JUL 1 3 1993

Environmental Engineers and Scientists

Workplan
Petroleum Release Investigation
Clark Oil Station # 1656
Grafton, WI

1020 Washington St.

July, 1993

Prepared For:

Clark Oil & Refining Corp.
8182 Maryland Avenue
St. Louis, MO 63105-3721

Prepared By:

BT², Inc.
3118 Watford Way
Madison, WI 53713

Environmental Engineers and Scientists

July 9, 1993

Mr. John Feeney
Wisconsin Department of Natural Resources
Southeastern District
441 North Richards St.
Milwaukee, WI 53212

SUBJECT: Workplan for Clark Oil Station # 1656

Dear Mr. Feeney:

BT [2], Inc. is submitting for your review a workplan for a soil and groundwater investigation at Clark Station # 1656 located in Grafton, Wisconsin. The investigation is being performed in response to soil contamination detected prior to an underground storage tank (UST) system upgrade. The intent of the investigation is to define the nature and extent of contamination.

If you have any questions regarding this letter, please contact me at (608) 277-2840.

Sincerely,
BT [2], Inc.,

Tom Bergamini

Tom Bergamini
Hydrogeologist

cc: Mr. Terry Miner, Clark Oil & Refining Corp.

W1_605.wp

BT [2], Inc., 3118 Watford Way, Madison, WI 53713, Ph. (608)277-2840, FAX 277-2850

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1.0 SITE LOCATION AND KEY INFORMATION

1. Site Owner:	Clark Oil & Refining Corp.
2. Site Address:	Clark Oil Station # 1656 1020 Washington St. Grafton, WI 53024 (414) 377-9941
3. Site Location **(see Figure 1)**:	NW1/4, NE1/4, Sec.24, T10N, R21E Latitude 43°19'00"N, Longitude 87°57'00"W
4. Site Contact:	Mr. Terry Miner Clark Oil & Refining Corp. 8182 Maryland Avenue St. Louis, MO 63105-3271 (314) 854-9629
5. Environmental Consultant:	BT ^{2}, Inc. 3118 Watford Way Madison, WI 53713-3251
6. Project Hydrogeologist:	Tom Bergamini (608) 277-2840
7. Purposes of Investigation:	a) Define the nature and extent (horizontal and vertical) of soil contamination in the immediate vicinity of an underground storage tank (UST) system. Determine the horizontal and vertical extent of groundwater contamination. b) Assess the alternative methods for addressing soil and groundwater contamination.

2.0 SITE BACKGROUND

2.1 Case Summary, Actions to Date

New product piping and a vapor recovery system were installed at this site by Badger Oil Equipment, Inc. in May, 1993. In order to expedite the management of any contaminated soil or groundwater encountered during construction, two soil borings were drilled and sampled with a hand auger in the locations shown in **Figure 2** on March 31, 1993. One boring (H1) between the USTs and a dispenser island contained GRO in soil at a concentration of 40.7 mg/kg, and a second boring (H2) between two of the islands contained 128 mg/kg GRO (**see Table 1**). A petroleum product release was reported to Giselle Red at the WDNR Southeastern District Headquarters.

Approval was gained for disposal of soil from this site at the Waste Management Parkview Landfill. On May 5, construction began, and soil samples were collected from the excavations in the locations shown on **Figure 2**. Soil excavation was limited to 50 cubic yards of soil which had to be removed to provide space for new petroleum equipment. No additional overexcavation was performed. Screening of soil samples with a flame-ionization detector (FID) indicated that all excavated soil was contaminated, and it was hauled to the Parkview Landfill. Two soil samples were analyzed by a laboratory for confirmation. A sample collected below the old piping contained GRO at a concentration of 13,729 mg/kg, and a sample collected near the USTs contained 13.6 mg/kg GRO (see **Table 1**). Some of the old product piping was removed on May 5, and it was moderately corroded with no holes or breaks observed. Removal of the old piping and excavation of new piping trenches was completed on May 6. Badger Oil Equipment personnel reported that the remaining piping was moderately corroded, with no holes observed.

