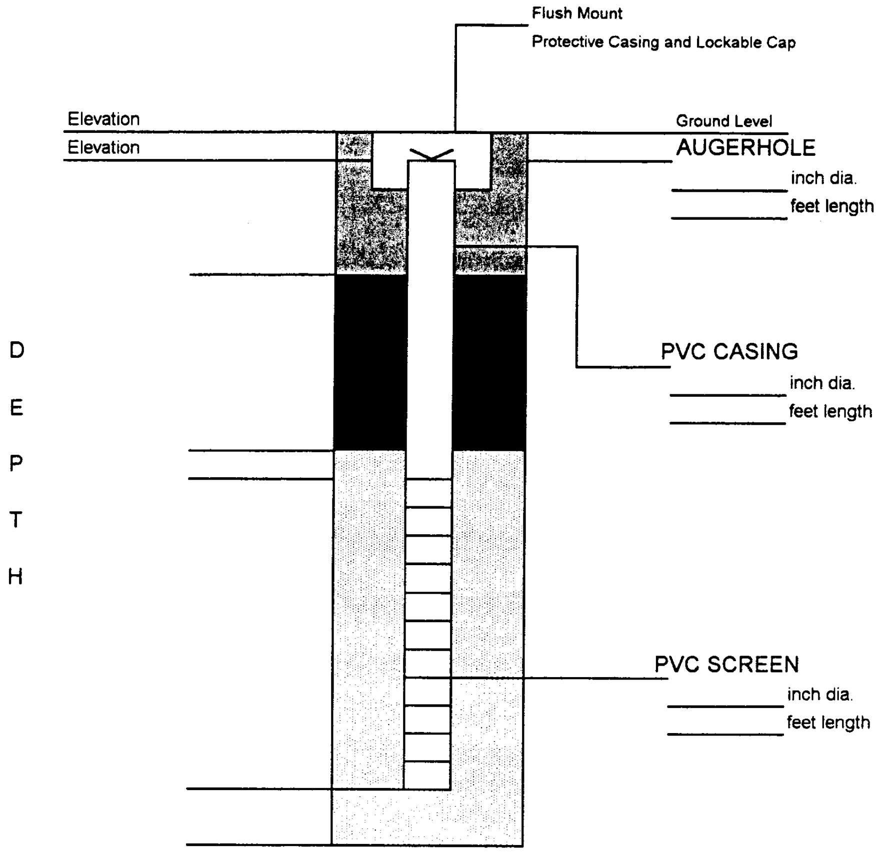
Driller:

Rig Make/Model:

Date:

GEOLOGIC LOG

Depth(ft.)	Description



WELL DESIGN

CASING MATERIAL	*SCREEN MATERIAL*	*FILTER MATERIAL*
Surface:	Type:	Type: Setting:
Monitor:	Slot Size:	*SEAL MATERIAL* Type: Setting:

COMMENTS:

LEGEND

▨ Cement/Bentonite Grout

■ Bentonite Seal

□ Silica Sandpack

Client:	**Location:**	**Project No.:**
URS Corporation	**OVERBURDEN WELL CONSTRUCTION DETAILS**	**Well Number:**

FIGURE A3-6
VACUUM OBSERVATION WELL CONSTRUCTION DETAIL FORM

monitored closely to keep the volume of discharged water to the minimum necessary to obtain sediment-free samples. A portable turbidimeter will be used to monitor effectiveness of development. A turbidity reading of less than 50 nephelometric turbidity units (NTUs) and steady-state pH, temperature, dissolved oxygen, and specific conductivity readings will be used as a guide for discontinuing well development.

Procedure

1) Newly installed monitoring wells will be developed using surge block agitation and overpumping until the turbidity is consistently less than 50 NTUs, and the indicator parameters have reached steady-state. All existing monitoring wells will be redeveloped until the turbidity is consistently less than 50 NTUs.

2) Equipment should be assembled, decontaminated (if necessary), and installed in the well. Care should be taken not to introduce contaminants to the equipment during installation.

3) Well development should proceed by repeatedly removing water from the well until the discharged water is less than 50 NTUs. The volume of water removed from the wells will not be less than that lost to the formation during drilling. All development water will be containerized on site in a bulk 1,500-gallon holding tank. The water will be tested and disposed of off-site at a TSD facility. The effectiveness of development should be monitored at regular intervals using a portable turbidimeter.

   Volume of water removed and turbidity, pH, temperature, dissolved oxygen, and conductivity measurements will be recorded on a Well Development Log form (Figure A3-7).

4) Well development will be discontinued when the turbidity of the discharged water is below 50 NTUs and the other indicator parameters have stabilized.

WELL DEVELOPMENT LOG *URS Corporation*

PROJECT TITLE: ______________________ WELL NO.: ____________

PROJECT NO.: ______________________

STAFF: ______________________

DATE(S): ______________________

1. TOTAL CASING AND SCREEN LENGTH (FT.) = ____________
2. WATER LEVEL BELOW TOP OF CASING (FT.) = ____________
3. NUMBER OF FEET STANDING WATER (#1 - #2) = ____________
4. VOLUME OF WATER/FOOT OF CASING (GAL.) = ____________
5. VOLUME OF WATER IN CASING (GAL.)(#3 x #4) = ____________
6. VOLUME OF WATER TO REMOVE (GAL.)(#5 x ___) = ____________
7. VOLUME OF WATER REMOVED (GAL.) = ____________

WELL ID.	VOL. (GAL/FT)
1"	0.0
2"	0.2
3"	0.4
4"	0.7
5"	1.0
6"	1.5
8"	2.6

ACCUMULATED VOLUME PURGED (GALLONS)

PARAMETERS											
pH											
SPEC. COND. (umhos)											
TEMPERATURE (°C)											
TURBIDITY (NTU)											

COMMENTS:

FIGURE A3-7
WELL DEVELOPMENT LOG

A3.12 Documentation

A field notebook will be initiated at the start of on site work and maintained by the Field Coordinator. The field notebook will include the following daily information regardless of what activity is being performed.

- Date
- Meteorological conditions
- Crew members
- Brief descriptions of proposed field activities
- Locations where work is performed
- Problems and corrective actions taken
- All field measurements or descriptions recorded
- Calibration of field equipment used
- All modifications of the FSP

Each subsurface boring will be logged in a bound field notebook during drilling by the supervising geologist. Field notes will include descriptions of subsurface materials encountered during drilling, sample numbers, and types of samples recovered from the borehole. Additionally, the geologist will note time and material expenditures for later verification of contractor invoices on the Daily Drilling Record (Figure A3-8).

Upon completion of daily drilling activities, the geologist will complete the daily drilling record and initiate chain-of-custody for any samples recovered for chemical laboratory testing. Following completion of the drilling program, the geologist will transfer field notes onto standard forms for the report.

DAILY DRILLING RECORD ***URS Corporation***

PROJECT TITLE: ____________________ DATE: ____________________

CLIENT: ____________________ CONTRACTOR: ____________________

FROM	TO	PRODUCTIVE HOURS	ACTIVITIES/COMMENTS
TOTAL PRODUCTIVE HOURS			LEVEL B / LEVEL C / LEVEL D (CIRCLE ONE SELCTION)

LABOR:		MATERIALS / SUPPLIES:	
UNITS		UNITS	

WEATHER:

____
URS ONSITE COORDINATOR

____
CONTRACTOR REPRESENTATIVE

FIGURE A3-8
DAILY DRILLING RECORD

The proper completion of the following forms/logs will be considered correct procedure for documentation during the drilling program:

- Test Boring Logs (Figure A3-3)
- Shallow Bedrock Monitoring Well Construction Details (Figure A3-4A)
- Deep Bedrock Monitoring Well Construction Details (Figure A3-4B)
- Soil Vapor Extraction Well Construction Details (Figure A3-5)
- Vacuum Observation Well Construction Details (Figure A3-6)
- Well Development (Figure A3-7)
- Daily Drilling Record (Figure A3-8)
- Well Purging Log (Figure A4-1)
- Chain of Custody Record (Figure A4-2)
- Field Log Book - weather-proof, bound field book

A4.0 GROUNDWATER INVESTIGATION

During the Phase I RI, eleven monitoring wells will be sampled; eight from newly installed wells, and three from existing wells (Figure A3-2). During the Phase II RI, fourteen monitoring wells will be sampled; all eleven Phase I RI wells plus three wells installed during the Phase II RI. Groundwater samples for each RI will be analyzed for parameters identified in Table A4-1. To collect representative groundwater samples, groundwater wells must be adequately purged prior to sampling. Low volume sampling equipment and procedures will be used to purge the wells and retrieve groundwater samples. Purging will require the removal of one to three volumes of standing water by pumping at a rate of less than one (1) liter per minute. Drawdown must not exceed ten percent of the standing water column. Sampling should commence immediately after purging.

Groundwater sampling frequency is defined in Sections 2.2.5 and 3.0 of the Project Management Plan. The wells will be sampled following procedures found in Section A4.2. The samples will be labeled and shipped following procedures outlined in Sections A9.0 and A10.0 and analyzed for the parameters identified in Table A4-1.

A4.1 Well Purging Procedures

Procedures

1) The well cover will be unlocked and carefully removed to avoid having any foreign material enter the well. The interior of the riser pipe will be monitored for organic vapors using a photoionization detector (PID). If a reading of greater than 5 parts per million (ppm) is recorded, the well will be vented until levels are below 5 ppm before purging begins.

2) Using an electronic water level detector, the water level below top of casing will be measured. Knowing the total depth of the well, it will be possible to calculate the volume of water in the well. The end of the probe will be soap-and-water-washed and deionized-water-rinsed between wells.

TABLE A4-1
SUMMARY OF ANALYTICAL PARAMETERS
REMEDIAL INVESTIGATION, W.A. #D003825-29
CHEM-CORE

Parameter	Method Number / Reference[1]	Estimated Number of Samples	QA/QC Samples			Total No. of Samples
			MS/MSD/MD/MSB	Rinse Blanks	Trip Blanks	
A. Phase I Remedial Investigation						
I. Geoprobe Soil Samples						
Target Compound List (TCL)						
Volatiles + TICs	OLM04.2	40	2/2/0/2	1	0	47
TCL Semivolatiles + TICs	OLM04.2	4	1/1/0/1	1	0	8
TCL Pesticides/PCBs	OLM04.2	4	1/1/0/1	1	0	8
Target Analyte List (TAL) Metals (23) plus Cyanide	ILM04.1	4	1/0/1/0	1	0	7
II. Groundwater						
TCL Volatiles + TICs	OLM04.2	11	1/1/0/1	1	3	18
TCL Semivolatiles + TICs	OLM04.2	2	1/1/0/1	1	0	6
TCL Pesticides/PCBs	OLM04.2	2	1/1/0/1	1	0	6
TAL Metals (23) plus Cyanide	ILM04.1	2	1/0/1/0	1	0	5
III. Surface Water						
TCL Volatiles + TICs	OLM04.2	6	0/0/0/0	0	1	7
TCL Semivolatiles + TICs	OLM04.2	1	0/0/0/0	0	0	1
TCL Pesticides/PCBs	OLM04.2	1	0/0/0/0	0	0	1
TAL Metals (23) plus Cyanide	ILM04.1	1	0/0/0/0	0	0	1
IV. Sediment						
TCL Volatiles + TICs	OLM04.2	6	1/1/0/1	1	0	10
TCL Semivolatiles + TICs	OLM04.2	1	1/1/0/1	0	0	4
TCL Pesticides/PCBs	OLM04.2	1	1/1/0/1	0	0	4
TAL Metals (23) plus Cyanide	ILM04.1	1	1/0/1/0	0	0	3
V. Drill Water Supply						
TCL Volatiles + TICs	OLM04.2	1	0/0/0/0	0	0	1
VI. Waste Characterization (Soil)						
TCLP Extraction (ZHE and non-ZHE)	1311	1	0/0/0/0	0	0	1
TCLP Volatiles	8260B	1	0/0/0/0	0	0	1
TCLP Semivolatiles	8270C	1	0/0/0/0	0	0	1
TCLP Metals	ILM04.1	1	0/0/0/0	0	0	1
Ignitability	1030	1	0/0/0/0	0	0	1
Reactivity	SW-846, Chapter 7	1	0/0/0/0	0	0	1
Corrosivity	9045C	1	0/0/0/0	0	0	1

NOTES:

[1] NYSDEC Analytical Services Protocol, June 2000.

TABLE A4-1
SUMMARY OF ANALYTICAL PARAMETERS
REMEDIAL INVESTIGATION, W.A. #D003825-29
CHEM-CORE

Parameter	Method Number / Reference[1]	Estimated Number of Samples	QA/QC Samples			Total No. of Samples
			MS/MSD/MD/MSB	Rinse Blanks	Trip Blanks	
B. Phase II Remedial Investigation						
I. Geoprobe Soil Samples						
TCL Volatiles + TICs	OLM04.2	10	1/1/0/1	1	0	14
TCL Semivolatiles + TICs	OLM04.2	1	0/0/0/0	0	0	1
TCL Pesticides/PCBs	OLM04.2	1	0/0/0/0	0	0	1
TAL Metals (23) plus Cyanide	ILM04.1	1	0/0/0/0	0	0	1
II. Groundwater						
TCL Volatiles + TICs	OLM04.2	14	1/1/0/1	1	3	21
Dissolved Iron	ILM04.1	14	1/0/1/0	1	0	17
Hardness	130.2	14	1/0/1/0	1	0	17
III. Waste Characterization (Soil)						
TCLP ZHE Extraction	1311	1	0/0/0/0	0	0	1
TCLP Volatiles	8260B	1	0/0/0/0	0	0	1
IV. SVE Pilot Test						
TCL Volatiles + TICs	TO-14A	1	0/0/0/0	0	0	1

NOTES:

[1] NYSDEC Analytical Services Protocol. June 2000.

3) Calibrate field instruments (e.g., pH, specific conductance, PID, turbidity).

4) In all wells, a decontaminated submersible pump will be used to purge the required water volume (i.e., until stabilization of pH, temperature, specific conductivity, and turbidity). Dedicated new high density polyethylene (HDPE) discharge and intake tubing will be used for each well.

5) Slowly install the well pump into the well and set the pump to about the midpoint of the well screen. Configure the dedicated HDPE tubing with a three-way gate valve with the discharge directed through the three-way valve and micropurge flow cell and into a calibrated bucket.

6) Set the pump rate to less than 1 liter per minute and measure the water level continuously. Adjust the discharge rate until the water level does not drop beyond 10 percent of the screen length.

7) Purge well until the water quality parameters have stabilized. The stabilization criteria are: specific conductivity - 3% full scale range; pH - 0.10 pH unit; temperature - 0.2°C, and turbidity <50 NTU.

8) Purging of three well volumes is not necessary if the indicator parameters are stable. However, at least one (1) well volume must be purged before sampling can begin. During purging, it is permissible to by-pass the flow cell until the groundwater has cleared.

9) Indicator parameters must be measured continuously using the flow cell.

10) Well purging data are to be recorded in the field notebook and on the Well Purge Log (Figure A4-1).

11) Dispose of HDPE tubing as per Section A11.0.

WELL PURGE LOG

URS Corporation

PROJECT TITLE: ____________________ WELL NO.: ____________

PROJECT NO.: ____________________ START: ____________

STAFF: ____________________ STOP: ____________

DATE(S): ____________________ SAMPLE: ____________

1. TOTAL CASING AND SCREEN LENGTH (FT.) = ____________
2. WATER LEVEL BELOW TOP OF CASING (FT.) = ____________
3. NUMBER OF FEET STANDING WATER (#1 - #2) = ____________
4. VOLUME OF WATER/FOOT OF CASING (GAL.) = ____________
5. VOLUME OF WATER IN CASING (GAL.)(#3 x #4) = ____________
6. VOLUME OF WATER TO REMOVE (GAL.)(#5 x ___) = ____________
7. VOLUME OF WATER REMOVED (GAL.) = ____________

WELL ID.	VOL. (GAL/FT)
1"	0.0
2"	0.2
3"	0.4
4"	0.7
5"	1.0
6"	1.5
8"	2.6

ACCUMULATED VOLUME PURGED (GALLONS)

PARAMETERS											
pH											
SPEC. COND. (umhos)											
TEMPERATURE (°C)											
TURBIDITY (NTU)											

COMMENTS:

FIGURE A4-1
WELL PURGING LOG

A4.2 Groundwater Sampling Procedures

Procedures

1) After well purging is completed, a sample will be collected into the appropriate containers. The sampling order shall be volatiles, semivolatiles, pesticides, PCBs, metals, then water quality parameters including dissolved iron and hardness. The aliquot for total metals will not be filtered since turbidity will be less than 50 NTUs. Use an in-line filter (0.45 μm) for the dissolved iron analyses. The results of the dissolved iron analysis will be used for the treatability study. The aliquot for dissolved iron will be preserved with nitric acid after filtration in accordance with NYSDEC TAGM #4015.

2) Disconnect the flow cell during sampling and reduce pump rate to 100 milliliters per minute. Direct the discharge tubing toward the inside wall of the sample container to minimize volatilization. Fill volatile sample containers so no headspace (air bubbles) are present. Preserve as needed and cap all sample containers.

3) All sample bottles will be labeled in the field using a waterproof permanent marker (Section A9.0).

4) Samples will be collected into sample bottles (Table A4-2) (containing required preservatives) and placed on ice in coolers for processing (preservation and packing) prior to shipment to the analytical laboratory. A chain-of-custody record will be initiated. The analytical laboratory will certify that the sample bottles are analyte-free prior to shipping.

TABLE A4-2
SAMPLE CONTAINER, PRESERVATION, AND HOLDING TIME REQUIREMENTS
CHEM-CORE SITE

PARAMETER	ANALYTICAL METHOD [1]	CONTAINER	PRESERVATION	HOLDING TIME [2]
Water				
TCL Volatiles + TICs	OLM04.2	3 x 40ml VOA, Glass	HCl to pH<2, Cool 4° C	10 days preserved
TCL Semivolatiles + TICs	OLM04.2	2 x 1 L Amber Glass	Cool 4° C	5 days until extraction/40 days for analysis
TCL Pesticides/PCBs	OLM04.2	1 x 1 L Amber Glass	Cool 4° C	5 days until extraction/40 days for analysis
TAL Metals (total)	ILM04.1	1 x I L HDPE	HNO_3 to pH<2, Cool 4° C	6 months; 26 days for mercury
Cyanide	ILM04.1	1 x I L HDPE	NaOH to pH>12, Cool 4° C	12 days
Hardness	130.2	1 x 250 ml HDPE	HNO_3 to pH<2, Cool 4° C	6 months
Dissolved Iron	ILM04.1	1 x I L HDPE	HNO_3 to pH<2, Cool 4° C	6 months
Air (SVE Test)				
TCL Volatiles + TICs	TO-14A	Summa Canister	Cool 4° C	14 days
Soil/Sediment/Waste				
TCL Volatiles + TICs	ASP 95-1	2 x 4 oz. Glass	Cool 4° C	10 days
TCL Semivolatiles + TICs	ASP 95-2	1 x 4oz. Glass	Cool 4° C	10 days until extraction/40 days for analysis
TCL Pesticides/PCBs	ASP 95-3	1 x 4oz. Glass	Cool 4° C	10 days until extraction/40 days for analysis
TCLP Volatiles	8260B	2 x 4 oz. Glass	Cool 4° C	7 days to TCLP extraction/7 days for analysis
TCLP Semivolatiles	8270C	1 x 8 oz. Glass	Cool 4° C	5 days to TCLP extraction/7 days until extraction/40 days for analysis
TCLP Metals	ILM04.1	1 x 8 oz. Glass	Cool 4° C	6 months to TCLP extraction, 6 months to analysis. 5 days to TCLP, 26 days to analysis for mercury
Ignitability	1030	1 x 8 oz. Glass	Cool 4° C	As soon as possible
Corrosivity	9045C	1 x 4 oz. Glass	Cool 4° C	As soon as possible
Reactivity	Chapter 7 Section 7.3	1 x 4 oz. Glass	Cool 4° C	As soon as possible

1 - New York State Department of Environmental Conservation, Analytical Services Protocol (ASP), June 2000 Edition.

2 - All holding times begin with the Validated Time of Sample Receipt (VTSR) at the laboratory.

5) Remove pump and disconnect valves and tubing. Submersible pumps must be decontaminated prior to and between each use. Clean pump by flushing 10 gallons of potable water through the pump. Rinse with deionized water after flushing the pump.

6) Well sampling data are to be recorded in the field notebook and on the Well Purging Log (Figure A4-1).

A4.3 Water Level Monitoring Procedures

Determination of groundwater surface elevations throughout a monitoring well network makes possible the construction of a potentiometric surface contour map and determination of groundwater flow patterns.

Water levels in all monitoring wells will be measured using an electronic water level indicator or weighted tape. Initially, measurements will be taken following well development until the well has recovered to anticipated static conditions. Water levels will also be measured prior to groundwater purging sampling. Water level measurement procedures are presented below.

Procedure

1) Clean water level probe following the decontamination procedures (Section A7.0) and test water level meter to ensure that the batteries are charged.

2) Lower probe slowly into the monitoring well until audible alarm indicates the top of the water column.

3) Read the depth to the nearest hundredth of a foot, from the graduated cable using a set reference point on the riser pipe.

4) Repeat the measurement for confirmation and record the water level.

5) Remove the probe from the monitor slowly, drying the cable and probe with a clean "Chem Wipe" or paper towel.

6) Replace monitoring well cap and lock protective cap in place.

7) Decontaminate the water level indicator (Section A7.0) if additional measurements are to be taken.

A4.4 Sample Container, Preservation and Holding Time Requirements

Table A4-1 presents the summary of analytic parameters for all samples to be collected as part of this RI. Table A4-2 lists the sample container, volume, preservation and holding time requirements for samples to be collected at the site.

A4.5 Hydraulic ConductivityTesting

Slug tests will be performed in all newly installed monitoring wells during both phases of drilling using a Hermit Data Logger, pressure transducer, and stainless steel slugs. Both falling head (slug-in) and rising head (slug-out) tests will be performed if the well monitors are submerged below the water table. The tests will consist of inserting or removing the slug from the well and monitoring the recovery of the water level in the well to static conditions. This data will be analyzed using the methods of Bouwer and Rice (1976) and Bouwer (1989).

Slug testing is a rapid and inexpensive procedure for estimating the horizontal hydraulic conductivity of an aquifer material screened by a monitoring well. Equipment consists of dedicated/disposable nylon rope, decontaminated stainless steel slug and pressure transducer, a Hermit Data logger, and a water level indicator.

Procedure

1) Measure dimensions of the slug to be used to displace water in the monitor and predetermine the volume of water which will be displaced and corresponding initial water level change which will occur by adding or removing the slug.

2) Record initial water level in the well (static water level).

3) Lower the pre-cleaned pressure transducer into well to well bottom. Pull transducer up one foot. Connect transducer to Hermit Data Logger.

4) Insert stainless steel slug into well, below water table, with nylon rope. Allow water level in well to return to static condition.

5) Simultaneously initiate Hermit Data Logger and rapidly insert or remove the slug from the well.

6) Monitor water level recovery in well with Hermit Data Logger until static water level has been regained.

7) Download Hermit Data Logger and record data in field notebook. Review data to verify slug test was successful.

8) Remove equipment from well and decontaminate.

9) Analyze data in office using computer.

A5.0 SURFACE WATER AND SEDIMENT SAMPLING

Surface water and sediment sampling will conform to the program and design specifications set forth in the PMWP. Six pared surface water / sediment samples will be collected from the Black Rock Channel at the proposed locations depicted in Figure A3-2.

The surface water samples will be sampled by direct submersion of the sample container from a boat. If, however, the sample location does not lend itself to easy access, then an extendable pond sampler may be used to collect samples by attaching the sample container or pre-cleaned sampling beaker made of appropriate material (glass, stainless steel, or Teflon) to the pond sampler. Volatile samples should be collected by submerging the VOA vial and capping underwater, if possible. Otherwise, care must be taken when using a separate container for collection so as not to agitate the water during collection or transfer into the VOA vials.

A5.1 Surface Water Sampling Procedures

Procedure

1) Assemble the pond sampler. Make sure that the sampling beaker and the bolts and nuts that secure the clamp to the pole are tightened properly.

2) With proper protective garment and gear, take grab samples by slowly submerging the pre-cleaned beaker with minimal surface disturbance.

3) Retrieve the pond sampler from the surface water with minimal disturbance.

4) Remove the cap from the sample bottles and slightly tilt the mouth of the bottle below the dipper/device edge.

5) Empty the sampler slowly, allowing the sample stream to flow gently down the side of the bottle with minimal entry turbulence.

6) Continue delivery of the sample until the bottle is almost completely filled.

7) In the same manner, fill all required sample bottles and preserve the sample as required.

8) Secure the appropriately lined (Teflon and polyethylene) cap tightly.

9) Attach another pre-cleaned beaker prior to sampling at the next location.

10) Record all field data in the field notebook.

Reference: *Characterization of Hazardous Waste Sites Manual, Volume 2, Available Sampling Methods*, 3rd Ed., USEPA, Nov. 1986.

A5.2 Sediment Sampling with a Petite Ponar Dredge

The Petite Ponar Dredge sampler will be used to sample sediments in the Black Rock Channel.

Procedure

1) Attach the necessary length of rope (a bowline knot is best) to the Petite Ponar Dredge. Attach the rope to the boat.

2) Set the trip mechanism on the dredge. Be careful not to place fingers or hands on or into any pinch points.

3) Lower dredge to the sediment gently lowering through the final 1 to 2 feet of water. Trip the dredge by allowing the line to slacken.

4) Lift the dredge to the surface with a smooth, even motion.

5) Tilt the Ponar to pour off water. Take care to distinguish between water and sediment.

6) Empty the contents of the Ponar into a clean stainless-steel bowl.

7) Sediment for volatile organic analyses should be placed directly into the bottle to minimize disturbance. Sediment for other analyses are homogenized in a clean stainless-steel bowl with a clean stainless-steel spoon or equivalent. When necessary, protect the samples from wind blown dust, rain, etc., and from warming, especially samples for organic analyses. Cover the pan with aluminum foil for protection, but avoid contact with the sample, especially samples to be analyzed for metals.

8) Complete the bottle label before filling it with sediment. Bottles for volatile organic analysis should be filled to the very top. Exclude air pockets by tamping or gently compacting the soil as the bottle is filled. Do not agitate the sediment or expose to aeration by the wind.

9) Clean the threads and lip of the bottle with a paper towel (Soft Cote or Chem Wipe). Do not touch the sample with the paper towel or gloves. Check the liner in the bottle cap before tightening the cap onto the bottle.

10) Clean the outside of the bottle with water and/or a paper towel. Label sample bottles as described in Section A8.0.

11) Place the sample on ice as soon as possible after filling the sample bottles. Some samples for organic analysis need to be protected from light by using amber bottles and/or by putting in the cooler.

12) Chain of custody forms must be completed by the samplers before leaving the site (Figure A4-2) (Section A9.0).

CHAIN OF COUNTDOWN RECORD

URS Greiner Woodward Clyde

TESTS

BOTTLE TYPE AND PRESERVATIVE

PROJECT NO.

SITE NAME

SAMPLERS (PRINT/SIGNATURE)

LAB ____________

COOLER ______ of ______

PAGE ______ of ______

DELIVERY SERVICE: ____________ AIRBILL NO.: ____________

LOCATION IDENTIFIER	DATE	TIME	COMP/ GRAB	SAMPLE ID	MATRIX	TOTAL NO.# OF CONTAINERS									REMARKS	SAMPLE TYPE	BEGINNING DEPTH (IN FEET)	ENDING DEPTH (IN FEET)	FIELD LOT NO.# (RPIMS ONLY)

MATRIX CODES

AA - AMBIENT AIR
SE - SEDIMENT
SH - HAZARDOUS SOLID WASTE
SL - SLUDGE
WP - DRINKING WATER
WW - WASTE WATER
WG - GROUND WATER
SO - SOIL
DC - DRILL CUTTINGS
WL - LEACHATE
GS - SOIL GAS
WC - DRILLING WATER
WO - OCEAN WATER
WS - SURFACE WATER
WQ - WATER FIELD QC
LH - HAZARDOUS LIQUID WASTE
LF - FLOATING/FREE PRODUCT ON GW TABLE

SAMPLE TYPE CODES

TB# - TRIP BLANK
SD# - MATRIX SPIKE DUPLICATE
RB# - RINSE BLANK
FR# - FIELD REPLICATE
N# - NORMAL ENVIRONMENTAL SAMPLE
MS# - MATRIX SPIKE

(# - SEQUENTIAL NUMBER (FROM 1 TO 9) TO ACCOMMODATE MULTIPLE SAMPLES IN A SINGLE DAY)

RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)	DATE	TIME	SPECIAL INSTRUCTIONS
RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED FOR LAB BY (SIGNATURE)	DATE	TIME	

Distribution: Original accompanies shipment, copy to coordinator field files

URSF-075C/1 OF 1/CofCR/GCM

FIGURE A4-2

13) Samples must be packaged and shipped according to USDOT and IATA regulations when applicable. At a minimum, samples must be packaged to prevent breakage.

14) Sampling equipment must be decontaminated (Section A7.0) between sample locations and before leaving the site. Dunk the dredge in the water to wash off some of the sediment.

A6.0 SURVEYING AND MAPPING

Project control surveying will provide for site topographic mapping and for location of sampling points. All surveying will be performed under the supervision of a New York State licensed land surveyor, following the requirements of the Project Management Plan and the HASP.

A6.1 Establishing Horizontal Primary Project Control

In order to determine the horizontal locations of site features, horizontal control will be established by surveying to/from established survey monuments in the New York State Plane Coordinate System, Transverse Mercator Projection, West Zone, North American Datum (NAD) of 1983. This information will be used for base map preparation.

Procedure

1) Research for monuments.
2) Recover monuments in field.
3) Set and reference points on primary traverse.
4) Turn angles and measure distances.
5) Compute closures and adjust traverse.

A6.2 Establishing Vertical Primary Project Control

In order to determine site elevations, vertical control must be established by surveying to/from established survey monuments in the North American Vertical Datum (NAVD) of 1988.

Procedure

1) Research for monuments.
2) Recover monuments in field.
3) Set project benchmarks.

4) Run level line from monuments to set project benchmarks and back.

5) Reduce notes and adjust benchmark elevations.

6) Prepare recovery sketches.

A6.3 Global Positioning System (GPS) Surveying

Most of the surveying will be performed using GPS systems methodologies. This data will be converted into the horizontal and vertical coordinate systems noted in Sections A6.1 and A6.2.

A7.0 SAMPLING EQUIPMENT CLEANING PROCEDURES

To assure that no outside contamination will be introduced into the samples/data, thereby invalidating the samples/data, the following cleaning protocols will apply for all equipment used to collect samples/ data during the field investigations. Drilling equipment and heavy machinery will be steam cleaned on site on the decontamination pad located along the north side of the building. All water generated during washing will be containerized and transported to the drum staging area.

Procedures:

1) Thoroughly clean equipment with soap and tap water, until all visible contamination is gone.
2) Rinse with tap water, until all visible evidence of soap is gone.
3) Rinse with deionized water.
4) Rinse with 10% reagent grade nitric acid.
5) Rinse with pesticide grade methanol.
6) Air dry.
7) If equipment will not be used immediately, wrap in oil-free aluminum foil.

A8.0 SAMPLE LABELING

In order to prevent misidentification and to aid in the handling of environmental samples collected during the field investigation, sample labeling procedures listed below will be followed:

Procedure:

1) Affix a label to each sample container. The following information will be written on each label with permanent marker prior to wrapping label with cellophane tape:

   Site name
   Sample identification
   Project number
   Date/time
   Sampler's initials
   Sample preservation
   Analysis required

2) Each sample of each matrix will be assigned a unique alpha-numeric identification code. An example of this code and a description of its components is presented below:

   Examples

   1. MW1-GW
      MW1 =Monitoring Well 1
      GW = Groundwater

   2. SB1 - 2'-4'
      SB1 = Soil Boring 1
      2' - 4' =Two-foot to four-foot soil sample

List of Abbreviations

Monitor Type

MW = Monitoring Well

S = Shallow

D = Deep

SVE = Soil Vapor Extraction

VO = Vacuum Observation

Sample Type

SB = Soil Boring

GW = Groundwater

WW = Waste Water

EB = Equipment Rinse Blank

HW = Hydrant Water (Decon Water/Drilling Water)

TB = Trip Blank

RB = Rinse Blank

MS = Matrix Spike

MSD = Matrix Spike Duplicate

MD = Matrix Duplicate

A9.0 SAMPLE SHIPPING

Proper documentation of sample collection and the methods used to control these documents are referred to as chain-of-custody procedures. Chain-of-custody procedures are essential for presentation of sample analytical chemistry results as evidence in litigation or at administrative hearings held by regulatory agencies. Chain-of-custody procedures also serve to minimize loss or misidentification of samples and to ensure that unauthorized persons do not tamper with the samples.

The procedures used in this remedial predesign follow the chain-of-custody guidelines outlined in NEIC Policies and Procedures, prepared by the National Enforcement Investigations Center (NEIC) of the U.S. Environmental Protection Agency Office of Enforcement.

Procedure

1) The chain-of-custody (COC) record (Figure A4-2) should be completely filled out, with all relevant information.

2) The original COC goes with the samples. It should be placed in a ziplock bag and taped inside the sample cooler. The sampler should retain a copy of the COC.

3) Place 2-inches of inert cushioning material such as vermiculite or bubble-wrap in bottom of cooler.

