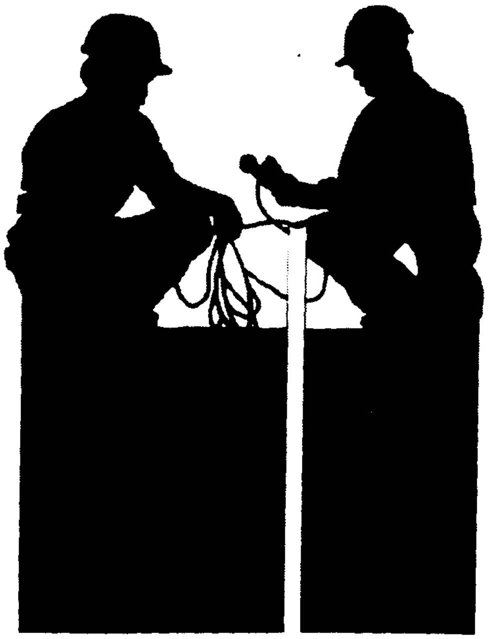
Remedial Investigation/ Feasibility Study
WORK PLAN

GENERAL INSTRUMENT CORPORATION
Hicksville, New York

October 1987



BCM

Engineers, Planners and Scientists

REPORT

GENERAL
INSTRUMENT

Government Systems Division
General Instrument Corporation
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November 9, 1987

Josh, ~~[illegible]~~
Please
review for
public participation
Thanks
Bob

Mr. R. Becherer
N.Y. State Dept. of Environmental Conservation
Building #40
State University of New York
Stoney Brook, N.Y. 11794

Subject: Letter of Transmittal

Dear Mr. Becherer:

Ref: Order on Consent 1-1528

Enclosed please find a copy of the Remedial Investigation and Feasibility Study Work Plan for your approval.

Very truly yours,

Charles Gorsch
Plant Engineer

/ct
Enclosures

NOV 12 1987

REMEDIAL INVESTIGATION/FEASIBILITY STUDY
REMEDIAL INVESTIGATION WORK PLAN

FOR

GENERAL INSTRUMENT CORPORATION
HICKSVILLE, NEW YORK

OCTOBER 1987

2 1987

BCM PROJECT NO. 00-5268-12

PREPARED BY

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FOREWORD

This document is intended to address administrative and planning requirements of the New York State Department of Environmental Conservation (NYDEC) in accordance with U.S. Environmental Protection Agency (EPA) guidelines in order to conduct a Remedial Investigation/Feasibility Study (RI/FS) at General Instrument Corporation's (GI) Facility in Hicksville, New York. GI is conducting the RI/FS as required in a draft Administrative Consent Order (ACO) from the NYDEC dated December 1986.

The RI/FS will be consistent with requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Superfund Amendments and Reauthorization Act (SARA).

This work plan is intended as a planning tool. As new data are developed or field conditions dictate, changes may be made.

1.0 INTRODUCTION

1.1 GENERAL

The General Instrument Corporation (GI) facility is located on approximately 11.5 acres on the western edge of the Town of Hicksville in Nassau County, New York. Hicksville is located in the west-central portion of Long Island (Figure 1-1). The GI Site consists of a research and design laboratory, and manufacturing operations that produce semiconductors, radar systems, and electronic equipment.

In 1980 an underground waste solvent storage tank was found to be leaking by GI. The underground tank and adjacent soils were removed by GI in December 1980, and two groundwater monitoring wells (W-1-75 and W-2-120) were installed by GI in 1981 to monitor downgradient groundwater quality. Analysis of groundwater samples obtained in December 1981 and May 1982 from the two monitoring wells indicated the presence of elevated concentrations of priority pollutant volatile organic compounds (VOCs). A groundwater collection and treatment system was installed in June 1982. The treatment system, which was experimental, was found to be ineffective and was discontinued in 1985. Four additional groundwater monitoring wells, two upgradient and two further downgradient, were installed in May 1986 by GI. Installation of the wells and analyses of groundwater samples were conducted by BCM Eastern Inc. (BCM) for GI.

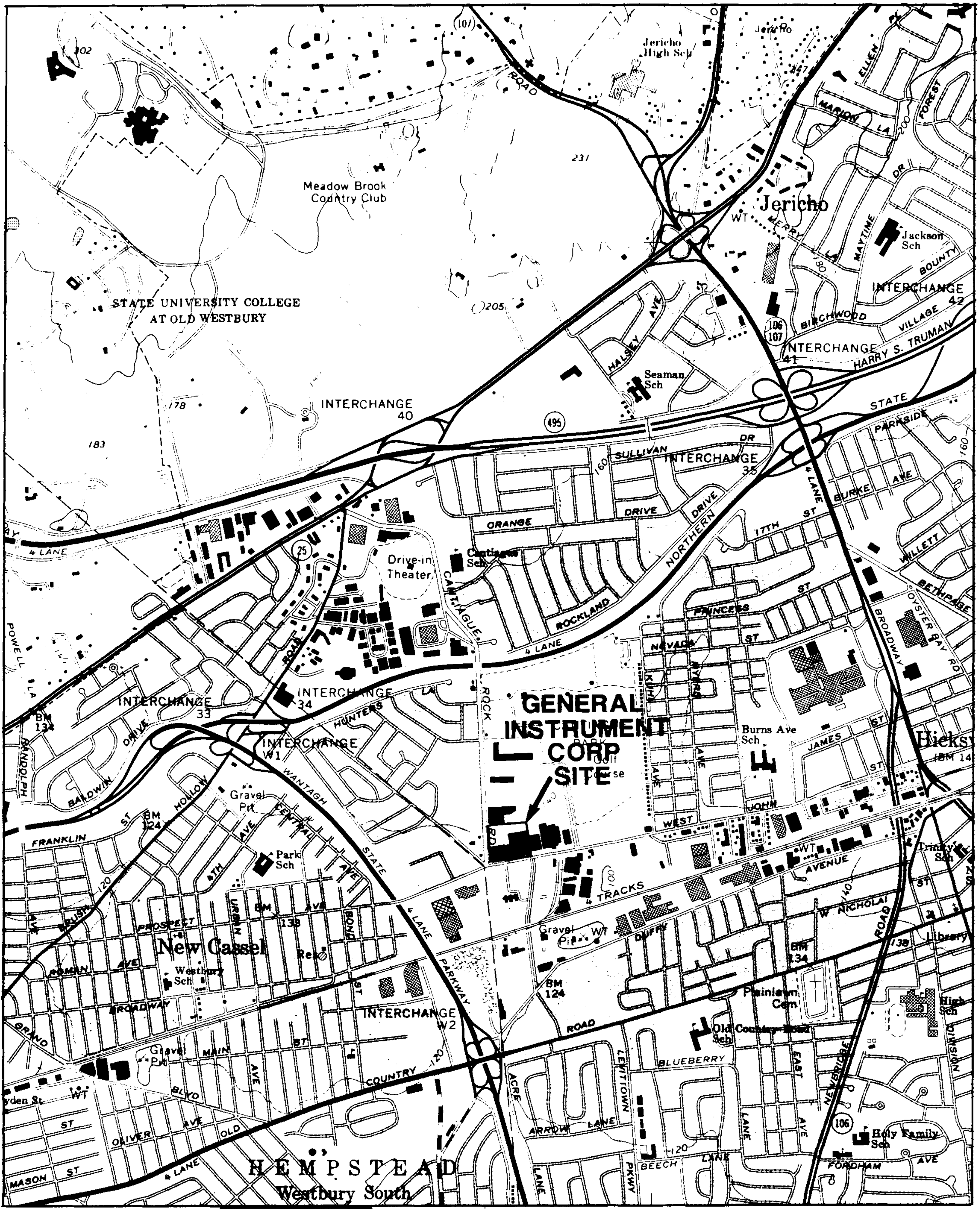
Currently, GI has retained BCM to conduct a Remedial Investigation/Feasibility Study (RI/FS) at the Hicksville site. This work plan presents an overall approach to the RI/FS and a detailed scope of work for the planned Remedial Investigation (RI). The work plan has been developed based on a review of previous data.

The general purpose of the RI is to fully assess the extent and environmental significance of contamination resulting from leakages from the waste solvent storage tank. The investigation will consider past and present remedial activities. The study will also include an Endangerment Assessment (EA), which will evaluate public health risk, if any, associated with potential contaminants and their migration.

The Feasibility Study (FS) will assess, in detail, the information and data collected during the RI and will present recommended approaches to remediation and management of any existing or potential environmental impacts.

1.2 OBJECTIVES OF THE RI/FS

The RI will have the following overall objectives based on EPA guidance and requirements:



SOURCE: U.S.G.S. Topographic Map; Quadrangle: Hicksville, New York (1979).

BCM Project No. 00-5268-12

0 2000 Feet

North

GENERAL INSTRUMENT CORPORATION
Hicksville, New York

Figure 1-1

Site Location Map

- Identify and characterize the extent of contamination resulting from leakage of the former underground waste solvent storage tank.
- Identify population and other environmental components at risk.
- Assess exposure routes to plant, animal, and human populations.
- Obtain data for the development and evaluation of remedial action alternatives.

The FS objectives are as follows:

- Identify general response activities.
- Identify and screen technologies and develop remedial alternatives.
- Screen and evaluate remedial alternatives based on public health, environmental, cost, and other factors.
- Prepare a management plan containing the selected set of site-specific remediation alternatives.

Specific objectives for each RI field task are discussed in Section 4.0 of this document.

1.3 SCOPE OF WORK

To accomplish the objectives of the RI/FS, a scope of work has been prepared for the project that addresses principal tasks to be conducted. The tasks have been divided into three parts. Part 1 consists of project scope and planning. Part 2 covers the field investigations and related activities. Part 3 is the FS for remedial action. The principal tasks to be conducted are as follows.

1.3.1 Part 1 - Project Scope and Planning

- Review records and data obtained during previous GI site investigation work.
- Visit the GI site as needed to support background documentation and work plan development.
- Prepare the RI work plan and submit the plan to the NYDEC for review and approval.

- Complete project plans and all other pre-field investigative planning.

1.3.2 Part 2 - Field Investigation

- Continue records review.
- Site features investigation - obtain information on existing land use and demographics for use in the EA.
- Site topographic mapping - prepare photogrammetric mapping of the site to be used in RI data collection and assessment and FS alternatives evaluation.
- Soil sampling and borings - delineate extent of impact, collect data for use in the EA, and obtain information for remedial management planning.
- Hydrogeologic investigation - characterize existence and extent of groundwater contamination from the former waste solvent storage tank, and compile data on groundwater behavior at the site.
- Water resources investigation - identify and characterize groundwater and surface water supply sources potentially influenced by contamination at the site.
- Biological investigation - assess impact, if any, of contamination on the biological community.
- Fate and transport - evaluate potential environmental fate and mode of transportation associated with contamination.
- Endangerment assessment - evaluate public health and environmental risk, if any, associated with contaminant migration and exposure routes.
- If necessary, conduct bench and pilot scale studies on wastes, soils, and water for treatability and compatibility with construction materials.

1.3.3 Part 3 - Feasibility Study

- Prepare an FS Work Plan.
- Describe proposed responses establishing FS purpose and objectives.

- List and preliminarily screen remedial technologies based on site conditions, contaminant characteristics, and technology requirements.

- Develop remedial alternatives based on overall objectives as well as site-specific objectives.

- Screen applicable remedial alternatives based on environmental protection, environmental effects, technical feasibility, cost, and consistency with other alternatives.

- Evaluate remedial alternatives based on technical, environmental, public health, institutional, and cost factors and on consistency with other alternatives.

- Prepare the remedial management plan and the FS report.

2.0 DESCRIPTION OF CURRENT SITUATION

2.1 GENERAL

The description of the current situation has been developed using data, information, and results provided by GI and contained in previous investigations conducted for GI by BCM. Additional information was obtained from available government references and aerial photographs.

2.2 SITE LOCATION AND ENVIRONMENTAL SETTING

2.2.1 Geology

The GI facility lies in the Coastal Plain physiographic province and is underlain primarily by Upper Cretaceous and Quarternary (Upper Pleistocene) age sediments. These sediments dip to the southeast, and rest uncomformably upon Pre-Cambrian igneous and metamorphic bedrock (see Figure 2-1).

Pleistocene age sediments form the surficial deposits in the region. These deposits consist of till and outwash plain deposits resulting from advances of ice during the Wisconsin Glaciation. Sediments consist of poorly stratified sand and gravel, some clayey matrices, and some boulders. The sand and gravel beds consist mainly of quartz with igneous and metamorphic rock fragments (Isbister, 1966).

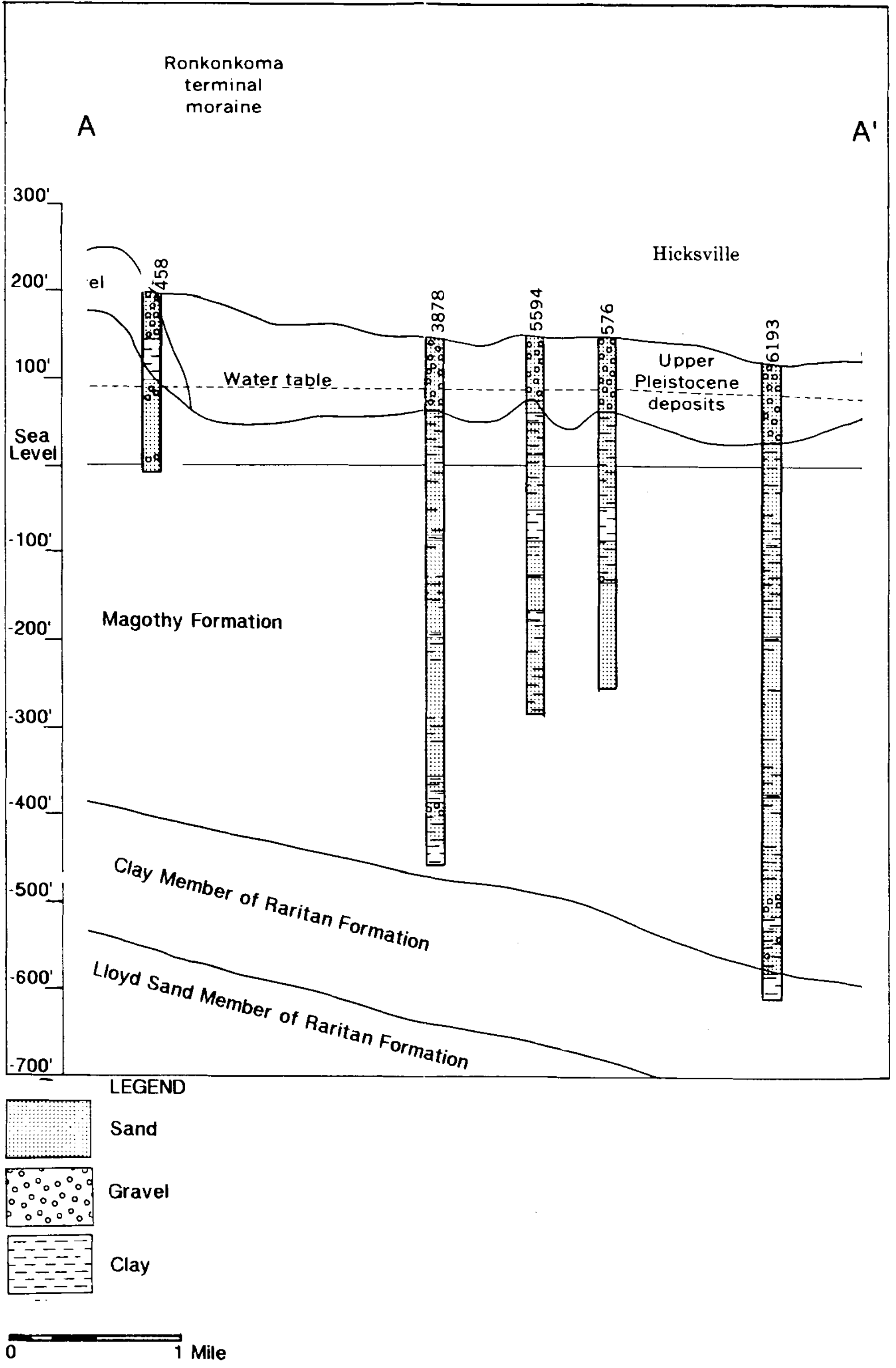
The sediments immediately underlying the GI facility are Upper Pleistocene glacial outwash-plain deposits of the Harbor Hill drift geologic unit. The deposits are well sorted and stratified sands and gravels (Isbister, 1966). According to BCM well logs, a discontinuous orange-brown silty clay layer occurs near the southeastern portion of the facility approximately 50 feet below the ground surface.

Fine to medium Cretaceous age sands of the Magothy Formation underly the glacial sediments, approximately 80 feet below ground surface. These sediments are white, pink, gray, and yellow. Sediments of the Magothy Formation are predominantly sands, but contain some gravel, heavy minerals, and clay; zones of gravel are common near the base of the formation. Lignite, pyrite, and cemented concretionary layers of quartz and iron oxide are also common (Isbister, 1966).

Line of Geologic Cross Section

SOURCE: USGS QUADRANGLE: Hicksville, N.Y. (1979).

Geologic Cross Section



SOURCE: ISBISTER: Geology, Hydrology, Northeastern Nassau County, Long Island, N.Y. -Geologic Survey Water -Supply Paper 1875.

GENERAL INSTRUMENT CORPORATION
Hicksville, New York

Figure 2-1

Geologic Cross Section and Line of Cross Section

The Magothy Formation rests uncomformably on top of the Raritan Formation at depths ranging from 100 to 700 feet in Eastern Nassau County. The Raritan Formation consists of the Lloyd Sand Member and a clay member. The Lloyd Sand consists of discontinuous layers of sand, gravel, sandy clay, silt, and clay. The sand and gravel beds consist mainly of yellow, white, and gray quartz. The clay member of the Raritan Formation overlies the Lloyd sand, dipping approximately 60 feet per mile (ft/mi) to the southwest (Isbister, 1966). The clay layer occurs approximately 500 feet below the GI Site and is roughly 150 feet thick.

Bedrock beneath the site is a biotite schist with a weathered zone up to 100 feet thick. The bedrock slopes to the southeast and occurs about 900 feet below sea level beneath the GI facility.

Data from the four groundwater monitoring wells installed during the May 1986 groundwater quality investigation provide additional stratigraphic details. Well logs from the 1986 investigation (Section 2.3) are included in Appendix A.

2.2.2 Hydrogeology

Groundwater beneath the GI facility occurs approximately 60 to 70 feet below the ground surface. Monitoring wells W-1-75, W-3-72, W-5-78, and W-6-79 are screened in the glacial outwash sediments. Monitoring wells W-2-120 and W-3-112 are screened in the upper Magothy Formation.

Two aquifers underlie Nassau County. The upper and principal aquifer is composed of unconsolidated glacial outwash sediments and sediments of the Magothy Formation. The clay member of the Raritan Formation provides the lower boundary for this aquifer. The lower aquifer occurs beneath the Raritan Formation clay member and on top of the underlying igneous and metamorphic bedrock. This aquifer consists primarily of unconsolidated sediments of the lower Raritan Formation.

In general, productive water-bearing zones in the Magothy Formation consist of discontinuous sand and gravel lenses, which occur at various depths. The two most productive zones of the upper aquifer consist of the saturated portion of the glacial deposits and the basal 100 feet to 150 feet of the Magothy Formation (Isbister, 1966). Groundwater in this aquifer occurs under unconfined and confined (artesian) conditions. The degree of confinement increases with depth resulting from the combined influence of discontinuous layers of silt and clay in the Magothy Formation (Isbister, 1966).

The principal aquifer is recharged by precipitation. Although infiltration rates are relatively high in the area of the outwash plain, recharging water may not reach the water table for months. The lengthy recharge time is due to discontinuous layers of clay, silt, and fine sand, which act to decrease vertical permeability.

Hydraulic interconnection between the glacial outwash and the Upper Magothy Formation has been established (Lusczynski, 1949). Potential confining strata or clay lenses exist in the immediate vicinity of the GI facility. Reported permeabilities in the Magothy Formation range from 200 to 1,100 gallons per day per square foot (gpd/sq. ft) but may be as high as 2,000 gpd/sq ft. On a regional scale, the hydraulic gradient is about 10 feet/mile (ft/mi) to the south (Isbister, 1966). Preliminary head measurements at the GI Site indicate a shallow gradient ranging from 0.00064 ft/ft (3.4 ft/mi) to 0.0014 ft/ft (7.4 ft/mi) to the south.

2.2.3 Soils

The U.S. Department of Agriculture-Soil Conservation Service classifies the soils at the site as Urban Land. Most of the plant property is covered by buildings and pavement. There are two small grassed areas located along the perimeter of the property adjacent to West John Street. Much of the surrounding area is also classified as Urban Land or sandy fill. The dominant naturally occurring soil is the Hempstead Soil Series. This series consists of deep, well drained soils formed in a silty matrix overlying sand and gravel. These soils typically have a dark brown to almost black silty loam surface layer, 10 inches thick, underlain by a subsoil of brown to yellow, fine-grained moderately heavy loam and clayey loam, which merges with the underlying outwash deposits (Isbister, 1966).

2.2.4 Well Inventory

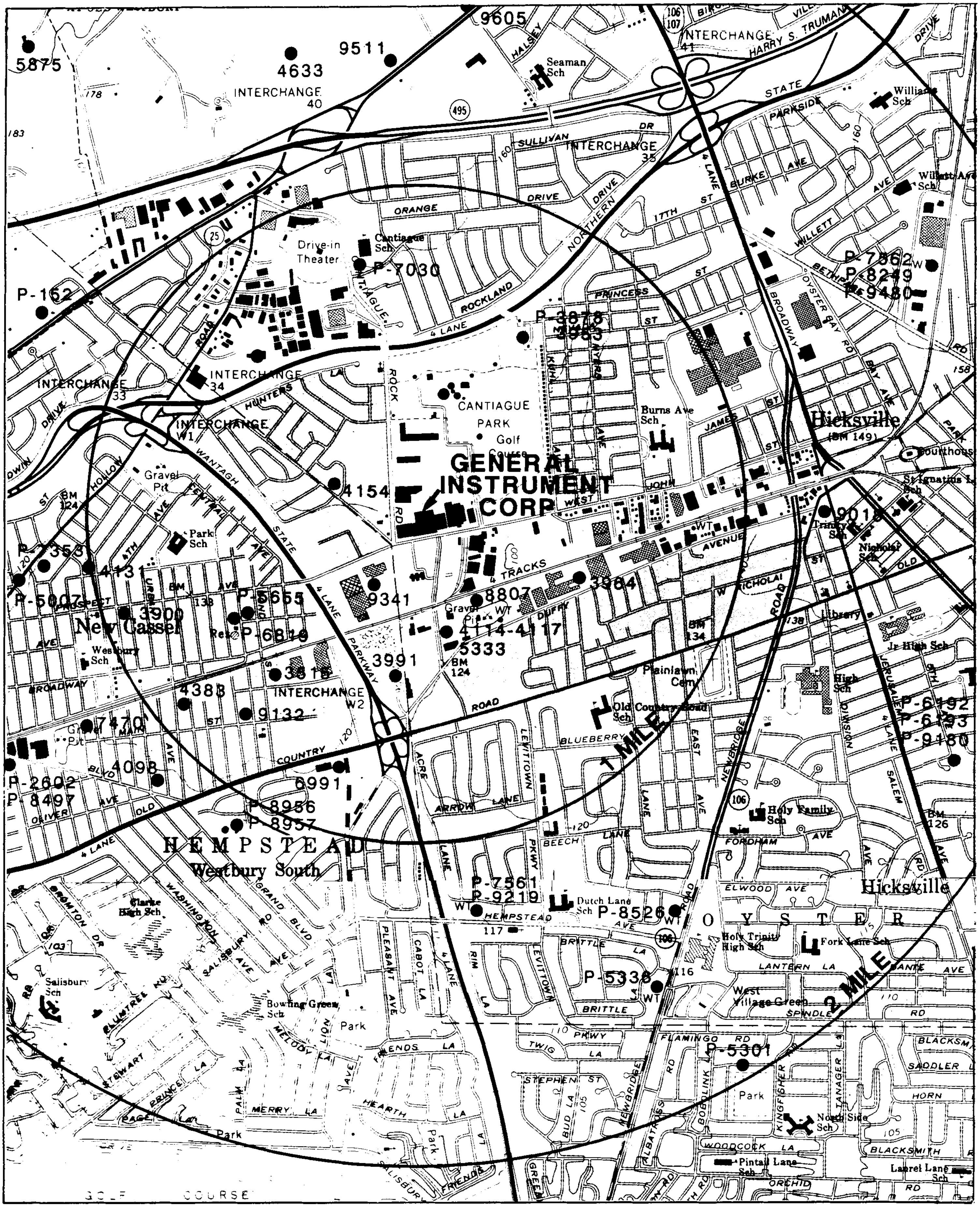
Figure 2-2 identifies wells, reportedly currently in use, which are located within a 2-mile radius of the GI Site. Table 2-1 identifies public supply wells within a 1- and 2-mile radius of the GI facility. Where the information was available, owner, well depth, depth to water, the aquifer in which the well is screened, and the screened interval are supplied. Table 2-2 lists private wells within a 1- and 2-mile radius, and where available the same information as described above is provided.

2.2.5 Surface Water

The GI Site is situated in a flat glacial outwash plain, which is composed of highly permeable sand and gravel. South-flowing streams in Nassau County disappear soon after reaching this outwash plain; water rapidly infiltrates into the sand and gravel. As a result, there are no streams or surface water bodies within a 3-mile radius of the GI Site. The closest streams are northwest and east of the study area, 3 miles and 6 miles away, respectively.

2.2.6 Aerial Photography

The following aerial photographs were obtained to assist in a review of historical land use at the GI Site and in the surrounding region:



SOURCE: U.S.G.S. Quadrangles: Freeport, New York (1979); Hicksville, New York (1979).

BCM Project No. 00-5286-12

0 2000 Feet

North

LEGEND

● Well

GENERAL INSTRUMENT CORPORATION
Hicksville, New York

Figure 2-2

Local Well Inventory

TABLE 2-1

PUBLIC SUPPLY WELLS WITHIN A 1- AND 2-MILE RADIUS
OF THE GENERAL INSTRUMENT SITE

GENERAL INSTRUMENT CORPORATION
HICKSVILLE, NEW YORK

Well No.	Owner/User	Altitude (ft)	Use of Water	Use of Well	Aquifer	Screened Interval (ft) Below Groundwater Surface
1-Mile Radius						
P 3878	Hicksville Water District, WD	150	Public Supply	Withdrawal of water	Magothy	-255 to -273
P-3953	Hicksville, WD	152	Public Supply	Withdrawal of water	Magothy	- 17 to -267
P 7030	Jericho, WD	158	Public Supply	Withdrawal of water	Magothy	-322 to -372
P 5655	Westbury, WD	130	Public Supply	Withdrawal of water	Magothy	- 75 to -125
P 6819	Westbury, WD	130	Public Supply	Withdrawal of water	Magothy	-540 to -600
2-Mile Radius						
P 8956	Bowling Green, WD	115	Public Supply	Withdrawal of water	Magothy	-409 to -469
P 8957	Bowling Green, WD	115	Public Supply	Withdrawal of water	Magothy	-354 to -414
P 152	Old Westbury, WD	141	Public Supply	Withdrawal of water	Magothy	-297 to -337
P 2072	Hicksville, WD	162	Unused	Destroyed	Magothy	N/A
P 7562	Hicksville, WD	163	Public Supply	Withdrawal of water	Magothy	N/A
P 8249	Hicksville, WD	163	Public Supply	Withdrawal of water	Magothy	-237 to -327
P 150	Hicksville, WD	N/A	Unused	Destroyed	Upper Glacial	N/A
P 149	Hicksville, WD	N/A	Unused	Unused	Upper Glacial	N/A
P 6193	Hicksville, WD	130	Public Supply	Withdrawal of water	Magothy	-266 to -337

TABLE 2-1 (Continued)

Well No.	Owner/User	Altitude (ft)	Use of Water	Use of Well	Aquifer	Screened Interval (ft) Below Groundwater Surface
P 6192	Hicksville, WD	130	Public Supply	Withdrawal of water	Magothy	-445 to -498
P 9180	Hicksville, WD	130	Public Supply	Withdrawal of water	Magothy	-415 to -500
P 5301	Levittown, WD	66	Public Supply	Withdrawal of water	Magothy	-365 to -418
P 5336	Hicksville, WD	114	Public Supply	Withdrawal of water	Magothy	-358 to -409
P 148	Hicksville, WD	114	Unused	Observation well	Magothy	- 19 to - 39
P 8526	Hicksville, WD	119	Public Supply	Withdrawal of water	Magothy	-401 to -482
P 3552	Hicksville, WD	119	Unused	Unused	Magothy	- 3 to - 52
P 3553	Hicksville, WD	117	Unused	Unused	Magothy	- 18 to - 53
P 7561	Hicksville, WD	117	Public Supply	Withdrawal of water	Magothy	N/A
P 9212	Hicksville, WD	117	Public Supply	Withdrawal of water	Magothy	-421 to -487
P 2201	Westbury, WD	115	Unused	Destroyed	Magothy	N/A
P 2236	Westbury, WD	116	Unused	Unused	Magothy	-404 to -449
P 2602	Westbury, WD	114	Public Supply	Withdrawal of water	Lloyd	-646 to -686
P 8497	Westbury, WD	115	Public Supply	Withdrawal of water	Magothy	-341 to -424
P 5007	Westbury, WD	119	Public Supply	Withdrawal of water	Magothy	- 90 to 140
P 7353	Westbury, WD	120	Public Supply	Withdrawal of water	Magothy	-180 to -270

N/A - Not Available

Reference: Kilburn, C. 1982. Groundwater pumpage in Nassau County, Long Island, New York, 1920-77. Introduction and user's guide to the data compilation. USGS Open - File Report 81-499.

