33200 Bainbridge Road
Suite 39
Solon, Ohio 44139
(216) 843-2112

SUBSURFACE INVESTIGATION REPORT

FOR

MASTER METALS, INCORPORATED
2850 WEST 3RD STREET
CLEVELAND, OHIO 44113

CTI PROJECT NO. 019
JANUARY 21, 1991

COMPLIANCE TECHNOLOGIES, INC.

Environmental Consulting and Remediation

Recycled paper

1.0 INTRODUCTION

This report presents the results of a Phase II environmental site assessment of the MASTER METALS, INC. (MMI) site in Cleveland, Ohio. The field investigation was conducted by COMPLIANCE TECHNOLOGIES, INC. during December 1990. The MMI facility is located at 2850 West 3rd Street in Cleveland's industrial valley on a 4.3 acre site. The facility functions as a secondary lead smelter (SIC 3341) which manufactures lead and lead alloys from lead-bearing industrial wastes, spent lead-acid batteries and various lead scrap. Recovery of the lead from the industrial lead-acid batteries also occurs on site.

Historical information provided by MMI personnel relates an approximate 60 year period-to-date of lead smelting operations on the site. Prior to the smelting operations the area is said to have been a slag disposal/landfill area for various steel mills nearby. Weathered outcroppings of slag material appearing to have been placed in a molten condition are visible along the southwest boundary of the MMI facility. In addition, discussions with construction company personnel on site who had encountered several feet of hard, slag material while excavating for a building footer seemed to attest to the prior slag disposal activities in the area. Therefore, based upon information provided by on-site personnel, it may be assumed that the slag material underlying the MMI facility was generated by either steel or lead smelting operations.

As a result of prior and ongoing land-use of the MMI site, this Phase II environmental assessment was performed in order to evaluate sub-surface soil and groundwater conditions and any possible impact upon these media through prior slag disposal/ landfill activities, surrounding industry operations, and past and ongoing lead smelting operations. Finally, while four groundwater monitoring wells were installed as part of this Phase II project, data regarding groundwater quality will not be a subject of this report due to time constraints but will be the subject of future reports.

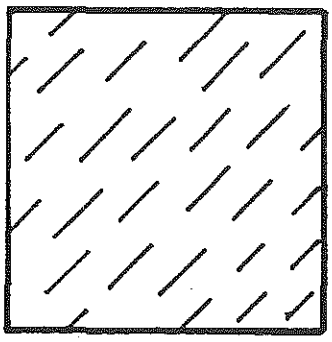
2.0 SCOPE OF WORK

2.1 FIELD ACTIVITIES

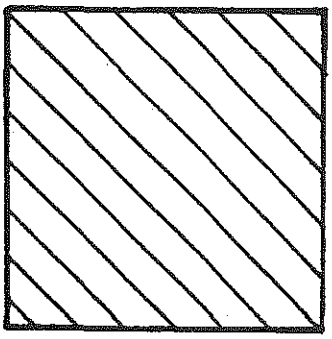
Field activities for the Phase II investigations were conducted on December 3, 4, 5, 6, 7, 10, and 11, 1990. These activities consisted of collecting subsurface soil samples at 30 of 31 planned locations on or nearby MMI's facility. Locations of core borings for sample collection were determined by association with MMI closed waste piles, processing areas, rail docks, storage container areas, sump areas, and off-site or background areas. The sampling protocol would best be characterized as being both Random and Judgement oriented based upon the aforementioned locations and facility operations and site history. Activities also included the installation of four groundwater monitoring wells for purposes of generating data on groundwater quality. Personnel safety during field activities was assured through CTI's Site Health and Safety Plan, MMI's Hazard Communication Plan, and through site visits by the Underground Utilities Protection Services (Log #1203MSS35) personnel, Mr. Carl Price. Health and Safety documents are attached as APPENDIX A.

2.1.1 Soil Sampling

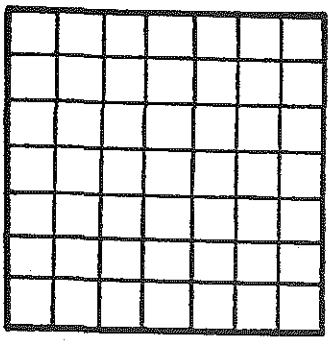
Thirty-one (31) locations on or near the MMI facility were identified for subsurface soil sampling via a truck-mounted rotary coring machine employing a 2.25 inch hollow-shafted auger. Soil samples were retrieved by a hammer-driven 2-inch split-spoon tube sampler at depths of 3-5 feet and 8-10 feet with the latter sample retrieved at just above the water table whenever existing groundwater precluded the 8-10 foot depth. The locations of the borings are illustrated on Figures 1, 2, 3, 4, and 5.



CLOSING HAZARDOUS WASTE PILE UNITS



FORMER WASTE PILE ; NOW CONTAINER STORAGE

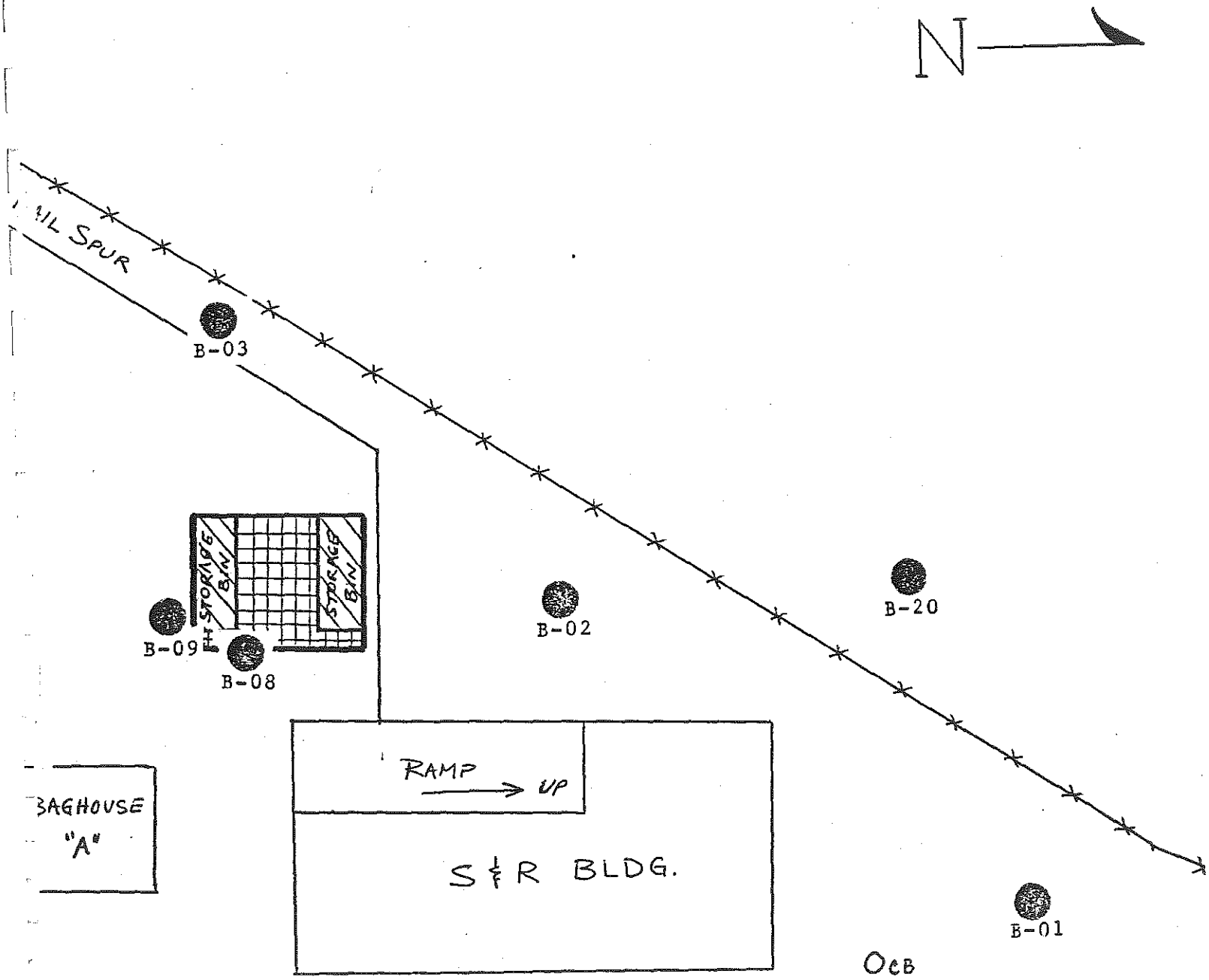


FORMER BATTERY CRACKING AREA

STORM DRAIN

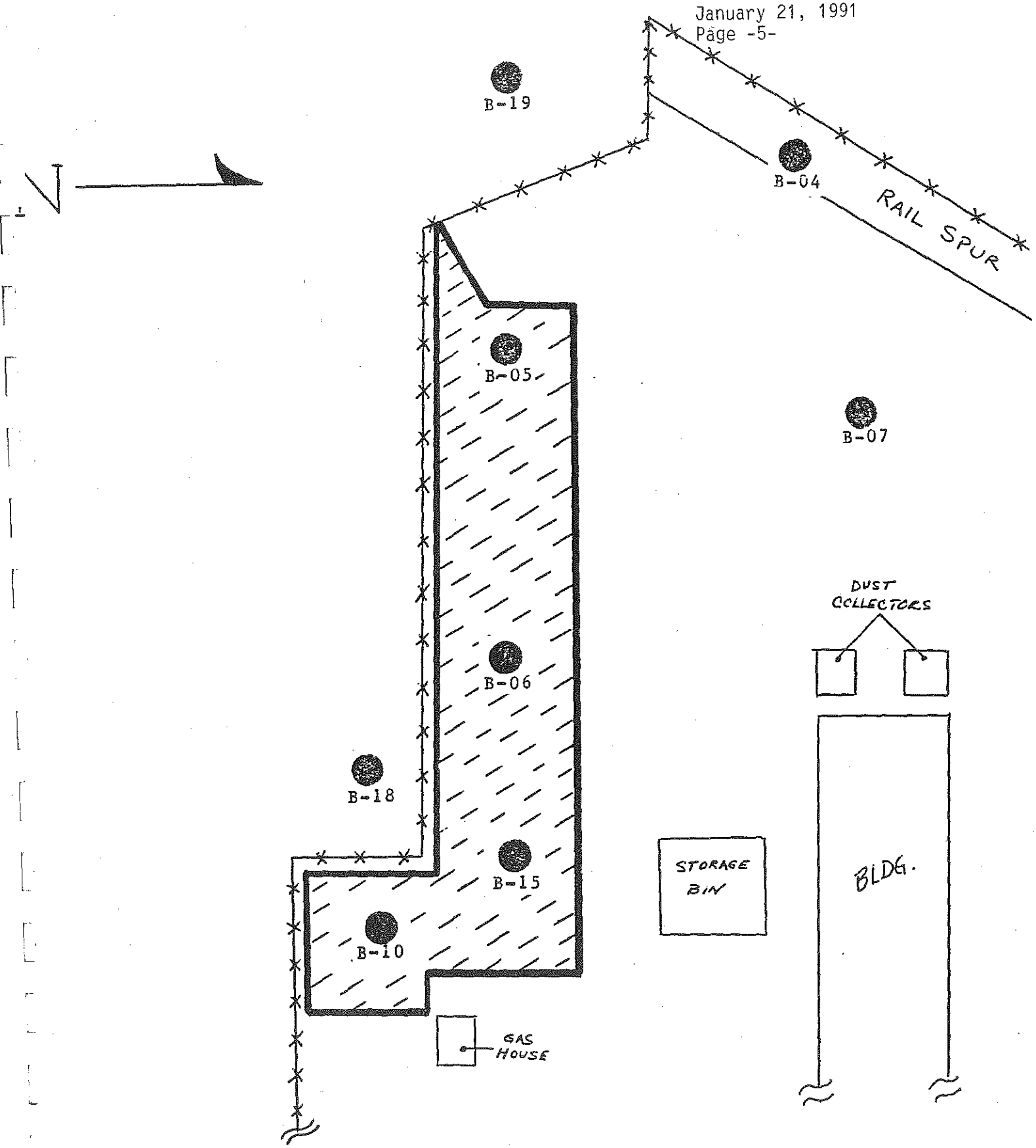
CATCH BASIN

MAP KEY TO FIGURES 1-5



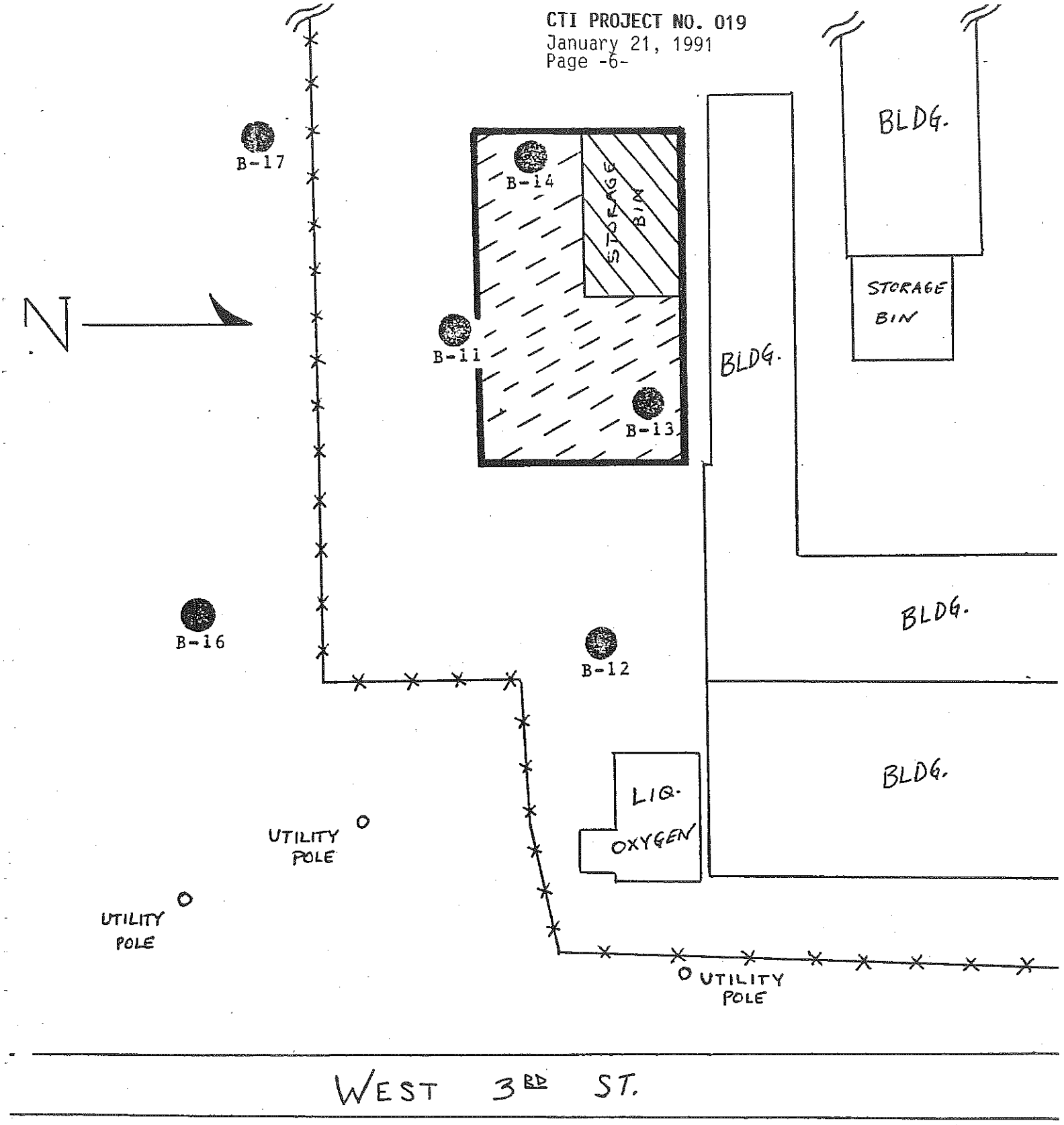
NORTHWEST QUADRANT

FIGURE 1



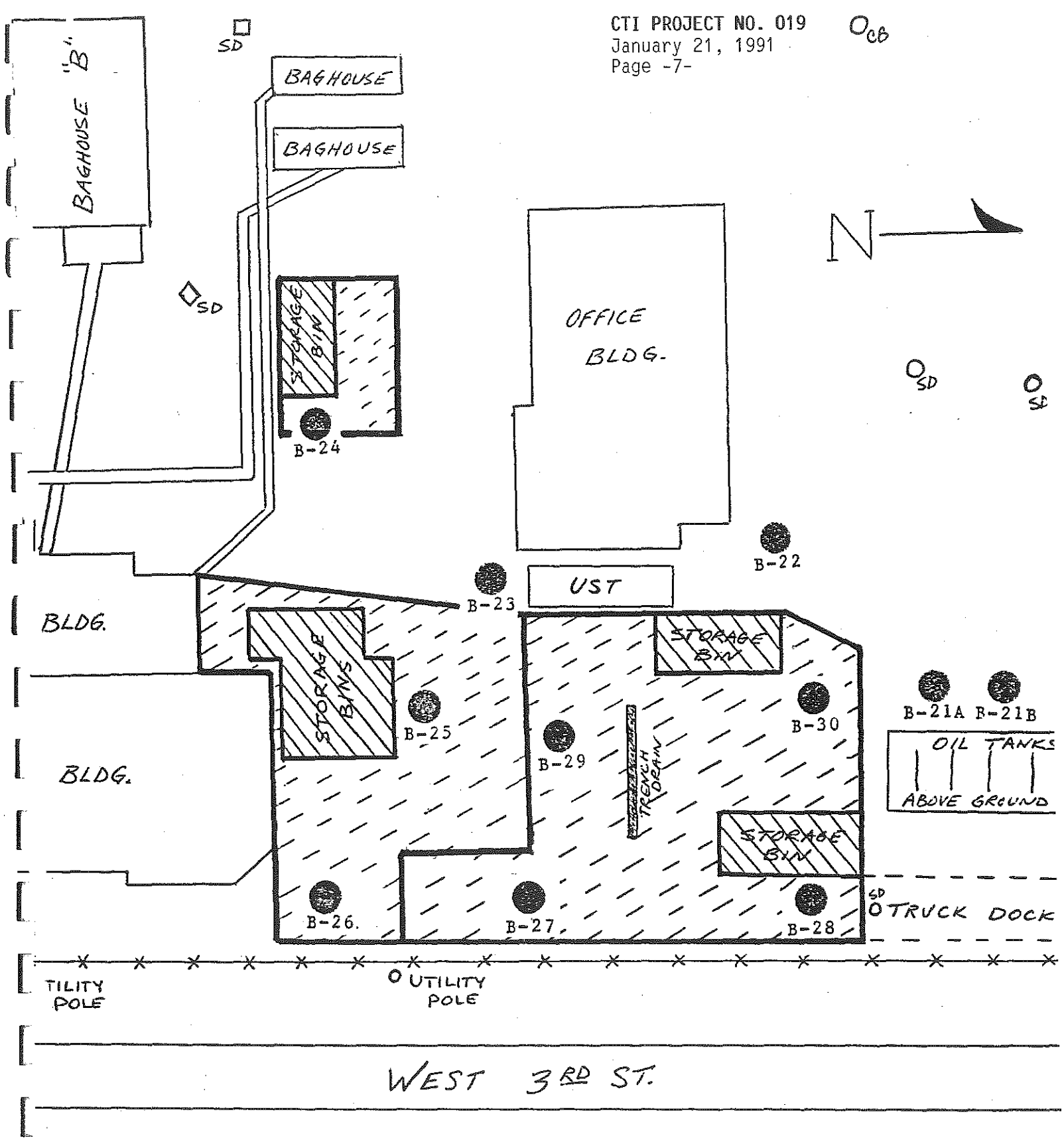
SOUTHWEST QUADRANT

FIGURE 2



SOUTHEAST QUADRANT

FIGURE 3



NORTHEAST QUADRANT

FIGURE 4

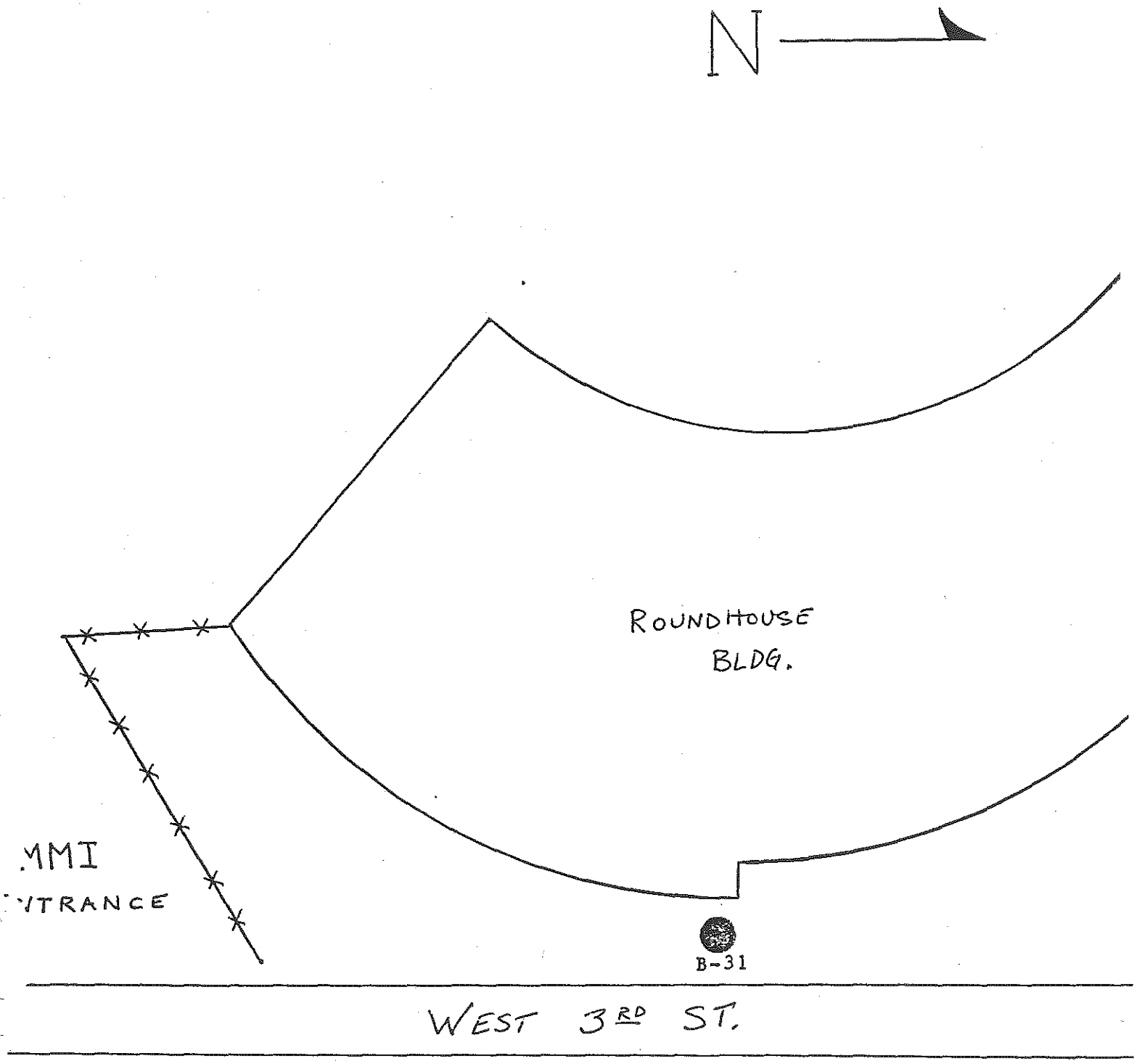


FIGURE 5

Soil samples were collected on December 4, 5, 6, and 7, 1990 from 30 of the 31 locations. Grab samples were taken from the split-spoon tube at the prescribed depths of 3-5 feet and 8-10 feet when soil conditions allowed. Samples were also retrieved from the auger shaft at depths of 2-5 feet whenever auger refusal occurred in the extremely hard slag material. The slag material was encountered in nearly all areas of the MMI facility at depths immediately below the facility's concrete base and earthen surfaces. The core boring information is presented in APPENDIX B.