4) Place bottles in cooler in such a way that they do not touch (use cardboard dividers or bubble-wrap).

5) Wrap\VOA vials securely in bubble-wrap and tape. Place them in the center of the cooler.

6) Pack cooler with ice in doubled ziplock plastic bags.

7) Pack cooler with cushioning material.

8) Tape drain shut.

9) Wrap cooler completely with strapping tape at two locations securing the lid. Do not cover any labels.

10) Place lab address on top of cooler. For out-of-town laboratory, add the following: Put "This side up" labels on all four sides and "Fragile" labels on at least two sides. Affix numbered custody seals on front right and left of cooler. Cover seals with wide, clear tape.

11) Ship samples via overnight carrier the same day that they are collected, whenever possible.

A10.0 FIELD SAMPLING INSTRUMENTATION

Field sampling equipment, such as a split spoon, hand auger, etc., will require no maintenance beyond decontamination between sampling locations. Calibration procedures for electronic instruments are summarized on the following pages. More detailed procedures for instrument calibration and maintenance can be found in the equipment operating manuals.

Maintenance procedures for the common instrumentation that will be used during field investigations are discussed in the manufacturer operating manuals. A copy of the manufacturer's operating manual for each instrument will be kept with the instrument or the operator. All field sampling equipment will be calibrated each day of use. The calibration procedures and results will be recorded in the field notebook.

A10.1 Photoionization Detector (PID)

The photoionization detector (PID) (HNu Model PI 101) is a portable instrument used to detect, measure, and provide a direct reading of the concentration of a variety of trace gasses. The detector employs the principle of photoionization. This process involves the absorption of ultraviolet light by a gas molecule leading to ionization.

Calibration Procedure

1) Turn function switch to BATT. The needle should be in the green region.
2) Turn function switch to STANDBY. Set the zero point with the zero set control.
3) Attach the ¼-inch tubing to the probe inlet and to the regulator on the tank of isobutylene and open the valve on the regulator. NOTE: If the pressure in the isobutylene tank is below 200 psi, consider the tank exhausted and use a full tank.
4) Turn the function switch to the 0-200 range.
5) Adjust the span setting so the meter gives a reading of 58 ppm.

A10.2 Combustible Gas Indicator (CGI)

The instructions listed below review the operation of the Bachrach Sentinel 44-Combustible/Toxic Gas and O_2 Deficiency Meter.

1) Press the POWER key.
2) Observe that the Liquid Crystal Display (LCD) backlight turns on. The backlight stays on for 30 seconds and then turns off.
3) Observe that the LCD sequences through the following messages:

Serial number and software version.

```
SERIAL xxxxxx
VERSION yyy
```

Where xxxxxx = serial number of unit
yy = software version level

Battery voltage and its capacity

```
BATTERY TEST
xx.xV  yy% CAP
```

Where xx.x = battery voltage
yy = remaining battery capacity

If the dosimeter functions are turned on, the remaining number of dosimeter recording segments and hours for TWA and STEL calculations are displayed.

```
DOS CAPACITY
xx SGMNTS  yy HR
```

Where xx = remaining number of recording segments
yy = remaining number of recording hours

Month, day, and year the instrument was last calibrated

```
LAST CAL DATE
     mm/dd/yy
```

Alarm messages (e.g., "LOW BATTERY" "CALIBRATION EXPIRED", "MEMORY FULL", "ONLY x:x HOURS STORAGE REMAIN").

Real Time Gas display. A typical fresh-air four-gas display is shown below.

```
20.9   0    0    0
02    LEL   CO  H2S
```

5) The instrument now starts monitoring the surrounding air and provides readouts of the detected concentrations of oxygen and combustibles, plus carbon monoxide and/or hydrogen sulfide. A confidence beep is sounded once every minute to assure the user that the unit is on and monitoring the gas channels.

6) Allow the instrument to warmup for several minutes until the gas-display stabilizes. Then if one or more gas readings exceed the limits listed below while sampling fresh air, the sensors should be software zeroed.

Oxygen	20.9± 0.5%
Combustibles	± LEL
Carbon Monoxide	± 10 ppm
Hydrogen Sulfide	± 5 ppm

7) Before each day's usage, sensitivity must be tested on a known concentration of calibration gas specified on the instrument nameplate that is equivalent to 25 to 50% of full scale concentration. Accuracy must be within ±20% of actual.

A10.3 Micropurge Flow Cell

The Micropurge Flow Cell is a complete system for monitoring chemical parameters during groundwater purging and sampling. Discharge from the purging/sampling pump in routed through an engineered flow cell that contains a multi-parameter sensor probe. Readings from the probe are displayed on a hand-held meter which can also store readings for future recall or transfer to a personal computer. The flow cell measures:

- Temperature
- Conductivity
- Percent dissolved oxygen
- pH
- Oxidation/reduction potential (ORP)

Parameters which can be derived and displayed include:

- Specific Conductivity
- Salinity
- Dissolved oxygen in micrograms per liter (mg/L)
- Total Dissolved Solids
- Resistivity

Calibration procedures for the above-stated parameters are provided in the instrument user manual. The manual will be kept on site with the instrument for reference.

A10.4 Turbidity Meter

The turbidity meter is a portable water quality monitoring instrument which measures water clarity in nephelomatic turbidity units (NTU). Specifically, turbidity meters measure scattered light through water at 90 degrees from the light source. A reference beam passes through the sample and is measured at 180 degrees. The ratio of the two readings are electronically converted to NTU. Routine calibration is outlined below.

1) Fill the turbidity tubes with 1.0 NTU and 10.0 NTU standards and wipe the outer wall with a clean cloth.

2) Open the lid of the turbidimeter and insert the turbidity tube. Be sure to align the indexing arrow on the turbidity tube with the arrow on the meter.

3) Close the lid and press "Read". If the displayed value is not the same as the standard, proceed to Step 4. If the displayed value is the same as the standard, end calibration and the instrument is ready to be used.

4) Depress the "Cal" button for 5 seconds until cal is displayed. Adjust the flashing displayed value using the up/down arrow keys until the desired value is displayed.

5) Press "cal" button to store values to memory and end calibration. The meter is now ready for use. Place turbidity tubes with water samples into the meter and press "Read".

A10.5 Total Vapor Analyzer (TVA)

The TVA is a portable instrument that measures total organic vapors via a flame ionization detector and a photoionization detector. Prior to starting the instrument, make sure that the battery is charged, the sample probe is connected, the hydrogen tank is filled, and the hydrogen valve is in the "on" position. Allow the instrument to warm up for 20 minutes. Once the warm up period has expired, the instrument is ready for calibration and use. The procedures described below detail the steps required to set up the instrument for use.

Normal Operation Procedure

1) Press the ON key
2) Press the CONTROL key
3) Press the 3 key to ignite the flame ionization detector
4) Once the flame has ignited, the instrument automatically enters the run mode and is ready for measurement.
5) To shut the instrument off, press the OFF key and close the hydrogen valve.
6) Recharge the battery after each days use.

To calibrate the unit, execute the following procedure:

1) Press ON
2) Press CONTROL
3) Press 3 to ignite
4) Press 2 = Setup
5) Press 1 = Calibrate
6) Press 2 = Span Concentration
7) Enter Span Concentration for calibration gas being used

Note: IF PID only, enter concentration of isobutylene. If FID only, enter concentration of methane. If dual, enter concentration of both gases.

8) Press 3 = Zero
9) Press 1 = Both
10) Challenge analyzer with zero gas sample
11) Press ENTER = start
12) Wait to stabilize
13) Press ENTER = start
14) Press 4 = Span

15) (PID 1^{st}) Press 2 = PID
16) Press ENTER = start
17) Challenge analyzer with isobutylene span gas and wait for readings to stabilize
18) Press ENTER to accept
19) Press 4 = Span
20) Press 3 = FID
21) Press ENTER = Start
22) Challenge analyzer with methane span gas and wait for readings to stabilize
23) Press ENTER = Accept
24) Press 5 = Response Factor
25) Confirm that Response Factor says "RF0:DEFAULT"
26) Press EXIT 2 times to main menu
27) Press 1 = Run

You are now in the survey mode.

A10.6 Preventative Maintenance

Table A10-1 presents the URS field instrumentation preventative maintenance summary. In case of an emergency, other URS offices, the instrument manufacturer, and/or an equipment rental vendor will be contacted. If necessary, instrumentation manufacturers will be contacted for unit repair/replacement. In addition, potential instrumentation rental vendors, which could provide overnight UPS/Federal Express service, are listed below.

Vendors
Response Rentals: Rochester, NY: 1-716-424-2140
Hazco Services: Dayton, OH 1-800-343-0256

TABLE A10-1

FIELD INSTRUMENTATION PREVENTATIVE MAINTENANCE SUMMARY

Instrument	Maintenance Details
HNU PI-101 Photoionization Detector	Initiate factory checkout and calibration, yearly or when malfunctioning or after changing UV light source. Wipe down readout unit after each use. Clean UV light source window every month or as use and site conditions dictate. Clean the ionization chamber monthly. Recharge battery after each use. Service: 800-343-0256
Micropurge Flow Cell Model FC4000	Calibrate the required parameters using appropriate factory-suppled standards and buffers on a daily basis. Store the sonde (probe) in a 2M KCl solution at the end of each work day. Factory calibrate annually.
Bacharach Sentinel 44 Combustible Gas Indicator	Calibrate LEL, O_2 and H_2S sensors daily. Replace foam pump filter monthly. Factory calibrate yearly.
Lamotte Turbidity Meter	Replace 9 volt battery when necessary. Clean lamp after each days use. Clean turbidity tubes after each reading and replace tubes when discoloration of glass occurs.

A11.0 INVESTIGATION-DERIVED WASTE CHARACTERIZATION AND DISPOSAL

Fluids generated during equipment decontamination, well development and well purging will be contained on site and transported to a TSD facility for treatment. Soil cuttings may also require off-site disposal. Sampling and treatment will be coordinated by URS. Personal protective equipment and high density polyethylene (HDPE) sampling equipment will be double bagged and placed for disposal at a municipal landfill.

A12.0 PILOT TEST

The pilot test will conform to the program and design specifications set forth in the Project Management Work Plan. One SVE well and four vacuum observation wells will be installed inside the warehouse building at 1382 Niagara Street. Procedure for well installation are provided in Section A3.10.

PART B

QUALITY ASSURANCE PROJECT PLAN (QAPjP)

TABLE OF CONTENTS

Page No.

PART B - QUALITY ASSURANCE PROJECT PLAN

TABLE OF CONTENTS
QUALITY ASSURANCE PROJECT PLAN

Page No.

TABLES

Following
Page No.

APPENDICES

B1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPjP) is designed to provide an overview of quality assurance/quality control (QA/QC) procedures and programs which will be adhered to during the Remedial Investigation (RI) activities as described in the Project Management Work Plan (PMWP) (URS, April 2001). The QAPP will give specific methods and QA/QC procedures for chemically testing environmental samples obtained from the Chem-Core Site. In addition, it will help verify the quality of the data produced during the RI.

B2.0 PROJECT/SITE DESCRIPTION

The site is located in the City of Buffalo, Erie County, New York. A complete description of the Chem-Core Site is provided in Section 1.1.1 - Site Description and History, of the PMWP.

B3.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The URS Corporation (URS) organizational structure for this project is presented in the PMWP and identifies the names of key project personnel. In addition to overall project coordination, the Project Manager will be responsible for overseeing both the analytical and field QA/QC activities. The ultimate responsibility for maintaining quality throughout the project rests with the Project Manager.

The URS Project QA/QC Officer is responsible for verifying that corporate QA procedures are followed. The QA/QC Officer (or designee) will be in direct contact with the analytical laboratory to monitor laboratory activities so that holding times and other QA/QC requirements are met.

The Remedial Investigation Coordinator is responsible for verifying that QA procedures are followed in the field. This will provide for the valid collection of representative samples. The Remedial Investigation Coordinator will be responsible for coordinating the activities of all personnel involved with implementing the project in the field, and will be in daily communication with the Field Geologist. This person will verify that all field work is carried out in accordance with the approved project Field Sampling Plan.

The analytical laboratory to be used for the analysis of soil, groundwater, surface water/sediment, and waste samples is Mitkem Corporation, located in Warwick, Rhode Island. The laboratory is certified by New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) for the appropriate categories (i.e., contract laboratory program procedures). The QA Manager of the laboratory will be responsible for performing project-specific audits and for overseeing the quality control data generated. Also, the Laboratory Project Manager will be in daily communication with the QA/QC Officer (or designee).

B4.0 DATA QUALITY OBJECTIVES

B4.1 Background

Data quality objectives (DQOs) are qualitative and quantitative statements which specify the quality of data required to support the RI for the Chem-Core Site. DQOs focus on the identification of the end use of the data to be collected. The project DQOs will be achieved utilizing the definitive data category, as outlined in Data Quality Objective Process for Superfund, Interim Final Guidance, USEPA (September 1993). The definitive data are generated using rigorous analytical methods, such as approved United States Environmental Protection Agency (USEPA) reference methods. A summary of the analytical methods to be used is presented in Table B4-1.

The project DQOs for data collected during this remedial investigation are:

- To determine the extent of the dissolved-phase groundwater plume, groundwater flow direction, and evaluation of presence of dense non-aqueous phase liquids.
- To determine extent of soil contamination, both onsite and offsite.
- To maintain the highest possible scientific/professional standards for each procedure.
- To assure the ultimate defensibility of the data produced during the remedial investigation.

B4.2 QA Objectives For Chemical Data Measurement

For the definitive data category described above, the data quality indicators of precision, accuracy, representativeness, comparability, and completeness will be measured during the offsite chemical analysis.

TABLE B4-1
SAMPLE CONTAINER, PRESERVATION, AND HOLDING TIME REQUIREMENTS
CHEM-CORE SITE

PARAMETER	ANALYTICAL METHOD [1]	CONTAINER	PRESERVATION	HOLDING TIME [2]
Water				
TCL Volatiles + TICs	OLM04.2	3 x 40ml VOA, Glass	HCl to pH<2, Cool 4° C	10 days preserved
TCL Semivolatiles + TICs	OLM04.2	2 x 1 L Amber Glass	Cool 4° C	5 days until extraction/40 days for analysis
TCL Pesticides/PCBs	OLM04.2	1 x 1 L Amber Glass	Cool 4° C	5 days until extraction/40 days for analysis
TAL Metals (total)	ILM04.1	1 x I L HDPE	HNO_3 to pH<2, Cool 4° C	6 months; 26 days for mercury
Cyanide	ILM04.1	1 x I L HDPE	NaOH to pH>12, Cool 4° C	12 days
Hardness	130.2	1 x 250 ml HDPE	HNO_3 to pH<2, Cool 4° C	6 months
Dissolved Iron	ILM04.1	1 x I L HDPE	HNO_3 to pH<2, Cool 4° C	6 months
Air (SVE Test)				
TCL Volatiles + TICs	TO-14A	Summa Canister	Cool 4° C	14 days
Soil/Sediment/Waste				
TCL Volatiles + TICs	ASP 95-1	2 x 4 oz. Glass	Cool 4° C	10 days
TCL Semivolatiles + TICs	ASP 95-2	1 x 4oz. Glass	Cool 4° C	10 days until extraction/40 days for analysis
TCL Pesticides/PCBs	ASP 95-3	1 x 4oz. Glass	Cool 4° C	10 days until extraction/40 days for analysis
TCLP Volatiles	8260B	2 x 4 oz. Glass	Cool 4° C	7 days to TCLP extraction/7 days for analysis
TCLP Semivolatiles	8270C	1 x 8 oz. Glass	Cool 4° C	5 days to TCLP extraction/7 days until extraction/40 days for analysis
TCLP Metals	ILM04.1	1 x 8 oz. Glass	Cool 4° C	6 months to TCLP extraction, 6 months to analysis. 5 days to TCLP, 26 days to analysis for mercury
Ignitability	1030	1 x 8 oz. Glass	Cool 4° C	As soon as possible
Corrosivity	9045C	1 x 4 oz. Glass	Cool 4° C	As soon as possible
Reactivity	Chapter 7 Section 7.3	1 x 4 oz. Glass	Cool 4° C	As soon as possible

1 - New York State Department of Environmental Conservation, Analytical Services Protocol (ASP), June 2000 Edition.

2 - All holding times begin with the Validated Time of Sample Receipt (VTSR) at the laboratory.

B4.2.1 Precision

Precision examines the distribution of the reported values about their mean. The distribution of reported values refers to how different the individual reported values are from the average reported value. Precision may be affected by the natural variation of the matrix or contamination within that matrix, as well as by errors made in field and/or laboratory handling procedures. Precision is evaluated using analyses of a laboratory matrix spike/matrix spike duplicate (for organics) and matrix duplicates (for inorganics), which not only exhibit sampling and analytical precision, but indicate analytical precision through the reproducibility of the analytical results. Relative percent difference (RPD) is used to evaluate precision. RPD criteria must meet the requirements for the methods identified in Table B4-1.

B4.2.2 Accuracy

Accuracy measures the analytical bias in a measurement system. Accuracy may be affected by: errors that occurred during the sampling process; contamination originating in the field, during preservation procedures, or during sample handling; natural variations in the sample matrix; or by errors that occurred during laboratory sample preparation and analysis. Sampling accuracy may be assessed by evaluating the results of rinse and trip blanks. These data help to assess the potential contamination contribution from various outside sources. The laboratory objective for accuracy is to equal or exceed the accuracy demonstrated for the applied analytical methods on samples of the same matrix. The percent recovery criterion is used to estimate accuracy based on recovery in the matrix spike/matrix spike duplicate and matrix spike blank samples. The spike and spike duplicate, which indicates effect that the matrix may have on the target compounds, is also a good gauge of method efficiency. For volatile, semivolatile, and polychlorinated biphenyls (PCBs), surrogate recovery results are measured. Acceptable ranges of recovery are reported in the referenced methods identified in Table B4-1.

B4.2.3 Representativeness

Representativeness expresses the degree to which the sample data accurately and precisely represent the characteristics of a population of samples, parameter variations at a sampling point, or environmental conditions. Representativeness is a qualitative parameter which is most concerned with the proper design of the sampling program or subsampling of a given sample. Objectives for representativeness are defined for sampling and analysis tasks and are a function of the investigative objectives (i.e., determination of vertical and horizontal extent of contamination). The sampling procedures, as described in Part A - Field Sampling Plan, have been selected with the goal of obtaining representative samples for the media of concern.

B4.2.4 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. A DQO for this program is to produce data with the greatest possible degree of comparability. This goal is achieved through using standard techniques to collect and analyze representative samples and reporting analytical results in appropriate units. Complete field documentation using standardized data collection forms will support the assessment of comparability. Comparability is limited by the other parameters (e.g., precision, accuracy, representativeness, completeness), because only when precision and accuracy are known can data sets be compared with confidence. In order that data sets may be comparable, it is imperative that contract-required methods and procedures be explicitly followed.

B4.2.5 Completeness

Completeness is defined as a measure of the amount of valid data obtainable from a measurement system compared to the amount that was expected to be obtained under normal conditions. To meet project needs, it is important that appropriate QC procedures be maintained to verify that valid data are obtained. For the data generated, a goal of 90 percent is required for completeness (or usability) of the analytical data. If this goal is not met, then NYSDEC and URS project personnel will determine whether the deviations may cause the data to be rejected.

B5.0 SAMPLING LOCATIONS AND PROCEDURES

Sampling locations and procedures are discussed in Sections 4, 5, and 6 of Part A - Field Sampling Plan. The laboratory analytical program is provided in Table B5-1.

TABLE B5-1
SUMMARY OF ANALYTICAL PARAMETERS
REMEDIAL INVESTIGATION, W.A. #D003825-29
CHEM-CORE

Parameter	Method Number / Reference[1]	Estimated Number of Samples	QA/QC Samples			Total No. of Samples
			MS/MSD/MD/MSB	Rinse Blanks	Trip Blanks	
A. Phase I Remedial Investigation						
I. Geoprobe Soil Samples						
Target Compound List (TCL)						
Volatiles + TICs	OLM04.2	40	2/2/0/2	1	0	47
TCL Semivolatiles + TICs	OLM04.2	4	1/1/0/1	1	0	8
TCL Pesticides/PCBs	OLM04.2	4	1/1/0/1	1	0	8
Target Analyte List (TAL) Metals (23) plus Cyanide	ILM04.1	4	1/0/1/0	1	0	7
II. Groundwater						
TCL Volatiles + TICs	OLM04.2	11	1/1/0/1	1	3	18
TCL Semivolatiles + TICs	OLM04.2	2	1/1/0/1	1	0	6
TCL Pesticides/PCBs	OLM04.2	2	1/1/0/1	1	0	6
TAL Metals (23) plus Cyanide	ILM04.1	2	1/0/1/0	1	0	5
III. Surface Water						
TCL Volatiles + TICs	OLM04.2	6	0/0/0/0	0	1	7
TCL Semivolatiles + TICs	OLM04.2	1	0/0/0/0	0	0	1
TCL Pesticides/PCBs	OLM04.2	1	0/0/0/0	0	0	1
TAL Metals (23) plus Cyanide	ILM04.1	1	0/0/0/0	0	0	1
IV. Sediment						
TCL Volatiles + TICs	OLM04.2	6	1/1/0/1	1	0	10
TCL Semivolatiles + TICs	OLM04.2	1	1/1/0/1	0	0	4
TCL Pesticides/PCBs	OLM04.2	1	1/1/0/1	0	0	4
TAL Metals (23) plus Cyanide	ILM04.1	1	1/0/1/0	0	0	3
V. Drill Water Supply						
TCL Volatiles + TICs	OLM04.2	1	0/0/0/0	0	0	1
VI. Waste Characterization (Soil)						
TCLP Extraction (ZHE and non-ZHE)	1311	1	0/0/0/0	0	0	1
TCLP Volatiles	8260B	1	0/0/0/0	0	0	1
TCLP Semivolatiles	8270C	1	0/0/0/0	0	0	1
TCLP Metals	ILM04.1	1	0/0/0/0	0	0	1
Ignitability	1030	1	0/0/0/0	0	0	1
Reactivity	SW-846, Chapter 7	1	0/0/0/0	0	0	1
Corrosivity	9045C	1	0/0/0/0	0	0	1

NOTES:

[1] NYSDEC Analytical Services Protocol, June 2000.

TABLE B5-1
SUMMARY OF ANALYTICAL PARAMETERS
REMEDIAL INVESTIGATION, W.A. #D003825-29
CHEM-CORE

Parameter	Method Number / Reference[1]	Estimated Number of Samples	QA/QC Samples MS/MSD/MD/MSB	QA/QC Samples Rinse Blanks	QA/QC Samples Trip Blanks	Total No. of Samples
B. Phase II Remedial Investigation						
I. Geoprobe Soil Samples						
TCL Volatiles + TICs	OLM04.2	10	1/1/0/1	1	0	14
TCL Semivolatiles + TICs	OLM04.2	1	0/0/0/0	0	0	1
TCL Pesticides/PCBs	OLM04.2	1	0/0/0/0	0	0	1
TAL Metals (23) plus Cyanide	ILM04.1	1	0/0/0/0	0	0	1
II. Groundwater						
TCL Volatiles + TICs	OLM04.2	14 15	1/1/0/1	1	3.	21
Dissolved Iron	ILM04.1	14 15	1/0/1/0	1	0	17
Hardness	130.2	14 15	1/0/1/0	1	0	17
III. Waste Characterization (Soil)						
TCLP ZHE Extraction	1311	1	0/0/0/0	0	0	1
TCLP Volatiles	8260B	1	0/0/0/0	0	0	1
IV. SVE Pilot Test						
TCL Volatiles + TICs	TO-14A	1	0/0/0/0	0	0	1

NOTES:

[1] NYSDEC Analytical Services Protocol, June 2000.

B6.0 SAMPLE CUSTODY AND HOLDING TIMES

Procedures addressing field and laboratory sample chain-of-custody and holding times are presented in Part A - Field Sampling Plan. Table B4-1 contains sample methods and holding time requirements.

B7.0 ANALYTICAL PROCEDURES

All analyses will be performed in accordance with the following documents:

- New York State Department of Environmental Conservation, (NYSDEC) *Analytical Services Protocol* (ASP), June 2000.

Table B5-1 identifies the specific methods to be performed on the individual matrices. All holding times begin with validated time of sample receipt (VTSR) at the laboratory.

B8.0 CALIBRATION PROCEDURES AND FREQUENCY

To obtain a high level of precision and accuracy during sample processing procedures, laboratory instruments must be calibrated properly. Several analytical support areas must be considered so the integrity of standards and reagents is upheld prior to instrument calibration. The following sections describe the analytical support areas and laboratory instrument calibration procedures.

B8.1 Analytical Support Areas

Prior to generating quality data, several analytical support areas must be considered:

Standard/Reagent Preparation - Primary reference standards and secondary standard solutions shall be obtained from National Institute of Standards and Technology (NIST), or other reliable commercial sources to verify the highest purity possible. The preparation and maintenance of standards and reagents will be accomplished according to the methods referenced in Table B4-1. All standards and standard solutions are to be formally documented (i.e., in a bound logbook) and should identify the supplier, lot number, purity/concentration, receipt/preparation date, preparer's name, method of preparation, expiration date, and any other pertinent information. All standard solutions shall be validated prior to use. Care shall be exercised in the proper storage and handling of standard solutions (e.g., separating volatile standards from nonvolatile standards). The laboratory shall continually monitor the quality of the standards and reagents through well documented procedures.

Balances - The analytical balances shall be calibrated and maintained in accordance with manufacture specifications. Calibration is conducted with two class "S" weights that bracket the expected balance use range. The laboratory shall check the accuracy of the balances daily and they must be documented properly in permanently bound logbooks.

Refrigerators/Freezers - The temperature of the refrigerators and freezers within the laboratory shall be monitored and recorded daily. This will verify that the quality of the standards and reagents is not compromised and the integrity of the analytical samples is upheld. Appropriate acceptance ranges (between 2 and 6 degrees Celsius for refrigerators) shall be clearly posted on each unit in service.

Water Supply System - The laboratory must maintain a sufficient water supply for all project needs. The grade of the water must be of the highest quality (analyte-free) in order to eliminate false-positives from the analytical results. Ultraviolet cartridges or carbon absorption treatments are recommended for organic analyses and ion-exchange treatment is recommended for inorganic analyses. Appropriate documentation of the quality of the water supply system(s) will be performed on a regular basis.

B8.2 Laboratory Instruments

Instrument calibration is required to verify that the analytical system is operating properly and at the sensitivity necessary to meet established quantitation limits. Each instrument for organic and inorganic analyses shall be calibrated with standards appropriate to the type of instrument and linear range established within the analytical method(s). Calibration of laboratory instruments will be performed according to methods specified in Table B4-1. In general, standards will be used that bracket the expected concentration of the samples. This will require using different concentration levels that are used to demonstrate the instrument's linear range of calibration.

Calibration of an instrument must be performed before analyzing any samples and then at periodic intervals (continuing calibration) during the sample analysis to verify that the instrument is still calibrated. If the contract laboratory cannot meet the method-required calibration, corrective action shall be taken, as discussed in Section B11.0. All corrective action procedures taken by the contract laboratory are to be documented, summarized within the case narrative, and submitted with the analytical results.

B9.0 INTERNAL QUALITY CONTROL CHECKS

Internal QC checks are used to determine if analytical operations at the laboratory are in control, as well as determining the effect sample matrix may have on data being generated. The type and frequency of specific QC samples performed by the contract laboratory will be according to the specified analytical method and project specific requirements. Acceptable criteria and/or target ranges for these QC samples are presented within the analytical methods referenced in Table B4-1.

QC results which vary from acceptable ranges shall result in the implementation of appropriate corrective measures, the potential application of qualifiers, and/or an assessment of the impact these corrective measures have on the established data quality objectives. Quality control samples, including any project-specific QC, will be analyzed are discussed below.

B9.1 <u>Batch QC</u>

Method Blank Samples - A method blank is defined as laboratory-distilled or deionized water that is carried through the entire analytical procedure. The method blank is used to determine the level of laboratory background contamination. Method blanks are analyzed at a frequency of one per analytical batch.

Matrix Spike Blank Samples - A matrix spike blank (MSB) sample is an aliquot of water spiked (fortified) with all the compounds being analyzed for calculation of precision and accuracy to verify that the analysis being performed is in control. A MSB will be performed for each matrix and organic parameter.

Laboratory Control Samples – A laboratory control sample (LCS) is a known matrix spiked with elements being analyzed for calculation of precision and accuracy to verify that the analysis being performed is in control. An LCS will be performed for each matrix and inorganic parameter.

B9.2 Matrix-Specific QC

Matrix Spike Samples - An aliquot of a matrix is spiked with known concentrations of specific compounds as stipulated by the methodology. The matrix spike (MS) and matrix spike duplicate (MSD) samples are subjected to the entire analytical procedure to assess both accuracy and precision of the method for the matrix by measuring the percent recovery and relative percent difference of the two spiked samples. The samples are used to assess matrix interference effects on the method, as well as to evaluate instrument performance. MS/MSDs are analyzed at a frequency of one each per 20 samples per matrix. MS/MSDs (an MS for metals only) will be performed for the parameters as listed in Table B5-1.

Matrix Duplicate Samples - The matrix duplicate (MD) is two representative aliquots of the same sample which are prepared and analyzed identically. Collection of duplicate samples provides for the evaluation of precision both in the field and at the laboratory by comparing the analytical results of two samples taken from the same location. Obtaining duplicate samples from a soil matrix requires homogenization of the sample aliquot (except for volatiles) before filling sample containers to best achieve representative samples. Every effort will be made to obtain replicate samples; however, due to interferences, lack of homogeneity, and the nature of the soil samples, the analytical results are not always reproducible. Duplicate samples are to be included at a frequency of one per 20 samples per matrix for metals only, as listed in Table B5-1.

B9.3 Additional QC

Rinsate (Equipment) Blanks - A rinsate blank is a sample of laboratory-demonstrated analyte-free water passed through and over the cleaned sampling equipment. A rinsate blank is used to indicate potential contamination from sample instruments used to collect and transfer samples. This water must originate from one common source within the laboratory and must be the same water used by the laboratory performing the analysis. The rinsate blank should be collected, transported, and analyzed in the same manner as the samples acquired that day. Rinsate blanks will be performed at the rate as listed in Table B5-1 for the total number of samples collected throughout the sampling event.

Trip Blanks - Trip blanks are only required when analyzing for volatile organics in aqueous matrices. They consist of a set of 40 ml volatile organic vials filled at the laboratory with laboratory demonstrated analyte free water. The trip blanks then accompany the bottles that are prepared at the laboratory into the field and back to the laboratory, along with the collected samples for analysis. The trip blanks are never opened in the field. Trip blanks will be analyzed for volatile organic parameters only. Trip blanks must be included at a rate of one per aqueous volatile sample shipment, as listed in Table B5-1.

B10.0 CALCULATION OF DATA QUALITY INDICATORS

B10.1 Precision

Precision is evaluated using analyses of a field duplicate and/or a laboratory MS/MSD sample which not only exhibit sampling and analytical precision, but indicate analytical precision through the reproducibility of the analytical results. Relative percent difference (RPD) is used to evaluate precision by the following formula:

$$\%\,RPD = \frac{(X_1 - X_2)}{[(X_1 + X_2)/2]} \times 100\%$$

where:

X_1 = Measured value of sample or matrix spike

X_2 = Measured value of duplicate or matrix spike duplicate

Precision will be determined through the use of MS/MSD samples for organics and matrix duplicate samples for inorganics analyses. RPD criteria for this project must meet the method requirements referenced in Table B4-1.

B10.2 Accuracy

Accuracy is defined as the degree of difference between the measured or calculated value and the true value. The closer the numerical value of the measurement comes to the true value or actual concentration, the more accurate the measurement is. Analytical accuracy is expressed as the percent recovery of a compound or element that has been added to the environmental sample at known concentrations before analysis. Analytical accuracy may be assessed through the use of known and unknown QC samples and spiked samples. Accuracy is presented as percent recovery. Accuracy will be determined from matrix spike, matrix spike duplicate, and matrix spike blank samples, as well as from surrogate compounds added to organic fractions (i.e., volatiles, semivolatiles, pesticides/PCB), and is calculated as follows:

$$\% R = \frac{(X_s - X_u)}{K} \times 100\%$$

where:

X_s = Measured value of the spike sample

X_u = Measured value of the unspiked sample

K = Known amount of spike in the sample

B10.3 Completeness

Completeness is calculated on a per matrix basis for the project and is calculated as follows:

$$\% \text{ Completeness} = \frac{(X_v - X_n)}{N} \times 100\%$$

where:

X_v = Number of valid measurements

X_n = Number of invalid measurements

N = Number of valid measurements expected to be obtained

B11.0 CORRECTIVE ACTIONS

Laboratory corrective actions shall be implemented to resolve problems and restore proper functioning to the analytical system when errors, deficiencies, or out-of-control situations exist at the laboratory. Full documentation of the corrective action procedure needed to resolve the problem will be filed in the project records, and the information summarized in the case narrative. A discussion of the corrective actions to be taken is presented in the following sections.

B11.1 Incoming Samples

Problems noted during sample receipt shall be documented by the laboratory. URS's QA/QC Officer (or designee) shall be contacted immediately for problem resolution. All corrective actions shall be documented thoroughly.

B11.2 Sample Holding Times

If any sample extractions and/or analyses exceed method holding time requirements, URS's QA/QC Officer (or designee) shall be notified immediately for problem resolution. All corrective actions shall be documented thoroughly.