Source: BCM Eastern Inc. (BCM Project No. 00-5268-12)

TABLE 2-2

PRIVATE SUPPLY WELLS WITHIN A 1- AND 2-MILE RADIUS OF THE GENERAL INSTRUMENT SITE

GENERAL INSTRUMENT CORPORATION
HICKSVILLE, NEW YORK

Well No.	Owner/User	Altitude (ft)	Use of Water	Use of Well	Aquifer	Screened Interval (ft) Below Groundwater Surface
1-Mile Radius						
6860	General Instrument	N/A	Unused	Destroyed	Upper Glacial	N/A
6202	Servomechanisms	118	Unused	Unused	Magothy	105 to 133
8807	Certified Industries	119	Industrial	Withdrawal of water	Magothy	9 to 22
4431	Certified Industries	98	Unused	Destroyed	Upper Glacial	
6655	Metco. Inc.	122	Unused	Unused	Magothy	74 to 114
3515*	N/A	N/A	N/A	N/A	N/A	N/A
9132*	N/A	N/A	N/A	N/A	N/A	N/A
4383*	N/A	N/A	N/A	N/A	N/A	N/A
4098*	N/A	N/A	N/A	N/A	N/A	N/A
6991*	N/A	N/A	N/A	N/A	N/A	N/A
3964*	N/A	N/A	N/A	N/A	N/A	N/A
9018*	N/A	N/A	N/A	N/A	N/A	N/A
10036*	N/A	N/A	N/A	N/A	N/A	N/A
9511*	N/A	N/A	N/A	N/A	N/A	N/A
9605*	N/A	N/A	N/A	N/A	N/A	N/A
4154*	N/A	N/A	N/A	N/A	N/A	N/A

TABLE 2-2 (Continued)

Well No.	Owner/User	Altitude (ft)	Use of Water	Use of Well	Aquifer	Screened Interval (ft) Below Groundwater Surface
4114 - 4117*	N/A	N/A	N/A	N/A	N/A	N/A
5333*	N/A	N/A	N/A	N/A	N/A	N/A
3991*	N/A	N/A	N/A	N/A	N/A	N/A
2-Mile Radius						
5851	State Univ. of N.Y. at Old Westbury	218	Domestic	Withdrawal of water	Magothy	47 to 41
3925	Coca Cola Company	158	Unused	Unused	Upper Glacial	36 to 15
4633	Meadowbrook Country Club	176	Irrigation	Withdrawal of water	Magothy	13 to 39
5335	Certified Redi-Mix Co., Inc.	170	Unused	Destroyed	Upper Glacial	N/A
7531	L.I. Lighting Company	148	Air Conditioning	Withdrawal of water	Magothy	3 to 39
5149	L.I. Lighting Company	147	Commercial	Withdrawal of water	Magothy	12 to 42
3898/9	L.I. Lighting Company	145	Commercial	Withdrawal of water	Upper Glacial	22 to 7/22 to 11
3900	L.I. Lighting Company	144	Commercial	Withdrawal of water	Upper Glacial	2 to 12
3461	County Community Corp.	112	Unused	Destroyed	Upper Glacial	N/A
3584	Levitt & Sons	N/A	Unused	Destroyed	Magothy	
3634	Levitt & Sons	N/A	Unused	Destroyed	Magothy	215 to 235
7470	Flatlands Ready	98	Industrial	Withdrawal of water	Upper Glacial	52 to 36

N/A - Not Available
Source: Kilburn, C. 1982. Groundwater pumpage in Nassau County, Long Island, New York, 1920-77. Introduction and user's guide to the data compilation. USGS Open - File Report 81-499.
* NYDEC

Source: BCM Eastern Inc. (BCM Project No. 00-5268-12)

Date	Source	Scale
03/16/85	EROS Data Center Sioux Falls, SD 75198	1:80,000
03/16/85	EROS Data Center Sioux Falls, SD 75198	1:58,000
03/14/74	EROS Data Center Sioux Falls, SD 75198	1:24,000
02/23/66	EROS Data Center Sioux Falls, SD 75198	1:24,000

2.3 PREVIOUS INVESTIGATIONS

In December 1981, an underground waste solvent storage tank and surrounding soil were removed from the site by GI. Two groundwater monitoring wells (W-1-75 and W-2-120) were installed hydraulically downgradient from the former underground tank location. Analysis of groundwater obtained from the two monitoring wells in December 1981 and May 1982 indicated the presence of a number of organic compounds. Total concentrations of VOCs measured in wells W-1-75 and W-2-120 ranged from 642.1 micrograms per liter (ug/l) or parts per billion (ppb) to 11,668 ug/l. Individual organic compounds detected (in 1981 and 1982 samples) include:

Trichloroethene (TCE)
Tetrachloroethene (PCE)
Dichlorobenzene
Xylenes
1,1,1 Trichloroethane
Toluene
Ethylbenzene
Chloroform
Methylene Chloride
1,1-Dichloroethene
Trans-dichloroethene

Results of these analyses, for Well W-1-75 and Well W-2-120 are presented on Tables 2-3 and 2-4, respectively. As an interim measure, GI retained BCM to further investigate groundwater at the site. In 1986, four additional wells were installed to further determine the extent of groundwater contamination. These four additional wells and the two previously existing wells were sampled in June 1986 and again in July 1987 in order to further define groundwater chemistry. Groundwater data obtained from these two wells during the 1986 groundwater investigation conducted by BCM and subsequent sampling conducted by BCM for GI in 1987 are also included.

TABLE 2-3

GROUNDWATER ANALYTICAL RESULTS

WELL W-1-75

GENERAL INSTRUMENT CORPORATION
HICKSVILLE, NEW YORK

Parameters	Units	December 1981	May 1982	June 1986	July 1987
Phenols	ug/l	287	1,020	---	NS
Trichloroethene	ug/l	4,300	2,200	13,000	NS
Tetrachloroethene	ug/l	2,700	860	1,030	NS
Dichlorobenzenes	ug/l	1,200	1,100	28,000	NS
Xylene	ug/l	1,500	450	---	NS
Isopropanol	ug/l	4.9	---	---	NS
Acetone	ug/l	<0.1	---	---	NS
Butyl Acetate	ug/l	<0.2	---	---	NS
Ethyl Acetate	ug/l	<0.2	---	---	NS
1,1,1 Trichloroethane	ug/l	158	40	153	NS
Butyl Alcohol	ug/l	<0.2	---	---	NS
Toluene	ug/l	<0.7	<1	18.7	NS
Ethylbenzene	ug/l	23.6	<1	1,100	NS
Ethyltoluene	ug/l	---	---	---	NS
Diethylbenzene	ug/l	<2	---	---	NS
Chloroform	ug/l	75.2	60	24.7	NS
Methylene Chloride	ug/l	17	<1	6.4	NS
1,1 Dichloroethene	ug/l	2.0	<1	<1	NS
Trans-dichloroethene	ug/l	1,400	300	504	NS
Benzene	ug/l	<0.5	<1	<1	NS
Vinyl chloride	ug/l	<0.1	<1	<1	NS
1,1-Dichloroethane	ug/l			9.7	NS
Bromoform	ug/l			1.9	NS

--- Not analyzed
NS - Not sampled due to dedicated pump failure

Source: BCM Eastern Inc. (BCM Project No. 00-5268-12)

TABLE 2-4

GROUNDWATER ANALYTICAL RESULTS

WELL W-2-120

GENERAL INSTRUMENT CORPORATION
HICKSVILLE, NEW YORK

Parameters	Units	December 1981	May 1982	June 1986	July 1987
Phenols	ug/l	66	---	---	<1
Trichloroethene	ug/l	222	19	1.5	4.22
Tetrachloroethene	ug/l	7.0	<1	<1	<1
Dichlorobenzenes	ug/l	<3.0	<1	<1	1.78
Xylene	ug/l	54	600	---	0.34
Isopropanol	ug/l	<0.1	---	---	---
Acetone	ug/l	<0.1	---	---	<1
Butyl Acetate	ug/l	<0.2	---	---	---
Ethyl Acetate	ug/l	<0.2	---	---	---
1,1,1 Trichloroethane	ug/l	15.9	14	3.7	2.57
Butyl Alcohol	ug/l	<0.2	---	---	---
Toluene	ug/l	128	<1	3.1	<1
Ethylbenzene	ug/l	10	<1	<1	0.23
Ethyltoluene	ug/l	---	---	---	---
Diethylbenzene	ug/l	<2	---	---	---
Chloroform	ug/l	16.1	1.8	<1	<1
Methylene Chloride	ug/l	400	7.3	<1	<1
1,1 Dichloroethene	ug/l	<0.1	<1	<1	<1
Trans-dichloroethene	ug/l	170	<1	<1	<1
Benzene	ug/l	<0.5	<1	<1	<1
Vinyl chloride	ug/l	<0.1	<1	<1	<1

--- Not analyzed

Source: BCM Eastern Inc. (BCM Project No. 00-5268-12)

Results of analyses of samples from W-1-75 and W-2-120 conducted in June 1986 indicated that elevated total VOCs ranged from 8.3 ug/l to 43,848 ug/l. Additional individual VOCs detected in June 1986 included relatively low concentrations of 1,1-dichloroethane and bromoform. Well W-1-75 was not sampled in July 1987 due to failure of the dedicated pump. Total VOC results for July 1987 samples from W-2-120 indicate 9 ug/l total VOCs.

In June 1982, at the request of the Nassau County Department of Health, GI authorized BCM to develop a groundwater quality management program. The program was designed to reduce contaminant levels in groundwater beneath the GI plant.

The objectives of the program were:

1. Provide a mechanism for halting further contamination of the aquifer.

2. Provide a method of retrieval or recovery of the contaminated groundwater beneath the plant.

3. Provide a viable, acceptable treatment and disposal method for all recovered groundwater.

In order to address the above objectives, the following program was instituted:

1. Groundwater was continuously pumped from Well W-1-125 (immediately downgradient of the former underground tank) at a rate of 20 gallons per minute (gpm). A gravel recharge bed was installed over the former location of the waste solvent tank. Treated water was recharged at a rate of 5 gpm.

2. The recovered groundwater was passed through an experimental carbonaceous absorbent material.

3. Fifteen gpm of treated groundwater were disposed of via the existing recharge lagoon on the plant property. Five gpm were discharged to the groundwater via the gravel recharge bed located over the former site of the storage tank.

4. Hydraulic characteristics of the two existing onsite wells were determined and used to develop theories concerning contaminant plume extent and migration behavior.

In 1985 BCM determined that the groundwater recovery and abatement program instituted was not operating effectively. The experimental system was unable to accommodate high levels of VOCs and suspended inorganic sediment in the groundwater. An attempt to improve the experimental treatment system was ineffective. As a result, BCM concluded that an improved system was necessary to effectively reduce levels of contaminants in groundwater at the GI Site. The program was therefore terminated by GI in 1985.

In April 1986, four additional groundwater monitoring wells were installed by BCM for GI to develop more data about the extent of the contaminant plume and upgradient groundwater quality. Available analytical data suggest that low levels of volatile organic contaminants may be flowing into the site from an upgradient source. Analytical results for 1986 and 1987 groundwater sampling are presented in Table 2-5 and Table 2-6, respectively.

2.4 INTERIM REMEDIAL ACTIONS

Before NYDEC approval of this Work Plan, GI will implement remedial measures on an interim basis. Following implementation of the interim remediation, a report that presents actions, data generated, and results will be prepared and submitted to GI and NYDEC as an addendum to this Work Plan. Some of the elements of the interim remediation may duplicate RI/FS Work Plan elements, thereby eliminating the necessity of conducting these elements during the RI/FS.

TABLE 2-5

GROUNDWATER ANALYTICAL RESULTS

JUNE 1986

GENERAL INSTRUMENT CORPORATION
HICKSVILLE, NEW YORK

	Well:	W-1-75	W-2-120	W-3-72	W-3-112	W-5-78	W-6-79
	BCM Sample No.:	610612	610605	610608	610610	610604 & 610611	610609
	Units						
Phenols	ug/l	<1	<1	<1	<1	<1	<1
Trichloroethene	ug/l	13,000	1.5	47.6	12.6	2.9	263
Tetrachloroethene	ug/l	1,030	<1	491	117	11.3	45.4
1,2-Dichlorobenzene	ug/l	28,000	<1	<1	<1	<1	84.9
1,3-Dichlorobenzene	ug/l	<1	<1	<1	<1	<1	<1
1,4-Dichlorobenzene	ug/l	<1	<1	<1	<1	<1	<1
m,p-Xylene	ug/l	<1	<1	<1	<1	<1	<1
o-Xylene	ug/l	<1	<1	<1	<1	<1	<1
1,1,1-Trichloroethane	ug/l	153	3.7	1.1	3.1	<1	58.2
Toluene	ug/l	18.7	<1	<1	4.8	<1	6.3
Ethylbenzene	ug/l	1,100	<1	<1	<1	<1	61.3
Chloroform	ug/l	24.7	<1	<1	<1	<1	<1
Methylene Chloride	ug/l	6.4	<1	<1	<1	<1	<1
1,1-Dichloroethene	ug/l	<1	<1	<1	<1	<1	<1
Trans-1,2-dichloroethene	ug/l	504	<1	17.1	<1	<1	797
Benzene	ug/l	<1	<1	<1	<1	<1	<1
Vinyl Chloride	ug/l	<1	<1	<1	<1	<1	228
Chlorobenzene	ug/l	<1	3.1	<1	<1	<1	<1
cis-1,2-Dichloroethene	ug/l	<1	<1	<1	<1	<1	<1
1,1-Dichloroethane	ug/l	9.7	<1	1.8	1.0	<1	10.2
1,2-Dichloroethane	ug/l	1.4	<1	<1	<1	<1	<1
1,1,2-Trichloroethane	ug/l	<1	<1	<1	<1	<1	<1

Source: BCM Eastern Inc. (BCM Project No. 00-5268-12)

TABLE 2-6

GROUNDWATER ANALYTICAL RESULTS

JULY 1987

GENERAL INSTRUMENT CORPORATION
HICKSVILLE, NEW YORK

	Well:	W-1-75	W-2-120	W-3-72	W-3-112	W-5-78	W-6-79
	BCM Sample No.:		716220	716221	716222	716223	716224 716225
Parameter	Units						
Phenols	ug/l	NS	0.013	0.006	0.002	0.042	0.008
Trichloroethene	ug/l	NS	4.22	306	10.5	9.78	1.71
Tetrachloroethene	ug/l	NS	<0.20	<0.20	<0.20	<0.20	<0.20
1,2-Dichlorobenzene	ug/l	NS	<0.20	<0.20	<0.20	<0.20	2.94
1,3-Dichlorobenzene	ug/l	NS	<0.20	<0.20	<0.20	<0.20	0.37
1,4-Dichlorobenzene	ug/l	NS	<0.20	<0.20	<0.20	<0.20	0.49
m,p-Xylene	ug/l	NS	<0.20	<0.20	<0.20	<0.20	0.69
o-Xylene	ug/l	NS	0.34	<0.20	<0.20	<0.20	1.51
1,1,1-Trichloroethane	ug/l	NS	0.51	6.15	3.70	4.28	<0.20
Toluene	ug/l	NS	0.23	<0.20	0.56	0.20	0.38
Ethylbenzene	ug/l	NS	<0.20	<0.20	<0.20	<0.20	2.27
Chloroform	ug/l	NS	<0.20	<0.20	<0.20	<0.20	<0.20
Methylene Chloride	ug/l	NS	<0.20	<0.20	<0.20	<0.20	<0.20
1,1-Dichloroethene	ug/l	NS	<0.20	0.56	<0.20	<0.20	<0.20
Trans-1,2-dichloroethene	ug/l	NS	<0.20	0.41	<0.20	<0.20	<0.20
Benzene	ug/l	NS	<0.20	<0.20	<0.20	<0.20	1.38
Vinyl Chloride	ug/l	NS	<0.20	<0.20	<0.20	<0.20	10.3
Chlorobenzene	ug/l	NS	<0.20	<0.20	<0.20	<0.20	0.22
cis-1,2-Dichloroethene	ug/l	NS	1.78	87.5	3.45	6.98	7.25
1,1-Dichloroethane	ug/l	NS	0.60	2.35	1.86	0.33	0.34
1,2-Dichloroethane	ug/l	NS	<0.20	<0.20	<0.20	<0.20	<0.20
1,1,2-Trichloroethane	ug/l	NS	2.57	2,110	308	9.21	0.47
Alkalinity							
Total alkalinity	mg/l	NS	80	240	73	76	43
P. alkalinity	mg/l	NS	0	0	0	0	0
Calcium	mg/l	NS	20	33	38	20	40
Fluoride	mg/l	NS	3.15	3.71	9.53	<0.1	0.373
Iron	mg/l	NS	1.63	<1.0	6.25	<0.1	15.2
Magnesium	mg/l	NS	0.559	3.05	2.69	1.29	1.50
Sodium	mg/l	NS	20.5	199	55.7	64.5	4.68
Chloride	mg/l	NS	7	8	16	9	3
Nitrate	mg/l	NS	0.4	<1	<1	5.3	<1
Sulfate	mg/l	NS	19	71	39	20	9
Total dissolved solids	mg/l	NS	87	486	245	251	153
Total suspended solids	mg/l	NS	403	15	15	61	123
Chemical oxygen demand	mg/l	NS	245	190	51	85	41
Biochemical oxygen demand	mg/l	NS	18.5	5	<5	<5	<5

NS - Not sampled due to dedicated pump failure.

Source: BCM Eastern Inc. (BCM Project No. 00-5268-12)

3.0 PROJECT MANAGEMENT AND PLANNING

3.1 PROJECT ORGANIZATION AND STAFFING

3.1.1 General Instrument Key Personnel

- Project Manager
- Safety Coordinator
- Field Engineer

3.1.2 BCM Key Personnel

- Principal-in-Charge
  - Alan M. Robinson

- Project Manager
  - RI - John W. Fowler
  - FS - To be named before initiation of FS

- Senior Technical Reviewers
  - William H. Fleming, P.E.
  - Steffan R. Helbig, Hydrogeologist
  - Ronald M. Kaiserman, Hydrogeologist

- Project Geologist
  - Jason M. Schindler

- Endangerment Assessment
  - Steven M. Jones, Ph.D.

- Project QA/QC Manager
  - Atwood F. Davis

- Laboratory Analyses Coordinator
  - John J. Tobin

- Data Processing Coordinator
  - Robert M. Hardy, P.E.

- Safety Manager
  - M. Douglas Mueller, CIH

- Project Safety Officer
  - Mary L. Glowacki

Field investigations and project support will be provided by contractor engineers, geologists, safety specialists, biologists, technicians, and qualified individuals as required.

3.2 PROJECT PLANNING

This project has been planned and objectives have been developed according to the following guidelines:

- Available background and other data have been reviewed and evaluated. The results of these efforts to date are presented in Section 2.0 of this document, "Description of the Current Situation."
- This Work Plan has been developed to act as an overall remedial investigation control document. The Work Plan describes technical and management aspects of the project. It includes technical outlines of tasks, project staffing, scheduling, background, and objectives.

As part of the project management and planning, the following documents will be finalized before beginning the field investigation.

3.2.1 Site Operations Plan (SOP)

The SOP is the control document for all technical project tasks. The SOP will include:

- Background of the project - a summary of the background information contained within the Work Plan, and other source documents
- Project Objectives - the specific objective of each project task
- Specifications for all field investigations - land use/demographic study, site mapping, soil sampling and boring, and hydrogeological studies
- Project schedule
- Sampling protocols - methodology, chain-of-custody, analytical parameters (see QA/QC plan, Appendix B)
- Data Management - detailed specifications for the processing, management, and control of all project data (background research, interviews, field observations, sampling analytical results, chain-of-custody, bench and pilot studies, health and safety information, air monitoring data, QA/QC reports and plans, and contracts and subcontracts)

The SOP is a dynamic document and will be developed and modified as the project progresses. All changes will be relayed to the NYDEC.

3.2.2 Quality Assurance/Quality Control Plan (QA/QC PLAN)

The QA/QC Plan describes quality assurance/quality control procedures for the project, and includes sampling and laboratory procedures, monitoring, rationale, data uses, and data accuracy requirements (see Appendix B).

3.2.3 Health and Safety Plan (HASP)

The HASP describes safety procedures to be observed during any onsite work (see Appendix C).

3.3 DATA MANAGEMENT

As discussed briefly above, detailed data management specifications will be developed for inclusion in the SOP. The data management system will include the following elements:

Analysis and QA/QC

- Analytical procedures will be in accordance with EPA-approved methodologies unless such methodologies do not exist for a particular compound. These methodologies are specified within the project QA/QC Plan. The QA/QC Plan also specifies procedures for logging field data and establishing sample control (chain-of-custody) in order to ensure that analytical results reflect actual field conditions.

Data Base

- A computerized data base system will be used to establish a data base for the project analytical results. Once established, the project data base can be used for data analysis.

Health and Safety Records

- Careful monitoring of all onsite personnel will be maintained in accordance with the project HASP, GI, and the contractors' safety policies.

3.4 PROJECT REPORTING

The following reports will be developed from the data collected during the RI:

Endangerment Assessment

- Evaluates human health and environmental risks related to the study area.

Remedial Investigation Report

- Describes results and conclusions of the RI study and proposes preliminary remedial technologies to be evaluated.

Feasibility Study Report

- Describes and evaluates remedial alternatives, recommends appropriate remedial action(s), and specifies risks associated with various alternatives

3.5 PROJECT SCHEDULE

A detailed project schedule will be included (and presented graphically) in the SOP.

4.0 FIELD INVESTIGATION

4.1 GENERAL

The purpose of the field investigation is to acquire data necessary to accurately and comprehensively characterize the GI Site and contamination present. To accomplish this efficiently, the work plan for the field investigation has been divided into three phases. Techniques and approaches employed during each phase will be revised or modified based on results of the previous phases or other conditions encountered. Therefore, the descriptions of individual tasks to be accomplished during each phase provided herein are by necessity general and will be used as a guide.

The first phase of the field investigation, Phase 1, will serve as an initial investigation of the present magnitude of contamination in the unsaturated zone above the water table (if present) and the horizontal extent of the shallow groundwater contamination (water table) plume detected during previous investigations (see Section 2.3). Phase 2 will serve to further define those areas investigated during Phase 1 and to investigate the vertical extent of the groundwater contaminant plume. Also, Phase 2 will address any anomalies or data gaps that result from Phase 1. The purpose of Phase 3 (if needed) will be to complete the definition of the horizontal and vertical extent of the contaminant source (if present) in the unsaturated zone and the groundwater contaminant plume and to provide data necessary for completion of the FS. An RI report, which will include the endangerment assessment, will be prepared when all phases of the field investigation are complete.

4.2 PHASE 1

The objectives of Phase 1 of the field investigation program are as follows:

- Investigate site features and characterize local populations and the environment surrounding the site.
- Investigate and characterize regional and local hydrogeology and groundwater chemistry.
- Investigate stratigraphy underlying the site, focusing on possible low permeability or confining layers that may serve to inhibit downward contaminant migration.
- Locate and investigate the possible extent of onsite contamination source(s).

- Investigate the horizontal extent of the shallow groundwater contamination (water table) plume detected during previous investigations.

- Determine if there are offsite pumpage centers that may effect groundwater flow conditions.

- Supply information necessary for Phase 2.

Ten tasks are proposed in order to accomplish these objectives. The tasks are described in the following sections.

4.2.1 Task 1 - Regional Hydrogeologic Data Collection and Review

Task 1 will involve research into available hydrogeological information that may be applicable to the site. Data collection to date indicates that a significant amount of research into the geologic and hydrogeologic conditions in the vicinity of the GI Site has been conducted. Much of this information has been published or may be available through a number of sources, including the United States Geologic Survey (USGS) and Nassau County agencies. This information may be used in lieu of certain site-specific aquifer testing such as pump tests and in situ permeability tests, which will otherwise be necessary to determine hydrogeological characteristics at the site. It should be noted, however, that should unexpected site-specific hydrogeologic conditions be detected during the investigation, site-specific aquifer tests may be deemed necessary.

4.2.2 Task 2 - Investigation of Site Setting

Information on the GI Site setting, such as existing land use and demographics, is required as background for the Endangerment Assessment. Most of this information can be obtained from secondary data sources. The required information includes existing and proposed land uses and zoning, existing and projected population levels, details on nearby population centers, and Nassau County demographics. Existing and potential recreational use areas surrounding the site and local water resources and uses will be established through specific agency contacts.

4.2.3 Task 3 - Site Topographic Mapping

A detailed topographic map of the GI Site area will be produced. The map will cover approximately, but not be limited to, a 40-acre area extending from the GI site to the railroad tracks 1,800 feet south of the site, and will include the following specifications:

- 1.0-foot contour intervals plus spot elevations as needed
- USGS vertical datum
- USGS horizontal control

- New York State plane coordinates
- Scale of 1 inch equals 100 feet
- 24-inch by 36-inch format
- Property boundaries from existing available records
- Building locations
- Existing well locations
- Locations of above- and underground utilities from existing records and site evidence
- Paved areas
- Easements
- Rights-of-Way
- Fences
- 100-by-100-foot grid
- Polyester stable base material, suitable for reproduction
- Field survey crews to be supervised by a New York-licensed surveyor

4.2.4 Task 4 - Deep Soil Boring and Sampling Program

There is the potential for downward migration of contaminants into the deeper aquifer zones at the GI site based on the following factors:

- Sediments in both the saturated and unsaturated zones have relatively high permeabilities.

- There are no known laterally extensive confining zones or zones of low permeability.

- The tank's former contents included compounds that are denser than groundwater.

- There is a hydraulic interconnection between overlying glacial sediments and the underlying upper Magothy Formation.

- Data from Monitoring Well W-2-120, which is screened in the Upper Magothy, indicates elevated concentrations of contaminants that have been associated with the site.

These factors indicate the need to identify the vertical extent of contamination at the GI Site. In order to accomplish this, it will be necessary to obtain groundwater samples from different (discrete) depths in the aquifer.

A practical approach to observing vertical contamination is to determine if confining layers or zones of low (or relatively low) permeability exist locally beneath the site. These layers, if present, could serve to inhibit downward groundwater and contaminant movement because groundwater flow in the presence of such layers is primarily horizontal. Therefore, water-borne contaminants should also tend to move horizontally above zones of low permeability. Figure 4-1 depicts proposed multi-depth monitoring systems beneath the site.

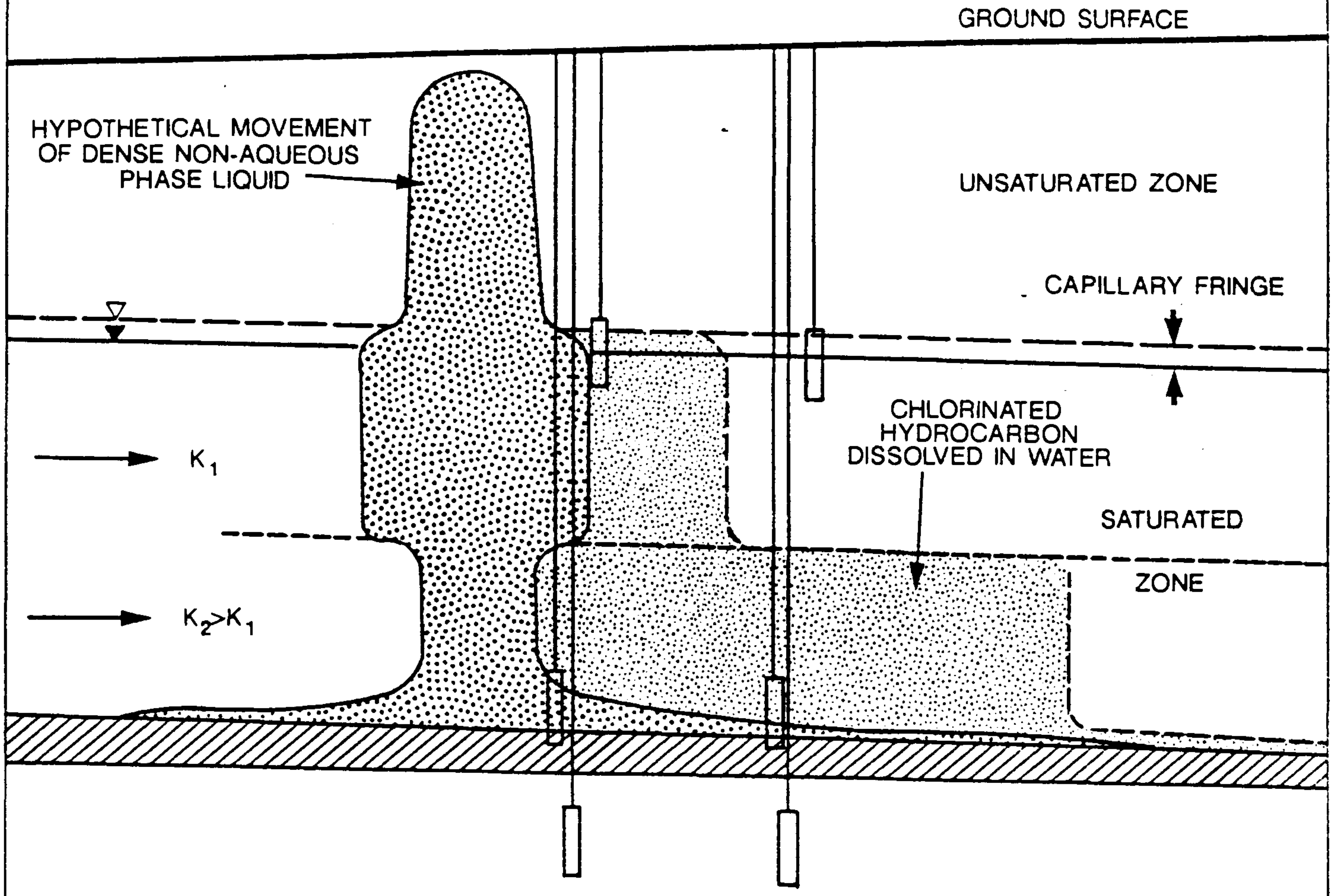
Two deep test borings (TB-1 and TB-2) will be conducted in order to characterize stratigraphy beneath the site (Figure 4-2). TB-1 will be conducted through the center of the former tank location. This will serve to locate any zones of relatively low permeability materials directly beneath the suspected contaminant source. These low permeability zones (if present) would serve to reduce vertical groundwater movement and to intercept downward moving nonaqueous (separate phase) contaminants. TB-2 will be located hydraulically downgradient from the site in order to assess lithology in the direction of groundwater flow and the area of the potential contamination plume. It will be located south of West John Street. Installation depths for deep monitoring wells (Section 4.3.3) will be selected based on the results of these borings.

The deep test borings will extend to 200 feet below the surface. If no confining layers are encountered or if contamination is found at the completion depth, deeper borings may be proposed in later phases.

The deep test borings will be advanced using clear water (preferably) or, if necessary, mud rotary drilling techniques. This method has been selected in order to minimize cross contamination. As the drilling fluid in contact with surrounding soils is circulated upward, downward contaminant movement via the boring is minimized. The fluid will be monitored periodically using an OVA and/or PID and will be changed if necessary. In addition, soil samples will be obtained and assessed in the field using headspace analyses (Appendix D). If elevated VOC concentrations are detected, the drilling fluid will be containerized for proper disposal and new fluid will be used.

Two-foot lithologic samples will be obtained continuously to the water table in TB-1 and at 10-foot intervals and at changes in lithology from below the water table to the completion depth of both borings (TB-1 and TB-2) using a split-spoon sampling device. Headspace analysis will be performed on each sample (Appendix D). Results will be recorded and analyzed. If a thick confining layer (greater than 5 feet in thickness) is encountered, a temporary steel casing will be installed and sealed in the confining layer. Drilling fluid will be changed, and the test boring will be continued through the steel casing. If a second confining layer is encountered, the test boring will be halted at that depth.