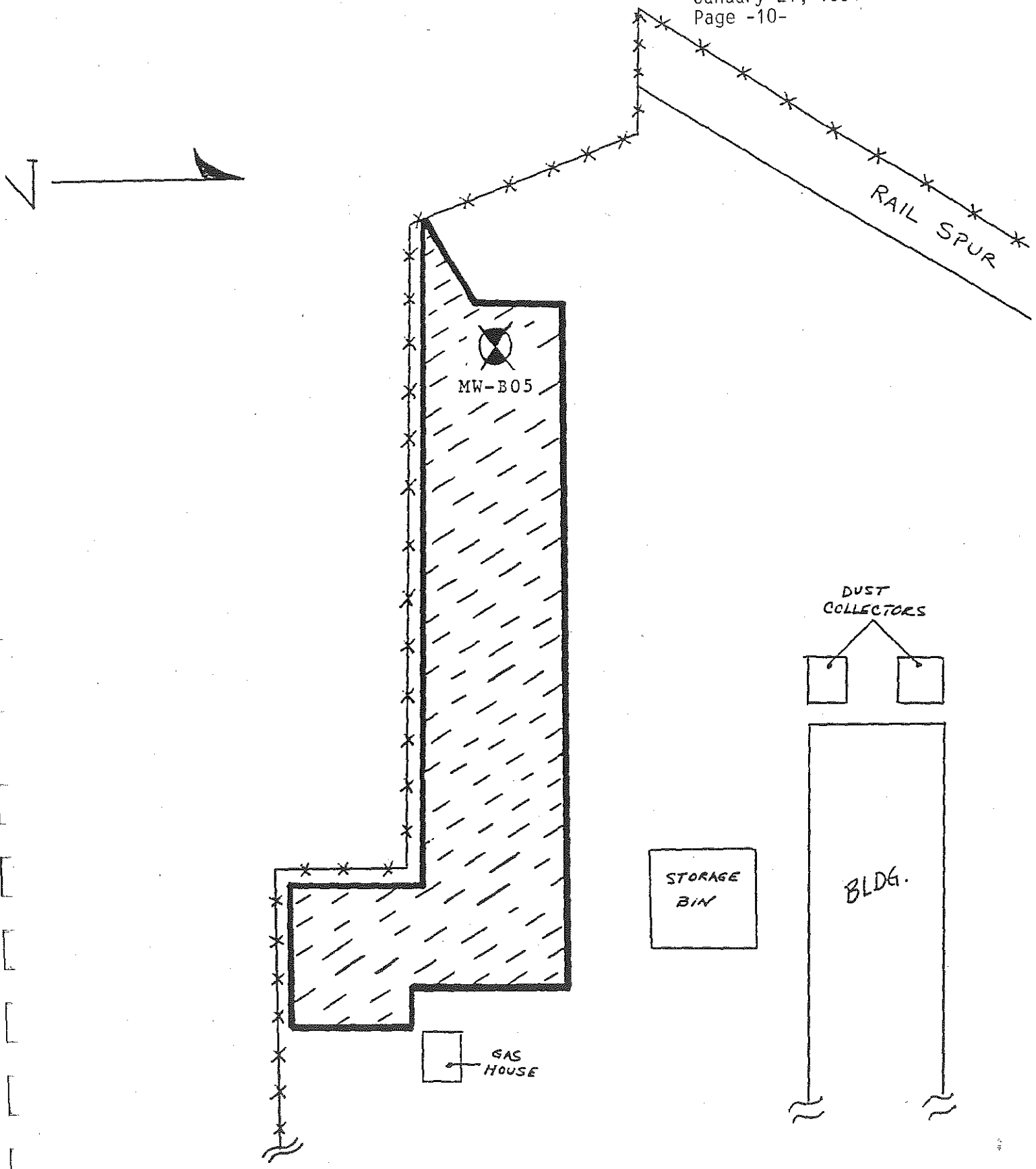
Field quality control of the coring, drilling, and sampling equipment included pressure steam cleaning of all concrete corers, hollow-shafted augers, and split-spoon samplers before and between core borings to ensure sample integrity. All samples were placed in laboratory-shipped glassware.

Soil samples from the core borings were sealed under chain-of-custody procedures and delivered daily to the analytical laboratory on December 4, 5, 6, and 7, 1990. Copies of the chain-of-custody documents are presented in APPENDIX C.

2.1.2 Groundwater Monitoring Wells

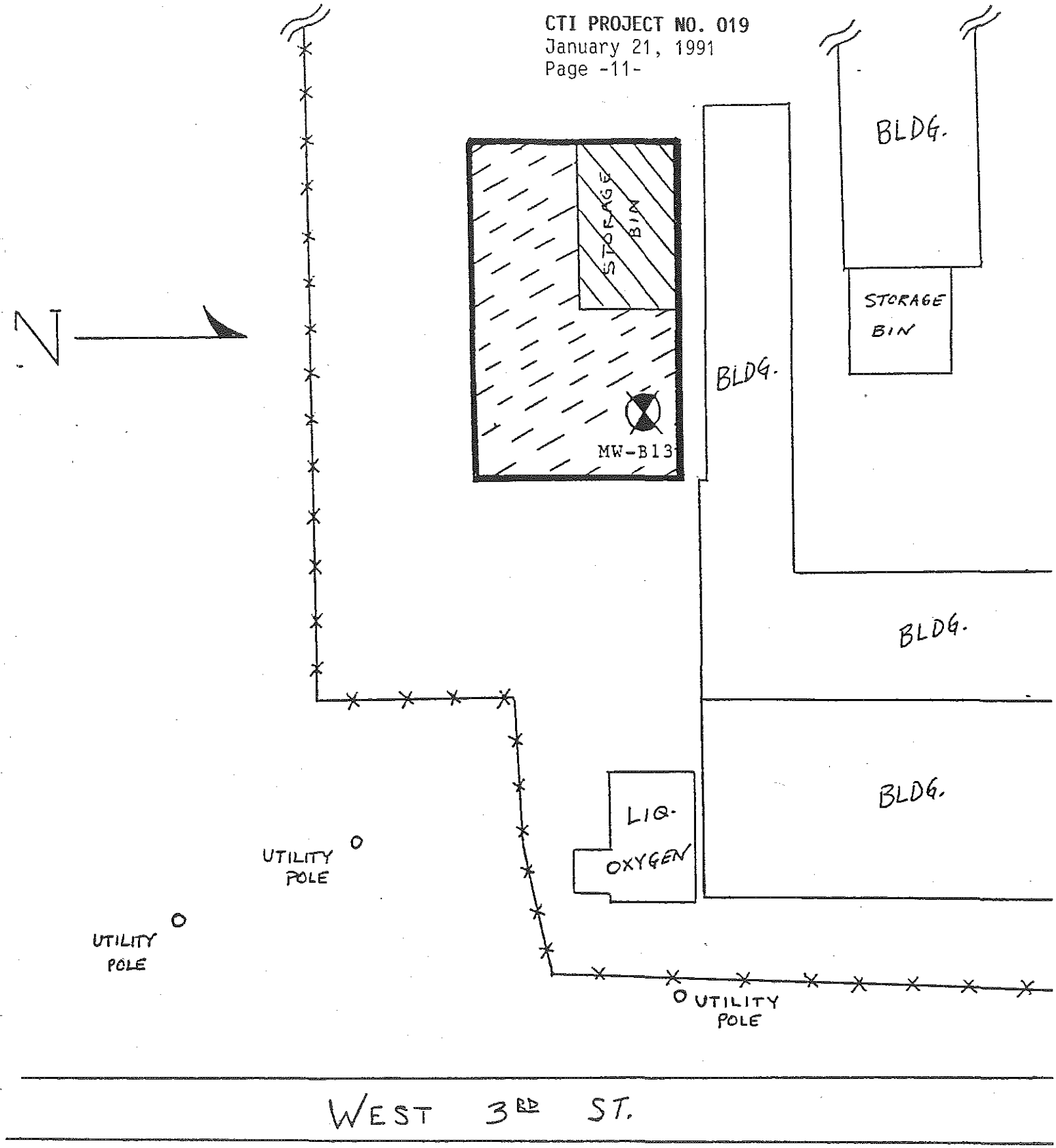
Four wells for purposes of monitoring groundwater beneath the MMI facility were installed on December 10 and 11, 1990. The well shafts were drilled via a truck-mounted rotary 6.25-inch hollow-shafted auger to a depth of 15 feet below grade. Wells consisted of Schedule 40 PVC riser, screening, and locking caps. Well grouting consisted of washed silica sand to a height of 13 feet capped by one foot of hydrated sodium bentonite as a sealed surface casing. Well heads were placed below grade and protected by cast-iron, flush-mounted covers concreted in place.

Wells were installed as part of this Phase II project, but water sampling, analysis, and data generation will be included in future reports concerning the groundwater underlying the MMI facility. Well locations are noted in Figures 6, 7, and 8.



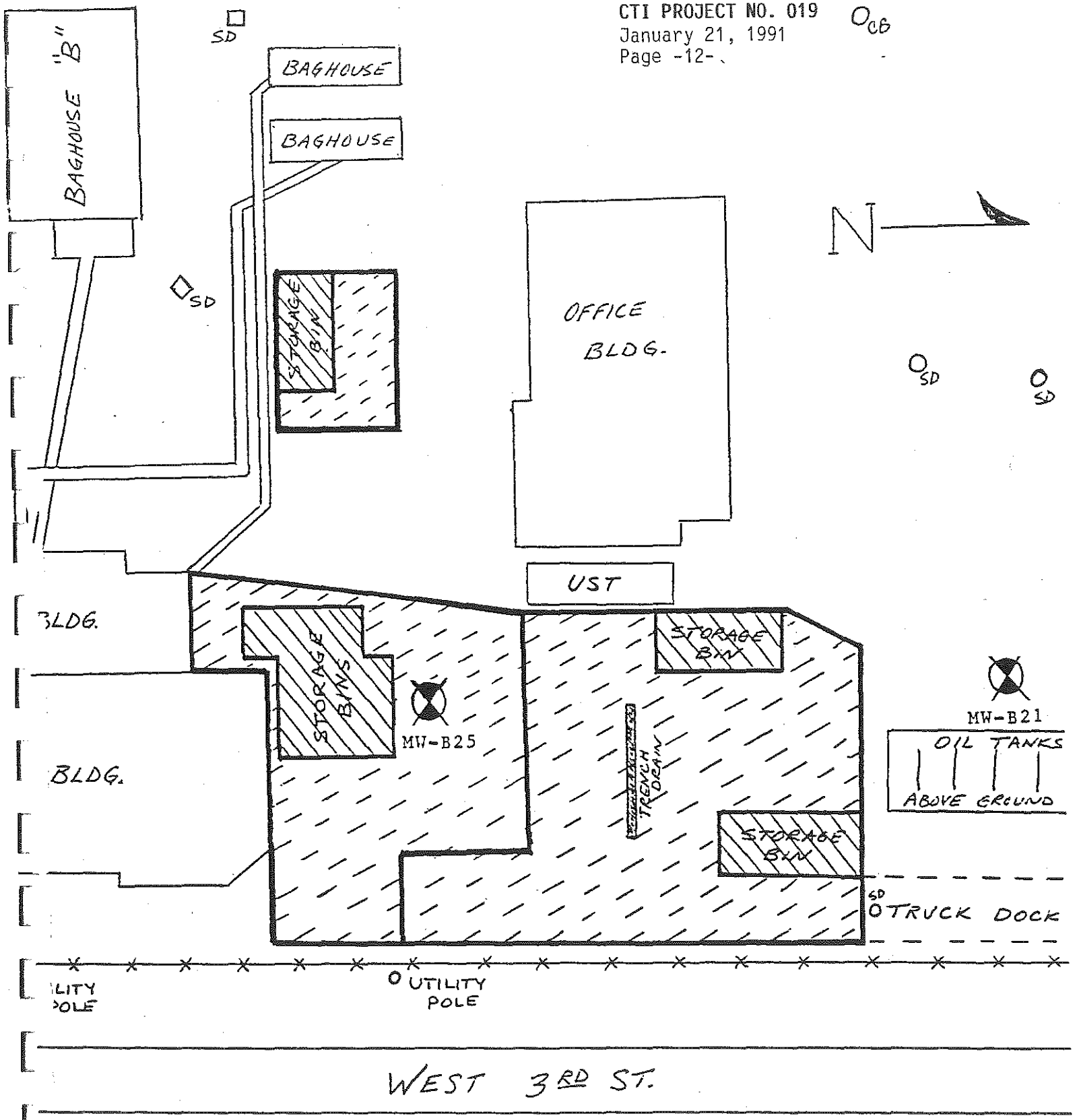
SOUTHWEST QUADRANT

FIGURE 6



SOUTHEAST QUADRANT

FIGURE 7



NORTHEAST QUADRANT

FIGURE 8

2.2 LABORATORY ANALYSIS

All samples of environmental media were delivered for analysis under chain-of-custody (APPENDIX C) to BHM Analytical Laboratory, Inc. of Chagrin Falls, Ohio. Samples were received by BHM on December 4, 5, 6, and 7, 1990. All soil samples from core borings were analyzed for Total Metals (RCRA) by Methods 6010 and 245.1 (U.S. EPA publication SW-846) and pH by Method 9040 (SW-846).

One grab sample of the underlying steel mill and/or lead smelting slag was analyzed for Total Metals (RCRA) by Methods 6010 and 245.1 (SW-846), TCLP Metals by Methods 6010 and 245.1 (SW-846), Reactive Sulfide by Method 9030 (SW-846), and pH by Method 9040 (SW-846).

3.0 RESULTS

3.1 SOILS INVESTIGATION

3.1.1 Soil Description

General soil description logs for soil samples collected from boring locations are presented in APPENDIX B.

Most soil sampling locations encountered the previously discussed industrial slag immediately beneath surface concrete or earth except for those borings in the Southeastern Quadrant (Figure 3) and borings B-5, B-10, B-15, B-18, and B-19 in the Southwestern Quadrant (Figure 2).

The thickness of the slag layer beneath the MMI site was difficult to determine due to its tendency to cause auger refusal, usually at depths approximating five feet where pieces of the slag tended to fracture off of the slag mass and jam the auger flights against the coring wall. However, a review of borings that achieved the desired ten foot depth show four

borings (B-16, B-21, B-25, B-30) with slag and cinder material still evident at that depth.

The sampling locations generally not encountering slag material were again those in the Southeastern and Southwestern Quadrants. Native-type soils consisting of light-to-coarse sands and silty clays were common.

Discolored soils consisted of blackened sands and silty clays in borings B-13 and B-16 in Figure 3, B-15 in Figure 2, and B-25 in Figure 4. Strong odors were associated with the blackened, bottom soils from borings B-13 and B-25.

3.1.2 Laboratory Analysis

Laboratory analysis performed on core boring and slag samples indicate the presence of heavy metals. Tests performed on the industrial slag sample also indicate that the lead content of this one sample is leachable. The results of all analysis are presented in APPENDIX D.

4.0 SUMMARY

This Phase II environmental assessment focused on sub-surface soil and groundwater conditions beneath the MMI facility and especially those specific areas associated with closed waste piles, processing areas, and waste storage areas. Based on the investigations completed to date and presented herein, the following conclusions may be drawn:

1. The MMI site is predominantly underlain by an industrial slag fill, assumably of steel-making or lead smelting origin. The slag material is of a largely undetermined depth due to its extreme hardness which often prevented coring to desired depths.

2. Other fill materials, e.g. wooden and metallic railroad debris, exist beneath the Northeast Quadrant of the facility.

3. The slag material shows contamination by heavy metals. A sample of the slag shows lead to be leachable.

4. Many samples of the apparently-native soils show concentration of heavy metals. Four samples of these soils showed a black discoloration.

5. The MMI site has several exposed, earthen-surface areas, the locations of which can be ascertained from APPENDIX B.

6. Water table depths beneath the MMI facility vary from depths of three to ten feet below grade.

5.0 REFERENCES

1. Environmental Risk: Identification and Management, A. R. Wilson, 1989.

2. Field Sampling Procedures Manual, New Jersey Department of Environmental Protection, 1988.

3. Health and Safety Training for Hazardous Waste Cleanup Operations, Center for Hazardous Materials Research, Pittsburgh, PA, 1988.

4. Interim Final RCRA Facility Investigation Guidance: Soil, Groundwater, and Subsurface Gas Releases, Volume II of IV, U.S. EPA, May, 1989.

5. OSHA Guidance Manual for Hazardous Waste Site Activities, U.S. Department of Health and Human Services, October 1985.

6. Standard Operating Safety Guidelines, U.S. EPA, July 1988.

APPENDIX A

33200 Bainbridge Road
Suite 39
Solon, Ohio 44139
(216) 843-2112

HEALTH AND SAFETY PLAN

FOR

MASTER METALS, INC.
2850 West Third St.
Cleveland, Ohio 44113

Prepared by:
Compliance Technologies, Inc.
33200 Bainbridge Road
Suite 39
Solon, Ohio 44139

SITE SAFETY PLAN

1.0 SITE DESCRIPTION

Start date: 12/3/90 Location: 2850 West 3rd St.

Hazards: Lead dusts, lead-bearing wastes, acid (battery), and moving heavy equipment. Areas affected are all on and off-site locations (perimeter) of the facility.

Surrounding population: Heavy industrial (steel) and rail.

Topography: Flat.

2.0 ENTRY OBJECTIVES

Site objective for Master Metals is to perform drilling, sampling, and well installation operations in order to identify constituents in the near-surface and sub-surface soils.

3.0 ONSITE ORGANIZATION AND COORDINATION

Field Team Leader: William Curran, CTI

Site Safety Officer: Bob Siladie, MMI

Field Team Members: Dean P. Lotz, Lake Drilling
Mike Bentley, Lake Drilling

All personnel arriving or departing the site should log in and out with the Team Leader. All activities must be cleared through the Team Leader.

4.0 ONSITE CONTROL

Coordination of site access and security is under the control of the Environmental Administrator, MMI. Control boundaries are the MMI property lines and the near-offsite drilling locations as delineated in the project map.

5.0 HAZARD EVALUATION

Lead: Toxic inhalation hazard. See appropriate MSDS.
Acid: Caustic; pH approximately 2.0. See appropriate MSDS.
The following additional hazards are expected on site: slippery ground, moving heavy equipment, and seasonable cold and wet weather.

6.0 PERSONAL PROTECTIVE EQUIPMENT

Modified Level "D": Work coveralls, Tyvek coveralls, dust mask, steel-toed boots, and Tyvek booties. Eye protection and hard hats as appropriate for drilling areas.