B11.3 Instrument Calibration

Sample analysis shall not be allowed until all initial calibrations meet the appropriate requirements. All laboratory instrumentation must be calibrated in accordance with method requirements. If any initial/continuing calibration standards exceed method QC limits, equipment must be recalibrated and, if necessary, all samples analyzed subsequent to the previously acceptable calibration check will be reanalyzed.

B11.4 Reporting Limits

The laboratory must meet the required detection limits as referenced in the methods listed in Table B4-1. If difficulties arise in achieving these limits due to sample matrix, the laboratory must notify URS project personnel for problem resolution. In order to achieve those detection limits, the laboratory must utilize all appropriate cleanup procedures in an attempt to maintain the project-required detection limits. When any sample requires a secondary dilution due to high levels of target analytes, the laboratory must document all initial analyses and secondary dilution results. Secondary dilution will be permitted only to bring target analytes within the linear range of calibration. If samples are analyzed at a secondary dilution with no target analytes detected, URS's QA/QC Officer (or designee) will be immediately notified so that appropriate corrective actions can be initiated.

B11.5 Method QC

All QC samples, including blanks, matrix duplicates, matrix spikes, matrix spike duplicates, matrix spike blanks, and other method-specified QC samples, shall meet the QC requirements of the methods referenced in Table B4-1. Failure of method-required QC will result in the review and possible qualification of all affected data. If the laboratory cannot find any errors, the affected sample(s) shall be reanalyzed and/or re-extracted/redigested, then reanalyzed within method-required holding times to verify the presence or absence of matrix effects. If matrix effect is confirmed, the corresponding data shall be flagged accordingly using the flagging symbols and criteria as defined by the data validation guidelines identified in Section B12.2. If matrix effect is not confirmed, then the entire batch of samples may have to be reanalyzed and/or re-extracted/redigested, then reanalyzed at no cost to the URS. URS shall be notified as soon as possible to discuss possible corrective actions should unusually difficult sample matrices be encountered.

B11.6 Calculation Errors

All analytical results must be reviewed systematically for accuracy prior to submittal. If upon data review calculation and/or reporting errors exist, the laboratory will be required to reissue the analytical data report with the corrective actions appropriately documented in the case narrative.

B12.0 DATA REDUCTION, VALIDATION, AND USABILITY

For all NYSDEC ASP analyses, including volatiles, semivolatiles, pesticides/PCBs, metals, and cyanide, NYSDEC ASP Superfund deliverable requirements will be employed for documentation and reporting of all data. Analyses for Toxicity Characteristic Leaching Procedure (TCLP) Resource Conservation and Recovery Act (RCRA) characteristics shall meet NYSDEC ASP Category B deliverable requirements. The NYSDEC Data Package Summary Forms (see Appendix B-1) will be completed by the analytical laboratory and included in the deliverable data packages.

B12.1 Data Reduction

Laboratory analytical data are first generated in raw form at the instrument. These data may be either in a graphic or tabular format. Specific data generation procedures and calculations are found in each of the referenced methods. Analytical results must be reported consistently. Data for aqueous samples will be reported in concentrations of micrograms per liter (μg/L). Data for soils will be reported in concentrations of micrograms per kilogram (μg/kg) for organics and milligrams per kilogram (mg/kg) for inorganics, and reported on a dry weight basis.

Identification of all analytes must be accomplished with an authentic standard of the analyte traceable to NIST or USEPA sources. Data reduction will be performed by individuals experienced with a particular analysis and knowledgeable of requirements.

B12.2 Data Validation

Data validation is a systematic procedure of reviewing a body of data against a set of established criteria to provide a specified level of assurance of validity prior to its intended use.

Data validation will be performed by environmental chemists under the supervision of the QA/QC Officer. All analytical samples collected will receive a limited data review. This review will include: a review of holding times; completeness of all required deliverables; review of QC results (surrogates, spikes, duplicates) to determine if the data are within the protocol required limits and specifications; a determination that all samples were analyzed using established and agreed upon analytical protocols; an evaluation of the raw data to confirm the results provided in the data summary sheets agree with the quality control verification forms; and a review of laboratory data qualifiers. The methods referenced in Table B4-1, as well as the general guidelines presented in the following documents, will be used to aid the chemist during the data review:

- USEPA Region II, *CLP Organic Data Review*, SOP No. HW-6, Rev. #11, June 1996.
- USEPA Region II, *Evaluation of Metals Data for the Contract Laboratory Program* (CLP) based on SOW 3/90, SOP Revision XI, January 1992.

Where possible, discrepancies will be resolved by URS's chemists (i.e., letters will not be written to the laboratory). A complete analytical data validation is not anticipated. However, if the initial limited data review reveals significant deviations and problems with the analytical data, URS may recommend a complete validation of the data.

B12.3 Data Usability

A Data Usability Summary Report (DUSR) will be prepared following the guidelines presented in the NYSDEC Division of Environmental Remediation's *Guidance for the Development of Data Usability Summary Reports*, June 1999 Revision. The DUSR will describe the samples and the analytical parameters, data deficiencies, analytical protocol deviations, and quality control problems and their effect on the data. The DUSR will also include recommendations on resampling/reanalysis.

B13.0 PREVENTIVE MAINTENANCE

The laboratory is responsible for maintaining its analytical equipment. Preventive maintenance is provided on a regular basis to minimize down-time and the potential interruption of analytical work. Instruments are maintained in accordance with the manufacturer's recommendations. If instruments require maintenance, only trained laboratory personnel or manufacturer-authorized service specialists are permitted to do the work. Maintenance activities will be documented and kept in permanent logs. These logs will be available for inspection by auditing personnel.

B14.0 PERFORMANCE AND SYSTEM AUDITS

Audits will include a careful evaluation of both field and laboratory quality control procedures, and will be performed before or shortly after systems are operational. Performance audits are conducted by introducing control samples into the data production process. These control samples may include performance evaluation samples, or field samples spiked with known amounts of analyte.

Systems audits are onsite qualitative inspections and reviews that provide a quantitative measure of the quality of the data produced by one section of or the entire measurement process. The audits are performed against a set of requirements that may be a quality assurance project plan or work plan, a standard method, or a project statement of work. The primary objective of the systems audits is to verify that the QA/QC procedures are being followed.

B14.1 Performance and External Audits

As part of its established quality assurance program, the laboratory is required to take part in regularly-scheduled performance evaluations and laboratory audits from state and federal agencies. They are conducted as part of the certification process and to monitor the laboratory performance. The audits also provide an external quality assurance check of the laboratory, and provide reviews and information on the management systems, personnel, standard operating procedures, and analytical measurement systems. Acceptable performance on evaluation samples and audits is required for certification and accreditation. The laboratory shall use the information provided from these audits to monitor and assess the quality of its performance. Problems detected in these audits shall be reviewed by the Laboratory QA Manager and Laboratory Management, and corrective action shall be instituted as necessary.

B14.2 Systems/Internal Audits

As part of its quality assurance program, the Laboratory QA Manager shall conduct periodic checks and audits of the analytical systems. The purpose of these is to verify that the analytical systems are working properly, and that personnel are adhering to established procedures and documenting the required information. These checks and audits also assist in determining or detecting where problems are occurring.

The Laboratory QA Manager periodically will submit laboratory control samples. These samples will serve to check the entire analytical method, the efficiency of the preparation method, and the analytical instrument performance. The results of the control samples are reviewed by the Laboratory QA Manager who reports the results to the analyst and the Laboratory Director. When a problem is indicated, the Laboratory QA Manager will assist the analyst and laboratory management in determining the reason and in developing solutions. The Laboratory QA Manager also will recheck the systems as required.

REFERENCES

Comprehensive Environmental Response Compensation and Liability Act (CERCLA) Quality Assurance Manual, Final Copy , Revision I, October 1989.

National Enforcement Investigations Center of USEPA Office of Enforcement. *NEIC Policies and Procedures.* Washington: USEPA.

New York State Department of Environmental Conservation. 2000. *Analytical Services Protocol,* June. Albany, NY.

New York State Department of Environmental Conservation. 1999. Division of Environmental Remediation, *Guidance for the Development of Data Usability Summary Reports*. June. Albany, NY.

United States Environmental Protection Agency (USEPA). 1987. *A Compendium of Superfund Field Operations Methods,* EPA/540/P-87-001, (OSWER Directive 9355.0-14). December. Cincinnati, OH: USEPA.

URS. 2001. Project Management Work Plan. April. Buffalo, NY.

USEPA. 1993. Data Quality Objectives Process for Superfund, Interim Final Guidance. September. Washington: USEPA.

USEPA. 1992. *Evaluation of Metals Data for the Contract Laboratory Program (CLP) based on SOW 3/90, HW-2 (SOP Revision XI).* 30 January. USEPA Region II.

USEPA. 1996. *Contract Laboratory Program Organic Data Review, SOP No. HW-6, Revision 11.* June. USEPA Region II.

APPENDIX B-1

NYSDEC DATA PACKAGE SUMMARY FORMS

To be included with all lab data and with each workplan

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SAMPLE IDENTIFICATION AND ANALYTICAL REQUIREMENT SUMMARY

Customer Sample Code	Laboratory Sample Code	Analytical Requirements					
		*VOA GC/MS Method #	*BNA GC/MS Method #	*VOA GC Method #	*Pest PCBs Method #	*Metals	*Other

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SAMPLE PREPARATION AND ANALYSIS SUMMARY
SEMIVOLATILE (BNA)
ANALYSES

Laboratory Sample ID	Matrix	Date Collected	Date Rec'd at Lab	Date Extracted	Date Analyzed

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SAMPLE PREPARATION AND ANALYSIS SUMMARY
VOLATILE (VOA)
ANALYSES

Laboratory Sample ID	Matrix	Date Collected	Date Rec'd at Lab	Date Extracted	Date Analyzed

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SAMPLE PREPARATION AND ANALYSIS SUMMARY
PESTICIDE/PCB
ANALYSES

Laboratory Sample ID	Matrix	Date Collected	Date Rec'd at Lab	Date Extracted	Date Analyzed

SAMPLE PREPARATION AND ANALYSIS SUMMARY
SEMIVOLATILE (BNA)
ANALYSES

Laboratory Sample ID	Matrix	Analytical Protocol	Extraction Method	Auxiliary Cleanup	Dil/Conc Factor

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SAMPLE PREPARATION AND ANALYSIS SUMMARY
INORGANIC ANALYSES

Laboratory Sample ID	Matrix	Metals Requested	Date Rec'd at Lab	Date Analyzed

PART C

HEALTH AND SAFETY PLAN
(HASP)

URS Corporation

HEALTH AND SAFETY PLAN
RI/FS
CHEM-CORE SITE
BUFFALO, NY

May 2001

Approved By: ______________________ Date: 16 May 2001

Michael Gutmann
Senior Geologist
Project Manager

Approved By: ______________________ Date: 16 May 01

Steven Jay Sherman, CIH
Regional Health and Safety Manager

STEVEN J. SHERMAN
12-31-2003

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REMEDIAL INVESTIGATION/FEASIBILITY STUDY PROJECT

HEALTH AND SAFETY PLAN

CHEM-CORE
SITE # 9-15-176
BUFFALO, NEW YORK

Prepared For:

NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF ENVIRONMENTAL REMEDIATION
WORK ASSIGNMENT D003825-29.0

FINAL

Prepared By:

URS CORPORATION
282 DELAWARE AVENUE
BUFFALO, NEW YORK 14202

MAY 2001

TABLE OF CONTENTS

PART C - HEALTH AND SAFETY PLAN Page No.

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

TABLES

FIGURES

APPENDICES

ACRONYMS

ACGIH	American Conference of Governmental Industrial Hygienists
ANSI	American National Standards Institute
CFR	Code of Federal Regulations
CGI	Combustible Gas Indicator
CIH	Certified Industrial Hygenist
CPR	cardiopulmonary resuscitation
F	degrees Fahrenheit
FSP	Field Sampling Plan
GFCI	Ground-Fault Circuit Interrupters
H_2S	hydrogen sulfide
HASP	Health and Safety Plan
HEPA	high efficiency particulate absolute
HSO	Health and Safety Officer
KV	kilovolt
LEL	lower explosive limit
mg/m^3	milligrams per cubic meter
MSDS	Materials Safety Data Sheets
MW	monitoring well
NIOSH	National Institute for Occupational Safety and Health
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OSHA	Occupational Safety and Health Administration
PCE	tetrachloroethylene
PDM	Particulate Dust Monitor
PEL	Permissible Exposure Limit
PID	photoionization detector
PPE	personal protective equipment
ppm	parts per million
PZ	piezometer
SB	soil boring

ACRONYMS (Continued)

STEL	Short Term Exposure Limit
TCE	trichloroethylene
TLV	Threshold Limit Value
TVA	Toxic Vapor Analyzer
TWA	Time-Weighted Average
URS	URS Corporation
USDOT	United States Department of Transportation
USEPA	United States Environmental Protection Agency
UST	underground storage tank

C1.0 INTRODUCTION

This *Health and Safety Plan* (HASP) includes appropriate health and safety procedures to be followed during investigative activities at and in the vicinity of the Chem-Core Site in the City of Buffalo, Erie County, New York, under New York State Department of Environmental Conservation (NYSDEC) State Superfund Work Assignment No. D003825-29 to URS Corporation (URS). Anticipated field activities at the site will include:

- Setting up support facilities/mobilization
- Land surveying
- Geoprobe boring investigation
- Soil Sampling
- Surface water and sediment sampling
- Advancing borings, installing and developing groundwater monitoring wells
- Collecting groundwater samples
- Soil Vapor Extraction Well/Vacuum Observation Well Installation
- Real-time air monitoring
- Staging/disposing of investigation-derived waste

The procedures presented in this plan comply with the following regulatory or guidance documents:

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)

ACGIH-0027	(2000) *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices*
ACGIH-0375	(2000) *Guide to Occupational Exposure Values*
ACGIH-0460	*Guidelines for the Selection of Chemical Protective Clothing*, 3rd Edition

CODE OF FEDERAL REGULATIONS (CFR)

29 CFR Part 1904	"Recording and Reporting Occupational Injuries and Illnesses"
29 CFR Part 1910	"Occupational Safety and Health Standards," especially Part 1910.120-Hazardous Waste Site Operations and Emergency Response"
29 CFR Part 1926	"Safety and Health Regulations for Construction," especially Part 1926.65 - "Hazardous Waste Site Operations and Emergency Response"
49 CFR Part 171	"General Information, Regulations, and Definitions"
49 CFR Part 172	"Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements"

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (USEPA)

No Publication No.	(1984) *Standard Operating Safety Guides*, Office of Emergency and Remedial Response
USEPA Order 1440.2	(1981) *Health and Safety Requirements for Employees Engaged in Field Activities*

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH)

NIOSH Pub No. 85-115 - (October 1985) Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities

URS personnel who will be involved in intrusive activities on site have completed the appropriate waste site worker training as required by Occupational Safety and Health Administration OSHA 29 CFR 1910.120(e)(2), 1910.120(e)(3), and 1910.120(e)(8), as applicable, and the required medical surveillance as required by OSHA 1910.120(f). Copies of training certificates and medical surveillance certification for all URS field personnel will be maintained on site.

C2.0 RESPONSIBILITIES

The following is a summary of the health and safety responsibilities of various project personnel.

C2.1 Project Health and Safety Officer

The responsibilities of the Project Health and Safety Officer (HSO) are to develop and coordinate the site health and safety program, and to provide necessary direction and supervision to the Site HSO. The Project HSO will contact the local health department, hospital, police, and fire departments prior to the initiation of work at the sites. This individual will conduct the initial site-specific training session (onsite health and safety briefing), and will review and confirm changes in personal protection requirements when site conditions are found to be different from those originally anticipated.

The Project HSO will be involved in all discussions on health and safety matters with the NYSDEC, OSHA, local health authorities, or other governmental or labor representatives. In addition, this individual will provide the Site HSO with details concerning the task-specific health and safety considerations. The Project HSO reports directly to the Project Manager and the Corporate Health and Safety Director.

C2.2 Site Health and Safety Officer

The responsibilities of the Site HSO are as follows:

- Implement this HASP
- Enforce day-to-day health and safety protocols in effect on the site
- Require that all URS workers who will be involved in intrusive activities on the site have had appropriate waste site worker training and medical examinations and review and maintain training and medical certifications on site
- Require that all personnel entering the site understand the provisions of this HASP

- Conduct periodic training sessions in proper use and maintenance of personal protective equipment and safety practices
- Conduct periodic emergency response drills
- Conduct daily health and safety meetings each morning
- Direct and advise onsite URS personnel, visitors, and subcontractor HSO on all aspects, especially changes, related to health and safety requirements at the site
- Conduct necessary health and safety monitoring
- Administer the air monitoring program
- Monitor site conditions and determine all necessary changes in levels of personal protection and, if warranted, execute work stoppages
- Report changes in site conditions and changes in personal protection requirements to the Project HSO
- Prepare accident/incident reports

The Site HSO reports directly to the Project HSO. URS will designate a qualified backup for the Site HSO prior to the initiation of onsite activities.

C2.3 Field Team Personnel

Field team personnel will be responsible for understanding and complying with site health and safety requirements. At least two members of the project field team on site will be trained in first aid and cardiopulmonary resuscitation (CPR), and will be certified by the American Red Cross. Field team personnel will have completed the required waste site worker training to comply with 29 CFR, Part 1910.120.

A chain-of-command chart for implementation of this HASP is presented in Figure C2-1.

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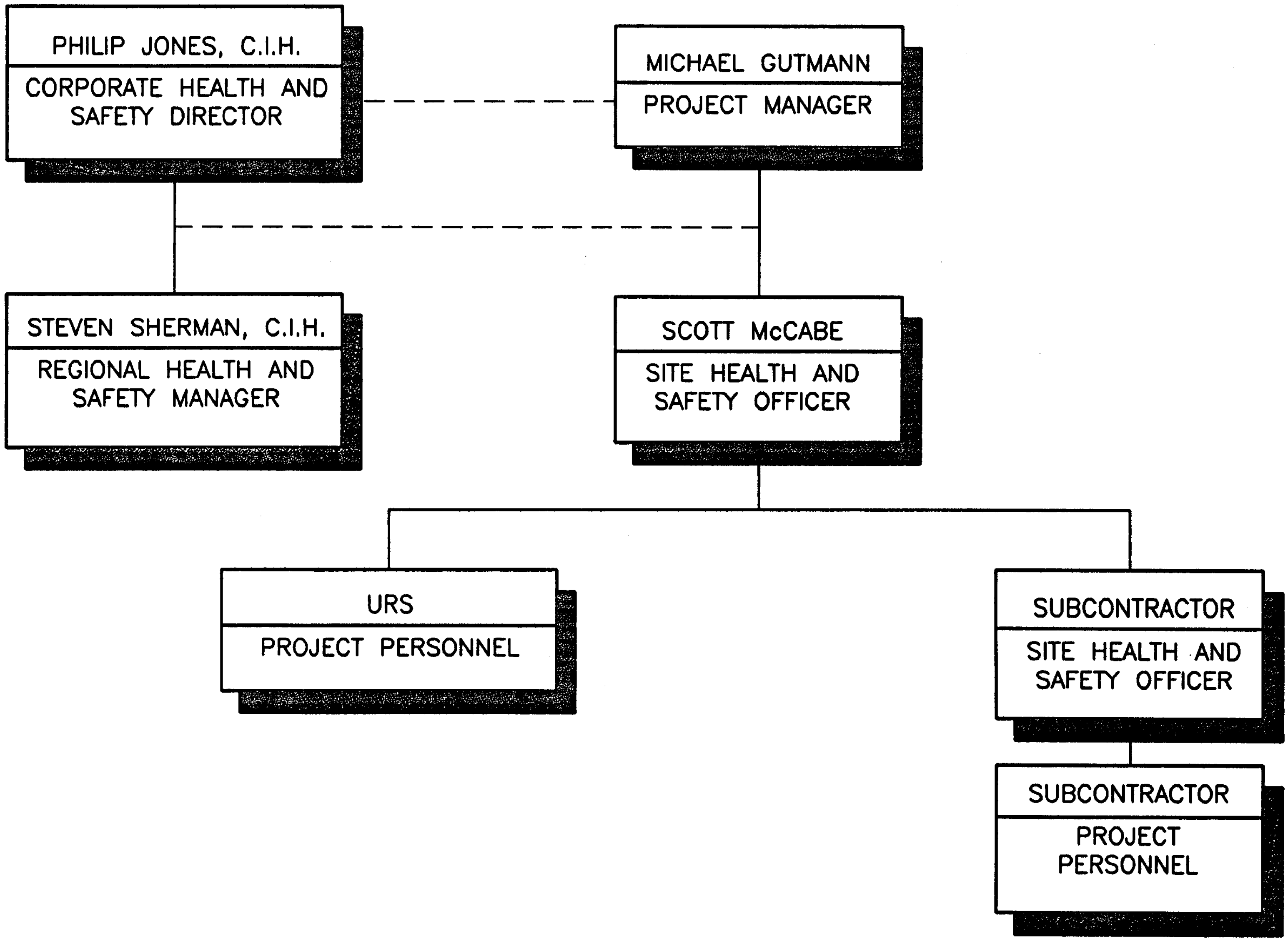


HEALTH AND SAFETY CHAIN-OF-COMMAND

FIGURE C2-1

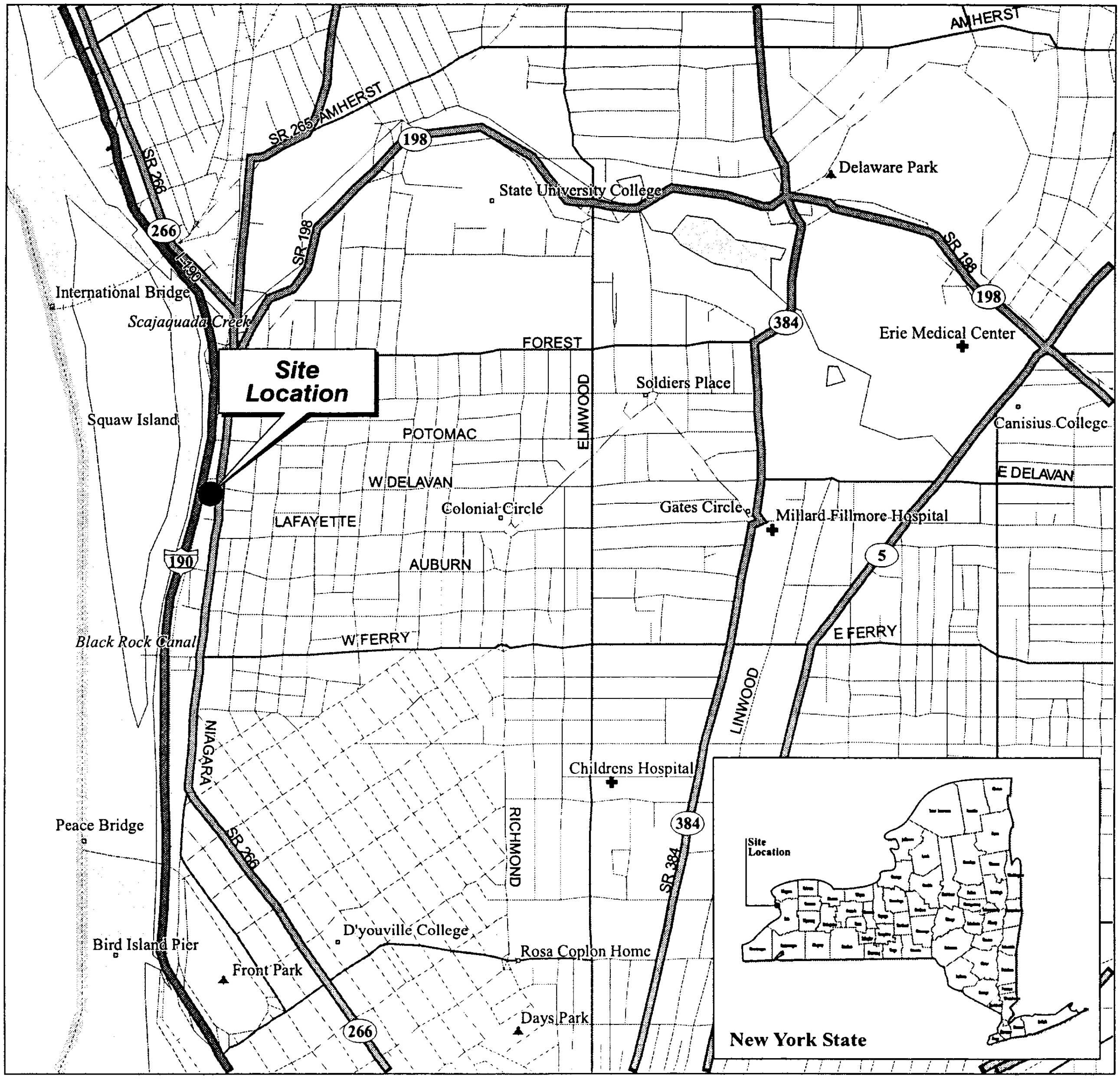
C3.0 SITE DESCRIPTION AND HISTORY

Site Description

Chem-Core is a Class 2 site, listed on the NYSDEC Registry of Inactive Hazardous Waste Sites (NYSDEC Site No. 9-15-176). The Chem-Core Buffalo site is a former chemical wholesaling facility located at 1382 Niagara Street in the City of Buffalo, Erie County, New York (Figure C3-1). Situated on a historically industrial corridor, the site is in close proximity to residential neighborhoods to the east and a Rail corridor to the west with both the Interstate I-190 highway and the Black Rock Channel (which leads from Lake Erie to the Niagara River) farther to the west.

The site is a 3,900 square foot industrial building on approximately 0.15 acres. The facility structures occupy most of the property parcel, with exposed soil in a driveway/yard area at the north end of the site. To the north of the driveway/ yard area is a two-story structure which is operated by Great Lakes Pressed Steel Corp. Just beyond the building to the north is West Delevan Street, a dead-end street which is used as a parking area/ driveway. Of note is the presence of large storm sewer lines which go under this street and flow westward to discharge to the Black Rock Channel. Refer to Figure C3-2 for the location of adjacent properties and other features.

To the south of the site is the former location of the Mentholatum Corporation (new owners, the Garrett Leather Corporation). The western portion of this property has a warehouse building with enclosed loading docks at the north end abutting the Chem-Core building. The eastern part of the property is covered by asphalt parking and driveway areas and various concrete slabs, foundations and sidewalks. An approximate six-inch slab of concrete (without visible existence of rebar) was encountered during installation of the MW - 3 at the southeast corner of the site (Figure C3-2). Of note was the former presence of Underground Storage Tanks (USTs) when Mentholatum operated and occupied a building just south of the Chem-Core site (Figure C3-2). No definite locations for the former USTs has been identified, but the NYSDEC has records of their removal. Also of note were USTs removed from a site across Niagara Street to the east/ southeast of the site which were part of a former Taxi service.



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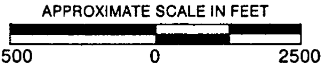

URS

CHEM-CORE FACILITY SITE LOCATION MAP

FIGURE C3-1

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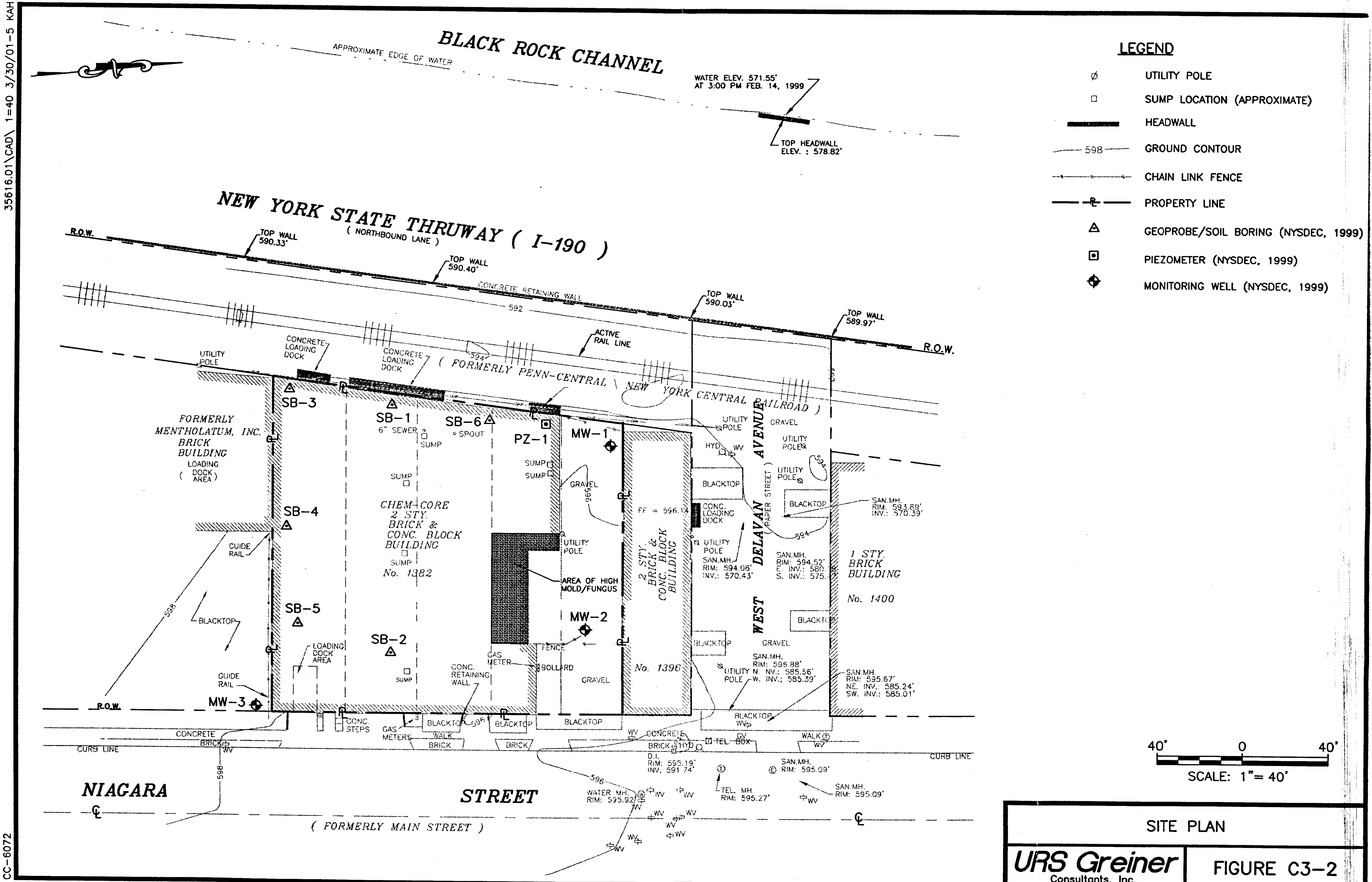


SITE PLAN

URS Greiner
Consultants, Inc.

FIGURE C3-2

CC-6072

To the east of the site, across Niagara Street (five lane roadway), is the Acme Bearing company and a used car lot, with residential housing to the east (approximately 200' from the site). Immediately to the west of the site is an active railway which is utilizing a single track down the center of the rail right-of-way. An approximately 10' tall, concrete retaining wall separates the I-190 highway from the west of the railway. The Black Rock Channel is immediately beyond a concrete and sheet-pile retaining wall to the west of the highway right-of-way.

Site History

The facility has been used for commercial operations since the early 1930s as a chemical-handling facility, with several business and commercial tenants operating from rented portions of the site structures. From the review of an aerial photograph taken in 1938, the on-site building appeared to be constructed similar to the current state. During the initial operation of the company, a significant percentage of the business was related to supplying acids to metal fabrication industries. During the 1950s, sales involved chlorinated solvents for dry cleaning industries. In the 1970s and 1980s, the company sold chlorinated degreasing solvents. Another large percentage of sales involved inert materials such as Diatomaceous Earth, Fuller's Earth and Bentonite Clay. The company also marketed propylene glycol and glycerine to the hand lotion industry and primary alcohol to the printing industry.

Until 1980, Chem-Core received Diatomaceous Earth via a rail spur located directly west of the building. During the 1970s and until 1988, the company received bulk liquid materials at a receiving station on the north side of the building. The materials were transferred into 55 gallon drums by a gravity operated drum filling machine connected to the truck with a hose. The company had a USEPA hazardous waste identification number and was classified as a RCRA small quantity generator.

C4.0 TRAINING REQUIREMENTS

All personnel conducting field activities on site are required to be certified in health and safety practices for hazardous waste operations as specified in the federal OSHA Regulations (29 CFR 1910.120) (revised March 6, 1990). Paragraph (e) (2) of the above-referenced regulations requires that each employee, at the time of job assignment, receive a minimum of 40 hours of initial instruction off the site, and a minimum of three days of supervised field experience.

Paragraph (e) (3) of the above-referenced regulations requires that all onsite management and supervisory personnel directly responsible for, or who supervise employees engaged in hazardous waste operations, must initially receive eight hours of additional specialized training. Management and supervisory training must emphasize health and safety practices related to managing hazardous waste work.

Paragraph (e)(8) of the above-referenced regulations requires that workers and supervisors must receive eight hours of refresher training annually on the items specified in Paragraph (e)(1) and/or (e)(3).