Headspace analyses (Appendix D) will be performed on each sample. Results will be recorded and examined in order to determine possible gross changes in VOC concentrations with depth.



LEGEND

▨ Chlorinated Hydrocarbon Phase

▨ Chlorinated Hydrocarbon Dissolved in Water

▨ Zone of Low or No Permability

▯ Proposed Monitoring Well Location (Screen Interval)

→ Groundwater Flow Direction

K Hydraulic Conductivity

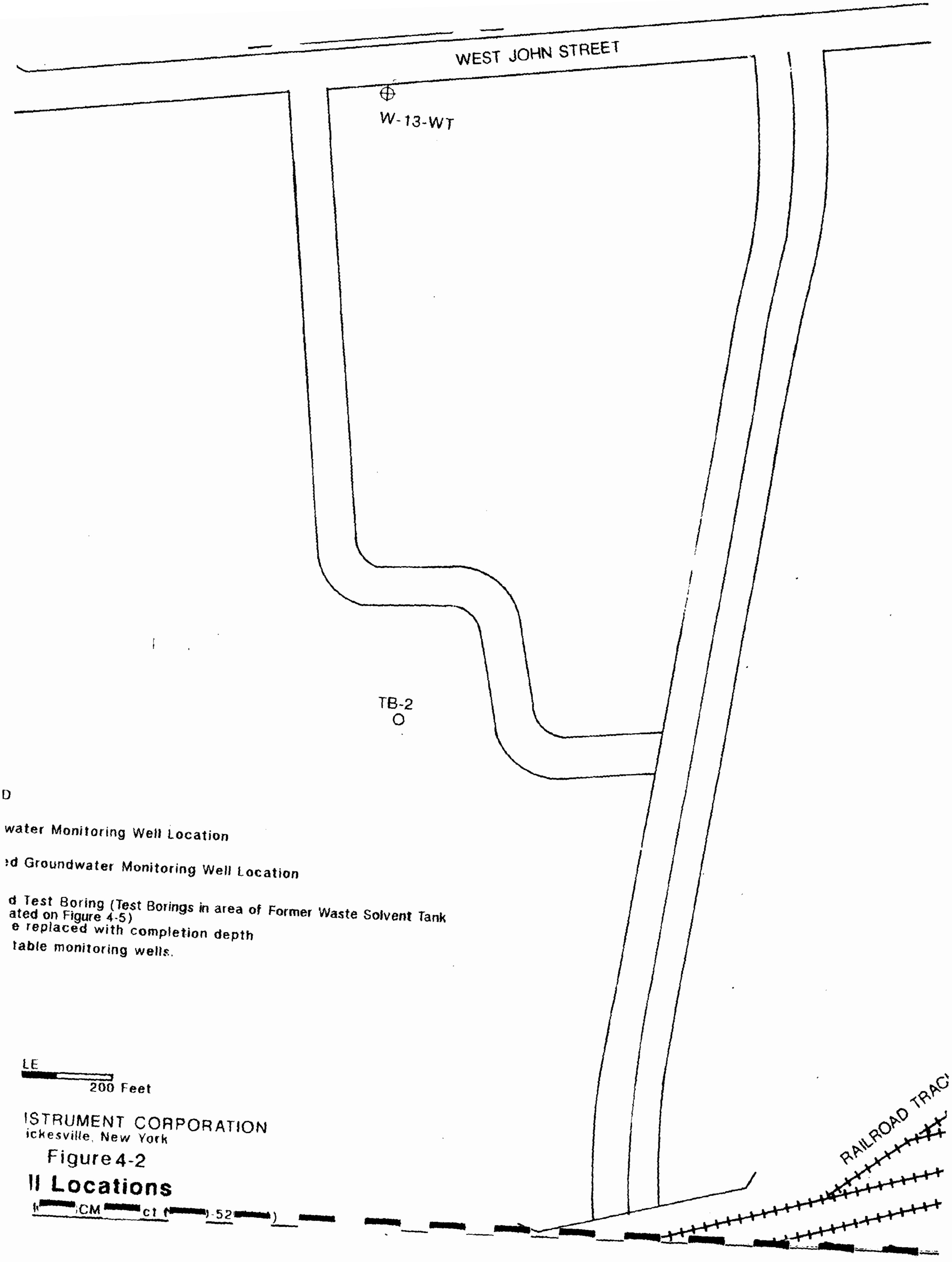
GENERAL INSTRUMENT CORPORATION
Hicksville, New York

Figure 4-1

Proposed Multidepth Groundwater Monitoring System

Adapted from Schwille, 1981.

BCM Project No. 00-5268-12



D

water Monitoring Well Location

ed Groundwater Monitoring Well Location

d Test Boring (Test Borings in area of Former Waste Solvent Tank
ated on Figure 4-5)
e replaced with completion depth
table monitoring wells.

LE
200 Feet

ISTRUMENT CORPORATION
ickesville, New York

Figure 4-2

ll Locations

[illegible]CM[illegible]ct ([illegible])-52[illegible])

In TB-1, soil samples will be selected for laboratory analysis from the set of lithologic samples from the unsaturated zone. Sample depths are illustrated on Figure 4-3. Sample depths and rationale are presented below:

- Samples will be selected for laboratory analysis at 10-foot intervals in the unsaturated zone. The purpose of these samples will be to identify any overall vertical attenuation of soil contamination, if present, at the site.

- Samples will be selected for laboratory analysis at distinct changes in lithology in the unsaturated zone. Changes in lithology may serve to alter contaminant migration rates and directions in the unsaturated zone.

- One sample will be obtained for laboratory analysis from the shallowest naturally occurring sediments. This sample will serve to characterize the shallowest sediments likely to have been impacted by the tank leak.

- One sample will be selected for laboratory analysis based on highest headspace analysis results. This sample will likely contain the highest concentration of contaminants in the test boring. Therefore, this sample will be analyzed to identify elevated concentrations of individual parameters.

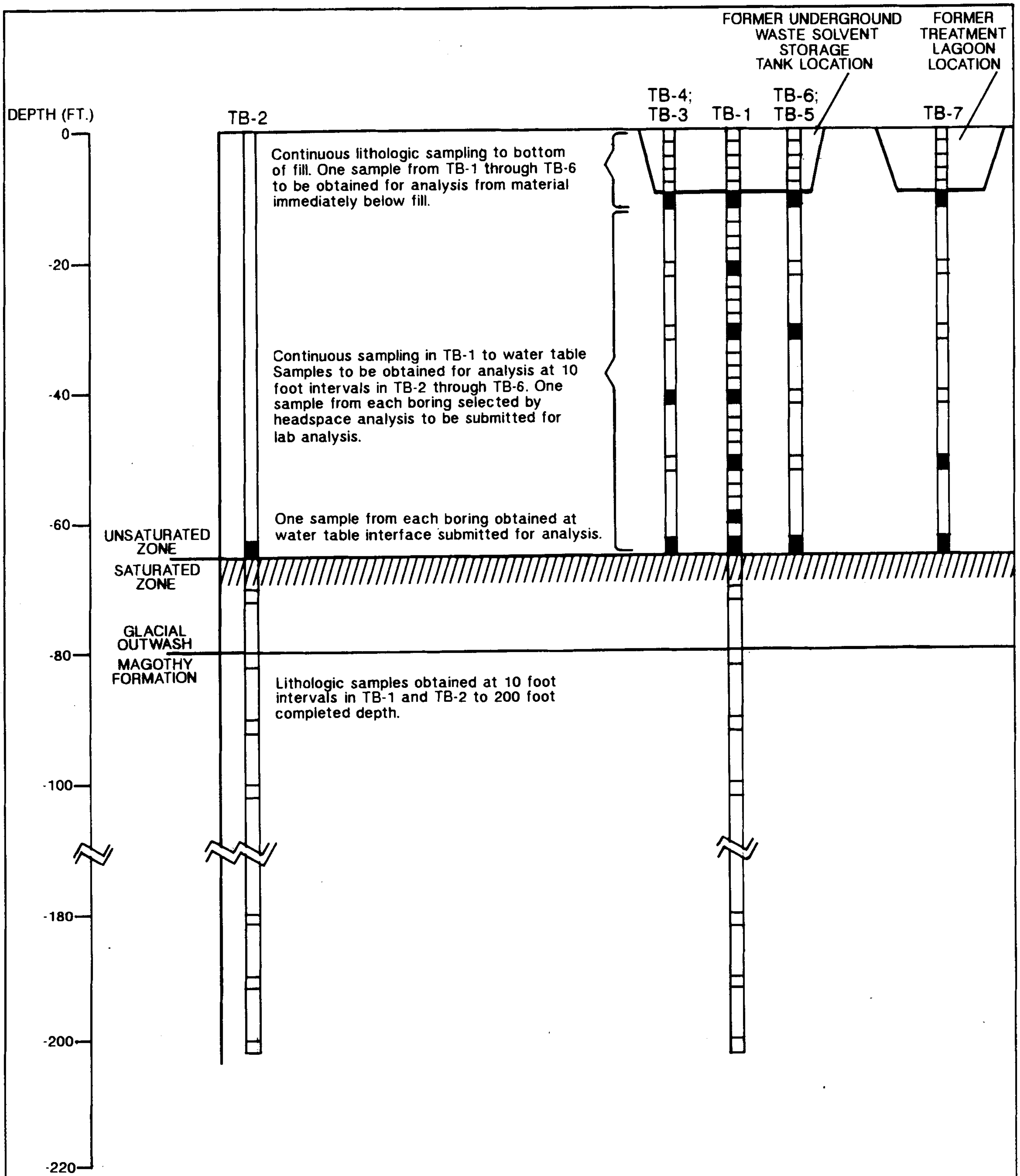
- One sample will be obtained from material immediately above the water table interface. This sample should characterize contamination, if present, which is currently entering the groundwater system.

One sample will be obtained from TB-2 for laboratory analysis. This sample will be taken from material immediately above the water table interface. Sample depth locations are illustrated on Figure 4-3.

Physical soils testing will be conducted on samples from boring TB-1 at every change in lithology. The following physical parameters will be tested:

- Vertical hydraulic conductivity (fine-grained strata)
- Grain size analysis (including hydrometer)
- Atterberg limits (where applicable)
- Unified soil classification

These tests will be performed using standard ASTM methods. Samples of clay and silt layers, if encountered, will be recovered using a Shelby tube sampling device.



Continuous lithologic sampling to bottom of fill. One sample from TB-1 through TB-6 to be obtained for analysis from material immediately below fill.

Continuous sampling in TB-1 to water table Samples to be obtained for analysis at 10 foot intervals in TB-2 through TB-6. One sample from each boring selected by headspace analysis to be submitted for lab analysis.

One sample from each boring obtained at water table interface submitted for analysis.

Lithologic samples obtained at 10 foot intervals in TB-1 and TB-2 to 200 foot completed depth.

LEGEND

■ Analytical Sample Location

☐ Lithologic Sample Location

Vertical Scale: 1"=20'
Horizontal Not to Scale

NOTE: All depths and number of samples are estimated and subject to change based on data acquired during the investigation.

SOURCE: BCM Eastern, Inc. (BCM Project No. 00-5268-12).

GENERAL INSTRUMENT CORPORATION
Hicksville, New Jersey

Figure 4-3
Sampling Locations

TABLE 4-1

PHASE I ANALYTICAL PARAMETERS SOIL SAMPLES

GENERAL INSTUMENT CORPORATION
HICKSVILLE, NEW YORK

Test Boring	Total Number of Samples	Analytical Parameters	EPA Method Number	Comments
TB-1	4	VOCs by GC	8240	
	3	CLP/TCL Organics PP Metals Total Phenols	8240, 8250 7000 Series 9066	**
TB-1D	1	CLP/TCL Organics PP Metals Total Phenols VOCs	8240,8250 7000 Series 9066 601, 602	Duplicate sample
TB-2	1	VOCs	624	Sample to be obtained at water table interface
TB-3	3	VOCs	624	**
TB-3D	1	VOCs	624	Duplicate sample
TB-4	3	VOCs	624	**
TB-5	3	VOCs	624	**
TB-6	3	VOCs	624	**
TB-7	3	VOCs	624	**
Total	25			

---

* Does not include pesticides and PCBs fraction.

** One sample to be obtained at interface between fill and natural soil, one selected based on headspace analyses, and one obtained at the water table interface.

Source: BCM Eastern Inc. (BCM Project No. 00-5268-12)

Each analytical soil sample will be obtained and handled following protocols described in the QA/QC plan (Appendix B). Samples will be shipped to a New York State-certified laboratory. Approximately seven samples from TB-1 will be obtained for analysis. One of the samples will be obtained immediately above the water table interface, one will be selected from material immediately below the backfill, and one will be selected based on headspace analysis (Appendix D), if applicable, or based on visual or other criteria. These three samples and one sample from TB-2 obtained at the water table interface will be analyzed for the following parameters (see also Table 4-1):

- Superfund Amendments Reauthorization Act (SARA) Contract Laboratory Program Targeted Compound List (CLP/TCL), volatile and semivolatile organic compounds plus 40 additional tentatively identified National Bureau of Standards (NBS) library search compounds (CLP/TCL organics) by gas chromatography/mass spectrometry (GC/MS)

- Priority pollutant metals (PP metals)

- Total phenols

The remaining four samples from TB-1 will be analyzed for CLP/TCL volatile organic compounds (VOCs) plus is tentatively identified NBS library search compounds by GC/MS.

Following completion of soil sampling each test boring will be logged using a geophysical logging device. The logging device to be used will measure natural gamma radiation emitted from the surrounding soils.

The geophysical logs will be used to characterize the local stratigraphy. This will be useful in interpretting movement of water and contaminants in the unsaturated and saturated zones. The deep test borings will be abandoned using the following procedures:

1. Grout (Portland cement/5 percent bentonite) will be injected into the borehole using a tremie pipe.

2. The boring will be covered and the grout seal allowed to set up over night.

3. Additional grout will be added as necessary on the following day to make up for shrinkage/settlement.

4.2.5 Task 5 - Water Table Monitoring Wells

Previous investigations (Section 2.3) have established the presence of site-related VOCs in the shallow groundwater zone. Shallow water table contamination has been observed in shallow monitoring wells located hydraulically downgradient from the source area. In order to further investigate the extent of this contamination, eight additional monitoring wells are proposed. Water table monitoring well locations are shown on Figure 4-2. The rationale for well placement is presented in Table 4-2.

The monitoring wells will be installed using hollow-stem auger drilling techniques. If conditions warrant, water or mud rotary drilling techniques will be substituted or used in conjunction with the augers. No split-spoon sampling will be conducted until the water table is encountered. Split-spoon samples will be obtained at 5-foot intervals below the water table.

The drill rig and other equipment will be steam cleaned between each location. The well screen and riser pipe will be steam cleaned prior to installation. The monitoring wells will be installed by a New York State-licensed driller and observed and evaluated by a BCM geologist. A detailed log of lithology and well construction details will be maintained. Split-spoon samples will be classified using the New York State Department of Transportation (NYSDOT) soil description procedures. Site activities and sampling records will be recorded in a bound field log maintained by the geologist.

The monitoring wells will be constructed of 4-inch inside diameter (I.D.) Schedule 40 polyvinyl chloride (PVC) with factory-slotted screen. The screen slot size and gravel pack grade will be determined based on the results of the physical soils testing (see Section 4.2.4). A gravel pack will be installed in the annulus around the well screen. The grout pack will extend to 2 feet above the top of the screen. A 2-foot bentonite pellet seal will be installed immediately above the gravel pack. A 5-percent bentonite and Portland cement grout will extend from the top of the bentonite seal to the surface. Construction materials will be emplaced into the annulus using a tremie pipe. Water table monitoring well construction details are illustrated on Figure 4-4. The inner and outer casings and the ground elevated will be surveyed by a New York State-licensed surveyor. Well casings will be marked at the exact point at which the rod used for surveying was placed. Well locations will be plotted on the site topographic map (Section 4.2.3).

Wells will be developed using compressed air until water becomes clear or for 1 hour.

TABLE 4-2

PHASE I ADDITIONAL GROUNDWATER MONITORING WELLS

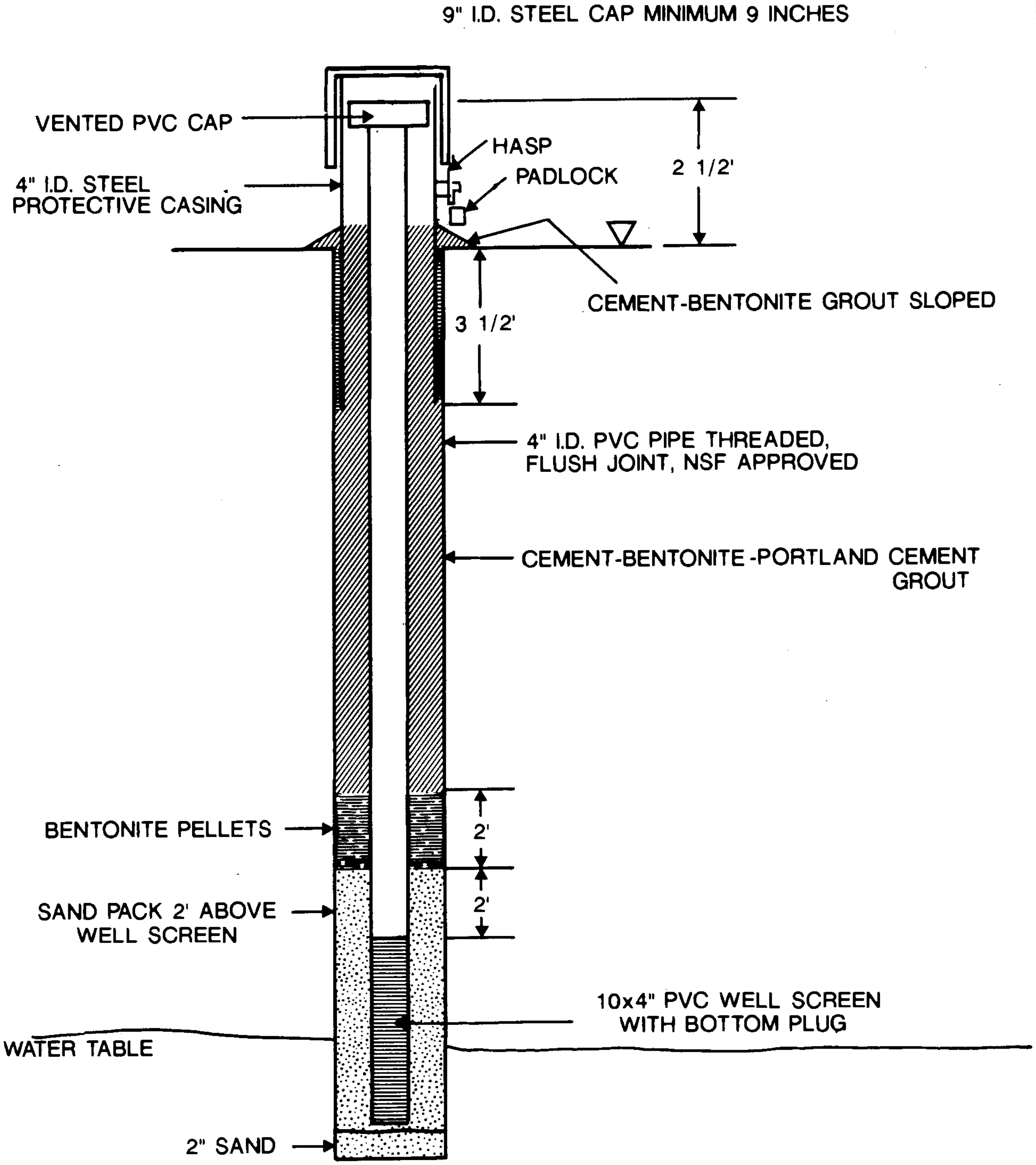
GENERAL INSTRUMENT CORPORATION
HICKSVILLE, NEW YORK

Well	Location and Rationale
W-2-(WT)	Downgradient from former tank location. Also immediately downgradient from aboveground tank farm.
W-7-(WT)	Northwest corner of site. Background well will detect possible contaminants migrating from offsite.
W-8-(WT)	Northeast corner of site. Background well will detect possible contaminants migrating from offsite.
W-9-(WT)	Southwest of former tank location. Will determine horizontal extent of plume, if present.
W-10-(WT)	Southwest corner of GI property. Will determine horizontal extent of plume, if present.
W-11-(WT)	East of elevated contaminant zone detected at W-6-79. Will determine horizontal extent of plume, if present.
W-12-(WT)	Southeast corner of GI property. Will determine horizontal extent of plume, if present, and whether contaminated groundwater reaches the GI property from the east.
W-13-(WT)	South of GI property. Will determine horizontal extent of plume, if present.

Note: (WT) will be replaced with the completion depth of each water table monitoring well, measured in feet below ground surface.

Source: BCM Eastern Inc. (BCM Project No. 00-5268-12)

ADAPTED FROM: New York State Department of Environmental Conservation, Division of Solid Hazardous Waste, Bureau of Hazardous Site Control. Guidelines for Exploratory Boring, Monitoring Wells Installation, and Documentation of these Activities.



GENERAL INSTRUMENT CORPORATION
Hicksville, New York

Figure 4-4

Monitoring Well Construction

BCM Project No. 00-5286-12

4.2.6 Task 6 - Unsaturated Zone Sampling Program

The continuing source of groundwater contamination at the GI Site is believed to be residual contamination, which may remain in the unsaturated zone (above the water table) beneath the location of the former waste solvent storage tank. A second possible contaminant source is the area beneath the former treatment lagoon. Other potential contamination sources include locations where solvents and waste solvents were handled or stored and locations where surficial contamination may be likely to migrate into the subsoil.

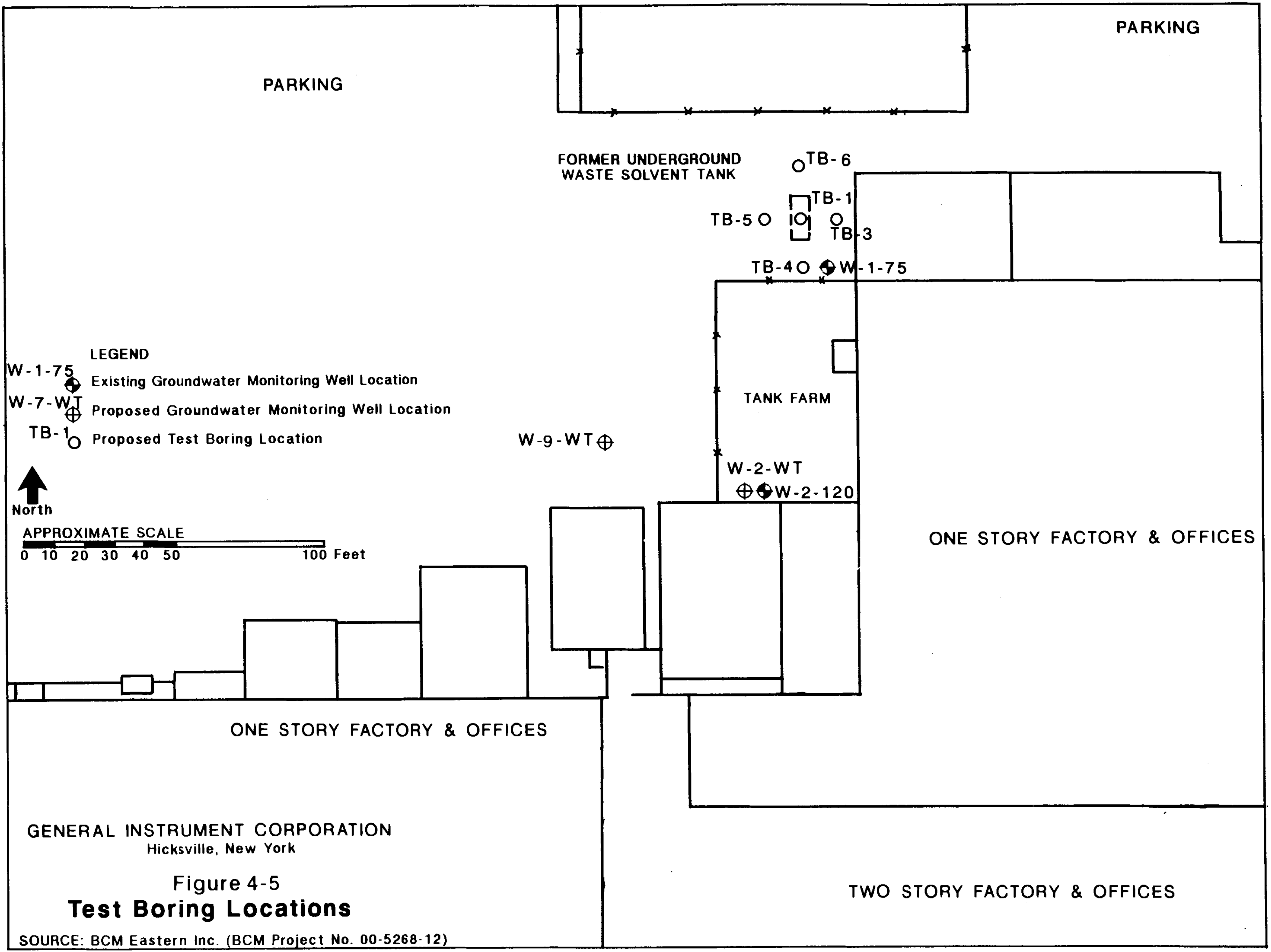
Following interpretation of the results of the deep soil borings, four additional soil test borings (TB-3 through TB-6) will be conducted in the area of the former waste solvent tank location (Figure 4-2). Available information will be reviewed to determine the exact location of the former tank. The test borings will be located 10 feet from the sides and ends of the former tank location. One additional test boring (TB-7) will be conducted in the area of the former treatment lagoon. These test borings will be used to evaluate the extent of contamination, if present, beneath the former lagoon and tank locations. BCM will review lagoon closure documents to determine the exact location of TB-7. Sample depths are illustrated on Figure 4-3. Boring locations are shown on Figure 4-5.

Test borings TB-3 through TB-7 will extend to the water table, which is anticipated to be 60 to 70 feet below grade. The borings will be advanced using hollow-stem auger drilling techniques.

Two-foot lithologic samples will be obtained continuously through the material used to backfill the former tank location and the lagoon. Samples will be obtained at 10-foot intervals below the fill to the water table.

Headspace analyses will be performed on all split-spoon samples recovered (Appendix D). A total of three samples from each test boring (TB-3 through TB-7, 15 samples) will be selected for laboratory analysis. The following samples will be selected:

- One sample from each boring that exhibits the highest relative concentration of VOCs (if present) will be submitted for laboratory analyses.
- One analytical sample will be obtained at the interface between the fill and underlying natural soil.
- One additional analytical sample will be obtained at each shallow test boring from soil immediately above the water table. Continuous split-spoon soil samples will be obtained from 1 to 2 feet above the expected water table depth until the water table is encountered (see Figure 4-3). The water table depth will be estimated based on water levels in nearby wells (W-1-75, W-2-120, and W-3-72, and W-3-112).



GENERAL INSTRUMENT CORPORATION
Hicksville, New York

Figure 4-5
Test Boring Locations

SOURCE: BCM Eastern Inc. (BCM Project No. 00-5268-12)

Each analytical soil sample will be obtained and handled following protocols described in the QA/QC plan (Appendix B). Samples will be shipped to a NYDEC-certified laboratory and analyzed for parameters that will be selected based on the results of previous site sample analyses from TB-1. Samples will be analyzed for CLP/TCL VOCs by GC/MS plus 15 library search compounds. Other parameters may be added based on the results of TB-1 analyses.

Each shallow test boring will be abandoned using the procedure outlined in Section 4.2.4 for deep test borings (Note: grout will be installed while aguers are still in the ground. Additional grout will be added as augers are withdrawn in order to keep a constant head).

Following completion of soil sampling each test boring will be logged using a portable geophysical logging device (as described for the deep test borings - Section 4.2.4).

4.2.7 <u>Task 7 - Phase 1 Groundwater Sampling</u>

One round of groundwater samples will be obtained from each monitoring well during Phase 1. Samples will be collected no earlier than 2 weeks after well installation and development. Sampling parameters are included on Table 4-3. Samples will be obtained, handled, and analyzed according to protocols specified in the QA/QC plan (Appendix B).

Samples will be obtained from monitoring wells located immediately downgradient and upgradient from the former tank location. These will be analyzed for a broad suite of parameters. Samples from wells W-1-75, W-2-120, W-2-(WT), W-3-72, and W-3-112 will be analyzed in the laboratory for:

- CLP/TCL organics (except pesticides/PCBs)
- PP metals
- Total phenols

Samples obtained from all remaining wells (W-5-78 through W-13-[WT]) will be analyzed for:

- VOCs plus library search of 15 NBS compounds
- Total dissolved solids (TDS)

These analyses will accurately identify and quantify VOCs in the groundwater in order to determine the extent of any contaminant plume that may be present. Results of these analyses will further delineate the horizontal extent of the contaminant plume and establish target parameters for further investigation. Additional organic compounds or analyses may be added during Phase 2, depending upon the results of Phase 1 samples.

Specific conductance, pH, and temperature measurements will be conducted on all samples in the field during sampling.

TABLE 4-3

PHASE 1 GROUNDWATER SAMPLING PARAMETERS

GENERAL INSTRUMENT
HICKSVILLE, NEW YORK

Sample Location	Analytical Parameters	EPA Method Number	Comments
W-1	CLP/TCL Organics + 40	624, 625	
	PP Inorganics	200 Series	
	Total Phenols	420.2	
	Specific Conductance	120.1	*
	pH	150.1	*
	Temperature	170.2	*
W-1D	CLP/TCL Organics + 40	624, 625	Duplicate
	PP Inorganics	200 Series	
	Total Phenols	420.2	
	Specific Conductance	120.1	*
	pH	150.1	*
	Temperature	170.2	*
W-2-(WT)	CLP/TCL Organics + 40	624, 625	
	PP Inorganics	200 Series	
	Total Phenols	420.2	
	Specific Conductance	120.1	*
	pH	150.1	*
	Temperature	170.2	*
W-2	CLP/TCL Organics + 40	624, 625	
	PP Inorganics	200 Series	
	Total Phenols	420.2	
	Specific Conductance	120.1	*
	pH	150.1	*
	Temperature	170.2	*
W-3-72	CLP/TCL Organics + 40	624, 625	
	PP Inorganics	200 Series	
	Total Phenols	420.2	
	Specific Conductance	120.1	*
	pH	150.1	*
	Temperature	170.2	*
W-3-112	CLP/TCL Organics + 40	624, 625	
	PP Inorganics	200 Series	
	Total Phenols	420.2	
	Specific Conductance	120.1	*
	pH	150.1	*
	Temperature	170.2	*
W-5-78	VOCs	624	
	TDS	160.1	
	Specific Conductance	120.1	*
	pH	150.1	*
	Temperature	170.2	*
W-6-79	VOCs	624	
	TDS	160.1	
	Specific Conductance	120.1	*
	pH	150.1	*
	Temperature	170.2	*
W-7-(WT)	VOCs	624	
	TDS	160.1	
	Specific Conductance	120.1	*
	pH	150.1	*
	Temperature	170.2	*

TABLE 4-3 (Continued)

Sample Location	Analytical Parameters	EPA Method Number	Comments
W-8-(WT)	VOCs	624	
	TDS	160.1	
	Specific Conductance	120.1	*
	pH	150.1	*
	Temperature	170.2	*
W-9-(WT)	VOCs	624	
	TDS	160.1	
	Specific Conductance	120.1	*
	pH	150.1	*
	Temperature	170.2	*
W-10-(WT)	VOCs	624	
	TDS	160.1	
	Specific Conductance	120.1	*
	pH	150.1	*
	Temperature	170.2	*
W-11-(WT)	VOCs	624	
	TDS	160.1	
	Specific Conductance	120.1	*
	pH	150.1	*
	Temperature	170.2	*
W-11D-(WT)	VOCs	624	
	TDS	160.1	
	Specific Conductance	120.1	*
	pH	150.1	*
	Temperature	170.2	*
W-12-(WT)	VOCs	624	Duplicate
	TDS	160.1	
	Specific Conductance	120.1	*
	pH	150.1	*
	Temperature	170.2	*
W-13-(WT)	VOCs	624	
	TDS	160.1	
	Specific Conductance	120.1	*
	pH	150.1	*
	Temperature	170.2	*

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* Parameters to be analyzed in the field

(WT) To be replaced with well completion depth measured in feet below ground surface.