7.0 ONSITE WORK PLANS

Project Manager: Stephen Kovatch; Scope of Work.
Team Leader: William Curran; Oversees and manages drilling, sampling, well installation, and sample analyses.
Work Party: Lake Drilling; Provides drilling equipment and personnel for drilling, sampling, and well installation.

All parties were briefed on the contents of this work plan on DECEMBER 3, 1990.

8.0 DECONTAMINATION PROCEDURES

Disposable suits, dust masks, gloves, and booties to be discarded shall be placed in MMI-designated containers at the close of the work day. All policies of MMI in effect concerning washing, eating, and smoking, among others, are to be strictly followed.

9.0 SITE SAFETY AND HEALTH PLAN

Bob Siladie, Environmental Administrator, MMI is the designated Site Safety Officer and directly responsible to the Team Leader for safety recommendations on site.
Emergency medical care is best requested by dialing 911 from the office phone. First-aid care is available at the following location(s): 1.) CTI service truck; 2.) Lake Drilling service truck; 3.) MMI, rear hallway near locker room.
The Site Safety Officer shall be notified of any personnel injuries, fires, explosions, and equipment failure in order to undertake appropriate action.

10.0 SITE SAFETY PLAN ACKNOWLEDGEMENT

All site personnel have read the above plan and are familiar with its provisions.

	NAME	SIGNATURE
Project Manager	STEPHEN KOVATCH	Stephen J Kovatch
Team Leader	Bill Curran	Bill Curran
Site Safety Officer	BOB SILADIE	Bob Siladie
Work Party Personnel	Dean P Lotz	Dean P Lotz
	Mike Bentley	Mike Bentley

Master Metals, Inc.
HAZARD COMMUNICATION MANUAL
REGISTERED #677

HazCom PRE-JOB SAFETY CONFERENCE CHECKLIST

Date 12 / 5 /1990 Contract #_____ P.O. #_____

Scope of the Contract Soil Drilling

Contractor CTI Phone 843-2112

Main office contact Bill Curran Title Mediation MGR.

Field Superintendent _____ Phone 843-2112

Codes: n/a = not applicable; X = done; / = not done & required. __

1. Work areas defined _____ X
2. Workers' egress defined _____ X
3. Method(s) of hazard warnings: X MSDS sheets __ MSDS book __
   __ Process sheets X Signs X Labels __ Other _____
4. Have ALL contractor's and sub-contractor's employees been instructed in the use of the warning method used? Y N If no, give date to complete: ___/___/19___. __
5. Does the contractor have own HazCom Manual? Y N If yes, does MMI have a copy? Y N Is the CIL included? _Y _N
6. Has this contractor worked at this facility before? _Y N __
7. MMI project coordinator name Rudy Zupan
8. List Personal Protective Equipment that the Contractor will need.
   - ✓ gloves of special type _____
   - ✓ respirators with cartridges for _____
   - __ air-line respirators for _____
   - ✓ hard hats ✓ safety glasses __ splash goggles __ face shield
   - __ aprons ✓ dust suits ✓ chemical suits __ escape packs
   - __ ear plugs __ ear muffs __ other _____
9. List special equipment contractor will need.
   - __ ventilation ✓ special disposal methods __ other _____
10. Signed Stephen J. Kovatch
    contractor
    Bob Sladko
    MMI

HazCom Form #12 5/88-HOWSAFE!

MATERIAL SAFETY DATA SHEET

I. MATERIAL IDENTIFICATION

Manufacturer's Name: Charles Bluestone Company Telephone Number: (412) 384-7400
Address: P.O. Box 326 Elizabeth, PA 15037

Material Name: Lead Scrap

II. HAZARDOUS INGREDIENTS

	CAS Number	%		OSHA 8-hr TWA	ACGIH 8-hr TWA (1984-85)	ACGIH STEL (1984-85)
Lead	(7439-92-1)	≥ 59		0.05 mg/m^3	0.15 mg/m^3	0.45 mg/m^3
Tin	(7440-31-5)	≤ 25		2 mg/m^3	2 mg/m^3	4 mg/m^3
Antimony	(7440-36-0)	≤ 24		0.5 mg/m^3	0.5 mg/m^3	--
Arsenic	(7440-38-2)	< 4		0.01 mg/m^3	0.2 mg/m^3	--
Copper	(7440-50-8)	≤ 3	(Dust)	1 mg/m^3	1 mg/m^3	2 mg/m^3
			(Fume)	0.1 mg/m^3	0.2 mg/m^3	--
Silver	(7440-22-4)	≤ 2		0.01 mg/m^3	0.1 mg/m^3	--
Cadmium	(7440-43-9)	< 1	(Dust)	0.2 mg/m^3	0.05 mg/m^3	0.2 mg/m^3
			(Fume)	0.1 mg/m^3	0.05 mg/m^3 *	--

* Ceiling Limit

Note: antimony trioxide, arsenic, and cadmium have been identified as potential human carcinogens. See Section VI, Health Hazard Data.

III. PHYSICAL DATA

Melting Point (of lead): 327° C
Specific Gravity: 9.73 - 11.36
Boiling Point (of lead): 1740° C

Vapor Pressure: 1 mm Hg @ 973° C (of lead)
Solubility in water: insoluble

Appearance: dependent on composition of scrap metal, processing method used, and existing protective coatings.

(9/85)

IV. FIRE AND EXPLOSION DATA

Flash Point: information not available
Flammability Limits: information not available
Autoignition Temperature: information not available

Solid, massive form of material is not combustible under ordinary fire conditions. Fire and explosion hazards are moderate when material is in the form of dust and exposed to heat or flames, chemical reaction, or contact with powerful oxidizers.

Fire Extinguishing Methods: Use special mixtures of dry chemicals. Do not use water or moist sand. Fire fighters should wear self-contained breathing apparatus and protective clothing.

V. REACTIVITY DATA

Massive material is stable at ordinary temperatures, but dust presents moderate fire and explosion hazards. Material may be incompatible with acids, bases, and oxidizers. Molten scrap metal may react violently with water. For additional information, users should consult data sheets on individual component elements.

VI. HEALTH HAZARD DATA

TLV: see Section II.
Primary Routes of Entry: ingestion of dust, inhalation of dust or fume.

Exposure to the massive form of lead scrap presents few health hazards in itself. However, normal handling of scrap may result in generation of dusts containing the component elements, and inhalation or ingestion of these dusts may present potentially significant health hazards. Thermal cutting and melting of lead scrap may produce fumes containing the component elements, and breathing these fumes may also present potentially significant health hazards. Special precautions should be taken if scrap is contaminated; see Section IX.

Prolonged inhalation of lead fumes or dusts, or ingestion of lead compounds, can result in lead poisoning. Symptoms include abdominal pain or colic, constipation, nausea, joint and muscle pains, and muscular weakness. Severe cases of overexposure may lead to central nervous system disorders, characterized by somnolence, stupor, and ultimately death.

Overexposure to tin dusts may cause irritation of the skin and mucous membranes, and may result in a benign pneumoconiosis (stannosis).

Overexposure to arsenic fumes or dusts can lead to arsenic poisoning, characterized by nausea, vomiting, and diarrhea. Prolonged overexposure can lead to liver and kidney damage, central nervous system disorders, and ultimately death. Arsenic can cause skin irritation and allergic reactions.

Overexposure to cadmium fumes or dusts may cause chest pains, shortness of breath, lung changes, and pulmonary edema, ultimately leading to death. Cadmium may also cause damage to the liver and kidneys.

Fumes of copper may cause metal fume fever with flu-like symptoms. Copper may cause skin and hair discoloration; silver may cause a greyish pigmentation of the skin, and can cause irritation of the skin and mucous membranes.

Overexposure to antimony may cause gastrointestinal upset and various nervous complaints, such as sleeplessness, irritability, and muscular pains.

Antimony trioxide, arsenic, and cadmium have been identified as potential cancer-causing agents.

FIRST AID:

Eye Contact:	Flush well with running water to remove particulate. Get medical attention.
Skin Contact:	Brush off excess dust. Wash area well with soap and water.
Inhalation:	Remove to fresh air. Get medical attention.
Ingestion:	Seek medical help if large quantities of material have been ingested. (Ingestion of significant amounts of scrap metal is unlikely.)

VII. SPILL PROCEDURES

No special precautions are necessary for spills of bulk material. If large quantities of dust are spilled, remove by vacuuming or wet sweeping to prevent heavy concentrations of airborne dust. Clean-up personnel should wear respirators and protective clothing.

Scrap metal can be reclaimed for reuse. Follow Federal, State, and Local regulations regarding disposal.

VIII. SPECIAL PROTECTION INFORMATION

Use general and local exhaust ventilation to keep airborne concentrations of dust or fume below the TLV. Employees should wear MSHA or NIOSH approved respirators for protection against airborne dust or fumes. Full protective clothing should be worn by workers exposed to heavy concentrations of dust, and showering should be required before changing into street clothes. Gloves and barrier creams may be necessary to prevent skin sensitization and dermatitis.

Approved safety glasses or goggles should be worn when working with dusty material. Safety eyewash stations should be provided in close proximity to work areas.

Pre-employment and periodic medical evaluations should be provided. Attention should be directed toward skin, eyes, respiratory tract, blood, kidneys, pulmonary function, and neurologic health. Chest X-rays should be included if symptoms are present.

Food should not be consumed in the work area.

Special attention is drawn to the requirements of the Occupational Safety and Health Administration standards for lead (29 CFR 1910.1025) and arsenic (29 CFR 1910.1018). State OSHA programs will also have similar requirements.

Special precautions should be taken if scrap is contaminated; see Section IX.

IX. SPECIAL PRECAUTIONS

Use good housekeeping practices to prevent accumulations of dust and to keep airborne dust concentrations at a minimum. Avoid breathing dust or fumes.

Store material away from incompatible materials, and keep dust away from sources of ignition.

This material is potentially contaminated with coatings, paints, and other contaminants. If the material is contaminated, special precautions (such as process control and personal protective equipment, appropriate to the nature of the suspected contaminants) should be taken to avoid resulting exposures when handling, cutting (mechanical or thermal), and/or melting.

Prepared by: Institute of Scrap Iron and Steel (ISIS)
in consultation with JRB Associates

Date Prepared: September 1985

ULFURIC ACID 66 BE REVISION DF:01-06-90

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FOR PRODUCT AND SALES INFORMATION

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PRODUCT IDENTIFICATION

UCT NAME: SULFURIC ACID CAS NO.: 7664-93-9
N NAMES/SYNONYMS: SULFURIC ACID; VWR CODE: P1361
F VITRIOL; SULFURIC ACID > 93%; SULFURIC ACID > 66 DEG BE;
FURIC ACID > 1.83 SPECIFIC GRAVITY
ULA: H2 S 04 DATE ISSUED: 08/89
U RATING (NFPA 49) SUPERCEDES: 12/88
EALTH: 3 HAZARD RATING SCALE:
IRE: 0 0=MINIMAL 3=SERIOUS
EACTIVITY: 2 1=SLIGHT 4=SEVERE
PECIAL: NO WATER 2=MODERATE

HAZARDOUS INGREDIENTS

			EXPOSURE LIMITS, MG/M3			
			OSHA	ACGIH	OTHER	
MPONENT	CAS NO.	%	PEL	TLV	LIMIT	HAZARD
FURIC ACID	7664-93-9	>93	1	1	1 (DUPONT)	CORROSIVE
	7732-18-5	BALANCE	NONE	NONE	NONE	NONE

PHYSICAL PROPERTIES

ING POINT, DEG F: A = 529; B = 590 VAPOR PRESSURE, MM HG/20 DEG C: A,B = NIL
E ING POINT, DEG F: A = -20; B = 30 VAPOR DENSITY (AIR=1): N/A
IFIC GRAVITY (WATER=1): A = 1.835; B = 1.84 WATER SOLUBILITY, %: COMPLETE
RANCE AND ODOR: COLOR- EVAPORATION RATE (BUTYL ACETATE=1): <1
S TO PALE YELLOW, OILY
QUID. ODORLESS.

93% OR 66 DEG.BE SULFURIC ACID; B = 99% SULFURIC ACID

FIRST AID MEASURES

HALED: REMOVE TO FRESH AIR. GIVE ARTIFICIAL RESPIRATION IF NOT
HING. GET IMMEDIATE MEDICAL ATTENTION.

. OF EYE CONTACT: IMMEDIATELY FLUSH EYES WITH LOTS OF RUNNING

ER FOR 30 MINUTES, LIFTING THE UPPER AND LOWER EYELIDS OCCASIONALLY. IMMEDIATE MEDICAL ATTENTION.

ASE OF SKIN CONTACT: IMMEDIATELY FLUSH SKIN WITH LOTS OF RUNNING TER FOR 30 MINUTES. REMOVE CONTAMINATED CLOTHING AND SHOES; WASH ONE REUSE. GET IMMEDIATE MEDICAL ATTENTION.

SWALLOWED: DO NOT INDUCE VOMITING. IF CONSCIOUS, GIVE LOTS OF WATER MILK. GET IMMEDIATE MEDICAL ATTENTION. DO NOT GIVE ANYTHING BY TH TO AN UNCONSCIOUS OR CONVULSING PERSON.

HEALTH HAZARD INFORMATION

MARY ROUTES OF EXPOSURE: SKIN OR EYE CONTACT

IONS AND SYMPTOMS OF EXPOSURE

INHALATION: VAPORS AND MISTS ARE EXTREMELY CORROSIVE TO THE NOSE, UAT, AND MUCOUS MEMBRANES. BRONCHITIS, PULMONARY EDEMA, AND MICAL PNEUMONITIS MAY OCCUR. IRRITATION, COUGHING, CHEST PAIN, AND ICULTY IN BREATHING MAY OCCUR WITH BRIEF EXPOSURE WHILE PROLONGED XPOSURE MAY RESULT IN MORE SEVERE IRRITATION AND TISSUE DAMAGE. EATHING HIGH CONCENTRATIONS MAY RESULT IN DEATH.

EYE CONTACT: VAPORS, LIQUID, AND MISTS ARE EXTREMELY CORROSIVE TO HE EYES. BRIEF CONTACT OF THE VAPORS WILL BE SEVERELY IRRITATING. ILE CONTACT OF THE LIQUID OR MISTS WILL SEVERELY DAMAGE THE EYES AND LONGED CONTACT MAY CAUSE PERMANENT EYE INJURY WHICH MAY BE FOLLOWED Y BLINDNESS.

SKIN CONTACT: VAPORS, MISTS, AND LIQUID ARE EXTREMELY CORROSIVE THE SKIN. VAPORS WILL SEVERELY IRRITATE THE SKIN AND LIQUID AND IS WILL SEVERELY BURN THE SKIN. PROLONGED LIQUID CONTACT WILL BURN DESTROY SURROUNDING TISSUE AND DEATH MAY ACCOMPANY BURNS WHICH EX- END OVER LARGE PORTIONS OF THE BODY.

SWALLOWED: VAPORS, MISTS, AND LIQUID ARE EXTREMELY CORROSIVE TO MOUTH AND THROAT. SWALLOWING THE LIQUID BURNS THE TISSUES, CAUSES KE ABDOMINAL PAIN, NAUSEA, VOMITING, AND COLLAPSE. SWALLOWING RGE QUANTITIES CAN CAUSE DEATH.

ONIC EFFECTS OF EXPOSURE: MAY CAUSE EROSION OF THE TEETH, LESIONS THE SKIN, BRONCHIAL IRRITATION, COUGHING, AND PNEUMONIA.

DICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE: ACUTE AND CHRONIC PIRATORY DISEASES.

TOXICITY DATA

L: RAT LD50 = 2,140 MG/KG

MAL: NO DATA FOUND

INHALATION: GUINEA PIG LC50 = 18 MG/M3

A CINOGENICITY: THIS MATERIAL IS NOT CONSIDERED TO BE A CARCINOGEN Y THE NATIONAL TOXICOLOGY PROGRAM, THE INTERNATIONAL AGENCY FOR SEARCH ON CANCER, OR THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION

ER DATA: ALTHOUGH ONE LIMITED STUDY OF REFINERY WORKERS DID SUGGEST A OSSIBLE LINK BETWEEN SULFURIC ACID EXPOSURE AND LARYNGEAL CANCER, THE UDY WAS LIMITED BECAUSE OF THE SMALL NUMBER OF WORKERS AND THE MIXED XPOSURES TO SEVERAL OTHER MATERIALS INCLUDING DIETHYL SULFATE, AN IARC NTP CARCINOGEN. BASED ON THE OVERALL WEIGHT OF EVIDENCE FROM ALL N MAL TOXICITY AND HUMAN EPIDEMIOLOGICAL STUDIES, NO CAUSE-AND-EFFECT ELATIONSHIP BETWEEN CANCER AND SULFURIC ACID EXPOSURE HAS BEEN SHOWN. DIVIDUALS WITH PREEXISTING DISEASE OF THE LUNGS MAY HAVE INCREASED EPTIBILITY TO THE TOXICITY OF EXCESSIVE EXPOSURES.

PERSONAL PROTECTION

ILATION: LOCAL MECHANICAL EXHAUST VENTILATION CAPABLE OF MAIN-

UNING EMISSIONS AT THE POINT OF USE BELOW THE PEL.

'IRATORY PROTECTION: WEAR A NIOSH-APPROVED RESPIRATOR APPROPRIATE THE VAPOR OR MIST CONCENTRATION AT THE POINT OF USE. APPROPRIATE SPIRATORS MAY BE A FULL FACEPIECE AIR-PURIFYING CARTRIDGE SPIRATOR EQUIPPED FOR ACID GASES/MISTS, A SELF-CONTAINED BREATHING APPARATUS IN THE PRESSURE DEMAND MODE, OR A SUPPLIED-AIR PIRATOR.

PROTECTION: CHEMICAL GOGGLES AND FULL FACESHIELD UNLESS A FULL SEPIECE RESPIRATOR IS ALSO WORN. IT IS GENERALLY RECOGNIZED THAT CONTACT LENSES SHOULD NOT BE WORN WHEN WORKING WITH CHEMICALS BECAUSE UNTACT LENSES MAY CONTRIBUTE TO THE SEVERITY OF AN EYE INJURY.

TECTIVE CLOTHING: ACID-RESISTANT SLICKER SUIT WITH RUBBER APRON, RUBBER BOOTS WITH PANTS OUTSIDE, AND RUBBER GLOVES WITH GAUNTLETS.

HER PROTECTIVE MEASURES: AN EYEWASH AND SAFETY SHOWER SHOULD BE ARBY AND READY FOR USE.

FIRE AND EXPLOSION INFORMATION

ASH POINT, DEG F: NONE
METHOD USED: N/A

FLAMMABLE LIMITS IN AIR, %
LOWER: N/A UPPER: N/A

EXTINGUISHING MEDIA: THIS MATERIAL IS NOT COMBUSTIBLE. USE EXTINGUISHING MEDIA APPROPRIATE FOR SURROUNDING FIRE.

ECIAL FIRE FIGHTING PROCEDURES: FIRE FIGHTERS SHOULD WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING. USE WATER SPRAY TO COOL NEARBY CONTAINERS AND STRUCTURES EXPOSED TO FIRE.

USUAL FIRE AND EXPLOSION HAZARDS: EXTINGUISH ALL NEARBY SOURCES OF IGNITION SINCE FLAMMABLE HYDROGEN GAS WILL BE LIBERATED FROM CONTACT WITH SOME METALS. KEEP WATER OUT OF CONTAINERS.

HAZARDOUS REACTIVITY

BILITY: STABLE
CONDITIONS TO AVOID: NONE

POLYMERIZATION: WILL NOT OCCUR

ERIALS TO AVOID: ALKALIS, OXIDIZING OR REDUCING MATERIALS, CYANIDES, SULFIDES, OR COMBUSTIBLE MATERIALS. REACTS WITH MANY METALS. CONCENTRATED ACID REACTS VIOLENTLY WITH WATER.

ZARDOUS DECOMPOSITION PRODUCTS: MAY LIBERATE CARBON MONOXIDE, CARBON DIOXIDE, AND OXIDES OF SULFUR.

SPILL, LEAK, AND DISPOSAL PROCEDURES

TION TO TAKE FOR SPILLS OR LEAKS: WEAR ACID-RESISTANT SLICKER SUIT COMPLETE PROTECTIVE EQUIPMENT INCLUDING RUBBER GLOVES, RUBBER BOOTS, AND A SELF-CONTAINED BREATHING APPARATUS IN THE PRESSURE DEMAND MODE OR SUPPLIED-AIR RESPIRATOR. IF THE SPILL OR LEAK IS SMALL, A FULL FACE-CE AIR-PURIFYING CARTRIDGE RESPIRATOR EQUIPPED FOR ACID GASES MAY BE SATISFACTORY. IN ANY EVENT, ALWAYS WEAR EYE PROTECTION. REMOVE ALL SOURCES OF IGNITION. FOR SMALL SPILLS OR DRIPS, MOP OR WIPE UP AND DISPOSE OF IN DOT-APPROVED WASTE CONTAINERS. FOR LARGE SPILLS, CONTAIN BY ING WITH SOIL OR OTHER NON-COMBUSTIBLE ABSORBENT MATERIAL AND CAREFULLY NEUTRALIZE WITH SODA ASH OR LIME. IF SODA ASH IS USED, PROVIDE ADEQUATE VENTILATION TO DISSIPATE THE CARBON DIOXIDE GAS. KEEP NON-NEUTRALIZED MATERIAL OUT OF SEWERS, STORM DRAINS, SURFACE WATERS, AND SOIL.

