Remedial Investigation Work Plan

Former Manufactured Gas Plant Site
Clark Street
Auburn, New York

New York State Electric & Gas Corporation
Binghamton, New York

August 1992

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1.0 Introduction

1.1 General

This document presents a detailed Work Plan for a focused Remedial Investigation (RI) to be performed at the site of a former manufactured gas plant (MGP) located on Clark Street in Auburn, New York. The Work Plan was prepared by Blasland & Bouck Engineers, P.C. (Blasland & Bouck) at the request of the New York State Electric & Gas Corporation (NYSEG), the current owner of the Clark Street MGP site.

NYSEG voluntarily initiated preparation of this Work Plan based on the recommendations contained in a "Site Screening Report" prepared by Atlantic Environmental Services, Inc. (Atlantic) in 1991. Atlantic had recommended investigation based on a "Site Screening and Priority Setting System" (SSPS) score for the site resulting from the detection of volatile organic compounds (VOCs) and polycyclic aromatic hydrocarbons (PAHs) in on-site surface soils and in sediment adjacent to the site. The SSPS was developed by the Electric Power Research Institute to assist in setting priorities for investigation of MGP sites.

The Work Plan consists of a scope of work describing the proposed field sampling program (Section 3.0) and a schedule and cost estimate for implementing the RI (Sections 4.0 and 5.0, respectively). The scope of work is based on a conceptual model of the site developed by Blasland & Bouck (Section 2.0) and is supported by Field Sampling Procedures, a Quality Assurance Project Plan (QAPP), and Health and Safety Plan (HASP), which are included as appendices to this Work Plan.

1.2 Objectives

The overall objectives of the Clark Street MGP Site RI are to:

1. Identify and delineate the potential contaminant source areas, including characterization of residues present;
2. Define the extent of contaminants in various environmental media (soils, ground water, sediments, etc.); and
3. Determine if the residues and associated contaminants present a potential significant threat to human health and/or the environment.

1.3 Overview of RI Field Investigations

To obtain information necessary to meet the objectives of the RI, four field sampling investigations will be conducted:

- Source Area Investigation
- Surface Soil Investigation
- Ground-Water Investigation
- Sediment Investigation

The rationale for each field sampling investigation is described in detail in Section 3.0 of the Work Plan. In general, the RI field sampling program will be performed in two phases. The first phase of work will focus on characterizing likely source locations and residues associated with each potential source area. The environmental media in which residues and associated contaminants may be present or migrate, specifically ground water, surface soil, and sediments, will be evaluated during the subsequent phase of field work. In this manner, sampling locations and final laboratory analytical methods for these environmental media will focus on only those areas of the site and parameters requiring evaluation.

2.0 Conceptual Site Model

2.1 General

To formulate an approach for the remedial investigation, a conceptual model of the site was developed which consists of the following:

- Clark Street site overview;
- Clark Street site history;
- Potential source areas and associated residues at the Clark Street site;
- Potential migration pathways at the Clark Street site; and
- Potential exposure pathways routes and potential receptors at the Clark Street site.

In the conceptual model for the Clark Street site, existing information and data addressing source areas, migration pathways, and exposure routes/receptors are presented. This information and the identified data gaps provide the basis for the proposed RI activities.

2.2 Clark Street Site Overview

The Clark Street MGP Site is located on Clark Street in the City of Auburn, Cayuga County, New York. The site area is 3.08 acres in size and is currently bounded by the Owasco Outlet (a river) to the north and east, by an access road at the end of Clark Street and a Conrail right-of-way to the south, and by property reportedly owned by Robert A. and Loretta M. Sackel that houses a vehicle maintenance shop to the west (Atlantic, 1991). The site is accessed via an access road off of Clark Street. Figure 1 depicts the site location.

The site is currently owned by NYSEG and is presently occupied by a NYSEG electric substation and gas regulator building. The substation is contained within a fenced area. The remaining site area is unfenced and covered with gravel fill and/or vegetation. The vegetation is the thickest at the perimeter of the site adjacent to the Owasco Outlet. The general topography of the site slopes downward towards the Owasco Outlet.

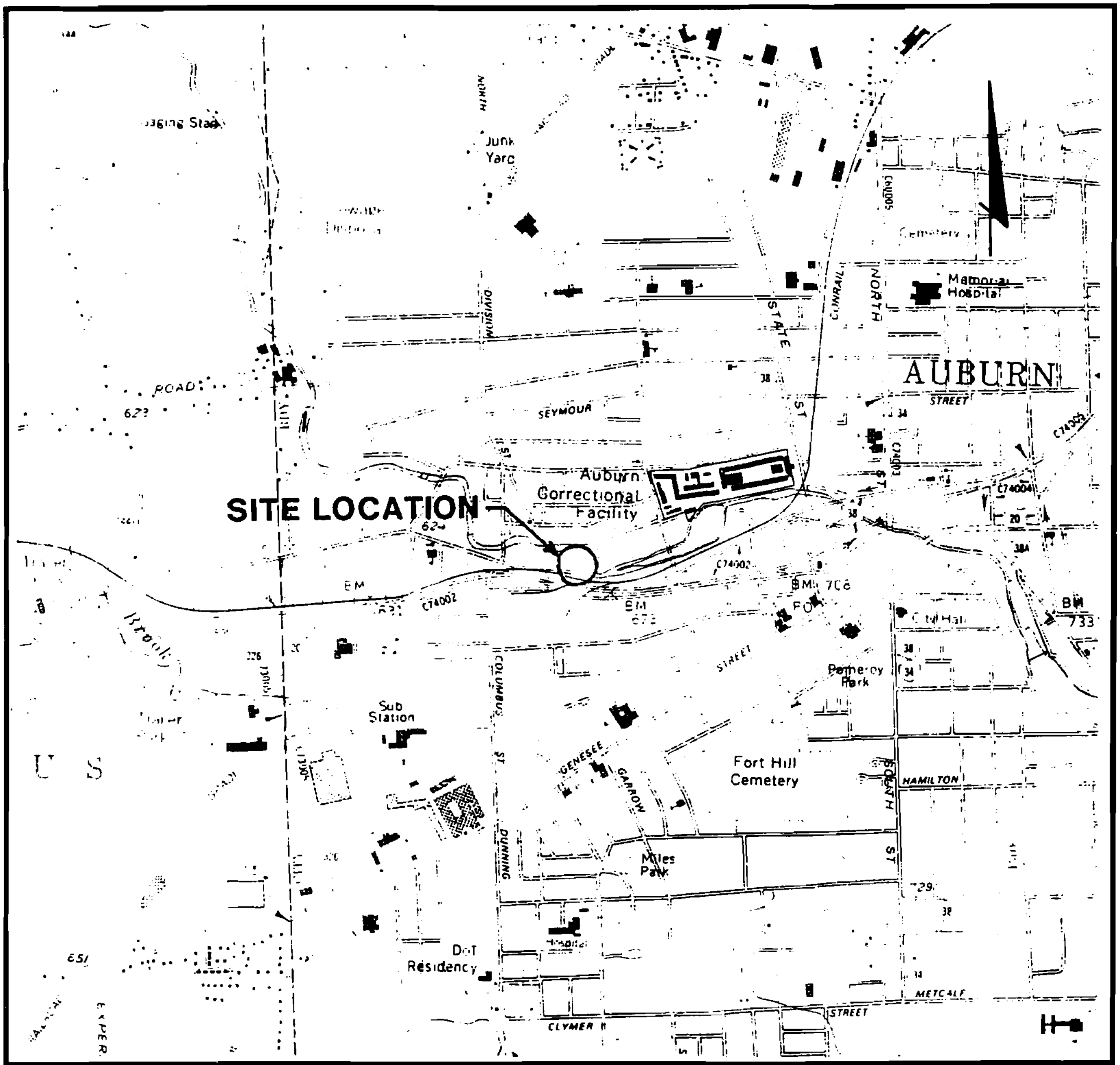
MGP operations were initiated at the site on or about 1904 and continued until gas production operations were terminated in or about 1946 when the facility was converted to a utility operations center/natural gas storage facility (Atlantic, 1991). The MGP facility was dismantled in the late 1950s and early 1960s (Atlantic, 1991). Currently, the foundation of the former gas plant building is visible, and the natural gas regulator building is located in the remaining portion of the former gas plant building. A partially buried structure was observed to the northwest of the former gas plant building, and two circular depressions were observed near the former locations of the two largest gas holders.