Source: BCM Eastern Inc. (BCM Project No. 00-5268-12)

4.2.8 Task 8 - Continuous Water Level Monitoring

A large number of water supply wells are known to exist within a 2-mile radius of the site (Section 2.2.4). It is conceivable that offsite centers of pumpage may periodically affect groundwater flow direction at the GI Site.

Following well installation and groundwater sampling, continuous water level monitoring devices will be placed on four of the monitoring wells (W-3-72, W-3-112, W-10-(WT), and W-12-(WT)). Water levels will be recorded for a 4-week period. Results will be analyzed and investigated further, if necessary, during Phase 2.

4.2.9 Task 9 - Data Interpretation

Data generated during the Phase 1 investigation will be analyzed for gaps and possible additional areas requiring investigation. These results will be used to alter and modify approaches and methods to be used in the Phase 2 investigation.

QA/QC data review/validation of all analytical results will be conducted as part of the investigation QA/QC program. This will consist of a review of all available information for analyses that will be performed by the laboratory. Items to be reviewed will include: data completeness, holding times, blank analysis results, initial and continuing calibrations, detection limits, compound identification, quantitative calculations, and tentatively identified compound results. This review will ensure the quality of all reported results and will qualify results where necessary.

4.2.10 Task 10 - Phase 1 Interim Status Report

An interim status report, which will document analytical results and investigation activities, will be prepared upon completion of Phase 1. The Phase 1 - Interim Status report will include results and comments for all investigative activities during Phase 1. This will include the following:

- Results of the hydrogeologic data collection and review. This information may be used to model hydrogeologic characteristics of the site during Phase 2 (Section 4.3.5). Comments will be made regarding the completeness of available data and the potential need for site hydrogeologic testing.

- Report of the investigation of the site setting. This will include a summary of all natural resources, land use, and demographic data.

- A detailed site topographic map.

- Summary of all field activities conducted during the soil boring/sampling and well installation/groundwater sampling programs.
- A summary of Phase 1 analytical results.
- A summary of the results and findings of the QA/QC review.
- Comments and recommendations regarding modifications to investigative approaches outlined in the work plan, additional areas requiring investigation, and a discussion of data gaps that will be addressed during Phase 2.

4.3 PHASE 2

The objectives of Phase 2 of the investigation program are as follows:

- Further define the extent of onsite contamination in the unsaturated zone (this assumes that Phase 1 borings do not identify the outer extent of contamination).
- Define the horizontal extent of the water table contaminant plume hydraulically downgradient from the site (if Phase 1 monitoring wells do not sufficiently define the plume).
- Investigate the vertical extent of the groundwater contaminant plume.

Six tasks will be conducted in order to accomplish the objectives listed above. These tasks, numbered 11 through 16, are described in the following subsections.

4.3.1 Task 11 - Additional Soil Sampling

Additional soil sampling may be implemented based on the results of Phase 1. If elevated concentrations of site-related compounds are detected in any of test borings TB-1 through TB-7, additional investigative test borings may be conducted.

It is impossible to determine at this time whether additional borings or sampling will be necessary. It is assumed that six additional test borings will be conducted and that three samples from each will be analyzed for VOCs and library searched by GC/MS (two in the former lagoon and four in the area of the former tank location).

4.3.2 Task 12 - Additional Groundwater Monitoring Wells

Additional water table groundwater monitoring wells will be proposed based on the results of Phase 1. These wells will be used to define the horizontal extent of the water table plume. It is assumed that three additional wells will be required on the portion of the site south of West John Street. Well placement will be based on results of Phase 1.

4.3.3 Task 13 - Well Clusters

In order to determine the vertical extent of the contaminant plume, it is necessary to obtain samples from selected (discrete) depths within the aquifer. Monitoring wells must be installed at these depths in order to obtain groundwater samples. Therefore, clusters of multi-depth groundwater monitoring wells will be installed at selected areas around the site. Each cluster will consist of one shallow monitoring well (installed during Phase 1) and, possibly, one or more deeper wells.

Clustered well depths and locations will be determined based on the results of Phase 1. Well depth selection is outlined in Section 4.2.4 and well location will be based upon water table zone groundwater quality. A typical well cluster is illustrated on Figure 4-1.

It is impossible to determine the number of well clusters, wells per cluster, depths, and well cluster locations prior to Phase 1 results. It is assumed that five well clusters (two upgradient and three downgradient) consisting of one water table and two deep wells will be required. This will require the installation of ten additional deep wells, two at each of five locations where water table wells will have been installed during Phase 1.

4.3.4 Task 14 - Phase 2 Groundwater Sampling

Groundwater samples obtained during Phase 2 will be used to confirm Phase 1 results and further define the extent of the contaminant plume. Groundwater samples will be obtained from all wells (approximately 26 wells).

Analyses will be performed on samples from wells that indicated no elevated site-specific contamination in order to confirm that these are in fact "clean" locations. The remaining samples will be analyzed to further define the extent of the contaminant plume. Analytical target parameters will be proposed based upon Phase 1 results.

4.3.5 Task 15 - Data Interpretation

Data generated during the Phase 2 investigation, and results of Phase 1, will be used to develop the Phase 3 investigation. Data interpretation may include computerized groundwater flow and contaminant transport simulation (modeling).

4.3.6 Task 16 - Phase 2 Interim Status Report

An interim status report will be prepared following completion of Phase 2 activities. The Phase 2 Interim Status report will include results and comments for all investigative activities completed during Phase 2. This report will include the following:

- Discussion of work plan revisions and areas addressed during Phase 2
- Summary of all field activities conducted during Phase 2
- Summary of all Phase 2 analytical results
- Summary of the results and findings of the QA/QC review
- Comment and recommendations regarding modification to the work plan, additional areas requiring investigation, and a discussion of data gaps to be addressed during Phase 3
- Results of computerized groundwater modeling

4.4 PHASE 3

The objectives of the Phase 3 investigation will be to fill in data gaps and supply information required for development of the FS.

In order to accomplish these objectives, Phase 3 has been divided into four tasks. These tasks, numbered 17 through 20, are described in the following sections.

4.4.1 Task 17 - Additional Well Clusters

If necessary, based on results of Phase 2, additional well clusters will be installed. A number of unforeseen possibilities may make additional well clusters necessary. For example, a contaminant plume significantly larger or deeper than expected, or possible alternate contaminant flow directions induced by offsite pumping, may necessitate additional monitoring.

It is assumed that three additional well clusters will be required.

4.4.2 Task 18 - Phase 3 Groundwater Sampling

A round of groundwater samples will be obtained, as necessary, to confirm the results of Phase 2. Additional sampling may be necessary if additional wells are installed during Phase 3 or if they are deemed necessary due to Phase 2 results. Selection of wells to be sampled and analytical parameters will be based on results of Phase 2. It is assumed that all wells will be analyzed for VOCs.

4.4.3 Task 19 - Data Interpretation

Results of the Phase 3 field investigation will be analyzed and interpreted. Data will be checked for completeness.

4.4.4 Task 20 - Phase 3 Interim Status Report

Following completion of the interpretation of Phase 3 results, a brief letter report will be prepared. This report will summarize all field activities and analytical data developed during Phase 3. The Phase 3 interim report will also comment on the completeness of data generated during the RI as needed for development of the EA and FS studies.

4.5 DISPOSAL OF WASTE GENERATED DURING REMEDIAL INVESTIGATION

It will be the responsibility of GI to properly dispose of all waste material generated during the remedial investigation. Waste materials anticipated include, but are not limited to, the following:

Solid Wastes

- Drill cuttings
- Other excavated soils
- Disposable safety equipment such as splash suits, respirator cartridges, and gloves

Liquid Wastes

- Drilling fluids
- Groundwater
- Spent decontamination fluids including acetone, hexane, and nitric acid

BCM and any BCM subcontractors will stage all waste materials in 55-gallon steel drums provided by BCM subcontractors. The drums will be properly marked to indicate their contents, and a written record will be maintained. GI and/or its contractors will be responsible for proper disposal of the waste materials.

5.0 ANALYSIS OF REMEDIAL INVESTIGATION DATA

5.1 GENERAL

A number of techniques will be used to acquire data during the Remedial Investigation process. These are listed below:

- Interviews with current and former plant personnel
- Development of background data sources
- Compilation and review of existing data pertaining to the site
- Conduct site visits
- Conduct field investigations
- Conduct bench and pilot studies (optional)

Sampling methodology will be in accordance with EPA-approved procedures, and samples will be analyzed as specified in the QA/QC Plan.

The analytical results will be subjected to QA/QC review. The QA/QC review emphasizes accuracy, consistency, and representativeness of data.

5.2 PURPOSE

The RI will collect data to enable the development of an assessment of the risk posed to human health and the environment, and to enable the development of remediation methods, if necessary.

To accomplish these goals, the data assembled will be continuously assessed for quality and completeness. Detailed QA/QC procedures will be specified in the QA/QC Plan to ensure quality of the data, and contingencies will be developed to address any discrepancies (e.g., re-sampling or re-analysis).

Data completeness will be addressed as the project develops by assessing, during each successive task, the utility of data previously collected. If contamination is established, the data will be assessed to determine the need for further sampling so that the extent of vertical and horizontal migration of contamination can be characterized. If there is insufficient data to allow technically supportable progress to the next phase of investigation (the EA or the FS), additional sampling or re-analysis may be required.

5.3 METHODOLOGY

The data will be systematically evaluated as the project develops, with each phase of the field investigation adding to the data base and aiding in the project's focus and direction.

The planned methodology is as follows:

- Data will be compiled on land use and demographics in the vicinity of the site.
- The study area will be mapped to provide a base upon which field data can be plotted.
- Historical information will be reviewed including photographs, interviews with plant personnel, and plant records.
- Unsaturated zone sampling data will be used to determine the magnitude and extent of residual contamination and proposed remediation alternatives.
- Since groundwater contamination has been established, this investigation will focus on the potential for further migration of contaminated groundwater as a component of the project EA.
- Existing groundwater quality data will be compiled and analyzed to ascertain the groundwater quality in the study area.
- Air monitoring will be conducted concurrently with all phases of the field investigation as a method of establishing proper protective levels for onsite personnel.
- Bench and pilot studies may be conducted to aid in the evaluation of remedial alternatives, and in the design and construction of the selected alternative.

Throughout the RI, information collected will be continuously evaluated to establish data sufficiency. Once sufficient data has been collected and risks assessed, a plan for remediation of these risks will be developed.

6.0 ENVIRONMENTAL FATE AND TRANSPORT

Data generated during the RI will be interpreted in order to predict the environmental fate and transport of chemical substances found at the site. The fate and transport of substances are functions of their physical and chemical characteristics and their behavior in the environmental media in which they are situated. Characteristics of substances detected at the site will be investigated with regard to the physical and chemical processes potentially active at the site. Physical and chemical characteristics investigated will include the following factors:

- Density
- Solubility
- Volatility
- Sorption
- Biodegradability

This information will be compared with analytical results obtained during the RI in order to correlate it with the observed results and to enable predictions of any changes with regard to fate and transport through time.

7.0 ENDANGERMENT ASSESSMENT

7.1 GENERAL

As part of the RI, an assessment will be made of the risks to public health and the environment posed by past and present waste management activities. The potential health risks associated with the study area are based on possible exposure of the public to contamination migrating offsite, through direct exposure to site-generated contaminated groundwater. Due to the conditions of the site area, including no nearby surface water and no shallow contaminated soil, the endangerment assessment will be limited to the groundwater/water-use exposure route. Potential environmental risks occur through contaminant bio-accumulation within the food chain.

The principal risk associated with the study area is the possibility of long-term contaminant migration. The offsite migration of contaminants may present a potential risk to the environment.

The level of risk associated with residual contamination at any given site is a function of the chemicals present, the magnitude of human or environmental exposure likely to occur, and the nature of the population that may be exposed. In establishing the level of risk that is associated with the contamination, it is not necessary or practical to assess the risk associated with every chemical present at the site. Rather, it is appropriate to select several chemicals as indicators of the overall risk associated with the contamination. Therefore, the first step in the risk assessment process is the selection of indicator chemicals based on the data developed in this study.

Indicator chemicals will be selected on the basis of the potential degree of risk associated with their release. Since the risk to public health is a function of the degree of exposure, the chemicals best suited to be selected as indicators at any site are those that are the most toxic and those most likely to escape and persist in the environment and result in human exposure.

Once these indicator chemicals have been selected, risks to public health resulting from residual levels of contamination can be assessed.

Potential exposures will be evaluated for a given residual level of contamination, based on an evaluation of the pathways of exposure and other factors. These exposures will be assessed in terms of potential dose to the exposed population. Based on the potential dose, the nature of the exposed population, and the toxicity of the chemicals of concern, an assessment of health risk posed by a given level of residual contamination will be made. The various alternative remedial action plans can then be evaluated in terms of health risk and other factors. Adverse environmental impacts will be thoroughly investigated and evaluated.

7.2 INFORMATION REQUIREMENTS

After the data have been collected, they must be organized to allow for: (1) an assessment of the type and potential hazard of the waste; (2) an assessment of the mechanisms and rates by which hazardous constituents may migrate offsite; (3) an identification of receptors that may be affected by those constituents; and, (4) a determination of the severity of the potential effects. The following discussion describes considerations within these categories.

Waste Characteristics - This category considers the waste's environmental mobility, persistence, and adverse effects. These considerations are:

- Toxicity
- Persistence
- Ignitability
- Reactivity
- Corrosivity
- Solubility
- Volatility
- Physical state

Solubility, volatility, and physical state measure the extent to which mobile wastes can leave a site. Toxicity and persistence assess potential to cause health-related injuries. Ignitability, reactivity, and corrosivity evaluate the possibility of fire, explosion, or similar emergencies.

Site Characteristics - The site characteristics category considers the physical conditions of the site that may contribute to the potential for offsite migration. These considerations are:

- Climate
- Past site uses
- Existing site uses
- Drainage characteristics
- Surficial soil characteristics
- Slope
- Vegetative pattern
- Ecological system
- Waste containment

These data are useful in assessing the potential for contaminants to exit the site via any available pathways.

Pathways - This category considers the potential for migration and attenuation of contaminants. The items considered are:

- Levels of contamination
- Type of contamination
- Distance to nearest surface water body
- Depth to groundwater and vertical and horizontal permeability
- Net precipitation
- Groundwater flow rate and direction
- Food chain
- Air quality

Distance to the nearest surface water and depth to groundwater measure the availability of pollutant migration routes. Soil permeability, mineralogy, thickness, etc., measure the potential for contaminant attenuation and ease of migration. Net precipitation uses annual precipitation and evapotranspiration to estimate the amount of leachate a site produces. Evidence of contamination, type of contamination, and level of contamination evaluate pollution currently apparent at the site.

Receptors - This category considers the proximity of human populations and critical environments, the types of water uses within the area, and the potential for further growth. The considerations in this category are:

- Population within proximity of site
- Distance and direction to drinking water wells
- Distance to offsite buildings
- Land use, current and anticipated
- Critical environments

Residential population and distance to the nearest offsite building measure the potential for human exposure. Distance to the nearest drinking water well measures the potential for human ingestion of contaminants, should underlying aquifers be polluted. Land use evaluates the current and anticipated uses of the surrounding area. The critical environments determines the potential for adversely affecting important biological resources and fragile natural settings.

Soils, surface water, groundwater, air, biota, and demographic information to be used in the EA will be obtained in the Remedial Investigation described in Section 4.0. A principal objective of the investigation is to obtain sufficient primary data on which the EA will be based. Throughout the field (and laboratory) investigation, the data for each environmental medium will be reviewed to determine whether suitable and sufficient data have been collected to allow a thorough endangerment assessment.

7.3 RISK ASSESSMENT PROCEDURES

After organization of the site data into manageable environmental categories, a determination of the potential environmental risks associated with the site will be made. This involves the application of certain techniques to estimate the leachate generation rate, the ability of the groundwater and surface water to conduct contaminants, and the potential for exposure of humans or environmental resources to the contaminants.

The hazard potential of the waste source is determined by the toxicity associated with the chemicals and the potential for leachate generation and migration. The toxicity associated with the contaminants will be assessed by comparing the RI analytical results to certain water quality and health criteria, including:

1. NYDEC Groundwater Standards
2. Clean Water Act priority pollutant standards
3. Safe Drinking Water Act standards
4. Applicable literature on toxicology and public health data for specific chemicals
5. Short- and long-term toxicity data and bio-accumulation data
7. Multimedia environmental goals (MEGs) as defined by the EPA for short-term exposures of human population or biota
8. Health Advisories - EPA guidelines on anticipated impact of some synthetic organic compounds

Migration potential is determined by evaluating the magnitude of any containment source, the chemical's characteristics, and the degree of contact between the waste source and the migration pathway.

7.4 ENDANGERMENT ASSESSMENT PROCEDURES

7.4.1 Contaminant Identification

The level of risk associated with residual contamination at any given site is a function of the chemical present, the magnitude of human or environmental exposure likely to occur, and the nature of the population that will be exposed. In establishing the level of risk that is associated with the contamination, it is not necessary or practical to assess the risk associated with every chemical present at a waste site.

Rather, it is appropriate to select several chemicals as indicators of the overall risk associated with the contamination. Therefore, the first step in the risk assessment process is to select indicator chemicals based on the data developed in the remedial investigation.

For sites with more than 10 to 15 chemicals, the present EPA assessment guidelines allow for the selection of key "indicator chemicals" that represent the highest potential risk based on amounts, inherent toxicity, mobility, etc. Since the risk to public health is a function of the degree of exposure, the chemicals best suited to be selected as indicators at any site are those that are the most toxic and those likely to escape and persist in the environment and result in human exposure. For the GI project, compounds that are transported in groundwater will be given careful attention. An initial list of five to ten indicator chemicals will be developed, based on a ranking according to measured site concentrations and available toxicity data. Final selection will be based primarily on the properties of individual compounds as they relate to human exposure potential. Those chemicals with the highest exposure potential will be included in the final list. A maximum of five indicator chemicals is proposed for the GI project. Only those chemicals known to occur on the GI Site will be included in the final list.

7.4.2 Exposure Assessment

Potential exposures to the indicator chemicals will be evaluated for a given residual level of contamination, based on an evaluation of the pathways of exposure and other factors. These exposures will be assessed in terms of potential dose to the exposed population. Based on the potential dose, the nature of the exposed population, and the toxicity of the indicator chemical, an assessment of health risk posed by a given level of residual contamination will be made. Because there are no surface waters near the GI Site and because the area above the former leaking underground storage tank location is covered with an impervious parking surface, groundwater is the primary medium of migration of contaminants from the site. Accordingly, the endangerment assessment will concentrate on the fate and transport of contaminants in the groundwater and the public health risks associated with exposure to the groundwater.

The exposure assessment will include identification of site characteristics, exposure pathways, exposure point concentrations, and human receptors. Characterization of the GI Site will establish the physical conditions of the site that may contribute to the potential for offsite migration. Data on site characterization will include.

- Climate
- Past site uses
- Existing site uses
- Drainage characteristics
- Slope
- Waste containment

Analysis of exposure pathways will focus on the potential for offsite migration and attenuation of contaminants at the GI Site. Data for this aspect of the endangerment assessment will include:

- Type of contamination
- Level of contamination
- Soil characteristics
- Depth to groundwater and vertical and horizontal permeability
- Groundwater flow rate and direction
- Precipitation

Data on soil characteristics will provide an estimate of the potential for offsite migration routes. Precipitation data will be used to estimate to the amount of leachate produced at the GI Site.

In order to evaluate the potential human health risk associated with a no-action or baseline situation, it is necessary to estimate the concentration of the indicator chemicals at one or more human exposure points. For this project, exposure points will be groundwater wells. Concentrations of contaminants at exposure points will be estimated using models to quantify the amount of indicator chemicals that will be released into the groundwater pathway and to predict their fate and transport through the groundwater.

For the GI project, identification of human receptors will consider the proximity of human populations and critical environments, the types of water uses within the area, and the potential for growth. Data on human receptors will include:

- Population within reasonable proximity of the site
- Distance and direction to groundwater wells
- Land use

Land Use and Demographics

Land use and demographic data will be collected in order to measure the impact or level of risk associated with the GI Site. The inventory of existing land uses will be documented using information provided by the municipal comprehensive management plan and similar sources of information provided by the Town of Hicksville. Aerial photos and site reconnaissance will also be utilized as part of the data collection process. Residential, commercial, and industrial uses in the area will be identified. The report will pay particular attention to recreation areas, schools, hospitals, and other facilities that contain concentrations of persons who can be considered sensitive to contamination because of age or health conditions. Information on these facilities will include the number of users and seasonal variations in this number, if any. Existing data on anticipated future land use changes and development proposals will also be collected from the municipal and county planning authorities.

Demographic data will be collected primarily from the U.S. Census Bureau (1980 Census). Such data will be collected for the municipality and census tracts included within the study area. The data will describe the local demographic conditions in terms of population, housing, and income. Population data will focus on the age and sex distribution, and the total number of sensitive receptors. Housing data will focus on total number of units, ownership status, and vacancy rates. Income data will focus on income distribution, per capita income, and poverty levels. Estimates for more recent years (1980 to 1987) and future projections will be collected from the appropriate county and municipal agencies. A summary and analysis of all land use and demographic data will be included in the Phase 1 interim status report (see Section 4.2.10) and in the Final RI report (see Section 9.0).

7.4.3 Toxicity Assessment

A detailed profile will be developed for each of the indicator compounds. Characteristics of the compounds will include:

- Toxicity
- Persistence
- Ignitability
- Reactivity
- Corrosivity
- Solubility
- Volatility
- Physical State

Through use of the EPA guidance documents and direct consultation with the EPA Criteria and Assessment Office, BCM will obtain acceptable daily intake or reference dose information to evaluate chronic exposure risks. The toxicity information will be combined with the potential human intake levels to characterize risk.

7.4.4 Risk Characterization

Using the guidance in the EPA Superfund Public Health Evaluation Manual (EPA, 1986), BCM will calculate hazard indexes for noncarcinogenic and potential carcinogenic indicator chemicals. For noncarcinogenics, the index is a ratio of exposure point concentrations to acceptable intake levels. For potential carcinogenics, the total risk is a multiplication of exposure concentrations by the potency factor or unit risk.

All estimated risk values from exposure to noncarcinogenics and potential carcinogenics will be summarized in clear, concise tables. All applicable standards and criteria available for those chemicals will also be shown in the summary table. For noncarcinogenics, those pathways that yield values above an acceptable daily intake or EPA-verified reference doses will be clearly noted. Likewise for carcinogenics, any results that exceed the 10^{-4} and 10^{-8} cancer risks will be noted. A discussion will be prepared to summarize the risk assessment process that will provide GI's site managers and agency reviewers with a clear understanding of the health risks associated with the site. All assumptions and areas of uncertainty in the risk evaluation will be fully described.

In addition to the public health risk assessment, a summary of public welfare impacts will be prepared. A qualitative evaluation will be made, which will describe existing and proposed land use and development potential in the area surrounding the site.

8.0 BENCH AND PILOT STUDIES

8.1 GENERAL

Bench and pilot studies may be needed to obtain sufficient data to evaluate remedial alternatives and/or provide information for the design and construction of a selected alternative.

Bench and/or pilot studies are included within this work plan. They will be implemented should remedial investigation findings, remedial alternative evaluations, and/or design requirements indicate that treatment is a necessary and feasible option. Studies may also be implemented to test the compatibility and/or stability of wastes with construction materials.

Bench and pilot scale studies can be triggered during the Remedial Investigation, the Feasibility Study, or remedial design tanks. The triggering mechanism would be analysis of RI data (Section 5.0). Tasks 3 through 5 of the FS (Section 10.2) could each trigger the studies. Implementation of pilot studies would most likely be required during the remedial design tasks to be completed after the FS. The scope for such a test would be provided in Task 6 of the Feasibility Study (Section 10.2).

8.2 BENCH STUDIES

Bench studies will be used (if necessary) for materials testing and to evaluate the treatability of a waste material, contaminated soil, or water. Their purpose is to determine the feasibility of remedial alternatives (biological, chemical, or physical) and/or the impacts of wastes or contaminated soil on construction materials (e.g., impact of waste on a liner).

When possible, results of such studies conducted elsewhere will be used in lieu of a bench test. It is recognized, however, that wastes and site conditions vary considerably, and that there are risks associated with using information gained from other sites.

Should a bench study(s) be triggered, a set of objectives and a detailed scope of study will be developed. Data will be reviewed during the entire course of the test. Findings will be summarized and conclusions developed at the completion of the study.

8.3 PILOT STUDIES

Pilot studies generally specify design and operating criteria for the full-scale application after a remedial alternative has been selected.

Prior to initiation of a pilot study, a set of objectives and a detailed scope of study will be prepared. Because full-scale operating conditions are to be simulated, pilot systems require the use of actual construction materials and are operated over relatively long time periods. Tests will be continuously evaluated and modifications will be made as appropriate. Data obtained from the pilot studies will then be used to design the remedial actions. As there are high cost and time requirements for such studies, it may be more effective to extrapolate data from bench studies.

9.0 REMEDIAL INVESTIGATION REPORT

9.1 GENERAL

The Remedial Investigation Report will be prepared at the end of the Remedial Investigation. The report will summarize the methods, findings, and conclusions of the RI, and will indicate the objectives of the Feasibility Study.

9.2 REPORT FORMAT

Executive Summary

1.0 Background Information

- Location
- Historical description
- Physiography
- Assessment of environmental conditions
- Objectives

2.0 Environmental Setting

3.0 Waste Characterization

4.0 Soils Investigation

5.0 Hydrogeologic Investigation

6.0 Bench and Pilot Studies

7.0 Environmental Fate and Transport

8.0 Endangerment Assessment*

- Potential receptors
- Health impacts
- Environmental impacts

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* This item will be prepared as a separate report, which will be summarized within the RI Report.

9.0 Summary of Findings and Conclusions

- Conclusions
- Recommendations for FS
- Recommendations for Additional Studies
- References
- Appendices

Note: A Feasibility Study (FS) Work Plan will be developed as part of the final RI Report.

10.0 FEASIBILITY STUDY

10.1 PURPOSE

The purpose of the FS is to develop, evaluate, and select alternatives to remediate the existing and potential impacts resulting from waste management activities. The FS report will serve as the basis for the FS. The FS will serve as a preliminary engineering study to evaluate and select the remedial alternatives for the study area.

10.2 SCOPE

The FS will consist of seven tasks:

Task 1	Description of the Proposed Responses
Task 2	Preliminary Remedial Technologies
Task 3	Development of Alternatives
Task 4	Initial Screening of Alternatives
Task 5	Evaluation of Alternatives
Task 6	Report
Task 7	Additional Requirements

An FS Work Plan detailing the technical approach, project management, and schedule will be completed simultaneously with the RI Report.

10.2.1 Task 1 - Description of the Proposed Responses

Study area background information, and a summary of the RI findings and conclusions, will be prepared. A statement of purpose and objectives, and a detailed FS scope of work, will be developed in response to the RI's findings and conclusions.

10.2.2 Task 2 - Preliminary Remedial Technologies

Based on the RI findings and conclusions, and the statement of purpose established in Task 1, a master list of potentially feasible remediation technologies will be prepared. The master list will include both onsite and offsite technologies. The master list will then be screened to select remedial technologies suitable for sites within the study area.

10.2.3 Task 3 - Development of Alternatives

Preliminary remedial alternatives for management of specific areas within the site (including exposure routes, if necessary) will be developed utilizing the selected remedial technologies, and considering two perspectives: 1) the study area objective for remedial management; and, 2) specific objectives for individual sites within the study area. The alternatives will address the following general criteria:

- Public health and environmental concerns
- Findings and conclusions of the RI Study
- Applicable federal and state standards, guidance, and advisories

Alternative selection will include, as appropriate:

- Offsite treatment and disposal
- Alternatives that meet applicable standards and criteria
- Alternatives that exceed applicable standards or criteria
- Alternatives that do not achieve relevant standards or criteria, but will provide suitable levels of environmental protection
- No Action

10.2.4 Task 4 - Initial Screening of Alternatives

The alternatives developed in Task 3 will be screened to eliminate those that are infeasible or inappropriate based on five screening criteria. The criteria are:

- Environmental protection
- Environmental effects of the remedy
- Technical feasibility
- Cost
- Consistency with other site-specific remediation alternatives

Should it become apparent during the course of completing this task, or at any point in the FS, that additional site-specific data are required to screen or evaluate alternatives (e.g., specific location foundation characteristics), the data will be obtained in the most rapid and efficient manner possible. The goal will be to obtain this information without delaying progress of the FS.

10.2.5 Task 5 - Evaluation of Alternatives

A detailed analysis of the alternatives passing the Task 4 initial screening will be conducted. The detailed analysis will further consider, at a minimum:

- Technical considerations (feasibility, safety, etc.)
- Environmental impact
- Public health concerns
- Institutional issues
- Cost
- Regulatory requirements and guidance
- Consistency with other site-specific remediation alternatives

In addition, each alternative will be ranked based on the above-mentioned criteria, and compared to the other alternatives.

10.2.6 Task 6 - Report

A report will be prepared presenting the results of the FS. In addition to the main text of the remedial management plan, a preliminary engineering concept of all management program components will be provided.

10.2.7 Task 7 - Additional Requirements

The additional tasks required to implement the remedial management plan, such as post-closure plans, compliance schedules, and long-term monitoring, will be provided.