PLY WITH ALL APPLICABLE GOVERNMENTAL REGULATIONS ON SPILL REPORTING, HANDLING AND DISPOSAL OF WASTE.

SPOSAL METHODS: DISPOSE OF CONTAMINATED PRODUCT AND MATERIALS USED CLEANING UP SPILLS OR LEAKS IN A MANNER APPROVED FOR THIS MATERIAL. SULT APPROPRIATE FEDERAL, STATE AND LOCAL REGULATORY AGENCIES TO TAIN PROPER DISPOSAL PROCEDURES.
EMPTY CONTAINERS CAN HAVE RESIDUES, GASES AND MISTS AND ARE JECT TO PROPER WASTE DISPOSAL, AS ABOVE.

SPECIAL PRECAUTIONS

..AGE AND HANDLING PRECAUTIONS: STORE IN A COOL, DRY, WELL-VENTILATED ..CE AWAY FROM INCOMPATIBLE MATERIALS. VENT CONTAINER CAREFULLY, AS ..DED, TO RELIEVE PRESSURE. KEEP CONTAINER TIGHTLY CLOSED WHEN NOT IN USE. DO NOT USE PRESSURE TO EMPTY CONTAINER. WASH THOROUGHLY AFTER HANDLING. DO NOT GET IN EYES, ON SKIN, OR ON CLOTHING.

..AIR AND MAINTENANCE PRECAUTIONS: DO NOT CUT, GRIND, WELD, OR DRILL ON OR NEAR THIS CONTAINER.

..ER PRECAUTIONS: CONTAINERS, EVEN THOSE THAT HAVE BEEN EMPTIED, WILL ..AIN PRODUCT RESIDUE AND VAPORS. ALWAYS OBEY HAZARD WARNINGS AND HANDLE EMPTY CONTAINERS AS IF THEY WERE FULL.

FOR ADDITIONAL INFORMATION

CONTACT MSDS COORDINATOR, VAN WATERS & ROGERS INC.
DURING BUSINESS HOURS, PACIFIC TIME (408)435-8700

OTHER REGULATORY INFORMATION

DO NOT DETACH THIS SECTION FROM THE MSDS AND BE SURE TO INCLUDE THIS SECTION WHEN COPYING THE MSDS.

..S PRODUCT IS A TOXIC CHEMICAL SUBJECT TO THE REPORTING REQUIREMENTS OF SECTION 313 OF TITLE III OF THE SUPERFUND AMENDMENTS AND REAUTHORI-ZATION ACT OF 1986 AND 40 CFR PART 372.

..S PRODUCT CONTAINS THE FOLLOWING CHEMICAL(S) CONSIDERED BY THE STATE OF CALIFORNIA'S SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT OF 1986 (PROPOSITION 65) AS CAUSING CANCER OR REPRODUCTIVE TOXICITY AND FOR ..CH WARNINGS ARE NOW REQUIRED:

CHEMICAL	CAS NO.	%, WT
ARSENIC	7440-38-2	<0.4 PPM
CADMIUM	7440-43-9	<2.0 PPM
LEAD	7439-92-1	<0.01 PPM

NOTICE

..VAN WATERS & ROGERS INC. ("VW&R") EXPRESSLY DISCLAIMS ALL EXPRESS OR IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WITH RESPECT TO THE PRODUCT OR INFORMATION PROVIDED HEREIN.**

.. INFORMATION APPEARING HEREIN IS BASED UPON DATA OBTAINED FROM THE MANUFACTURER AND/OR RECOGNIZED TECHNICAL SOURCES. WHILE THE INFORMA-TION IS BELIEVED TO BE ACCURATE, VW&R MAKES NO REPRESENTATIONS AS TO ..S ACCURACY OR SUFFICIENCY. CONDITIONS OF USE ARE BEYOND VW&R'S CON-TROL AND THEREFORE USERS ARE RESPONSIBLE TO VERIFY THIS DATA UNDER THEIR OWN OPERATING CONDITIONS TO DETERMINE WHETHER THE PRODUCT IS SUITABLE FOR THEIR PARTICULAR PURPOSES AND THEY ASSUME ALL RISKS OF THEIR USE, HANDLING, AND DISPOSAL OF THE PRODUCT, OR FROM THE PUBLICA-TION OR USE OF, OR RELIANCE UPON, INFORMATION CONTAINED HEREIN. THIS INFORMATION RELATES ONLY TO THE PRODUCT DESIGNATED HEREIN, AND DOES NOT RELATE TO ITS USE IN COMBINATION WITH ANY OTHER MATERIAL OR IN ANY OTHER PROCESS.

REVISION

09/89: QUANTIFIED OTHER REGULATORY INFORMATION.

**** E N D O F M S D S ****

APPENDIX B

APPENDIX C

LAKE DRILLING CO. INC. • P.O. BOX 33284 • CLEVELAND, OHIO 44133 TEST BORING RECORD

LER DEAN P. LOTZ

TER ON COMPLETION 3' 24 HOUR WATER 4'

12-10-90 TIME DEPTH

G HAMMER Wt. lbs. DROP in.

MPLER HAMMER Wt. 140 lbs. DROP in.

SAMPLER SIZE 2 in. O.D. CASING SIZE in.

UGER SIZE 3 1/4 in. GROUND WATER

HOLE NO. B-1 SURFACE ELEVATION Sheet No. 1 of 1 Sheets

FOR CTI

LOCATION MASTER METALS, WEST 3RD

STARTED COMPLETED JOB NO. 90319

VATION	DEPTH	Driller's Log ☒ / Geologist's Log ☐ / Mechanical Analysis ☐	Remarks	Sample Depth	Blows on Sampler
	4'	BROWN BLACK CINDERS WITH SLAG	WET		
		AUGER REFUSAL 4'		3-5	50/2

LAKE DRILLING CO. INC. • P.O. BOX 33284 • CLEVELAND, OHIO 44133 TEST BORING RECORD

LER DEAN P. LOTZ

ER ON COMPLETION 3' 24 HOUR WATER 4.5

D 12-10-90 TIME DEPTH

NG HAMMER Wt. lbs. DROP in.

IPLER HAMMER Wt. 140 lbs. DROP in.

SAMPLER SIZE 2 in. O.D. CASING SIZE in.

UGER SIZE 3 1/4 in. GROUND WATER

HOLE NO. B-2 SURFACE ELEVATION Sheet No. 1 of 1 Sheets

FOR CTI

LOCATION MASTER METALS, WEST 3RD

STARTED COMPLETED JOB NO. 90319

ATION	DEPTH	Driller's Log ☒ / Geologist's Log ☐ / Mechanical Analysis ☐	Remarks	Sample Depth	Blows on Sampler
	4.5'	RUST BROWN CLAY WITH SLAG	WET	3-5	50/2
		AUGER REFUSAL 4.5'			

LAKE DRILLING CO. INC. • P.O. BOX 33284 • CLEVELAND, OHIO 44133 TEST BORING RECORD

LLER DEAN P. LOTZ

TER ON COMPLETION 3' 24 HOUR WATER

12-10-90 TIME DEPTH 5'

..NG HAMMER Wt. lbs. DROP in.

MPLER HAMMER Wt. 140 lbs. DROP 30 in.

SAMPLER SIZE 2 in. O.D. CASING SIZE in.

UGER SIZE 3 1/4 in. GROUND WATER

HOLE NO. B-3 SURFACE ELEVATION Sheet No. 1 of 1 Sheet

FOR CTI

LOCATION MASTER METALS, WEST 3RD

STARTED COMPLETED JOB NO. 90319

VATION	DEPTH	Driller's Log ☒ / Geologist's Log ☐ / Mechanical Analysis ☐	Remarks	Sample Depth	Blows on Sampler
	5'	BLACK CINDERS WITH SLAG (FILL)	WET	3-5	50/0
		AUGER REFUSAL 5'			

LAKE DRILLING CO. INC. • P.O. BOX 33284 • CLEVELAND, OHIO 44133 TEST BORING RECORD

LER DEAN P. LOTZ

HOLE NO. B-4 SURFACE ELEVATION Sheet No. 1 of 1 Sheets

ER ON COMPLETION 24 HOUR WATER

D 12-10-90 TIME DEPTH 5'

FOR CTI

NG HAMMER Wt. lbs. DROP in.

IPLER HAMMER Wt. 140 lbs. DROP in.

SAMPLER SIZE 2 in. O.D. CASING SIZE in.

LOCATION MASTER METALS, WEST 3RD

UGER SIZE 3 1/4 in. GROUND WATER

STARTED COMPLETED JOB NO. 90319

ATION	DEPTH	Driller's Log ☒ / Geologist's Log ☐ / Mechanical Analysis ☐	Remarks	Sample Depth	Blows on Sampler
	5'	BLACK CINDERS WITH SLAG - TRACE OF BROWN SANDY CLAY	MOIST	3-5	5-10-7-8
		AUGER REFUSAL 5'			

LAKE DRILLING CO. INC. • P.O. BOX 33284 • CLEVELAND, OHIO 44133 — TEST BORING RECORD

ER: DEAN P. LOTZ
W ER ON COMPLETION: 7.5' 24 HOUR WATER:
D/ 12-10-90 TIME: DEPTH: 10'
ING HAMMER Wt. lbs. DROP in.
PLER HAMMER Wt. 140 lbs. DROP 30 in.
SAMPLER SIZE 2 in. O.D. CASING SIZE in.
JGER SIZE 3 1/4 in. GROUND WATER

HOLE NO. B-5 SURFACE ELEVATION Sheet No. 1 of 1 Sheets
FOR CTI
LOCATION MASTER METALS, WEST 3RD
STARTED COMPLETED JOB NO. 90319

Geologist's Log ☐
Mechanical Analysis ☐

ATION	DEPTH	Driller's Log ☒	Remarks	Sample Depth	Blows on Sampler
		6" CONCRETE			
	5'	BROWN SAND WITH BRICK ROCK FRAGMENTS	MOIST	3-5	4-4-4-3
	10'	BROWN WET MEDIUM SANDS	WET	8-10	1/12-1/2

LAKE DRILLING CO. INC. • P.O. BOX 33284 • CLEVELAND, OHIO 44133 TEST BORING RECORI

ILLER DEAN P. LOTZ

ATER ON COMPLETION 4.5' 24 HOUR WATER

12-10-90 TIME DEPTH 5'

ING HAMMER Wt. lbs. DROP in.

AMPLER HAMMER Wt. 140 lbs. DROP 30 in.

AMPLER SIZE 2 in. O.D. CASING SIZE in.

JGER SIZE 3 1/4 in. GROUND WATER

HOLE NO. B-6 SURFACE ELEVATION Sheet No. 1 of 1 Shee

FOR CTI

LOCATION MASTER METALS, WEST 3RD

STARTED COMPLETED JOB NO. 90319

EVATION	DEPTH	Driller's Log ☒ / Geologist's Log ☐ / Mechanical Analysis ☐	Remarks	Sample Depth	Blows on Sampler
		8" CONCRETE			
		BLACK CINDERS WITH SLAG (FILL)	WET	2-5	50/0
	4.5'				
		AUGER REFUSAL 4.5'			

LAKE DRILLING CO. INC. • P.O. BOX 33284 • CLEVELAND, OHIO 44133 TEST BORING RECORD

ER DEAN P. LOTZ

HOLE NO. B-7 SURFACE ELEVATION Sheet No. 1 of 1 Sheets

W R ON COMPLETION 24 HOUR WATER

DA 2-10-90 TIME DEPTH 5'

FOR CTI

HAMMER Wt. lbs. DROP in.

PLER HAMMER Wt. 140 lbs. DROP 30 in.

SAMPLER SIZE 2' in. O.D. CASING SIZE in.

LOCATION MASTER METALS, WEST 3RD

JGER SIZE 3 1/4 in. GROUND WATER

STARTED COMPLETED JOB NO. 90319

ATION	DEPTH	Driller's Log ☒ Geologist's Log ☐ Mechanical Analysis ☐	Remarks	Sample Depth	Blows on Sampler
		6" CONCRETE			
	5'	BLACK GRAY FILL CINDERS AND SLAG	DRY	3-5	50/0
		AUGER REFUSAL 5'			

LAKE DRILLING CO. INC. • P.O. BOX 33284 • CLEVELAND, OHIO 44133 — TEST BORING RECORD

LER: DEAN P. LOTZ
ER ON COMPLETION: 24 HOUR WATER:
D: 12-10-90 TIME: DEPTH: 6'
NG HAMMER Wt. lbs. DROP in.
IPLER HAMMER Wt. 140 lbs. DROP 30 in.
SAMPLER SIZE 2 in. O.D. CASING SIZE in.
JGER SIZE 3 1/4 in. GROUND WATER

HOLE NO. B-8 SURFACE ELEVATION Sheet No. 1 of 1 Sheets
FOR CTI
LOCATION MASTER METALS, WEST 3RD
STARTED COMPLETED JOB NO. 90319

Geologist's Log ☐
Mechanical Analysis ☐

ELEVATION	DEPTH	Driller's Log ☒	Remarks	Sample Depth	Blows on Sampler
		4" CONCRETE			
				3-5	4-10-20-23
	6'	BLACK CINDERS AND SLAG (FILL)	WET		
		REFUSAL 6'			

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LER: DEAN P. LOTZ
HOLE NO.: B-9 SURFACE ELEVATION: Sheet No. 1 of 1 Sheets
ER ON COMPLETION: 24 HOUR WATER:
D: 12-10-90 TIME: DEPTH: 5'
FOR: CTI
G HAMMER Wt. lbs. DROP in.
MPLER HAMMER Wt. 140 lbs. DROP 30 in.
MPLER SIZE 2 in. O.D. CASING SIZE in.
LOCATION: MASTER METALS, WEST 3RD
JGER SIZE 3 1/4 in. GROUND WATER
STARTED: COMPLETED: JOB NO. 90319

VATION	DEPTH	Driller's Log ☒ / Geologist's Log ☐ / Mechanical Analysis ☐	Remarks	Sample Depth	Blows on Sampler
		4" CONCRETE			
	5'	BLACK CINDERS WITH SLAG/TRACE OF BROWN SAND			
		AUGER REFUSAL 5'			

AKE DRILLING CO. INC. • P.O. BOX 33284 • CLEVELAND, OHIO 44133 TEST BORING RECORD

ER Dean P. Lotz

W R ON COMPLETION 10' 24 HOUR WATER

DA 12-10-90 TIME DEPTH 12'

HOLE NO. B-10 SURFACE ELEVATION Sheet No. 1 of 1 Sheets

FOR CTI

A G HAMMER Wt. lbs. DROP in.

C PLER HAMMER Wt. 140 lbs. DROP 30 in.

SAMPLER SIZE 2" in. O.D. CASING SIZE in.

JGER SIZE 3 1/4 in. GROUND WATER

LOCATION MASTER METALS, WEST 3RD

STARTED COMPLETED JOB NO. 90319

ATION	DEPTH	Driller's Log ☒ / Geologist's Log ☐ / Mechanical Analysis ☐	Remarks	Sample Depth	Blows on Sampler
				3-5	7-8-5-4
	10'	BROWN MEDIUM SAND WITH BRICK ROCK FRAGMENTS	MOIST	8-10	6-5-3-2
	12'	LIGHT BROWN COARSE SAND	WET	10-12	4-4-36

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LER: DEAN P. LOTZ
ER ON COMPLETION: 8.5' 24 HOUR WATER:
D: TIME: DEPTH:
G HAMMER Wt.: lbs. DROP: in.
MPLER HAMMER Wt.: 140 lbs. DROP: 30 in.
SAMPLER SIZE: 2" in. O.D. CASING SIZE: in.
JGER SIZE: 3 1/4 in. GROUND WATER:

HOLE NO.: B-11 SURFACE ELEVATION: Sheet No. 1 of 1 Sheets
FOR: CTI
LOCATION: MASTER METALS, WEST 3RD
STARTED: COMPLETED: JOB NO.: 90319

Geologist's Log ☐ Mechanical Analysis ☐

VATION	DEPTH	Driller's Log ☒	Remarks	Sample Depth	Blows on Sampler
	5'	BROWN MEDIUM SANDS	MOIST	3-5	6-4-4-3
	10'	BROWN COARSE SAND TO 3" OF GRAY SILTY CLAY	WET	8-10	2-2-4-6

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ER DEAN P. LOTZ

W. R ON COMPLETION 8.5 24 HOUR WATER

DA 2-10-90 TIME DEPTH 10'

NG HAMMER Wt. lbs. DROP in.

PLER HAMMER Wt. 140 lbs. DROP 30 in.

SAMPLER SIZE 2" in. O.D. CASING SIZE in.

JGER SIZE 3 1/4 in. GROUND WATER

HOLE NO. B-12 SURFACE ELEVATION Sheet No. 1 of 1 Sheets

FOR CTI

LOCATION MASTER METALS, WEST 3RD

STARTED COMPLETED JOB NO. 90319

ATION	DEPTH	Driller's Log ☒ / Geologist's Log ☐ / Mechanical Analysis ☐	Remarks	Sample Depth	Blows on Sampler
	2'	BROWN SANDY CLAY	MOIST		
	5'	BROWN MEDIUM SAND	MOIST	3-5	1/12-1-2
	10'	BROWN COARSE SAND TO 3" GRAY SILTY CLAY	WET	8-10	2-3-4-5

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LER DEAN P. LOTZ

ER ON COMPLETION 8.5' 24 HOUR WATER

12-10-90 TIME DEPTH 10'

G HAMMER Wt. lbs. DROP in.

MPLER HAMMER Wt. 140 lbs. DROP 30 in.

SAMPLER SIZE 2 in. O.D. CASING SIZE in.

JGER SIZE 3 1/4 in. GROUND WATER

HOLE NO. B-13 SURFACE ELEVATION Sheet No. 1 of 1 Sheets

FOR CTI

LOCATION MASTER METALS, WEST 3RD

STARTED COMPLETED JOB NO. 90319

VATION	DEPTH	Driller's Log ☒ / Geologist's Log ☐ / Mechanical Analysis ☐	Remarks	Sample Depth	Blows on Sampler
		6" CONCRETE			
	5'	BROWN SAND CLAY WITH GRAVELS	MOIST	3-5	6-4-22
	10'	BROWN SAND WITH GRAY BLACK (6") SILTY CLAY	MOIST ODOR	8-10	5-4-4-4

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LER: DEAN P. LOTZ
ER ON COMPLETION: 8.5' 24 HOUR WATER:
12-10-90 TIME: DEPTH: 10'
ING HAMMER Wt. lbs. DROP in.
MPLER HAMMER Wt. 140 lbs. DROP 30 in.
SAMPLER SIZE 2 in. O.D. CASING SIZE in.
UGER SIZE 3 1/4 in. GROUND WATER

HOLE NO. B-14 SURFACE ELEVATION Sheet No. 1 of 1 Sheets
FOR CTI
LOCATION MASTER METALS, WEST 3RD
STARTED COMPLETED JOB NO. 90319

VATION	DEPTH	Driller's Log ☒ / Geologist's Log ☐ / Mechanical Analysis ☐	Remarks	Sample Depth	Blows on Sampler
		6" CONCRETE			
	5'	BROWN MEDIUM SAND WITH BRICK	MOIST	3-5	64-33
	8.5'	BROWN COARSE SAND	WET		
	10'	GRAY SILTY CLAY	MOIST	8-10	6-4-2-3

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LER: DEAN P. LOTZ
HOLE NO.: B-15 SURFACE ELEVATION: Sheet No. 1 of 1 Sheets
ER ON COMPLETION: 8 24 HOUR WATER:
12-10-90 TIME: DEPTH: 10' FOR: CTI
NG HAMMER Wt. lbs. DROP in.
MPLER HAMMER Wt. 140 lbs. DROP 30 in.
SAMPLER SIZE 2 in. O.D. CASING SIZE in. LOCATION: MASTER METALS, WEST 3RD
UGER SIZE 3 1/4 in. GROUND WATER STARTED COMPLETED JOB NO. 90319

Geologist's Log ☐
Mechanical Analysis ☐

VATION	DEPTH	Driller's Log ☒	Remarks	Sample Depth	Blows on Sampler
		8" CONCRETE			
		BROWN SAND WITH BRICK ROCK FRAGMENTS			
	5'		MOIST	3-5	1-2-3-2
	10'	BROWN COARSE SAND LAST 4" BLACK	WET	8-10	1-2-2-2

LAKE DRILLING CO. INC. • P.O. BOX 33284 • CLEVELAND, OHIO 44133

TEST BORING RECORD

LER: DEAN P. LOTZ

HOLE NO.: B-16 SURFACE ELEVATION: Sheet No. 1 of 1 Sheets

TER ON COMPLETION: 9' 24 HOUR WATER:

12-10-90 TIME: DEPTH: 10'

FOR: CTI

ING HAMMER Wt.: lbs. DROP: in.

MPLER HAMMER Wt.: 140 lbs. DROP: 30 in.

SAMPLER SIZE: 2" in. O.D. CASING SIZE: in.

LOCATION: MASTER METALS, WEST 3RD

UGER SIZE: 3 1/4 in. GROUND WATER:

STARTED: COMPLETED: JOB NO.: 90319

VATION	DEPTH	Driller's Log ☒ / Geologist's Log ☐ / Mechanical Analysis ☐	Remarks	Sample Depth	Blows on Sampler
	3'	BROWN SANDY CLAY	MOIST		
				3-5	1-1-1-3
	9'	BROWN MOIST MEDIUM SANDS			
	10'	BLACK SILTY CLAY LAST 5" GRAY SLAG	WET	8-10	8-7-20-8

LAKE DRILLING CO. INC. • P.O. BOX 33284 • CLEVELAND, OHIO 44133 **TEST BORING RECORD**

ER DEAN P. LOTZ

HOLE NO. B-17 SURFACE ELEVATION Sheet No. 1 of 1 Sheets

W ER ON COMPLETION 9' 24 HOUR WATER

D 12-10-90 TIME DEPTH 10'

FOR CTI

NG HAMMER Wt. lbs. DROP in.