Additionally, all personnel must receive adequate site-specific training in the form of an onsite health and safety briefing given by the Project HSO prior to participating in onsite field work. This will involve a review of this HASP with emphasis on the following:

- Protection of the adjacent community from hazardous substances which may be released during intrusive activities

- Attention to health effects and hazards of substances known to be present on site

- Attention to physical hazards on site, and the importance of knowing proper means of avoiding these hazards

- Health hazards, protective measures, emergency and first aid measures, fire and explosion information, reactivity, incompatible materials, and emergency procedures for spills of hazardous chemicals brought onto the site for use during normal field operations

- Hazards and protection against heat/cold

- The need for vigilance in personal protection, and the importance of attention to proper use, fit, and care of personal protective equipment

- The effectiveness and limitations of personal protective equipment

- Prescribed decontamination procedures

- Site control, including work zones, access, and security

- The proper observance of daily health and safety practices, such as the entry and exit of work zones and the site, proper hygiene during lunch, break, etc.

- Recognition in oneself or in others of physical conditions requiring immediate medical attention, and application of simple first aid measures

- Emergency procedures to be followed (with rehearsals) in cases of fire, explosion, or sudden release of hazardous gases.

The NYSDEC shall be notified when such site-specific training sessions are to be conducted.

Health and safety meetings will be conducted daily by the Site HSO and will cover protective clothing and other equipment to be used that day, potential chemical and physical hazards, emergency procedures, and conditions and activities from the previous day.

All visitors entering the Exclusion Zone or Contamination Reduction Zone will be required to acknowledge, on a sign-off sheet, the review of The Health and Safety Plan. They must be equipped with their own personal protective equipment which meets or exceeds the level of protection in use on site at the time of their visit (see Section C7.0 for a discussion of the work zones).

C5.0 MEDICAL SURVEILLANCE REQUIREMENTS

All URS personnel who engage in onsite activities for 30 days or more per year participate in the Medical Surveillance Program which involves undergoing an annual medical examination. The examination is conducted by a physician who is board-certified in occupational medicine. The physician is familiar with the job-related duties of each worker examined. All URS project personnel involved in onsite activities in the Exclusion Zone at the site participate in the Medical Surveillance Program.

Components of the Medical Surveillance Program are shown in Table C5-1. The physician must state whether the individual is fit to conduct work on hazardous waste sites using personal protection, or whether he or she must work within certain restrictions. Personnel may be excluded from this site for medical reasons. Copies of medical examination reports are given to each employee who are encouraged to forward copies to their personal physician.

Any person exposed to high levels of hazardous substances will be required to undergo a repeat medical exam at or before the conclusion of the project to determine possible health impacts. Any person suffering a lost-time injury or illness must have medical approval prior to returning to work on site. When employment is terminated for any reason, the employee must receive an exit medical examination.

All medical records are held by the employer for the period of employment plus at least 30 years, in accordance with OSHA regulations on confidentiality and any other applicable regulations and will be made available to OSHA upon request.

TABLE C5-1

COMPONENTS OF MEDICAL SURVEILLANCE PROGRAM

- Medical and occupational history
- Physical examination, with particular attention to the cardiopulmonary system, general physical fitness, skin, blood-forming, hepatic, renal, and nervous systems
- Urinalysis, to include:
    - color
    - appearance
    - specific gravity
    - pH
    - ketones
    - protein
    - glucose
    - blood
    - bilirubin
    - leukocyte esterase
    - nitrite
    - WBC
    - RBC
    - casts
    - bacteria
    - epithelial cells
    - crystals
    - yeasts
- Blood analysis, to include:
    - complete blood count
    - hemoglobin
    - albumin, globulin, total protein
    - bilirubin - direct and total
    - g-glutamyl transpeptidase
    - serum glutamic oxalacetic transaminase
    - lactic dehydrogenase
    - alkaline phosphatase
    - sodium
    - potassium
    - chloride
    - magnesium
    - calcium
    - phosphorus
    - uric acid
    - BUN (blood urea nitrogen)
    - creatinine
    - cholesterol
    - triglycerides
    - glucose
    - iron
    - heavy metals - arsenic, lead, mercury, and zinc protoporphyrin
- Pulmonary function test
- Additional tests as appropriate, including:
    - chest X-ray
    - electrocardiogram
    - stress test

C6.0 SITE HAZARD EVALUATION

C6.1 Chemical Hazards

The primary chemicals of concern are volatile organic compounds (acetone, 1,1-dichloroethene, 1,1-dichloroethane, 1,2-dichloroethene, methylene chloride, tetrachloroethylene (PCE), toluene, 1,1,1-trichloroethane, trichloroethylene (TCE) , vinyl chloride, and xylene. The health and safety characteristics and occupational exposure values of these and other chemicals potentially present on site are summarized in Table C6-1. The route of exposure to these contaminants can be by dermal, respiratory, or ingestion, depending on the type of compound and activity being conducted.

Because this work will be carried out within an enclosed building, additional chemical exposure hazards such as carbon monoxide, and fuel vapor, also exist. Field personnel may also be exposed to chemicals used for sample preservation, equipment decontamination, and gases used for instrument calibration. The materials safety data sheets (MSDS) for the above-referenced chemicals and gases are presented in Appendix D.

C6.2 Physical Hazards

Physical hazards range from the dangers of tripping and falling on uneven ground to those associated with the operation of heavy equipment such as drill rigs. During site activities, workers may have to work on drilling equipment by climbing the mast. The drilling subcontractor will assure that their workers conform with any applicable OSHA and NIOSH recommendations for climbing activities. These activities will be overseen by the subcontractor drilling supervisor and URS field geologist.

Field activities that involve drilling usually involve contact with various types of machinery. At least two people on site must be currently American Red Cross-certified in first aid and CPR. Personnel trained and certified in first aid should be prepared to take care of cuts and bruises as well as other minor injuries. A first aid kit approved by the American Red Cross will be present and available during all field activities.

TABLE C6-1
HAZARD CHARACTERISTICS OF POTENTIALLY PRESENT CONTAMINANTS OF CONCERN
CHEM-CORE SITE

SUBSTANCE	TOXICITY/CARCINOGENICITY	OCCUPATIONAL EXPOSURE VALUES*
Acetone	Low to moderate toxicity by ingestion and inhalation. Narcotic in high concentrations.	500 ppm (TLV-TWA) 750 ppm (Ceiling) (3) 1000 ppm (PEL)
1,1-Dichloroethylene	Moderately toxic by ingestion, inhalation, and skin contact. Irritant and narcotic in high concentrations.	5 ppm (TLV-TWA)
1,1-Dichlorethane	Toxic by inhalation, ingestion and skin contact. Suspected human carcinogen.	100 ppm (TLV-TWA and PEL)
1,2-Dichloroethene	Moderately toxic by ingestion, inhalation and skin contact. Irritations and narcotic in high concentrations.	200 ppm (TLV-TWA and PEL)
Methylene Chloride	Moderately toxic. Narcotic in high concentrations.	50 ppm (TLV-TWA) 25 ppm (PEL)
Tetrachloroethylene (Perchloroethylene)	Moderately toxic. Irritating to skin and eyes. Confirmed animal carcinogen.	25 ppm (TLV-TWA) 100 ppm (PEL) 100 ppm (STEL) (2) (TLV) 200 ppm (Ceiling) (3) (PEL)
Toluene	Moderate toxicity via the oral, inhalation, and intraperitoneal routes, low toxicity via the dermal route.	50 ppm (Skin) (1) (TLV-TWA) 200 ppm (PEL) 300 ppm (Ceiling) (3) (PEL)
1,1,1-Trichloroethane	Irritating to eyes and tissue.	350 ppm (TLV-TWA and PEL) 450 ppm (STEL) (2) (TLV)
Trichloroethylene	Toxic by inhalation.	50 ppm (TLV-TWA) 100 ppm (STEL) (2) (TLV) 100 ppm (PEL) 200 ppm (Ceiling (3) (PEL)
Vinyl Chloride	Confirmed human carcinogen.	1 ppm (TLV-TWA and PEL) 5 ppm (STEL) (2) (PEL)

TABLE C6-1 (Continued)

SUBSTANCE	TOXICITY/CARCINOGENICITY	OCCUPATIONAL EXPOSURE VALUES*
Xylene	Toxic by inhalation and ingestion	100 ppm (TLV-TWA and PEL) 150 ppm (ceiling) (3)

Notes

* PELs are 8-hour Time-Weighted Averages (TWAs) unless otherwise noted.

(1) “Skin” Notation ? Listed substances followed by the designation ?Skin? refer to the potential significant contribution to the overall exposure by the cutaneous route, including mucous membranes and the eyes, either by contact with vapors or, of probable greater significance, by direct skin contact with the substance. Vehicles present in solutions or mixtures also can enhance potential skin absorption significantly. It should be noted that while some materials are capable of causing irritation, dermatitis, and sensitization in workers, these properties are not considered relevant when assigning a skin notation. It should be noted, however, that the development of a dermatological condition can significantly affect the potential for dermal absorption.

(2) STEL - Short Term Exposure Limit. 15-minute TWA exposure which should not be exceeded at any time during a work day.

(3) Ceiling - The concentration that should not exceeded during any part of the working exposure.

Definitions

Threshold Limit Values (TLVs) - Refers to airborne concentrations of substances as issued by the American Conference of Governmental Industrial Hygienists (ACGIH) and represents conditions under which it is believed that nearly all workers may be repeatedly exposed, day after day, without adverse effect. TLV is a registered trademark of the ACGIH.

Threshold Limit Value - Time-Weighted Average (TLV-TWA) - The Time-Weighted Average concentration as issued by ACGIH for a normal 8-hour work day and a 40-hour workweek, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect.

Threshold Limit Value - Short-Term Exposure Limit (TLV-STEL) - The maximum concentration as issued by ACGIH to which workers can be exposed continuously for a short period of time (up to 15 minutes) without suffering from 1) irritation, 2) chronic or irreversible tissue damage, or 3) narcosis of sufficient degree to increase the likelihood of accidental injury, impair self-rescue, or materially reduce work efficiency.

TABLE C6-1 (Continued)

Permissible Exposure Limits (PELs) - Exposure limits that are enforceable by the Occupational Safety and Health Administration (OSHA) as legal standards and cannot be exceeded over an 8-hour exposure.

ppm - parts per million, air

mg/m^3 - milligrams per cubic meter, air

References

29 CFR, Part 1910.1000, Tables Z-1 and Z-2, Limits for Air Contaminants, July 1, 1995.

American Conference of Governmental Industrial Hygienists. *2000 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices*, Cincinnati, Ohio.

Hawley, Gessner G. *The Condensed Chemical Dictionary,* Tenth Edition, New York: Van Nostrand Reinhold, 1981.

Sax, R. Irving. *Dangerous Properties of Industrial Materials*, Sixth Edition, New York: Van Nostrand Reinhold, 1984.

Some animals and insects may bite and thereby pose a health hazard in the form of irritation, illness, or poisoning. Anyone bitten should be given immediate first aid as necessary, and shall be transported to the nearest medical facility (if necessary). Members of the field investigation team will be properly briefed regarding the potential for encountering animals and insects. The potential threat of the deer tick and the possibility of contracting Lyme disease is a serious matter. The likelihood of contracting Lyme disease will be greatly decreased by field personnel wearing long pants, long-sleeved shirts, and hard hats. All field personnel will be instructed to take a shower daily upon returning to the hotel or place of residence to further decrease the likelihood of contracting Lyme disease.

Improper lifting by workers is one of the leading causes of industrial injuries. Field workers in the drilling program will often be required to lift heavy objects (drill casings, auger flights, etc.). Therefore, all members of the field crew should be trained in the proper methods of lifting heavy objects. All workers should be cautioned against lifting objects too heavy for one person.

C6.2.1 Biological Hazards

Several areas within the site structure have had previous sampling done by another consulting firm, which showed the presence of elevated levels of airborne fungi (mold). These locations are noted on the site map and/or building plans (Figure C3-2). Specifically, *penicillum* and *aspergillus versicolor* (fungal organisms) were identified which pose a potential health hazard through inhalation. These biological hazards appear to be isolated to these rooms because of the observed presence of wet conditions, and accumulated debris, which presents an environment suitable for significant fungal growth.

There are no suitable means of real-time monitoring for airborne fungi. During investigative activities in these areas, all field personnel will wear Level C PPE and observe standard good practices of disposal or decontamination of footwear and gloves prior to leaving the subject areas. Field personnel will perform the work required in this area with minimal disturbance to the surface areas affected by the fungi. Artificial ventilation measures will not be employed.

C6.3 Temperature Stress

A Heat/Cold Stress Log will be kept and maintained on a daily basis for all personnel wearing protective ensembles on site.

C6.3.1 Heat Stress

The combination of high ambient temperature, high humidity, physical exertion, and personal protective apparel which limits the dissipation of body heat and moisture can cause heat stress. The Site HSO is responsible for monitoring heat stress in the field team personnel.

The following prevention, recognition, and treatment strategies will be implemented to protect personnel from heat stress. Personnel will be trained to recognize the symptoms of heat stress, and to apply the appropriate treatment.

A. Prevention

1. Provide plenty of liquids. Available in the Support Zone will be a 50 percent solution of fruit punch in water, or the like, or plain water.

2. Provide cooling devices. A portable, pump-activated sprayer and containers of tap water will be available in the Contamination Reduction Zone to reduce body temperature, cool protective clothing, and/or act as a quick-drench shower in case of an exposure incident.

3. Adjustment of the work schedule. During the hot summer days, labor-intensive tasks which pose a high potential risk of heat stress can be performed during the coolest part of the day.

B. Recognition and Treatment

Any person who observes any of the following forms of heat stress, either in themselves or in another worker, will report this information to the Site HSO immediately after implementing treatment, if possible.

1. Heat Rash (prickly heat):

Cause:	Continuous exposure to hot and humid air, aggravated by chafing clothing.
Symptoms:	Eruption of red pimples around sweat ducts, accompanied by intense itching and tingling.
Treatment:	Remove source of irritation and cool the skin with water or wet cloths.

2. Heat Syncope (fainting):

Cause:	Sun rays beating down on victim's head and prolonged upright position can lead to mild dehydration and contraction of the blood vessels resulting in a temporary deficiency of blood to the brain.
Symptoms:	Brief loss of consciousness.
Treatment:	Worker should assume a horizontal position and drink 2 liter to 1 liter of fluid (not alcohol). Elevate the legs and cover the head.

3. Heat Cramps (heat prostration):

Cause:	Profuse perspiration accompanied by inadequate replenishment of body water and electrolytes.

Symptoms: Sudden development of pain and/or muscle spasms in the abdominal region.

Treatment: Move the worker to the Contamination Reduction Zone. Remove protective clothing. Provide fluids orally. Decrease body temperature and allow a period of rest in a cool location.

4. <u>Heat Exhaustion (heat toxemia, sunstroke)</u>:

Cause: Overexertion in a hot environment and profuse perspiration accompanied by inadequate replenishment of body water and electrolytes. A serious condition.

Symptoms: Muscular weakness, tiredness, staggering gait, nausea, dizziness, shallow breathing, pale and clammy skin, approximately normal body temperature.

Treatment: Perform the following while simultaneously making arrangements for transport to a medical facility: Move the worker to the Contamination Reduction Zone. Remove protective clothing. Lie the worker down on his or her back, in a cool place, and raise the feet 6 to 12 inches. Keep warm, but loosen all clothing. If conscious, provide sips of a salt water solution using one teaspoon of salt in 12 ounces of water. Transport the worker to a medical facility.

5. <u>Heat Stroke</u>:

Cause: Same as heat exhaustion. An extremely serious condition.

Symptoms: Dry, red, hot skin, dry mouth, dizziness, nausea, headache, rapid pulse. Temperature continues to rise unless treatment is implemented.

Treatment: The basic principle is to lower the body temperature rapidly.

1. Move the victim out of the sun.
2. Remove clothes.
3. Soak victim completely with water, wet hair as well.
4. Place victim in front of a fan or in a breeze, if possible.
5. If ice is available, apply directly to the victim, especially under the arms and on the head.
6. Monitor body temperature with available thermometers. Temperature should start to decrease within minutes.
7. As temperature approaches 101 degrees Fahrenheit (°F), stop cooling measures and initiate transport to a hospital or declare an emergency response. The temperature should continue to fall, often to subnormal, during this period.

Other considerations in treating heat stroke are:

1. Rub skin briskly during cooling process.
2. If cardiac arrest occurs, perform CPR (ONLY IF CERTIFIED) and continue cooling.

3. If a seizure occurs, continue cooling; the seizure will stop.
4. No drugs of any kind are to be given to the victim.

C. Heat Stress - Predisposing Factors

Preventing heat stress is clearly preferred to treatment. The following factors increase the individual's risk of heat stress:

- Physically unfit
- Age
- Not accustomed to heat
- Sunburn
- Alcohol and drugs
- Dehydration
- Heavy or non-breathable clothing
- Not covering one's head

C6.3.2 Cold Stress

Personnel can be susceptible to cold stress while conducting field work during cold weather months. To guard against cold stress and to prevent cold injuries, appropriate warm clothing should be worn, warm shelter must be previously identified and readily available, rest periods should be adjusted as needed, and the physical conditions of onsite field personnel should be closely monitored. All personnel working onsite must be able to recognize the signs and symptoms of cold stress and apply first aid as needed. The Site HSO is responsible for monitoring the signs and symptoms of cold stress among field personnel.

The development of cold stress and cold injuries is influenced by three factors: the ambient temperature, the velocity of the wind, and the amount of sunshine. Fingers, toes, and ears are the most susceptible parts of the body affected by cold.

A. Frost Nip:

Frost nip is the first sign of frost bite and is the only form of local cold injury that can be definitively treated in the field.

Symptoms:	A whitened area of the skin which is slightly burning or painful.
Treatment:	Rewarming the affected part.

B. Frost Bite: Local damage is caused by exposure to low temperature environmental conditions. It results at temperatures when ice crystals form, either superficially or deeply, in the fluids and underlying soft tissues of the skin. The nose, cheeks, ears, fingers, and toes are most commonly affected.

Symptoms:	Skin is cold, hard, white, and numb. There may also be blisters. The affected parts will feel intensely cold; however, there may not be any pain. The victim may not know that he or she is frost-bitten.

As time goes on, the victim may experience mental confusion and impairment of judgment. The victim may stagger and eyesight may fail. The victim may fall and become unconscious. Shock is evident and breathing may cease. If death occurs, it is usually due to heart failure.

Treatment: Generally, definitive thawing should not be performed in the field, because if re-freezing occurs, it could result in severe damage. The victim should be transported to a medical facility after the following measures are instituted:

Do Not:

- Do not walk on a thawed foot or toes or use thawed hands.
- Do not allow victim to smoke or drink alcohol.
- Do not rub affected area with anything.
- Do not break any blisters.
- Do not apply heat of any kind.

Do:

- Do place victim in protected environment.
- Do prevent further heat loss (warmer clothes).
- Do protect from further damage (warm covering).

C. Mild Hypothermia

Symptoms: The single most important sign of mild hypothermia is a change in behavior. Some signs that can be observed are:

- Decrease in work efficiency
- Decreased level of communication
- Forgetfulness

- Poor judgment
- Poor motor skills (difficulty in handling objects, dropping tools)

The target organ of mild hypothermia is the brain. During mild hypothermia, most of the body's protective mechanisms for temperature control are intact. Shivering is usually present and "goose flesh" and pale skin persist. When asked directly, the victim will usually say that he feels cold. A worker impaired by mild hypothermia can be a danger to himself and co-workers.

Treatment:

- The victim should be moved indoors or into a heated vehicle.
- Remove all wet or damp clothing, dry skin, and apply dry clothing.
- The head should be covered with a hat or blanket.
- Blankets should be put on the victim.
- The victim should be given hot fluids (no alcohol).
- If possible, monitor the victim's temperature at 15 minute intervals.

D. Moderate Hypothermia

For field purposes, this may be defined as the stage at which the patient is clearly incapable of functioning effectively, but is conscious.

Symptoms: The victim's body temperature is well below normal and some mental changes may occur which include:

- Disorientation to people, place, and time
- Hallucinations
- Inappropriate laughing or crying
- Bizarre behavior for that individual

During moderate hypothermia, shivering is absent, "goose flesh" disappears, and the heart rate may slow down. The victim does not "feel" cold.

Treatment:

- First, treat the patient for mild hypothermia
- Provide warming with hot blowers or heaters
- Use human body heat
- Watch for signs of returning to normal (e.g., shivering, goose flesh, teeth chattering)
- Monitor mental status

After these steps are initiated, the victim should be taken to a medical facility. The patient should not return to work for at least 48 hours.

E. Severe Hypothermia

Symptoms: Characterized by a decrease in the body temperature which results in a deep coma in which even vital signs become very weak and finally undetectable. Most occupational cases occur when the victim is alone or lost. These victims, for all practical purpose, appear to be dead, but the saying "not dead until warm and dead" applies to severe hypothermia. Many of these victims can survive.

Treatment:

- The patient is not to be considered dead.
- Remove wet clothes, dry skin, and apply dry clothes.
- Activate rewarming.
- Prepare to transfer the victim to a medical facility.
- If the patient is pulse-less and is not breathing, perform CPR (ONLY IF CERTIFIED), while enroute to the medical facility.
- Very cold victims often tolerate long periods of arrest, even without CPR. The victim must be handled very carefully because of extreme susceptibility to even minor trauma.

C6.4 Overhead Utility Line Hazards

A daily inspection will be performed to determine whether drilling activities will be done in proximity to overhead utility lines.

The following distances will be maintained from overhead utility lines:

- up to 50KV: at least 10 feet
- over 50KV: add a half foot per KV
- overhead lines of unknown voltage will require a distance of at least 20 feet from the drilling rig boom

Any work which will take place at distances of less than 10 feet from overhead lines will require either de-energizing and ground of those lines or isolation shielding per 29CFR1910.333.

C6.5 Electrical Shock Hazards

- All electrical equipment will be powered by circuits or extension cords equipped with ground-fault circuit interrupters (GFCI).
- Only three pronged extension cords will be used.
- All power lines, circuits, and receptacles in the building will be presumed to be energized unless tested.

C6.6 Noise

Hearing protection (ear plugs or muffs) will be used with equipment such as the drill rig, jackhammers, concrete saws, etc. In the absence of noise monitoring data, personnel should assume that if normal conversation cannot be carried out near operation equipment, then hearing protection is required.

C7.0 SITE CONTROL

To keep unauthorized personnel from entering the work area during drilling, or environmental sampling activities, and for good control of overall site safety, three work zones will be established. These zones are the Support Zone, the Contamination Reduction Zone, and the Exclusion Zone. Actual Exclusion Zone size will be determined by the optimal size of work area and by local obstructions.

C7.1 Support Zone

The Support Zone for the Chem-Core Site will be the area where support facilities, such as the equipment storage shed, will be located. A clean storage area or supply truck will contain personal protective equipment (disposable suits, gloves, boots, etc.), a first aid kit, a fire extinguisher, a stretcher, sampling equipment, sample containers, non-caffeinated beverages, drinking water, and self-contained breathing apparatus. Emergency eyewash(s) will be staged at work areas.

C7.2 Contamination Reduction Zones

A mobile Contamination Reduction Zone will be staged adjacent to each active drilling Exclusion Zone. During drilling operations, materials brought to the surface may come in contact with workers' boots or protective clothing and equipment. A mobile decontamination area will be set up adjacent to the active drilling area. All personnel in the active drilling area will be required to decontaminate themselves and light equipment prior to leaving the active drilling Exclusion Zone.

C7.3 Exclusion Zone

The Exclusion Zone is the area around each active drilling or sampling location. The exact size of this active Exclusion Zone will be determined by optimal size of work area and by local obstructions. All personnel leaving the active or Exclusion Zone will be required to do so via the mobile Contamination Reduction Zone, and to carry out proper decontamination procedures.

C7.4 Site Visitation

It is expected that officials from the NYSDEC and other regulating bodies and jurisdictions will visit the site during operations. It is also possible that an OSHA representative will wish to inspect the operations and visits by the local press may also occur. All such visitors must meet the same requirements as onsite workers (OSHA-approved training, site-specific training, use of PPE, and medical surveillance) before going into any Exclusion Zone. All visitors must sign-off as having read this HASP prior to entering an Exclusion Zone. Visitors other than the NYSDEC, OSHA, New York State Department of Health (NYSDOH), or town or county government representatives will be subject to the additional requirement of having to receive written permission from the NYSDEC to enter an Exclusion Zone. A Daily Site Visitors Log will be kept and all visitors to the site will sign in and provide their affiliation, the date of visit, affirmation that they have read and understood the HASP, arrival time, departure time, and purpose of visit.

C8.0 PERSONAL PROTECTION

Since personnel working on site may be exposed to chemical contaminants released during intrusive activities, or may come in contact with contaminants in wastes, drill cuttings, or soils, various levels of protection must be available. Components of all levels of personal protection that will be available are listed in Table C8-1. The anticipated levels of protection for various field activities are given in Table C8-2.

In the event that monitoring shows exceedance of action levels established for this site, personnel working in Level D protection will don their respirators (change to Level C). The Site HSO will consult with the Project HSO to decide if and when Level D protection may be resumed, or if a higher level of personal protection is required.

Some modification in safety equipment (e.g., switching from poly-coated disposable coveralls to standard disposable coveralls) may be implemented to balance concerns for full contaminant protection against concerns for the possibility of heat stress resulting from the need to wear more restrictive protective equipment. Such modifications may be implemented only if approved in advance by the Site HSO, following consultation with the Project HSO. Protective equipment which fully complies with the requirements of all required levels of protection will be immediately available at all times on the site.

Level C respiratory protection normally will be provided using NIOSH-approved full-face respirators, with high-efficiency particulate air (HEPA P-100) combination filter cartridges approved for removing organic vapors, particulates, gases, and fumes. The filter cartridges will be changed at the end of each work day or when breakthrough occurs, whichever comes first. All URS field team members will have been fit-tested for respirators using irritant smoke prior to project assignment. Due to difficulties in achieving a proper seal between face and mask, persons with facial hair will not be allowed to work in areas requiring respiratory protection. Contact lenses are no longer prohibited by OSHA.

TABLE C8-1
COMPONENTS OF PERSONAL PROTECTION LEVELS
CHEM-CORE SITE

Level D Protection	Level C Protection
Safety glasses with side shields (or goggles)	Full-face air-purifying respirator
Hard Hat, ANSI-approved	Hard Hat
Steel-toe, steel-shank work shoes or boots (ANSI-approved chemical resistant)	Steel-toe, steel-shank work shoes or boots (chemical resistant)
Face shield (optional)	Poly-coated disposable coveralls
Poly-coated disposable or standard disposable coveralls (optional)	Inner gloves of snug-fitting latex or nitrile (optional)
Inner gloves of snug-fitting latex or nitrile (optional)	Outer boots of neoprene or butyl rubber of disposal outer "booties" (optional)
Outer gloves of neoprene or nitrile (optional)	Duct-taping of gloves and boots to disposable coveralls (optional)
Outer boots of neoprene or butyl rubber or disposable outer "booties" (optional)	

Notes:

1. The use of optional equipment is primarily dependent upon site conditions.

2 Respirator to be fitted with NIOSH-approved high-efficiency filter (HEPA P-100) combination respirator cartridges approved for organic vapors, particulates, gases, and fumes.

TABLE C8-2
PLANNED LEVELS OF PERSONAL PROTECTION FOR EACH ACTIVITY
CHEM-CORE SITE

Field Activity	Level of Protection*
A. Non-Intrusive Activities	
1. Site Reconnaissance/Surveys	D
2. Land Surveying	D
3. Support Zone Activities	D
B. Intrusive Activities	
1. Drilling/Monitoring Well Installation**	D+/C
2. Environmental Sampling	D/C
3. Equipment Decontamination	D/C

Notes:

* These are the levels of protection at which work will commence during the various activities on the site. Due to onsite conditions, and as directed by the Site HSO, it may become necessary to upgrade, or it may be possible to downgrade, the level of personal protection.

** Geoprobe borings in the area of high fungi/mold will be performed in Level C PPE.

Level D+ includes the requirements specified in Table 8-1 for Level C with the exception of the full-face air-purifying respirator.

C9.0 AIR MONITORING

Real-time air monitoring will be performed during all intrusive activities (e.g., drilling, and monitoring well installation) by trained URS personnel. While sampling activities are in progress, monitoring frequencies will be as summarized in Table C9-1. Air monitoring equipment will be calibrated daily and all data will be recorded in the field notebook and transferred to Instrument Reading Logs (Appendix B). Each day, intrusive work will not begin until the instruments are calibrated and background levels are taken and recorded. Air will be monitored for total volatiles with a photoionization detector (PID) (HNu Model PI 101, 10.2 eV lamp, or equivalent). Explosive atmosphere, oxygen content, and hydrogen sulfide will be monitored with an explosimeter (Bacharach Sentinel 44, or equivalent). Particulates will be monitored during drilling using a MIE PDM-1000 Miniram dust/aerosol monitor, or equivalent. All real-time air monitoring results and meteorological data (e.g., temperature range, wind speed, wind direction, etc. obtained from onsite measurements and/or national weather service, radio, or airport) will be recorded in the field notebook and will be transferred to Instrument Reading Logs.

C9.1 Total Volatiles

Air monitoring for total volatiles (organic vapors) will be performed using a PID (HNu Model PI 101, or equivalent) equipped with the standard probe which contains a 10.2 eV lamp. When readings less than 1 part per million (ppm) above background in the breathing zone are observed consistently, monitoring will take place at least every 10 minutes or for every sample retrieved and Level D protection will be utilized. When readings between 1 ppm and 5 ppm above background in the breathing zone are observed consistently, monitoring will be continuous and Level D+ protection will be utilized. If readings from 5 to 10 ppm above background in the breathing zone are observed, and all other action levels indicate that intrusive activities can proceed, monitoring will be continuous and Level C protection will be utilized. If organic vapor readings exceed 10 ppm above background in the breathing zone, or other instrument readings necessitate work suspension, intrusive activities will be halted and the level of protection used by onsite personnel will be reassessed. Monitoring frequencies during intrusive activities will be as summarized in Table C9-1.

TABLE 9-1
ACTION LEVELS DURING INTRUSIVE ACTIVITIES

Organic Vapors (PID)	Combustibles	Oxygen	Hydrogen Sulfide	Particulates	Responses
6-1 ppm Above Background, Sustained Reading	0-10% LEL	19.5-23.5%	0-5 ppm	<0.10 mg/m^3	• Continue intrusive activities. • Level D protection. • Continue monitoring every 10 minutes/every sample retrieved in work area.
1-5 ppm Above Background, Sustained Reading	0-10% LEL	19.5-23.5%	5-10 ppm	0.10-0.15 mg/m^3	• Continue intrusive activities. • Level D+ protection. • Continuous monitoring for organic vapors in the work area and at the Exclusion Zone perimeter. • Continuous monitoring for LEL, O_2, and H_2S in the work area.
5-10 ppm Above Background, Sustained Reading	0-10% LEL	19.5-23.5%	5-10 ppm	>0.15 mg/m^3	• Continue intrusive activities. • Level C protection. • Continuous monitoring for organic vapors in the work area and at the Exclusion Zone perimeter. • Continuous monitoring for LEL, 0_2, and H_2S in the work area. • Employ dust suppression measures if particulate readings > 0.15 mg/m^3 above background are sustained over 15 minute period.
>10 ppm Above Background, Sustained Reading	>10% LEL	<19.5% or >23.5%	>10 ppm	>0.15 mg/m^3	• Temporarily suspend intrusive activities. • Withdraw from area; shut off all engine ignition sources. • Continuous monitoring for organic vapors at Exclusion Zone perimeter if organic vapor readings >10 ppm. • Continuous LEL monitoring in breathing zone if LEL reading >10%. • Employ dust suppression measures if particulate readings > 0.15 mg/m^3 above background are sustained over 15 minute period. • Consult with Project HSO.

Notes:

Air monitoring for action levels will occur in the breathing zone.

If action levels for any one of the monitoring parameters is exceeded , the appropriate responses listed in the right hand column should be taken.

C9.2 Explosive Atmosphere/Oxygen Content/Hydrogen Sulfide Gas

A Bacharach Sentinel 44 combustible gas indicator (CGI), or equivalent, will be used to monitor for explosive atmosphere, percent oxygen, and hydrogen sulfide content. Readings greater than 10% LEL, less than 19.5% oxygen, greater than 23.5% oxygen, or greater than 10 ppm hydrogen sulfide will require temporary suspension of intrusive activities until the Project SHO determines a safe re-entry level.

C9.3 Particulates

Particulate monitoring will be conducted during any drilling activities involving dry soils or concrete slab penetration. Particulates will be monitored in the active work area upwind and downwind from the activated drilling location. If particulate levels, integrated over a period not to exceed two minutes under windy conditions or 10 minutes under calm conditions, at the downwind location are in excess of 0.15 mg/m^3, the upwind station will be monitored immediately using the same monitor. If the downwind measurement exceeds the background measurement by more than 0.15 mg/m^3, operations will be temporarily suspended and water may be used to suppress the dust. Operations will be continued once ambient conditions improve, as determined by the Site HSO.

C9.4 Work Stoppage Responses

The following responses will be initiated whenever one or more of the action levels necessitating a work stoppage is exceeded:

- The Site HSO will be consulted immediately.
- All personnel (except as necessary for continued monitoring and contaminant mitigation, if applicable) will be cleared from the work area (e.g., from within the Exclusion Zone).

Any chemical release to air, water, or soil must be reported to the Site HSO at once. Any exposure resulting from protective equipment failure must be immediately reported to the Site HSO and to the Project HSO in writing within 24 hours.

C9.5 Calibration of Air Monitoring Instruments

Photoionization Detector: The photoionization detector will be calibrated to a benzene surrogate daily (prior to field activities) and the results will be recorded in the field notebook and transferred to Instrument Reading Logs.