A detailed site history based on a review of past reports and historical maps is presented below. The detailed site history was prepared to establish the locations of potential source areas and source area residues. The site history was used as a basis for preparing the conceptual model.

2.3 Clark Street MGP Site History

A detailed site history of the Clark Street MGP site has been prepared based on a review of the following information:

- 1892 Sanborn Map
- 1898 Sanborn Map
- 1904 Sanborn Map
- 1926 Site Plan Map



NEW YORK STATE
ELECTRIC & GAS CORPORATION

AUBURN, NEW YORK
CLARK STREET SITE

SITE LOCATION MAP

SCALE
2,000' 0' 2,000'

BLASLAND & BOUCK ENGINEERS, P.C.
ENGINEERS & GEOSCIENTISTS

- 1939 Sanborn Map
- 1943 Site Plan Map
- 1946 Site Plan Map
- 1958 Site Plan Map

The site plan maps were presented in Atlantic Environmental Services, Inc., 1991 report and are based on NYSEG file information.

1886 to 1904

Information regarding structures or uses of the site was not present on the 1886, 1892, or 1898 Sanborn Maps. Based on a review of the Sanborn Maps from 1886, 1892, and 1898, a manufactured gas plant, designated as the Auburn Gas Works, was located approximately 2,200 feet east of the Clark Street MGP Site. In the late 1800s, the Southern Central Railroad Yards bordered the site to the south, and various structures identified as "dwellings" bordered the site to the west. The Acme Oil Company occupied the area adjacent to and west of the railroad yard (southwest of the site). Entities occupying the area east of the site (across the Owasco Outlet) could not be determined from the 1886, 1892, and 1898 Sanborn Maps. The Owasco Outlet (also referred to as both the Owasco Creek and the Owasco River) was present on the Sanborn Maps north and east of the site.

1904 to 1926

The 1904 Sanborn Map and the 1926 Site Plan Map show several MGP facilities located on the site. The MGP facilities included:

1904

- A gas plant building comprised of a meter room, a purifying room, an engine room, a generator room, and a fifth area on the west end of the building which contained two boilers. The gas plant building was located near the southern edge of the property;
- A 204,000 cubic foot distribution gas holder located north of the gas plant building;
- A 75,000 cubic foot relief gas holder located northwest of the gas plant;
- An oil tank (unknown capacity) located west of the gas plant building; and
- A shed located north of the gas plant building along the Owasco Outlet bank.

1926

The gas plant building is shown on the 1926 Site Plan Map along with the two gas holders described above. An unnamed tank is shown on the 1926 Site Plan Map between the gas plant building and the 75,000 cubic foot gas holder. The oil tank shown on the 1904 Sanborn Map has been replaced by a 210,000 cubic foot gas holder.

1926 to 1943

A third boiler is shown in the boiler room on the gas plant building on the 1943 Site Plan Map, and a coal storage area is indicated on the west side of the gas plant building. A tar shed is shown on the 1939 Sanborn Map north of the gas plant building. This structure is labeled tar pumping house on the 1943 Site Plan Map. The 204,000 cubic foot gas holder and the two smaller tanks west of this gas holder (one an oil tank, the other not labeled) were removed by 1939. The remaining gas holder, indicated on the previous maps, increased in capacity from 210,000 cubic feet in 1939 to 491,000 cubic feet in 1943. A switch board house is present west of the gas plant building near the Owasco Outlet in 1943. The shed near the Owasco Outlet had been removed by 1943.

During these years, gas production, treatment, and storage processes consisted of the following:

Gas Production

Coal was used as a carbon source. The coal was transported to the site via the adjacent railroad and stored prior to use in the manufactured gas plant.

The coal was heated in the generator(s) located in the generator room, and used as a fuel source in the boilers that produced steam. The steam was then introduced into the generator(s) to produce "blue gas".

The "blue gas" was then introduced into the carburetor/superheater (in the generator room) and cracked with oil to produce carburetted water gas. The oil was stored in oil storage tank to the west of the manufactured gas plant building in the earlier years of operation and in the tank at the north corner of the manufactured gas plant building in the later years of operation.

Gas Treatment

A condenser system was used to remove water from the manufactured gas, resulting in the generation of tars, waters, and/or a tar/water emulsion. The condenser was a part of, or attached to, the generator room. In the early years of the MGP operation, the tar/water emulsions may have been stored in manufactured gas holders for separation. The presence of the tar shed and tar pump house indicates that a distinct area for the separation and handling of tars was present in the later years of operation. Following condensation, the manufactured gas was purified using wood chips, lime, and possibly iron oxide.

Gas Storage

The carburetted water gas was then metered in the meter room and stored on-site in the gas holders. The manufactured gas may have been stored prior to purification. One of the holders was likely used as a relief holder prior to the purification process to equalize gas pressure during the gas production process.

The older gas holders were water seal holders which may have stored tars/water emulsions (especially before the tar shed was constructed). The large gas holder (491,000 cubic foot capacity) could have been a waterless holder. Gas stored in these holders would then have been metered through the meter room prior to distribution.

During this time period (1904 to 1943), site ownership was held by the Citizen's Light, Heat & Power Company Gas Works (1904 Sanborn map); Empire Gas & Electric Company (1926 Site Plan map); and NYSEG (1939 Sanborn map and 1943 Site Plan map). Reportedly, NYSEG obtained ownership in 1936 (Atlantic, 1991). In 1904 and 1926, the site was bordered to the southwest by the Auburn and Syracuse Electric Company Power House building, later designated as the Niagara, Lockport, & Ontario Power Company. By 1939, the power company was no longer present, and at least a portion of the former power company property was occupied by the Blue Moon Coal Company. The area further to the south of the site was occupied by the Lehigh Valley Railroad Yards (formerly the Southern Central Valley Railroad). A filling station and the American Locomotive Company, Diesel Engine Division, were also shown southwest of the site on the 1939 Sanborn Map. In 1904, four manufacturing facilities were in operation to the east of the site: American Wringer Company, Dunn & McCarthy Shoe Factory, F.A. Benson Paper Box Factory, and Empire Manufacturing Company (clothing). By 1939, the Dunn & McCarthy Shoe Factory occupied the area east of the site.

1943 to 1958

The 1946 Site Plan Map designates the site as the Clark Street Operations Center. The 491,000 cubic foot distribution gas holder and former tar pumping house (labeled storage) were present on the site, and the gas plant building was apparently used for storage and as a carpenter shop in 1946. A regulatory room, a fireproof regulatory room, and a booster room are also designated in the gas plant building on the 1946 Site Plan Map.

The 1958 Site Plan Map indicates that the boiler room on the west end of the gas plant building is being used as a welding room. A new boiler room is shown on the north side of the building. By 1958 the last remaining gas holder had been removed and a new substation had been constructed north of the gas plant building. During the time period between 1943 to 1958, manufactured gas production was phased out, and the site was used for natural gas regulation and distribution.

The 1958 Site Plan Map indicates the area to the west of the site was occupied by an automobile junkyard that later became a woodlot by 1961 (Atlantic, 1991). Further information on adjacent land use is not available from the Site Plan Maps.

A site history base map is presented as Figure 2.

2.4 Potential Source Areas and Associated Residues at the Clark Street Site

Potential source areas for chemical constituents could include specific on-site areas as well as off-site sources that may have contributed to and impacted site-related migration pathways. Potential on-site MGP source areas and off-site sources are discussed below, as well as identified data gaps.

2.4.1 Potential MGP Source Areas

Potential source areas from the former MGP operations at the Clark Street site and the associated residues are identified in Table 1. The approximate locations of these potential source areas are also shown on the site history base map, included as Figure 2.