2.2 Background Geology & Hydrogeology

Clark Station # 1656 is located in the Lake Michigan Basin, and it is underlain by approximately 50 feet of unconsolidated deposits over bedrock (Skinner and Borman, 1973). The unconsolidated deposits are derived primarily from glacial processes.

Silurian Dolomite is present at the bedrock surface below this site. This comprises the Niagara Aquifer, which is the most widely used aquifer in the area. Most wells yield at least 10 gallons per minute (gpm), and some high-capacity wells yield as much as 1200 gpm. Water moves mostly in fractures in the dolomite, so recharge to the aquifer is local and paths of groundwater movement are short (Skinner and Borman, 1973). Below the Niagara Aquifer is the Ordovician Maquoketa Formation, which consists of shale, dolomitic shale and dolomite (Mudrey and others, 1982). The Maquoketa Formation acts as an aquitard between the overlying Niagara Aquifer and the sandstone aquifer below (Skinner and Borman, 1973). The sandstone aquifer is comprised by the following bedrock units (Mudrey and others, 1982):

Ordovician Sinnipee Group (dolomite with some limestone and shale)
Ordovician Ancell Group (sandstone with minor conglomerate, shale and limestone)
Ordovician Prairie du Chien Group (dolomite with some sandstone and shale)
Cambrian sandstones of the Trempealeau, Tunnel City and Elk Mound Groups

The sandstone aquifer yields up to 1500 gpm in high-capacity wells. Most recharge of the aquifer is laterally from the west, but small quantities of water move downward through the Maquoketa shale and wells that are open to both the Niagara and sandstone aquifers in areas of heavy groundwater usage (Skinner and Borman, 1973).

The unconsolidated deposits at this site are mapped as Ozaukee Member till of the Keewaunee Formation. This till was deposited by the glacier ice of the Lake Michigan Lobe of the Laurentide Ice Sheet approximately 13,000 years ago (Clayton and others, 1991). The Ozaukee Member till is light reddish brown to light gray, hard and blocky to crumbly when dry, and very plastic when wet. The till contains abundant dolomite pebbles and cobbles, and the average composition of the matrix is 13% sand, 47% silt, and 40% clay (Mickelson and others, 1984). The soil observed in borings and excavations at this site is brown clayey silt to silt with some clay and trace sand, which fits the description of the Ozaukee Member. The glacial deposits are not a productive aquifer in this area (Skinner and Borman, 1973).

Groundwater is present below this site at a depth of approximately 15 - 20 feet. The groundwater-flow direction is reported to be southeast toward the Milwaukee River. Typical infiltration rates for the soil in this area range from 0.8 to 2.5 inches per hour (Skinner and Borman, 1973).

3.0 PROPOSED SCOPE OF WORK

3.1 Description of Investigative Work and Objectives

The investigation will be carried out in one or two phases, depending on site conditions. The initial phase will be a soil investigation to determine the horizontal and vertical extent of soil contamination and to determine the likelihood of groundwater contamination. Six soil borings will be advanced to depths of approximately 15 feet. Sampling will be either continuous or at 2.5 foot intervals.

If soil contamination extends beyond the depth or area of the initial borings, further investigation will be performed to determine the degree and extent of the contamination. During a subsequent drilling mobilization, additional soil borings and/or groundwater monitoring wells will be installed and sampled. If monitoring wells are installed, a minimum of two rounds of groundwater sampling will be performed to assess and monitor contamination.

3.2 Sampling

Soil and, if necessary groundwater samples will be collected to define the nature of overall petroleum contamination, using indicator parameters such as Gasoline Range Organics (GRO) and Diesel Range Organics (DRO), and the concentrations of specific compounds, including volatile organic compounds (VOCs) and lead (Pb).