REFERENCES

Isbister, John, 1966, Geology and Hydrogeology of Northwestern Nassau County, Long Island, New York. Geologic Survey Water-Supply Paper 1825, United States Government Printing Office.

Lusczynski, N.J., 1949, Levittown Pumping Test, September 16-18, 1949; U.S. Geologic Survey Open-file report.

Schwille, F., 1981, Groundwater Pollution in Porous Media by Fluids Immiscible with Water. The Science of the Total Environment, Vol. 21, pp. 173-185.

U.S. Environmental Protection Agency (EPA), 1986, Superfund Public Health Evaluation Manual. Office of Solid Waste and Emergency Response Directive 9285.4-1, EPA 54011-86/060.

APPENDIX A

WELL LOGS

BCM **WELL DRILLING LOG**			
		WELL NO:	W-3-72
		SHEET	1 OF: 3
PROJECT:	General Instrument	PROJECT NO:	00-5258-12
WELL LOCATION:	Upgradient	DATE(S) DRILLED	5/27/86
DRILLING CONTRACTOR:	Empire Soils Investigations	DRILLING METHOD	Mud Rotary
BORING DIAMETER:	8" SAMPLING METHOD:	SAMPLE INTERVAL:	5'
LOGGED BY:	Julie Newman	TOTAL DEPTH:	72.5'
SCREEN SIZE AND MATERIAL:	PVC, 4" ID, 0.02" slots	SCREENED INTERVAL:	62-72
CASING SIZE AND MATERIAL:	PVC, 4" ID, flush joint	CASED INTERVAL:	0-62
GRAVEL PACK SIZE:	Special packed sand, Grade 2	PACKED INTERVAL:	72.5-55.5
GROUT TYPE:	Portland Cement + 10% Bentonite	GROUTED INTERVAL:	0-53.5
GROUTING METHOD:	Tremie	BENTONITE SEAL:	53.5-55.5
DEVELOPMENT METHOD:	Compressed Air TIME: 1 hr.	ESTIMATED YIELD:	
STATIC WATER DEPTH:	64.0 DATE: 6/2/86	REFERENCE:	Ground Level

REMARKS:

LITHOLOGIC INTERVAL	SAMPLE INTERVAL	SPOON BLOWS	RECOVERY (IN.)	CLASSIFICATION OF MATERIALS
0-9	5-7	17-36-97-100/5	11	SAND, coarse and very coarse, some gravel and cobbles to 1" diameter, light brown.
9-19	10-12	7-18-23-34	5	SAND, medium, little fine, coarsening down, trace gravel, light brown.
	15-17	12-12-23-17	5	laminated, light brown and orange-brown; cobble (3/4" diameter) at 16'.
			19	Driller reports gravel and cobbles.
19-24	20-23	19-11-15-56	Wash	COBBLES, GRAVEL AND SAND, cobbles rounded, gravel and sand.

WELL NO. W-3 -72 SHEET 2 OF: 3

LITHOLOGIC INTERVAL	SAMPLE INTERVAL	SPOON BLOWS	RECOVERY (in.)	CLASSIFICATION
24-55				24' Driller reports sand.
	25-27	22-29-53-70	wash	SAND, medium and coarse, very poorly sorted; trace fine, little very coarse, trace very coarse. Light brown. Cobble (1")
	27-29	20-34-40-30	wash	
	30-32	7-18-23-24	3"	
	35-37	14-22-26-25	2"	coarse and very coarse. Trace silt.
	40-42	16-24-49-38	2"	cobbles to 2" diameter in cuttings.
	45-47	19-26-40-38	2"	
55-75	55-57	12-12-29-46	3"	SAND, coarse, some very coarse, trace medium. Very light brown. Cobble (1").
	60-62	100/.4 +	8"	No cobbles, wet, light brown. 61.8'- GRAVEL, rounded, some sand, coarse and very coarse, trace medium. Angular.
	65-67	14-12-11-23	wash	
	67-69	13-27-18-21	3"	little medium
	70-72	18-81-58-51	3"	trace fine
75-80	75-77	26-41-27-28	2"	SAND, medium and coarse, trace very coarse, trace-little fine. Light brown. Trace fine black sand.
80-105	80-82	12-30-28-40	5"	SAND, medium and fine, trace silt. Green-gray. Mica-rich. Pockets of fine black sand (1 mm diameter) not continuous across spoon.
	85-87	10-23-46-18	wash	
	90-92	34-30-43-42	5"	same as above decreasing fine, dark gray with black. Angular. Little mica.
	95-97	26-35-33-50	6"	same as above increasing silt. Gray-green and black laminated. Black layers are 1-3 mm thick.
	100-102	14-22-30-34	11"	same as above little fine. Green-gray and black not laminated. Trace gravel. Angular.
				gravel layer at 101.9'.

WELL NO. W-3 -72 SHEET 3 OF: 3

LITHOLOGIC INTERVAL	SAMPLE INTERVAL	SPOON BLOWS	RECOVERY (in.)	CLASSIFICATION
105-111.9	105-107	27-32-34-100/5	13"	SAND, coarse, little medium, trace very coarse. 2" gravel layer (with sand) at 106.2'. Trace fine black sand.
	110-112		15"	2" gravel layer at 111.7'.
111.9-115				SAND, medium, little fine, little silt. Dark gray-green.
115-	115-117	47/6, 100/1	5"	SAND, medium and fine, little silt. Light Brown. Cobble 2" diameter at 117'.

BCM

WELL DRILLING LOG

WELL NO:	W-3-112	**SHEET**	1 **OF:** 3
PROJECT:	General Instrument	**PROJECT NO:**	00-5366-12
WELL LOCATION:	Upgradient	**DATE(S) DRILLED**	5/20 - 5/23
DRILLING CONTRACTOR:	Empire Soils Investigations	**DRILLING METHOD**	Mud Rotary
BORING DIAMETER:	8" **SAMPLING METHOD:** Split Spoon	**SAMPLE INTERVAL:**	5'
LOGGED BY:	Julie Newman	**TOTAL DEPTH:**	113 1/2
SCREEN SIZE AND MATERIAL:	PVC, 4" ID, 0.02" slots,	**SCREENED INTERVAL:**	102-112
CASING SIZE AND MATERIAL:	PVC, 4" ID Flush Joint	**CASED INTERVAL:**	0 - 102
GRAVEL PACK SIZE:	Special Packed Sand Grade 2	**PACKED INTERVAL:**	99.5 - 113.5
GROUT TYPE:	Portland Cement + 10% Bentonite	**GROUTED INTERVAL:**	0 - 97.5
GROUTING METHOD:	Tremie	**BENTONITE SEAL:**	99.5 - 97.5
DEVELOPMENT METHOD:	Compressed Air **TIME:** 45 min.	**ESTIMATED YIELD:**	
STATIC WATER DEPTH:	64.1 **DATE:** 6/2/86	**REFERENCE:**	Ground Level

REMARKS: By 20' - 10 bags of bentonite were used, approximately 1,000 gallons mud. Quick Gel used from 25' to end.

LITHOLOGIC INTERVAL	SAMPLE INTERVAL	SPOON BLOWS	RECOVERY (IN.)	CLASSIFICATION OF MATERIALS
0-9	5-7	17-36-97-100/5	11	SAND, coarse and very coarse, some gravel and cobbles to 1" diameter, light brown.
9-19	10-12	7-18-23-34	5	SAND, medium, little fine, coarsening down, trace gravel, light brown.
	15-17	12-12-23-17	5	laminated, light brown and orange-brown; cobble (3/4" diameter) at 16'.
			19	Driller reports gravel and cobbles.
19-24	20-23	19-11-15-56	Wash	COBBLES, GRAVEL AND SAND, cobbles rounded, gravel and sand.

WELL NO. W-3 SHEET 2 OF: 3

LITHOLOGIC INTERVAL	SAMPLE INTERVAL	SPOON BLOWS	RECOVERY (in.)	CLASSIFICATION
24-55				24' Driller reports sand.
	25-27 27-29 30-32	22-29-53-70 20-34-40-30 7-18-23-24	wash wash 3"	SAND, medium and coarse, very poorly sorted; trace fine, little very coarse, trace very coarse. Light brown. Cobble (1")
	35-37	14-22-26-25	2"	coarse and very coarse. Trace silt.
	40-42	16-24-49-38	2"	cobbles to 2" diameter in cuttings.
	45-47	19-26-40-38	2"	
55-75	55-57	12-12-29-46	3"	SAND, coarse, some very coarse, trace medium. Very light brown. Cobble (1").
	60-62	100/.4 +	8"	No cobbles, wet, light brown. 61.8'- GRAVEL, rounded, some sand, coarse and very coarse, trace medium. Angular.
	65-67	14-12-11-23	wash	
	67-69	13-27-18-21	3"	little medium
	70-72	18-81-58-51	3"	trace fine
75-80	75-77	26-41-27-28	2"	SAND, medium and coarse, trace very coarse, trace-little fine. Light brown. Trace fine black sand.
80-105	80-82	12-30-28-40	5"	SAND, medium and fine, trace silt. Green-gray. Mica-rich. Pockets of fine black sand (1 mm diameter) not continuous across spoon.
	85-67 90-92	10-23-46-18 34-30-43-42	wash 5"	same as above decreasing fine, dark gray with black. Angular. Little mica.
	95-97	26-35-33-50	6"	same as above increasing silt. Gray-green and black laminated. Black layers are 1-3 mm thick.
	100-102	14-22-30-34	11"	same as above little fine. Green-gray and black not laminated. Trace gravel. Angular. gravel layer at 101.9'.

WELL NO. W-3 SHEET 3 OF: 3

LITHOLOGIC INTERVAL	SAMPLE INTERVAL	SPOON BLOWS	RECOVERY (in.)	CLASSIFICATION
105-111.9	105-107	27-32-64-100/5	13"	SAND, coarse, little medium, trace very coarse. 2" gravel layer (with sand) at 106.2'. Trace fine black sand.
	110-112		15"	2" gravel layer at 111.7'.
111.9-115				SAND, medium, little fine, little silt. Dark gray-green.
115-	115-117	47/6, 100/1	5"	SAND, medium and fine, little silt. Light Brown. Cobble 2" diameter at 117'.

BCM

WELL DRILLING LOG

WELL NO:	W-5-78
SHEET	1 OF: 2

PROJECT:	General Instrument	PROJECT NO:	00-5268-12
WELL LOCATION:	Downgradient	DATE(S) DRILLED	~~5/28/86~~ 5/29/86
DRILLING CONTRACTOR:	Empire	DRILLING METHOD	Mud Rotary
BORING DIAMETER: 8"	SAMPLING METHOD: Split Spoon	SAMPLE INTERVAL:	10' to 50', 5' to 7
LOGGED BY:	Julie Newman	TOTAL DEPTH:	78.5
SCREEN SIZE AND MATERIAL:	PVC, 4" ID, 0.02 slots	SCREENED INTERVAL:	68-78
CASING SIZE AND MATERIAL:	PVC, 4" ID, flush joint	CASED INTERVAL:	0-68
GRAVEL PACK SIZE:	Special sorted sand. Grade 2.	PACKED INTERVAL:	64-78.5
GROUT TYPE:	Portland Cement and 10% Bentonite	GROUTED INTERVAL:	0-61.5
GROUTING METHOD:	Tremie	BENTONITE SEAL:	61.5-64
DEVELOPMENT METHOD:	Compressed Air TIME: 35 min.	ESTIMATED YIELD:	

STATIC WATER DEPTH: 62.6'	DATE: 6/2/86	REFERENCE: Ground Level

REMARKS: All TIP readings over sampling split spoons = 0 ppm.

LITHOLOGIC INTERVAL	SAMPLE INTERVAL	SPOON BLOWS	RECOVERY (IN.)	CLASSIFICATION OF MATERIALS
0-21.5	10-12 20-22	7-35-38-40 3-10-15-26	8 7	SAND, coarse, trace very coarse, little medium, little gravel. Brown.
21.5-30				GRAVEL, COBBLES and SAND, coarse and very coarse. Brown.
30-55	30-32	9-37-25-42	4	SAND, coarse and very coarse, little gravel, trace medium. Brown. Cobble (1-1/2") at 31.8'. Trace medium black grains. Tip over hole during drilling at 35'-0 ppm.

WELL NO. W-5-78 SHEET 2 OF: 2

LITHOLOGIC INTERVAL	SAMPLE INTERVAL	SPOON BLOWS	RECOVERY (in.)	CLASSIFICATION
				Tip over hole during drilling at 40'-0 ppm.
	40-42	13-22-51-57	7	Decreasing very coarse and gravel till 41.9'. Coarsens at 41.9'.
				Tip over hole during drilling at 50'-0 ppm.
	50-52	22-17-24-31	4	Iron staining. No gravel, trace very coarse.
				Tip over hole during drilling at 55'-0 ppm.
55-70	55-57	17-18-21-22	8"	SAND, medium, little coarse, little fine, trace silt. Light brown. Iron staining.
	60-62	12-14-22-30		Some coarse. Trace fine black grains. Wet at 61.9'. Tip over hole during drilling at 60'-0 ppm. Tip over hole during drilling at 65'-0 ppm.
	65-67	14-18-24	3	Trace coarse, some fine, trace gravel. Very light brown. Wet.
				Tip over hole during drilling at 70 0 ppm.
70-75	70-72	15-12-17-10	10	SAND, poorly sorted. Medium and coarse, some fine, some very coarse, trace gravel, trace silt. Trace fine black grains. Light brown. Cobble at 71.5 (3/4").
75'	75-77	15-16-14-13		SAND, medium, little fine, trace fine black grains. Trace very coarse at 77'. Trace silt.

BCM

WELL DRILLING LOG

WELL NO:	W-6-79
SHEET	1 OF: 2
PROJECT: General Instrument	PROJECT NO: 00-5268-12
WELL LOCATION: Downgradient (south central portion of site)	DATE(S) DRILLED: 5/30/86 6/2/86
DRILLING CONTRACTOR: Empire Soils Investigations	DRILLING METHOD: Mud Rotary 10' to 50'
BORING DIAMETER: 8" — SAMPLING METHOD: Split Spoon	SAMPLE INTERVAL: 5' to 75'
LOGGED BY: Julie Newman	TOTAL DEPTH: 79
SCREEN SIZE AND MATERIAL: PVC, 4" I.D. 0.02 slots	SCREENED INTERVAL: 69-79
CASING SIZE AND MATERIAL: PVC, 4" I.D., Flush Joint	CASED INTERVAL: 0-69
GRAVEL PACK SIZE: Grade 2	PACKED INTERVAL: 67-79
GROUT TYPE: Portland & Saylors Type 1 Cement + 10% Bentonite	GROUTED INTERVAL: 0-65
GROUTING METHOD: Tremie	BENTONITE SEAL: 65-67
DEVELOPMENT METHOD: Compressed Air — TIME: 45 min.	ESTIMATED YIELD: 3-5 gpm
STATIC WATER DEPTH: 62.6 — DATE: 6/3/86	REFERENCE: Ground Level

REMARKS: Development water had a chemical order and an orange color.

TIP readings over spoon: 70-72' - 2 ppm; 75-77-3 ppm

LITHOLOGIC INTERVAL	SAMPLE INTERVAL	SPOON BLOWS	RECOVERY (IN.)	CLASSIFICATION OF MATERIALS
				Tip over hole during drilling at 5' - 0 ppm
0-20	10-12	15-24-35-38	11	SAND, coarse and very coarse, little gravel. Brown. Cobbles at 11.2' and 11.8'.
				Tip over hole during drilling at 20' - 0 ppm
20-30	20-22	34-35-29-38	6"	SAND, GRAVEL and COBBLES, sand, coarse and very coarse, brown.
30-50	30-32	12-22-19-25	8"	SAND, coarse and very coarse, little gravel, trace medium. Brown. Trace medium black grains. Cobble at 31.6'.
				Tip over hole during drilling at 33'. 0 ppm. Tip over hole during drilling at 40'. 0 ppm.

WELL NO. W-6-79

SHEET 2 OF: 3

LITHOLOGIC INTERVAL	SAMPLE INTERVAL	SPOON BLOWS	RECOVERY (in.)	CLASSIFICATION
	40-42	11-21-27-32	13	No gravel. Coarsening at 41.7', little gravel. Cobble at 41.7'.
				TIP over hole during drilling at 50' - 0 ppm.
50-53	50-52	31-65-60-26	5	SAND, medium, trace fine. Brown. Gravel at 51.9. Wet at 51.9'.
53-55				CLAY, light orange brown.
55-65	55-57	13-28-35-45	9	SAND, medium and fine, trace silt, very light brown. Orange-brown laminations (2 mm).
				Clay layer at 59 (?).
	60-62	9-18-10-9	5	Wet.
65-70	65-67	16-25-24	10	SAND, fine, little silt. Light brown. Wet.
70-	70-72 75-77	27-27-32-37 14-15-18-15	7 5	SAND, medium, trace fine. Brown. Trace fine black grains. Trace mica. Wet.

BCM

APPENDIX B

QUALITY ASSURANCE/QUALITY CONTROL PLAN

REMEDIAL INVESTIGATION/FEASIBILITY STUDY

CONTENTS

CONTENTS (Continued)

CONTENTS (Continued)

FOREWORD

The Quality Assurance/Quality Control (QA/QC) Plan developed herein for the Remedial Investigation/Feasibility Study (RI/FS) for General Instrument Corporation, Hicksville, New York, is based on information contained in the RI/FS Work Plan and on anticipated conditions at the site as noted in Sections 1.2 and 1.3 of the Work Plan.

As the Site Operation Plan is developed and as field conditions warrant, this QA/QC Plan will be amended to reflect site-specific procedures.

This QA/QC Plan is developed specifically for the General Instrument site and is prepared to conform to the U.S. Environmental Protection Agency (USEPA) Guidance Documents OWRS QA-1 and QAMS 005/80, which establish guidelines and specifications for preparation of QA Project Plans.

1.0 PROJECT NAME: General Instrument
Hicksville, New York

2.0 PROJECT REQUESTED BY: General Instrument in accordance with New York Division of Environmental Conservation (NYDEC)

3.0 DATE OF REQUEST: April 1986

4.0 DATE OF PROJECT INITIATION: Upon approval by General Instrument (GI)

5.0 PROJECT OFFICERS:

General Instrument Project Manager: Charles Gorsch
BCM Project Manager: John W. Fowler
BCM Field Investigation Coordinator: Jason M. Schindler

6.0 QUALITY ASSURANCE OFFICER: Atwood F. Davis

7.0 PROJECT DESCRIPTION AND GENERAL QA/QC

The project consists of a Remedial Investigation and Feasibility Study (RI/FS) consistent with the National Oil and Hazardous Substances Contingency Plan 40CFR300 (NCP) for General Instruments, Hicksville, New York.

The overall objectives of the RI are to:

- Identify and characterize the extent of soil and groundwater contamination at the GI site.
- Identify population and other environmental components possibly at risk.
- Assess exposure routes to plant, animal, and human populations.
- Obtain data for the development and evaluation of remedial action alternatives.

FS objectives are to:

- Identify general response actions.
- Identify and screen technologies and develop remedial alternatives utilizing information generated in the RI.
- Screen and evaluate remediation alternatives based on public health, environmental, cost, and other factors.
- Prepare the remedial management plan containing the selected set of site-specific remediation alternatives.

The Work Plan that has been prepared for the project describes specific tasks to be conducted as necessary, including:

Phase 1

Task 1 - Regional Hydrogeologic Data Collection and Review
Task 2 - Investigation of Site Setting
Task 3 - Site Topographic Mapping
Task 4 - Deep Soil Boring and Sampling Program
Task 5 - Water Table Monitoring Wells
Task 6 - Shallow Soil Sampling Program
Task 7 - Groundwater Sampling
Task 8 - Continuous Water Level Monitoring
Task 9 - Data Interpretation
Task 10 - Phase 1 Interim Status Report

Phase 2

Task 11 - Additional Soil Sampling
Task 12 - Additional Groundwater Monitoring Wells
Task 13 - Well Clusters
Task 14 - Phase 2 Groundwater Sampling
Task 15 - Data Interpretation
Task 16 - Phase 2 Interim Status Report

Phase 3

Task 17 - Additional Well Clusters
Task 18 - Groundwater Sampling
Task 19 - Data Interpretation
Task 20 - Phase 3 Interim Status Report

7.1. Intended Data Use

Data will be used to define the nature, degree, and extent of study area contamination. Data to be collected will consist of soil samples, groundwater samples, and hydrogeological data.

7.2 Sampling Network and Design Rationale

Sampling plans have been developed that address potential contamination at the site. As noted above, a variety of sample types will be collected. These will be analyzed for the Target Compound List and other parameters as applicable. Rationale for sampling is presented within each sampling plan. In general, however, the sampling plans are based on:

1. Topography and likely places for elevated contaminant concentration or migration
2. Groundwater hydrology and groundwater remedial action
3. Site history and location of site-specific areas of concern
4. Data needs in development of an assessment of risk that the study area may pose to human health and the environment

Location of specific sampling points will be surveyed and illustrated on a photogrammetrically generated topographic map.

7.3 Sampling Locations, Number of Samples, and Frequency of Collection

7.3.1 Site Characterization and Monitoring Program

The site characterization consists of three parts:

1. Part I - Planning project scope
2. Part II - Field Investigation
3. Part III - Feasibility Study

The RI/FS describes the project scope in detail;

7.3.2 Soil Sampling

Specifics of the program and sampling locations are discussed in Section 4.0 of the Work Plan.

7.3.3 Groundwater Sampling

Specifics of the program and sampling locations are discussed in Section 4.0 of the Work Plan.

7.4 Analytical Parameters for Water and Soil

The following table summarizes the parameters to be analyzed for the remedial investigation.

> Samples will be analyzed as indicated in Section 4.0 of the Work Plan for the Superfund Amendment Reauthorization Act (SARA) Contract Laboratory Program Targeted Compound List (CLP/TCL) for volatile and semivolatile organic constituents +40 (Tables 2 and 3) by GC/MS.

Additional parameters include (by matrix):

Priority Pollutant Metals
Total Recoverable Phenols
Total Dissolved Solids

TABLE 1

PRIORITY POLLUTANT INORGANICS
(METALS)

Elements	CLP Required Detection Level[1,2] (ug/l)
1. Antimony	60
2. Arsenic	10
3. Beryllium	5
4. Cadmium	5
5. Chromium	10
6. Copper	25
7. Lead	5
8. Mercury	0.2
9. Nickel	40
10. Selenium	5
11. Silver	10
12. Thallium	10
13. Zinc	20

Source: SARA CLP Invitation For Bid WA85-J838 (BCM Project No. 00-5268-12)

TABLE 2

CLP/TCL ORGANICS

	Volatiles	CLP Detection Limits[1] [2]	
		Low Water[3] ug/l	Low Soil/Sediment[4,5] ug/kg
1.	Chloromethane	10	10
2.	Bromomethane	10	10
3.	Vinyl Chloride	10	10
4.	Chloroethane	10	10
5.	Methylene Chloride	5	5
6.	Acetone	10	10
7.	Carbon Disulfide	5	5
8.	1,1-Dichloroethene	5	5
9.	1,1-Dichloroethane	5	5
10.	1,2-Dichloroethene (total)	5	5
11.	Chloroform	5	5
12.	1,2-Dichloroethane	5	5
13.	2-Butanone	10	10
14.	1,1,1-Trichloroethane	5	5
15.	Carbon Tetrachloride	5	5
16.	Vinyl Acetate	10	10
17.	Bromodichloromethane	5	5
18.	1,1,2,2-Tetrachloroethane	5	5
19.	1,2-Dichloropropane	5	5
20.	trans-1,3-Dichloropropene	5	5
21.	Trichloroethene	5	5
22.	Dibromochloromethane	5	5
23.	1,1,2-Trichloroethane	5	5
24.	Benzene	5	5
25.	cis-1,3-Dichloropropene	5	5
26.	Bromoform	5	5
27.	2-Hexanone	10	10
28.	4-Methyl-2-Pentanone	10	10
29.	Tetrachloroethene	5	5
30.	Toluene	5	5
31.	Chlorobenzene	5	5
32.	Ethyl Benzene	5	5
33.	Styrene	5	5
34.	Xylenes (total)	5	5

Source: SARA CLP Invitation For Bid WA87-J001 (BCM Project No. 00-5268-01)

TABLE 3

CLP/TCL ORGANICS

Semivolatiles		CLP Detection Limits[1] [2] Low Water[3] ug/l	 Low Soil/Sediment[4,6] ug/kg
35.	Phenol	10	330
36.	bis(2-Chloroethyl) ether	10	330
37.	2-Chlorophenol	10	330
38.	1,3-Dichlorobenzene	10	330
39.	1,4-Dichlorobenzene	10	330
40.	Benzyl Alcohol	10	330
41.	1,2-Dichlorobenzene	10	330
42.	2-Methylphenol	10	330
43.	bis(2-Chloroisopropyl)ether	10	330
44.	4-Methylphenol	10	330
45.	N-Nitroso-Dipropylamine	10	330
46.	Hexachloroethane	10	330
47.	Nitrobenzene	10	330
48.	Isophorone	10	330
49.	2-Nitrophenol	10	330
50.	2,4-Dimethylphenol	10	330
51.	Benzoic Acid	50	1,600
52.	bis(2-Chloroethoxy)methane	10	330
53.	2,4-Dichlorophenol	10	330
54.	1,2,4-Trichlorobenzene	10	330
55.	Naphthalene	10	330
56.	4-Chloroaniline	10	330
57.	Hexachlorobutadiene	10	330
58.	4-Chloro-3-Methylphenol (para-chloro-meta-cresol)	10	330
59.	2-Methylnaphthalene	10	330
60.	Hexachlorocyclopentadiene	10	330
61.	2,4,6-Trichlorophenol	10	330
62.	2,4,5-Trichlorophenol	50	1,600

TABLE 3 (Continued)

Semivolatiles	CLP Detection Limits[1] [2] Low Water[3] ug/l	CLP Detection Limits[1] [2] Low Soil/Sediment[4,6] ug/kg
63. 2-Chloronaphthalene	10	330
64. 2-Nitroaniline	50	1,600
65. Dimethylphthalate	10	330
66. Acenaphthylene	10	330
67. 3-Nitroaniline	50	1,600
68. Acenaphthene	10	330
69. 2,4-Dinitrophenol	50	1,600
70. 4-Nitrophenol	50	1,600
71. Dibenzofuran	10	330
72. 2,4-Dinitrotoluene	10	330
73. 2,6-Dinitrotoluene	10	330
74. Diethylphthalate	10	330
75. 4-Chlorophenyl Phenyl Ether	10	330
76. Fluorene	10	330
77. 4-Nitroaniline	50	1,600
78. 4,6-Dinitro-2-Methylphenol	50	1,600
79. N-nitrosodiphenylamine	10	330
80. 4-Bromophenyl Ether	10	330
81. Hexachlorobenzene	10	330
82. Pentachlorophenol	50	1,600
83. Phenanthrene	10	330
84. Anthracene	10	330
85. Di-n-Butylphthalate	10	330
86. Fluoranthene	10	330
87. Pyrene	10	330
88. Butyl Benzyl Phthalate	10	330
89. 3,3'-Dichlorobenzidine	20	660
90. Benzo(a)anthracene	10	330
91. bis(2-Ethylhexyl)phthalate	10	330
92. Chrysene	10	330
93. Di-n-octyl Phthalate	10	330
94. Benzo(b)fluoranthene	10	330
95. Benzo(k)fluoranthene	10	330
96. Benzo(a)pyrene	10	330
97. Indeno(1,2,3-cd)pyrene	10	330
98. Dibenz(a,h)anthracene	10	330
99. Benzo(g,h,i)perylene	10	330

Source: SARA CLP Invitation For Bid WA87-J001 (BCM Project No. 00-5268-01)

FOOTNOTES
(To Previous Tables)

1 Specific detection limits are highly matrix-dependent. The detection limits listed by the CLP are intended for guidance and may not always be achievable. Analytical support documents will be provided to justify elevated detection limits.

2 Contract-required detection level is the level of detection that the laboratory must be able to achieve in reagent-grade water. Solid values are reported as dry weight; assuming 100 percent dry weight and following CLP protocols, the solid detection limits would be 200 times higher.

3 Medium-level water contract-required detection limits (CRDL) for volatile and semivolatile TCL compounds are 100 times the individual low-water CRDL.

4 Detection limits for soil/sediment are based on wet weight. Detection limits calculated by the laboratory for soil/sediment, calculated on dry weight basis, as required by the CLP, will be higher.

5 Medium-level soil/sediment CRDLs for volatile TCL compounds are 100 times the individual low soil/sediment CRDL.

6 Medium-level soil/sediment CRDLs for semivolatile TCL compounds are 60 times the individual soil/sediment CRDL.

7.5 Analytical Methods

Where applicable, USEPA-approved methodologies will be used. The USEPA methods anticipated for this site are referenced as follows:

1. USEPA Environmental Monitoring Support Laboratory/Office of Research and Development (EMSL-ORD), Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020, Revised March 1983.

2. USEPA Office of Solid Waste and Emergency Response (OSWER), Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, Second Edition, Revised April 1984.

3. Federal Register, 40 CFR Part 136, Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act, Vol. 49, No. 209, October 26, 1984.

4. Superfund Amendment Reauthorization Act (SARA) Contract Laboratories Program (SARA-CLP), Solicitation Number WA 87-J001, Organic Statement of Work, Exhibit D Analytical Methods, USEPA, Procurement Section A, Washington, DC, 1984.

5. CERCLA-CLP, Solicitation Number WA85-J838, Inorganic Statement of Work, Exhibit D Analytical Methods, USEPA, Procurement Section A, Washington, DC, 1985.

If a specific sample matrix or analyte is not represented in USEPA methodology, and if another standardized methodology is available (such as ASTM or NIOSH), the standardized method will be referenced and used. If no standard method can be established for a specific matrix or analyte, a referenced method will be adopted or modified.

7.6 Sample Preservation, Holding Times, and Sample Container Material

All aqueous and solid samples will be collected, preserved, and held in accordance with USEPA requirements specified in the Users Guide to the Contract Laboratory Program, USEPA Office of Emergency and Remedial Response, July 1984. These procedures are modifications of USEPA Requirements in 40 CFR Part 136 of the Federal Register, October 26, 1984, and SW-846, April 1984.

Sample container materials used will be those specified with the aforementioned preservation/holding time procedures.