Explosimeter: Once a day, the explosimeter will be calibrated to a methane gas and hydrogen sulfide gas standard. Prior to each use, the oxygen sensor will be air-calibrated at an upwind location. This calibration involves adjusting the meter to read 20.9%, the concentration of oxygen in ambient air.

Particulate Monitor: All instrument operation checks will be performed prior to use each day according to manufacturer specifications. The instrument will be zeroed daily using a "zero-air" bag per manufacturer's recommendations.

C9.6 Community Air Monitoring Plan

Real-time air monitoring for volatile organic compounds will be conducted at the perimeter of the Exclusion Zone during the drilling program as follows:

- Volatile organic compounds and dust particulates will be monitored at the downwind perimeter of the exclusion zone on a periodic basis. If total organic vapor levels exceed 5 ppm above background, work activities will be halted and monitoring continued under the provisions of a Vapor Emission Response Plan (Section C9.7.1). All readings will be recorded and be available for NYSDEC and NYSDOH personnel to review if requested.

- If particulate levels at the downwind station exceed particulate levels at the upwind station by more than 0.15 mg/m^3, work activities will be halted and appropriate dust suppression measures will be employed.

C9.6.1 Vapor Emission Response Plan

If the ambient air concentration of organic vapors exceeds 5 ppm above background at the perimeter of the Exclusion Zone, activities will be halted and monitoring continued. If the organic vapor level decreases below 5 ppm above background, work activities can resume. If the organic vapor levels are greater than 5 ppm over background but less than 25 ppm over background at the perimeter of the Exclusion Zone, activities can resume provided the organic vapor level 200 feet downwind of the Exclusion Zone or half the distance to the nearest residential or commercial structure, whichever is less, is below 5 ppm over background.

If the organic vapor level is above 10 ppm at the perimeter of the Exclusion Zone, activities must be shut down. When work shutdown occurs, downwind air monitoring as directed by the Site HSO will be implemented to ensure that vapor emission does not impact the nearest residential or commercial structure at levels exceeding those specified in the Major Vapor Emission Response Plan (Section C9.7.2).

C9.6.2 Major Vapor Emission Response Plan

If any organic vapor levels greater than 5 ppm over background are identified 200 feet downwind from the Exclusion Zone or half the distance to the nearest residential or commercial property, whichever is less, all work activities will be halted.

If, following the cessation of work activities, or as the result of an emergency, organic vapor levels persist above 5 ppm above background 200 feet downwind from the Exclusion Zone or half the distance to the nearest residential or commercial property, then the air quality will be monitored within 20 feet of the perimeter of the nearest residential or commercial structure (20-foot zone).

If efforts to abate the emission source are unsuccessful and organic vapor levels approaching 5 ppm persist for more than 30 minutes in the 20-foot zone, then the Major Vapor Emission Response Plan shall automatically be placed into effect. Also, the Major Vapor Emission Response Plan shall be immediately placed into effect if 20-foot zone organic vapor levels are greater than 10 ppm above background.

Upon activation of the Major Vapor Emission Response Plan, the following activities will be undertaken:

- All Emergency Response authorities will immediately be contacted by the Site HSO and advised of the situation.

- Air monitoring will be conducted at 30 minute intervals within the 20-foot zone. If two successive readings below action levels are measured, air monitoring may be halted or modified by the Site HSO.

C10.0 SAMPLE HANDLING

The collection and analysis of environmental samples will require caution, not only to ensure the safety of site sampling and support personnel, but also to ensure accuracy of results. To minimize hazards to laboratory personnel, sample volumes will be no larger than necessary, and the outside of all sample containers will be wiped clean prior to shipment. All sample handling will be done wearing surgical gloves. Packaging and preparation of shipping paperwork will only be done by personnel who have received URS USDOT training.

To preserve sample integrity and to prevent contaminant escape, packaging of samples will follow the sampling protocols outlined in the *Part A - Field Sampling Plan* (FSP). All samples will be placed in a sealed shipping container prior to shipment.

Provisions for chain-of-custody documentation are also described in Section A9.0 of the FSP.

C11.0 DECONTAMINATION PROCEDURES

C11.1 Decontamination of Personnel

Protective clothing, boots, and gloves will be decontaminated before entering the Support Zone by a thorough soap-and-water wash prior to leaving the Exclusion Zone. Personnel performing intrusive tasks in potentially contaminated areas (drilling and environmental sampling) will be advised that all clothing worn under protective clothing (i.e., underwear, shirts, socks, trousers) should be laundered separately from street clothing before re-wearing. If protective clothing is breached and personal clothing becomes contaminated, the personal clothing will be disposed of.

C11.2 Decontamination of Equipment

Decontamination of sampling equipment is described in the FSP. Other light equipment (such as tools, containers, monitoring instruments, radios, clipboards, etc.) will be segregated and deposited on plastic drop cloths or in plastic-lined containers placed in the Contamination Reduction Zone, and will be wiped off with damp cloths.

Decontamination of drilling equipment, such as auger flights, and heavy equipment and vehicles will be carried out by high-pressure water in the Contamination Reduction Zone.

All decontamination activities will be done wearing PPE appropriate to the hazard. Use of solvents will require dermal and respiratory protection.

C12.0 EMERGENCY PROCEDURES

The most likely incidents for which emergency measures may be required are:

- An exposure-related worker illness
- A sudden release of hazardous gases/vapors during drilling or excavation
- An explosion or fire occurring during drilling or excavation
- A heavy equipment-related accident, or other accident resulting in personal injury
- Slipping, tripping, or falling resulting in personal injury
- Spill of contaminated liquid or solid

Emergency procedures established to respond to these incidents are covered under the sections that follow.

C12.1 Communications

Communications will be centered in the field vehicles, which will contain telephones for direct outside communications with emergency response organizations. The vehicles also will contain two-way radios for contact with personnel working on site. If the Onsite Coordinator or designee leaves a field vehicle, a radio will be carried by him at all times. A radio will be maintained at the drill rig and with any groups of personnel who are performing tasks on site (e.g., environmental sampling).

C12.2 Escape Routes

Flags will be positioned near drill rigs to indicate wind direction. In the event of a sudden release of hazardous gases or a fire, all personnel will be required to move upwind or at 90 degrees away from the location of the release or fire, toward the site exit point. This may require personnel to move from the Exclusion Zone directly into an offsite area without proper decontamination. At the conclusion of the emergency, they should perform proper decontamination.

C12.3 Evacuation Signal

In the event of a sudden release or fire requiring immediate evacuation of the site, three quick blasts will be sounded on an air horn. Sounding the air horn will be the responsibility of the drill rig operator, backhoe operator, or the supervising geologist. The horns will be kept in a conspicuous place for quick access by personnel. An air horn will be kept in the Contamination Reduction Zone as well. The NYSDEC and the Project HSO will be notified by telephone, and later by written report, whenever a site evacuation is executed.

C12.4 Other Signals

Emergency hand signals for use by personnel wearing air-purifying respirators are summarized in Table C12-1.

C12.5 Fire

In the event of a fire that cannot be controlled with available equipment, Onsite Coordinator or designee will summon the local fire department immediately and apprise them of the situation upon their arrival. The NYSDEC also will be notified, (see Table C12-2 for telephone numbers of emergency response agencies).

C12.6 First Aid

At the startup of field activities, the Project HSO will contact hospital personnel regarding the potential hazards at the site. First aid for personal injuries will be administered, if possible, at the shed by the Onsite Coordinator or designee. If a site worker should require further treatment, the individual will be transported to the hospital in the URS vehicle located on site or an ambulance will be summoned. The onsite vehicle will carry written directions to the hospital as well as a copy of Figure C12-1 showing the route.

TABLE C12-1
EMERGENCY HAND SIGNALS
CHEM-CORE SITE

•	Hand gripping throat	Can't breathe.
•	Grip partner's wrist, or	Leave area immediately, no debate!
		place both hands around wrist.
•	Hands on top of head	- Need assistance.
•	Thumbs up	- I am all right, OK, I understand.
•	Thumbs down	- No, negative.

TABLE C12-2
EMERGENCY TELEPHONE NUMBERS
CHEM-CORE SITE

Emergency Response Agencies

City of Buffalo Fire Department	911
City of Buffalo Police Department	911
Erie County Sheriff Department	911

Medical Facilities

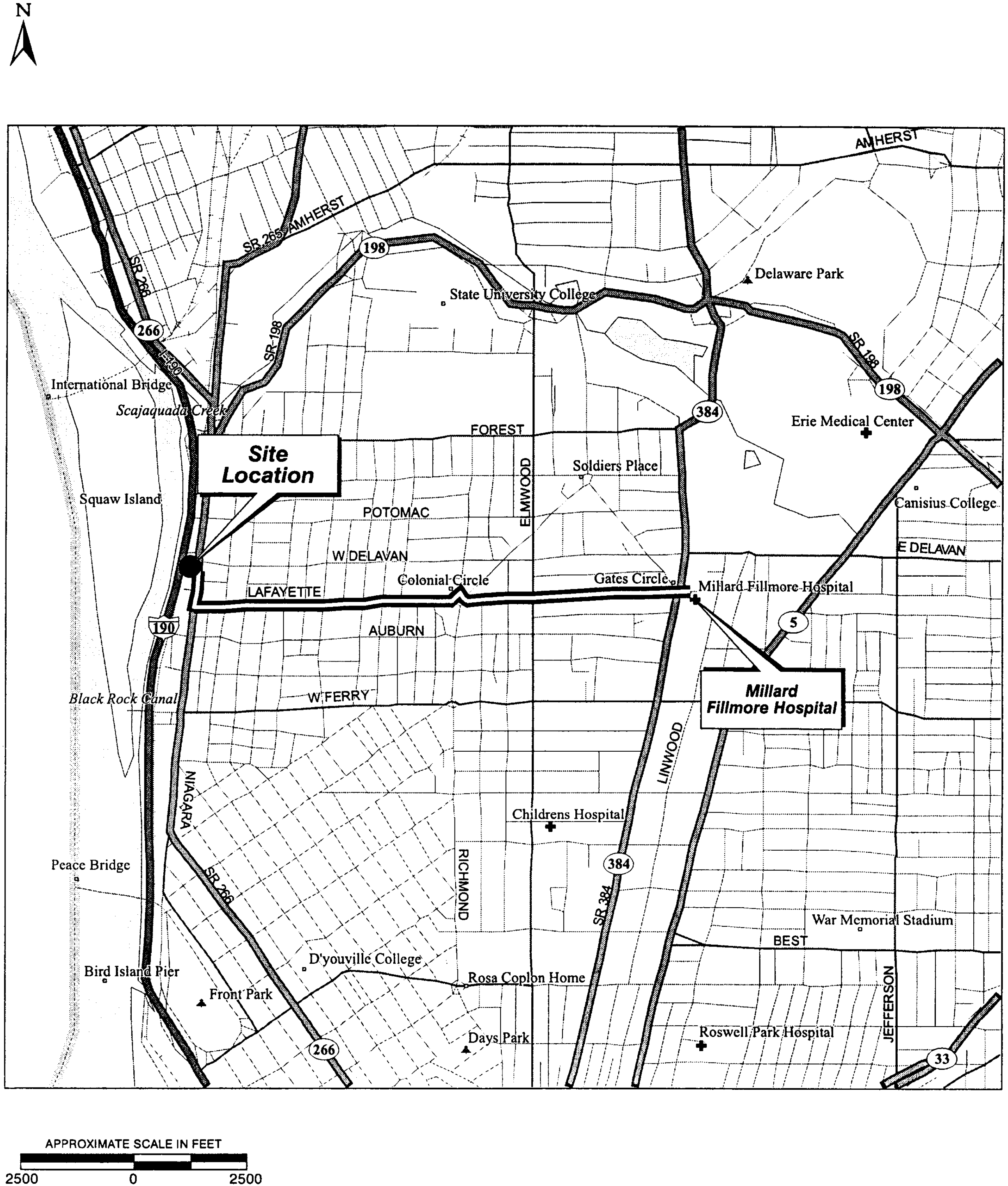
Millard Fillmore Hospital	(716) 568-3600
3 Gates Circle	(Emergency) (716) 568-6550
Buffalo, New York 14209	

Environmental and Health Agencies

USEPA National Response Center (chemical spills, oil spills, pollutant discharges)	1-800-424-8802
New York State Department of Environmental Conservation	(716) 226-2466
(Vivek Nathanami, PE) - Albany	(518) 457-0315
Maurice Moore - Buffalo Region 9	(716) 851-7220
Dave Szymanski - Buffalo Region 9	(716) 851-7220
New York State Department of Health - Toxics Coordinator (Matt Forcucci)	(716) 847-4385

URS

Michael Gutmann	(716) 856-5636
Steven Jay Sherman, C.I.H.	(716) 856-5636 (W) (716) 688-0084 (H)



From Site head South on Route 265 (Niagara Street) for approximately ¼ mile and make a left onto Lafayette Avenue. From Lafayette Avenue head East for approximately 2 miles. The hospital is located on the right in the Gates Circle area.

Millard Fillmore
Gates Circle Hospital
3 Gates Circle, Buffalo

Information: (716) 887-4600
Emergency: (716) 887-4880

URS

CHEM-CORE FACILITY ROUTE TO THE HOSPITAL

FIGURE C12-1

All accidents, however insignificant, will be reported to the Site HSO, who will report the accident to the Project HSO. All personnel designated to administer first aid will have received a minimum of eight hours training in first aid and CPR, and been certified by the American Red Cross.

In the event of a serious personal injury requiring offsite medical attention, the injured person will first be moved to the Contamination Reduction Zone, where an attempt will be made to go through the decontamination procedures, including removal of protective clothing. If the injury is life threatening, decontamination will be of secondary importance and the injured party will be taken directly to the hospital. If a head, neck, back, or spinal injury is suspected, the injured person will not be moved and an ambulance will be summoned to the site.

C12.7 Emergency Assistance

The name, telephone number, and location of police, fire, hospital, and other agencies whose services may be required, or from whom information may be needed, will be kept in the field vehicle. The list is presented in Table C12-2.

If an ambulance should have to be called to the site, the injured person should meet the ambulance outside the Exclusion Zone if possible. If a head or spinal injury is suspected or the person is unconscious for any reason, medical personnel may have to come into the Exclusion Zone.

C12.8 Spills

The potential for spills to occur during onsite work at the site is minimal, since the direct handling of hazardous waste containers (drums, tanks, etc.) is not expected to be part of the scope of work. In the event that residual materials are spilled on site, the following procedures will be implemented.

C12.8.1 Liquid Spills

If a liquid (decontamination water, well development water, etc.) is spilled on a permeable surface, 2 inches of surficial soil will be removed where the spill occurred and drummed. The area later will be either backfilled with clean soil or regraded. If liquid is spilled on an impermeable surface, a sorbent material will be applied to the spill area. The sorbent material will be swept up and drummed, and the spill area washed down with clean water.

C12.8.2 Soil Spills

Contaminated soil spilled on a permeable surface will be shoveled into a drum, and the top 2 inches of soil where the spill occurred also will be removed and drummed. The area then will be either backfilled with clean topsoil or regraded. If soil is spilled on an impermeable surface, the material will be shoveled (or swept) back into a drum, and the area washed with clean water.

All spills will be reported to the Project HSO within 24 hours. The Project HSO in turn will inform the NYSDEC of the incident.

C12.9 Reports

Any emergencies, spills, or releases that occur on the site will be reported to the Project HSO and NYSDEC within one hour and will be followed by written notification within 24 hours.

C12.10 Accident Investigation and Reporting

C12.10.1 Accident Investigations

All accidents requiring first aid which occur incidental to activities on site will be investigated. Standard OSHA formats will be used for reporting any accidents/injuries/illness that occur on the site. The investigation format will be as follows:

- Interviews with witnesses
- Photographs, if applicable
- Necessary actions to alleviate the problem

C12.10.2 Accident Reports

In the event that an accident or some other incident such as an explosion or exposure to toxic chemicals occurs during the course of the project, the Project HSO and NYSDEC will be telephoned within one hour and receive a written notification within 24 hours. The report shall include the following items:

- Name, telephone number, and location of the contractor, if not URS personnel
- Name and title of person(s) reporting
- Date and time of accident/incident
- Location of accident/incident, (i.e., building number, facility name)
- Brief summary of accident/incident giving pertinent details including type of operation ongoing at the time of the accident/incident
- Cause of accident/incident
- Casualties (fatalities, disabling injuries)
- Details of any existing chemical hazard or contamination
- Estimated property damage, if applicable
- Nature of damage; effect on contract schedule
- Action taken by contractor/URS to ensure safety and security
- Other damage or injuries sustained (public or private)

C13.0 SAFETY CONCERNS AND CONTINGENCY MEASURES DURING DRILLING OPERATIONS

Drilling at this site will be conducted under the OSHA Safety and Health Standards (29 CFR 1926/1910) relative to heavy equipment operation. The following sections describe site-specific safety measures to be implemented during various phases of drilling activities.

General precautionary measures that should be taken to prevent accidents and injuries during drilling activities are:

- All personnel working around the drilling rig will be shown the location and operation of kill switches
- The driller or the driller's helper are the only people who should operate the drill rig
- Keep hands away from moving parts
- Do not wear loosely-fitting clothing when working near the drill rig to avoid entanglement in cables, ropes, etc.
- Personnel working near the drill rig should look upward from time to time and generally be aware of what is overhead
- Personnel should not stand directly behind the drill rig to avoid falling or projected objects

An active drilling Exclusion Zone is established by the opening of a borehole. A PID calibrated to a benzene surrogate, an explosimeter calibrated to methane, and a particulate meter will be used in this zone. As described in Table C9-1, readings will be made at the borehole at timed intervals or every time a sample is retrieved from the borehole. Monitoring with real-time instrumentation will be performed at the borehole and around the drill rig. Action levels will be considered to have been reached when a continuous, steady reading at or above an action level has been observed.

If at any time during the drilling program, buried drums, cylinders, metal, or concrete are encountered, drilling activities will cease immediately. After obtaining instrument readings, the project geologist and the Site HSO will decide whether to continue or discontinue drilling.

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APPENDICES

APPENDIX A

WASTE SITE WORKER TRAINING PROGRAMS

TABLE A-1

WASTE SITE WORKER TRAINING PROGRAM (40 HOURS)

Introduction to Program
Sources of Reference
Hazardous Waste Operations and Emergency Response (29 CFR 1910.120)
Heat Stress/Cold Exposure
Chemical & Physical Hazards
Chemical Protective Clothing (CPC)

Toxicology
Respiratory Protection Principles
Air-Purifying Respirators (APR)
APR Inspection, Donning, and Doffing
Self Contained Breathing Apparatus (SCBA)
SCBA Checkout
SCBA Field Exercise
Review of SCBA Lab and Field Exercise
Air-Line Respirators (ALR)

Site Safety
Site Control
Decontamination
Air Monitoring Equipment
Permit Required Confined Spaces (29 CFR 1910.146)
Entry Permit Development
Confined Space Entry
Review of Confined Space Lab and Field Exercise
Material Handling and Spill Containment

Health and Safety Plans (HASP)
Emergency Response Plans (ERP)
HASP & ERP Development

Level A/B Field Exercise
Level B/C Field Exercise
Air Monitoring Equipment Lab
SCBA Proficiency Checkout

Review of Lab & Field Exercises
Review of Air Monitoring Equipment Lab
Medical Monitoring
Hazard Communication (29 CFR 1910.120)
Risk Assessment
APR Fit Test Demonstration and Certification
Written Test

TABLE A-2

WASTE SITE WORKER SUPERVISORY TRAINING PROGRAM (8 HOURS)

Record keeping Requirements Under Standard 29 CFR 1910.120
OSHA Inspections
Establishing Community Relations
Employee Training and Motivation
Management Traits
Dermal Protection Program
Respiratory Protection Program
Preventative Heat Stress and Cold Exposure Management
Medical Monitoring Requirements
Reporting and Recording Occupational Injuries, Illnesses, and Exposures
Accident Prevention
Spill Containment Program
Permit Required Confined Spaces (29 CFR 1910.146)
Determining the Effectiveness of Decontamination Procedures
Implementation of Site Health and Safety Plans
Implementation of Emergency Response Plans
Implementation of the Hazard Communication Standard (29 CFR 1910.120)
Responsibilities of the Site Safety and Health Supervisor and Project Manager
Personnel Sampling
Interpretation of Air Monitoring Data

TABLE A-3

WASTE SITE WORKER ANNUAL REFRESHER TRAINING PROGRAM (8 HOURS)

OSHA Requirements
Hazardous Wastes
Toxicology
Exposure Limits
Chemical Hazards
Temperature Stress
Other Physical Hazards
Radiation
Site Control at Hazardous Waste Sites
Decontamination Procedures
Personal Protective Equipment
Confined Spaces
Air Monitoring Equipment
Field Exercises

APPENDIX B

FIELD ACTIVITY FORMS

DAILY SAFETY MEETING

URS
CONSULTANTS, INC.

DATE: ______________________ CUSTOMER: ______________________

SPECIFIC: ______________________

SAFETY TOPICS PRESENTED:

PROTECTIVE CLOTHING/EQUIPMENT: ______________________

CHEMICAL HAZARDS: ______________________

PHYSICAL HAZARDS: ______________________

EMERGENCY PROCEDURES: ______________________

HOSPITAL/CLINIC: ______________________ PHONE: ______________________

PARAMEDIC PHONE: ______________________

HOSPITAL ADDRESS: ______________________

SPECIAL EQUIPMENT: ______________________

OTHER: ______________________

ATTENDEES:

NAME PRINTED:	SIGNATURE:

MEETING CONDUCTED BY:

Name Printed	*Signature*

URSF-026/1 OF 1/TSM

REPORT OF ACCIDENT / INJURY

URS
CONSULTANTS, INC.

PROJECT: ______________________ DATE OF OCCURRENCE: ______________

LOCATION: (be specific) ______________________________________

____

TYPE OF OCCURRENCE: (check all that apply)

☐ DISABLING INJURY
☐ PROPERTY DAMAGE
☐ CHEMICAL EXPOSURE
☐ EXPLOSION
☐ OTHER (explain) ______________________________________

☐ OTHER INJURY
☐ EQUIPMENT FAILURE
☐ FIRE
☐ VEHICLE ACCIDENT

____

WITNESSES TO ACCIDENT / INJURY: (and office)

______________________ ______________________

______________________ ______________________

______________________ ______________________

______________________ ______________________

INJURIES:

NAME OF INJURED: ______________________ OFFICE: ______________________

WHAT WAS BEING DONE AT THE TIME OF THE ACCIDENT/INJURY? ______________________

____

____

____

____

____

____

____

INSTRUMENT READING LOG

URS
CONSULTANTS, INC.

PROJECT: ______________________ JOB NO.: ______________________

OPERATOR: ______________________ DATE: ______________________

INSTRUMENT: ______________________ CALIBRATION: ______________________
Amt. Component. Date

SAMPLING TECHNIQUE: ______________________

____

SAMPLING INTERVAL: ______________________

BACKGROUND READING: ______________________

ACTION LEVEL RESPONSE: ______________________

TIME	LOCATION	READING (UNITS)	DETECTION LIMIT (SCALE)

URSF-027/1 OF 1/IRL

APPENDIX C

STANDARD OPERATING SAFETY PROCEDURES

APPENDIX C - STANDARD OPERATING SAFETY PROCEDURES

Rules for onsite personal safety are shown in Table C-1; rules for operational safety appear in Table C-2.

TABLE C-1

PERSONAL SAFETY RULES

- Visual contact must be maintained between crew members on site.

- Any practice that increases the probability of hand-to-mouth transfer and ingestion of materials is prohibited in any area designated as contaminated. These practices include as a minimum, eating, drinking, chewing gum or tobacco, and smoking.

- Hands and face must be thoroughly washed upon leaving the work area, and before engaging in any other activities, especially eating or drinking.

- Due to interference of facial hair with the mask-to-face seal on air-purifying respirators, personnel working on site will not be permitted to wear facial hair that interferes with the seal.

- Contact with contaminated surfaces or surfaces suspected of contamination should be avoided. Site personnel should avoid walking through puddles, mud, or other discolored areas, and should not kneel or sit on the ground.

- Field personnel shall be familiar with the physical characteristics of the site, including:

    - wind direction in relation to the working area
    - accessibility to associates, equipment, and vehicles
    - communications
    - work zones
    - site access

- Medicine and alcohol can exacerbate the effect from exposure to toxic chemicals. Prescribed drugs should not be taken by field personnel where the potential for absorption, inhalation, or ingestion of toxic substances exists unless specifically approved by a qualified physician. Alcoholic beverage and controlled substance intake is strictly forbidden during onsite operations.

TABLE C-2

OPERATIONAL SAFETY RULES

- No visitors shall be allowed into any Exclusion Zone without the permission of the New York State Department of Environmental Conservation.
- Onsite personnel must use the buddy system when wearing respiratory protective equipment. A third person, suitably equipped, is required as a safety backup during initial site entries.
- During day-to-day operations, onsite workers will act as a safety backup to each other. Offsite personnel will provide emergency assistance.
- Wind indicators will be set up so as to be visible from the Exclusion Zone.
- Daily briefings will be held to review site hazards, changes in level of personal protection required, special safety precautions for assigned work activities, and emergency response.
- All personnel going on site must be thoroughly briefed on anticipated hazards, and trained on equipment to be worn, safety procedures, emergency procedures, and communications

APPENDIX D

MATERIALS SAFETY DATA SHEETS

MATERIALS SAFETY DATA SHEETS FOR CHEMICALS USED ON SITE FOR ENVIRONMENTAL SAMPLING

AUGUST 1998

URS GREINER, INC.
282 DELAWARE AVENUE
BUFFALO, NEW YORK 14202-1805

FISHER SCIENTIFIC CHEMICAL DIV -- ACETONE - ACETONE, REAGENT
MATERIAL SAFETY DATA SHEET
FSC: 6810
NIIN: 014120075
Manufacturer's CAGE: 1B464
Part No. Indicator: B
Part Number/Trade Name: ACETONE

General Information

Item Name: ACETONE, REAGENT
Company's Name: FISHER SCIENTIFIC CO CHEMICAL DIV.
Company's Street: 1 REAGENT LANE
Company's City: FAIR LAWN
Company's State: NJ
Company's Country: US
Company's Zip Code: 07410
Company's Emerg Ph #: 201-796-7100 OR 201-796-7523
Company's Info Ph #: 201-796-7100
Safety Data Action Code: A
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SE
Date MSDS Prepared: 02DEC94
Safety Data Review Date: 26OCT95
Supply Item Manager: CX
MSDS Serial Number: BXWHG
Hazard Characteristic Code: F2
Unit Of Issue: BX
Unit Of Issue Container Qty: 4 LITER
Type Of Container: BOTTLE
Net Unit Weight: 6.4 LBS

Ingredients/Identity Information

Proprietary: NO
Ingredient: ACETONE (SARA III)
Ingredient Sequence Number: 01
Percent: 100
Ingredient Action Code: A
NIOSH (RTECS) Number: AL3150000
CAS Number: 67-64-1
OSHA PEL: 1000PPM
ACGIH TLV: 750PPM/1000STEL;9293
Other Recommended Limit: NONE RECOMMENDED

Physical/Chemical Characteristics

Appearance And Odor: CLEAR, COLORLESS, VOLATILE LIQUID WITH A CHARACTERISTIC SWEETISH ODOR
Boiling Point: 133F,56C
Melting Point: -139F,-95C
Vapor Pressure (MM Hg/70 F): 180
Vapor Density (Air=1): 2.0
Specific Gravity: 0.7899
Decomposition Temperature: UNKNOWN
Evaporation Rate And Ref: 6 (BUTYL ACETATE = 1)
Solubility In Water: VERY SOLUBLE
Percent Volatiles By Volume: 100 %
Viscosity: UNKNOWN
Corrosion Rate (IPY): UNKNOWN
Autoignition Temperature: 869F

Fire and Explosion Hazard Data

Flash Point: -4F,-20C
Flash Point Method: CC
Lower Explosive Limit: 2.5 %
Upper Explosive Limit: 13 %
Extinguishing Media: WATER SPRAY, DRY CHEMICAL, CARBON DIOXIDE, ALCOHOL-RESISTANT FOAM
Special Fire Fighting Proc: MOVE CONTAINER FROM FIRE AREA IF CAN DO SO. APPLY COOLING WATER TO SIDES OF CONTAINERS THAT ARE EXPOSED TO FLAMES. STAY AWAY FROM ENDS OF TANKS.
Unusual Fire And Expl Hazrds: VAPORS ARE HEAVIER THAN AIR AND MAY TRAVEL A CONSIDERABLE DISTANCE TO A SOURCE OF IGNITION AND FLASH BACK.

Reactivity Data

Stability: YES
Cond To Avoid (Stability): HEAT, OPEN FLAME
Materials To Avoid: STRONG OXIDIZING AGENTS, ACIDS, AMINES, BROMINE, NITRIC ACID

Health Hazard Data

Precautions for Safe Handling and Use

Control Measures

Transportation Data

Transportation Action Code: A
Trans Data Review Date: 95299
DOT PSN Code: ABF
DOT Proper Shipping Name: ACETONE
DOT Class: 3
DOT ID Number: UN1090
DOT Pack Group: II
DOT Label: FLAMMABLE LIQUID
IMO PSN Code: ADF
IMO Proper Shipping Name: ACETONE
IMO Regulations Page Number: 3102
IMO UN Number: 1090
IMO UN Class: 3.1
IMO Subsidiary Risk Label: -
IATA PSN Code: ACM
IATA UN ID Number: 1090
IATA Proper Shipping Name: ACETONE
IATA UN Class: 3
IATA Label: FLAMMABLE LIQUID
AFI PSN Code: ACM
AFI Prop. Shipping Name: ACETONE
AFI Class: 3
AFI ID Number: UN1090
AFI Pack Group: II
AFI Label: FLAMMABLE LIQUID
AFI Basic Pac Ref: A7.3

Disposal Data

Label Data

Label Required: YES *
Label Status: G *
Common Name: ACETONE *
Label Name: FISHER SCIENTIFIC CO CHEMICAL DIV. *
Label Street: 1 REAGENT LANE *
Label City: FAIR LAWN *
Label State: NJ *
Label Zip Code: 07410 *
Label Country: US *
Label Emergency Number: 201-796-7100 OR 201-796-7523 *

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delete information in this archive please sent updates to dan@hazard.com.

BOUGHT ACCORDING TO SPECIFICATION -- VV-G-1690,GASOLINE,AUTOMOTIVE,LEADED,UNLEAD - GASOLINE,
MATERIAL SAFETY DATA SHEET
FSC: 9130
NIIN: 002646215
Manufacturer's CAGE: 81348
Part No. Indicator: A
Part Number/Trade Name: VV-G-1690,GASOLINE,AUTOMOTIVE,LEADED,UNLEAD

General Information

Item Name: GASOLINE,AUTOMOTIVE
Company's Name: BOUGHT ACCORDING TO SPECIFICATION
Record No. For Safety Entry: 028
Tot Safety Entries This Stk#: 030
Date MSDS Prepared: 01JAN85
Safety Data Review Date: 30NOV79
MSDS Serial Number: BDQLM
Specification Number: VV-G-1690
Hazard Characteristic Code: F2

Ingredients/Identity Information

Proprietary: NO
Ingredient: GASOLINE
Ingredient Sequence Number: 01
NIOSH (RTECS) Number: LX3300000
CAS Number: 8006-61-9
OSHA PEL: 300 PPM/500 STEL
ACGIH TLV: 300 PPM/500STEL;9192

Physical/Chemical Characteristics

Fire and Explosion Hazard Data

Flash Point: -40F

Reactivity Data

Health Hazard Data

Precautions for Safe Handling and Use

Control Measures

Transportation Data

Trans Data Review Date: 79334
DOT PSN Code: GTN
DOT Proper Shipping Name: GASOLINE
DOT Class: 3
DOT ID Number: UN1203
DOT Pack Group: II
DOT Label: FLAMMABLE LIQUID
IMO PSN Code: HRV
IMO Proper Shipping Name: GASOLINE
IMO Regulations Page Number: 3141
IMO UN Number: 1203
IMO UN Class: 3.1

IMO Subsidiary Risk Label: -
IATA PSN Code: RMF
IATA UN ID Number: 1203
IATA Proper Shipping Name: MOTOR SPIRIT
IATA UN Class: 3
IATA Label: FLAMMABLE LIQUID
AFI PSN Code: MUC
AFI Prop. Shipping Name: GASOLINE
AFI Class: 3
AFI ID Number: UN1203
AFI Pack Group: II
AFI Label: FLAMMABLE LIQUID
AFI Basic Pac Ref: 7-7

Disposal Data

Disposal Data Review Date: 88179
Rec # For This Disp Entry: 01
Tot Disp Entries Per NSN: 001
Landfill Ban Item: YES
Disposal Supplemental Data: IN CASE OF ACCIDENTAL EXPOSURE OR DISCHARGE, CONSULT HEALTH AND SAFETY FILE FOR PRECAUTIONS.
1st EPA Haz Wst Code New: D001
1st EPA Haz Wst Name New: IGNITIBLE
1st EPA Haz Wst Char New: IGNITABILITY
1st EPA Acute Hazard New: NO

Label Data

Label Required: YES
Label Status: G
Common Name: VV-G-1690,GASOLINE,AUTOMOTIVE,LEADED,UNLEAD
Label Name: BOUGHT ACCORDING TO SPECIFICATION

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UNION OIL OF CALIF; UNION CHEMICAL DIV -- HEXANE (N-HEXANE) (AMSCO SOLV 1487) - HEXANE
MATERIAL SAFETY DATA SHEET
FSC: 8040
NIIN: 008538913
Manufacturer's CAGE: 94684
Part No. Indicator: A
Part Number/Trade Name: HEXANE (N-HEXANE) (AMSCO SOLV 1487)

General Information

Item Name: HEXANE
Company's Name: UNION OIL CO OF CALIF; UNION CHEMICAL DIVISION
Company's Street: 1345 NORTH MEACHAM ROAD
Company's City: SCHAUMBURG
Company's State: IL
Company's Country: US
Company's Zip Code: 60196
Company's Emerg Ph #: 714-864-2310
Company's Info Ph #: 714-864-2310
Record No. For Safety Entry: 006
Tot Safety Entries This Stk#: 006
Status: SM
Date MSDS Prepared: 28NOV88
Safety Data Review Date: 18DEC92
Supply Item Manager: GSA
MSDS Preparer's Name: C A EISENHARD
Preparer's Company: UNION OIL CO OF CALIF;UNION CHEMICAL DIV
Preparer's St Or P. O. Box: 1345 NORTH MEACHAM ROAD
Preparer's City: SCHAUMBURG
Preparer's State: IL
Preparer's Zip Code: 60196
MSDS Serial Number: BRFQQ
Hazard Characteristic Code: N/
Unit Of Issue: GL
Unit Of Issue Container Qty: 1 GL CN
Type Of Container: METAL

Ingredients/Identity Information

Proprietary: NO
Ingredient: HEXANE (N-HEXANE)
Ingredient Sequence Number: 01
NIOSH (RTECS) Number: MN9275000
CAS Number: 110-54-3
OSHA PEL: 500 PPM
ACGIH TLV: 50 PPM; 9293
Other Recommended Limit: NONE SPECIFIED

Physical/Chemical Characteristics

Appearance And Odor: CLEAR, HAS CHARACTERISTIC ODOR
Boiling Point: 150 TO 158F
Vapor Density (Air=1): HEAVIER
Specific Gravity: LIGHTER THN WTR
Evaporation Rate And Ref: SLOWER (ETHER=1)
Solubility In Water: NEGLIGIBLE
Percent Volatiles By Volume: 100

Fire and Explosion Hazard Data

Flash Point: -24F,-31C
Flash Point Method: TCC
Lower Explosive Limit: 1.1

Upper Explosive Limit: 7.5

Extinguishing Media: FOAM, CO2, OR DRY CHEMICAL

Special Fire Fighting Proc: SELF-CONTAINED BREATHING APPARATUS IS RECOMMENDED FOR FIREFIGHTERS. WATER MAY BE UNSUITABLE AS AN EXTINUISHING MEDIA, BUT HELPFUL IN KEEP ADJACENT CNTNRS COOL.