3.2.1 Soil Sampling

Soil borings will be advanced with 2.25" or 4.25" hollow stem augers with split spoon samples collected either continuously or at 2.5-foot intervals. Either five foot long continuous samplers or split spoon samplers will be used. If used, split spoons will be driven 18" to 24", with the longer interval to be used if sample recovery is poor. Continuous samplers will be preferred. Split spoon samplers will be used if, in the judgement of the field geologist, cobbles or bedrock capable of plugging the continuous sampler are present. Each soil sample will be examined for soil type (USCS System), moisture, grain size distribution, consolidation (blow counts), color, stratigraphic features, and petroleum discoloration or odors. Soil samples will be placed into an appropriate sample container. All laboratory sample jars will immediately be placed on ice in a cooler.

Soil from all borings will be subjected to headspace analysis in the field, and one to two samples from all borings will be sent for laboratory analysis. Soil samples will be screened with a flame-ionization detector (FID) or a photoionization detector (PID) for the presence of organic vapors in a headspace established above the sample. The screening technique used involves placing a uniform quantity of soil into a polyethylene bag, sealing it tightly, labeling the bag, and measuring organic vapor concentrations in the headspace after the sample has been allowed to equilibrate. This headspace technique is equivalent to the headspace technique presented in Appendix B of Chapter ILHR 10 Flammable and Combustible Liquids. Advantages of using polyethylene bags include:

1) Using a polyethylene bag, soils can be readily crumbled by kneading once the bag is sealed;

2) Polyethylene bags collapse when headspace samples are collected, thus preventing introduction of fresh air into the headspace;

3) Polyethylene bag seals are superior to aluminum foil seals used on glass jars.

3.2.2 Groundwater Monitoring Well Installation, Development, and Sampling

Any wells installed in subsequent drilling mobilizations will be installed and developed in accordance with NR 141. Monitoring wells will be purged and sampled in accordance with DNR guidelines. Wells will be purged immediately prior to sampling using a PVC, Teflon, or stainless steel bailer attached to a dedicated sampling rope, or a Grundfos submersible pump. The volume of water removed from each well will be measured so that if the well cannot be purged dry, three to five volumes of water will be removed. After well purging has been completed, samples will be collected using a bailer with a bottom unloading device. Groundwater samples will be placed into the following containers:

1. Four 40-ml vials with teflon lined caps (two each for water samples for GRO, GRO/PVOC, and VOC's)

2. Two 1-liter jars for DRO analysis

3. One 250-ml jar for total lead analysis (filtered and acidified)

4. Polyethylene bags (headspace analysis)

3.3 Laboratory Analysis and Methods

One or two soil samples from each boring will be sent to a certified laboratory for analysis. The number selected for laboratory analysis will be based on water table depths, stratigraphic boundaries, and FID/PID headspace measurements.

Sample analysis will be for the following parameters, as appropriate:

SAMPLE	METHOD
SOIL:	
Gasoline Range Organics (GRO)	WDNR Modified GRO Method
Diesel Range Organics (DRO)	WDNR Modified DRO Method
Petroleum Volatile Organic Compounds (PVOCs)	EPA Method 5030/8020
Lead (Pb)	EPA Method 3050/7420 or equivalent
GROUNDWATER:	
Gasoline Range Organics (GRO)	WDNR Modified GRO Method
Diesel Range Organics (DRO)	WDNR Modified DRO Method
Volatile Organic Compounds (VOC)[1]	EPA Method 5030/8021
Petroleum Volatile Organic Compounds (PVOCs)[1]	EPA Method 5030/8020
Lead (Pb)	EPA Method 3020/7421 or equivalent

[1] Groundwater will be analyzed for VOCs in the first round of sampling. If no non-petroleum compounds are detected, groundwater will be sampled for PVOCs, rather than VOCs, in any subsequent sampling rounds.

3.4 Field Instruments

A Sensidyne flame-ionization detector (FID) calibrated with methane gas or a Thermo Environmental Instruments photo-ionization detector (PID) calibrated with isobutylene will be used to record headspace concentrations in the field.

3.5 Health and Safety Plan

Refer to **Appendix A**

4.0 WASTE MANAGEMENT PLAN

4.1 Soil

Borehole cuttings will be subjected to FID or PID headspace analysis in the field. Contaminated soil which exhibits readings greater than 10 ppm will be covered with plastic and stockpiled or placed into 55 gallon drums and stored on site. Following soil sample analysis, the stored soil will be properly treated or disposed in an approved manner. Soil which has FID/PID readings of less than 10 ppm will be thin spread on site or blended into landscaped areas.