TABLE 4

TABLE OF METHODS AND REFERENCES

Parameter	Aqueous Reference	Solid Reference
Physical Properties		NA
Temperature	(1) 170.2	NA
pH	(1) 150.1	NA
Specific Conductance	(1) 120.1	NA
Total Dissolved Solids	(1) 160.1	NA
Metals*	(1,5) 200 Series CLP-M	(2,5) 7,000 Series, 200 Series CLP-M
Antimony	(1,5) 204.2	(2,5) 204.2
Arsenic	(1,5) 206.2	(2,5) 206.2
Beryllium	(1,5) 210.2	(2,5) 210.2
Cadmium	(1,5) 213.2	(2,5) 213.2
Chromium	(1,5) 218.2	(2,5) 218.2
Copper	(1) 220.2	(1) 220.2
Lead	(1,5) 239.2	(2,5) 239.2
Mercury	(1,5) 245.1	(2,5) 245.5
Nickel	(1) 249.2	(1) 249.2
Selenium	(1,5) 270.2	(2,5) 270.2
Silver	(1,5) 272.2	(2,5) 272.2
Thallium	(1,5) 279.2	(2,5) 279.2
Zinc	(1) 289.1	(1) 289.1
Metals Digestion	(1,5) 200, Attachment 1	(2,5) 3050, Attachment 1
Inorganic Non-Metallic		
Phenols, Total Recoverable	(1) 420.2	(2) 9066
Organics		
CLP/TCL Volatiles	(3,5) 624 CLP-M	(2,4) 8240 CLP-M
CLP/TCL Base/Neutral/Acids	(3,5) 625 CLP-M	(2,4) 8270 CLP-M

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* Inductively Coupled Plasma Method 200.7 may be used for multiple analysis of metals whose CRDL can be achieved by this method.

Source: BCM Eastern Inc. (BCM Project No. 00-5268-01)

TABLE 5

TABLE OF SAMPLING CONTAINERS, PRESERVATION, AND HOLDING TIMES (1)

Parameter	Sample	Container/Volume	Preservation	Holding Times
pH	Aqueous	NA	None	Performed onsite
Specific Conductance	Aqueous	(1) Polyethylene/1 qt	Cool, 4°C	28 days
Metals	Aqueous	(1) Polyethylene/1 qt	HNO_3 to pH <2.0	6 months
Mercury	Aqueous	(1) Polyethylene/1 qt	HNO_3 to pH <2.0	28 days
Total Recoverable Phenolics	Aqueous	Glass	Cool, 4°C, H_2SO_4 to pH <2	28 days
Total Dissolved Solids (TDS)	Aqueous	(1) Polyethylene/1 qt	Cool, 4°C	7 days
CLP/TCL Volatiles	Aqueous	(2) Glass vials w/TFE-lined Septum cap/40 ml	Cool, 4°C Keep from light	7 days (2)
CLP/TCL Base/Neutral/Acids (Extractables)	Aqueous	(2) Amber glass/1/2 gal or (4) Amber glass/1 qt with lined caps	Cool, 4°C Keep from light	5 days until extraction, (2) 40 days from extraction until analysis
Metals	Soils	(1) Glass wide-mouth/8 oz with TFE-lined cap	Cool, 4°C	6 months
Mercury	Soils	(1) Glass wide-mouth/4 oz with TFE-lined cap	Cool, 4°C	30 days (2)
Total Recoverable Phenols	Soils	(1) Glass wide-mouth/8 oz with TFE-lined cap	Cool, 4°C	28 days
CLP/TCL Volatiles	Soils	(2) Glass wide-mouth/4 oz with TFE-lined cap or (2) Glass vials with TFE-lined Septum caps/40 ml	Cool, 4°C, Kept from light	10 days (2)
CLP/TCL Extractables	Soils	(1) Glass wide-mouth/8 oz with TFE-lined cap	Cool, 4°C, Kept from light	10 days until extraction, (2) 40 days from extraction until analysis

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(1) Sample Containers, Preservation, and Holding Times are referenced in Section 7-F of this QA/QC Plan.

(2) CLP holding time from verified time of sample receipt (VTSR).

Source: Federal Register 40 CFR Part 136 October 26, 1984

In the event that a required analysis or sample matrix is not listed in these specifications, the specifications listed for preservation, holding times, and container requirements of the analytical method adopted or modified will be used.

7.7 Field Quality Assurance Samples

Due to the nature of the project and the intended and potential use of the data, samples will be collected for quality assurance purposes (trip blanks, field blanks, and field duplicates). These samples shall be defined and used as follows.

7.7.1 Trip Blank

A trip blank consists of ultrapure reagent-grade water filled in each type of the specific sampling containers to be used in the sample collection for the project. Trip blanks are filled at the laboratory, sealed, transported to the sampling site, and returned to the laboratory without having been reopened. Trip blanks will be used to assess the cleanliness of the sample containers immediately before sampling.

7.7.2 Field Blank/Rinsate Blank

A field blank consists of ultrapure reagent-grade water filled in each type of the specific sampling containers to be used in the sample collection for the project. The field blank containers are transported to the site empty, and are opened and filled onsite with distilled, deionized water that has rinsed the clean sampling apparatus. The field blank is resealed and returned to the laboratory. Field blank results will be used to assess the possible effects of inadvertent sampling contamination.

Note: Aqueous field blanks will be handled, preserved, prepared, and analyzed for all parameters specified for the project concurrently with the actual aqueous samples collected for the project.

Note: Solid field blanks are actually aqueous samples, and will only be analyzed for parameters whose solid sample preparation is amenable to aqueous samples. For this project, solid field blanks will be analyzed for volatile organics and metals.

7.7.3 Field Duplicate

A field duplicate consists of an actual sample for which twice as much volume as necessary to fill all sample containers has been collected. Aliquots of this volume are then equally distributed in two sets of sample containers. This results in two equal samples collected from one sampling location. Field duplicates will be used to assess consistency of sampling, sample homogeneity, and laboratory analytical consistency.

Note: Duplicate samples will be handled, preserved, prepared, and analyzed for all parameters specified for the project concurrently with actual solid samples collected for the project.

7.8 Field Quality Assurance Sampling Scheduling

The QA sampling schedule consists of 10 percent trip blanks, field blanks, and field duplicates per matrix per sampling program.

8.0 PROJECT ORGANIZATION

The following is a list of key project personnel and their responsibilities.

- Sampling QC:

  Field Investigation Coordination: Jason M. Schindler
  Chief Sampling Technician: Timothy M. Ebner

- Laboratory Analyses and Laboratory QC: To be assigned

  Laboratory Analysis:
  QA/QC Coordinator:

- Data Processing and Data Processing QC:

  Data Processing Coordinator: Robert M. Hardy

- Data Quality Review and Performance Auditing (BCM):
  Sharon A. Pace
  Clare E. Casselberry

- Project Safety Officer: Mary W. Glowacki

- Overall Project Coordination:

  Project Manager: John W. Fowler
  Project QA/QC: Atwood F. Davis

9.0 DATA QUALITY REQUIREMENTS AND OBJECTIVES

9.1 Detection Limits

Detection limit requirements will be based on the published method listed in the specific analytical method performed. However, due to complex sample matrices or small initial sample amounts, some detection limits may be elevated. Where detection limits are elevated, the actual detection limit for the sample will be reported and annotated with the reason for the elevation. All instrument detection limits will be determined and will be sufficient to meet the method detection limits. Detection limits for CLP/TCL parameters are included in tables in Section 7.4.

9.2 Accuracy and Precision

Accuracy and precision requirements will be based on the published values listed in the specific analytical methodology performed. Accuracy and precision will be audited through field and laboratory duplicates, matrix spikes, and standard reference materials as reported in the laboratory analytical results.

9.3 Quality Assurance Protocols

The analytical laboratory contracted for this project will follow full USEPA Contract Laboratory Program (CLP) Methodologies and QA/QC Protocols. The laboratory will be an NYDEC-approved facility.

9.4 Field Analysis QA/QC Protocols

Hydrogen Ion Concentration (pH), Specific Conductance, and Temperature will be analyzed in the field at the time of water sample collection. Analytical results will be recorded in the field notebook assigned for the sampling event or task. BCM will conduct these analyses using the following equipment or equivalent equipment that meets or exceeds the EPA criteria specified in the analytical protocols included in this section.

pH - Metrohm E488 pH meter
Specific Conductance - YSI Model 33 Conductivity Meter
Temperature - Laboratory/Field Precision Mercury Thermometer, Armor shielded; or YSI Meter Temperature Thermistor

Specifications

Metrohm E488 pH Meter

Range: 0 to 14 standard units
Accuracy: ±0.1 standard units
Temperature Compensation: Automatic or manual compensation to 25°C

YSI Model 33 Conductivity Meter

Range

Conductivity: 3 ranges (0-500, 0-5,000, and 0-50,000 micromhos/centimeter (umhos/cm)
Temperature: -2° to +50°C

Accuracy

Conductivity: ±2% of full range
Temperature: ±0.6° at 45°C with probe error less than ±0.3°

Temperature Compensation: Manual to 25°C

Thermometer

Only precision thermometers that have been calibrated to NBS specifications will be used. Alternately, the conductivity meter thermistors will be used.

Range

Thermometer: 0 to 50°C minimum in 1°C subdivisions
Meter Thermistors: As noted in each meter's specifications

Accuracy

Thermometer: Temperature recorded to nearest 0.5°C
Meter Thermistors: As noted in each meter's specifications

(1) pH (Hydrogen Ion Concentration)

Scope and Application

This method is applicable to ground, surface, and saline waters, and to domestic and industrial wastes.

Summary of Method

The pH of a sample is determined electrometrically using a pH meter and either a glass electrode in combination with a reference potential or a combination electrode.

Interferences

The glass electrode, in general, is not subject to solution interferences from color, turbidity, colloidal matter, oxidants, reductants, or high salinity.

Errors due to the presence of sodium at pH levels greater than 10 can be reduced or eliminated by using a "low sodium error" electrode. However, pH levels greater than 10 are unlikely to be encountered in this investigation and will be addressed should they appear.

Coatings of oily material or particulate matter can impair electrode response. If encountered, these coatings will be removed by gentle wiping with a laboratory tissue followed by a distilled water rinse.

Temperature effects on the electrometric measurement of pH will be controlled by using instruments that have temperature compensation.

Poorly buffered solutions with low specific conductance values (less than 200 umhos) may cause fluctuations in the pH readings. If this is encountered, the electrode will be equilibrated by immersing it in several portions of samples before taking the pH measurement.

Reagents

Secondary standard buffer solutions (pH 4, pH 7, and pH 10) purchased from commercial vendors will be used.

Buffering

The instructions provided with each type of pH meter will be followed.

Each meter/electrode system will be buffered at a minimum of two points that bracket the expected pH of the samples and that are approximately three pH units or more apart.

Test Procedure

1. The meter will be allowed to reach ambient temperature after it is removed from a field vehicle.

2. The meter will be calibrated at the temperature of the buffer solution as outlined in the above section.

3. If the sample temperature differs by more than 2°C from the buffer solutions, the meter will be adjusted for the temperature differences, unless automatic temperature compensation instruments are used.

4. The electrode will be thoroughly rinsed with distilled water.

5. When possible, the electrode will be immersed in situ or in a grab sample. The electrode will be swirled at a constant rate until the meter reading reaches equilibrium. The rate of stirring used will minimize the air transfer rate at the air/water interface of the sample.

6. The sample pH will be noted and recorded; the measurement will be repeated on successive volumes of sample or in situ until values differ by no less than 0.2 pH unit.

7. In the case of low specific conductance samples, such as those encountered with some groundwaters, 1 ml of 1M potassium chloride solution will be added per 100 ml of sample, and steps 5 and 6 will be followed.

8. When the meter is moved to another sampling location, the meter calibration will be checked by inserting the probe into the pH-7 buffer solution.

Precision and Accuracy

Under normal conditions the accuracy is ± 0.1 pH unit.

References

Standard Methods for the Examination of Wastewater, 15th Edition, p. 402, Method 423 (1980).

Instruction Manual for Models 399 A/F, 399 A/L Analog pH Meter, Orion Research Incorporated, 1983.

Annual Book of ASTM Standards, Part 31, "Water," Standard D1293-78(B).

Methods for Chemical Analysis of Water and Wastes, US EPA, 150.1 (1979).

Procedure No. 501, pH Measurement in Low Ionic Strength Solutions, Orion Application Information, Orion Research Incorporated.

(2) Temperature

Scope and Application

This method is applicable to ground, surface, and saline waters and to domestic and industrial waste

Summary of Method

Temperature measurements may be made with any high quality mercury-filled thermometer of thermistor with analog or digital read-out device.

Comments

The measurement device shall be routinely checked against a precision thermometer, a National Bureau of Standards-certified thermometer, or equivalent.

Test Procedure

Only a previously calibrated mercury-filled thermometer or thermistor will be used.

The thermometer or thermistor will be allowed enough time to equilibrate to outside temperature when removed from a field vehicle.

Insert thermometer or thermistor in situ when possible or in a grab sample. The thermometer or thermistor will be swirled in the sample and the temperature reading will be taken when the mercury column or read-out needle stops moving; the temperature will be recorded to the nearest 0.5°C.

Precision and Accuracy

Precision and accuracy for this method have not been determined.

References

Standard Methods for the Examination of Water and Wastewater, 15th Edition p. 124, Method 212 (1980).

Method for Chemical Analyses of Water and Wastes, USEPA, 170.2 (1979).

(3) Specific Conductance

Scope and Application

This method is applicable to ground, surface, and saline waters, and to domestic and industrial wastes.

Summary of Method

The specific conductance of a sample is measured by use of a selfcontained conductivity meter, Wheatstone bridge-type, or equivalent.

Test Procedure

Follow instructions manual for the field conductivity meter.

The meter will be checked with two standard solutions of 100 and 1,000 umhos/cm. If the meter does not read within 1 percent of the standards, the problem will be determined and corrected before proceeding. Most field instruments read conductivity directly; with those instruments, the manufacturer's instructions will be followed. The results will be recorded to the nearest 10 units for readings under 1,000 umhos/cm and the nearest 100 units for readings over 1,000 umhos/cm.

The actual sample temperature will be recorded when the measurement is made. The meter reading should be converted to specific conductance at 25°C using the information in the manufacturer's instruction manual. If the instrument has automatic temperature compensation, this will not be required.

Precision and Accuracy

The conductivity meter must have an accuracy of ± 2 percent of reading. With satisfactory equipment, results within 1 percent of the true value can be obtained.

References

Standard Methods for the Examination of Water and Wastewater, 15th Edition, p.70, Method 205 (1980).

Annual Book of ASTM Standards, Part 31, "Water," Standard D1125-64, p. 120 (1976).

Methods for Chemical Analysis of Water and Wastes, US EPA, 120.1 (1979).

Instruction Manual, SoluBridge RB-5/RB-6, Beckman Instruments, Inc. Rev. January 1982.

9.5 Representativeness

All samples will be collected and analyzed using EPA-approved methodology that will result in representative sampling and reporting. The Work Plan is designed such that the samples taken will present an accurate representation of actual site conditions. All sample points will be marked and noted on a large-scale topographic map. The rationales discussed in the Work Plan and the Site Operations Plan are designed to ensure that samples taken relate closely to actual site characteristics.

9.6 Data Comparability

Data comparability will be ensured by control of sampling procedures, analytical method, and data reporting. The design of the project Work Plan and Site Operations Plan sampling methodologies is such that comparability questions will be minimized. The proper sampling techniques and USEPA analytical methods used to attain the stated project objective of study area characterization, and the CLP level of deliverables reporting, are designed to maximize comparability of analytical results.

9.7 Data Completeness

An ongoing program of data review and representativeness will ensure that the proper number of samples are collected to adequately meet project goals. Data gaps will be continuously addressed when/if they occur by systematic resampling and/or increasing the number of sampling points.

The number of samples to be taken will be based entirely on the need for data completeness. In addition, the approach to project tasks, utilizing previously obtained data as a basis for subsequent sampling or well installation activities, ensures completeness of data. Additional sampling requirements will be documented and included as addendum sampling plans to the Work Plan and QA/QC Plan.

Auditing the completeness of laboratory analytical reports will be performed upon receipt of sample data packages.

10.0 SAMPLING PROCEDURES

The sampling procedures to be followed on this project are site-specific and will include groundwater and soil sampling, The procedures referenced in this document are those developed by the USEPA Environmental Services Division and included in the Engineering Support Branch Standard Operating Procedures and Quality Assurance Manual, April 1, 1986.

In the event that additional sample types are deemed necessary, sampling plans and procedures will be included as an addendum to the SOP and QA/QC Plan.

10.1 Presampling Preparation

To prevent possible contamination from sampling equipment, all sampling devices will be cleaned and sealed prior to initiation of sample collection. Whenever possible, sampling equipment will be dedicated for one sampling location. Whenever it is not possible to dedicate sampling equipment, field decontamination will be performed between sampling locations and actual sample grabs.

10.1.1 Cleaning Materials

1. The laboratory detergent will be a standard brand of phosphate-free laboratory detergent, such as Alquinox or Liquinox.
2. The nitric acid solution (10 percent) will be made from reagent-grade nitric acid and deionized water.
3. The standard cleaning solvents (acetone and hexane) will be pesticide-grade. The use of any solvent other than pesticide-grade for equipment cleaning purposes will be justified, and its use will be documented in field logbooks.
4. Tap water may be used from a municipal water treatment system.
5. Distilled, deionized, organic-free water will be used as the final water rinse.

10.1.2 Cleaning procedures for Teflon or glass field sampling equipment used for the collection of samples for trace organic compounds and/or metals analyses*

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* When the sampling equipment is used to collect samples that contain oil, grease, or other hard-to-remove materials, it may be necessary to rinse the equipment several times with pesticide-grade acetone and hexane to remove the materials before proceeding with Step 1. In extreme cases, it may be necessary to steam clean the field equipment before proceeding with Step 1. If the field equipment cannot be cleaned utilizing these procedures, it should be discarded.

1. Equipment will be washed thoroughly with laboratory detergent and water using a brush to remove any particulate matter or surface film.

2. The equipment will be rinsed thoroughly with tap water.

3. The equipment will be rinsed with at least a 10-percent nitric acid solution.**

4. The equipment will be rinsed thoroughly with tap water.

5. The equipment will be thoroughly rinsed with deionized water.

6. The equipment will be rinsed twice with acetone followed by hexane, and will be allowed to air dry.

7. The equipment will be wrapped completely with aluminum foil to prevent contamination during storage and/or transport to the field.

8. The Teflon or glass sampling equipment will be thoroughly rinsed with tap water in the field as soon as possible after use.

10.1.3 Cleaning procedures for stainless steel or metal sampling equipment used for the collection of samples for trace organic compounds and/or metals analyses***

1. The equipment will be thoroughly washed with laboratory detergent and hot water using a brush to remove any particulate matter or surface film.

2. The equipment will be thoroughly rinsed with hot tap water.

3. The equipment will be thoroughly rinsed with deionized water.

4. The equipment will be rinsed twice with acetone followed by hexane, and will be allowed to air dry.

** - Small and awkward equipment such as vacuum bottle inserts and well bailers may be soaked in the nitric acid solution instead of being rinsed with it. Fresh nitric acid solution will be prepared for each cleaning session.

*** - When the sampling equipment is used to collect samples that contain oil, grease, or other hard-to-remove materials, it may be necessary to rinse the equipment several times with pesticide-grade hexane to remove the materials before proceeding with Step 1. Any stainless steel sampling equipment that cannot be cleaned using these procedures will be discarded.

5. The equipment will be wrapped completely with aluminum foil to prevent contamination during storage and/or transport to the field.

6. The stainless steel or metal sampling equipment will be rinsed thoroughly with tap water in the field as soon as possible after use.

10.1.4 Sampling Equipment Cleaned in the Field

The effectiveness of field cleaning procedures will be monitored by rinsing field-cleaned equipment with organic-free water and submitting selected samples of the rinse water in standard sample containers for analysis, as outlined in the field blank procedures in Section 7.7.2.

10.1.5 Miscellaneous Equipment Cleaning Procedures

1. Portable Power Augers

   - The engine and power head will be cleaned with a power washer, or steam cleaner, or hand washed with a brush using detergent (may not be laboratory detergent but will not be a degreaser) to remove oil, grease, and hydraulic fluid from the exterior of the unit. These units will be rinsed thoroughly with tap water.

   - All augers and bits will be cleaned utilizing the procedures outlined in Section 10.1.3 (including footnotes).

2. Large Soil Boring and Drilling Rigs

   - The rig will be cleaned before being mobilized and brought onsite as outlined in Paragraph 1 of the aforementioned Portable Power Auger Cleaning Procedure.

   - All augers, auger bits, drilling rods, drill bits, hollow-stem augers, split-spoon samplers, Shelby tubes, or other parts of the drilling equipment that will contact the soil or groundwater will be cleaned by steam cleaning.

3. Miscellaneous Sampling and Flow Measuring Equipment

   - Miscellaneous flow measuring and sampling equipment will be washed with laboratory detergent, rinsed with hot tap water, followed by a thorough deionzied water rinse, and dried before being stored. This procedure will not be used for any equipment utilized in the collection of samples for trace organic compounds or metals analyses.

10.2 Preparation of Disposable Sample Containers

10.2.1 General

No sample container (with the exception of the glass and plastic composting containers) will ever be reused. All disposable sample containers will be stored in their original laboratory transport containers. Specific precleaning instructions for disposable sample containers are given in the following sections. These specifications apply to precleaned disposable sample containers as supplied by the contractor laboratory.

10.2.2 Specific Cleaning Procedures

1. Only new containers will be used.
2. Glass Containers for Extractable Organics
   - Wash bottles and jars, Teflon liners, and caps in hot tap water and laboratory detergent.
   - Rinse three times with tap water.
   - Rinse three times with deionized water.
   - Rinse bottles, jars, and liners (not caps) with hexane.
   - Oven dry bottles, jars, and liners at 125°C. Allow to cool.
   - Place liners in caps and cap containers.
   - Store containers in contaminant-free area.
3. Glass containers for purgeable organics
   - Wash vials, bottles, jars, Teflon liners, septa, and caps in hot tap water and laboratory detergent.
   - Rinse all items with deionized water.
   - Oven dry at 125°C.
   - Allow all vials, bottles, jars, liners, and septa to cool in an enclosed contaminant-free environment.
   - Seal vials, bottles, and jars in a contaminant-free area.

4. Polyethylene or glass bottles for inorganics

   - Wash bottles and caps in hot water with laboratory detergent.
   - Rinse both with nitric acid solution.
   - Rinse three times with deionized water.
   - Invert bottles and dry in contaminant-free environment.
   - Cap bottles.
   - Store in contaminant-free area.

10.3 Groundwater Sampling

10.3.1 Groundwater Sampling

The SOP specifies a groundwater monitoring program that will take place at the existing monitoring well and at monitoring wells to be installed by BCM specifically for this investigation. The following procedures will be used during monitoring well sampling.

1. General Groundwater Sampling Procedures

   All wells will be purged before sampling to clear the well of stagnant water that has been standing in the well casing and may not be representative of aquifer conditions.

   Each well will be purged of three to five times the volume of standing water in the well. If a well is pumped dry, the purge is adequate and the well will be sampled following recovery to 80 percent of the static level. An alternative method is to pump the well until specific conductivity, temperature, and pH of the groundwater stabilize. This method may be used in instances where in-place dedicated pumps are used for purging (due to low pump velocities).

   Total well depth measurement and groundwater level measurements will be made to determine the depth of water in order to calculate the standing well volume. All level measurements will be made in reference to an established point on the well casing (e.g., top of casing). This point will be documented in the field records/notebook. All measurements will be made and recorded to the nearest 0.01 foot.

Measuring the depth to the free groundwater surface will be accomplished by electric water level indicator. This instrument consists of a spool of dual conductor wire, a probe attached to the end, and an indicator. When the probe comes in contact with the water, the circuit is closed and a meter light and/or buzzer attached to the spool signals the contact. Penlight batteries are normally used as a power source.

Total well depth measurements will also be accomplished using a weighted tape or the electric water level indicators. This will be accomplished by lowering the tape or cable until the weighted end is felt resting on the bottom of the well. All total well depth measurements must be made and recorded to the nearest 0.5 foot.

All devices used to measure groundwater level will be calibrated to 0.01 foot per 10-foot length. Before each use, these devices will be prepared according to the manufacturer's instructions (if appropriate) and checked for obvious damage. These devices will be rinsed after use and before being used in the next well. All calibration and maintenance data will be recorded in a logbook.

Monitoring well purging will be accomplished using in-place plumbing/pumps; when these are not available, another appropriate pump (peristaltic, turbine, bladder, or centrifugal) may be used, depending upon well depth.

2. Purging Techniques - Monitoring Wells Without Plumbing or In-Place Pump

<u>Using Bailers to Purge</u> - Standard cleaned Teflon bailers with new nylon rope will be lowered into top of the water column, allowed to fill, and removed. The water will then be discarded.

<u>Field Care of Purging Equipment</u> - Regardless of which method is used for purging, new aluminum foil or plastic sheeting will be placed on the ground surface around the well casing to prevent contamination of the pumps, hoses, ropes, etc. in the event they need to be placed on the ground during the purging or accidentally come into contact with the ground surface.

Hoses used in purging that come into contact with the groundwater will be kept on a spool, during transporting and field use, to further minimize contamination from the transporting vehicle or ground surface.

Purging Entire Water Column - The pump/hose assembly or bailer used in purging will be lowered into the top of the standing water column but not deep into the column. The purging will "pull" water from the ground through the screened area of the well and up through the casing so that the entire static volume can be removed.

If the recovery of the well is at least as fast as the pump rate, the pump will be left hanging at the initial level until an adequate volume has been purged. If the pump rate exceeds the recovery rate of the well, the pump will be lowered, as needed, to accommodate the drawdown.

3. Sampling Equipment and Techniques

Equipment Available - Sampling equipment used during this investigation will include bottom-fill Teflon bailers, peristaltic pumps, and submersible pumps.

Other monitoring equipment used during sampling will include water level indicators, pH meters, thermometers, and conductivity bridges (see Section 9.3.3)

Well Sampling Techniques - After purging, samples will be collected using a peristaltic or submersible pump, or with a Teflon bailer. When a pump is used, samples for purgeable organic compounds will be collected using a bailer or by allowing the pump tube to fill and then allowing the water to drain into the sample vials. All equipment will be cleaned using the procedures described in Section 10.0.

When bailing, new foil or plastic sheeting will be placed on the ground around each well to prevent contamination of sampling equipment in the event any equipment is dropped or otherwise comes in contact with the ground. Braided nylon cord will be used to haul the bailer. The cord will be used once and discarded, to avoid possible cross contamination of the wells.

4. Special Sample Collection Procedures

Trace Organic Compounds and Metals - Special sample handling procedures will be instituted when trace contaminant samples are being collected. All sampling equipment, including pumps, bailers, drilling equipment, water level measurement equipment, etc., that come into contact with the water in the well must be cleaned in accordance with the procedures described in Section 10.0. Pumps will not be used for sampling, unless the interior and exterior portions of the pump and discharge hoses can be thoroughly cleaned. Blanks will be collected to determine the adequacy of cleaning prior to collection of any sample using a pump. Peristaltic pumps using Teflon tubing and a Teflon insert may be used to collect samples without the sample coming into contact with the pump by placing the Teflon insert into the opening at a standard-cleaned gallon glass container (Section 10.0). The Teflon tubing connects the container to the pump and sample source. The pump creates a vacuum in the container, thereby drawing the sample into the container without coming into contact with the pump tubing. Procedures for collecting samples for purgeable organic compounds analyses (VOA) are also given in Section 10.5. Samples for purgeable organic compounds analyses will be collected with well bailers or by direct filling into sample collection vials from the in-place bladder pumps.

5. Auxiliary Data Collection

Water table measurements from the top of the well casings (referenced to National Geodetic Vertical Datum) in permanent wells will be made to determine the general direction of groundwater flow and gradient. Additional study of the general topography and drainage patterns will indicate direction of groundwater flow.

Water table measurements will not be taken until the water table has stabilized, preferably 24 hours after well installation for permanent wells. The ground surface elevation at the wells should be determined by standard engineering survey practices.

In addition to water level measurements, the pumping rate used to purge a well, the volume of water in the well, and driller's logs are examples of auxiliary data that will be collected during groundwater sampling activities. This information will be documented in field records.

Temperature, specific conductance, and pH will be measured each time a well is sampled. This information will be obtained during the purging process to evaluate the adequacy of the purging procedure. In this situation, the final measurements for these parameters prior to sampling will be considered the measurement of record for the well. If these parameters are not evaluated during purging, they will be obtained prior to sampling. Methodologies for obtaining these data are given in Section 9.4.

Drilling Logs - Drilling logs will be prepared in a concise, complete format, and described in a manner that is easily understood to all who read them. BCM uses standardized log sheets, which are included at the end of this section. The following items will be included in the logging data:

- Boring number and location
- Description of soils and subsurface conditions (if applicable)
- Type of drilling equipment, driller, and drilling company (if applicable)
- Method of drilling
- Type and size of casing
- Type and size of well screen
- Depth to well screen
- Type of pump and pumping rate
- Drilling and sampling times
- Depth to water table, and date and time measured
- Type of samples taken and depths taken
- Volume of water purged

10.4 Soil Sampling

10.4.1 Deep Soil Sampling and Borings

For deeper sampling using hand equipment, a stainless steel auger will be used to bore a sampling hole until the desired depth is reached. Another clean auger bucket or a Shelby tube will be used to collect the sample. The sample will be placed in a stainless steel or glass pan. Surface debris will be removed from the location of the sampling hole using a clean stainless steel shovel or trowel before augering operations are initiated.

A split-spoon sampler (2-inch I.D.) will be used for sampling at greater depths. The split-spoon sampler will be used with power equipment, i.e., a drilling rig. Rotary or hollow stem auger drilling techniques will be used to advance the hole to the desired depth. The split-spoon will be added to the correct length of drill rod and forced into the undisturbed soil by means of a 140-pound weight or hammer. The split-spoon will be retrieved from the hole and opened to reveal the sample. During sampling activities, residual material from the drilling operation recovered in the split-spoon sampler will be discarded.

10.4.2 Special Precaution for Trace Contaminant Soil Sampling

All soil sampling equipment used to sample for trace contaminants will be stainless steel where possible. In no case will chromium, cadmium, or galvanized plated or coated equipment be used for soil sampling operations. Similarly, no painted equipment will be used. All paint and primer will be removed from soil sampling equipment by sandblasting or other means before such equipment is used for collecting soil samples.

10.4.3 Soil Samples Collected for Purgeable Organic Compounds Analyses (VOA)

Soil samples collected for purgeable organic compounds analyses will not be mixed and will be containerized as soon as possible after sampling. The samples will be placed in the sample containers so that minimal head space is left in the containers after they are closed.

10.4.4 Specific Sampling Equipment Quality Assurance Techniques

Drilling rigs and other major equipment used to collect soil samples will be identified so that the equipment can be traced through field records. Sampling spoons, hand augers, Shelby tubes, and other minor disposable equipment are exempted from this identification requirement.

All equipment used to collect soil samples will be cleaned as outlined in Section 10.1.5 and repaired, if necessary, before being stored at the conclusion of field studies.

Any cleaning conducted in the field or field repairs will be thoroughly documented in field records.