Unusual Fire And Expl Hazrds: AVOID SPREADING BURNING LIQUID WITH WATER FOR COOLING PURPOSES. KEEP WORK AREA FREE OF HOT METAL SURFACES AND OTHER SOURCES OF IGNITION.

Reactivity Data

Stability: YES

Materials To Avoid: INCOMPATIBLE WITH STRONG OXIDIZING AGENTS, STRONG ACIDS OR BASES AND AMINES.

Hazardous Decomp Products: THERMAL DECOMPOSITION IN THE PRESENCE OF AIR MAY YIELD CARBON MONOXIDE AND/OR CARBON DIOXIDE.

Hazardous Poly Occur: NO

Health Hazard Data

Route Of Entry - Inhalation: YES

Route Of Entry - Skin: YES

Route Of Entry - Ingestion: YES

Health Haz Acute And Chronic: MAY BE AN EYE IRRITANT. MAY CAUSE SKIN IRRITATION UPON PROLONGED OR REPEATED CONTACT. RESPIRATORY TRACT IRRITATION. CENTRAL NERVOUS SYSTEM DEPRESSION IN HIGH CONCENTRATIONS. WEAKENING AND NUMBNESS IN EXTREMITIES.

Emergency/First Aid Proc: EYES: FLUSH WITH LARGE AMOUNTS OF WATER FOR 15 MINS & GET IMMED MED ATTENTION. SKIN: WASH WITH SOAP & LARGE AMOUNTS OF WATER & SEEK MED ATTENTION IF IRRITATION PERSISTS. INHALATION: IF BREATHING DIFFIULTIES, DIZZINESS, OR LIGHTHEADEDNESS OCCUR, VICTIM SHOULD SEEK AIR FREE OF VAPORS. IF BREATHING STOPS, BEGIN ARTIF RESPIRATION & SEEK IMMED MED AID. INGESTION: DONT INDUCE VOMIT. GET IMMED MED AID.

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: KEEP IGNITION SOURCES AND HOT METAL SURFACES ISOLATED FROM SPILL. FLUSH SPILLED MATERIAL INTO SUITABLE RETAINING AREAS OR CONTAINERS WITH LARGE AMOUNTS OF WATER. SMALL AMOUNTS OF SPILLED MATERIAL MAY BE ABSORBED INTO AN APPROPRIATE ABSORBENT.

Waste Disposal Method: DISPOSE OF PRODUCT IN ACCORDANCE WITH APPLICABLE LOCAL, COUNTY, STATE, AND FEDERAL REGULATIONS.

Precautions-Handling/Storing: KEEP PRODUCT CONTAINERS COOL, DRY AND AWAY FROM IGNITION SOURCES. USE AND STORE THIS PRODUCT WITH ADEQUATE VENTILATION.

Other Precautions: PERSONNEL SHOULD AVOID INHALATION OF VAPORS. PERSONAL CONTACT WITH THE PRODUCT SHOULD BE AVOIDED. SHOULD CONTACT BE MADE, REMOVE SATURATED CLOTHING AND FLUSH AFFECTED AREAS WITH WATER.

Control Measures

Respiratory Protection: THE USE OF RESPIRATORY PROTECTION DEPENDS ON VAPOR CONCENTRATION ABOVE THE TIME-WEIGHTED TLV; USE A NIOSH APPROVED CARTRRIDGE RESPIRATOR OR GAS MASK. RESPIRATORY MASK OR ENVIRONMENTAL DEVICES MAY BE REQ'D IN EXTREME CASES.

Ventilation: GENERAL MECHANICAL VENT MAY BE SUFFICIENT. IF GENERAL VENT PROVES INADEQUATE, SUPPLEMENTAL LOCAL EXHAUST MAY BE REQ'D.

Protective Gloves: IMPERMEABLE

Eye Protection: SAFETY GLASSES, CHEM GOGGLES, FACESHIELD

Other Protective Equipment: IMPERMEABLE APRONS ARE ADVISED. EYE WASH & SHOWERS.

Transportation Data

Trans Data Review Date: 92356
DOT PSN Code: HEX
DOT Proper Shipping Name: HEXANES
DOT Class: 3
DOT ID Number: UN1208
DOT Pack Group: II
DOT Label: FLAMMABLE LIQUID
IMO PSN Code: IBK
IMO Proper Shipping Name: HEXANES
IMO Regulations Page Number: 3129
IMO UN Number: 1208
IMO UN Class: 3.1
IMO Subsidiary Risk Label: - *
IATA PSN Code: NKG
IATA UN ID Number: 1208
IATA Proper Shipping Name: HEXANES
IATA UN Class: 3
IATA Label: FLAMMABLE LIQUID
AFI PSN Code: NKG
AFI Prop. Shipping Name: HEXANES
AFI Class: 3
AFI ID Number: UN1208
AFI Pack Group: II
AFI Label: FLAMMABLE LIQUID
AFI Basic Pac Ref: 7-7
MMAC Code: NK

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Disposal Data

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Label Data

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Label Required: YES
Label Status: G
Common Name: HEXANE (N-HEXANE) (AMSCO SOLV 1487)
Special Hazard Precautions: MAY BE AN EYE IRRITANT. MAY CAUSE SKIN IRRITATION UPON PROLONGED OR REPEATED CONTACT. RESPIRATORY TRACT IRRITATION. CENTRAL NERVOUS SYSTEM DEPRESSION IN HIGH CONCENTRATIONS. WEAKENING AND NUMBNESS IN EXTREMITIES. N/K
Label Name: UNION OIL CO OF CALIF; UNION CHEMICAL DIVISION
Label Street: 1345 NORTH MEACHAM ROAD
Label City: SCHAUMBURG
Label State: IL
Label Zip Code: 60196
Label Country: US
Label Emergency Number: 714-864-2310

===

ALLIED CHEMICAL -- NITRIC ACID,REAGENT GRADE - NITRIC ACID,REAGENT
MATERIAL SAFETY DATA SHEET
FSC: 6810
NIIN: 010916213
Manufacturer's CAGE: 1L164
Part No. Indicator: A
Part Number/Trade Name: NITRIC ACID,REAGENT GRADE

General Information

Item Name: NITRIC ACID,REAGENT
Company's Name: ALLIED CHEMICAL CORP
Company's Street: COLUMBIA RD & PARK AVE
Company's P. O. Box: 1087R
Company's City: MORRISTOWN
Company's State: NJ
Company's Country: US
Company's Zip Code: 07960
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 002
Date MSDS Prepared: 01JAN85
Safety Data Review Date: 07OCT82
Supply Item Manager: 75
MSDS Serial Number: BGLMG
Specification Number: O-C-265
Hazard Characteristic Code: D4
Unit Of Issue: BT
Unit Of Issue Container Qty: 7 LB

Ingredients/Identity Information

Proprietary: NO
Ingredient: NITRIC ACID (SARA III)
Ingredient Sequence Number: 01
Percent: 70.5
NIOSH (RTECS) Number: QU5775000
CAS Number: 7697-37-2
OSHA PEL: 2 PPM/4 STEL
ACGIH TLV: 2 PPM/4 STEL; 9192

Physical/Chemical Characteristics

Appearance And Odor: COLORLESS LIQUID,PUNGENT ODOR.
Boiling Point: 251.6F/122C
Vapor Pressure (MM Hg/70 F): 8
Vapor Density (Air=1): 1.58
Specific Gravity: 1.42
Evaporation Rate And Ref: <1(BUTYL ACETATE)
Solubility In Water: COMPLETE
Percent Volatiles By Volume: N/A

Fire and Explosion Hazard Data

Flash Point: N/A
Lower Explosive Limit: N/A
Upper Explosive Limit: N/A
Extinguishing Media: IF INVOLVED IN A FIRE,USE WATER SPRAY.
Special Fire Fighting Proc: AVOID INHALE OF GAS.USE SELF-CNTND BRTHG APP.FUL PROTV EQUIP
Unusual Fire And Expl Hazrds: WILL INCREAS FLAMABILITY OF WOOD,ORGANICS. CAUSES EXPLOS W H*2S,METAL POWDERS,CARBIDES,TURPENTINE.

Reactivity Data

Stability: YES

Materials To Avoid: METALS,H*2S,WOOD,EXCELSIOR,PAPER PRODUCTS,SIMILAR ORGANICS.

Hazardous Decomp Products: POISONOUS OXIDES OF NITROGEN(GASEOUS)

Hazardous Poly Occur: NO

Health Hazard Data

Signs/Symptoms Of Overexp: SEVER BURNS TO EYES,SKIN.INHALE OF VAPOR DAMAGES RESPIR TRACT.SYMPTOMS MAY BE DELAYED.ING.MAY B FATL

Emergency/First Aid Proc: SKIN:FLUSH WITH PLENTY WATER.EYES:FLUSH W WATER 15 MIN.GET IMMEDIATE MEDICAL ATTENTION.IF INHALED:REMOVE TO FRESH AIR,GET IMMEDIATE MEDICAL ATTENTION.INGEST:HAVE VICTIM DRINK PLENTY WATER. DO NOT INDUCE VOMITING.

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: FLUSH WITH PLENTY OF WATER AND NEUTRALIZE WITH ALKALINE MATL SUCH AS SODA ASH,LIME,ETC.PROVIDE ADEQUATE VENTILATION AS OXIDES OF NITROGEN AND CO*2 ARE GENERATED DURING NEUTRALIZATION.

Waste Disposal Method: DILUTE AND NEUTRALIZE.IF PERMITTED BY LOCAL,STATE AND FEDERAL REGULATIONS,FLUSH NEUTRAL RESIDUE TO SEWER WITH PLENTY OF WATER.CONTACT LOCAL AUTHORITIES FOR DISPOSAL COMPLIANCE.

Precautions-Handling/Storing: STORE IN WELL-VENTILATED PROPERLY DRAINED SITE AWAY FROM HEAT,SUN.ISOLATE FROM METALS,ORGANICS,WOOD,PAPER PRODUCTS. PROTECT FROM PHYSICAL DAMAGE.

Other Precautions: NITRIC ACID VAPOR AND OXIDES ARE INSIDIOUS.SYMPTOMS FROM INHALATION MAY BE DELAYED.DO NOT BREATH FUMES.SEE MCA CHEMICAL SAFETY DATA SHEET SD-5,FROM MANUFACT CHEM ASSO.IN WASHINGTON,D.C.

Control Measures

Respiratory Protection: USE SELF-CNTND OR CLEAN AIR SUPPLIED BREATHING APPARATUS.

Ventilation: LOCAL EXHAUST SUFFICIENT TO ELIMINATE ALL FUMES.

Protective Gloves: NEOPRENE

Eye Protection: CHEM SAFETY GOGGLES

Other Protective Equipment: NEOPREN APRON/SHOES,HARD HAT,NEOPREN CLOTHNG, FACE SHIELD.

Transportation Data

Trans Data Review Date: 82280
DOT PSN Code: KFD
DOT Proper Shipping Name: NITRIC ACID
DOT Class: 8
DOT ID Number: UN2031
DOT Pack Group: II
DOT Label: CORROSIVE
IMO PSN Code: KPF
IMO Proper Shipping Name: NITRIC ACID
IMO Regulations Page Number: 8195
IMO UN Number: 2031
IMO UN Class: 8
IMO Subsidiary Risk Label: -
IATA PSN Code: RWF
IATA UN ID Number: 2031
IATA Proper Shipping Name: NITRIC ACID
IATA UN Class: 8
IATA Label: CORROSIVE
AFI PSN Code: RWF
AFI Symbols: 0
AFI Prop. Shipping Name: NITRIC ACID

AFI Class: 8
AFI ID Number: UN2031
AFI Pack Group: II
AFI Label: CORROSIVE
AFI Basic Pac Ref: 12-14

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Disposal Data

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Disposal Data Review Date: 88088
Rec # For This Disp Entry: 01
Tot Disp Entries Per NSN: 002
Landfill Ban Item: YES
Disposal Supplemental Data: IN CASE OF ACCIDENTAL EXPOSURE OR DISCHARGE, CONSULT HEALTH AND SAFETY FILE FOR PRECAUTIONS.
1st EPA Haz Wst Code New: D001
1st EPA Haz Wst Name New: IGNITIBLE
1st EPA Haz Wst Char New: IGNITABILITY
1st EPA Acute Hazard New: NO
2nd EPA Haz Wst Code New: D002
2nd EPA Haz Wst Name New: CORROSIVE
2nd EPA Haz Wst Char New: CORROSIVITY
2nd EPA Acute Hazard New: NO

===

Label Data

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Label Required: YES
Label Status: F
Special Hazard Precautions: POISONOUS; MAY BE FATAL IF INHALED, SWALLOWED OR ABSORBED THROUGH SKIN. CONTACT MAY CAUSE BURNS TO SKIN AND EYES. FIRE MAY PRODUCE IRRITATING OR POISONOUS GASES. RUNOFF FROM FIRE CONTROL OR DILUTION WATER MAY CAUSE POLLUTION.
Label Name: ALLIED CORP., ALLIED CHEMICAL,CSS DEPT.
Label Street: COLUMBIA RD & PARK AVE
Label P.O. Box: 1087R
Label City: MORRISTOWN
Label State: NJ
Label Zip Code: 07960
Label Country: US

===

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BOUGHT ACCORDING TO SPECIFICATION -- FED SPEC O-S-598 - SODIUM HYDROXIDE,TECHNICAL
MATERIAL SAFETY DATA SHEET
FSC: 6810
NIIN: 008204914
Manufacturer's CAGE: 81348
Part No. Indicator: A
Part Number/Trade Name: FED SPEC O-S-598

General Information

Item Name: SODIUM HYDROXIDE,TECHNICAL
Company's Name: BOUGHT ACCORDING TO SPECIFICATION
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Date MSDS Prepared: 01JAN85
Safety Data Review Date: 04DEC79
MSDS Serial Number: BFQTS
Specification Number: O-S-598
Hazard Characteristic Code: C2

Ingredients/Identity Information

Proprietary: NO
Ingredient: SODIUM HYDROXIDE (SARA III)
Ingredient Sequence Number: 01
NIOSH (RTECS) Number: WB4900000
CAS Number: 1310-73-2
OSHA PEL: 2 MG/M3
ACGIH TLV: C 2 MG/M3; 9293

Physical/Chemical Characteristics

Appearance And Odor: NOT SPECIFIED BY MANUFACTURER.
Boiling Point: UNKNOWN
Melting Point: UNKNOWN
Specific Gravity: UNKNOWN
Decomposition Temperature: UNKNOWN
Solubility In Water: UNKNOWN

Fire and Explosion Hazard Data

Reactivity Data

Health Hazard Data

Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO

Precautions for Safe Handling and Use

Control Measures

Transportation Data

Trans Data Review Date: 79338
DOT PSN Code: NGY
DOT Proper Shipping Name: SODIUM HYDROXIDE SOLUTION
DOT Class: 8

DOT ID Number: UN1824
DOT Pack Group: II
DOT Label: CORROSIVE
IMO PSN Code: NTB
IMO Proper Shipping Name: SODIUM HYDROXIDE, SOLUTION
IMO Regulations Page Number: 8226
IMO UN Number: 1824
IMO UN Class: 8
IMO Subsidiary Risk Label: -
IATA PSN Code: WST
IATA UN ID Number: 1824
IATA Proper Shipping Name: SODIUM HYDROXIDE SOLUTION
IATA UN Class: 8
IATA Label: CORROSIVE
AFI PSN Code: WST
AFI Prop. Shipping Name: SODIUM HYDROXIDE, SOLUTION
AFI Class: 8
AFI ID Number: UN1824
AFI Pack Group: II
AFI Label: CORROSIVE
AFI Special Prov: N34
AFI Basic Pac Ref: 12-5

Disposal Data

Label Data

Label Required: YES
Label Status: G
Common Name: FED SPEC O-S-598
Label Name: BOUGHT ACCORDING TO SPECIFICATION

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BOUGHT ACCORDING TO SPECIFICATION -- O-S-809,SULFURIC ACID,CL 1,TY 1 - SULFURIC ACID,TECHNIC
MATERIAL SAFETY DATA SHEET
FSC: 6810
NIIN: 008487312
Manufacturer's CAGE: 81348
Part No. Indicator: A
Part Number/Trade Name: O-S-809,SULFURIC ACID,CL 1,TY 1

General Information

Item Name: SULFURIC ACID,TECHNICAL
Company's Name: BOUGHT ACCORDING TO SPECIFICATION
Record No. For Safety Entry: 007
Tot Safety Entries This Stk#: 007
Date MSDS Prepared: 01JAN85
Safety Data Review Date: 12JAN84
Supply Item Manager: CX
MSDS Serial Number: BFSLT
Specification Number: O-S-809
Spec Type, Grade, Class: TYPE II, CLASS 1
Hazard Characteristic Code: C1
Unit Of Issue: BT
Unit Of Issue Container Qty: 80 FL OUNCES
Type Of Container: BOTTLE
Net Unit Weight: UNKNOWN

Ingredients/Identity Information

Proprietary: NO
Ingredient: SULFURIC ACID (SARA III)
Ingredient Sequence Number: 01
Percent: 77.5
NIOSH (RTECS) Number: WS5600000
CAS Number: 7664-93-9
OSHA PEL: 1 MG/M3
ACGIH TLV: 1 MG/M3; 9192

Physical/Chemical Characteristics

Appearance And Odor: NOT SPECIFIED BY MANUFACTURER.
Boiling Point: UNKNOWN
Melting Point: UNKNOWN
Vapor Pressure (MM Hg/70 F): UNKNOWN
Vapor Density (Air=1): UNKNOWN
Specific Gravity: UNKNOWN
Decomposition Temperature: UNKNOWN
Evaporation Rate And Ref: UNKNOWN
Solubility In Water: COMPLETE
Viscosity: UNKNOWN
Corrosion Rate (IPY): UNKNOWN

Fire and Explosion Hazard Data

Flash Point: NOT APPLICABLE

Reactivity Data

Stability: YES
Cond To Avoid (Stability): HIGH HEAT, MOISTURE
Hazardous Decomp Products: OXIDES OF SULFUR, HYDROGEN SULFIDE, HYDROGEN GAS
Hazardous Poly Occur: NO

Health Hazard Data

LD50-LC50 Mixture: UNKNOWN
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: NO
Route Of Entry - Ingestion: NO
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO

Precautions for Safe Handling and Use

Neutralizing Agent: SODA ASH

Control Measures

Protective Gloves: RUBBER, PVC
Eye Protection: CHEMICAL SAFETY GOGGLES
Work Hygienic Practices: WASH THOROUGHLY AFTER HANDLING.

Transportation Data

Trans Data Review Date: 84013
DOT PSN Code: NUC
DOT Proper Shipping Name: SULFURIC ACID
DOT Class: 8
DOT ID Number: UN1830
DOT Pack Group: II
DOT Label: CORROSIVE
IMO PSN Code: OFJ
IMO Proper Shipping Name: SULPHURIC ACID
IMO Regulations Page Number: 8230 *
IMO UN Number: 1830
IMO UN Class: 8
IMO Subsidiary Risk Label: -
IATA PSN Code: XIX
IATA UN ID Number: 1830
IATA Proper Shipping Name: SULPHURIC ACID
IATA UN Class: 8
IATA Label: CORROSIVE
AFI PSN Code: XIX
AFI Prop. Shipping Name: SULPHURIC ACID
AFI Class: 8
AFI ID Number: UN1830
AFI Pack Group: II
AFI Label: CORROSIVE
AFI Special Prov: 2,A3,A7,N34
AFI Basic Pac Ref: 12-5

Disposal Data

Label Data

Label Required: YES
Label Status: G
Common Name: O-S-809,SULFURIC ACID,CL 1,TY 1
Label Name: BOUGHT ACCORDING TO SPECIFICATION

URL for this msds http://hazard.com. If you wish to change, add to, or delete information in this archive please sent updates to dan@hazard.com.

AIR PRODUCTS

GASES GROUP MATERIAL SAFETY DATA SHEET

SECTION 1: PRODUCT IDENTIFICATION

PRODUCT NAME: METHANE
FORMULA: CH_4
SYNONYMS: Methyl Hydride, Marsh Gas
MANUFACTURER: Air Products and Chemicals, Inc.
7201 Hamilton Boulevard
Allentown, PA 18195 - 1501

PRODUCT INFORMATION : 1 - 800 - 752 - 1597

MSDS NUMBER: 2M01-4 **EFFECTIVE DATE:** May 1993 **REVISION:** 4

SECTION 2: HAZARDOUS COMPONENTS

Methane is packaged as pure product (>99%).

CAS NUMBER: 74-82-8

EXPOSURE LIMITS:

OSHA: None established
ACGIH: Simple Asphyxiant
NIOSH: None established

SECTION 3: HAZARD IDENTIFICATION

EMERGENCY OVERVIEW

Methane is a flammable, colorless, odorless, compressed gas packaged in cylinders under high pressure. It poses an immediate fire and explosion hazard when concentrations exceed 5.0%. High concentrations that can cause rapid suffocation are within the flammable range and should not be entered.

EMERGENCY TELEPHONE NUMBERS

800 - 523 - 9374	in Continental U.S. (except PA), Canada and Puerto Rico
800 - 322 - 9092	in Pennsylvania
610 - 481 - 7711	outside U.S.

POTENTIAL HEALTH EFFECTS

INHALATION: Methane is nontoxic. It can, however, reduce the amount of oxygen in the air necessary to support life. Exposure to oxygen-deficient atmospheres (< 19.5 %) may produce dizziness, nausea, vomiting, loss of consciousness, and death. At very low oxygen concentrations (< 12 %) unconsciousness and death may occur without warning.

EYE CONTACT: No harmful affect.

SKIN CONTACT: No harmful affect.

CARCINOGENIC POTENTIAL: Methane is not listed as carcinogen or potential carcinogen by NPT, IARC, or OSHA Subpart Z.

EXPOSURE INFORMATION

ROUTE OF ENTRY: Inhalation.
EFFECT: Asphyxiation (suffocation).

TARGET ORGANS: None
CONDITIONS AGGRAVATED: None

SECTION 4: FIRST AID

INHALATION: Conscious persons should be assisted to an uncontaminated area and inhale fresh air. Unconscious persons should be moved to an uncontaminated area, given artificial respiration and supplemental oxygen. Quick removal from contaminated area is most important.

EYE CONTACT: No treatment necessary.

SKIN CONTACT: No treatment necessary.

SECTION 5: FIRE AND EXPLOSION

FLASH POINT	AUTO IGNITION TEMP	FLAMMABLE LIMITS
-306 °F	1076 °F	5.0% - 15%

EXTINGUISHING MEDIA: Dry chemical, carbon dioxide, or water.

HAZARDOUS COMBUSTION PRODUCTS: None

FIRE FIGHTING PROCEDURES: If possible, without risk, stop the flow of methane then fight fire according to types of materials burning. If possible, move adjacent cylinders away from fire area. If the flow of methane cannot be safely shut off, allow fire to burn itself out. This will avoid possible accumulation and re-ignition of a flammable gas mixture. Cool cylinders with water spray until well after fire is out.

UNUSUAL HAZARDS: Upon exposure to intense heat or flame cylinder may vent rapidly or rupture due to pressure increase.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Evacuate all personnel from affected area. Increase ventilation to release area. Use a flammable gas meter (explosimeter) to monitor concentration. An immediate fire and explosion hazard exists when atmospheric concentrations exceed 5.0%. Use appropriate protective equipment (SCBA and fire resistant suit). Never enter an area where the concentration is within the 20% of the lower flammable limit (1.0%). If the leak is from cylinder or cylinder valve, call the Air Products emergency telephone number. If the leak is in users system, close cylinder valve, vent and purge lines with inert gas before attempting repairs.

SECTION 7: STORAGE AND HANDLING

STORAGE: Cylinders should be stored upright in a well-ventilated, secure area. Storage area temperatures should not exceed 125 °F (52 °C) and should be free of oxidizers and sources of ignition. "No Smoking or Open Flames" signs should be posted in storage area. Storage should be away from heavily traveled areas and emergency exits. Avoid areas where salt or other corrosive materials are present. Valve protection caps and valve outlet seals should remain on cylinders not connected for use. Separate full from empty cylinders. Use a first-in first-out system. Keep good inventory records. Visually inspect stored cylinders on a routine basis, at least weekly, for any indication of leakage or other problems.

HANDLING: Do not drag, roll, or slide cylinder. Use a suitable handtruck designed for cylinder movement. Never attempt to lift a cylinder by its cap. Secure cylinders at all times while in use. Use a pressure reducing regulator or separate control valve to safely discharge gas from cylinder. Use a check valve to prevent reverse flow into cylinder. Never apply flame or localized heat directly to any part of the cylinder. Do not allow any part of the cylinder to exceed 125 °F (52 °C). High temperature may cause damage to cylinder and/or premature failure of pressure relief device which will result in the venting of the cylinder contents. If user experiences any difficulty operating cylinder valve, discontinue use and contact supplier. Use an adjustable strap-wrench to remove over-tight or rusted caps.

Use a "FULL", "IN USE", and "EMPTY" tag system on cylinders. This will greatly reduce the chances of inadvertently connecting or operating the wrong cylinder.

SPECIAL REQUIREMENTS: Always store and handle compressed gases in accordance with Compressed Gas Association, Inc.(ph.703-412-0900) pamphlet CGA P-1, *Safe Handling of Compressed Gases in Containers*. Local regulations may require specific equipment for storage or use.

CAUTION: Compressed gas cylinders shall not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder refilled by someone other then the owner, without the owner's written consent, is a violation of federal law.

SECTION 8: PERSONAL PROTECTION / EXPOSURE CONTROL

ENGINEERING CONTROLS: Provide ventilation and/or local exhaust to prevent accumulation of gas concentrations above 1.0%.

RESPIRATORY PROTECTION:

GENERAL USE: None required.

EMERGENCY: Do not enter areas where concentration is greater than 1.0% (20% of LEL). Exposure to concentrations below this level does not require respiratory protection.

SKIN PROTECTION:

GENERAL USE: Leather work gloves and safety shoes for handling cylinders.

EMERGENCY: Leather gloves, fire resistant suit.

EYE PROTECTION: Safety glasses and/or face shield.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: Colorless

ODOR: Odorless

VAPOR PRESSURE: Permanent noncondensable gas.

GAS DENSITY: 0.042 lb / cu. ft.@ 70 °F

BOILING POINT: -258.6 °F

FREEZING POINT: -296.45 °F

SOLUBILITY IN WATER: Negligible

SPECIFIC GRAVITY: 0.555 @ 70 °F (air=1)

SPECIFIC VOLUME: 24.06 cu. ft. / lb. @ 70 °F 1 atm.

MOLECULAR WEIGHT: 16.04

SECTION 10: REACTIVITY / STABILITY

CHEMICAL STABILITY: Stable

CONDITIONS TO AVOID: None

INCOMPATIBILITY: Oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS: None

HAZARDOUS POLYMERIZATION: Will not occur.

SECTION 11: TOXICOLOGICAL INFORMATION

Methane is nontoxic and acts as a simple asphyxiant.

SECTION 12: ECOLOGICAL INFORMATION

This product does not contain any Class I or Class II ozone depleting chemicals. This product is not listed as a marine pollutant by DOT (49 CFR).

SECTION 13: DISPOSAL

UNUSED PRODUCT / EMPTY CYLINDER: Return cylinder and unused product to supplier. Do not attempt to dispose of unused product. Ensure cylinder valve is properly closed, valve outlet cap has been reinstalled, and valve protection cap is secured before shipping cylinder.

DISPOSAL: Residual product in the system may be burned if a suitable burning unit (flair incinerator) is available on site. This shall be done in accordance with federal, state, and local regulations. Wastes containing this material may be classified by EPA as hazardous waste by characteristic (i.e., Ignitability, Corrosivity, Toxicity, Reactivity). Waste streams must be characterized by the user to meet federal, state, and local requirements. If classified as hazardous waste this material will have a CERCLA reportable quantity (RQ) of 100 pounds (D001 Ignitable).

SECTION 14: TRANSPORTATION

DOT HAZARD CLASS: 2.1

DOT SHIPPING LABEL: Flammable Gas

DOT SHIPPING NAME: Methane

IDENTIFICATION NUMBER: UN 1971

SPECIAL SHIPPING INFORMATION: Cylinders should be transported in a secure upright position in a well ventilated truck. Never transport in passenger compartment of a vehicle. Always ensure valve is closed, and valve outlet seal and protective cap are in place before shipping cylinder.

SECTION 15: REGULATORY INFORMATION

U.S. FEDERAL REGULATIONS:

CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act of 1980 requires notification to the National Response Center of a release of quantities of hazardous substances equal to or greater than the reportable quantities (RQ's) in 40 CFR 302.4.

CERCLA REPORTABLE QUANTITY: NONE (see Section 13).

SARA TITLE III: SUPERFUND AMENDMENT AND REAUTHORIZATION ACT OF 1986

SECTION 302: Requires emergency planning based on threshold planning quantities (TPQ's) and release reporting based on reportable quantities (RQ's) of EPA's extremely hazardous substances (40 CFR 355).

Extremely Hazardous Substances in product are: NONE

SECTIONS 311 / 312: Require submission of material safety data sheets (MSDSs) and chemical inventory reporting with identification of EPA defined hazard classes. The hazard classes for this product are:

HEALTH: Immediate	PHYSICAL: High Pressure Flammability

SECTION 313: Requires submission of annual reports of release of toxic chemicals that appear in 40 CFR 372. This information must be included in all MSDS's that are copied and distributed for this material.

Components present which could require reporting under Section 313: NONE

TOXIC SUBSTANCE CONTROL ACT (TSCA): Methane is listed on the TSCA inventory.

STATE REGULATIONS

CALIFORNIA:

Proposition 65:	This product does NOT contain any listed substances which the State of California requires warning under this statute.
SCAQMD Rule:	VOC – 24.06 cu. ft. / lb

SECTION 16: SUPPLEMENTAL INFORMATION

HAZARD RATINGS:

	HEALTH	FLAMMABILITY	REACTIVITY	SPECIAL
NFPA:	0	4	0	SA
HMIS:	0	4	0	

REVISION INFORMATION: New format.

AIR PRODUCTS

Specialty Ga
Material Safe
Data She

94 JUN 27 [illegible]:51

EMERGENCY PHONE (800) 523-9374 **IN PENNSYLVANIA (800) 322-9092**	**PRODUCT NAME** ISOBUTYLENE	CAS #115-11-7
AIR PRODUCTS AND CHEMICALS, INC. **BOX 538** **ALLENTOWN, PA 18105** **(215) 481-8257**	**TRADE NAME AND SYNONYMS** Isobutylene **CHEMICAL NAME AND SYNONYMS** Isobutylene, Isobutene. 2-Methylpropene	
ISSUE DATE AND REVISIONS 04/78, 06/85	**FORMULA** (iso) C_4H_8	**CHEMICAL FAMILY** Alkene

HEALTH HAZARD DATA

TIME WEIGHTED AVERAGE EXPOSURE LIMIT

See last page.