2.4.2 Potential Off-Site Source Areas

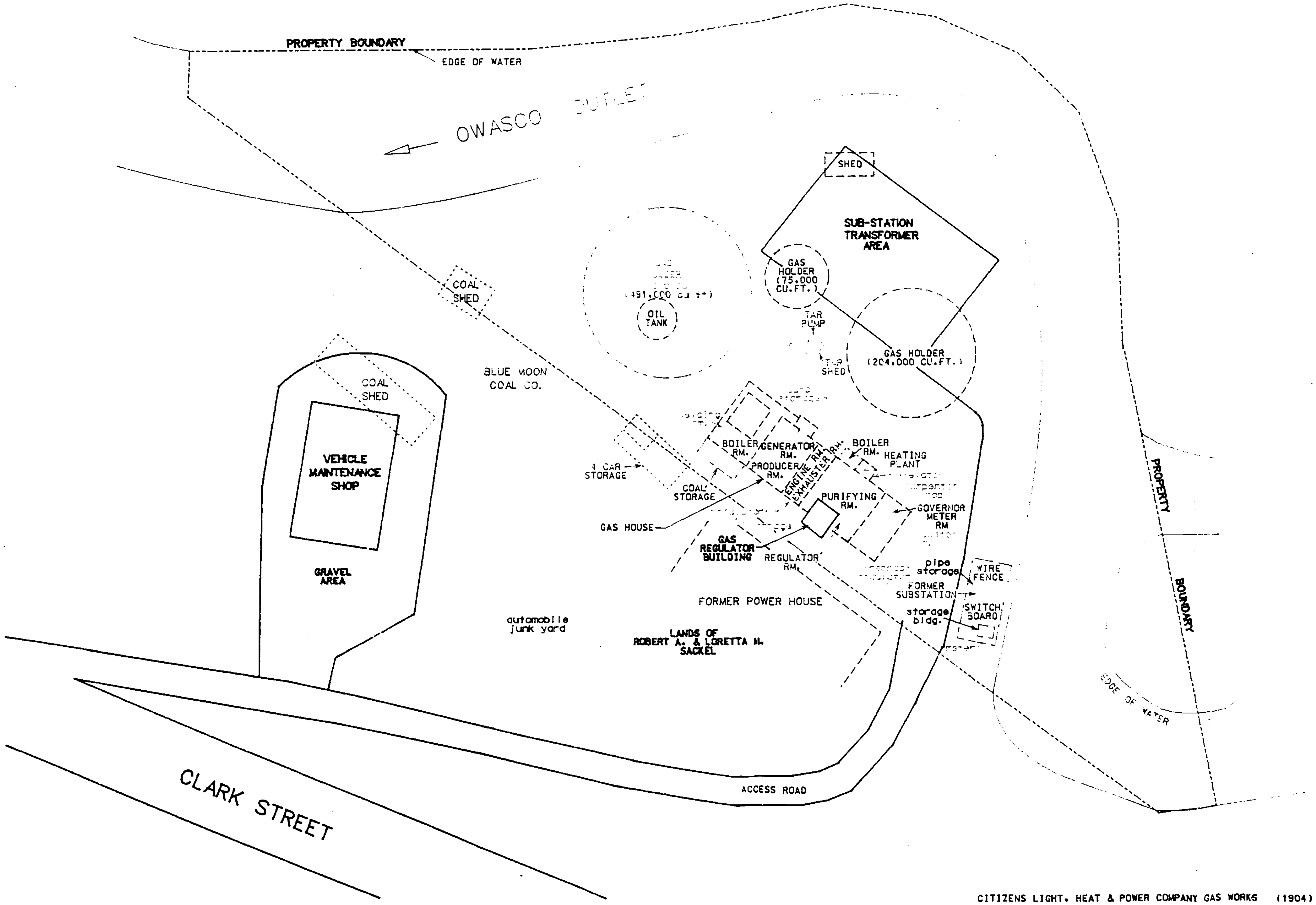
Industrial activities potentially producing MGP-related chemical constituents may have occurred at the following locations: the American Wringer Company, Dunn & McCarthy Shoe Factory, F.A. Benson Paper Box Factory, Empire Manufacturing Company, and other industries located east of and upstream of the site; the railroad and railroad yards located south of the site; and the filling station, the American Locomotive Company, the automobile junkyard, and the vehicle maintenance shop to the west-southwest of the site. The potential exists that these or other entities may have impacted site ground water and/or the Owasco Outlet in the vicinity of the Clark Street MGP Site.

2.4.3 Identified Data Gaps

The data gaps regarding potential source areas include:

1. The field location (horizontal and vertical extent) of potential on-site MGP source areas and associated residues; and

2. The physical and chemical characteristics of MGP residues, if present on site.



CITIZENS LIGHT, HEAT & POWER COMPANY GAS WORKS (1904)
EMPIRE GAS & ELECTRIC COMPANY (1926)
NEW YORK STATE ELECTRIC & GAS CORPORATION (1939-1958)

NOTE: THIS MAP HAS BEEN PREPARED BASED ON A SURVEYED SITE PLAN DEVELOPED BY S.Y. KIM LAND SURVEYORS DATED 01-16-91.

4,5,12,13,14,15,18,19,21,22,24,25,26,43,44,63 ON 6/22/92 PGL 60
1300301R•13003SM1

FIGURE 2

LEGEND

1904 STRUCTURES
1926 STRUCTURES
1939 STRUCTURES
1943 STRUCTURES
1946 structures
1958 structures
EXISTING STRUCTURES

NEW YORK STATE
ELECTRIC & GAS
CORPORATION

CLARK STREET SITE
AUBURN, NEW YORK

SCALE
0 30' 60' 90'

SITE HISTORY BASE MAP

BLASLAND & BOUCK ENGINEERS, P.C.
ENGINEERS & GEOSCIENTISTS

Table 1

Potential Source Areas/Residues
Clark Street Site

Processes	Potential Source Areas	Potential Residues
Carburetted Water Gas Production		
Coal brought in via railroad, crushed and stored in coal shed	• Coal Shed	• Coal Residuals • Coke • Ash • Clinker
Coal moved to generating rooms and steam boilers to be used as a fuel	• Generating Room	• Coal Residuals • Coke • Ash • Clinker
Coal as a carbon source heated in generators in generating rooms to generate coal gas	• Generating Room • Tar Shed • Gas Holders	• Tar
Steam from steam boilers injected into the coal gas in generators to produce blue gas	• Generating Room • Tar Shed • Gas Holders	• Tar
Blue gas further processed in carburetor/superheater where heated oil cracked into the coal gas/steam to produce carburetted water gas. Oil stored in two storage tanks.	• Generating Room • Boiler Room • Oil Storage Tanks and Pipelines • Gas Holders	• Tars • Oils • Unused Oils
Carburetted Water Gas Treatment		
Water gas further processed in a condenser system (type unknown - likely a piping system at or on the generating rooms where water and tars were removed).	• Condensers • Tar Shed • Gas Holder	• Tars • Oils • Tar/Oil/Water Emulsions
Water gas further processed by wood chips and lime (possibly iron oxide.)	• Purifiers	• Spent Lime • Spent Wood Chips • Spent Iron Oxide • Oils
Carburetted Water Gas Storage		
After purification, the water gas was metered and stored in the gas holders. During storage, the water in the water seals contacted the gas and tars/oils stored.	• Gas Holders • Piping • Drip Oil Tanks	• Tars • Oils • Contaminated Water

2.5 Potential Migration Pathways at the Clark Street Site

The potential migration pathways for the MGP sources and off-site source areas include: ground-water transport, storm water transport, air transport, and surface- water transport in the Owasco Outlet. Each of these migration pathways is discussed below, including a summary of available information and the identified data gaps.

2.5.1 Ground-Water Transport

Existing Information

The site is located in Ontario-Mohawk Lowland physiographic region of the Eastern Oswego River Basin (Kantrowitz, 1970). The Oswego River Basin encompasses numerous surface waters, including the Owasco Outlet, which lies adjacent to the site. In this physiographic region, the overburden soil consists of till, and the bedrock consists of the Onondaga Limestone and the Hamilton Shale. Seven well records were obtained from locations within a three mile radius of the Clark Street Site (Kantrowitz, 1970). Of these seven wells, two were completed in till (22 and 30 feet in depth), one was completed in sand (111 feet in depth), one was completed in limestone (60 feet in depth), and three were completed in shale (101, 116, and 240 feet in depth). The shale yields an average of 6 gallons per minute (gpm), and the median yield of the limestone is approximately 25 gpm (Kantrowitz 1970). However, none of the aforementioned wells are located immediately adjacent to the former Clark Street MGP Site.