4.2 Groundwater

Potentially contaminated groundwater will be generated during the development, purging, and sampling of monitoring wells, if installed. All development and purge water will be collected in 55 gallon drums. The water will be subjected to headspace analysis in the field. Water that exhibits field instrument readings greater than 10 ppm will be treated on-site with granular activated carbon, disposed of at an approved publicly owned treatment plant or handled through other appropriate and approved means. Water that exhibits field instrument readings less than 10 ppm as methane will be released on site to landscaped areas.

4.3 Free Product

Any free product collected from groundwater wells will be collected in 55 gallon or smaller drums which are approved for storage of flammable liquids. The free product will be reused for engine fuel if this can occur without treatment. Otherwise, the free product will be properly treated or disposed of as hazardous waste.

5.0 QUALITY ASSURANCE PROJECT PLAN

The Quality Assurance Project Plan (QAPP) describes the level of quality control effort which will be applied to the field sampling program.

5.1 Data Quality Objectives

The data quality objectives identified for this project are as follows:

1. Collect soil samples for the purpose of qualitative interpretation of geologic conditions, such as grain size and stratigraphy.

2. Collect headspace samples for semi-quantitative analysis of soil contamination.

3. Collect soil and groundwater samples for quantitative interpretation of the degree and extent of contamination.

5.2 Level of Quality Control - Field Sampling Program

The quality of data from the field sampling program will be evaluated through the collection and analysis of quality control samples. Quality control for samples will consist of the following (for every 10 samples collected):

1. Soil:	One Duplicate sample (analyzed for GRO/PVOC) One Methanal Trip Blank
2. Groundwater*:	One Trip Blank One Field Blank One Duplicate

* All groundwater blanks and duplicates will be analyzed for GRO and VOCs or PVOCs

5.3 Decontamination

All soil sampling tools will be washed in an Alconox solution followed by a clean water rinse. Tap water from a clean supply well or distilled water will be used for the final rinse. Sampling equipment will be air or towel dried between sampling locations. All groundwater sampling equipment will be decontaminated by washing in an alconox solution followed by a clean water rinse. Pumps and bailers will, if possible, be decontaminated in locations removed from possible sources of cross contamination. Dedicated PVC sampling bailers will be used at each monitoring well to help eliminate cross contamination.

5.4 Laboratory Analysis

Laboratory analysis will be performed by a laboratory certified by the Wisconsin Department of Natural Resources to analyze the target analyte(s). The level of quality control effort employed by the lab will be commensurate with the standards established by the WDNR or EPA method used (for example, EPA Method 8021).

5.5 Documentation

Data documentation procedures are specified below. These procedures are designed to ensure that data is collected and processed in a manner that ensures its integrity and quality.

5.5.1 Field Observations and Measurements

Field observations and measurements will be recorded on field record forms. Information concerning field activities and conditions will be recorded directly and legibly in the field logbooks in ink. If an entry must be changed, the change will not obscure the original entry. The logbook will document the date, weather conditions, site activities, and personnel on site including visitors. Field data records will be organized into standard formats.

5.5.2 Sample Identification and Chain of Custody

Soil samples will be identified by the sampling location and sample number. For example, soil sample number 2 from soil boring number 3 will be designated as B3S2. Field samples will be identified by labels. Sample labels will also list the date, sample collection time, and BT^2, Inc. project number. Groundwater samples will be identified by the monitoring well name (e.g., MW2). Chain of Custody forms will be prepared. The Chain of Custody record will include sample number, sampling procedures, analysis required, the signature of the sampler, type of sample (grab or composite), number of containers, and signature blocks for all who handle the sample (with the exception of shipping personnel). The original Chain of Custody form or a copy will be maintained for the project files.

5.6 Shipping and Handling

Samples will be hand-packed into a cooler with ice and delivered by courier to the environmental laboratory.