SYMPTOMS OF EXPOSURE

Inhalation: Moderate concentrations which exclude an adequate supply of oxygen to the lungs cause dizziness, drowsiness and eventual unconsciousness. It also has a very mild anesthetic effect which might cause lack of coordination or lessened mental alertness.

Skin and Eye Contact: It is mildly irritating to mucous membranes. Due to its rapid rate of evaporation, isobutylene can cause tissue freezing or frostbite on contact.

TOXICOLOGICAL PROPERTIES

Isobutylene has a very mild anesthetic effect, however, the major health hazard is the exclusion of an adequate supply of oxygen to the lungs.

Frostbite effects are a change in color of the skin to gray or white possibly followed by blistering.

RECOMMENDED FIRST AID TREATMENT

PROMPT MEDICAL ATTENTION IS REQUIRED IN ALL CASES OF OVEREXPOSURE TO ISOBUTYLENE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS AND MUST BE AWARE OF EXTREME FIRE AND EXPLOSION HAZARD.

Inhalation: Move exposed personnel to an uncontaminated area. If not breathing, give artificial respiration, preferably mouth-to-mouth. If breathing is difficult, give oxygen. Medical assistance should be sought immediately.

Skin Contact or Frostbite: Remove contaminated clothing and flush affected areas with lukewarm water. DO NOT USE HOT WATER. A physician should see the patient promptly if the cryogenic "burn" has caused blistering of the skin or deep tissue freezing.

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES

Isobutylene is flammable over a wide range in air.

PHYSICAL DATA

BOILING POINT 19.6°F (– 6.9°C)	**LIQUID DENSITY AT BOILING POINT** 39.1 lb/ft^3 (626 kg/m^3)
VAPOR PRESSURE @ 70°F (21.1°C) = 39 psia (269 kPa)	**GAS DENSITY AT 70°F, 1 atm** 0.148 lb/ft^3 (2.37 kg/m^3)
SOLUBILITY IN WATER Insoluble	**FREEZING POINT** – 220.6°F (– 140.3°C)

APPEARANCE AND ODOR

Colorless gas with an unpleasant odor similar to that which is emitted when burning anthracite coal.

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used) See last page.	**AUTO IGNITION TEMPERATURE** 869°F (465°C)	**FLAMMABLE LIMITS % BY VOLUME** **LEL** 1.8 **UEL** 9.6

EXTINGUISHING MEDIA Water, carbon dioxide, dry chemical	**ELECTRICAL CLASSIFICATION** Class 1, Group not specified

SPECIAL FIRE FIGHTING PROCEDURES

Keep cylinder(s) cool with water spray from a distance. If possible without risk, move cylinder(s) away from fire area. If possible without risk, stop the flow of gas to a fire. Allow gas fire to burn itself out. (Continued on last page.)

UNUSUAL FIRE AND EXPLOSION HAZARDS

Isobutylene is denser than air and can travel considerable distances to an ignition source and flash back. Cylinder(s) may explode or vent when exposed to fire.

REACTIVITY DATA

STABILITY **Unstable**		**CONDITIONS TO AVOID**
Stable	X	

INCOMPATIBILITY (Materials to avoid)

Oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS

None

HAZARDOUS POLYMERIZATION **May Occur**		**CONDITIONS TO AVOID**
Will Not Occur	X	

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Evacuate all personnel from affected area. Use appropriate protective equipment. If leak is in user's equipment, be certain to purge piping with an inert gas prior to attempting repairs. If leak is in container or container valve, call the "800" emergency phone number listed herein.

WASTE DISPOSAL METHOD

All Federal, State and Local regulations regarding health and pollution should be followed in waste disposal. Contact Air Products for specific recommendations. Do not dispose of unused quantities.

(Continued on last page.)

SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type) Positive pressure air line with mask or self-contained breathing apparatus should be available for emergency use.

VENTILATION Hood with forced ventilation	**LOCAL EXHAUST** To prevent accumulation above the LEL	**SPECIAL**
	MECHANICAL (Gen.) In accordance with electrical codes	**OTHER**

PROTECTIVE GLOVES
Plastic or rubber

EYE PROTECTION
Safety goggles or glasses

OTHER PROTECTIVE EQUIPMENT
Safety shoes. safety shower. eyewash "fountain."

SPECIAL PRECAUTIONS*

SPECIAL LABELING INFORMATION
DOT Shipping Name: Liquified petroleum gas DOT Hazard Class: Flammable gas
DOT Shipping Label: Flammable gas ID No.: UN 1075

SPECIAL HANDLING RECOMMENDATIONS
Use only in well-ventilated areas. Valve protection caps must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when connecting cylinder to lower pressure (< 250 psig) piping or systems. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder.

For additional recommendations consult the Air Products Specialty Gas Catalog Safety and Technical Information Section or Compressed Gas Association Pamphlet P-1.

SPECIAL STORAGE RECOMMENDATIONS
Protect cylinders from physical damage. Store in cool, dry, well-ventilated area of non-combustible construction away from heavily trafficked areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 130°F (54°C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a "first in-first out" inventory system to prevent full cylinders being stored for excessive periods of time. Post "No Smoking or Open Flames" signs in the storage or use area. There should be no sources of ignition in the storage or use area.

For additional recommendations consult the Air Products Specialty Gas Catalog Safety and Technical Information Section or Compressed Gas Association Pamphlet P-1.

SPECIAL PACKAGING RECOMMENDATIONS
Isobutylene is noncorrosive and may be used with any common structural material.

OTHER RECOMMENDATIONS OR PRECAUTIONS
Earth-ground and bond all lines and equipment associated with the isobutylene system. Electrical equipment should be non-sparking or explosion proof. Compressed gas cylinders should not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with his (written) consent is a violation of Federal Law (49CFR).

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*Various Government agencies (i.e., Department of Transportation, Occupational Safety and Health Administration, Food and Drug Administration and others) may have specific regulations concerning the transportation, handling, storage or use of this product which [illegible] reflected in this data sheet. The customer should review these regulations to ensure that he is in full compliance.

TIME WEIGHTED AVERAGE EXPOSURE LIMIT (Continued)

Isobutylene is defined as a simple asphyxiant. Oxygen levels should be maintained at greater than 18 molar percent at normal atmospheric pressure which is equivalent to a partial pressure of 135 mm Hg. (ACGIH 1984–85)

FLASH POINT (Method Used) (Continued)

– 105°F (– 76°C) Closed Cup

SPECIAL FIRE FIGHTING PROCEDURES (Continued)

Ventilate low areas where flammable or explosive mixtures may form.

WASTE DISPOSAL METHOD (Continued)

Return the properly labeled shipping container to Air Products for disposal with valve(s) tightly closed, outlet seal(s) secured and valve protection cap in place. For emergency disposal assistance, call the "800" emergency phone number listed herein.

Vulcan CHEMICALS

MATERIAL SAFETY DATA SHEET

24 Hour Emergency Phone (316) 524-5751

Division of Vulcan Materials Company / P. O. Box 530390 • Birmingham, AL 35253-0390

I - IDENTIFICATION

CHEMICAL NAME 1,1,1 Trichloroethane.	CHEMICAL FORMULA $C_2H_3Cl_3$	MOLECULAR WEIGHT 133.4
TRADE NAME Solvent 111®, General Purpose Grade, Industrial Grade		
SYNONYMS Methyl Chloroform		DOT IDENTIFICATION NO. UN 2831

II- PRODUCT AND COMPONENT DATA

COMPONENT(S) CHEMICAL NAME	CAS REGISTRY NO.	% (wt.) Approx.	OSHA PEL
* 1,1,1 Trichloroethane	71-55-6	96.5	350 ppm
* 1,4 Diethylene dioxide	123-91-1	< 3.0	
1,2 Butylene oxide	106-88-7	< 0.5	

The hazard information presented is based on tests conducted on this or similar mixtures.

* Denotes chemical subject to reporting requirements of Section 313 of Title III of the 1986 Superfund Amendments and Reauthorization Act (SARA) and 40 CFR Part 372

III - PHYSICAL DATA

APPEARANCE AND ODOR Clear, colorless liquid, mildly sweet odor	SPECIFIC GRAVITY 1.32 @ 25°/25°C
BOILING POINT 165°F (74°C)	VAPOR DENSITY IN AIR (Air = 1) 4.6
VAPOR PRESSURE 100 mm Hg @ 20°C	% VOLATILE, BY VOLUME 100
EVAPORATION RATE (ether – 1): 0.4	SOLUBILITY IN WATER 0.07 gm/100 gm @ 25°C

IV - REACTIVITY DATA

STABILITY Stable	CONDITIONS TO AVOID Avoid contact with open flame, electric arcs, or other hot surfaces which can cause thermal decomposition.

INCOMPATIBILITY (Materials to avoid)

Strong alkalies, oxidizers, and reactive metals (i.e., aluminum, potassium, sodium, etc.). Refer to Section VIII for additional information on aluminum.

HAZARDOUS DECOMPOSITION PRODUCTS

Hydrogen chloride, phosgene, chlorine.

HAZARDOUS POLYMERIZATION

Will not occur.

V - FIRE AND EXPLOSION HAZARD DATA

FLASHPOINT (Method used)
None (TCC)

FLAMMABLE LIMITS IN AIR
7.5 - 15.0% (vol.) @ 25°C

NFPA Hazard Ratings: Health 2;
Flammability 1; Reactivity 0

EXTINGUISHING AGENTS
Water, foam, dry chemical, carbon dioxide (CO_2)

UNUSUAL FIRE AND EXPLOSION HAZARDS Concentrated vapors can be ignited by high intensity ignition source. Firefighters should wear self-contained, positive-pressure breathing apparatus, due to thermal decomposition products, and avoid skin contact.

VI - TOXICITY AND FIRST AID

EXPOSURE LIMITS (When exposure to this product and other chemicals is concurrent, the exposure limit must be defined in the workplace.)

1,1,1 trichloroethane ACGIH: 350 ppm TWA (8 hr), 450 ppm STEL
OSHA: 350 ppm TWA (8 hr), 450 ppm STEL
(Odor threshold approximately 100 ppm; causes olfactory fatigue)

Effects described in this section are believed not to occur if exposures are maintained at or below appropriate TLVs.
Because of the wide variation in individual susceptibility, these exposure limits may not be applicable to all persons and those with medical conditions listed below.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE
Acute and chronic liver disease and rhythm disorders of the heart.

ACUTE TOXICITY Primary route(s) of exposure: ☑ Inhalation ☑ Skin Absorption ☐ Ingestion

Inhalation: Major potential route of exposure. Minimal effects observed below 1,000 ppm; dizziness, drowsiness, and throat irritation at levels above 1,000 ppm. Unconciousness and death possible at levels above 10,000 ppm. Blood pressure depression, cardiac sensitization, and ventricular arrhythmia can result from the exposure to near-anesthetic levels.
Studies in laboratory animals have shown 1,1,1-trichloroethane in aerosol form to be more acutely toxic than 1,1,1-trichloroethane vapor.

Skin: Prolonged or repeated skin contact can cause irritation, defatting of skin, and dermatitis. Absorption through intact skin is possible if contact with liquid is prolonged.
1,4 Diethylene dioxide as a pure substance is readily absorbed through intact skin.

Eyes: Liquid can cause slight temporary irritation with slight temporary corneal injury.
Vapors can irritate eyes.

Ingestion: Single dose toxicity is low to moderate. If vomiting occurs, 1,1,1 trichloroethane can be aspirated into the lungs, which can cause chemical pneumonia and systemic effects.

FIRST AID
Inhalation: Remove to fresh air. If breathing has stopped, administer artificial respiration. Call a physician.
Skin: Remove contaminated clothing and shoes. Wash exposed area with soap and water. Wash contaminated clothing before reuse.
Eyes: Flush eyes immediately with water for at least 15 minutes. If irritation persists, call a physician.
Ingestion: Do not induce vomiting. Contact physician or emergency medical facility immediately.

NOTE TO PHYSICIAN: Adrenalin should never be given to persons overexposed to 1,1,1 trichloroethane.

CHRONIC TOXICITY

The finding of chronic toxic effects in laboratory animals may indicate toxicity to humans. Overexposure should be avoided, failure to do so could result in injury, illness or even death.

Chronic overexposures to 1,1,1 trichloroethane and this mixture have caused liver toxic effects in experimental animals.

Carcinogenicity: The available data indicates that 1,1,1 trichloroethane and this mixture are not carcinogenic in laboratory animals.

1,1,1 trichloroethane is not listed on the OSHA, IARC, or NTP carcinogen lists.

Reproductive Toxicity: Three studies have been performed on laboratory animals to evaluate the effects of 1,1,1 trichloroethane on reproduction and fetal development. Two of the three studies indicate no reproductive toxicity. The third study noted delays in normal development, but these delays did not affect later life.

VII - PERSONAL PROTECTION AND CONTROLS

RESPIRATORY PROTECTION

Where vapor concentration exceeds or is likely to exceed 350 ppm, a NIOSH/MSHA approved organic vapor type respirator is acceptable. A NIOSH/MSHA approved self-contained breathing apparatus or air line respirator, with full face piece, is required for vapor concentrations above 1,000 ppm and for spills and/or emergencies. Follow any applicable respirator use standards or regulations.

VENTILATION

Do not use in closed or confined space. Open doors and/or windows. Use ventilation to maintain exposure levels below 350 ppm.

SKIN PROTECTION

Wear solvent-resistant gloves such as Viton, polyvinyl alcohol, or equivalent. Solvent-resistant boots, apron, headgear and/or faceshield should be worn where splashing is possible.

EYE PROTECTION

Wear safety glasses. Contact lenses should not be worn. Chemical goggles and/or face shields should be worn where splashing is possible.

HYGIENE

Avoid contact with skin and avoid breathing vapors. Do not eat, drink, or smoke in work area. Wash hands prior to eating, drinking, or using restroom.

OTHER CONTROL MEASURES

To determine exposure level(s), monitoring should be performed regularly. Safety shower and eyewash station should be available.

NOTE: Protective equipment and clothing should be selected, used, and maintained according to applicable standards and regulations. For further information, contact the clothing or equipment manufacturer or the Vulcan Chemicals Technical Service department.

VIII - STORAGE AND HANDLING PRECAUTIONS

Follow protective controls set forth in Section VII when handling this product.
Store labeled and sealed containers in a cool, dry, well-ventilated area. Prevent water or moist air from entering storage tanks or containers. Do not cut or weld on empty or full drums. Aluminum equipment should not be used for storage and/or transfer.
Vapors are heavier than air and will collect in low areas. Do not enter confined spaces such as tanks or pits without following proper entry procedures as required by 29 CFR 1910.146.
Contact with aluminum parts in a pressurizable fluid system may cause violent reactions.
Consult equipment supplier for further information.
Do not remove or deface label. Do not reuse drum without recycling or reconditioning in accordance with any applicable federal, state or local laws.

SARA Title III Hazard Categories: Immediate Health, Delayed Health.

IX - SPILL, LEAK AND DISPOSAL PRACTICES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Evacuate the area, ventilate, and avoid breathing vapors. Dike area to contain spill. If spill occurs indoors, turn off air conditioning and/or heating system, to prevent vapors from contaminating entire building. Clean up area (wear protective equipment - refer to Section VII) by mopping or with absorbent material and place in closed containers for disposal. Avoid contamination of ground and surface waters. Do not flush to sewer. Reportable Quantity (RQ) is 1000 lbs. Notify National Response Center (800/424-8802) of uncontrolled spills in excess of RQ.

WASTE DISPOSAL METHOD

Recovered liquids may be sent to a licensed reclaimer or incineration facility. Contaminated material must be disposed of in a permitted waste management facility. Consult federal, state, or local disposal authorities for approved procedures.

X - TRANSPORTATION

DOT HAZARD CLASSIFICATION

1,1,1-Trichloroethane, 6.1, UN 2831, PG III, RQ

PLACARD REQUIRED

KEEP AWAY FROM FOOD, 2831, Class 6

LABEL REQUIRED

KEEP AWAY FROM FOOD, Class 6
Label as required by OSHA Hazard Communication Standard, and any applicable state and local regulations.

Medical Emergencies

Call collect 24 hours a day for emergency toxicological information 415/821-5338

Other Emergency information

Call 316/524-5751 (24 hours)

For any other information contact:

**Vulcan Chemicals
Technical Service Department
P.O. Box 530390
Birmingham, AL 35253-0390
800/873-4898
8 AM to 5 PM Central Time
Monday Through Friday**

DATE OF PREPARATION: March 1, 1993

NOTICE: Vulcan Chemicals believes that the information contained on this Material Safety Data Sheet is accurate. The suggested procedures are based on experience as of the date of publication. They are not necessarily all-inclusive nor fully adequate in every circumstance. Also, the suggestions should not be confused with nor followed in violation of applicable laws, regulation, rules or insurance requirements.

NO WARRANTY IS MADE, EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OTHERWISE.

Form 3239-560
VMC [illegible] REV. 292

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MSDS NUMBER : M34514 **ISSUE DATE :** 03-08-96

PRODUCT NAME : MURIATIC ACID ALL GRADES

Manufacturer's Name and Address :
Occidental Chemical Corporation, Occidental Tower
5005 LBJ Freeway, P.O. Box 809050
Dallas, TX 75380 (214) 404-3800

24 HOUR EMERGENCY TELEPHONE : 1-800-733-3665 OR 214-404-3228

TO REQUEST AN MSDS : 1-800-699-4970

CUSTOMER SERVICE : 1-800-752-5151

PRODUCT USE : Chemical Processing/Metal Cleaning

CHEMICAL NAME : Hydrogen Chloride

CHEMICAL FORMULA : HCl

SYNONYMS/COMMON NAMES :
HCl Solution
Aqueous Hydrogen Chloride
Hydrochloric Acid

2. COMPOSITION/INFORMATION ON INGREDIENTS

CAS NUMBER / NAME
7732-18-5 Water

EXPOSURE LIMITS	PERCENTAGE	
PEL:Not Established	VOL	ND
TLV:Not Established	WT	64-91

COMMON NAMES:

Listed On(List Legend Below):
00 19 22 23 50

- -

2. COMPOSITION/INFORMATION ON INGREDIENTS (Continued)

7647-01-0 Hydrochloric acid

EXPOSURE LIMITS
PEL:5 ppm; 7 mg/m3, Ceiling
TLV:5 ppm; 7.5 mg/m3, Ceiling

PERCENTAGE	
VOL	ND
WT	9-36

COMMON NAMES:
HYDROGEN CHLORIDE

Listed On(List Legend Below):
00 01 02 13 18 21 22 45 50

LIST LEGEND
00 TSCA INVENTORY
02 SARA TOXIC CHEM, SECTION 313
18 NY HAZARDOUS SUBSTANCES
21 NJ SPECIAL HEALTH HAZ SUB
23 NJ REQUIREMENT- 1% OR GREATER
50 PHILIPPINES INVENTORY (PICCS)
01 SARA EXTR HAZ SUB, SECTION 302
13 PA ENVIROMENTAL HAZ SUBSTANCE
19 PA REQUIREMENT- 3% OR GREATER
22 CANADIAN DOMESTIC SUB LIST
45 EPA/OSHA ACCIDENTAL RELEASE

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

CORROSIVE. CAUSES SEVERE BURNS TO EYES, SKIN AND DIGESTIVE TRACT. SEVERELY IRRITATING TO RESPIRATORY TRACT, EYES AND SKIN. MAY CAUSE IRRITATION OF DIGESTIVE TRACT. MAY CAUSE DISCOLORATION OF TEETH.

Clear to light amber liquid with a pungent odor.

POTENTIAL HEALTH EFFECTS

ROUTES OF ENTRY:

Inhalation, Ingestion.

TARGET ORGANS:

Eyes, Skin, Respiratory Tract, Gastrointestinal Tract.

IRRITANCY:

All routes of exposure.

SENSITIZING CAPABILITY:

None known.

REPRODUCTIVE EFFECTS:

None known.

3. HAZARDS IDENTIFICATION (Continued)

CANCER INFORMATION:

Not known to be carcinogenic.

SHORT-TERM EXPOSURE (ACUTE)

INHALATION:

Breathing gas, fog, mist or spray may result in coughing and a burning or choking sensation in the throat. If inhaled deeply, fluid may collect in the lungs (edema). Prolonged or repeated exposure to concentrations in excess of the exposure limits may cause discoloration of teeth.

EYES:

Contact rapidly causes severe irritation of the eyes and eyelids. If not quickly removed by thorough irrigation with water, there may be prolonged or permanent visual impairment or total loss of sight. Hydrogen chloride gas escaping from the aqueous solution is immediately irritating.

SKIN:

Contact may cause burns and tissue destruction.

INGESTION:

Can cause severe burns to the mucous membranes of the digestive tract.

REPEATED EXPOSURE (CHRONIC)

None known.

SYNERGISTIC MATERIALS:

None known.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:

Pre-existing disorders affecting target organs.

4. FIRST AID MEASURES

EYES:

IMMEDIATELY FLUSH EYES WITH A DIRECTED STREAM OF WATER for at least 15 minutes, forcibly holding eyelids apart to ensure complete irrigation of all eye and lid tissue. Washing eyes within several seconds is essential to achieve maximum effectiveness. GET MEDICAL ATTENTION IMMEDIATELY.

SKIN:

Flush thoroughly with cool water under shower while removing contaminated clothing and shoes. Discard non-rubber shoes. Wash clothing before reuse. GET MEDICAL ATTENTION AS SOON AS POSSIBLE.

4. FIRST AID MEASURES (Continued)

INHALATION:

Remove to fresh air. If breathing is difficult, have trained person administer oxygen. If respiration stops, give mouth-to-mouth resuscitation. GET MEDICAL ATTENTION IMMEDIATELY.

INGESTION:

NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. (If available, give several glasses of milk.) If vomiting occurs spontaneously, keep airway clear and give more water. GET MEDICAL ATTENTION IMMEDIATELY.

NOTES TO PHYSICIAN:

No specialized procedures. Treat for clinical symptoms.

5. FIRE FIGHTING MEASURES

Flash Point: Non-Flammable

Method: Not Applicable

Autoignition Temperature: Not Applicable

FLAMMABLE LIMITS IN AIR, BY % VOLUME

- Upper: Non-Flammable
  Lower: Non-Flammable

EXTINGUISHING MEDIA:

Non-flammable / Non-combustible.

Use agents appropriate for surrounding fire.

Use water spray to keep fire-exposed containers cool.

FIRE FIGHTING PROCEDURES:

Keep unauthorized personnel removed and upwind. Wear NIOSH/MSHA approved positive pressure self-contained breathing apparatus and full protective clothing.

FIRE AND EXPLOSION HAZARD:

This product is nonflammable and nonexplosive under normal conditions of use. At high temperatures this product can decompose to give off hydrochloric acid and gas.

Vapors are irritating to the eyes and nose. Liquid is corrosive to the skin

This product attacks most metals with the evolution of explosive hydrogen gas.

5. FIRE FIGHTING MEASURES (Continued)

SENSITIVITY TO MECHANICAL IMPACT:

Not sensitive.

SENSITIVITY TO STATIC DISCHARGE:

Not sensitive.

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS:

Evacuate unnecessary personnel.

Keep unprotected personnel upwind of the spill area.

Follow protective measures provided under Personal Protection in Section 8.

ENVIRONMENTAL PRECAUTIONS:

Contain spill with dike to prevent entry into sewers or waterways.

According to 40 CFR 302 Table 302.4 (CERCLA), environmental releases that exceed the RQ must be reported to the National Response Center by calling 800-424-8802 (202-426-2675) and the State Emergency Response Commission and the Local Emergency Planning Committee (40 CFR 355.40) as appropriate.

METHODS FOR CLEANING UP:

Large spills should be removed by vacuum truck. Smaller spills may be soaked up and neutralized with soda ash which should be placed in closed containers, labeled and stored in a safe place outdoors to await proper disposal. Spills on areas other than pavement, e.g., dirt or sand, may be handled by removing the affected soils and placing in approved containers.

7. HANDLING AND STORAGE

HANDLING:

Wear personal protective equipment as described in Exposure Controls/Personal Protection (Section 8) of the MSDS.

Avoid breathing vapor, use with adequate ventilation. Wear NIOSH/MSHA approved respiratory protection if there is potential for exposure above the exposure limits.

Keep away from sources of ignition because toxic, corrosive and explosive gases may be formed.

Wash thoroughly after handling.

Open container carefully to avoid spurting.

7. HANDLING AND STORAGE (Continued)

SPECIAL MIXING AND HANDLING INSTRUCTIONS:

DO NOT ADD WATER DIRECTLY TO PRODUCT, and do not mix with alkalies such as sodium hydroxide (caustic soda) or alkali metals, to avoid a possible violent reaction. The product may be added to water with mixing and dilution.

STORAGE:

Store in a cool, ventilated area away from incompatible materials (see Section 10).

Dike and vent storage tanks.

Do not store in unlined containers.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS:

General room ventilation plus local exhaust at points of emission to maintain levels of airborne contaminants below exposure limits.

PERSONAL PROTECTION

RESPIRATORY:

Wear a NIOSH/MSHA approved respirator following manufacturer's recommendations, where airborne contaminants may occur.

EYE/FACE:

Wear chemical safety goggles plus full face shield to protect against splashing when appropriate (ANSI Z87.1).

SKIN:

Wear chemical resistant gloves such as rubber, neoprene or vinyl.

Whenever there is a possibility of splash or contact wear a chemical resistant full body suit and boots.

OTHER:

Emergency shower and eyewash facility should be in close proximity (ANSI Z358.1).

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance and Odor: Clear to light amber liquid with a pungent odor.

Odor Threshold: Not available

9. PHYSICAL AND CHEMICAL PROPERTIES (Continued)

Specific Gravity (Water=1): 1.05 to 1.18

Vapor Pressure: 14.6 to 80

Vapor Density (Air=1): 1.3 @ 20°C

Density: 8.75 to 9.83 lb/gal

Evaporation Rate: Not available

% Volatiles by Wt: Not applicable

Boiling Point: 140°F (60°C) to 221°F (105°C)

Freezing Point: -29°F (-34°C) to 5°F (-15°C)

Melting Point: Not available

Solubility in Water (% by wt.): 100

pH: 0.2% solution has a pH of 2

Octanol/Water Partition Coefficient: Not available

Thermal Decomposition Temperature: Not available

Other: Aqueous HCL solutions on boiling go to a constant boiling mixture that contains 20.24% HCL @ 110°C

VOC (% by wt.): Not applicable

10. STABILITY AND REACTIVITY

CHEMICAL STABILITY:

X STABLE
UNSTABLE

REACTS WITH:

AIR
WATER
X HEAT
OXIDIZERS
ACIDS
X ALKALIS
X METALS
OTHER
NONE

HAZARDOUS POLYMERIZATION:

OCCURS
X WILL NOT OCCUR

COMMENTS:

Avoid contact with alkali metals or other active metals and certain of their compounds. Do not add water directly to the product. The product may be added to water with mixing and dilution.

10. STABILITY AND REACTIVITY (Continued)

HAZARDOUS DECOMPOSITION PRODUCTS:

Generates toxic and irritating gases at high temperatures. Reacts with metals with the evolution of hydrogen which when mixed in air may result in fire or explosion if ignited. Chlorine gas may be released by mixing with strong oxidizers.

11. TOXICOLOGICAL INFORMATION

7647-01-0 **Hydrochloric acid**

ACUTE ORAL LD50 :	(rabbit)	900 mg/kg
ACUTE INHALATION LC50 :	(rat, 1 hr)	3124 ppm

12. ECOLOGICAL INFORMATION

7647-01-0 **Hydrochloric acid**

AQUATIC ECOTOX DATA
Fish:

LC50 (96 hr.)	(Mosquito fish)	282	mg/L
LC100(24 hr.)	(Trout)	10	mg/L

Invertebrates:

LC50 (48 hr.)	(Starfish)	100 - 330	mg/L
LC50 (48 hr.)	(Shrimp)	100 - 330	mg/L
LC50 (48 hr.)	(Shore crab)	240	mg/L

Amphibians:
No data available

Plants:
No data available

TERRESTRIAL ECOTOX DATA
Wildlife:
No data available

Plants:
No data available

ENVIRONMENTAL FATE DATA
Biotic:
No data available

Abiotic:
Dissociates in water

12. ECOLOGICAL INFORMATION (Continued)

Hydrochloric acid can be acutely toxic in aquatic life through reduction in aqueous pH to toxic levels. Typically most aquatic species are intolerant of pH levels lower than 5.5 for any extended length of time. Reduction in aqueous pH levels may also cause the liberation of metals such as aluminum which will also contribute to exhibited toxicity. Hydrochloric acid will dissociate in water and undergo neutralization with carbonate and other naturally occurring buffering agents. Terrestrial organisms would be subject to severe burns if exposed to HCl during an accidental release. A large HCl release could lead to a persistent reduction in pH in a poorly buffered system lacking in carbonates or other naturally occurring acid-neutralizers. Care should be taken to avoid accidental releases to aquatic or terrestrial ecosystems.

13. DISPOSAL CONSIDERATIONS

The materials resulting from clean-up operations may be hazardous wastes and, therefore, subject to specific regulations. Package, store, transport, and dispose of all (clean-up) materials and any contaminated equipment in accordance with all applicable federal, state, and local regulations.

Ensure that all responsible federal, state, and local agencies receive proper notification of spill and disposal methods.

Shipments of waste materials may be subject to manifesting requirements per applicable regulations. Appropriate disposal will depend on the nature of each waste material and should be done by a competent and properly permitted contractor.

14. TRANSPORT INFORMATION

DOT PROPER SHIPPING NAME: Hydrochloric Acid, Solution

DOT HAZARD CLASS: 8

DOT IDENTIFICATION NUMBER: UN1789

DOT PACKING GROUP: II

DOT HAZARDOUS SUBSTANCE(S): RQ 5,000 Lbs. (Hydrochloric Acid)

DOT MARINE POLLUTANT(S): Not Applicable

ADDITIONAL DESCRIPTION REQUIREMENT: Not Applicable

15. REGULATORY INFORMATION

U.S. FEDERAL REGULATIONS:

OSHA Standard 29 CFR 1910.1200 requires that information be provided to employees regarding the hazards of chemicals by means of a hazard communication program including labeling, material safety data sheets, training and access to written records. We request that you, and it is your legal duty to, make all information in this Material Safety Data Sheet available to your employees.

To aid our customers in complying with regulatory requirements, SARA Title III Hazard Categories for this product are indicated below. If the word "YES" appears next to any category, this product may be reportable by you under the requirements of 40.CFR.370. Please consult those regulations for details.

Under Section 302 of the Superfund Amendments and Reauthorization Act of 1986, hydrogen chloride IN THE GAS PHASE is classified as an Extremely Hazardous Substance. This material contains hydrogen chloride in aqueous solution.

This product contains a toxic chemical or chemicals subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR 372. See Section 2, List Legend 02.

TSCA:

All components of this product that are required to be on the TSCA inventory are listed on the inventory.

SARA/TITLE III HAZARD CATEGORIES:

Immediate(Acute) Health:	YES	Reactive Hazard	YES
Delayed(Chronic) Health:	NO	Sudden Release of Pressure	NO
Fire Hazard:	NO		

HMIS HAZARD RATINGS:

HEALTH HAZARD: 3 FIRE HAZARD: 0 REACTIVITY: 2

STATE REGULATIONS:

See Section 2. COMPOSITION/INFORMATION ON INGREDIENTS list legend for applicable state regulation.

Consult local laws for applicability.

INTERNATIONAL REGULATIONS:

Consult the regulations of the importing country.

CANADA:

WHMIS Hazard Class: D1B, E

16. OTHER INFORMATION

For additional non-emergency health, safety or environmental information telephone (716) 286-3042 or write to:

Occidental Chemical Corporation
Product Stewardship Department
360 Rainbow Boulevard South
P.O. Box 728
Niagara Falls, New York 14302-0728

MSDS LEGEND:

ACGIH = American Conference of Governmental Industrial Hygienists

CAS = Chemical Abstracts Service Registry Number

CEILING = Ceiling Limit (15 Minutes)

CEL = Corporate Exposure Limit

OSHA = Occupational Safety and Health Administration

PEL = Permissible Exposure Limit (OSHA)

STEL = Short Term Exposure Limit (15 Minutes)

TDG = Transportation of Dangerous Goods (Canada)

TLV = Threshold Limit Value (ACGIH)

TWA = Time Weighted Average (8 Hours)

WHMIS = Worker Hazardous Materials Information System (Canada)

* = See Section 3 Hazards Identification - Repeated Exposure(Chronic) Information

IMPORTANT: The information presented herein, while not guaranteed, was prepared by competent technical personnel and is true and accurate to the best of our knowledge. NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR PURPOSE, OR OF ANY OTHER KIND, EXPRESS OR IMPLIED, IS MADE REGARDING PERFORMANCE, STABILITY OR OTHERWISE. This information is not intended to be all-inclusive as to the manner and conditions of use, handling and storage. Other factors may involve other or additional safety or performance considerations. While our technical personnel will be happy to respond to questions regarding safe handling and use procedures, safe handling and use remains the responsibility of the customer. No suggestions for use are intended as, and nothing herein shall be construed as a recommendation to infringe any existing patents or violate any federal, state or local laws, rules, regulations or ordinances.