PLER HAMMER Wt. 140 lbs. DROP 30 in.

SAMPLER SIZE 2" in. O.D. CASING SIZE in.

LOCATION MASTER METALS, WEST 3RD

UGER SIZE 3 1/4 in. GROUND WATER

STARTED COMPLETED JOB NO. 90319

ELEVATION	DEPTH	Driller's Log ☒ Geologist's Log ☐ Mechanical Analysis ☐	Remarks	Sample Depth	Blows on Sampler
	3'	BROWN SAND CLAY WITH BRICK	MOIST		
				3-5	5-5-4-6
	9'	BROWN COARSE SAND	WET		
	10'	GRAY SILTY CLAY	MOIST	8-10	1-1-2-3

LAKE DRILLING CO. INC. • P.O. BOX 33284 • CLEVELAND, OHIO 44133 TEST BORING RECORD

LER DEAN P. LOTZ

TER ON COMPLETION 8' 24 HOUR WATER

12-10-90 TIME DEPTH 10'

ING HAMMER Wt. lbs. DROP in.

MPLER HAMMER Wt. 140 lbs. DROP 30 in.

SAMPLER SIZE 2 in. O.D. CASING SIZE in.

JGER SIZE 3 1/4 in. GROUND WATER

HOLE NO. B-18 SURFACE ELEVATION Sheet No. 1 of 1 Sheet

FOR CTI

LOCATION MASTER METALS, WEST 3RD

STARTED COMPLETED JOB NO. 90319

VATION	DEPTH	Driller's Log ☐ Geologist's Log ☐ Mechanical Analysis ☐	Remarks	Sample Depth	Blows on Sampler
	2'	BROWN SANDY CLAY	MOIST		
	3'	BROWN COARSE SAND	MOIST		
				3-5	3-5-3-4
	9'	BROWN COARSE SAND WITH GRAVELS	WET		
	10'	GRAY SILTY CLAY	MOIST	8-10	3-2-3-2

LAKE DRILLING CO. INC. • P.O. BOX 33284 • CLEVELAND, OHIO 44133 — TEST BORING RECORD

LER: DEAN P. LOTZ
ER ON COMPLETION: 9' 24 HOUR WATER:
12-10-90 TIME: DEPTH:
NG HAMMER Wt. lbs. DROP in.
MPLER HAMMER Wt. 140 lbs. DROP 30 in.
SAMPLER SIZE 2 in. O.D. CASING SIZE in.
JGER SIZE 3 1/4 in. GROUND WATER

HOLE NO. B-19 SURFACE ELEVATION Sheet No. 1 of 1 Sheet
FOR CTI
LOCATION MASTER METALS, WEST 3RD
STARTED COMPLETED JOB NO. 90319

Geologist's Log ☐
Mechanical Analysis ☐

VATION	DEPTH	Driller's Log ☒	Remarks	Sample Depth	Blows on Sampler
	3'	BROWN BLACK SANDY CLAY	MOIST		
				3-5	2-3-3-4
	9'	BROWN COARSE SAND	WET		
	10'	BROWN GRAY SILTY CLAY WITH BRICK LAYER	MOIST	8-10	5-4-4-2
		LAST 4" WET COARSE SAND			

LAKE DRILLING CO. INC. • P.O. BOX 33284 • CLEVELAND, OHIO 44133 — TEST BORING RECORD

LER: DEAN P. LOTZ
ER ON COMPLETION: 4' 24 HOUR WATER:
12-10-90 TIME: DEPTH:
HAMMER Wt.: lbs. DROP: in.
IPLER HAMMER Wt.: 140 lbs. DROP: 30 in.
SAMPLER SIZE: 2 in. O.D. CASING SIZE: in.
JGER SIZE: 3 1/4 in. GROUND WATER:

HOLE NO.: B-20 SURFACE ELEVATION: Sheet No. 1 of 1 Sheets
FOR: CTI
LOCATION: MASTER METALS, WEST 3RD
STARTED: COMPLETED: JOB NO.: 90319

Geologist's Log ☐
Mechanical Analysis ☐

ATION	DEPTH	Driller's Log ☒	Remarks	Sample Depth	Blows on Sampler
	3'	BLACK GRAY CLAY WITH SLAG	MOIST		
	5'	SLAG (FILL)	WET	3-5	50/3
		AUGER REFUSAL 5'			

LAKE DRILLING CO. INC. • P.O. BOX 33284 • CLEVELAND, OHIO 44133

TEST BORING RECORD

LER DEAN P. LOTZ

TER ON COMPLETION 24 HOUR WATER

12-10-90 TIME DEPTH 10'

G HAMMER Wt. lbs. DROP in.

MPLER HAMMER Wt. 140 lbs. DROP 30 in.

SAMPLER SIZE 2 in. O.D. CASING SIZE in.

JGER SIZE 3 1/4 in. GROUND WATER

HOLE NO. B-21 SURFACE ELEVATION Sheet No. 1 of 1 Sheet

FOR CTI

LOCATION MASTER METALS, WEST 3RD

STARTED COMPLETED JOB NO. 90319

VATION	DEPTH	Driller's Log ☒ / Geologist's Log ☐ / Mechanical Analysis ☐	Remarks	Sample Depth	Blows on Sampler
		4" CONCRETE			
	5'	SLAG, BLACK CINDERS WITH SAND	MOIST	3-5	50/1
	10'	GRAY SLAG FILL	WET 9'	8-10	50/0

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LER DEAN P. LOTZ

ER ON COMPLETION 24 HOUR WATER

12-10-90 TIME DEPTH 5'

G HAMMER Wt. lbs. DROP in.

MPLER HAMMER Wt. 140 lbs. DROP 30 in.

SAMPLER SIZE 2 in. O.D. CASING SIZE in.

JGER SIZE 3 1/4 in. GROUND WATER

HOLE NO. B-22 SURFACE ELEVATION Sheet No. 1 of 1 Sheets

FOR CTI

LOCATION MASTER METALS, WEST 3RD

STARTED COMPLETED JOB NO. 90319

VATION	DEPTH	Driller's Log ☒ / Geologist's Log ☐ / Mechanical Analysis ☐	Remarks	Sample Depth	Blows on Sampler
		4" CONCRETE			
	5'	GRAY SLAG (FILL)	MOIST	3-5	50/1
		AUGER REFUSAL 5'			

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ER DEAN P. LOTZ

HOLE NO. B-23 SURFACE ELEVATION ..... Sheet No. 1 of 1 Sheets

WA R ON COMPLETION ..... 24 HOUR WATER .....

D 12-10-90 TIME ..... DEPTH 1.5'

FOR CTI

G HAMMER Wt. ..... lbs. DROP ..... in.

PLER HAMMER Wt. 140 lbs. DROP 30 in.

SAMPLER SIZE 2 in. O.D. CASING SIZE ..... in.

LOCATION MASTER METALS, WEST 3RD

JGER SIZE 3 1/4 in. GROUND WATER .....

STARTED ..... COMPLETED ..... JOB NO. 90319

ATION	DEPTH	Driller's Log ☒ / Geologist's Log ☐ / Mechanical Analysis ☐	Remarks	Sample Depth	Blows on Sampler
		4" CONCRETE			
	1.5	BLACK CINDERS WITH SLAG			
		AUGER REFUSAL 1.5'			

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TEST BORING RECORD

LLER DEAN P. LOTZ

HOLE NO. B-24 SURFACE ELEVATION ..... Sheet No. 1 of 1 Sheets

TER ON COMPLETION ..... 24 HOUR WATER .....

12-10-90 TIME ..... DEPTH 2.5'

FOR CTI

..NG HAMMER Wt. ..... lbs. DROP ..... in.

MPLER HAMMER Wt. 140 lbs. DROP 30 in.

SAMPLER SIZE 2 in. O.D. CASING SIZE ..... in.

LOCATION MASTER METALS, WEST 3RD

JGER SIZE 3 1/4 in. GROUND WATER .....

STARTED ..... COMPLETED ..... JOB NO. 90319

VATION	DEPTH	Driller's Log ☒ / Geologist's Log ☐ / Mechanical Analysis ☐	Remarks	Sample Depth	Blows on Sampler
		6" CONCRETE			
	2.5	BLACK CINDERS WITH SLAG(FILL)			
		AUGER REFUSAL 2.5'			

LAKE DRILLING CO. INC. • P.O. BOX 33284 • CLEVELAND, OHIO 44133 TEST BORING RECORD

LER DEAN P. LOTZ
ER ON COMPLETION 7' 24 HOUR WATER
D 12-10-90 TIME DEPTH
.G HAMMER Wt. lbs. DROP in.
MPLER HAMMER Wt. 140 lbs. DROP 30 in.
SAMPLER SIZE 2 in. O.D. CASING SIZE in.
JGER SIZE 3 1/4 in. GROUND WATER

HOLE NO. B-25 SURFACE ELEVATION Sheet No. 1 of 1 Sheets
FOR CTI
LOCATION MASTER METALS, WEST 3RD
STARTED COMPLETED JOB NO. 90319

VATION	DEPTH	Driller's Log ☒ Geologist's Log ☐ Mechanical Analysis ☐	Remarks	Sample Depth	Blows on Sampler
		6" CONCRETE			
	5'	BLACK CINDERS WITH TRACE OF BROWN SAND	MOIST	3-5	4-4-5-5
	9'	BLACK SAND AND CINDERS	WET		
	10'	BLACK SILTY CLAY	MOIST	8-10	4-2-2-4
			ODOR		

LAKE DRILLING CO. INC. • P.O. BOX 33284 • CLEVELAND, OHIO 44133

TEST BORING RECORD

LLER DEAN P. LOTZ

TER ON COMPLETION ..... 24 HOUR WATER .....

12-10-90 TIME ..... DEPTH 7'

..NG HAMMER Wt. ..... lbs. DROP ..... in.

MPLER HAMMER Wt. 140 lbs. DROP 30 in.

SAMPLER SIZE 2 in. O.D. CASING SIZE ..... in.

JGER SIZE 3 1/4 in. GROUND WATER .....

HOLE NO. B-26 SURFACE ELEVATION ..... Sheet No. 1 of 1 Sheets

FOR CTI

LOCATION MASTER METALS, WEST 3RD

STARTED ..... COMPLETED ..... JOB NO. 90319

VATION	DEPTH	Driller's Log ☐ Geologist's Log ☐ Mechanical Analysis ☐	Remarks	Sample Depth	Blows on Sampler
		8" CONCRETE			
				3-5	12-11-2-2
	7'	BLACK CINDERS WITH SLAG	MOIST		
		AUGER REFUSAL 7'			

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LER DEAN P. LOTZ
ER ON COMPLETION 24 HOUR WATER
D 12-10-90 TIME DEPTH 1.5'
G HAMMER Wt. lbs. DROP in.
MPLER HAMMER Wt. 140 lbs. DROP 30 in.
SAMPLER SIZE 2 in. O.D. CASING SIZE in.
JGER SIZE 3 1/4 in. GROUND WATER

HOLE NO. B-27 SURFACE ELEVATION Sheet No. 1 of 1 Sheets
FOR CTI
LOCATION MASTER METALS, WEST 3RD
STARTED COMPLETED JOB NO. 90319

VATION	DEPTH	Driller's Log ☒ / Geologist's Log ☐ / Mechanical Analysis ☐	Remarks	Sample Depth	Blows on Sampler
		6" CONCRETE			
	1.5	BROWN SAND CLAY WITH WOOD	MOIST	0-2	1-50/5
		AUGER REFUSAL 1.5'			

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.LER DEAN P. LOTZ

HOLE NO. B-28 SURFACE ELEVATION ..... Sheet No. 1 of 1 Sheets

ER ON COMPLETION ..... 24 HOUR WATER .....

12-10-90 TIME ..... DEPTH 5'

FOR CTI

.G HAMMER Wt. ..... lbs. DROP ..... in.

APLER HAMMER Wt. 140 lbs. DROP 3 in.

SAMPLER SIZE 2 in. O.D. CASING SIZE ..... in.

LOCATION MASTER METALS, WEST 3RD

JGER SIZE 3 1/4 in. GROUND WATER .....

STARTED ..... COMPLETED ..... JOB NO. 90319

VATION	DEPTH	Driller's Log ☐ Geologist's Log ☐ Mechanical Analysis ☐	Remarks	Sample Depth	Blows on Sampler
		6" CONCRETE			
	5'	BLACK CINDERS WITH SLAG (FILL)	MOIST	3-5	50/0
		AUGER REFUSAL 5'			

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TEST BORING RECORD

LLER DEAN P. LOTZ

HOLE NO. B-29 SURFACE ELEVATION Sheet No. 1 of 1 Sheets

TER ON COMPLETION 24 HOUR WATER

12-10-90 TIME DEPTH 5'

FOR CTI

.NG HAMMER Wt. lbs. DROP in.

MPLER HAMMER Wt. 140 lbs. DROP 30 in.

SAMPLER SIZE 2 in. O.D. CASING SIZE in.

LOCATION MASTER METALS, WEST 3RD

UGER SIZE 3 1/4 in. GROUND WATER

STARTED COMPLETED JOB NO. 90319

VATION	DEPTH	Driller's Log ☒ / Geologist's Log ☐ / Mechanical Analysis ☐	Remarks	Sample Depth	Blows on Sampler
		6" CONCRETE			
		BLACK CINDERS AND SLAG WITH SAND AND GRAVEL LAYERS			
	5'		MOIST	3-5	6-5-5-4
		AUGER REFUSAL 5'			

LAKE DRILLING CO. INC. • P.O. BOX 33284 • CLEVELAND, OHIO 44133 TEST BORING RECORD

ILLER DEAN P. LOTZ

HOLE NO. B-30 SURFACE ELEVATION Sheet No. 1 of 1 Sheet

TER ON COMPLETION 7' 24 HOUR WATER

12-10-90 TIME DEPTH 10'

FOR CTI

NG HAMMER Wt. lbs. DROP in.

MPLER HAMMER Wt. 140 lbs. DROP 30 in.

SAMPLER SIZE 2 in. O.D. CASING SIZE in.

LOCATION MASTER METALS, WEST 3RD

UGER SIZE 3 1/4 in. GROUND WATER

STARTED COMPLETED JOB NO. 90319

VATION	DEPTH	Driller's Log ☒ / Geologist's Log ☐ / Mechanical Analysis ☐	Remarks	Sample Depth	Blows on Sampler
		6" CONCRETE			
	5'	BLACK CINDERS WITH SLAG, COAL, GRAVEL LAYERS	MOIST	3-5	3-2-25
	10'	BLACK CINDERS WITH SLAG AND COAL	WET	8-10	6-5-44

LAKE DRILLING CO. INC. • P.O. BOX 33284 • CLEVELAND, OHIO 44133 TEST BORING RECORD

LER DEAN P. LOTZ

W ER ON COMPLETION ..... 24 HOUR WATER .....

D 12-10-90 TIME ..... DEPTH 5'

G HAMMER Wt. ..... lbs. DROP ..... in.

PLER HAMMER Wt. 140 lbs. DROP 30 in.

SAMPLER SIZE 2 in. O.D. CASING SIZE ..... in.

UGER SIZE 3 1/4 in. GROUND WATER .....

HOLE NO. B-31 SURFACE ELEVATION ..... Sheet No. 1 of 1 Sheets

FOR CTI

LOCATION MASTER METALS, WEST 3RD

STARTED ..... COMPLETED ..... JOB NO. 90319

E ATION	DEPTH	Driller's Log ☒ / Geologist's Log ☐ / Mechanical Analysis ☐	Remarks	Sample Depth	Blows on Sampler
	5'	BLACK CINDERS AND SLAG	MOIST	3-5	50/2
		AUGER REFUSAL 5'			

APPENDIX C

33200 Bainbridge Road
Suite 39
Solon, Ohio 44139
(216) 843-2112

COMPLIANCE TECHNOLOGIES, INC.

Environmental Consulting and Remediation

CHAIN OF CUSTODY RECORD

CLIENT NAME: Bill or Steve CTI

SAMPLERS: (SIGNATURE) Bill Curran

PROJECT NUMBER: 0019

PROJECT NAME: Master Metals

STATION NUMBER	DATE	TIME	COMPOSITE	GRAB	STATION LOCATION	NO. OF CONTAINERS							REMARKS
B1	12-4-90			✓	Boring #1 2-3'	1							
B2	12-4-90			✓	Boring #2 2'-3'	1							
B3	12-4-90			✓	Boring #3 2'-3'	1							
B4	12-4-90			✓	Boring #4 2'-3'	1							
B-5	12-4-90			✓	Boring #5 Top 2'-3'	1							
B-5	12-4-90			✓	Boring #5 Bottom 8'-10'	1							
B-6	12-4-90			✓	Boring #6 Top 2'-3'	1							
B6	12-4-90			✓	Boring #6 Bottom 4'-5'	1							
G1	12-4-90			✓	(Grab) Slag (Boot Tie)	1							
MM1	12-4-90			✓	(Grab) (MM1 Brick)								

RELINQUISHED BY:	(SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	RECEIVED FOR LABORATORY BY: (SIGNATURE)	DATE	TIME
Bill Curran	CTI	12/4/90	7:30	Bill [illegible]	Bill [illegible]	12/5	9:00 am.
RELINQUISHED BY:	(SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	REMARKS		
RELINQUISHED BY:	(SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)			
RELINQUISHED BY:	(SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)			

CTI
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COMPLIANCE TECHNOLOGIES, INC.
Environmental Consulting and Remediation

CHAIN OF CUSTODY RECORD

CLIENT NAME: Bill or Steve CTI

SAMPLERS: (SIGNATURE) Bill Curran

PROJECT NUMBER: 0019

PROJECT NAME: Master Metals

STATION NUMBER	DATE	TIME	COMPOSITE	GRAB	STATION LOCATION	NO. OF CONTAINERS							REMARKS
B7	12/5/90			✓	Boring #7 3'	1							
B8	12/5/90			✓	Boring #8 3'-5'	1							
B9	12/6/90			✓	Boring #9 3'	1							
B10	12/6/90			✓	Boring #10 3'-5'	1							
B10	12/6/90			✓	Boring #10 8'-10'	1							
B11	12/6/90			✓	Boring #11 3'-5'	1							
B11	12/6/90			✓	Boring #11 8'-10'	1							
B12	12/6/90			✓	Boring #12 3'-5'	1							
B12	12/6/90			✓	Boring #12 8'-10	1							
B15	12/6/90			✓	Boring #15 BC 3'-5'	1							
					B#15								
B15	12/6/90			✓	Boring #15 8'-10'	1							

RELINQUISHED BY:	(SIGNATURE)	DATE	TIME	RECEIVED BY:	(SIGNATURE)	RECEIVED FOR LABORATORY BY: (SIGNATURE)	DATE	TIME
Bill Curran	WLC CTI	12/6	7:30	Bill Curran		Bill Curran	12/7	9:00AM
RELINQUISHED BY:	(SIGNATURE)	DATE	TIME	RECEIVED BY:	(SIGNATURE)	REMARKS		
RELINQUISHED BY:	(SIGNATURE)	DATE	TIME	RECEIVED BY:	(SIGNATURE)			
RELINQUISHED BY:	(SIGNATURE)	DATE	TIME	RECEIVED BY:	(SIGNATURE)			

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COMPLIANCE TECHNOLOGIES, INC.
Environmental Consulting and Remediation

CHAIN OF CUSTODY RECORD

CLIENT NAME: CTI Bill Curran

SAMPLERS: (SIGNATURE) Bill Curran

PROJECT NUMBER:

PROJECT NAME: Master Metals

STATION NUMBER	DATE	TIME	COMPOSITE	GRAB	STATION LOCATION	NO. OF CONTAINERS							REMARKS
B13	12/6/90			✓	Boring # B13 Top 3-5'	1							
B13	12/6/90			✓	Boring # B13 Bottom 8-10	1							
B14	12/6/90			✓	Boring # B14 Top 3-5'	1							
B14	12/6/90			✓	Boring # B14 Bottom 8'-10	1							
B16	12/6/90			✓	Boring # B16 Top 3-5'	1							
B16	12/6/90			✓	Boring # B16 Bottom 8-10'	1							
B17	12/6/90			✓	Boring # B17 Top ~~8-10~~ 3-5'	1							
B17	12/6/90			✓	Boring # B17 Bottom 8-10'	1							
B18	12/6/90			✓	Boring # B18 Top 3-5'	1							
B18	12/6/90			✓	Boring # B18 Bottom 8-10'	1							
B19	12/6/90			✓	Boring # B19 Top 3-5'	1							
B19	12/6/90			✓	Boring # B19 Bottom 8-10'	1							
B20	12/6/90			✓	Boring # B20 Top 4'	1							

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	RECEIVED FOR LABORATORY BY: (SIGNATURE)	DATE	TIME
Bill Curran	12-7-90	7:00A	Bill Curran	Bill Curran	12/7	9:00AM
RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	REMARKS		
RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)			
RE[illegible]ISHE[illegible]TURE			RE[illegible]D BY (SIGN[illegible]E)			

33200 Bainbridge Road
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Solon, Ohio 44139
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COMPLIANCE TECHNOLOGIES, INC.
Environmental Consulting and Remediation