In general, the till in the Ontario-Mohawk Lowland region is approximately 30 feet in thickness and yields 0.1 to 2 gpm (Kantrowitz, 1970). Drilling contractors familiar with subsurface conditions in Auburn, New York indicate the presence of a 20 to 30 feet thick till unit above bedrock (Parratt-Wolff, 1992). The till formed from a mixture of limestone, shale, and reworked red lacustrine clay (USDA, 1971).

Based on this limited geologic information and the location of the site, the ground-water system at the site likely consists of a fill unit in hydraulic connection with an alluvium unit comprised of silts and sands (if any alluvium is present). These units are underlain by a glacial till unit which may act as a confining unit between the fill/alluvium units and the bedrock. If present, dissolved constituents associated with potential site source areas could migrate in the fill/alluvium/till toward the Owasco Outlet. Non-aqueous phase liquids (NAPLs) less dense than water would migrate on the top of the ground-water surface. NAPLs denser than water could migrate on top of the till or the bedrock surface (or lenses of less permeable geologic and fill units), with the pathway depending on the slope of the confining unit and man-made influences (e.g., subsurface utilities).

Identified Data Gaps

The data gaps associated with the site ground-water migration pathway are as follows:

1. Characterization of the fill and geologic units that underlie the site;
2. Confirmation that till is present and acts as a confining unit;
3. A determination of site ground-water flow direction and velocity;
4. A determination of background (hydraulically upgradient) ground-water quality;
5. A determination of the extent of ground-water contamination associated with the site; and
6. A determination as to the presence or absence of NAPLs in the ground-water system.

2.5.2 *Storm Water Transport*

Existing Information

The Site Screening Report indicated the presence of a small swale (west side of the site) that transports surface water run-off from the site to the Owasco Outlet (Atlantic 1991). One soil sample from within the swale and one sediment sample in the Owasco Outlet at the confluence of the swale and the outlet were obtained and analyzed by Atlantic. PAHs, cyanide, and four metals were reported to be present in both samples (Atlantic, 1991). Other distinct surface water run-off pathways were not noted in the Site Screening Report; however, run-off from the entire site area and the Sackel property (located south and west of the site) may discharge to the Owasco Outlet. Ponded water has been observed at the site in the area of the distribution gas holder.

Identified Data Gaps

The data gap associated with storm water runoff pathways is:

- A determination of current and, to the extent possible, past preferential surface water runoff pathways and the point(s) at which they currently discharge or may have discharged into the Owasco Outlet.

2.5.3 *Air Transport*

Existing Information

There is a possibility that air may serve as a migration pathway at the site via volatilization and particulate transport; however, neither mechanism of migration is expected to be significant. Volatile organic compounds (VOCs) in surface or near surface residues could volatilize into ambient air. Contaminated surface soils could be transported by the wind as particulate matter or dust. Toluene, PAHs, cyanide, and six metals were detected in the surface soils during the site screening investigation (Atlantic, 1991).

Identified Data Gaps

The primary data gap associated with the air migration pathway is:

- Additional analytical data for surface soils in the vicinity of identified on-site MGP source areas.

2.5.4 *Owasco Outlet*

Existing Information

The Owasco Outlet flows from east to west in the area of the site and is approximately 50 to 75 feet wide. The Owasco Outlet flows into the Barge Canal which in turn flows into the Seneca River approximately 10 miles downstream of the site. The closest United States Geological Survey (USGS) gaging station is about 1.5 miles downstream of the site. At this station, average discharge has been recorded since 1914. The maximum discharge recorded was 3,250 cubic feet per second (cfs); the minimum discharge recorded was 2 cfs; and the average discharge is approximately 287 cfs. Discharge in the Owasco Outlet is affected by regulation of lake water levels via a dam at the outlet of the Owasco Lake (Campbell, 1989).

From the dam near the outlet of Owasco Lake (upstream of the Clark Street site) to the Throopville Bridge (approximately 3.5 miles downstream of the site), the Owasco Outlet is a Class D water. North and downstream of the Throopville Bridge, as well as from the dam to Owasco Lake, the Owasco Outlet is a Class C water (6NYCRR). The best usage of Class C and Class D waters is fishing. Class C waters are intended to be suitable for fish propagation and survival, as well as primary and secondary contact recreation. Class D waters are intended to be suitable for fish survival; however, the conditions in such waters may not be conducive to fish propagation. Class D waters are also intended to be suitable for primary and secondary contact recreation.

The City of Auburn uses water from Owasco Lake as a potable water supply. The intake for this water supply is located approximately 4 miles upstream of the site (Atlantic, 1991).

Identified Data Gaps

The primary data gaps associated with the Owasco Outlet migration pathway are:

- A determination of whether residues from the site could have potentially migrated into the Owasco Outlet sediments;
- A characterization of the sediment in the immediate vicinity of the site (depth, residues); and
- Identification of potential non-site related contributions (i.e., common chemical constituents) to the Owasco Outlet sediments.

2.5.5 Potential Exposure Pathways and Receptors at the Clark Street Site

Migration pathways can result in the following exposure pathways: dermal contact, ingestion, and inhalation. Exposure implies a receptor is, or could be, present. Therefore, not all migration pathways result in definitive exposure pathways. In general, given the present use and location of the site, both on-site and off-site exposure could occur.

Existing Information

On-Site Receptors

The Clark Street Site is currently owned by NYSEG. A portion of the site that houses the electric substation is fenced; however, the remainder of the site is unfenced. Hypothetically, NYSEG personnel or other individuals (contractors, workers, trespassers, etc.) could come in dermal contact with, or incidentally ingest by hand to mouth contact, potential MGP residues at the ground surface. In addition, individuals at the site could inhale contaminated dust or VOCs from surface or subsurface soils that potentially contain MGP residues. The prior Site Screening Report indicated the presence of PAHs, toluene, cyanide, and six metals in the surface soils at the site (Atlantic, 1991).

Contractors and other personnel that may be involved with the subsurface activities, such as utility workers, geotechnical workers, excavation contractors, etc., could potentially come in dermal contact with, or incidentally ingest MGP residues present in subsurface soils, ground water, or in utility conduits. Inhalation exposure of subsurface workers to VOCs and other chemical constituents in dust could occur, depending on the composition of the MGP residues. There is reportedly a subsurface 12-inch natural gas pipeline at the site, as well as overhead electric lines in the vicinity of the substation (Atlantic, 1991).

Off-Site Receptors

In the ground-water migration pathway, exposure to off-site receptors could occur via ingestion, dermal contact, and inhalation of VOCs if the ground water is used as a drinking (or other) water supply. There are no known ground-water users in the vicinity of the site. According to the Site Screening Report, an Auburn ordinance prohibits homeowners from drilling wells on their properties, and the Cayuga County Department of Health has also indicated there are no wells used in the City of Auburn (Atlantic, 1991).

Human and biotic exposure pathways are both potentially present in the Owasco Outlet. Humans could be potentially exposed to MGP residues and associated chemical constituents via the ingestion of surface water. However, the City of Auburn obtains their water supply from Owasco Lake at an intake point approximately four miles upstream of the Clark Street Site. Recreational users of the Owasco Outlet, such as fishermen, could also come in contact with MGP residues and associated constituents, if present, and/or ingest biota containing constituents associated with the site. Aquatic biota, such as fish, could both contact and ingest MGP-related residues and associated constituents from the water column and the sediments.

Identified Data Gaps

The primary data gaps associated with the identification of exposure pathways and receptors are:

- An assessment of subsurface utilities at and near the site that could be affected by MGP residues and the types of routine and non-routine access to these subsurface utilities that may occur;
- An evaluation of potential non-authorized site visitors;
- An evaluation of recreational uses of the Owasco Outlet; and

3.0 Scope of Work

3.1 General

The previous section presented the conceptual model of the Clark Street MGP Site which identified data gaps associated with potential source areas, residues, migration pathways, exposure pathways, and receptors. This section addresses each of the identified data gaps by defining the proposed RI work tasks required to satisfy the data gaps.