6.0 REFERENCES

Clayton, L; J.W. Attig; D.M. Mickelson, and M.D. Johnson, 1991. Glaciation of Wisconsin. Wisconsin Geological and Natural History Survey, Educational Series 36.

Mickelson, D.M.; L. Clayton; R.W. Baker; W.N. Mode; and A.F. Schneider, 1984. Pleistocene Stratigraphic Units of Wisconsin. Wisconsin Geological and Natural History Survey, Miscellaneous Paper 84-1.

Mudrey, M.G.; B.A. Brown; and J.K. Greenberg, 1982. Bedrock Geologic Map of Wisconsin. Wisconsin Geological and Natural History Survey.

Skinner, E.L. and R.G. Borman, 1973. Water Resources of Wisconsin: Lake Michigan Basin. United States Geological Survey, Hydrologic Investigations Atlas HA-432.

Tables

Table 1: Summary of Soil Analytical Results

Clark Oil Station #1656
Table 1

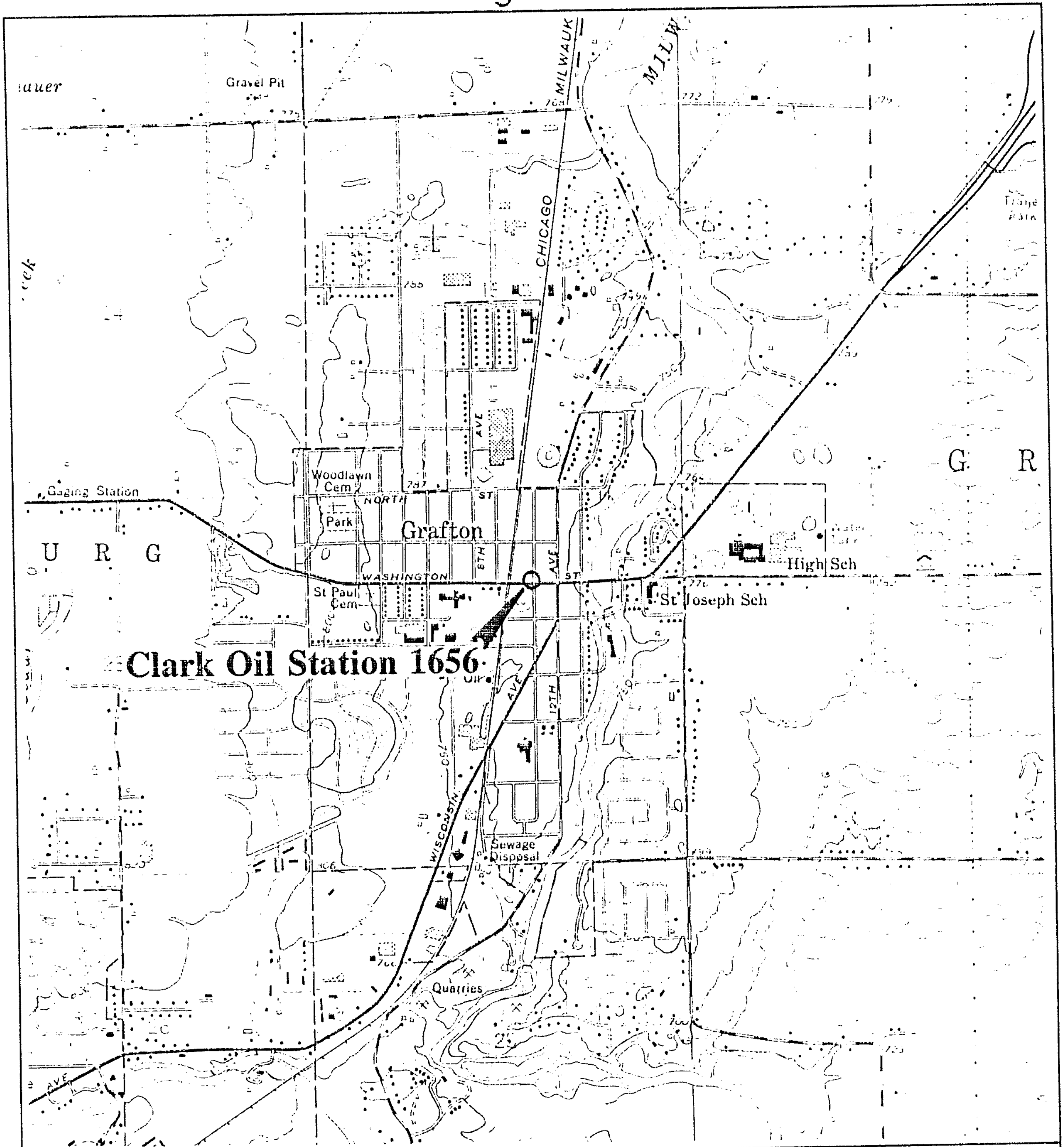
Summary of Soil Analytical Results
(Results are in mg/kg)