CHAIN OF CUSTODY RECORD

CLIENT NAME: CTI Bill Curran

SAMPLERS: (SIGNATURE) Bill Curran

PROJECT NUMBER:

PROJECT NAME: Master Metals

STATION NUMBER	DATE	TIME	COMPOSITE	GRAB	STATION LOCATION	NO. OF CONTAINERS	REMARKS
B21	12-7-90			✓	Boring 21 8-10'	1	
B22	12-7-90			✓	Boring 22 3-5'	1	
B24	12-7-90			✓	Boring 24 2'	1	
B25	12-7-90			✓	Boring 25 Top 3-5'	1	
B25	12-7-90			✓	Boring 25 Bottom 8-10'	1	
B26	12-7-90			✓	Boring 26 3-5'	1	
B27	12-7-90			✓	Boring 27 1'	1	
B28	12-7-90			✓	Boring 28 4.5'	1	
B29	12-7-90			✓	Boring 29 3-5'	1	
B30	12-7-90			✓	Boring 30 Top 3-5'	1	
B30	12-7-90			✓	Boring 30 Bottom 8-10'	1	
B31	12-7-90			✓	Boring 31 off site Back Ground	1	

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	RECEIVED FOR LABORATORY BY: (SIGNATURE)	DATE	TIME
Bill Curran	12/3/90	7:30	Bill [illegible]	Bill [illegible]	12/8	9:00AM
RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	REMARKS		
RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)			
RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)			

APPENDIX D

Occupational Medicine
BHM
Safety & Industrial Hygiene
Environmental Services
20690 Lakeland Blvd.
Euclid, OH 44119

Environmental Laboratory
7145 Pine St.
Chagrin Falls, OH 44022

WORK ORDER NUMBER: 0074 THROUGH 0119

CUSTOMER: BILL CURRAN
CTI CONSULTANTS
33200 BAINBRIDGE ROAD
SUITE 39
SOLON, OH 44139

CUSTOMER NO: B1 THROUGH 31 BKGD

CONTACT: BILL CURRAN

SAMPLE DESCRIPTION/SAMPLE ID NO:

BORINGS, SLAG

DATE RECEIVED: DECEMBER 5, 1990 THROUGH DECEMBER 8, 1990

DATE REPORTED: DECEMBER 28, 1990

TESTS REQUESTED: TOTAL METALS (RCRA)
TCLP METALS
TOTAL CYANIDE
REACTIVE SULFIDE
pH, FLASHPOINT

REVIEWED BY: Bill Dunn

APPROVED BY: Bill Dunn

CUSTOMER: CTI CONSULTANTS
WORK ORDER NO: 0074
SAMPLE ID: BORINGS, SLAG

DATE RECEIVED: 12-5--8-90
DATE REPORTED: 12-31-90
Method 9040

BHM ID	CTI ID	pH
074	B-1	9.60
075	B-2	6.5
076	B-3	8.2
077	B-4	8.8
078	B-5 TOP	8.8
079	B-5 8-10'	8.4
080	B-6 TOP	8.7
081	B-6 4-5'	10.5
082		SEE TCLP
083		SEE TCLP
084	B-7 3'	6.8
085	B-8 3-5'	5.5
086	B-9 3'	5.7
087	B-10 3-5'	6.2
088	B-10 8-10'	6.3
089	B-11 3-5'	5.8
090	B-11 8-10'	5.8
091	B-12 3-5'	6.5
092	B-12 8-10'	6.3
093	B-15 3-5'	6.6
094	B-15 8-10'	6.8
095	B-13 3-5'	8.1
096	B-13 8-10'	9.1
097	B-14 3-5'	7.1
098	B-14 8-10'	6.8
099	B-16 3-5'	8.0
100	B-16 8-10'	8.2
101	B-17 3-5'	7.9
102	B-17 8-10'	7.6
103	B-18 3-5'	8.2
104	B-18 8-10'	7.2
105	B-19 3-5'	7.3
106	B-19 8-10'	8.1
107	B-20 4'	10.1
108	B-21 8-10'	8.8
109	B-22 3-5'	11.0
110	B-24 2'	11.1
111	B-25 3-5'	7.7
112	B-25 8-10'	8.9
113	B-26 3-5'	11.2
114	B-27 1'	8.7
115	B-28 4.5'	8.7
116	B-29 3-5'	6.8
117	B-30 3-5'	10.9
118	B-30 8-10'	10.6
119	BACKGROUND	9.8

WORK ORDER NUMBER:082 total
CUSTOMER NUMBER:Grab Slag
TEST REQUESTED: Total RCRA Metals

Element	Result mg/Kg	Detection mg/Kg	Method
Arsenic	<0.50	0.50	6010
Selenium	<0.50	0.50	6010
Mercury	<0.01	0.01	245.1
Lead	7075	0.50	6010
Cadmium	41.3	0.25	6010
Nickel	9.25	1.00	6010
Barium	70.0	1.00	6010
Chromium	2.5	0.50	6010
Silver	<0.50	0.50	6010

WORK ORDER NUMBER:082 TCLP
CUSTOMER NUMBER:G1 GRAB SLAG
TEST REQUESTED:TCLP Metals
REACTIVE SULFIDE
pH,

Element	Result mg/L	Detection mg/L	Method
Arsenic	<0.10	0.040	6010
Selenium	<0.10	0.040	6010
Mercury	<0.04	0.0002	245.1
Lead	16.1	0.040	6010
Cadmium	0.11	0.02	6010
Nickel	0.51	0.02	6010
Barium	0.44	0.02	6010
Chromium	0.56	0.02	6010
Silver	<0.02	0.02	6010
Reactive S	<10.0		9030
pH	7.8		9040

WORK ORDER NUMBER:074
CUSTOMER NUMBER: B1 2-3
TEST REQUESTED: Total RCRA Metals

Element	Result mg/Kg	Detection mg/Kg	Method
Arsenic	<0.50	0.50	6010
Selenium	<0.50	0.50	6010
Mercury	<0.01	0.01	245.1
Lead	22.5	0.50	6010
Cadmium	1.25	0.25	6010
Nickel	16.5	1.00	6010
Barium	25.0	1.00	6010
Chromium	15.0	0.50	6010
Silver	<0.50	0.50	6010

WORK ORDER NUMBER:075
CUSTOMER NUMBER:B2 2-3
TEST REQUESTED: Total RCRA Metals

Element	Result mg/Kg	Detection mg/Kg	Method
Arsenic	<0.50	0.50	6010
Selenium	<0.50	0.50	6010
Mercury	<0.01	0.01	245.1
Lead	27.5	0.50	6010
Cadmium	0.75	0.25	6010
Nickel	10.5	1.00	6010
Barium	37.5	1.00	6010
Chromium	5.0	0.50	6010
Silver	<0.50	0.50	6010

WORK ORDER NUMBER:076
CUSTOMER NUMBER:B3 2-3
TEST REQUESTED: Total RCRA Metals

Element	Result mg/Kg	Detection mg/Kg	Method
Arsenic	<0.50	0.50	6010
Selenium	<0.50	0.50	6010
Mercury	<0.01	0.01	245.1
Lead	37.5	0.50	6010
Cadmium	17.75	0.25	6010
Nickel	15.0	1.00	6010
Barium	37.5	1.00	6010
Chromium	4.5	0.50	6010
Silver	<0.50	0.50	6010

WORK ORDER NUMBER:077
CUSTOMER NUMBER:B4 2-3
TEST REQUESTED: Total RCRA Metals

Element	Result mg/Kg	Detection mg/Kg	Method
Arsenic	<0.50	0.50	6010
Selenium	<0.50	0.50	6010
Mercury	<0.01	0.01	245.1
Lead	35.5	0.50	6010
Cadmium	7.5	0.25	6010
Nickel	15.0	1.00	6010
Barium	50.0	1.00	6010
Chromium	15.0	0.50	6010
Silver	<0.50	0.50	6010

WORK ORDER NUMBER:078
CUSTOMER NUMBER:85 2-3
TEST REQUESTED: Total RCRA Metals

Element	Result mg/Kg	Detection mg/Kg	Method
Arsenic	<0.50	0.50	6010
Selenium	<0.50	0.50	6010
Mercury	<0.01	0.01	245.1
Lead	16.5	0.50	6010
Cadmium	4.0	0.25	6010
Nickel	25.0	1.00	6010
Barium	2.5	1.00	6010
Chromium	25.0	0.50	6010
Silver	<0.50	0.50	6010

WORK ORDER NUMBER:079
CUSTOMER NUMBER:B5 8-10
TEST REQUESTED: Total RCRA Metals

Element	Result mg/Kg	Detection mg/Kg	Method
Arsenic	<0.50	0.50	6010
Selenium	<0.50	0.50	6010
Mercury	<0.01	0.01	245.1
Lead	17.5	0.50	6010
Cadmium	2.5	0.25	6010
Nickel	25.0	1.00	6010
Barium	0.5	1.00	6010
Chromium	22.5	0.50	6010
Silver	<0.50	0.50	6010

WORK ORDER NUMBER:080
CUSTOMER NUMBER:BG 2-3
TEST REQUESTED: Total RCRA Metals

Element	Result mg/Kg	Detection mg/Kg	Method
Arsenic	<0.50	0.50	6010
Selenium	<0.50	0.50	6010
Mercury	<0.01	0.01	245.1
Lead	40.0	0.50	6010
Cadmium	1.5	0.25	6010
Nickel	32.5	1.00	6010
Barium	17.5	1.00	6010
Chromium	6.25	0.50	6010
Silver	<0.50	0.50	6010

WORK ORDER NUMBER:081
CUSTOMER NUMBER:B6 4-5
TEST REQUESTED: Total RCRA Metals

Element	Result mg/Kg	Detection mg/Kg	Method
Arsenic	<0.50	0.50	6010
Selenium	<0.50	0.50	6010
Mercury	<0.01	0.01	245.1
Lead	32.5	0.50	6010
Cadmium	1.0	0.25	6010
Nickel	12.5	1.00	6010
Barium	10.0	1.00	6010
Chromium	22.5	0.50	6010
Silver	<0.50	0.50	6010

WORK ORDER NUMBER:084
CUSTOMER NUMBER: B7 3'
TEST REQUESTED: Total RCRA Metals

Element	Result mg/Kg	Detection mg/Kg	Method
Arsenic	<0.50	0.50	6010
Selenium	<0.50	0.50	6010
Mercury	<0.01	0.01	245.1
Lead	2625	0.50	6010
Cadmium	12.5	0.02	6010
Nickel	8.5	0.02	6010
Barium	6.5	0.02	6010
Chromium	1.5	0.02	6010
Silver	<0.02	0.02	6010

WORK ORDER NUMBER:085
CUSTOMER NUMBER:B8 3-5
TEST REQUESTED: Total RCRA Metals

Element	Result mg/Kg	Detection mg/Kg	Method
Arsenic	<0.50	0.50	6010
Selenium	<0.50	0.50	6010
Mercury	<0.01	0.01	245.1
Lead	1400	0.50	6010
Cadmium	7.5	0.02	6010
Nickel	22.5	0.02	6010
Barium	45.0	0.02	6010
Chromium	2.25	0.02	6010
Silver	<0.02	0.02	6010

WORK ORDER NUMBER:086
CUSTOMER NUMBER:B9 3'
TEST REQUESTED: Total RCRA Metals

Element	Result mg/Kg	Detection mg/Kg	Method
Arsenic	<0.50	0.50	6010
Selenium	<0.50	0.50	6010
Mercury	<0.01	0.01	245.1
Lead	3825	0.50	6010
Cadmium	1.25	0.25	6010
Nickel	2.0	0.50	6010
Barium	5.0	0.50	6010
Chromium	0.5	0.50	6010
Silver	<0.02	0.02	6010

WORK ORDER NUMBER: 087
CUSTOMER NUMBER: B10 3-5'
TEST REQUESTED: TOTAL RCRA METALS

ELEMENT	RESULT MG/KG	DETECTION MG/KG	METHOD
ARSENIC	<0.50	0.50	6010
SELENIUM	<0.50	0.50	6010
MERCURY	<0.01	0.01	245.1
LEAD	970.00	0.50	6010
CADMIUM	1.35	0.25	6010
NICKEL	1.80	0.50	6010
BARIUM	0.89	0.50	6010
CHROMIUM	<0.50	0.50	6010
SILVER	<0.02	0.02	6010

WORK ORDER NUMBER:088
CUSTOMER NUMBER:B10 8-10
TEST REQUESTED: Total RCRA Metals

Element	Result mg/Kg	Detection mg/Kg	Method
Arsenic	<0.50	0.50	6010
Selenium	<0.50	0.50	6010
Mercury	<0.01	0.01	245.1
Lead	11825	0.50	6010
Cadmium	25.0	0.25	6010
Nickel	170.0	0.50	6010
Barium	72.5	0.50	6010
Chromium	<0.5	0.50	6010
Silver	<0.02	0.02	6010

WORK ORDER NUMBER:089
CUSTOMER NUMBER:B11 3-5
TEST REQUESTED: Total RCRA Metals

Element	Result mg/Kg	Detection mg/Kg	Method
Arsenic	<0.50	0.50	6010
Selenium	<0.50	0.50	6010
Mercury	<0.01	0.01	245.1
Lead	11175	0.50	6010
Cadmium	14.0	0.25	6010
Nickel	40.0	0.50	6010
Barium	50.2	0.50	6010
Chromium	3.3	0.50	6010
Silver	<0.02	0.02	6010

WORK ORDER NUMBER:090
CUSTOMER NUMBER:B11 8-10
TEST REQUESTED: Total RCRA Metals

Element	Result mg/Kg	Detection mg/Kg	Method
Arsenic	<0.50	0.50	6010
Selenium	<0.50	0.50	6010
Mercury	<0.01	0.01	245.1
Lead	3500	0.50	6010
Cadmium	10.0	0.25	6010
Nickel	36.3	0.50	6010
Barium	20.0	0.50	6010
Chromium	1.25	0.50	6010
Silver	<0.02	0.02	6010

WORK ORDER NUMBER:091
CUSTOMER NUMBER:B12 3-5
TEST REQUESTED: Total RCRA Metals

Element	Result mg/Kg	Detection mg/Kg	Method
Arsenic	<0.50	0.50	6010
Selenium	<0.50	0.50	6010
Mercury	<0.01	0.01	245.1
Lead	52.5	0.50	6010
Cadmium	0.75	0.25	6010
Nickel	8.5	0.50	6010
Barium	9.50	0.50	6010
Chromium	16.0	0.50	6010
Silver	<0.02	0.02	6010

WORK ORDER NUMBER:092
CUSTOMER NUMBER:B12 8-10
TEST REQUESTED: Total RCRA Metals

Element	Result mg/Kg	Detection mg/Kg	Method
Arsenic	<0.50	0.50	6010
Selenium	<0.50	0.50	6010
Mercury	<0.01	0.01	245.1
Lead	1200	0.50	6010
Cadmium	2.75	0.25	6010
Nickel	45.0	0.50	6010
Barium	37.5	0.50	6010
Chromium	65.0	0.50	6010
Silver	<0.02	0.02	6010

WORK ORDER NUMBER:095
CUSTOMER NUMBER:B13 3-5
TEST REQUESTED: Total RCRA Metals

Element	Result mg/Kg	Detection mg/Kg	Method
Arsenic	<0.50	0.50	6010
Selenium	<0.50	0.50	6010
Mercury	<0.01	0.01	245.1
Lead	975	0.50	6010
Cadmium	1.75	0.25	6010
Nickel	9.25	0.50	6010
Barium	16.5	0.50	6010
Chromium	6.5	0.50	6010
Silver	<0.02	0.02	6010

WORK ORDER NUMBER:096
CUSTOMER NUMBER:B13 8-10
TEST REQUESTED: Total RCRA Metals

Element	Result mg/Kg	Detection mg/Kg	Method
Arsenic	<0.50	0.50	6010
Selenium	<0.50	0.50	6010
Mercury	<0.01	0.01	245.1
Lead	650	0.50	6010
Cadmium	1.00	0.25	6010
Nickel	17.5	0.50	6010
Barium	40.0	0.50	6010
Chromium	10.5	0.50	6010
Silver	<0.02	0.02	6010

WORK ORDER NUMBER:097
CUSTOMER NUMBER:B14 3-5
TEST REQUESTED: Total RCRA Metals

Element	Result mg/Kg	Detection mg/Kg	Method
Arsenic	<0.50	0.50	6010
Selenium	<0.50	0.50	6010
Mercury	<0.01	0.01	245.1
Lead	125	0.50	6010
Cadmium	0.51	0.25	6010
Nickel	10.5	0.50	6010
Barium	33.5	0.50	6010
Chromium	3.5	0.50	6010
Silver	<0.02	0.02	6010

WORK ORDER NUMBER:098
CUSTOMER NUMBER:B14 8-10
TEST REQUESTED: Total RCRA Metals

Element	Result mg/Kg	Detection mg/Kg	Method
Arsenic	<0.50	0.50	6010
Selenium	<0.50	0.50	6010
Mercury	<0.01	0.01	245.1
Lead	105	0.50	6010
Cadmium	2.5	0.25	6010
Nickel	27.5	0.50	6010
Barium	20.0	0.50	6010
Chromium	55.0	0.50	6010
Silver	<0.02	0.02	6010

WORK ORDER NUMBER:093
CUSTOMER NUMBER:B15 3-5
TEST REQUESTED: Total RCRA Metals

Element	Result mg/Kg	Detection mg/Kg	Method
Arsenic	<0.50	0.50	6010
Selenium	<0.50	0.50	6010
Mercury	<0.01	0.01	245.1
Lead	500	0.50	6010
Cadmium	0.5	0.25	6010
Nickel	49.0	0.50	6010
Barium	16.5	0.50	6010
Chromium	118.0	0.50	6010
Silver	<0.02	0.02	6010

WORK ORDER NUMBER:094
CUSTOMER NUMBER:B15 8-10
TEST REQUESTED: Total RCRA Metals

Element	Result mg/Kg	Detection mg/Kg	Method
Arsenic	<0.50	0.50	6010
Selenium	<0.50	0.50	6010
Mercury	<0.01	0.01	245.1
Lead	166.5	0.50	6010
Cadmium	0.75	0.25	6010
Nickel	36.5	0.50	6010
Barium	27.5	0.50	6010
Chromium	67.0	0.50	6010
Silver	<0.02	0.02	6010

WORK ORDER NUMBER:099
CUSTOMER NUMBER:B16 3-5
TEST REQUESTED: Total RCRA Metals

Element	Result mg/Kg	Detection mg/Kg	Method
Arsenic	<0.50	0.50	6010
Selenium	<0.50	0.50	6010
Mercury	<0.01	0.01	245.1
Lead	15.0	0.50	6010
Cadmium	0.75	0.25	6010
Nickel	70.0	0.50	6010
Barium	7.5	0.50	6010
Chromium	162.5	0.50	6010
Silver	<0.02	0.02	6010

WORK ORDER NUMBER:100
CUSTOMER NUMBER:B16 8-10
TEST REQUESTED: Total RCRA Metals

Element	Result mg/Kg	Detection mg/Kg	Method
Arsenic	<0.50	0.50	6010
Selenium	<0.50	0.50	6010
Mercury	<0.01	0.01	245.1
Lead	7.85	0.50	6010
Cadmium	0.75	0.25	6010
Nickel	45.0	0.50	6010
Barium	2.7	0.50	6010
Chromium	110.0	0.50	6010
Silver	<0.02	0.02	6010

WORK ORDER NUMBER:101
CUSTOMER NUMBER:B17 3-5
TEST REQUESTED: Total RCRA Metals

Element	Result mg/Kg	Detection mg/Kg	Method
Arsenic	<0.50	0.50	6010
Selenium	<0.50	0.50	6010
Mercury	<0.01	0.01	245.1
Lead	17.5	0.50	6010
Cadmium	0.75	0.25	6010
Nickel	87.5	0.50	6010
Barium	4.5	0.50	6010
Chromium	77.5	0.50	6010
Silver	<0.02	0.02	6010

WORK ORDER NUMBER:102
CUSTOMER NUMBER:B17 8-10
TEST REQUESTED: Total RCRA Metals

Element	Result mg/Kg	Detection mg/Kg	Method
Arsenic	<0.50	0.50	6010
Selenium	<0.50	0.50	6010
Mercury	<0.01	0.01	245.1
Lead	32.5	0.50	6010
Cadmium	0.75	0.25	6010
Nickel	46.2	0.50	6010
Barium	7.5	0.50	6010
Chromium	100.5	0.50	6010
Silver	<0.02	0.02	6010

WORK ORDER NUMBER:103
CUSTOMER NUMBER:B18 3-5
TEST REQUESTED: Total RCRA Metals

Element	Result mg/Kg	Detection mg/Kg	Method
Arsenic	<0.50	0.50	6010
Selenium	<0.50	0.50	6010
Mercury	<0.01	0.01	245.1
Lead	21.5	0.50	6010
Cadmium	<0.25	0.25	6010
Nickel	8.4	0.50	6010
Barium	48.7	0.50	6010
Chromium	5.3	0.50	6010
Silver	<0.02	0.02	6010

WORK ORDER NUMBER:104
CUSTOMER NUMBER:B18 8-10
TEST REQUESTED: Total RCRA Metals

Element	Result mg/Kg	Detection mg/Kg	Method
Arsenic	<0.50	0.50	6010
Selenium	<0.50	0.50	6010
Mercury	<0.01	0.01	245.1
Lead	14.7	0.50	6010
Cadmium	0.7	0.25	6010
Nickel	13.3	0.50	6010
Barium	12.0	0.50	6010
Chromium	3.5	0.50	6010
Silver	<0.02	0.02	6010