The scope of work necessary to address the data gaps and satisfy the objectives of the RI for the Clark Street site is presented under the following five work tasks:

- Work Task 1 - Background Information Review;
- Work Task 2 - Source Investigation;
- Work Task 3 - Surface Soil Investigation;
- Work Task 4 - Ground-Water Investigation; and
- Work Task 5 - Sediment Investigation.

Upon completion of the activities described herein, the RI data will be evaluated and a Task II RI Report will be prepared.

3.2 Proposed RI Activities

Work Task 1 - Background Information Review

Under this work task, additional background information (i.e., historic aerial photographs, publicly available documents and data, as well as NYSEG file and personnel information) will be obtained and reviewed to confirm the information presented in the site history base map. The components of the additional historical information review are described in the following subtasks.

Subtask 1.1 - Obtain Historical Photographs

Historical site photographs, if available, will be obtained from the local historical society and the National Archives (aerial photography). These photographs will be used to confirm the information presented on the site history base map (Figure 2) and to evaluate the existence of any potential preferential surface water runoff pathways at the site.

Subtask 1.2 - Obtain Publicly Available Information

This subtask will consist of obtaining information from NYSEG and local public sources on the approximate location of underground utilities (i.e., sewers, water, and underground electric and natural gas) at and in the vicinity of the site in order to evaluate potential subsurface migration pathways and exposure pathways. Geologic, hydrogeologic, and hydrologic information will be obtained from the United States Geological Survey (USGS), the New York State Department of Environmental Conservation (NYSDEC), and other local sources to develop an understanding of subsurface conditions in the vicinity of the site. The City of Auburn highway department will be contacted to obtain any information (i.e., boring logs) on construction of roadways in the area of the site to aid in understanding subsurface conditions at and near the site. Information will also be obtained on recreational uses and aquatic resources of the Owasco Outlet in the Auburn area to evaluate potential receptors.

Subtask 1.3 - Obtain NYSEG Information

This subtask will involve reviewing NYSEG's files for any additional historic information on the former MGP operations at the Clark Street site. In addition, we will contact NYSEG to determine current site usage to aid in the identification of potential receptors for performance of the preliminary risk assessment. In addition, if NYSEG identifies any workers that may have been involved with the operation or closure of the MGP site, then we will interview them during the field investigations.

Subtask 1.4 - Update Site History Base Map

The site history base map (Figure 2) will be updated based on the additional background information obtained in Subtasks 1.1, 1.2, and 1.3. The proposed RI activities will be modified as appropriate to address any additional data gaps defined during the background information review. The base map will be continually updated as RI activities progress.

Work Task 2 - Source Investigation

Under this work task, a source investigation will be conducted to verify the location of potential MGP-related source areas and confirm the presence and extent of MGP residues at the Clark Street site.. The source investigation will include the excavation of test pits and trenches, completion of test borings, characterization of the contents of the tank located northwest of the former gas plant building, field screening, residue sampling and analysis, and soil sampling and analysis as described in the subtasks below.

Subtask 2.1 - Field Stake Potential Source Areas

This subtask will involve the identification of approximate locations of the potential source areas described in Table 1. The potential source areas will be staked in the field and will be based on the information presented on the site history base map (Figure 2).

Subtask 2.2 - Install Test Pits and Trenches

Under this subtask, a series of test pits and trenches will be excavated to identify and determine the horizontal extent of MGP residues at the site. The location and number of test pits and trenches to be excavated at the potential source areas identified on Figure 2 is summarized as follows:

Potential Source Area	Number of Test Pits/Trenches
Distribution Gas Holders (210,000 and 491,000 cubic foot) and Oil Tank	3
Relief Gas Holder (75,000 cubic feet)	1
Distribution Gas Holder (204,000 cubic feet)	1
Oil Tank	1
Tar Shed	1
Total	7

Up to seven test pits and/or trenches will be installed to identify the presence and extent of MGP residues. The exact locations of the test pits and trenches will be determined in the field by site manager based on the location of the potential source areas and existing underground utilities. The test pits and trenches will be excavated until significant residue or ground water is encountered or to within the physical limits of the backhoe.

All test pit/trench materials will be visually described at depth, as well as photographed and/or videotaped for future reference. The materials from the test pit excavations will be temporarily staged on plastic, placed back in the excavation upon completion, and covered with clean fill materials. The procedures for test pit/trench excavations, including field logging and cleaning procedures, are provided in Appendix A.

Excavation and sampling equipment will be decontaminated prior to initiating the test pit activities in between each test pit and at the completion of all excavation activities. Decontamination will be conducted in a central area within a plastic-lined pad. Decontamination water and residual materials will be collected and transferred to a central container (or 55-gallon drums to be provided by NYSEG) for subsequent on-site infiltration or disposal by NYSEG.

During test pit excavations, continuous screening for volatile organic vapors will be conducted with a photoionization detector (PID) to evaluate the presence and relative concentration of VOCs in the subsurface and for health and safety monitoring. A flame ionization detector (FID) or a moisture-resistant PID, will be available on site as a back-up instrumentation. PID screening procedures are set forth in Appendix A. Additional health and safety procedures are provided in the HASP for the Clark Street MGP Site (Appendix B).

If residues are found during test pit and trench excavations, a representative sample of the residue will be collected and submitted for laboratory analyses. Sample collection procedures, including quality assurance/quality control (QA/QC) procedures, are provided in Appendix A. Up to 5 samples will be analyzed to determine the chemical composition of the sources and to determine the analytical parameter list for subsequent environmental sampling in other media using:

- Method 8240 for VOCs (Tentatively identified compounds (TICs) included);
- Method 8270 for semi-volatile compounds (SVOCs, TICs included);
- Method 6010/7000 series for the following metals:

    aluminum
    antimony
    arsenic
    barium
    cadmium
    chromium
    copper
    iron
    lead
    manganese
    mercury
    nickel
    selenium
    silver
    vanadium
    zinc

- Method 9010 for cyanide (total and amenable).
- Reactivity (Cyanide, Sulfide) per Chapter 7.3 of Test Methods for Evaluating Solid Waste (USEPA, 1990).
- BTU content by Method A006 (USEPA, 1984).
- A gas chromatograph (GC) - flame ionization detector (FID) fingerprint.

Any residue samples obtained will be identified, handled, packaged, and shipped to NYSEG-designated laboratory using the chain-of-custody procedures provided in Appendix A. QA/QC for field procedures are presented in Appendix A, and general and laboratory QA/QC procedures are discussed in Appendix C.

The locations of any physical features (i.e., foundations) identified as a result of this subtask will be established by measuring from previously surveyed site features and subsequently surveyed after the monitoring wells are installed. The site base map will be revised to incorporate any new information obtained during the test pit and trench excavations.

Subtask 2.3 - Install Test Boring

Under this subtask, test borings will be installed in areas confirmed by the test pits and trench excavations to contain MGP residues to define the vertical extent of the residues. In addition, test borings will be installed in potential source areas where test pit and trench excavations cannot be completed due to the presence of physical barriers (eg., the foundation of the former gas plant building, the natural gas regulator building, and the electric substation). The locations and number of test borings to be completed at the site are as follows:

Potential Source Area	Number of Test Borings
Distribution Gas Holders (210,000 and 491,000 cubic foot) and Oil Tank	2
Relief Gas Holder (75,000 cubic feet)	1
Distribution Gas Holder (204,000 cubic feet)	2
Oil Tank	1
Tar Shed	1
Gas House	3
Total	**10**

The exact locations of the test borings will be determined in the field by the site manager based on the test pit observations and existing underground utility information. The test borings will be installed to depths up to 30 feet, the assumed top of bedrock. However, if visual observations or PID measurements indicate that the till unit is acting to confine MGP residues and associated constituents, the test borings will only be completed to a depth sufficient to characterize the vertical extent of the residues without breaching the confining layer. Soils generated during drilling will be staged on plastic segregated based on visual observations and PID readings, then transferred to 55-gallon drum containers to be provided by NYSEG for subsequent disposal by NYSEG or placed back into the borehole mixed with bentonite.