10.5 Marking and Segregation of Used Field Equipment

Field equipment or reusable sample containers that need cleaning or repairs will not be stored with clean equipment, sample tubing, or sample containers. Field equipment, reusable sample containers, disposable sample containers, and sample tubing that are used during the course of an investigation will not be replaced in storage without being recleaned.

10.6 Auxiliary Data Collection

10.6.1 Auxiliary Data Collection for Water Sampling

A bound field logbook will be used to record daily water collection activities, describe sampling locations and techniques, list photographs taken, document weather conditions during the investigation, record water levels, and record any field analytical data, etc. Visual observations will also be recorded in field records.

Samples will be labeled at the time of sampling. See Section 11.1 for sample labeling procedures.

10.6.2 Auxiliary Data Collection for Soil Sampling

A system of logging all pertinent data collected during drilling and sampling operations will be maintained using bound field logbooks and drilling/boring logs. The test hole locations will be recorded and referenced to the site map so that each location can be permanently established.

Samples will be tagged and/or labeled at the time of sampling. See Section 11.1 for sample labeling procedures.

11.0 SAMPLE CUSTODY/SAMPLE CONTROL

As part of project management, sample control procedures have been established to ensure sample integrity.

11.1 Sample Identification

- Each container will be labeled by the sampler to avoid any possibility of sample misidentification.
- At a minimum, each label will contain the following information:
  1. Field sample number
  2. Sample description
  3. Date sampled
  4. Time sampled
  5. Sampler name
- At the laboratory, the samples will be logged into a bound notebook with numbered pages.
- Each sample will be assigned a unique laboratory identification number that will be used for analysis assignment, sample tracking, and data reporting.

11.2 Sample Custody Procedures

- Empty sample containers will be prepared and relinquished by the laboratory on a chain-of-custody record.
- Each sample collected for the project will be entered on the chain-of-custody record.

- The original chain-of-custody record will accompany the sample containers during transport to document custody.

- If custody is relinquished through a common parcel carrier for delivery to the laboratory, the following protocol will be followed:

  1. The original chain-of-custody record will be placed inside the shipping package.

  2. The shipping package will be sealed with a custody seal. The seal will be placed on the package in such a manner that the package cannot be opened without breaking the seal. The seal will serve to document that the samples remained unaltered during shipment through the common parcel carrier.

- The laboratory will assume custody of the samples upon receipt, and a designated sample custodian will be charged with sample care and receipt.

- Sample preparation and analysis custody will be tracked by laboratory worksheets.

- The laboratory will retain custody of the samples in a secure area until the samples are ordered destroyed.

- Sample custody procedures are modifications of those established by the USEPA National Enforcement Investigation Center (NEIC), which were developed for bulk transfer of samples.

12.0 LABORATORY PROCEDURES AND PREVENTIVE MAINTENANCE SCHEDULING

The laboratory will follow all USEPA laboratory procedures (including maintenance and calibration) as specified in the CLP protocols WA85-J838, WA86-J001, and EPA Methods 600/4-79-020 and SW-846.

13.0 DATA DOCUMENTATION, REDUCTION, AND REPORTING

13.1 Data Reporting

Data reporting for all analyses will include but not be limited to:

- A copy of the Sample Analysis Request Form that was submitted prior to sampling.

- A completed Chain-of-Custody form with the appropriate signatures.
- A tabulation of the analytical results.
- Sample identification number.
- The parameters analyzed and their corresponding detected concentrations (when no concentration can be measured, the value to be reported shall be either none detected [ND] or Below Method Detection Limit [BMDL], as appropriate.
- The method detection limit for each parameter.
- A reporting of accuracy for each parameter.
- Blank results, whenever applicable.
- For matrix spike results, a reporting of precision for each parameter.
- Surrogate spike results.
- Citation of the analytical method used.

13.2 Additional Reporting Requirements

Reporting requirements of all GC and GC/MS data will also include:

- Copies of the sample chromatograph with retention times appropriately labeled. Unknown consequential peaks should be labeled "unknown."
- Copies of working standard chromatographs.
- Detailed written description of the extraction method employed per parameter or parameter grouping.
- A short description of the method of analysis employed.

13.3 Additional Reporting Requirements - GC/MS

Reporting of all GC/MS data will also include:

- Copies for the reconstructed total ion chromatographs for each sample extract.

- Copies of the mass spectra of compounds identified in the sample extract (both background and subtracted raw spectra will be included), and copies of the mass spectra of tentatively identified non-priority pollutant compounds.
- DFTPP and/or BFB tune spectra and a listing for each 8-hour shift; results (tune results) must be certified by the signature of the laboratory supervisor.

13.4 Data Management

- All data produced during project investigations will be reduced and stored in a data base system to be established on a mainframe computer system; this includes: hydrogeological data, sampling data, and analytical data. All analytical data will also be maintained in the laboratory's data system should review at a later date be required.
- All project documents, correspondence, information, and paperwork will be stored in a project filing system.
- Analytical data deliverables will be archived, should review at a later date be required.

14.0 DATA VALIDATION

Data validation will be accomplished by the laboratory QA/QC specialist. Documentation of data validation will be provided with all analytical results. The archived analytical data packages will be available from the archives for USEPA or third party data validation purposes.

15.0 AUDITING

All analytical work will be done following USEPA contract lab protocol. All QA/QC requirements herein will be followed by any subcontracted laboratory used in the course of this project.

To ensure continuity in all phases of the QA/QC framework, the laboratory QA/QC coordinator will monitor all aspects of the QA/QC program and, working with the BCM Field Coordinator, will propose immediate remedial action should deficiencies arise. Some internal auditing processes consist of:

15.1 Replicate Analysis

A minimum of 10 percent of the samples submitted to the laboratory will be analyzed in replicate. Samples for replicate analyses will be selected at random by the laboratory. These samples will be designated at the time they are logged in and the parameters for replicate analyses are selected. Samples for replicate analysis may also be designated by field personnel at the time of sample collection.

15.2 Spiked Samples

A minimum of 10 percent of the samples submitted will be selected for spiking with a known concentration of a given analyte. The spike added to the sample will be of the same order of magnitude as the analyte in question found in the sample. The percent recovery will accurately reflect the accuracy of the analysis in a given range. Spiking will be done by the laboratory on samples randomly selected by the laboratory.

15.3 Duplicate Samples

A minimum of 10 percent of the samples collected will be laboratory-blind field duplicates (as defined in Section 7.7). Duplicate samples will be selected at the discretion of sampling personnel.

15.4 Performance Evaluation Quality Assurance Samples

At the discretion of the Project Manager and Project Quality Assurance Officer, National Bureau of Standards Standard Reference Materials (or equivalent) will be submitted to the laboratory for performance evaluation. This sample will receive a log number and an identification number and will be submitted as a bona fide client sample (laboratory-blind).

15.5 Split Samples

Provisions can be made to supply the NYDEC, USEPA, or other agency with split samples for its own analyses. The split sample is essentially a field duplicate. Such requests for split samples should be made in advance of the sampling event to ensure that enough sample containers are available to meet the request.

15.6 Standard Curve Validation

All analyses will require that standard samples (samples that the analyst has prepared from pure materials and distilled water or from certified materials traceable to the National Bureau of Standards) be analyzed concurrently with the samples. The range covered by the standards will comprise the useful parameter concentration range and sensitivity of the analytical method used. All standard curves will be established in accordance with Contract Laboratory Program protocols. When continuing analyses of the same samples are being done, one or more points on the curve may be checked to validate continuing calibration.

Laboratory analytical deliverables packages will be reviewed for completeness of deliverables by the BCM Analysis Coordinator or designated alternate at the time of receipt.

16.0 CORRECTIVE ACTION

Once acceptance criteria have been established for each analysis (either using USEPA criteria or laboratory-generated criteria), all analytical results must fall within the criteria range. When an analytical quality control result (e.g., matrix spike recovery) falls outside of the criteria, the instrument and technique will be checked for accuracy in a step by step procedure until the problem is found. The problem and its solution will be documented, and the associated samples will be reanalyzed. These procedures are specified in the CLP protocols included in WA85-J838 and WA86-J001.

If all laboratory procedures and instruments are shown to be in order when the diagnostic procedures are run, a notation will be made in the analytical results that the data fell outside of the acceptable range.

This information will be reviewed by the Laboratory QA Manager and the BCM Analytical Coordinator, and a decision will be made concerning data applicability.

REFERENCES

1. "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," EPA Office of Solid Waste and Emergency Response (OWSER), SW-846, Second Edition, Revised April 1984 and SW-846, Third Edition, Revised November 1986, as applicable.

2. Superfund Amendments Reauthorization Act Contract Laboratories Program (SARA-CLP), Solicitation Number WA87-J001, Organic Statement of Work, Exhibit D, Analytical Methods, USEPA, Procurement section A, Washington, D.C., 1985.

3. CERCLA-CLP, Solicitation Number WA85-J838, Inorganic Statement of Work, Exhibit D Analytical Methods, USEPA, Procurement Section A, Washington, D.C., 1985.

4. Engineering Support Branch, Standard Operating Procedures and Quality Assurance Manual, April 1, 1986. USEPA Region IV, Environmental Services Division, Athens, GA.

5. "Methods for Chemical Analysis of Water and Wastes," United States Environmental Protection Agency, EMSL-Cincinnati, OH EPA 600/4-79-020, Revised March 1983.

6. "Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater," EPA Environmental Monitoring and Support Laboratory, Cincinnati, OH, EPA-600/4-82-057 Revised July 1982.

BCM

WELL DRILLING LOG

WELL NO:

SHEET OF:

PROJECT:

PROJECT NO:

WELL LOCATION:

DATE(S) DRILLED

DRILLING CONTRACTOR:

DRILLING METHOD

BORING DIAMETER:

SAMPLING METHOD:

SAMPLE INTERVAL:

LOGGED BY:

TOTAL DEPTH:

SCREEN SIZE AND MATERIAL:

SCREENED INTERVAL:

CASING SIZE AND MATERIAL:

CASED INTERVAL:

GRAVEL PACK SIZE:

PACKED INTERVAL:

GROUT TYPE:

GROUTED INTERVAL:

GROUTING METHOD:

BENTONITE SEAL:

DEVELOPMENT METHOD:

TIME:

ESTIMATED YIELD:

STATIC WATER DEPTH:

DATE:

REFERENCE:

REMARKS:

LITHOLOGIC INTERVAL	SAMPLE INTERVAL	SPOON BLOWS	RECOVERY (IN.)	CLASSIFICATION OF MATERIALS

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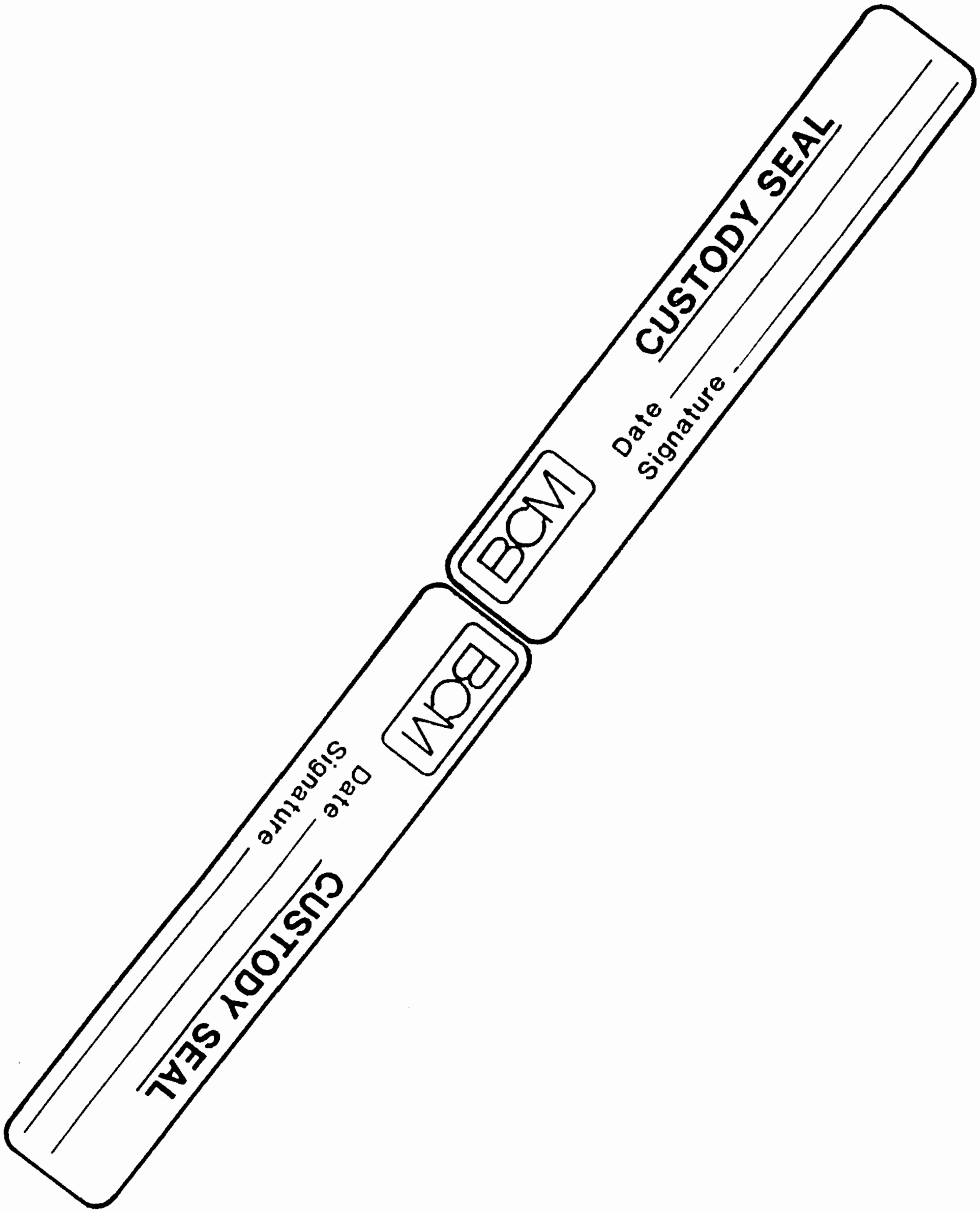
BCM
CUSTODY SEAL
Date
Signature
BCM
CUSTODY SEAL
Date
Signature

BCM

CHAIN OF CUSTODY RECORD

PROJ NO.

PROJECT NAME

SAMPLERS. *(Signature)*

SAMPLE TYPE KEY

AQ-Aqueous
S-Solid
A-Air
L-Liquid
O-Other

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CON-TAIN-ERS							TYPE	SAMPLING REMARKS

Empties dispatched by:	Date/Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date/Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date/Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date/Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date/Time	Received for Laboratory by: *(Signature)*	Date/Time	(Shipping/Receiving) Remarks	
			CUSTODY SEALS INTACT (Y,N,NA)		

Distribution Original Accompanies Shipment, Copy to Coordinator
QA Files, Copy to Project Manager

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APPENDIX C

HEALTH AND SAFETY PLAN

APPENDIX C

HEALTH AND SAFETY PLAN

FOR

REMEDIAL INVESTIGATION/FEASIBILITY STUDY

GENERAL INSTRUMENT CORPORATION
HICKSVILLE, NEW YORK

SEPTEMBER 1987

BCM PROJECT NO. 00-5268-12

PREPARED BY

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SAFETY SPECIALIST

AND

M. DOUGLAS MUELLER, CIH
ASSISTANT VICE PRESIDENT

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FIGURES

1.0 INTRODUCTION

General Instrument Corporation (GI) retained BCM Eastern Inc. (BCM) to conduct a Remedial Investigation/Feasibility Study (RI/FS) at the GI facility in Hicksville, New York. The purpose of the Remedial Investigation is to assess the extent and degree of groundwater and soil contamination due to an underground waste solvent storage tank, and to assess the environmental health significance of the contamination. The objective of the Feasibility Study is to identify remediation alternatives, taking into account available technologies, costs, public health risks, and other factors. The RI/FS will be consistent with the requirements of the New York Department of Environmental Conservation (NYDEC), the Comprehensive Environmental Response Compensation and Liability Act (CERCLA), and the Superfund Amendments and Reauthorization Act (SARA).

2.0 BACKGROUND INFORMATION

2.1 SITE DESCRIPTION

The General Instrument Corporation (GI) facility in Hicksville, New York, is an active manufacturing plant located on approximately 11.5 acres on Long Island, New York (Figure 1-1). This plant manufactures semiconductors, radar systems, and electronic equipment, and has a research and design laboratory.

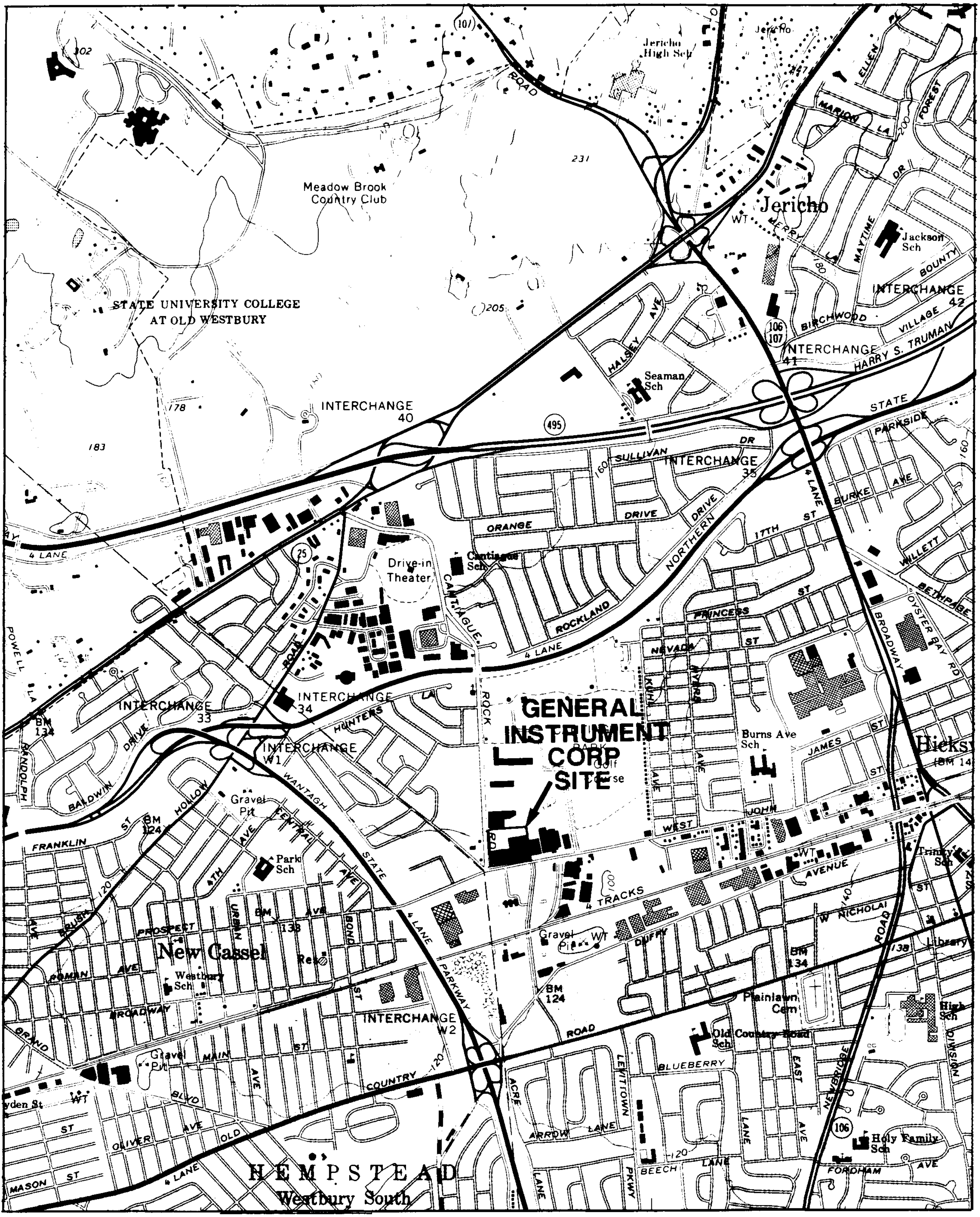
In 1980, an underground waste solvent storage tank was found to be leaking. The tank and surrounding soils were subsequently removed and two groundwater monitoring wells were installed downgradient of the former tank site. Samples taken from these wells indicated the presence of volatile organic compounds, which prompted the installation of four more monitoring wells in the spring of 1986.

Additional wells and soil sampling proposed in the Remedial Investigation phase of the RI/FS will further characterize the degree and extent of soil and groundwater contamination.

2.2 PROJECT DESCRIPTION

Field investigative tasks during the RI phase will include the following:

- Installation of approximately eight water table monitoring wells at various points around the site.
- Two deep test borings (approximately 200 feet in depth) with soil sampling. One boring will be conducted through the former waste solvent tank area with continuous sampling, while the other boring will be located hydraulically downgradient of the site; both will be sampled at approximately 10-foot intervals.
- Four soil test borings extending to the water table (approximately 70 feet) in the area of the former waste solvent tank will be sampled at 10-foot intervals.
- One test boring extending to the water table (approximately 70 feet) through the center of the former treatment lagoon will be sampled at approximately 10-foot intervals.



SOURCE: U.S.G.S. Topographic Map; Quadrangle: Hicksville, New York (1979).

BCM Project No. 00-5268-12

0 2000 Feet

North

QUADRANGLE LOCATION

GENERAL INSTRUMENT CORPORATION
Hicksville, New York

Figure 1
Site Location Map

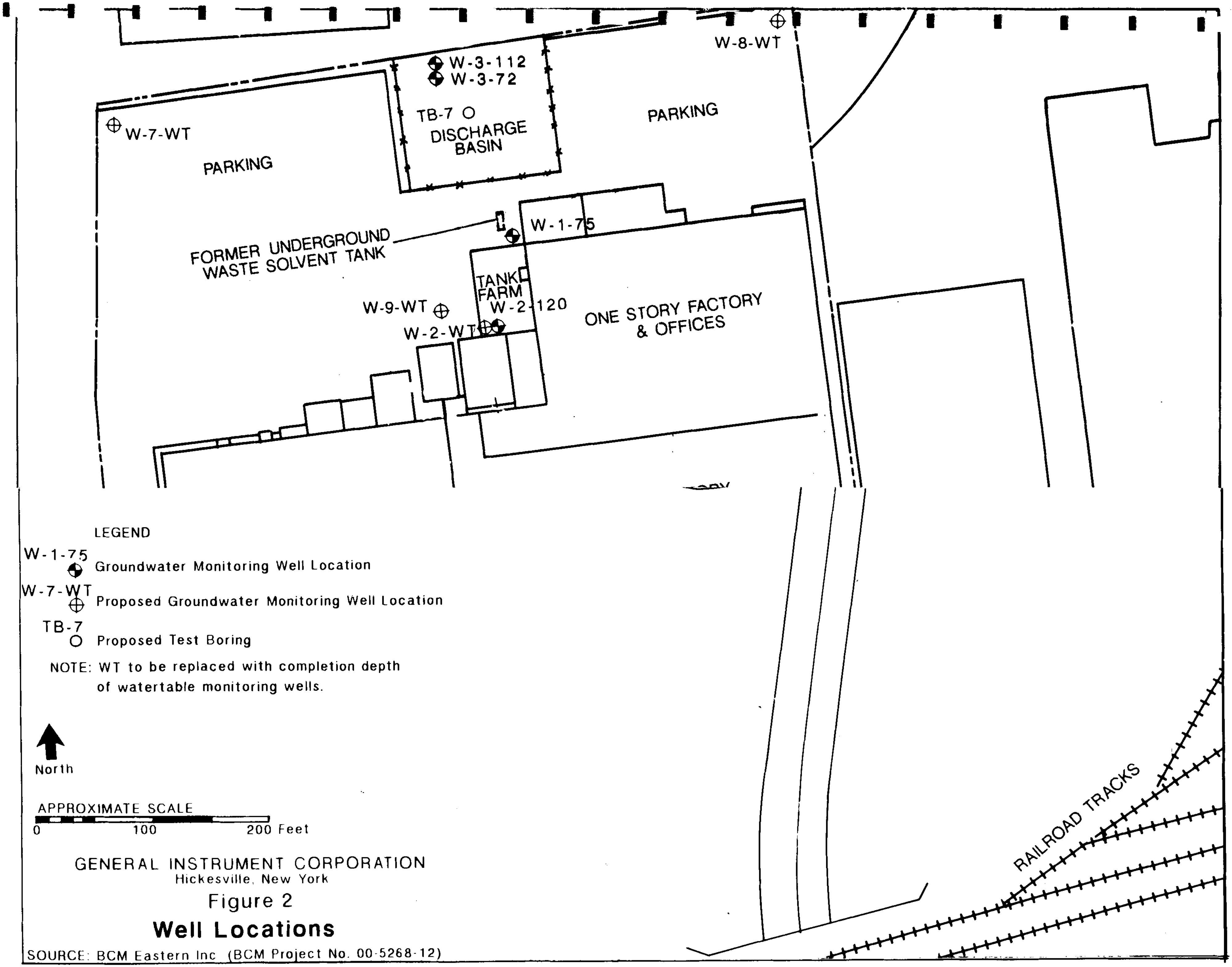
3.0 HAZARD EVALUATION

Contingencies advised in this Health and Safety Plan are based on analytical results from groundwater samples collected from 1981 to 1987 at hydraulically downgradient wells W-1-75, W-2-120, W-5-78 and W-6-79, and upgradient wells W-3-72 and W-3-112.

Table 1 lists those compounds reported to be above the detection limit of the analytical procedures used. These compounds and their associated health effects, in conjunction with the specific work tasks involved, formed the basis for the following site safety protocol.

The installation of upgradient wells W-7 and W-8 (Figure 2) will be started under Level C respiratory protection, with continuous air monitoring. After establishing the total volatile organics present in the background air and in the breathing zone near intrusive work being conducted, the onsite Safety Specialist or designee may decide to upgrade or downgrade the level of respiratory protection. If no volatile organics are detected in the breathing zone after drilling has entered contaminated soils, respiratory protection may be downgraded to Level D. Dermal protection, however will remain as prescribed during intrusive work in all areas. Level C and Level D respiratory protection equipment are described in Section 7.0.

All intrusive work conducted in the area of the former lagoon, and former waste solvent storage tank, and downgradient of the waste solvent tank, will be initiated and conducted under Level C respiratory protection with continuous air monitoring. Respirator cartridges must be changed at least twice each day, once in mid-morning and once after lunch before work is re-started. More frequent cartridge changes may be required at the discretion of the onsite Safety Specialist or designee or if there is any breakthrough (odor, etc.) observed.



GENERAL INSTRUMENT CORPORATION
Hickesville, New York

Figure 2

Well Locations

SOURCE: BCM Eastern Inc. (BCM Project No. 00-5268-12)

TABLE 1

HAZARD SUMMARY OF COMPOUNDS DETECTED IN GROUNDWATER

Chemical Name	Groundwater* (mg/l) Upgradient	Groundwater* (mg/l) Downgradient	OSHA PEL/ ACGIH TLV	Primary Hazards
BENZENE CAS: 71-43-2	ND**	<0.5-1.38	10 ppm, 30 mg/m^3 10 ppm, 30 mg/m^3	Inhalation causes eye, nose, throat irritation, CNS depression, blood changes. Direct contact causes eye and skin irritation. Human carcinogen, causes leukemia. Flammable. Odor threshold 20 ppm.
BROMOFORM CAS: 75-25-2	ND	1.9	0.5 ppm, 5 mg/m^3 (skin) 0.5 ppm, 5 mg/m^3 (skin)	Chloroform-like odor. Non-flammable. Toxic by ingestion and skin absorption. Inhalation of small amounts causes eye irritation, excessive saliva, and reddening of the face.
CHLOROBENZENE CAS: 180-90-7	ND	0.22	75 ppm, 350 mg/m^3	Inhalation causes irritation to skin, eyes, nasal passage, CNS effects, liver damage. Flammable, Flashpoint 85°F. Almond-like odor.
CHLOROFORM CAS: 67-66-3	ND	1.8-75.2	50 ppm, 240 mg/m^3 (ceiling) 10 ppm, 50 mg/m^3	Non-flammable. Narcotic by inhalation. Suspect human carcinogen.
1,2-DICHLOROBENZENE CAS: 95-50-1	ND	2.94-28,000	50 ppm, 300 mg/m^3 (ceiling) 50 ppm, 300 mg/m^3 (ceiling)	Inhalation can cause injury to liver and kidneys. High concentrations cause CNS depression, irritation to nose and eyes. Absorbed through skin.
1,3-DICHLOROBENZENE CAS: 541-73-1	ND	2.37-28,000	None	Irritant to skin, eyes, and respiratory tract.
1,4-DICHLOROBENZENE CAS: 106-46-7	ND	0.39-28,000	75 ppm, 450 mg/m^3	Flashpoint 150°F. Inhalation causes irritation to skin, eyes, and respiratory tract. Mothball-like odor.
1,1-DICHLOROETHANE CAS: 75-34-3	ND	0.49-9.7	100 ppm, 400 mg/m^3 200 ppm, 810 mg/m^3	Moderately toxic. Combustible. Inhalation causes CNS depression, irritation to eyes, skin, and throat. Colorless liquid with a chloroform-like odor

TABLE 1 (Continued)

Chemical Name	Groundwater* (mg/l)		OSHA PEL ACGIH TLV	Primary Hazards
	Upgradient	Downgradient		
1,2-DICHLOROETHANE CAS: 107-06-2	1.4	ND	50 ppm 10 ppm, 40 mg/m^3	Flashpoint 55.4°F. Chloroform like odor. Toxic by inhalation, ingestion, and skin absorption. Strong irritant to eyes and skin. CNS depressant, suspect carcinogen.
1,1-DICHLOROETHENE CAS: 75-35-4	ND	<0.1-27.30	5 ppm, 20 mg/m^3 5 ppm, 20 mg/m^3	Suspect carcinogen. Cumulative liver and kidney damage. Irritant to skin, mucous membranes; narcotic in high concentrations.
ETHYLBENZENE CAS: 100-41-4	ND	<1-1,100	100 ppm, 435 mg/m^3 100 ppm, 435 mg/m^3	Skin, eyes and respiratory tract irritant by inhalation and ingestion. FP 59°F, odor threshold 2.0 ppm.
METHYLENE CHLORIDE CAS: 75-09-2	ND	<1-400	500 ppm 100 ppm, 350 mg/m^3	Non-flammable. Odor detection 25-50 ppm. Suspect carcinogen. Inhalation causes CNS effects and eye irritation. Prolonged skin contact causes dermatitis.
O,M,P-XYLENE	ND	0.69-1,500	100 ppm, 435 mg/m^3 100 ppm, 435 mg/m^3	Flammable. Inhalation causes CNS effects (dizziness, excitement, drowsiness). Absorbed through skin. Direct skin and eye contact may cause irritation. Prolonged skin contact may cause dermatitis.
Phenols	ND	66-1,020	5 ppm, 19 mg/m^3	Flashpoint 172.4°F. Toxic by inhalation, ingestion, and skin absorption. Strong irritant to skin, eyes, respiratory tract, liver. Causes liver and kidney damage.