WORK ORDER NUMBER:105
CUSTOMER NUMBER:819 3-5
TEST REQUESTED: Total RCRA Metals

Element	Result mg/Kg	Detection mg/Kg	Method
Arsenic	<0.50	0.50	6010
Selenium	<0.50	0.50	6010
Mercury	<0.01	0.01	245.1
Lead	126.0	0.50	6010
Cadmium	<0.25	0.25	6010
Nickel	4.5	0.50	6010
Barium	48.7	0.50	6010
Chromium	210	0.50	6010
Silver	<0.02	0.02	6010

WORK ORDER NUMBER:106
CUSTOMER NUMBER:B19 8-10
TEST REQUESTED: Total RCRA Metals

Element	Result mg/Kg	Detection mg/Kg	Method
Arsenic	<0.50	0.50	6010
Selenium	<0.50	0.50	6010
Mercury	<0.01	0.01	245.1
Lead	62.5	0.50	6010
Cadmium	1.6	0.25	6010
Nickel	7.9	0.50	6010
Barium	27.3	0.50	6010
Chromium	3.6	0.50	6010
Silver	<0.02	0.02	6010

WORK ORDER NUMBER:107
CUSTOMER NUMBER:B20 4'
TEST REQUESTED: Total RCRA Metals

Element	Result mg/Kg	Detection mg/Kg	Method
Arsenic	<0.50	0.50	6010
Selenium	<0.50	0.50	6010
Mercury	<0.01	0.01	245.1
Lead	55.0	0.50	6010
Cadmium	1.75	0.25	6010
Nickel	1.0	0.50	6010
Barium	54.5	0.50	6010
Chromium	2.8	0.50	6010
Silver	<0.02	0.02	6010

WORK ORDER NUMBER:108
CUSTOMER NUMBER:B21 8-10
TEST REQUESTED: Total RCRA Metals

Element	Result mg/Kg	Detection mg/Kg	Method
Arsenic	<0.50	0.50	6010
Selenium	<0.50	0.50	6010
Mercury	<0.01	0.01	245.1
Lead	102.0	0.50	6010
Cadmium	1.8	0.25	6010
Nickel	4.2	0.50	6010
Barium	79.0	0.50	6010
Chromium	6.5	0.50	6010
Silver	<0.02	0.02	6010

WORK ORDER NUMBER:109
CUSTOMER NUMBER:B22 3-5
TEST REQUESTED: Total RCRA Metals

Element	Result mg/Kg	Detection mg/Kg	Method
Arsenic	<0.50	0.50	6010
Selenium	<0.50	0.50	6010
Mercury	<0.01	0.01	245.1
Lead	352.0	0.50	6010
Cadmium	1.6	0.25	6010
Nickel	<0.5	0.50	6010
Barium	114.0	0.50	6010
Chromium	3.9	0.50	6010
Silver	<0.02	0.02	6010

WORK ORDER NUMBER:110
CUSTOMER NUMBER:B24 2'
TEST REQUESTED: Total RCRA Metals

Element	Result mg/Kg	Detection mg/Kg	Method
Arsenic	<0.50	0.50	6010
Selenium	<0.50	0.50	6010
Mercury	<0.01	0.01	245.1
Lead	4960.0	0.50	6010
Cadmium	50.9	0.25	6010
Nickel	28.0	0.50	6010
Barium	88.0	0.50	6010
Chromium	12.0	0.50	6010
Silver	<0.02	0.02	6010

WORK ORDER NUMBER:111
CUSTOMER NUMBER:B25 3-5'
TEST REQUESTED: Total RCRA Metals

Element	Result mg/Kg	Detection mg/Kg	Method
Arsenic	<0.50	0.50	6010
Selenium	<0.50	0.50	6010
Mercury	<0.01	0.01	245.1
Lead	5010.0	0.50	6010
Cadmium	198.0	0.25	6010
Nickel	73.0	0.50	6010
Barium	32.0	0.50	6010
Chromium	37.8	0.50	6010
Silver	<0.02	0.02	6010

WORK ORDER NUMBER:112
CUSTOMER NUMBER:B25 8-10'
TEST REQUESTED: Total RCRA Metals

Element	Result mg/Kg	Detection mg/Kg	Method
Arsenic	<0.50	0.50	6010
Selenium	<0.50	0.50	6010
Mercury	<0.01	0.01	245.1
Lead	650.0	0.50	6010
Cadmium	130.0	0.25	6010
Nickel	124.0	0.50	6010
Barium	81.0	0.50	6010
Chromium	6.0	0.50	6010
Silver	<0.02	0.02	6010

WORK ORDER NUMBER:113
CUSTOMER NUMBER:B26 3-5'
TEST REQUESTED: Total RCRA Metals

Element	Result mg/Kg	Detection mg/Kg	Method
Arsenic	<0.50	0.50	6010
Selenium	<0.50	0.50	6010
Mercury	<0.01	0.01	245.1
Lead	1120.0	0.50	6010
Cadmium	208.0	0.25	6010
Nickel	49.0	0.50	6010
Barium	45.0	0.50	6010
Chromium	610.0	0.50	6010
Silver	<0.02	0.02	6010

WORK ORDER NUMBER:114
CUSTOMER NUMBER:B27 1'
TEST REQUESTED: Total RCRA Metals

Element	Result mg/Kg	Detection mg/Kg	Method
Arsenic	<0.50	0.50	6010
Selenium	<0.50	0.50	6010
Mercury	<0.01	0.01	245.1
Lead	14070.0	0.50	6010
Cadmium	3.4	0.25	6010
Nickel	34.0	0.50	6010
Barium	36.0	0.50	6010
Chromium	57.0	0.50	6010
Silver	<0.02	0.02	6010

WORK ORDER NUMBER:115
CUSTOMER NUMBER:B28 4.5'
TEST REQUESTED: Total RCRA Metals

Element	Result mg/Kg	Detection mg/Kg	Method
Arsenic	<0.50	0.50	6010
Selenium	<0.50	0.50	6010
Mercury	<0.01	0.01	245.1
Lead	1300.0	0.50	6010
Cadmium	100.0	0.25	6010
Nickel	13.0	0.50	6010
Barium	66.0	0.50	6010
Chromium	4.6	0.50	6010
Silver	<0.02	0.02	6010

WORK ORDER NUMBER:116
CUSTOMER NUMBER:B29 3-5'
TEST REQUESTED: Total RCRA Metals

Element	Result mg/Kg	Detection mg/Kg	Method
Arsenic	<0.50	0.50	6010
Selenium	<0.50	0.50	6010
Mercury	<0.01	0.01	245.1
Lead	225.0	0.50	6010
Cadmium	55.4	0.25	6010
Nickel	12.6	0.50	6010
Barium	12.6	0.50	6010
Chromium	5.5	0.50	6010
Silver	<0.02	0.02	6010

WORK ORDER NUMBER:117
CUSTOMER NUMBER:B30 3-5'
TEST REQUESTED: Total RCRA Metals

Element	Result mg/Kg	Detection mg/Kg	Method
Arsenic	<0.50	0.50	6010
Selenium	<0.50	0.50	6010
Mercury	<0.01	0.01	245.1
Lead	1260.0	0.50	6010
Cadmium	1.7	0.25	6010
Nickel	4.2	0.50	6010
Barium	12.6	0.50	6010
Chromium	193.0	0.50	6010
Silver	<0.02	0.02	6010

WORK ORDER NUMBER:118
CUSTOMER NUMBER:B30 8-10'
TEST REQUESTED: Total RCRA Metals

Element	Result mg/Kg	Detection mg/Kg	Method
Arsenic	<0.50	0.50	6010
Selenium	<0.50	0.50	6010
Mercury	<0.01	0.01	245.1
Lead	32.3	0.50	6010
Cadmium	1.3	0.25	6010
Nickel	1.2	0.50	6010
Barium	69.0	0.50	6010
Chromium	1.7	0.50	6010
Silver	<0.02	0.02	6010

WORK ORDER NUMBER:119
CUSTOMER NUMBER:BKGD B31 5
TEST REQUESTED: Total RCRA Metals

Element	Result mg/Kg	Detection mg/Kg	Method
Arsenic	<0.50	0.50	6010
Selenium	<0.50	0.50	6010
Mercury	<0.01	0.01	245.1
Lead	229.0	0.50	6010
Cadmium	2.1	0.25	6010
Nickel	7.6	0.50	6010
Barium	136.0	0.50	6010
Chromium	10.9	0.50	6010
Silver	<0.02	0.02	6010

State Form 4336

F. Wright

DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

Boyle 8-16-89

INDIANAPOLIS

OFFICE MEMORANDUM

RECEIVED
MAY 30 1989
OFFICE OF RCRA
Waste Management Division
U.S. EPA, REGION V

DATE: May 1, 1989

TO: Rosemary Cantwell
Enforcement

THRU: Harold Templin HT 5/18/89
Karyl Schmidt KS 5-19-89

FROM: Roger Koelpin RK 5/18/89
Geology

SUBJECT: Modification of U.S. Steel (EPA I.D. No. 005444062) Submission; Work Plans for Hydrogeologic Investigations and Groundwater Quality Assessment Programs (WPHI-GWQAP).

I have reviewed the WPHI-GWQAP which was submitted to the Indiana Department of Environmental Management for review December, 1988. The WPHI-GWQAP addressed Cause No. H-015, closure of HWD2, HWD5 and HWT2. The modification to the WPHI-GWQAP (M-WP) addresses Cause No. H-015 as the priority. Resolution of Cause No. H-015, including replacement of the existing monitoring system and reestablishment of background will allow determination of the status of the RCRA units. Depending on the status of the RCRA units, closure or corrective action alternatives must then be pursued.

To minimize the likelihood of the recurrence of past frustration of studies seeking to characterize ground water flow to the Gary Works, and install monitoring well systems that comply with the performance requirements of 329 IAC 3-20-2 a regional characterization of ground water flow by review of existing ground water elevation data is proposed. A regional characterization provides a context in which observations may be interpreted in a manner that is germane to the area. A review of existing data is proposed in the initial phase of this study because it provides over seven years of data describing the behavior of the ground water system, which the USX assures the IDEM is both accurate and precise.

The following methodology is a minimum requirement to increase the likelihood of both an adequate ground water monitoring system and representative ground water samples through post closure of HWD-2, HWD-5 and HWT-2. This document modifies the December 1988 submission of Work Plans for Hydrogeologic Investigations and Groundwater Quality Assessment Programs at Gary Works (WPHI-GWQAP), and shall be refered to as M-WP.

This document (M-WP) does not replace the WPHI-GWQAP, rather it provides required modifications to the WPHI-GWQAP.

This study was originally proposed as part of a response to an IDEM Notice of Violation to U.S. Steel, an Assessment Plan to characterize contamination admittedly present at the Gary Works and as part of a Closure Plan for HWD-5. Furthermore, in light of ground water elevation determinations made from data gathered at the November 1988 sampling event, HWD-2 and HWD-5 do not have monitoring systems that meet the minimum required number of downgradient wells that are capable of immediately detecting contamination from the respective

units and the ground water at well HWD5-5 is a hazardous material (pH = 12.59). Therefore, the objectives of this IDEM modification (M-WP) to the December 1988 submission of the USX Work Plans for Hydrogeologic Investigation and Groundwater Quality Assessment Programs (WPHI-GWQAP) are as follows:

PHASE A.

1. Determine the factors affecting ground water flow directions.

2. Determine areas most likely to provide adequate well locations through post-closure.

3. Revise Sampling and Analysis Plan and submit to IDEM for approval.

PHASE I.

4. Determine the homogeneity of materials comprising the vadose and phreatic zones.

5. Determine the vertical and horizontal continuity of the lacustrine sediments which overlie the bedrock.

6. Installation of an appropriate and adequate (Series A, and; Series B if necessary) clustered monitoring system.

PHASE II.

7. Determine the impact of the regulated RCRA units, HWD-2, HWD-5 & HWT-2, on ground water.

8. Determine the impact of slag on ground water chemistry.

9. Explanation of the excessive pH (12.59) in HWD5-5 at the November 1988 sampling event.

PHASE III.

10. Determination of suitable closure or remedial alternatives for HWD-2, HWD-5 and HWT-2 and submission of Closure-Post Closure, Assessment or Corrective Action Plans for the respective units.

With these objectives, the plan should be revised as follows:

COMPONENTS COMMON TO ALL SITE WORK PLANS (pg. 14 WPHI-GWQAP)

PHASE A.

All ground water elevation data will be evaluated for the wells currently being sampled and piezometers P-1, 2, 3, 14, 15 & 16.

The evaluation will include measurement of the azimuth of the ground water flow direction (drawn as a flow line) for each time that ground water elevations were measured in the wells/piezometers. The percentage of events for which the direction of flow for the well or piezometer was within a given range will be plotted on a rose diagram. The rose diagrams will be subdivided into either two or five degree increments of angular measure from north. All rose diagrams will use the same intervals of angular measure and the same scales for percentage. All rose diagrams will be submitted with the report for Phase A.

A table keyed to the monitoring well or piezometer identification number will be constructed. Included in the table, but not limited to, will be the following:

* the total number of times ground water elevations were measured in the given well or piezometer

* the number of times that the well or piezometer was upgradient (water level is greater than inferred for the entire RCRA unit)

* the number of times that the well or piezometer was clearly downgradient (a line can be drawn that is perpendicular to water level contours, connecting the well/piezometer and the RCRA unit)

* the number of times the well or piezometer was neither clearly upgradient or clearly downgradient of the RCRA unit (e.g. level in well is equal to an inferred elevation for the unit)

* the maximum (mean sea level) ground water elevation measured at the well or piezometer, and the date(s) of occurrence

* the minimum (mean sea level) ground water elevation measured at the well or piezometer, and the date(s) of occurrence

* the most frequent flow direction (using the same intervals of angular measure for all wells) for the well or piezometer, and the number of occurrences within that range

* the angular measure of the range of flow directions for the well or piezometer, and the date(s) of the occurrence of the extreme(s) from the interval in which flow most frequently occurs for the well or piezometer

A well having more than one class (upgradient, downgradient, crossgradient) will be compared to all the other wells having more than one class to assess the factors controlling ground water flow. If changes in class for the well occur at the same events as for other wells in the plant, then plant-wide factors (e.g. Lake Michigan or Grand Calumet River levels, precipitation) should be considered for further investigation. If the changes in class at a given unit occur independently of changes in class at the other units, then more localized factors (e.g. ponding, duration of ponds, filling of impoundments, differences in infiltration) should be considered for further investigation. Combinations of regional and localized factors may also be at work, requiring the determination of thresholds at which one factor begins to dominate others.

Further investigation will consist of, but not be limited to, a qualitative regional hydrogeological study to delineate features and processes affecting ground water flow. The area of study will be bounded by the drainage basin divide between the Grand and Little Calumet Rivers to the south and east, the East Chicago Corporate Limit to the west and Lake Michigan to the north. Descriptions and estimates of the magnitude of processes influencing ground water flow at the Gary Works may be obtained from reputable and verifiable sources such as Indiana Department of Natural Resources, United States Geological Survery Water Resources Branch, Indiana Geological Survey, National Weather Service (NOAA), U.S. Army Corps of Engineers and the Soil Conservation Service.

Spatial relationships shall be displayed as regional maps. These maps will depict time-discrete variations (but not necessarily for each existing suite of ground water measurements) in surface water and ground water elevations to illustrate processess associated with the observed water level measurements. To be specifically included in this mapping effort, but not limited to, are:

* Plant coordinate system

* Regulated RCRA unit boundaries

* Plant property boundaries

* Rivers, waterways, streams, springs, seeps, lakes, ponds, marshes, and impoundments that are within or adjacent to the plant boundaries

* Boring/monitoring well/piezometer/staff gauge/pumping well locations, each clearly identified (e.g. piezometer vs. monitoring well); individual identification numbers may be omitted from this map to improve clarity, but are to include ground water elevations (MSL +/- 0.01 ft.) for the event depicted

* Buildings, roadways, paved parking areas, railroads, tanks, storm sewers and drains, and drainage ditches within and adjacent to the plant boundaries

* Topographic features such as lime piles, ungraded slag heaps, built-up roadways and rail lines, and drainage divides within and adjacent to the plant boundaries

* Areas where topography is being changed such as stock piles, slag fill areas and solid waste management units

* The elevation data will be displayed on one potentiometric surface map per sampling event. The contour interval used (to be held constant) on each map will be sufficient to display inferred mounding and/or localized reversals of flow. Intermittent features such as seeps and ponding of runoff will be indicated even if not present during the specific sampling event being depicted.

Another part of the investigation will entail topographic mapping of the facility to be used in the evaluation of factors affecting ground water flow. This map shall be to the same scale as the regional hydrogeologic map, or to a scale which is easily transferable to the regional hydrogeologic map. If separate maps are prepared to detail the RCRA units, then each separate map of a unit will be to the same scale as the other topographic maps for the other RCRA units. To be included, but not limited to, on the topographic maps will be the following:

* Plant coordinate system

* Regulated RCRA unit boundaries

* Plant property boundaries

* Rivers, waterways, streams, springs, seeps, lakes, ponds, marshes, and impoundments that are within or adjacent to the plant boundaries (to include areas of intermittent ponds or seeps)

* Boring/monitoring well/piezometer/staff gauge/pumping well locations, each clearly identified (e.g. piezometer vs. monitoring well); individual identification numbers may be omitted from this map to improve clarity

* Buildings, roadways, paved parking areas, railroads, tanks, storm sewers and drains, and drainage ditches within and adjacent to the plant boundaries

* Areas where topography is being changed such as stock piles, slag fill areas and solid waste management units

* Contour intervals shall be appropriate to depict the features of interest; in areas of extreme relief, skipping contours (e.g. two foot intervals skipped to ten or twenty foot intervals) is recommended for regional maps as opposed to a wide contour interval throughout the mapped area

The narrative to the regional investigation should include the rationale for prioritizing the factors influencing ground water flow (e.g. sensitivity analysis results). The factors deemed significant in ground water flow characterization should be discussed, describing associations between the specific factors and the observed responses (e.g. total precipitation 10 days prior to sampling and increased pH) for wells falling into two or more classes (e.g. upgradient, downgradient). Well HWD5-5 is to be discussed explicitly.

After the identification and evaluation (consider the use of numerical and or analytical methods of ground water flow including evapotranspiration to test conclusions) of factors influencing ground water and surface water flow, and construction of plant-wide hydrologic and topographic maps, the following questions must be answered:

1. Are any trends or associations observed to account for the variability in ground water flow?

2. Are the trends or associations useful for determination of well locations that would remain in compliance through post closure?

3. How will proposed closure alternatives for HWD-2, HWD-5 and HWT-2 affect these trends or associations?

4. If useful associations or trends can be identified, what well cluster locations would provide the greatest likelihood of compliance with 329 IAC 3-20-2 through post-closure of HWD-2 HWD-5 and HWT-2?

If no useful associations or trends can be identified then the wells shall be resurveyed by a licensed surveyor unless the wells have been resurveyed earlier in Phase A. If the reference elevations surveyed in Phase A differ from the measurements made when the wells for a given unit were installed, by an amount greater than the apparent range of ground water elevations at that unit, for the period of record for the unit, the data is unsalvageable and all well elevations shall be resurveyed at all units prior to each subsequent sampling event.

If the reference elevations surveyed in this effort differ from the measurements made when the wells were installed by an amount less than the apparent range of ground water elevations at the unit, then the ground water elevation data will be reevaluated to determine whether the data can be corrected and salvaged (e.g. a sudden jump in ground water elevations on the order of the observed error in reference elevation, which persists for the remaining period of record). If the ground water elevation data can be salvaged the corrected data will be re-evaluated and presented in tabular and diagramatic form as previously specified. Corrections shall be clearly documented in the narrative and submitted to the State. If the data cannot be salvaged the unit will be dropped from the analysis of ground water flow, and all wells, at all RCRA units, shall be resurveyed prior to each subsequent sampling event.

In the event that either no useful trends or associations can be determined, or the ground water elevation data for either HWD-2 or HWD-5 is in error and cannot be salvaged, then complete encirclement of HWD-2 and/or HWD-5 is called for, to assure at least three downgradient well clusters capable of immediately detecting significant releases from the unit, regardless of variation in ground water flow direction, through post-closure.

Background levels for indicator parameters, drinking water suitability and ground water quality will be developed for all well clusters encircling the respective unit(s). The required upgradient well clusters will be located a greater distance from the unit(s) than at present to provide an upgradient background data set for statistical comparison that is unaffected by the facility and that will remain valid through post-closure of the unit(s).

Phase A will result in selection of locations for the well clusters, which provide the greatest likelihood of compliance with 329 IAC 3-20-2 through the post-closure period of HWD-2, HWD-5 and HWT-2. The results and recommendations will be submitted to the State for approval before beginning Phase I.

Also at the end of Phase A, a revised Sampling and Analysis Plan will be submitted including the followings:

Detection of immiscible layers:

Include procedures to detect light phase immiscible layers.

Include procedures to detect dense phase immiscible layers.

Sampling of immiscible layers:

Sampling of immiscible layers to occur prior to purging of wells.

Sampling procedures shall minimize mixing with water soluble phases.

Well evacuation:

Specify that any problems encountered in well purging are to be included in the field notebook.

Specify that positive gas displacement bladder pumps will be used.

Specify that fluorocarbon resin-coated wire, single strand stainless steel wire, or monofilament line will be used for non-dedicated bailers.

Specify that bladder pumps are to be operated in a continuous manner to minimize aeration of sample.