The test borings will also be used to provide site geologic information and to identify whether non-aqueous phase liquids (NAPLs) are present in the subsurface at the top of the till or the bedrock. If these test borings indicate the presence of NAPLs at a depth, additional test borings and/or the installation of piezometers may be recommended by the site manager to evaluate the vertical extent of the residues in the subsurface. Any recommendations and modifications to the field program will be discussed and agreed upon with the NYSEG project manager.

During installation of the test borings, soil samples will be collected continuously via a split-spoon sampler, visually described using the Unified Soil Classification System (USCS), and screened with a PID for the presence and relative concentration of VOCs. The PID screening procedures will also provide for health and safety monitoring during the installation of the test borings. Additional health and safety procedures are provided in the HASP for the Clark Street MGP Site (Appendix B). Test boring procedures, including field logging and cleaning procedures, as well as PID monitoring and screening procedures, are presented in Appendix A. In addition, up to five soil samples representative of the subsurface units will be selected for grain-size analysis using ASTM Procedure D-422-63.

Excavation and sampling equipment will be decontaminated prior to initiating the test boring activities in between each test boring and at the completion of all boring activities. Decontamination will be conducted in a central area within a plastic-lined pad. Decontamination water will be collected and transferred to a central container (or 55-gallon drums provided by NYSEG) for subsequent on-site infiltration or disposal by NYSEG.

Up to five soil samples will be selected for laboratory analysis during completion of the test borings. Representative samples of MGP residues will be selected from areas not sampled during test pit and trench excavations. Sample selection will be based on visual evidence of MGP residues and/or PID screening measurements. Soil sample collection procedures, including QA/QC procedures, are presented in Appendix A.

The five soil samples will be analyzed for the following parameters:

- Method 8240 for VOCs (TICs included);
- Method 8270 for SVOCs (TICs included);
- Methods 6010/7000 series for the following metals:
    - aluminum
    - antimony
    - arsenic
    - barium
    - cadmium
    - chromium
    - copper
    - iron
    - lead
    - manganese
    - mercury
    - nickel
    - selenium
    - silver
    - vanadium
    - zinc
- Method 9010 for cyanide (total and amenable).
- Reactivity (Cyanide, Sulfide) per Chapter 7.3 of Test Methods for Evaluating Solid Waste (USEPA, 1990).
- BTU content by Method A006 (USEPA, 1984).
- A gas chromatograph (GC) - flame ionization detector (FID) fingerprint.

The test boring locations will be surveyed in the field using standard surveying practices.

Soil/residue samples will be identified, handled, packaged, and shipped to a NYSEG-designated laboratory using the chain-of-custody procedures provided in Appendix A. QA/QC for field procedures are presented in Appendix A, and general and laboratory QA/QC procedures are discussed in Appendix C.

Subtask 2.4 - Characterize Contents of Underground Tank

This subtask will consist of characterizing the contents of the underground tank observed northwest of the former gas plant building at the site. In order to access the tank, the area adjacent to the tank will be excavated by hand to expose the tank exterior. Once the tank exterior is sufficiently exposed, the dimensions of the tank will be measured (length and width). Access to the tank will be attempted through existing openings. If the tank cannot be accessed by existing openings, procedures for gaining access to the tank for sample collection will be evaluated with NYSEG. Once an opening is made, the depth to the bottom of the tank will be measured, and one or more samples of the tank contents will be obtained for visual observation, as well as PID screening and monitoring (Appendix A). Health and safety procedures to be followed during the tank excavation and sampling are presented in the HASP for the Clark Street MGP Site (Appendix B).

If MGP residues are present in the tank, one or more samples representative of each phase of residue present in the tank will be collected and analyzed for the following parameters:

- Method 8240 for VOCs (TICs included);
- Method 8270 for SVOCs (TICs included);
- Method 6010/7000 series for the following metals;

  aluminum
  antimony
  arsenic
  barium
  cadmium
  chromium
  copper
  iron
  lead
  manganese
  mercury
  nickel
  selenium
  silver
  vanadium
  zinc

- Method 9010 for cyanide (total and amenable).
- Reactivity (Cyanide, Sulfide) per Chapter 7.3 of Test Methods for Evaluating Solid Waste (USEPA, 1990).
- BTU content by Method A006 (USEPA, 1984).
- A gas chromatograph (GC) - flame ionization detector (FID) fingerprint.

Sampling procedures, including a discussion of QA/QC procedures, are provided in Appendix A. Any residue samples obtained will be identified, handled, packaged, and shipped to a NYSEG-designated laboratory using the chain-of-custody procedures provided in Appendix A. QA/QC for field procedures are presented in Appendix A, and general and laboratory QA/QC procedures are discussed in Appendix C.

Work Task 3 - Surface Soil Investigation

Under this task, surface soil samples will be obtained and analyzed to evaluate the presence and concentration of MGP-related constituents. Up to five surface soil samples will be obtained in areas above identified source areas (if these areas were not previously sampled and analyzed), and/or in identified on-site surface water run-off pathways. Care will be taken to avoid those areas disturbed during the test pit and test boring activities. In addition, at least one background surface soil sample will be obtained. The procedures for collecting surface soil samples are provided in Appendix A.

Surface soil samples will be analyzed for:

- Method 8240 for VOCs;
- Method 8270 for SVOCs;
- Method 8080 for PCBs; and
- Other MGP constituents detected in the on-site residues.

The surface soil samples will be identified, handled, packaged, and shipped using the chain-of-custody procedures provided in Appendix A. QA/QC for field procedures is discussed under the appropriate procedure in Appendix A, and general and laboratory QA/QC procedures are discussed in Appendix C.

Work Task 4 - Ground-Water Investigation

Under this work task, a ground-water investigation will be conducted to evaluate the presence and extent of MGP residues and/or MGP-related constituents in the ground-water flow system beneath the Clark Street MGP site. The hydrogeologic investigation will include the installation of nested monitoring wells in the overburden, ground-water elevation measurements, in-situ hydraulic conductivity testing, and ground-water sampling and analysis. A description of the ground-water investigation is presented in the following subtasks.