SAMPLE	DATE	PH	Flash Pt	GRO	BENZENE	TOLUENE	E	XYLENES	MTBE	1,2,4-TMB	1,3,5-TMB	Lead
H1	3/31/93	8.26	none to 200°	40.7	0.21	NA	NA	NA	NA	NA	NA	58.5
H2	3/31/93	9.88	none to 200°	178	0.43	NA	NA	NA	NA	NA	NA	7.32
S4 old piping	5/5/93	NA	NA	13,729	70	321	137	891	<7.3	570	248	691
S6 SE Corner UST exc.	5/5/93	NA	NA	13.6	<0.05	<0.05	<0.05	1.3	<0.05	1.6	0.6	37.4

ABBREVIATIONS
GRO = Gasoline Range Organics
TMB = Trimethylbenzene
PID = Photoionization Detector
E= Ethylbenzene
MTBE = Methyl tert-butyl ether
NA = Not Analyzed

Figures

Figure 1



Clark Oil Station 1656 — Site Location Map

MN
GN
0°39'
11 MILS
0°

UTM GRID AND 1976 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

WISCONSIN
QUADRANGLE LOCATION

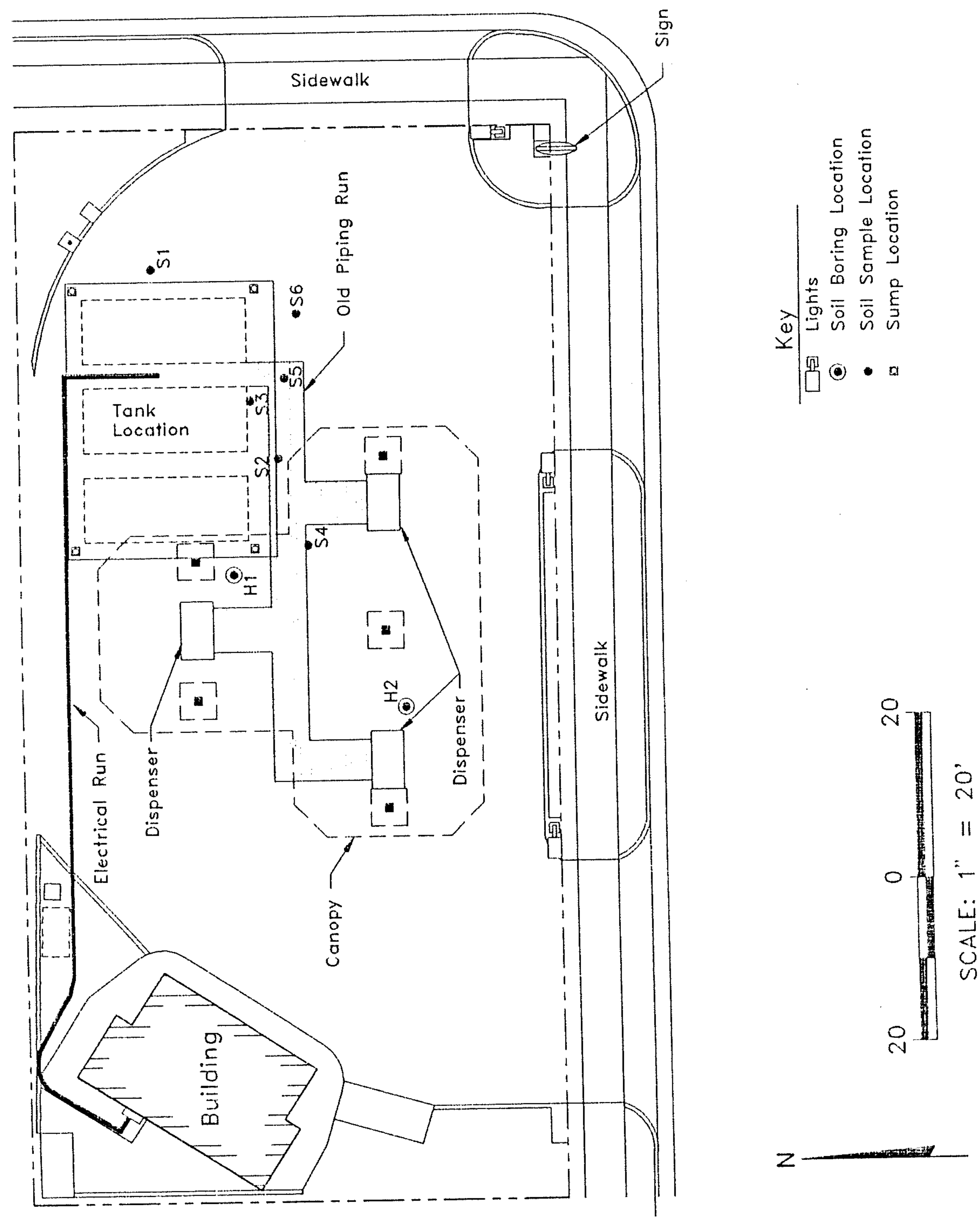
CEDARBURG, WIS.
SW/4 PORT WASHINGTON 15' QUADRANGLE
N4315—W8752.5/7.5

1959
PHOTOREVISED 1971 AND 1976
AMS 3470 IV SW—SERIES V861

Scale: 1" = 2000'	fig1.dwg
Project No. 605	6/30/93

BT², Inc.