Specify that bailers are to be lowered slowly to prevent degassing of the sample.

Specify that bailers shall be emptied in a manner that minimizes agitation and aeration of the sample.

Specify that non-dedicated equipment will be rinsed with de-ionized water instead of distilled water.

Specify that non-dedicated sampling equipment is to be thoroughly dried before re-use.

Specify that pumping rates for positive gas displacement bladder pumps during sampling for volatiles shall be less than 100 milliliters per minute.

Sample containers:

Specify if plastic bottles are used for metals samples, they shall be polyethylene with polypropylene caps.

Specify that if glass bottles are used for metals samples, fluorocarbon resin-lined caps shall be used.

Specify that if sample bottles are to be re-used for metals samples the following procedure will be used:

nonphosphate detergent wash
1 : 1 nitric acid rinse
tap water rinse
1 : 1 hydrochloric acid rinse
tap water rinse
de-ionized water rinse

Specify that if sample bottles are to be reused for organic samples the following steps are to be used:

nonphosphate detergent, hot water wash
tap water rinse
de-ionized water rinse
acetone rinse
pesticide grade hexane rinse

Specify that trip blanks for each sample container type will be prepared and evaluated.

Sample preservation procedure:

TOX, TOC, phenols, coliform bacteria and nonvolatile organic samples are to be cooled to four degrees Centigrade.

Dissolved metals, radium, gross alpha, and gross beta samples are to be acidified with nitric acid, to pH 2.

Phenolics samples are to be acidified with sulfuric acid to pH 2.

TOC samples may be acidified to pH 2 with either nitric or hydrochloric acid.

TOX samples are to be preserved with 1 ml. of 1.1 M sodium sulfite.

Samples for pesticides are to be adjusted to $6 < pH < 8$ with either sodium hydroxide or sulfuric acid.

Special handling considerations:

Specify organic samples are not to be filtered.

Specify that samples for volatiles are to be decanted without headspace.

Laboratory analysis procedure:

Include holding time constraints for TOX, TOC, phenols, coliform bacteria, nonvolatile organics, radium, gross alpha, and gross beta laboratory analyses.

Specify that a laboratory logbook shall be kept, in order to note:

experimental condition (temperature, humidity etc.)
whether samples for volatiles are received with headspace
the results of all QC samples
time, date and name of each person at each processing step

Sample labels:

Specify inclusion of name of sampler, time of collection, parameters requested.

Field logbook:

Specify that the following shall be included:

purpose of sampling (e.g. detection, assessment)

presence of immiscible layers and detection method

collection method for immiscible layers and sample ID nos.

well yield - high or low

purge volume and pumping rate

time well purged

well evacuation procedure

sample withdrawal procedure

date and time of collection

well sampling sequence

types of sample containers and sample ID nos.

preservatives used

parameters requested

field analysis data and method(s)

sample distribution and transporter

field observations including;

Unusual recharge rates

Equipment malfunctions

Possible sample contamination

Sampling rates

Sample analysis request sheets:

Specify inclusion of name of person receiving sample and laboratory ID no.

Laboratory logbook:

Specify that one will be kept to document sample preparation techniques, instrumental methods, experimental conditions.

Specify that documentation of any deviations from approved procedures shall be noted in the laboratory logbook.

Specify that QC samples will not be used to "correct" or "adjust" the data.

Reporting low and zero concentration values:

Specify that concentration values shall accompany less than limit of detection annotations.

Specify that the TEGD shall be followed for statistical evaluation of data having values that are less than detection limits.

Significant digits:

Specify that all values are to be reported with consistent significant digits.

Specify that all indicator parameters shall be reported with at least three significant digits.

Units of measure:

Specify that all units of measure for a given parameter shall be consistent throughout the report.

Specify that the reporting format shall clearly indicate consistent units of measure throughout the report (e.g. do not use "all values ppb unless otherwise noted").

Phase A shall be completed in 60 days from the effective date of the Agreed Order, in Cause No. H-015.

PHASE I.

Phase I objectives are characterization of the geology at the Gary Works and installation of an adequate ground water monitoring system based upon Phase A results. A new depth-discrete ground water monitoring system, capable of meeting the performance requirements of 329 IAC 3-20-2, will replace the existing system at all three RCRA units to bring them into compliance. Clusters are necessary as explained in the IDEM reply to the USX, December 1988, response to the November 1987 Notice of Violation. The system will consist of series A shallow wells screened in the slag only and series A deep wells screened above the lacustrine sediments at the bottom of the slag/"sand" aquifer, within the "sands".

The deepest borings of the clusters will extend through the lacustrine sediments, to bedrock, to verify the thickness and lateral continuity of the alleged aquitard. The deepest borings shall be sampled continuously through the lacustrine sediments to the underlying bedrock. In the event the lacustrine sediments are vertically and horizontally continuous, the deep borings will be grouted, or filled so as to exclude communication between the unconfined aquifer and the bedrock aquifer. USX shall document that the methods and materials used to seal the borings into the lacustrine sediments were as per the boring requirements of the Unconsolidated Deposit Descriptive Requirements and submit the documentation to the IDEM.

Should it be shown that the lacustrine sediments are discontinuous, then additional Series B monitoring well clusters screened in the bedrock will be required. The decision as to where the screens shall be located in the bedrock will be based, in part, upon pumping tests to characterize ground water flow through the bedrock and with consultation with IDEM.

In light of past failures to maintain the required number of downgradient wells at the facility, evaluation of ground water elevation data will be done for each subsequent sampling event. In addition to the ground water monitoring wells, additional points will be included in elevation determinations. If evaluations indicate that the unit is no longer in

compliance, then the facility will notify the State within 15 days of the determination. Accordingly, the facility will immediately install additional clusters to remedy the situation.

Additional Points for Water Elevation Determinations:

Staff gauges shall be installed, and referenced to mean sea level in the following surface bodies of water:

1. the pond east of P-16
2. the pond southwest of HWD5-4
3. the pond northwest of HWD5-5
4. the Grand Calumet River, south of HWD2-1
5. the pond east of HWD2-7
6. the pond north of HWD2-6
7. the pond north of HWD2-5

The water levels in these surface bodies of water will be measured to the nearest 0.01 foot at each sampling event, reported per sampling event, and will be included in ground water elevation evaluations by the facility at least until the respective unit is certified closed.

Ground water elevations will also be measured to the nearest 0.01 foot in piezometers P-14, 15 and 16 at each sampling event, reported per sampling event, and will be included in ground water elevation evaluations by the facility at least until HWD5 is certified closed.

Ground water elevations will also be measured to the nearest 0.01 foot in piezometers P-1, 2 and 3 at each sampling event, reported per sampling event, and will be included in ground water elevation evaluations by the facility at least until HWD2 is certified closed.

The existing wells shall be abandoned and reported to the State in accordance with 310 IAC 16-10-2.

Borings, Soil Sampling and Documentation

Amend WPHI-GWQAP to Include:

Paragraph 1, pgs. 14-15, changed to:

The deepest well of each new cluster (less than 10 foot centers), and each individual well or piezometer will be continuously sampled from the surface through the lacustrine sediments alleged to be an aquitard.

Should laboratory analyses of continuous samples document that no changes in textural class (by USDA textural classification), organic content and mineralogy occur, then changes in sampling for subsequent phases may be proposed to IDEM.

Paragraph 3, pgs. 15-16.

Change "(minimally undisturbed)" to "(minimally disturbed)" if this is a typographical error, otherwise cite the reference.

Paragraph 8, pg. 17.

Describe what type and how decontamination facilities (e.g. pad construction and removal) will be incorporated.

Describe how decontamination effluent will be disposed of.

Basic Soil Boring Information pg. 17.

Amend WPHI-GWQAP to include:

Narrative describing rationale for location of borehole(s). (May be included as part of a hydrogeologic report for Phase A instead of on each boring log)

Soils Descriptions/Characteristics (etc.)

Amend WPHI-GWQAP to include:

Soil texture (field estimates of matrix sand, silt and clay percentages, percentage of gravel, then textural class as one of 12 USDA textural divisions, followed by USCS equivalents.

Development of soil zones (and vertical extent) and/or weathered zones (if encountered), including illuviated and/or eluviated zones in the slag.

Field vertical section logs (or report quality edited versions thereof) with a maximum of one-foot depth intervals.

Record of fractures (possible in cohesive sediments) as to: how they were identified (e.g. weathering rinds, coatings); orientation(s) (dip angles and bearings of fracture plane(s)); dimensions (width and length) and elevations.

Soil horizon, if applicable.

Soil structure, if applicable.

Monitoring Well Materials, Installation and Documentation
Amend WPHI-GWQAP to include:

The full thickness and extent of the confining (low permeability) layers beneath the site will be determined at all boring locations.

It will be determined whether the sand is hydraulically connected to the limestone. If so, the limestone must be monitored with the Series B monitoring well clusters. The location and depth of these clusters will be determined through consultation with the OSHWM, based on the following data:

The bedrock shall be sampled by continuous coring. Cores will be examined by a qualified geologist. The descriptions will include, but not be limited to, the following:

* General boring information, as per the Unconsolidated Deposit Descriptive Requirements

* Depth of cored interval with respect to mean sea level and percent recovery

* Rock type (e.g. Folk Classification for Carbonates) including mineralogy

* Lithologic description; roundness, degree of sorting, and grain-size for clastics

* Color, from a standard color chart (e.g. Munsell), including staining and location of staining

* Reaction (effervescence) to dilute (10%) HCl

* Sedimentary structures: bedding; cross-stratification; deformation; bedding surface structures; fossils and or bioturbation; include thickness of bedding, boundaries or contacts

* Description of primary and secondary porosity features including: pore types; degree of cementation; extent of solutioning; orientation and spacing of bedding planes and laminations; orientation, spacing and aperture of fractures and fracture intersections

* Drilling time per foot of core, at constant pressure, and constant rpm

Coring will continue until drilling time (per foot of core) is high enough, or water loss is low enough through a continuous ten foot interval of a high density, low permeability unit which is both unfractured and laterally continuous (present and correlatable by comparison to all other cores) and is capable of isolating flow from deeper aquifers. Aquifer testing to characterize the flow mechanisms (e.g. equivalent porosity, discrete fracture, dual porosity) will be initiated in the bedrock aquifer. On the successful completion of the pumping test(s), intervals to be screened and monitored in the bedrock aquifer by the series B clusters will be submitted to the State for evaluation with pumping test data and core descriptions.

Paragraph 1, pgs. 18-19., replaced by:

Clustered wells are to replace the entire existing ground water monitoring system. Series A clusters will consist of shallow and deep wells. Series B clusters will be required for monitoring of the bedrock if the alleged aquitard of lacutrine sediments is shown to be discontinuous.

Series A shallow wells are defined as wells with screens straddling the water table, with depths less than the bottom of the slag. Screen lengths are not to exceed 10 feet.

Series A deep wells are defined as wells with screens below the slag. The screens shall be placed at the top of the lacustrine sediments not greater than ten feet in length above the lacustrine sediments, and they are not to extend into the slag.

Should continuous sampling of the subsurface indicate, through grain-size analysis, that individual hydrostratigraphic units which comprise discrete flow zones exist then these discrete flow zones must be individually screened and monitored also. The screen lengths must be such that the screens are isolated from other flow zones.

Figures 2 and 3 (pgs. 19 and 20, WPHI-GWQAP) will be modified accordingly.

Paragraph 12, pg. 24, will be amended to include:

Protective steel casing reference elevation (mean sea level-determined by a licensed surveyor) measuring points will be clearly and permanently marked on the casing, on each well/piezometer to be used.

Item 1 will be changed to read:

Well total depth and casing length above ground will be measured to +/-0.01 foot at each sampling event.

Field and Laboratory Analysis of Soil Sample Properties

Amend WPHI-GWQAP to include:

Paragraph 1, pgs. 24-25.

The deepest well of each new cluster (less than 10 foot centers), new individual wells and new piezometers will be continuously sampled.

Laboratory analyses will be done on at least one sample per hydrostratigraphic unit. Samples will not be composited, rather, if a sampling interval (e.g. split spoon sample) intersects a contact between units, the sample will be split at the contact, to make two discrete samples.

One hydrostratigraphic unit is differentiated from another hydrostratigraphic unit on the basis of abundance of coarse fragments, USDA textural classification, consistency, cohesiveness, weathering and/or soil development, Munsell color description, reaction to cold dilute HCl, fracturing, development of secondary porosity features, surface features, sedimentary features/structures, mineralogy, soil structure and horizonation. Changes in any one or more of these parameters can be indicative of a change in the hydrologic behavior of the sampled interval. Therefore further analysis of the sample is warranted.

If a hydrostratigraphic unit may cause perching of ground water then samples from immediately above, and immediately below, the unit exhibiting the potential for perching must be subjected to laboratory analyses also.

Initial textural determinations must be done using the USDA textural classification scheme, using the Modified Wentworth scale for grain-size classes. Laboratory grain-size determinations will be done on each sample to confirm field estimates, and may be subsequently reclassified using the USCS textural classification. Use of USCS standard sieve sizes is not acceptable.

Further laboratory analysis is to be done at a minimum of one sample per hydrostratigraphic unit and at intervals no greater than five feet from sample top to sample top.

The laboratory determinations of calcium carbonate equivalency shall be waived for samples that fall into the USDA textural classes of sand or loamy sand, as defined by laboratory determinations of grain-size distribution.

The laboratory determinations of cation exchange capacity shall be waived for samples that fall into the USDA textural classes of sand or loamy sand, as defined by laboratory determinations of grain-size distribution, and which have little or no organic material.

Paragraph 2, pg. 25, amend to show:

Sampling of surface fill/slag will be done continuously. Laboratory analyses of slag samples will not be addressed at this point, however the samples will be saved. Should Appendix IX results indicate assessment is necessary, then the slag samples will be subjected to laboratory analyses as described in the amendments to paragraph 1, this section. If holding times have been exceeded, new samples will be collected for analysis, continuously, near each new cluster.

Paragraph 3, pgs. 25-26, amend to show:

Sieve sizes used will be for Modified Wentworth grain-size scale. Either the pipette or hydrometer method may be used for determination of fraction of fines. The pipette method is preferred.

Sampling frequencies for cation exchange capacity and calcium carbonate equivalency as indicated in amended paragraph 1, pgs. 24-25, this section.

Previous workers (Environmental Geology of Lake and Porter Counties, Indiana, an Aid to Planning, Indiana Geological Survey Special Report 11, 1975) have determined, from borings 40, 45 and 46, the lacustrine unit superjacent to the bedrock to be a silty clay loam, or clay loam to sandy clay loam respectively, not a clay.

Include clay mineralogy for samples and how relative percentages of clay minerals present were determined.

Include visual determination of sand petrology.

Gradation curves (cumulative percent passing Modified Wentworth Scale sieve sizes) will be provided. It is not required to repeat sieving with USCS gradations to present the USCS equivalents to the Wentworth determinations. It is important to first determine textural classes using the USDA system, and then transpose the USDA classes to the USCS system. The USDA system includes detail which would be lost in a translation from the Unified system to the USDA system, thereby invalidating efforts to define hydrostratigraphic units.

Phase I shall be completed within 90 days of approval of Phase A reccommendations by IDEM.

PHASE II.

Upon the installation of an adequate ground water monitoring well system as defined by the successful completion of Phase I, actual characterization of ground water chemistry shall commence. Subsequent to the characterization of ground water chemistry, the status of each RCRA unit shall be determined. The veracity of the determinations shall be insured by use of an IDEM approved Sampling and Analysis Plan, which will have been submitted for review at the end of Phase A.

At the end of Phase II, it shall be possible to evaluate the suitability of closure or remediation of the RCRA units, in Phase III.

Ground water sampling and analysis for hazardous constituents. Replace with:

Within thirty (30) days after the new wells have stabilized, an accelerated monitoring program will be implemented for the new wells. The accelerated program shall entail collection and analysis of parameters once a month until four complete sets of background data have been obtained for each new well.

The parameters to be sampled on a monthly basis for the accelerated program are those of 329 IAC 3-20-3(b)(1-3) and (e) including the additional parameters listed in table 1, proposed by USX on page 27 of the WPHI-GWQAP, and, detection and sampling for immiscible phases.

TABLE 1. ADDITIONAL PARAMETERS

aluminum	magnesium
bicarbonate/carbonate alkalinity	potassium
boron	silica
calcium	strontium

Appendix IX scans will be done for all wells, in the first month of the accelerated background period also.

At the completion of the Appendix IX scans, a decision as to whether or not to proceed to assessment will be made. If no wells show contamination (less than detection limits for organics, below SDWA maximums for inorganics) on the basis of depth discrete comparisons, then the accelerated background determination shall continue.

If any Appendix IX parameters exceed allowable concentrations at any well for a given unit, that unit shall immediately go into assessment. Assessment on the basis of unfavorable Appendix IX parameters shall include determination of the source of contamination, extent of the source, rate and extent of contaminant migration, and concentration of contamination in ground water. For the purpose of determining the rate, extent and concentration of contamination a revised list, based upon constituents revealed to be present in the ground water by the Appendix IX scans, may be proposed for the unit(s) for subsequent sampling.

For evaluation of the impact of slag on the ground water if the Appendix IX determinations were unfavorable, samples taken of the slag shall be subjected to laboratory analyses as specified in the IDEM Unconsolidated Deposit Descriptive Requirements. If sample holding times have not been exceeded, then the slag samples may be used for subsequent chemical determinations (e.g. EP toxicity).

In the event that the slag is determined to be a source of contamination, then mapping of the slag may be useful. Mapping would be considered useful if the characteristics of slag in one area are discernable from slags found in other areas. If this is the case then plant-wide sampling and mapping of the slag at the Gary Works, will be required. This map must indicate, at a minimum, the plant property boundaries, local slag types and their boundaries, a north arrow, a scale consistent with other regional maps and a legend of the slags mapped.

For units that are not in assessment as a result of the Appendix IX scans, the determination of background shall continue. In the first month after the four month background determination period, the wells shall be resampled for the parameters specified in 329 IAC 3-20-3(b)(1-3) and (e) and the additional parameters listed in table 1. The indicator parameters will be evaluated, in a depth-discrete manner to determine the impact of the RCRA units on ground water, as per 329 IAC 3-20-4(b).

The Series A data for shallow and deep intervals will be compared on a well by well basis to determine if significant differences exist between the intervals being monitored. Series B wells will be included in both comparisons if present.

If a significant difference is detected between upgradient and downgradient wells, the wells shall be resampled as per 329 IAC 3-20-4 (c)(2) and (f).

If additional samples confirm contamination then the results must be reported to the Commissioner within 15 days of confirmation. An assessment plan must then be developed in accordance with the requirements of IAC 3-20-4(d).

After the establishment of background, and/or the determination that assessment is necessary, all recordkeeping and reporting shall be done in accordance with 329 IAC 3-20-5.

If the unit is not in assessment, and past the initial five month background determination period, sampling will be as per 329 IAC 3-20-3(d & e), and including the parameters listed in table 1.

If immiscible phases are not detected in any of the first five months of the accelerated background determination period, these parameters need only be tested for, on an annual basis afterwards.

If appropriate for the given unit (e.g. unit is not in assessment), and USX wishes to restore annual variability in indicator parameters the indicator parameters need be resampled two additional times; once in the ninth month (month 9) and once in the thirteenth month (month 13) following the initiation of the accelerated background determination. Background statistics may be recalculated substituting the fifth month (month 5) for month 2, ninth month (month 9) for month 3 and the thirteenth month (month 13) for month 4 indicator parameter results. Statistical comparison of subsequent sampling event indicator parmeters may be made to the background means and variances redetermined to include annual variability.

The impact of the slag on ground water chemistry shall be determined by statistical comparison of shallow to deep Series A well results, on an event by event basis for the background period (months one through five), for all wells. A Student's t-test shall be used, at the 0.01 level, and 0.005 level for pH. If no statistically significant differences are indicated then USX may submit an alternative monitoring plan, which ends sampling in either the shallow or deep Series A wells. The existing sampling program shall continue until the alternative plan, submitted by USX, is approved by IDEM.

If statistically significant differences are found between the shallow and deep Series A wells, then USX shall submit either a proposal to determine the extent and magnitude of the slag influences, or explain why no further study of the slag is required, either of which will be subject to IDEM approval. The proposal or explanation will be submitted with Phase II chemistry results.

Exception to the requirement of additional study of slag influences on ground water chemistry, will be partially based on the explanation of the excessive pH found in HWD5-5 during the November 1988 sampling event. A report on the cause(s) of the 12.59 pH in HWD5-5 will be included with the Phase II chemistry results. The report will, in part, assess the impact of such high pH water on the source of drinking water, Lake Michigan. Further action addressing ground water quality reflected by HWD5-5 will be subject to IDEM approval.

PHASE III.

Upon the completion of Phase II, the status of all three of the RCRA units shall be established. At this point it will be possible to properly determine suitable closure or remedial approaches for the respective units. Therefore submission of Closure-Post Closure Plans or of Corrective Action Proposals, including the excessive pH's measured at HWD5-5 during the 11/88 sampling event, within two months of the completion of Phase II is required for completion of Phase III.

SITE-SPECIFIC WORK PLANS

To be submitted upon completion of each Phase. It is recommended that USX remain in contact with IDEM as work progresses, before submission of the final report for a given phase. This allows flexibility to adapt requirements and specifications as site-specific conditions dictate, heading off rejection of work or proposals as inadequate, and ultimately allays the assessment of fines for failure to comply.

cc: Ms. Fayola Wright, U.S. EPA, Region V

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