Subtask 4.1 - Monitoring Well Installation

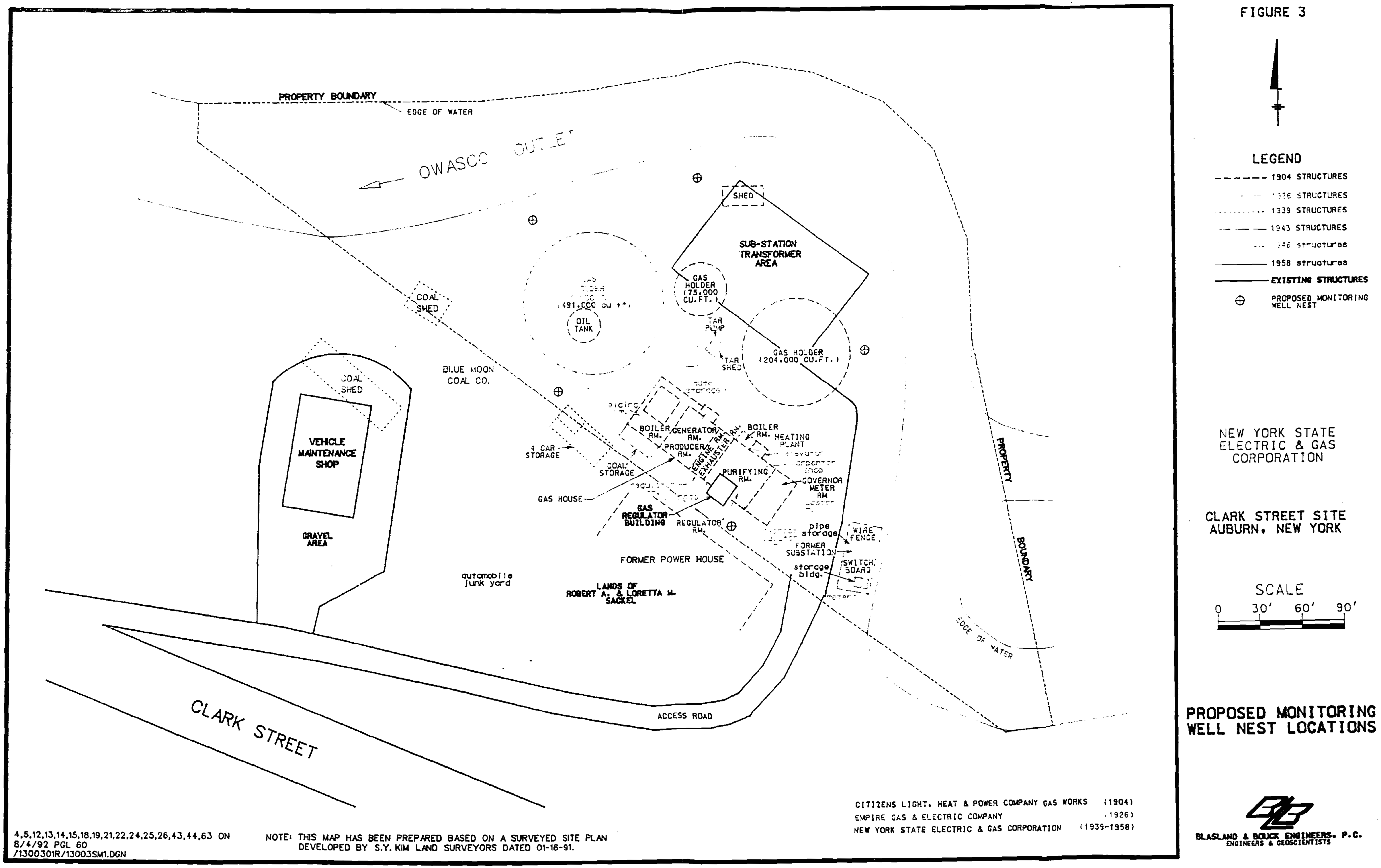
This subtask will consist of the installation of five ground-water monitoring well nests in the overburden at the site. Three monitoring well nests will be installed hydraulically downgradient of the identified source areas, and two monitoring well nests will be installed hydraulically upgradient of the identified source areas. The monitoring wells will be installed in the following locations:

- Two nests hydraulically downgradient of the westernmost gas holders and oil tanks;
- One nest hydraulically downgradient of the easternmost gas holder; and
- Two nests hydraulically upgradient of all MGP facilities and hydraulically downgradient of areas of potential off-site sources.

A total of ten monitoring wells will be installed at the site. Proposed locations are depicted on Figure 3; the exact locations of the monitoring wells will depend on the identified source areas of MGP residues.

Prior to monitoring well installation, soil borings will be drilled. Soil samples will be obtained continuously via a split-spoon sampler, visually classified according to the USCS and screened with a PID. At each monitoring well nest, a continuous profile of the subsurface soils will be obtained to the depth of the deepest boring. At adjacent borings, the subsurface soils will be sampled every 5 feet. Procedures for completion of soil borings, including soil sampling, field screening, and QA/QC procedures, are provided in Appendix A. The procedures for PID screening of the soil samples are provided in Appendix A. Health and safety procedures to be followed during monitoring well installation are presented in the HASP (Appendix B). Soils generated during drilling will be staged on plastic, then transferred to 55-gallon drums/containers to be provided by NYSEG for subsequent disposal by NYSEG.

FIGURE 3



NEW YORK STATE ELECTRIC & GAS CORPORATION

CLARK STREET SITE
AUBURN, NEW YORK

PROPOSED MONITORING WELL NEST LOCATIONS

CITIZENS LIGHT, HEAT & POWER COMPANY GAS WORKS (1904)
EMPIRE GAS & ELECTRIC COMPANY (1926)
NEW YORK STATE ELECTRIC & GAS CORPORATION (1939-1958)

NOTE: THIS MAP HAS BEEN PREPARED BASED ON A SURVEYED SITE PLAN DEVELOPED BY S.Y. KIM LAND SURVEYORS DATED 01-16-91.

4,5,12,13,14,15,18,19,21,22,24,25,26,43,44,63 ON
8/4/92 PGL 60
/1300301R/13003SM1.DGN

BLASLAND & BOUCK ENGINEERS, P.C.
ENGINEERS & GEOSCIENTISTS

The monitoring wells will be installed following NYSEG's standard procedures in "Installation Procedures for Monitoring Wells and Piezometers at Former Coal Gasification Plant Sites", Revision 3, June 1989. These procedures are included in Appendix A. The well screen of the shallow well in each nest will span the uppermost 10 feet of saturated fill/alluvium/till. The well screen in the deeper well of each nest will span a deeper zone. This well screen zone will depend on the zones of residues or constituents identified at the site source areas and based on the PID screening results.

All drilling and sampling equipment will be decontaminated prior to initiating the drilling activities after each well location, and at the completion of all drilling activities, as set forth in Appendix A. Decontamination water will be contained with the decontamination pad and then transferred into a central container (or 55-gallon drums provided by NYSEG) for subsequent on-site infiltration or disposal by NYSEG.

Upon completion of each monitoring well, the well will be developed to remove fine grain materials that may have settled in or around the monitoring well during installation, and to insure the monitoring well will properly transmit ground water. Development water will be placed in a central container for subsequent infiltration in an on-site recharge pit. The procedures used for developing monitoring wells are provided in Appendix A.

In-situ hydraulic conductivity tests will be performed at each ground-water monitoring well to determine the hydraulic conditions of the overburden. The procedures for in-situ hydraulic conductivity tests are provided in Appendix A.

In addition, three stilling wells will be installed within or adjacent to the Owasco Outlet hydraulically downgradient of the site. After the monitoring and stilling wells are installed, water levels will be obtained. The procedures that will be used for obtaining water levels are provided in Appendix A.

The locations and elevations (referenced to the National Geodetic Vertical Datum (NGVD) of 1929) of the ground-water monitoring wells and stilling wells will be surveyed using standard surveying practices. The topographic survey map prepared by S.Y. Kim Land Surveyor P.C. dated January 16, 1991, will be used as the site base map.

Subtask 4.2 - Ground-Water Sampling and Analysis

Under this subtask, the monitoring wells will be sampled quarterly over a period of one year to evaluate the water quality hydraulically upgradient of the site (background) and the potential presence and concentration of MGP constituents in the ground water. Ground-water samples will be obtained from monitoring wells in a predetermined order based on the known or suspected concentrations of chemical constituents at the site in accordance with procedures in Appendix A. Prior to sampling, ground-water elevations will be measured at each monitoring and stilling well. Purge water will be disposed of in an on-site recharge pit. The recharge pit will be installed at the completion of the subsurface activities over an area of contaminated subsurface soils. Specifications for the on-site recharge pit are provided in Appendix A.

A representative ground-water sample from each monitoring well will be collected in the field and measured for temperature, conductivity, and pH. The procedures for measuring these parameters, including QA/QC procedures are presented in Appendix A.

Ground-water samples will be analyzed for:

- Method 8240 for VOCs;
- Method 8270 for SVOCs;

- Method 8080 for PCBs (first sampling event only); and
- Other MGP constituents detected in on-site residues.

The ground-water samples will be identified, handled, packaged, and shipped using the chain of custody procedures provided in Appendix A. QA/QC for field procedures is discussed under the appropriate procedure in Appendix A, and general and laboratory QA/QC procedures are discussed in Appendix C.

Work Task 5 - Sediment Investigation

Under this task, sediment probing and coring will be conducted to investigate the distribution of residues and contaminants in Owasco Outlet sediments. The probing will also be conducted to define the distribution of sediment types according to texture.

The non-channel sediment deposits will be probed along the edge of the site to a point just upstream of the site near the southern property boundary. Probing will involve tapping a 2-inch diameter clear Lexan tube into the stream bed of the outlet until refusal is encountered. Upon retrieval, the depth of sediment penetrated and the length of the sediment core will be measured. Sediment texture and the lengths and appearance of any sediment horizons will be described, and water depth and horizontal position will be noted at each sediment probing location. The position of the sediment probings will be located using taped measurements to fixed land features. Approximately 25 sediment probings (every 25 feet along the edge of the site) will be completed.