TABLE 1 (Continued)

Chemical Name	Groundwater* (mg/l) Upgradient	Groundwater* (mg/l) Downgradient	OSHA PEL/ ACGIH TLV	Primary Hazards
TETRACHLOROETHENE	117-491	<1-2,700	100 ppm, 200 ppm (ceiling) 50 ppm, 335 mg/m^3	Toxic by inhalation and ingestion. Causes irritation to eyes, nose, throat, CNS effects, flush face. Suspect carcinogen. Non-flammable. Prolonged contact can lead to dermatitis.
TOLUENE CAS: 108-88-3	0.50-4.8	0.2-128	200 ppm 100 ppm, 375 mg/m^3	Benzene-like odor. Flashpoint 40°F. Suspect animal carcinogen. Inhalation causes CNS depression. Respiratory irritation. Prolonged contact causes skin irritation.
TRANS-1,2-0 DICHLOROETHENE CAS: 156-60-5	0.41-17.1	<1-1,400	None	Limited toxicological available. The lowest concentration in air to which humans have been exposed and produced a toxic effect = 4,800 mg/m^3/10m
1,1,1-TRICHLOROETHANE CAS: 71-55-6	1.1-6.15	0.51-158	350 ppm 1,900 mg/m^3 350 ppm 1,900 mg/m^3	Non-flammable. Irritant to skin, eyes, and respiratory tract by inhalation and direct contact. CNS depressant.
1,1,2 TRICHLOROETHANE CAS: 79-00-5	12.6-306	0.47-9.21	10 ppm, 45 mg/m^3 (skin) 10 ppm, 45 mg/m^3 (skin	Nonflammable Characteristic chloroform-like odor. Absorbed by skin. Irritant to skin and eyes.
TRICHLOROETHENE CAS: 79-01-6	10.5-306	1.71-13,000	100 ppm 50 ppm, 270 mg/m^3	Non-flammable. CNS depressant, skin and eye irritant by inhalation and direct contact. Suspect animal carcinogen.
VINYL CHLORIDE CAS: 75-01-4	ND	<0.1-228.00	1.0 ppm 5 ppm, 10 mg/m^3	Positive human and animal carcinogen. Inhalation causes CNS effects, abdominal pain, GI bleeding, cyanosis, liver damage.

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* Range in levels of contamination detected in wells sampled from 1981 to 1986

** ND = No detected.

4.0 PARTICIPANTS AND RESPONSIBILITIES

4.1 PROJECT MANAGER - JOHN W. FOWLER

The Project Manager will be responsible for assigning qualified field personnel and coordinating the work with General Instrument and the drilling contractor.

4.2 PROJECT GEOLOGIST - JASON M. SCHINDLER

The Project Geologist will be responsible for coordinating site activities with General Instrument and the drilling contractor. The Project Geologist will also supervise the field investigation. This will include scheduling and determining boring locations. The Project Geologist and/or his designee will also be responsible for performing the duties of the Safety Specialist if Level D or C protection is utilized.

4.3 PROJECT SAFETY SPECIALIST - MARY GLOWACKI

The Safety Specialist will be responsible for implementing the site safety plan and for ensuring compliance with BCM's safety manual. At the site, the Safety Specialist or designee shall:

a. Ensure that appropriate personal protective equipment is available and properly used by BCM. Subcontractors will supply their own personal protective equipment.

b. Ensure that all onsite personnel are aware of and follow the provisions of this plan, and are instructed in work practices, safety, and emergency procedures.

c. Conduct onsite monitoring of personnel hazards (chemical and physical) to determine the degree of hazards and establish the proper level of protection required.

d. Evaluate weather, topography, and potential physical and chemical hazards, and recommend any necessary modifications to the work plans and personal protection levels to ensure the safety and health of all project personnel.

e. Monitor the safety performance of all project personnel to ensure that proper safety and health procedures are employed.

4.4 SUBCONTRACTOR - DRILLING TEAM

The drilling subcontractor will supply a team, adequately trained and equipped with the proper safety equipment, to conduct the drilling operations. BCM is not responsible for subcontractor safety equipment; however, BCM will enforce this Site Safety Plan as it regards to all onsite personnel.

5.0 SITE CONTROL

5.1 DESIGNATION OF WORK ZONES

A primary means of maintaining site control in order to ensure safe, efficient work and to prevent migration of hazardous materials into uncontaminated areas is to designate work areas. The work areas serve to limit site access, contain gross contamination, provide site security, and place a buffer zone between the hazardous site and the surrounding environment. General considerations for establishing the work zones include:

1. The extent of the contamination encountered while drilling
2. The probability of airborne contamination (properties of wastes onsite, and wind speed and predominant direction)
3. Terrain
4. Location of manufacturing operations and plant personnel, roadways, local population, and businesses

Typically, three work zones established: an Exclusion Zone, a Contamination Reduction Zone, and a Support Zone, which are defined in the following sections and controlled by the Safety Specialist. Figure 3 illustrates the general principles of the site work zones.

5.2 EXCLUSION ZONE

The Exclusion Zone (EZ) will be established onsite by the Safety Specialist. The EZ will be cordoned off by plastic tape supported by cones or stakes. The area will be large enough for safe movement of essential personnel and is intended to contain the drilling rig and an area that may be exposed to contaminated soil and/or groundwater. Only personnel essential to the completion of the project will be permitted to enter the Exclusion Zone. All personnel in the Exclusion Zone will be required to wear protective equipment established by the Safety Specialist, as outlined in Section 7.0

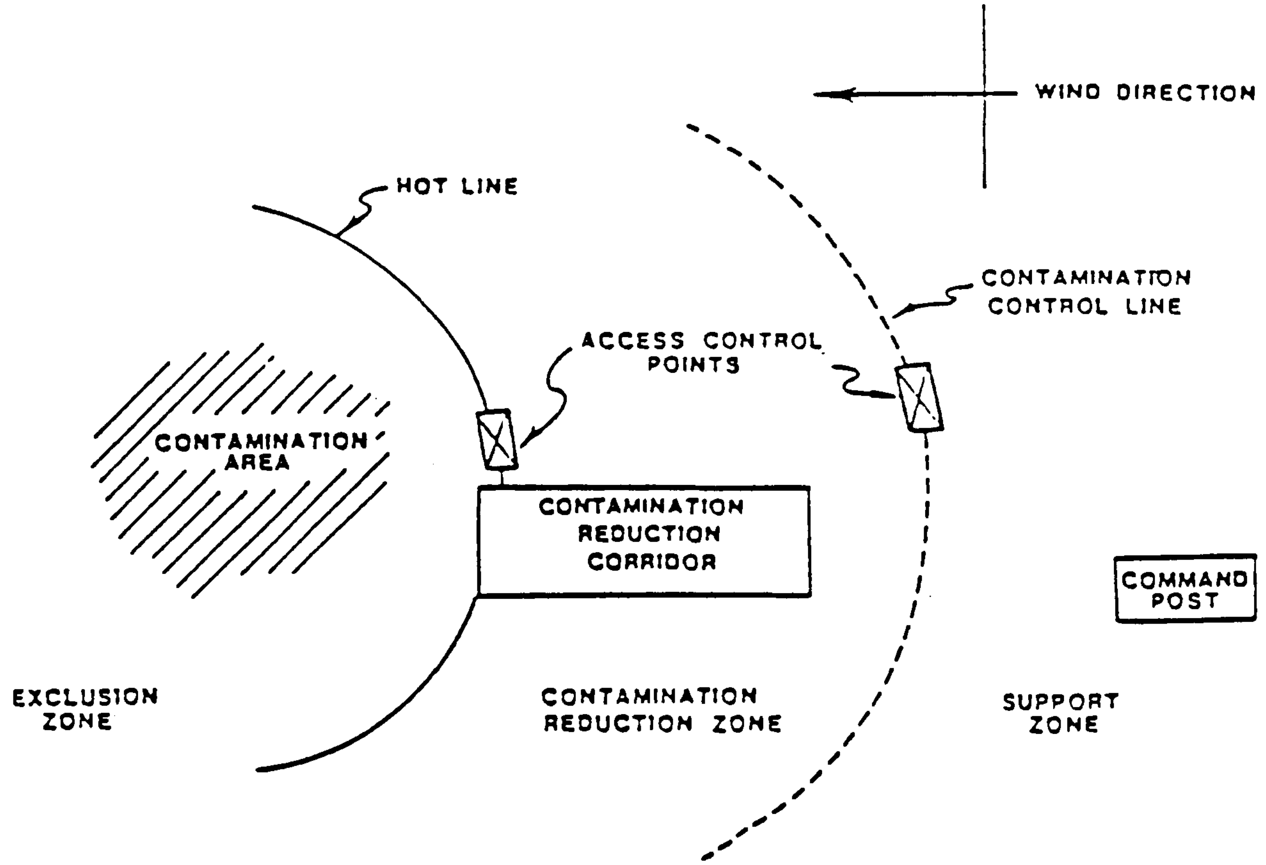

Figure 3
SITE WORK ZONES

5.3 CONTAMINATION REDUCTION ZONE

The Contamination Reduction Zone (CRZ) serves as the interface between the Exclusion Zone (contaminated) and support zone (clean). This transition zone serves as a buffer to further reduce the probability of the clean zone becoming contaminated. It also provides additional assurance that the physical transfer of contaminated substances on people or equipment, or in the air, is limited through a combination of decontamination, distance between zones, air dilution, zone restrictions, and work functions. Material supplies will be staged within the Contamination Reduction Zone (CRZ) to service equipment and for easy access by personnel within the Exclusion Zone. All vehicles, equipment, and personnel will be totally decontaminated before leaving this zone as outlined in Section 10.0. All protective clothing that is removed will be temporarily stored in the CRZ or will be disposed of properly if contaminated.

5.4 SUPPORT ZONE

This portion of the area is considered "clean" or uncontaminated. Support equipment such as the safety van, equipment/supplies, etc. will be located here. The Support Zone (SZ) shall be clearly delineated to prevent active or passive contamination from the work site. This area serves as the entry and exit point for personnel, equipment, and material to and from the work area.

6.0 ACCESS AND DEPARTURE PROCEDURES

Personnel required to enter into the Contamination Reduction Zone must sign in and be briefed by the Safety Specialist. Prior to entry, personnel will be informed of current activities and the protection level requirements. Their signatures will signify their acknowledgement and affirm that they will follow the recommended minimum levels of protection specified by BCM.

The following sign in/out formats are established for BCM and non-BCM employees.

BCM

GENERAL INSTRUMENT CORPORATION
HICKSVILLE, NEW YORK, FACILITY

PROJECT PARTICIPANTS SITE ENTRY LOG

BCM Employee Name	Purpose for Entry	Date	Time In	Time Out

BCM

GENERAL INSTRUMENT CORPORATION
HICKSVILLE, NEW YORK, FACILITY

SITE ENTRY LOG
(Non-BCM Employee)

I have reviewed the health and safety procedures prepared by BCM for this site and understand the information presented in the Health and Safety Plan (HASP). I agree to comply with the stated policies as set forth in these procedures. I recognize that they are the minimum levels of protection required based on current knowledge of the site. Higher levels of protection may be used at my discretion following notification to the BCM onsite Safety Specialist. I also understand that all safety equipment must be supplied by my company/organization and not through BCM. If I do not comply with the BCM HASP, I will have to leave the site.

Printed Name	Organization	Signature	Date

7.0 LEVELS OF PROTECTION - B, C, AND D

(DEPENDENT ON ACTIVITY)

The following considerations will define whether Level B, Level C, or Level D protection will be used.

1. For participants who are upwind of the Exclusion Zone (Figure 3) and who are not required to enter the work area, Level D protection is expected to be adequate (see Section 8.3.3).

2. For participants who are within the Exclusion Zone, Level C or Level B protection will be required. Level C equipment will be donned if organic vapors greater than background levels are detected in the breathing zone. Level B will be considered if monitoring instruments reveal greater than 5 ppm readings of sustained total organic vapors above background in the breathing zone. Otherwise, Level C will provide adequate protection.

3. For participants who must be present during soil sampling or earth penetration of any kind, or following such operations where excessive vapors or dusts remain, Level C may be required. The Safety Specialist will make this determination.

NOTE: The distinction between Levels B, C and D will be based on respiratory protection requirements. Self-contained breathing apparatus (SCBA) or pressure-demand airline respirators will replace air-purifying respirators when Level B is prescribed.

7.1 GLOVES

White surgical-type PVC gloves will be worn under green nitrile gloves for work that entails prolonged contact with potentially contaminated soil; for added durability, the heavy black neoprene-impregnated glove will be worn in addition to the PVC and nitrile gloves.

7.2 DISPOSABLE SPLASH SUIT

The polycoated (yellow) Tyvek splash suit will be worn, as a minimum, by all personnel in the work zone.

7.3 BOOTS

Disposable booties will be worn over steel-toed work shoes at all times in the Exclusion Zone.

7.4 EYE PROTECTION

Safety glasses with side shields or goggles will be worn whenever respiratory protection is not required (Level D).

Eye protection will be afforded through the use of full-face air purifying respirators or airline respirators.

7.5 HEAD GEAR

Hard hats will be required of all personnel in the Exclusion Zone and must meet ANSI 284.1-1969 specifications for puncture resistance.

7.6 RESPIRATORY PROTECTION

The respiratory protective devices used at this site will be airline respirators (Level B) and/or air-purifying respirators (Level C). The level of respiratory protection applied will be based upon findings derived from the use of HNu Systems Photoionization Detector (HNu PI-101) and/or Century Systems Organic Vapor Analyzer (OVA-128). As an alternative to the HNu, PI-101, a Photovac TIP, may be used.

The decision to upgrade or downgrade levels of respiratory protection is based on an airborne concentration level that exceeds the predetermined "action level."

Based on the chemicals suspected to be onsite (Table 1), their toxicity, anticipated exposure, and prior site experience, the action level of 5 ppm as described below will act as a trigger for upgrading or downgrading respiratory protection between Levels B and C. Level D usage will be decided as described in Section 3.0.

If sustained organic vapor concentrations detected by the HNu or OVA exceeds 5 ppm above background levels in the breathing zone, pressure-demand airline (supplied air) respirators will be warranted (Level B Protection). In the event of an organic vapor level excursion greater than 5 ppm above background in the breathing zone, the Safety Specialist or designee will monitor the persistence of the levels as other non-essential personnel retreat a safe distance (vapor levels below 5 ppm above background). If levels persist above 5 ppm above background in the breathing zone, airline respirators will be warranted.

The switching of levels of protection will be at the discretion of the Safety Specialist or designee. If long-term organic vapor levels are less than 5 ppm above background level, level of protection C will be in effect using full-face air-purifying respirators with organic vapor/acid gas/high-efficiency particulate cartridges.

Respiratory specifications are as follows:

1. LEVEL B - RESPIRATORY PROTECTION:

   NIOSH-approved self-contained breathing apparatus (SCBA)

   NIOSH-approved pressure-demand airline respirator

2. LEVEL C - RESPIRATORY PROTECTION:

   NIOSH-approved full-face air-purifying respirator, with organic vapor/acid gas/high-efficiency cartridges

NOTE: Failure of the air supply system will prompt immediate cessation of all onsite activities that require the use of Level B protection.

8.0 GENERAL REQUIREMENTS FOR ENTRY INTO CONTAMINATED ZONES

Before proceeding downrange into the Exclusion Zone, all personnel shall comply with the following requirements:

1. Have satisfied the medical surveillance requirements of the Superfund Amendment Reauthorization Act (SARA) of 1986 as listed in 29 CFR Part 1910
2. Have had appropriate training
3. Have reviewed the HASP and are fully aware of the requirements in the plan
4. Dressed out in accordance with the task-specific plans
5. Have notified the Safety Specialist or designee
6. Have signed the access and departure log as listed in Section 6.0.

All personnel entering areas and performing tasks that require Level C or B respiratory protection shall:

1. Be respirator fit-tested
2. Be cleanly shaven
3. Have been trained in respiratory protection
4. Work in a minimum of a two-person team with a line-of-sight to a third person

8.1 SITE ENTRY AND EXIT PROCEDURES

8.1.1 Startup

1. Team briefing to review intended daily operations and safety procedure update.
2. Daily check of all monitoring and safety equipment.
3. Personnel dress out and team proceeds downrange.
4. Entry time and personnel are logged.

5. The Safety Specialist reviews site conditions and initiates appropriate monitoring.

6. All downrange time for Level B activities will be monitored by the Safety Specialist.

8.1.2 Shutdown

1. All personnel exit from the Exclusion Zone and decontaminate.

2. All personnel logged out by the Safety Specialist.

3. Ensure that the site and all equipment are secured.

8.2 VISITOR PROTOCOL

All visitors who proceed downrange in the Exclusion Zone must comply with the following requirements:

1. Visitors must have reviewed the site-specific HASP and must agree to comply with the policies set forth in this plan.

2. Visitors will be limited to Level D work areas.

3. Visitors must be escorted by onsite personnel.

4. The Safety Specialist must be notified prior to site entry.

8.3 ACTION LEVELS/GENERAL PERSONAL PROTECTION GUIDELINES

Instantaneous reading devices (OVA, HNu, TIP) will be used onsite to provide a continuous update of the levels of volatile organics. If sustained non-methane organic vapor concentrations detected by the OVA and HNu exceed 5 ppm above background levels in the breathing zone, the Safety Specialist or designee will monitor the persistence of the levels as other non-essential personnel retreat a safe distance. If levels persist above 5 ppm above background in the breathing zone, the Safety Specialist will advise the appropriate course of action. The switching from level of protection C to B, or vice versa, will be at the discretion of the Safety Specialist. If long-term organic vapor levels are less than 5 ppm above background, level of protection C will be put into effect using full-face air-purifying respirators. Table 2 lists the EPA Action Level Criteria for monitoring instrumentation. Protocol for Level B, C, or D implementation follows.

TABLE 2

EPA ACTION LEVEL CRITERIA

Monitoring Instrument	Hazard	Action Level	Action
Explosimeter	Explosive Atmosphere	<10% LEL	Complete the inspection.
		10%<LEL<25%	Complete the inspection, with continuous monitoring.
		>25% LEL	<u>EXPLOSION</u> Hazard; evacuate the area.
Oxygen Meter	Oxygen Level	>19.5%	Complete the inspection.
		<19.5%	Complete the inspection, with SCBA and continuous monitoring.
Organic Vapor Analyzer(OVA)	Organic Vapors	1) Depends on species 2) Total response mode	Upgrade/downgrade level of personal protection, as necessary
HNu photo-ionizer	Organic vapors/ Gases	1) Depends on species 2) Total response mode	Upgrade/downgrade level of personal protection, as necessary

8.3.1 Level B

- Performing initial tasks in areas of unidentified suspected wastes
- Vapor concentrations of unknown compounds that exceed the action level of 5 ppm above background
- Oxygen-deficient atmospheres (less than 19.5 percent oxygen)
- In the event of a high organic vapor excursion while performing onsite tasks

Level B Respiratory Protection:

NIOSH-approved SCBA
NIOSH-approved pressure-demand airline respirator

8.3.2 Level C

- Donned during performance of tasks in designated contaminated zones as specified in the Task-Specific Plans

Level C Respiratory Protection:

NIOSH-approved, full-face, air-purifying respirator, with organic vapor/acid gas/high-efficiency particulate cartridges

8.3.3 Level D (No Respiratory Protection)

- For tasks that do not disturb onsite features
- In support and clean areas
- If organic vapor concentrations in the breathing zone remain at background levels

8.3.4 Explosive Atmospheres

- Greater than 10 percent of the Lower Explosive Limit (LEL) and less than 25 percent of the LEL, as recorded by an explosimeter; complete the inspection with continuous monitoring.
- Greater than 25 percent of the LEL; secure and evacuate the work area until the area can be aired out, and the LEL drops below 10 percent.

8.3.5 Oxygen-Deficient Atmospheres

- Less than 19.5 percent (by volume) oxygen atmosphere requires upgrading to Level B respiratory protection.

8.4 PERSONAL HYGIENE REQUIREMENTS

All personnel whose responsibilities involve onsite activities will comply with BCM's policy pertaining to personal hygiene. The following guidelines are established as an integral part of this policy:

- Eating, drinking, smoking, and chewing gum or tobacco are prohibited in any contaminated area.
- Hands and face must be thoroughly washed upon leaving the work area.
- Facial hair that may interfere with the respirator mask-to-face seal is not allowed.
- Contact with contaminated surfaces or surfaces suspected of being contaminated should be avoided while unprotected.
- Medicine and alcohol can potentiate the effects from exposure to some toxic chemicals. Personnel receiving medication should indicate this fact to the Safety Specialist or designee.

9.0 SAFETY PROCEDURES

9.1 DRILLING SAFETY

1. Prior to drilling, adequate site clearing and leveling should be performed to accommodate the drill rig and supplies, and provide a safe working area.
2. All onsite personnel should stand clear of the drill rig immediately prior to and during startup of the engine.
3. Organic vapor monitoring will be conducted continuously in the workers' breathing zone during drilling operations.
4. If Level B (airline respirators) is utilized, particular attention should be given to the airline hose in order to ensure that workers do not trip on the hose and that the hose does not become entangled or severed by moving parts.
5. Immediately following the completion of drilling operations, the entire work area will be monitored to determine if vapor concentrations have returned to background levels. If elevated levels are detected, the source will be determined and the appropriate action will be taken.

10.0 DECONTAMINATION (LEVELS B, C, AND D)

10.1 STAGE I

All protective clothing should be removed and disposed of in the appropriate container. Due to the nature of the tasks involved, a totally disposable outfit has been selected to simplify the decontamination procedure.

10.2 STAGE II

Stage II decontamination will consist of the following steps:

1. Remove gross quantities of mud and dirt from overboots with scrapers.
2. Wash mud and dirt from gloves with detergent solution; then use a brush to wash mud and dirt from overboots.
3. Clean airlines (Level B), truck tires, etc. with detergent solution.
4. Remove overboots and place in plastic trash bag for further decontamination or re-entry.
5. Remove gloves and place in plastic bag with overboots.
6. Remove Tyvek coveralls and place them into designated containers for disposal (or reuse if same-day re-entry is anticipated). All contaminated equipment (coveralls, gloves, etc.) will be disposed of onsite in accordance with the Safety Specialist's guidelines.
7. Remove respirator (Level B or C) and proceed to Stage III decontamination.

10.3 STAGE III

Stage III decontamination will consist of the following steps:

1. Hang respirator (Level B or C) on rack.
2. Wash hands and face with soap and water.

3. If respirator is grossly contaminated or work is completed for the day, remove cartridges or regulator, and clean and disinfect the respirator using the normal procedure (Attachment A). If the respirator is not contaminated and same-day re-entry is planned, wipe down the respirator with equipment wipes provided. Place respirator in clean bag and proceed to clean area.

11.0 MONITORING EQUIPMENT

11.1 TYPE OF EQUIPMENT

The air monitoring equipment listed below will be used to provide instantaneous readings of the levels of volatile organic compounds present in the breathing zones of site personnel, and along the perimeter of the facility property. In addition, the HNu will be used to screen soil samples.

HNu Photoionization Analyzer, Model PI 101,
HNu Systems, Inc. (with 11.7eV lamp)

Portable Organic Vapor Analyzer, Model OVA-128,
Century Systems

Alternate:

TIP Photoionization Detector, Model #10510
Photovac International, Inc.

When using the OVA, the GC mode will be used alternately with the PID mode to differentiate between the presence of methane and other non-specified volatile organic compounds.

The calibration of all air monitoring devices will be checked before and after each day's use. Calibration information and daily air monitoring results will be maintained on a daily logs (Tables 3 and 4, respectively).

11.2 MONITORING PROTOCOL

1. Check and record calibration at day's start.
2. Onsite - prior to drilling, determine and record background levels using both HNu and OVA. Airborne VOC levels, weather conditions, and prevailing wind direction and speed should all be noted.
3. Report perimeter VOC levels periodically.
4. Check and record breathing zone levels periodically during drilling and sampling.
5. Check and record source levels with HNu (i.e., sampling spoon, borehole, etc.).
6. Check and record calibration at day's end.

TABLE 3

GENERAL INSTRUMENT COMPANY

EQUIPMENT CALIBRATION LOG

Date	Time	Equipment No.	Span Setting	Calibration	Reading	Initial

TABLE 4

GENERAL INSTRUMENT COMPANY

AIR MONITORING DATA LOG

DATE: ______________________

SAMPLER: ____________________

EQUIPMENT NO.: ______________

Scan No.	Location	Time	Reading (ppm)

12.0 FIRST AID EQUIPMENT

Standard First Aid Kit: Manufactured by Fischer Scientific

- Blankets (2)
- Bandages
- Compresses
- Bandaids
- Iodine
- Tourniquet
- Ammonia inhalants
- Gauze
- Absorbent Cotton
- Eye wash solution (Isotonic) (4 oz.)

Eye wash station: Manufactured by Norton Company, Safety Products Div.
Volume: 32 oz. (Isotonic)

13.0 MEDICAL SURVEILLANCE

All project participants must exhibit good health and must possess a doctor's certification of adequate fitness by means of a current annual physical examination. At a minimum, the examination must meet the requirements of the Superfund Amendment Reauthorization Act (SARA) of 1986 as listed in 29 CFR Part 1910.

14.0 EMPLOYEE TRAINING

All project participants must have completed 40 hours of hazardous waste training mandated in Section 128(e) of the Superfund Amendment Reauthorization Act (SARA). In addition to having fulfilled the 40-hour training program prior to working onsite, all project participants will receive site-specific training before work begins. Workers will be briefed on the proper use of protective equipment, safety zone configurations, decontamination procedures, action levels relative to contaminant detection, and the emergency contingency plan.

15.0 EMERGENCY CONTINGENCY PLAN

If an incident occurs that requires declaration of an emergency, all personnel will assemble at the decontamination station for instruction. The BCM office will be notified of the incident as soon as is practicable. Arrangement for decontamination, evacuation, and/or transport will be made at that time.

15.1 NOTIFICATION/REPORTING PROCEDURES

In the event of an emergency, Charles Gorsch, GI Plant Engineer, will be notified as soon as possible as to the nature of the incident (gas release, injury, etc.) and the need for further action.

15.2 ACUTE VAPOR RELEASES

If significant levels (greater than 5 ppm above background levels) of persistent organic vapors are detected in the breathing zone, all onsite personnel will don Level B protection (airlines) upon notification by the Safety Specialist. The Project Geologist and Safety Specialist or designee will determine all onsite policies regarding personnel protection and mitigation schemes, such as closing the boring to lessen the escape of concentrated vapor. Should concentrated vapor release endanger the public, Emergency Services (Section 15.6) will be notified at once.

15.3 SIGNIFICANT, PROLONGED SHIFTS IN WIND DIRECTION

Significant shifts are those conditions in which wind carries detectable levels of contaminants beyond the boundaries of the Exclusion Zone and threatens unprotected plant personnel or the community. In the event of such an occurrence, all activities will be suspended and the boring will be filled at once if acute vapor release persists.

15.4 PERSONNEL INJURY

In the event of an injury, all personnel will assemble at the decontamination zone. If the injured person is immobile, one or more persons should remain nearby to provide any necessary first aid. If medical help is needed, the Safety Specialist or Project Geologist will summon the appropriate assistance as outlined below, or transport as necessary. The extent of decontamination of any injured personnel and those coming to his or her aid is a judgement that must be made on a case-by-case basis and is the responsibility of the Safety Specialist or his/her designee.

While onsite activity is in progress, at least one qualified person will be available at all times to administer first aid, including CPR.

15.5 EVACUATION PLAN

In the event of an onsite evacuation, the following plan would be put into effect:

- A signal consisting of five 1-second blasts of vehicle or air horn will be used.
- All personnel will immediately evacuate downwind areas and report to the decontamination area for further instruction.

15.6 EMERGENCY SERVICES

In the event of an emergency, the appropriate General Instrument Corporation personnel and emergency services should be notified as needed.

Contact List:

Hicksville Police Department, 2nd Precinct	516-364-0500
Hicksville, Fire Department	516-933-6444
Contact Fire Department for Ambulance	
Massapequa Hospital Seaford, NY	516-454-3313
General Instruments Corporation Charles Gorsch Plant Engineer	516-933-3125
BCM Eastern Inc. Doug Mueller, CIH - Safety Director Alan M. Robinson - Vice President, Earth Resources Division John W. Fowler - Project Manager	215-825-3800

Directions to Massapequa Hospital:

Take Long Island Expressway (East) to 135 Seaford Oyster Bay South. Take 135 Seaford Oyster Bay South to Southern State Parkway (Eastbound). Get off at exit 29 North. Turn left at 1st traffic light. Turn left again at next light. Will see hospital.

ATTACHMENT A

PROCEDURE FOR CLEANING AND DISINFECTING RESPIRATORS

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PROCEDURE FOR CLEANING AND DISINFECTING RESPIRATORS

1. Remove cartridges (if of the air-purifying type) and put in container provided.
2. Remove regulator of airline respirator.
3. Remove any gross contamination with water and paper towels, taking care not to scratch the plastic lens.
4. Mix 70 ml of concentrated cleaning solution into 3 gallons of water in the bucket provided.
5. Soak respirator in solution for about 10 minutes (remove regulator if airline respirator).
6. Dip respirator into rinse bucket several times.
7. Rinse respirator with copious amounts of fresh water from the eye wash station.
8. Shake excess water from respirator, dry with paper towels, ensure that exhalation valve is clean, dry, and operable, and place into new plastic bag.

APPENDIX D

HEADSPACE ANALYSES PROTOCOLS

APPENDIX D

HEADSPACE ANALYSIS PROTOCOLS

Headspace analysis is a field analysis used to determine the presence or absence of gross volatile organic compounds (VOCs) in a sample. An organic vapor analyzer (OVA) and/or a photoionization detector (PID) is used to scan for relative VOC concentrations in the headspace of a jar partially filled with sample material. The following protocol is used for headspace analyses:

- Each sample is separated into two portions.
- One portion is placed into a laboratory-prepared sample bottle and placed in a chilled environment for transport to the laboratory.
- The remainder is placed into a jar, the mouth of which is covered with aluminum foil before replacing the cap.
- The sample is allowed to warm to room temperature and given time for VOCs, if present, to collect the headspace in the jar above the sample.
- The cap is then removed and the sampling port of the OVA and/or PID instrument(s) is inserted through the foil. The relative VOC concentration is read directly from the instrument(s).

This test is primarily a qualitative test used to determine the possible presence or absence of gross VOC concentrations in soil samples. Lack of analytical controls and differences in the scanning instruments' abilities to detect various compounds make quantitative results unreliable. However, relative differences in concentrations detected may be used as a tool in developing further investigative methods.