Figure 2



Clark Oil Station 1656 – Site Map

Project No. 605	site–map.dwg	BT^2, Inc.
Drawn By: KP	6/30/93	

Clark Oil Station 1656 - Proposed Soil Boring Location Map

Project No. 605

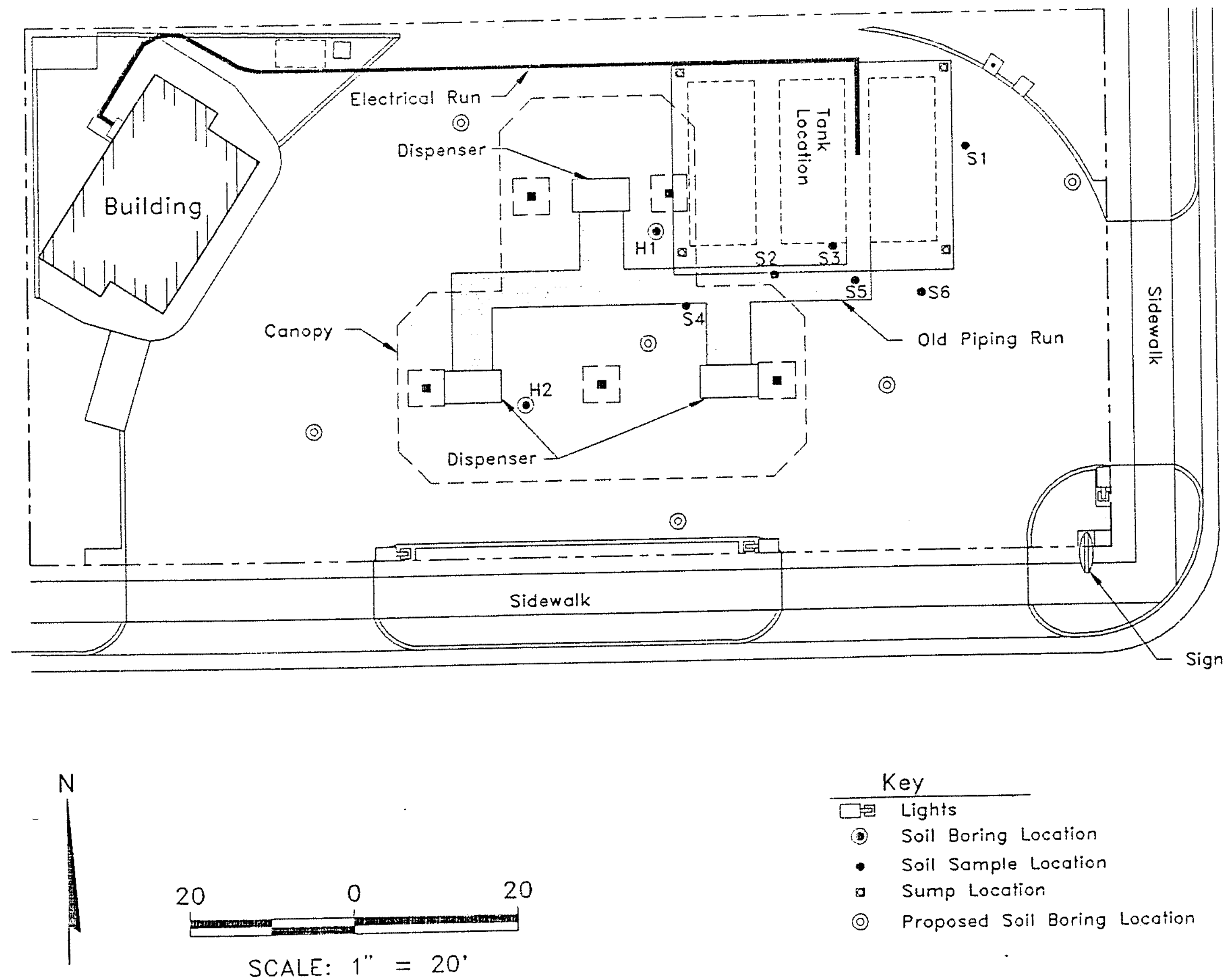
site-map.dwg

Drawn By: KP

6/30/93

BT^2, Inc.

Figure 3



Appendix A

BT ^{2}, Inc. Health & Safety Form

BT ^{2}, Inc. Health and Safety Form

Site Name:	Clark Station # 1286
Field Activities Date:	July, 1993
BT ^{2}, Inc. Safety Manager:	Tom Bergamini, (608) 277-2840
Client Contact:	Mr. Terry Miner, (314) 854-9629
Site Address:	Clark Station # 1656 1020 Washington St. Grafton, WI 53024
Site Use:	Service Station
Project Description:	Contaminated Soil Investigation
Utilities Located by:	Digger's Hotline and Owner
Suspected Subsurface Contaminant:	Petroleum Products
Safety Equipment Requirements:	Borehole samples will be screened with a flame ionization detector or a photoionization detector. Level D protection is anticipated.
Nearest Hospital:	St. Mary's Hospital 743 N. Montgomery St. Port Washington, WI 53074
Directions from Site to Hospital:	From site turn left onto Washington St (Hwy 60). Take Hwy 60 to I-43 interchange. Take on-ramp to I-43 north. Proceed on I-43 north to Hwy 33 interchange. Exit on Hwy 33 (Saukville/Port Washington exit) and proceed east toward Port Washington. Follow Hwy 33 through Port Washington until intersection with Franklin St. Turn left on Franklin St. & follow signs to hospital.

Important Phone Numbers:

Emergency (Police, Fire, Ambulance)	911
Police	(414) 377-2220
Fire Department	(414) 377-3131
St. Mary's Hospital	(414) 284-5511
BT ^{2}, Inc. Safety Officer (Tom Bergamini)	(608) 277-2840
Client Contact (Mr. Terry Miner)	(314) 854-9629