This Material Safety Data Sheet (MSDS) covers the following materials:

- MURIATIC ACID 20BE
- MURIATIC ACID 32% (20 DEG. BE')
- MURIATIC ACID, 18% BELLE
- MURIATIC ACID 20° BE' DEER PARK
- MURIATIC ACID 20° BE' COMMERICAL NIAGARA
- MURIATIC ACID 20° BE' WATER WHITE NIAGARA
- MURIATIC ACID 20° BE' HIGH GRADE EXCHANGE
- MURIATIC ACID 20 COMMERCIAL

16. OTHER INFORMATION (Continued)

- MURIATIC ACID 20° BE' WATER WHITE TACOMA
- MURIATIC ACID 22° BE' WATER WHITE TACOMA
- MURIATIC ACID, 18% NIAGARA
- MURIATIC ACID, 10% DEER PARK
- MUR ACD 20 WW-TAC (CAN)
- MUR ACD 22 WW-TAC (CAN)
- MUR ACID 20 COM NF (CAN)
- MUR ACD 20 WW-NIAG (CAN)

17. WARNING LABEL INFORMATION

SIGNAL WORD:

DANGER

HAZARD WARNINGS:

CORROSIVE.

CAUSES SEVERE BURNS TO EYES, SKIN AND DIGESTIVE TRACT.

SEVERELY IRRITATING TO RESPIRATORY TRACT, EYES AND SKIN.

MAY CAUSE IRRITATION OF DIGESTIVE TRACT.

MAY CAUSE DISCOLORATION OF TEETH.

PRECAUTIONS:

Keep container tightly closed and properly labeled.

Avoid breathing vapors.

Use with adequate ventilation to maintain exposure level below PEL.

Avoid contact with eyes, skin and clothing.

Wear chemical safety goggles plus full face shield to protect against splashing when appropriate (ANSI Z87.1).

Wash thoroughly after handling.

Avoid contact with metals.

Do not allow entry into sewers and waterways.

Wear chemical resistant clothing.

Material in contact with metals may liberate flammable hydrogen gas.

17. WARNING LABEL INFORMATION (Continued)

FIRST AID

EYES:

IMMEDIATELY FLUSH EYES WITH A DIRECTED STREAM OF WATER for at least 15 minutes, forcibly holding eyelids apart to ensure complete irrigation of all eye and lid tissue. Washing eyes within several seconds is essential to achieve maximum effectiveness. GET MEDICAL ATTENTION IMMEDIATELY.

SKIN:

Flush thoroughly with cool water under shower while removing contaminated clothing and shoes. Discard non-rubber shoes. Wash clothing before reuse. GET MEDICAL ATTENTION AS SOON AS POSSIBLE.

INHALATION:

Remove to fresh air. If breathing is difficult, have trained person administer oxygen. If respiration stops, give mouth-to-mouth resuscitation. GET MEDICAL ATTENTION IMMEDIATELY.

INGESTION:

NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. (If available, give several glasses of milk.) If vomiting occurs spontaneously, keep airway clear and give more water. GET MEDICAL ATTENTION IMMEDIATELY.

IN CASE OF SPILL OR LEAK:

Get protective equipment.

Contain spill and pump into marked container for reclamation or disposal.

Avoid discharges to sewers and streams.

Spills of 5000 pounds or more must be reported to the National Response Center, 1-800-424-8802.

Use NIOSH/MSHA self-contained breathing apparatus and full protective equipment.

FIRE:

Material does not burn.

Use extinguishing medium as appropriate for surrounding fire.

Use NIOSH/MSHA self-contained breathing apparatus and full protective equipment.

Fire will liberate toxic gases.

HANDLING AND STORAGE:

Store in a cool, dry, well-ventilated area away from metals and strong alkalies, flammable substances and oxidizing materials.

17. WARNING LABEL INFORMATION (Continued)

Dike and vent storage tanks.

Do not store in unlined containers.

Do not add water directly to product, do not mix with alkalies or alkali metals.

DISPOSAL:

Submit to an approved chemical disposal service for disposal in accordance with government regulations.

INFORMATION REQUIRED BY FEDERAL, STATE OR LOCAL REGULATIONS:

This Product Contains:

CAS#	NAME
7732-18-5	Water
7647-01-0	Hydrochloric acid

HMIS RATING: HEALTH 3 FLAMMABILITY 0 REACTIVITY 2

LABEL NUMBER: 0396M34514

For Industrial Use Only

MATERIAL SAFETY DATA SHEET

METHANOL

MSDS No. HCR001422

Rev. Date 02/02/96

LYONDELL PETROCHEMICAL COMPANY
1221 MC KINNEY STREET, SUITE 1600
P.O. BOX 3646
HOUSTON, TEXAS 77253-3646

IMPORTANT: Read this MSDS before handling and disposing of this product and pass this information on to employees, customers, and users of this product.
This product is considered a hazardous chemical under the OSHA Hazard Communication Rule.

Trade Name	METHANOL
Other Names	METHYL ALCOHOL; (MEETS ASTM D-1152 SPECIFICATIONS); WOOD ALCOHOL; WOOD NAPHTHA; WOOD SPIRITS; CARBINOL; COLUMBIAN SPIRITS; PYROXYLIC SPIRITS; MANHATTAN SPIRITS.

Telephone Numbers
EMERGENCY
800/424-9300 CHEMTREC
800/245-4532 HOT LINE
CUSTOMER SERVICE
713/652-7200 INFO ONLY

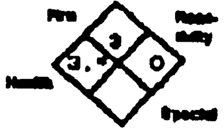
Chemical Family	ALIPHATIC ALCOHOL
DOT Hazardous Materials Proper Shipping Name	METHANOL OR METHYL ALCOHOL
Generic Name	METHANOL
DOT Hazard Class	3 (6.1) (FLAMMABLE LIQUID/POISON), PG-II
CAS No.	67-56-1
Company ID No.	E000142300
UN/NA ID No.	UN 1230

EXTREMELY FLAMMABLE! OSHA/NFPA CLASS-IB FLAMMABLE LIQUID.
KEEP AWAY FROM HEAT, SPARKS, AND FLAME. KEEP CONTAINERS CLOSED.
POISON-CLASS 3. HARMFUL OR FATAL IF SWALLOWED OR ABSORBED THROUGH THE SKIN!
INGESTION OF ONE TO FOUR OUNCES CAN CAUSE IRREVERSIBLE INJURY TO THE NERVOUS SYSTEM, BLINDNESS, OR DEATH. IT CANNOT BE MADE NON-POISONOUS.
CAUSES EYE AND RESPIRATORY SYSTEM IRRITATION AND MAY CAUSE SKIN IRRITATION!
AVOID LIQUID, MIST, OR VAPOR CONTACT. WEAR PROPER PROTECTIVE CLOTHING. WASH THOROUGHLY AFTER HANDLING. (SEE SECTIONS V. AND XI.)
MAY BE HARMFUL IF INHALED! MAY CAUSE INTERNAL ORGAN DAMAGE!
AVOID BREATHING VAPORS. USE ONLY WITH ADEQUATE VENTILATION. INHALATION OR LIQUID PENETRATION OF THE SKIN CAN CAUSE CENTRAL NERVOUS SYSTEM (CNS) DEPRESSION. PROLONGED OR REPEATED HIGH INHALATION EXPOSURE MAY CAUSE OPTIC NERVE DAMAGE, PULMONARY AND/OR CEREBRAL EDEMA, LIVER AND/OR KIDNEY DAMAGE, BIRTH DEFECTS, COMA, RESPIRATORY FAILURE, AND DEATH.

Flash Point (Method)	Autoignition Temperature (Method)	Flammable Limits (% Vol. in Air) At Normal Atmospheric Temperature and Pressure
AP 53°F (D-56) SEE "FIRE & EXPLOSION HAZARDS"	AP 725°F (E-659) BASED UPON NFPA "METHANOL"	Lower AP 6.0 Upper AP 36.5 BASED UPON NFPA "METHANOL"

Fire and Explosion Hazards	EXTREMELY FLAMMABLE! THIS MATERIAL RELEASES VAPORS AT OR BELOW AMBIENT TEMPERATURES. WHEN MIXED WITH AIR IN CERTAIN PROPORTIONS AND EXPOSED TO AN IGNITION SOURCE, THESE VAPORS CAN BURN IN THE OPEN OR EXPLODE IN CONFINED SPACES. BEING HEAVIER THAN AIR, FLAMMABLE VAPORS MAY TRAVEL LONG DISTANCES ALONG THE GROUND BEFORE REACHING A POINT OF IGNITION AND FLASHING BACK.
Extinguishing Media	ALCOHOL TYPE FOAM DRY CHEMICAL CO2 INERT GAS - HALON/N2 FOAM WATER FOG, WATERSPRAY, AND FOAM CAN COOL THE FIRE, BUT PROBABLY WILL NOT ACHIEVE EXTINGUISHMENT.

HAZARD RATING:
4 - Extreme
3 - High
2 - Moderate
1 - Slight
0 - Insignificant



* Chronic Health Hazard - See Section IV.

Special Firefighting Procedures	MIXTURES WITH WATER CONTAINING MORE THAN 21 VOL.% METHANOL ARE FLAMMABLE. DIKE UP FIRE CONTROL WATER FOR LATER DISPOSAL; DO NOT SCATTER THE MATERIAL. METHANOL FIRES MAY NOT BE VISIBLE TO THE NAKED EYE. DO NOT ENTER ANY CONFINED/ENCLOSED FIRE SPACE WITHOUT PROPER PROTECTIVE EQUIPMENT, INCLUDING SELF-CONTAINED BREATHING APPARATUS. WATER COOL FLAME-EXPOSED CONTAINERS FROM THE SIDE UNTIL WELL AFTER THE FIRE IS OUT. EVACUATE IMMEDIATELY IF THERE IS A RISING SOUND OF VENTING SAFETY DEVICES OR TANK DISCOLORIZATION.

[illegible]

Summary of Acute Hazards	LIQUID, MIST OR VAPORS CAN CAUSE EYE, SKIN AND RESPIRATORY TRACT IRRITATION AND CNS DEPRESSION. ASPIRATION INTO THE LUNGS WILL CAUSE CHEMICAL PNEUMONIA	
ROUTE OF EXPOSURE	**SIGNS AND SYMPTOMS**	**Primary Route(s)**
Inhalation	SHORT-TERM EXPOSURE TO HIGH LEVELS OF VAPOR MAY CAUSE CNS DEPRESSION. SYMPTOMS INCLUDE NAUSEA, DROWSINESS, VERTIGO, FATIGUE, CONVULSIONS, UNCONCIOUSNESS AND DEATH, DEPENDING ON EXPOSURE DURATION. (SEE "SUMMARY" BELOW.)	☒
Eye Contact	EYE IRRITATION MAY OCCUR UPON SHORT-TERM EXPOSURE, INCLUDING A BURNING SENSATION, TEARING, REDNESS, OR SWELLING. UPON DIRECT CONTACT WITH LIQUID, CONJUNCTIVITIS AND CORNEAL BURNS MAY OCCUR.	☒
Skin Absorption	UPON PROLONGED OR REPEATED CONTACT, ABSORPTION THROUGH THE SKIN MAY OCCUR AND PRODUCE TOXIC EFFECTS SIMILAR TO THOSE RESULTING FROM INHALATION EXPOSURE. (SEE "INHALATION" BOX ABOVE.)	☒
Skin Irritation	SKIN IRRITATION OR MORE SERIOUS DISORDERS MAY OCCUR UPON PROLONGED AND REPEATED CONTACT DUE TO SKIN DEFATTING.	☒
Ingestion	SWALLOWING ONLY 1 TO 4 OUNCES HAS BEEN REPORTED TO CAUSE DEATH OR SERIOUS IRREVERSIBLE INJURY SUCH AS BLINDNESS. METHANOL METABOLISM CAUSES SYSTEMIC ACIDOSIS RESULTING IN DAMAGE TO THE OPTIC NERVE. SYMPTOMS MAY BE DELAYED.	☒
Summary of Chronic Hazards and Special Health Effects	METHANOL IS SLOWLY ELIMINATED FROM THE BODY, HENCE REPEATED EXPOSURES MAY RESULT IN TOXIC LEVELS IN THE BLOOD AND TISSUES. IN LIMITED ANIMAL STUDIES, WHERE METHANOL WAS GIVEN ORALLY OR APPLIED TO THE SKIN, THERE HAS BEEN NO EVIDENCE OF CARCINOGENIC POTENTIAL. RODENT STUDIES HAVE SHOWN THAT HIGH-LEVEL EXPOSURE IMPAIRS NEURAL TUBE CLOSURE AND INDUCES OTHER BIRTH DEFECTS. PERSONNEL WITH PRE-EXISTING CNS DISEASE, SKIN DISORDERS, IMPAIRED LIVER OR KIDNEY FUNCION, OR CHRONIC RESPIRATORY DISEASES SHOULD AVOID EXPOSURE.	

[illegible]

Respiratory	DO NOT USE AIR-PURIFYING RESPIRATOR. ONLY NIOSH/MSHA APPROVED SUPPLIED AIR OR SELF-CONTAINED BREATHING APPARATUS OPERATED IN POSITIVE PRESSURE MODE ARE SATISFACTORY, IF EXPOSURE CAN EXCEED THE PEL/TLV.
Eye	EYE PROTECTION SUCH AS CHEMICAL SPLASH GOGGLES AND/OR FACE SHIELD MUST BE WORN WHEN POSSIBILITY EXISTS FOR EYE CONTACT DUE TO SPLASHING OR SPRAYING LIQUID, AIRBORNE PARTICLES, OR VAPOR. CONTACT LENSES SHOULD NOT BE WORN.
Skin	WHEN SKIN CONTACT IS POSSIBLE, PROTECTIVE CLOTHING INCLUDING GLOVES, APRON, SLEEVES, BOOTS, HEAD AND FACE PROTECTION SHOULD BE WORN. THIS EQUIPMENT MUST BE CLEANED THOROUGHLY AFTER EACH USE.
Engineering Controls	GENERAL ROOM OR LOCAL EXHAUST VENTILATION IS USUALLY REQUIRED TO MEET EXPOSURE STANDARD(S).
Other Hygienic and Work Practices	EMERGENCY EYE WASH FOUNTAINS AND SAFETY SHOWERS SHOULD BE AVAILABLE IN THE IMMEDIATE VICINITY OF ANY POTENTIAL EXPOSURE. USE GOOD PERSONAL HYGIENE PRACTICES. WASH HANDS BEFORE EATING, DRINKING, SMOKING, OR USING TOILET FACILITIES. PROMPTLY REMOVE SOILED CLOTHING/WASH THOROUGHLY BEFORE REUSE. SHOWER AFTER WORK USING PLENTY OF SOAP AND WATER.

[illegible]

Substance	Source	Date	Type	Value/Units	Time
METHYL ALCOHOL (METHANOL) - SKIN	OSHA	1989	PEL	200 PPM	8 HRS
			STEL	250 PPM	15 MIN
METHANOL (METHYL ALCOHOL) - SKIN	ACGIH	1994	TLV	200 PPM	8 HRS
			STEL	250 PPM	15 MIN

METHANOL

MSDS No.
HCR001423
Rev. Date
02/02/96

Inhalation	IMMEDIATELY REMOVE FROM CONTAMINATED AREA TO FRESH AIR. KEEP INDIVIDUAL QUIET. FOR RESPIRATORY DISTRESS, GIVE AIR OR OXYGEN, AND/OR ADMINISTER CPR (CARDIOPULMONARY RESUSCITATION). OBTAIN EMERGENCY MEDICAL ATTENTION.
Eye Contact	IMMEDIATELY FLUSH EYES WITH PLENTY OF CLEAN LOW-PRESSURE WATER FOR AT LEAST 15 MINUTES. RETRACT EYELIDS OFTEN. OBTAIN EMERGENCY MEDICAL ATTENTION.
Skin Contact	IMMEDIATELY REMOVE CONTAMINATED CLOTHING. WASH AFFECTED SKIN THOROUGHLY WITH SOAP AND WATER. IF IRRITATION PERSISTS, SEEK MEDICAL ATTENTION. WASH CLOTHING BEFORE REUSE; WASH OR DISCARD CONTAMINATED LEATHER SHOES/GLOVES.
Ingestion	SEE EMERGENCY MEDICAL TREATMENT PROCEDURES AND SECTION XI. "GENERAL COMMENTS".
Emergency Medical Treatment Procedures	METHANOL INGESTION IS LIFE-THREATENING. IF SWALLOWED AND CONSCIOUS, DRINK TWO GLASSES OF WATER AND INDUCE VOMITING BY FINGER DOWN THE THROAT OR WITH SYRUP OF IPECAC. FOLLOW EMESIS WITH TWO TEASPOONS OF BAKING SODA IN WATER. SYMPTOM ONSET MAY BE DALAYED. ETHANOL THERAPY MAY BE INDICATED. SEE SECTION XI. "GENERAL COMMENTS" FOR ADDITIONAL INFORMATION.

Precautions if Material is Spilled or Released	EXTREMELY FLAMMABLE LIQUID! RELEASE CAUSES AN IMMEDIATE FIRE/EXPLOSION HAZARD. REMOVE ALL IGNITION SOURCES AND SAFELY STOP FLOW OF SPILL. REMOVE ALL NON-ESSENTIAL PERSONNEL. USE PROPER PROTECTIVE EQUIPMENT. CONTAIN OR PREVENT FLOW TO SEWERS OR PUBLIC WATERS. BLANKET WITH AN APPROPRIATE FOAM. RESTRICT WATER USE FOR CLEANUP. IN URBAN AREAS, CLEANUP ASAP. IN NATURAL ENVIRONMENTS, SEEK ADVICE FROM ECOLOGISTS. THIS MATERIAL IS WATER-SOLUBLE AND MAY BIODEGRADE. COMPLY WITH ALL APPLICABLE LAWS. SPILLS MAY NEED TO BE REPORTED TO THE NATIONAL RESPONSE CENTER (800/424-8802). SPILLED MATERIAL AND ANY CONTAMINATED WATER OR SOIL MAY BE HAZARDOUS TO HUMAN OR OTHER LIFE.
Waste Disposal Methods	FOR LARGE SPILLS, MAXIMIZE PRODUCT RECOVERY FOR REUSE OR RECYCLING. FREE LIQUID MAY BE COLLECTED USING EXPLOSION-PROOF DIESEL OR VACUUM PUMPS. FOR SMALL SPILLS, TAKE UP WITH SAND OR OTHER NON-COMBUSTIBLE ABSORBENT. USE REGISTERED TRANSPORTERS TO MOVE CONTAMINATED PRODUCT/SOIL/WATER IN D.O.T.-APPROVED CONTAINERS. DISPOSE OF MATERIALS AT A LICENSED FACILITY PERMITTED TO HANDLE RCRA/OSHA "HAZARDOUS WASTES". INCINERATION IS THE RECOMMENDED DISPOSAL METHOD. BURN CONCENTRATED LIQUID IN SYSTEMS COMPATIBLE WITH WATER SOLUBLE WASTES. AVOID FLAMEOUTS. BIODEGRADATION MAY BE USED ON DILUTE AQUEOUS WASTE. ASSURE EMISSIONS AND EFFLUENT COMPLY WITH APPLICABLE LAWS.

Component Name	CAS No.	Carcinogen##		Composition amount (Wt.) (See Qualification on Page 4)
METHANOL (METHYL ALCOHOL)	67-56-1	N/AP	GT	99.9 PERCENT

##Listed By: 1 = NTP, 2 = IARC, 3 = OSHA, 4 = Other

Compositions given are typical values, not specifications.

Boiling Point (At 760.0 mm Hg) AP 148°F	**Viscosity Units, Temp. (Method)** AP 1 CPS AT 30°C (D-445)		**Dry Point** N/AP
Freezing Point AP -144°F	**Vapor Pressure** (MM HG AT 68°F) AP 96		**Volatile Characteristics** APPRECIABLE
Specific Gravity (H_2O = 1 at 39.2°F) AP 0.79	**Vapor Sp. Gr. (Air = 1.0 at 60°-90°F)** AP 1.1	**Solubility in Water** COMPLETE	**pH** N/AP
Hazardous Polymerization NOT EXPECTED TO OCCUR	**Other Chemical Reactivity** METHANOL FORMS AN AZEOTROPE WITH WATER.		**Stability** STABLE

Other Physical and Chemical Properties	MOLECULAR WEIGHT = 32.04; WATER CONTENT = LT 0.05 WT.% (ASTM D-1364); EVAPORATION RATE = 5.9 (IF N-BUTYL ACETATE = 1.0).
Appearance and Odor	CLEAR, COLORLESS LIQUID; FAINT, CHARACTERISTIC ALCOHOL ODOR; ODOR THRESHOLD = 55 PPM IN AIR; ODOR IS NOT A GOOD INDICATOR OF EXPOSURE LEVEL.
Conditions to Avoid	HEAT, SPARKS, OPEN FLAME, AND OXIDIZING CONDITIONS.
Materials to Avoid	STRONG OXIDIZING AGENTS; ALUMINUM, ZINC (GALVANIZED), OR ANY OTHER REACTIVE METAL WHICH WILL DISPLACE HYDROGEN; CERTAIN FORMS OF PLASTICS; AND RUBBER OR RUBBER-BASED COATINGS. ALUMINUM MAY FORM AN OXIDE SCALE ON PROLONGED CONTACT.
Hazardous Decomposition Products	EXCESSIVE HEATING AND/OR INCOMPLETE COMBUSTION WILL GENERATE HIGHLY POISONOUS CARBON MONOXIDE AND PERHAPS OTHER TOXIC VAPORS SUCH AS FORMALDEHYDE.

Handling, Storage, and Decontamination Procedures	STORE AND TRANSPORT IN ACCORDANCE WITH ALL APPLICABLE LAWS. KEEP AWAY FROM HEAT, SPARKS, AND OPEN FLAME! KEEP CONTAINERS CLOSED AND PLAINLY LABELED! GROUND ALL DRUMS AND TRANSFER VESSELS WHEN HANDLING. USE ONLY WITH ADEQUATE VENTILATION! AVOID BREATHING VAPORS. STORE SAMPLES IN A COOL (LT 80°F.), WELL VENTILATED PLACE. THE STORAGE AREA AND VENTILATION EQUIPMENT SHOULD COMPLY WITH NFPA STANDARDS OF CLASS-IA/B FLAMMABLE LIQUIDS AND NEC REQUIREMENTS. "PETROLEUM DISTILLATE"-16 CFR 1500.14(B)(3). USE SPECIAL FEDERAL LABELING IF INTENDED, OR PACKAGED FOR USE IN THE HOUSEHOLD OR BY CHILDREN. DO NOT USE THIS MATERIAL AS A CLEANING SOLVENT. ISOLATE, VENT, DRAIN, WASH AND PURGE SYSTEMS OR EQUIPMENT BEFORE ANY REPAIR OR MAINTENANCE. REMOVE ALL IGNITION SOURCES. CHECK ATMOSPHERE FOR OXYGEN DEFICIENCIES AND EXPLOSIVITY. USE ADEQUATE PERSONAL PROTECTIVE EQUIPMENT (SEE SECTION V.) AND OBSERVE PRECAUTIONS PERTAINING TO CONFINED SPACE ENTRY.
General Comments	INGESTION OF THIS PRODUCT, EVEN IN SMALL AMOUNTS, CAN CAUSE BLINDNESS AND DEATH. ONSET OF SYMPTOMS MAY BE DELAYED FOR 18-24 HOURS. TREATMENT PRIOR TO ONSET OF SYMPTOMS MAY BE LIFE-SAVING. METHANOL IS RAPIDLY ABSORBED, SO INDUCE VOMITING ASAP (WITHIN 30 MINUTES OF INGESTION) TO BE MOST EFFECTIVE. ETHANOL INHIBITS FORMATION OF TOXIC METABOLITES. IF INDICATED, START WITH A LOADING DOSE OF 7.6-10 ML/KG OF BODY WEIGHT OF 10% ETOH IN D5W OVER 30-60 MINUTES; MAINTENANCE DOSE OF 1.4 ML/KG TO ACHIEVE 100-130 MG/DL BLOOD ETOH LEVEL DURING ETHANOL THERAPY. (IF CHARCOAL IS ADMINISTERED, ETHANOL SHOULD BE ADMINISTERED INTRAVENOUSLY AND NOT ORALLY.) MAINTAIN CONTACT WITH THE POISON CONTROL CENTER DURING ALL ASPECTS OF THE DIAGNOSIS AND TREATMENT. REFER TO A.P.I.'S PUBLICATION 4524 ENTITLED "CLINICAL TOXICOLOGY OF THE ACUTE INGESTION OF METHANOL/HYDROCARBON BLENDS" FOR ADDITIONAL INFORMATION REGARDING MEDICAL MONITORING AND TREATMENT. SOME OF THE INFORMATION PRESENTED AND CONCLUSIONS DRAWN HEREIN ARE FROM SOURCES OTHER THAN DIRECT TEST DATA ON THE MIXTURE ITSELF.

- - - Note - - - Qualifications:

EQ = Equal	AP = Approximately	N/P = No Applicable Information Found
LT = Less Than	UK = Unknown	N/AP = Not Applicable
GT = Greater Than	TR = Trace	N/DA = No Data Available

XII. Regulatory Information

SUPERFUND AMENDMENTS AND REAUTHORIAZATION ACT OF 1986 (SARA), TITLE III

SECTION 311/312 HAZARD CATEGORIES
IMMEDIATE (ACUTE) HEALTH HAZARD DELAYED (CHRONIC) HEALTH HAZARD
FIRE HAZARD

SECTION 313
THIS PRODUCT CONTAINS THE FOLLOWING CHEMICALS SUBJECT TO THE REPORTING REQUIREMENTS OF SARA TITLE III, SECTION 313 AND 40 CFR 372:
METHANOL (METHYL ALCOHOL)

TOXIC SUBSTANCES CONTROL ACT (TSCA)

ALL COMPONENTS OF THIS PRODUCT ARE LISTED ON THE TSCA INVENTORY. BECAUSE THIS PRODUCT CONTAINS A SMALL, BUT DETECTABLE, CONCENTRATION OF ACETONE (2-PROPANONE), IT IS SUBJECT TO SECTION 12(B) EXPORT NOTIFICATION REQUIREMENTS.

COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION AND LIABILITY ACT (CERCLA)

THIS PRODUCT CONTAINS THE FOLLOWING CHEMICALS SUBJECT TO THE REPORTING REQUIREMENTS OF CERCLA:

	REPORTABLE QUANTITY (RQ), LBS
METHANOL (METHYL ALCOHOL)	5000#/2270KG

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT OF 1986 - PROPOSITION 65

THIS PRODUCT CONTAINS THE FOLLOWING CHEMICAL(S) LISTED BY THE STATE OF CALIFORNIA AS "KNOWN TO THE STATE TO CAUSE REPRODUCTIVE TOXICITY":
ETHANOL (ETHYL ALCOHOL)

METHANOL

MSDS No.
HCR001423
Rev. Date
02/02/95

Manufacturer:

LYONDELL PETROCHEMICAL COMPANY
1221 MC KINNEY STREET, SUITE 1600
P.O. BOX 3646
HOUSTON, TEXAS 77253-3646

Telephone Numbers

EMERGENCY
800/424-9300 CHEMTREC
800/245-4532 HOT LINE
CUSTOMER SERVICE
713/652-7200 INFO ONLY

Use Statement: FOR INDUSTRIAL USE ONLY
KEEP OUT OF REACH OF CHILDREN

Signal Word: DANGER

Physical Hazards:

EXTREMELY FLAMMABLE
AQUEOUS SOLUTIONS MAY PRODUCE FLAMMABLE VAPORS
CORROSIVE TO SOME METALS

Health Hazards:

HIGH INGESTION, SKIN, AND INHALATION HAZARD
MAY PERMANENTLY DAMAGE THE OPTIC NERVE
MAY DAMAGE CENTRAL AND MOTOR NERVES
MAY CAUSE METABOLIC ACIDOSIS OF BLOOD
MAY CAUSE LIVER AND/OR KIDNEY DAMAGE
EYE AND MUCOUS MEMBRANE IRRITANT
SKIN IRRITANT - DEFATTING ACTION
PROLONGED EXPOSURE MAY DAMAGE THE LUNGS
MAY CAUSE LONG-TERM ADVERSE HEALTH EFFECTS
MAY CAUSE BIRTH DEFECTS

Precautionary Measures:

DO NOT HANDLE NEAR HEAT, SPARKS, OR OPEN FLAME.
SPILL/LEAK CAN CAUSE FIRE/EXPLOSION.
KEEP CONTAINER CLOSED WHEN NOT IN USE.
DO NOT CONTACT WITH OXIDIZABLE MATERIALS.
USE ONLY WITH ADEQUATE VENTILATION/PERSONAL PROTECTION.
AVOID PROLONGED OR REPEATED BREATHING OF VAPOR.
AVOID CONTACT WITH EYES, SKIN, AND CLOTHING.
WASH THOROUGHLY AFTER HANDLING.
PREVENT CONTACT WITH FOOD, CHEWING, OR SMOKING MATERIALS.
DO NOT TASTE/SWALLOW.

DOT Information: UN/NA ID Number- UN 1230
Hazard Class- 3 (6.1) (FLAMMABLE LIQUID/POISON), PG-II
Proper Shipping- METHANOL OR METHYL ALCOHOL

Instructions:
In case of fire, use-

ALCOHOL TYPE FOAM
DRY CHEMICAL
CO_2
INERT GAS - HALON/N_2
FOAM

First Aid -Inhalation IMMEDIATELY REMOVE FROM CONTAMINATED AREA TO FRESH AIR. KEEP INDIVIDUAL QUIET. FOR RESPIRATORY DISTRESS, GIVE AIR OR OXYGEN, AND/OR ADMINISTER CPR (CARDIOPULMONARY RESUSCITATION). OBTAIN EMERGENCY MEDICAL ATTENTION.

-Eye Contact IMMEDIATELY FLUSH EYES WITH PLENTY OF CLEAN LOW-PRESSURE WATER FOR AT LEAST 15 MINUTES. RETRACT EYELIDS OFTEN. OBTAIN EMERGENCY MEDICAL ATTENTION.

-Skin Contact IMMEDIATELY REMOVE CONTAMINATED CLOTHING. WASH AFFECTED SKIN THOROUGHLY WITH SOAP AND WATER. IF IRRITATION PERSISTS, SEEK MEDICAL ATTENTION. WASH CLOTHING BEFORE REUSE; WASH OR DISCARD CONTAMINATED LEATHER SHOES/GLOVES.

-Ingestion SEE EMERGENCY MEDICAL TREATMENT PROCEDURES AND SECTION XI. 'GENERAL COMMENTS'.

In case of spill, EXTREMELY FLAMMABLE LIQUID! RELEASE CAUSES AN IMMEDIATE FIRE/EXPLOSION HAZARD. REMOVE ALL IGNITION SOURCES AND SAFELY STOP FLOW OF SPILL. REMOVE ALL NON-ESSENTIAL PERSONNEL. USE PROPER PROTECTIVE EQUIPMENT. CONTAIN OR PREVENT FLOW TO SEWERS OR PUBLIC WATERS. BLANKET WITH AN APPROPRIATE FOAM. RESTRICT WATER USE FOR CLEANUP. IN URBAN AREAS, CLEANUP ASAP. IN NATURAL ENVIRONMENTS, SEEK ADVICE FROM ECOLOGISTS. THIS MATERIAL IS WATER-SOLUBLE AND MAY BIODEGRADE. COMPLY WITH ALL APPLICABLE LAWS. SPILLS MAY NEED TO BE REPORTED TO THE NATIONAL RESPONSE CENTER (800/424-8802). SPILLED MATERIAL AND ANY CONTAMINATED WATER OR SOIL MAY BE HAZARDOUS TO HUMAN OR OTHER LIFE.

Protective Equipment

-Respiratory DO NOT USE AIR-PURIFYING RESPIRATOR. ONLY NIOSH/MSHA APPROVED SUPPLIED AIR OR SELF-CONTAINED BREATHING APPARATUS OPERATED IN POSITIVE PRESSURE MODE

-Eye EYE PROTECTION SUCH AS CHEMICAL SPLASH GOGGLES AND/OR FACE SHIELD MUST BE WORN WHEN POSSIBILITY EXISTS FOR EYE CONTACT DUE TO SPLASHING OR SPRAYING

-Skin WHEN SKIN CONTACT IS POSSIBLE, PROTECTIVE CLOTHING INCLUDING GLOVES, APRON, SLEEVES, BOOTS, HEAD AND FACE PROTECTION SHOULD BE WORN.

HAZARDOUS MATERIALS MANIFEST

(Requires placards if material weight exceeds 1,000 pounds gross)

Quantity/Pkg HM	Shipping Name	Hazard Class or Division	ID No.	Labels/Placards
	Gasoline	3	UN 1203	Flammable Liquid
	Paint	3	UN 1263	Flammable Liquid
	Matches (book, and strike on box)	4.1	UN 1944	Flammable Solid
	Acetone	3	UN 1090	Flammable Liquid
	Hexane	3	UN 1208	Flammable Liquid
	Methanol	3	UN 1230	Flammable Liquid, Poison
	Isobutylene	2.1	UN 1055	Flammable Gas
	Methane	2.1	UN 1971	Flammable Gas
	Hydrogen Sulfide	2.3	UN 1053	Poison Gas, Flammable Gas
	Hydrogen, compressed	2.1	UN 1049	Flammable Gas
	Air, compressed	2.2	UN 1002	Non-Flammable Gas
	Nitric Acid	8	UN 2031	Corrosive
	Sulfuric Acid	8	UN 1830	Corrosive
	Sodium Hydroxide	8	UN 1824	Corrosive
	Hydrochloric Acid	8	UN 1789	Corrosive