The frequency of probing will be increased in areas which yield potentially contaminated sediment or sediment qualities which otherwise suggest man-made influences. This probing will be used to identify the areal extent of these sediment types. The procedures for sediment probing are described in Appendix A.

In addition, 9 sediment samples will be collected for laboratory analyses based on visual evidence of contamination. If no visual evidence of contamination is present, the samples will be selected from locations where current or past surface water drainage enters the outlet from the site or in areas of identified fine-grained/organic-type sediments. A minimum of three sample will be collected upstream, and at least two samples will be collected downstream of the site for laboratory analysis to evaluate the potential extent of chemical constituents in the sediment. Additional sediment samples may be collected for analysis based on the results of the initial sediment probing.

Sediment samples will analyzed for the following parameters:

- TOC by the Lloyd Kahn Method;
- Method 8240 for VOCs;
- Method 8270 for SVOCs; and
- Other constituents detected in the on-site residues.

The sediment samples will be identified, handled, packaged, and shipped to a NYSEG-designated laboratory using the chain-of-custody procedures presented in Appendix A. QA/QC for field procedures is presented in Appendix A, and general and laboratory QA/QC procedures are presented in Appendix C.

Work Task 6 - Data Evaluation

Under this work task, the data generated during Work Tasks 1 through 5 will be evaluated in accordance with the following subtasks.

Subtask 6.1 - Analytical Data Presentation and Validation

Upon receipt of the ASP - Category B data package from Galson Laboratories, the NYSEG "Analytical Data Checklist Form" will be completed. This form will aid in assessing if the data package has, through a preliminary review, met the data quality objectives. The preliminary review will consist of determining whether the data package is complete and whether any holding times were exceeded. The reviewed analytical data will be revised on the Lotus 123 spreadsheet provided by the NYSEG-designated laboratory, as per the NYSEG instruction provided in "Submission Guidelines for Contractors Doing Ground-Water Sampling for NYSEG". Further QA/QC procedures are set forth in Appendix C. Independent data validation may be performed for some or all of the analytical data at the request of NYSEG.

Work Task 7 - Prepare Task II RI Report

This work task will consist of the preparation of a Task II RI Report for the Clark Street site. A draft report will be submitted to NYSEG for review following the completion of the second quarterly ground-water sampling event (see Section 4.0 - Schedule).

The draft Task II RI Report will be prepared in accordance with the following NYSEG format:

- Cover Page - The cover page will include the project title, indicate that the report was prepared for NYSEG by Blasland & Bouck and have the appropriate submittal date.
- Title Page - The title page will have the same information as the cover page and will indicate the names and signature of the project manager, principal investigators, and the project officer followed by his P.E. stamp.
- Executive Summary - This section will include a summary of the results of the Task II - Remedial Investigation and conclusions and recommendations resulting from the investigation.
- Table of Contents - The table of contents will present a list of the items presented in each section referenced both by name and page number.
- Introduction - The introduction section will include a discussion of the project background, site history as developed based on the results of Task II work efforts and restate the objectives of the Task II RI.
- Summary of Previous Investigations - This section will present a brief summary of the results from previous investigation activities conducted at the site (Task I work efforts).
- Site Activities - This section will present a description of the technique(s) used to investigate and define potential source areas and other areas at the site include a discussion of the methods used for sampling and analysis of environmental media (air, soil, sediments, ground water, etc.). A list of the analytical parameters will also be presented.
- Site Characterization - This section will present a discussion of the site geology, hydrogeology, surface water hydrology, land use, and air quality, and will be based on the results from the site activities and a review of applicable geologic and hydrogeologic reference documents.

The location and extent of the source areas identified in the conceptual model and verified during field investigations will be identified on a site map. This map will be supplemented by text describing the chemical constituents detected at each source area and the concentrations of the identified chemical constituents.

The hydrogeologic characterization will include an evaluation of both physical and chemical components of the ground-water flow system. Physical components that will be addressed are the characteristics of the ground-water flow system including: the presence and nature of the hydraulic confining unit; the direction, horizontal, and vertical gradients; flow velocities and discharge rates of the ground-water flow system; the relationship between the ground-water flow system and adjacent surface water systems; and the seasonal variations of all of the aforementioned components.

Water elevations will be calculated by subtracting the depth-to-water data from the surveyed elevation referenced to the NGVD of the measuring point. Water elevations will be entered into a Lotus 123 spreadsheet per the NYSEG specifications in "Submission Guidelines for Contractors Doing Ground-Water Sampling for NYSEG." Hydraulic conductivities will be calculated from in-situ hydraulic conductivity test data using the Bouwer-Rice method for unconfined conditions. Hydrogeologic contour maps will be prepared by contouring lines of equal water elevations using linear interpolation through known elevation points. Ground-water flow velocities will be calculated using the equations for average linear velocity, $V = K \times i/n_e$, where K is the hydraulic conductivity, i is the average hydraulic gradient (obtained from the ground-water contour map), and n_e is the effective porosity (estimated from literature values and grain-size analyses).

Two cross-sections depicting the subsurface geology, ground-water levels, and subsurface MGP structures and residues; five ground-water contour maps in plan view; and logs for all test pits, test borings, monitoring wells, and stilling wells will be prepared for use in characterizing the site.

The hydrologic characterization will present the findings of the sediment investigation and present the sediment probing/sampling locations and analytical results in one figure and one table. Analytical data will be initially evaluated using available sediment criteria for certain compounds through total organic carbon normalization. Analytical data will also be interpreted in light of sample position in the streambed as well as overall stream conditions and the spatial representativeness of the data and the potential for releases from the sediment bed.

The air quality characterization will be accomplished utilizing the surface soil analytical data to estimate on-site emissions of MGP residues and constituents at the site. This characterization will utilize the appropriate fate and transport modeling procedures.

- Chemical Distribution of Constituents On and Off Site - This section will define the distribution of the chemical constituents detected in the environmental media which was sampled during the site activities.

  The distribution of dissolved constituents and NAPLs in the ground-water flow system will be depicted in two cross-sectional and one plan view map. The mass of any chemical constituents entering adjacent surface waters from the ground-water flow system will be calculated from the concentrations of MGP residues and constituents in the ground water and the hydraulic properties of the ground-water flow system.

- Physical and Chemical Data Assessment - This section represents the initial step in the preliminary risk assessment for the site and will identify chemicals of interest and present a comparison of the data to existing regulatory standards and guidance values.

Chemicals of interest will be confirmed for each source area based on a review of the analytical database. The environmental media to be evaluated in this assessment will include surface and subsurface soils, ground water, surface water, sediment, and air. In general, chemical constituents which are detected in a given medium will be retained as chemicals of interest for that medium if all of the following conditions are met:

- The concentration detected on-site or downgradient/ downstream of the site exceeds the concentration detected in a background/upgradient/upstream sample by a factor of three;
- If the chemicals detected in a field or laboratory blank, the concentration in the environmental sample exceeds the highest concentration detected in any blank by a factor of at least five;
- The chemical is not an essential nutrient; and
- USEPA has derived either a Reference Dose (RfD) or a carcinogenic slope factor (SF) for the chemical.

Chemicals of interest which have been identified in each medium will be compared with appropriate standards and guidelines. Chemicals of interest which are identified in ground water and surface water will specifically be compared to NYSDEC Ambient Water Quality Standards and Guidance Values, NYSDEC, Technical and Operational Guidance Series (TOGS) 1.1.1, dated November 15, 1991 (or the most current version).

- Preliminary Identification of Exposure Risks - This section will present a discussion of the potential pathways of chemical migration and potential exposure pathways to on-site and off-site receptors.

  Once chemicals of interest have been identified for each medium, an exposure assessment will be conducted to identify potential pathways of exposure for both human and environmental receptors. A complete pathway consists of a source and a release mechanism, a point of exposure, and a feasible route of exposure at the exposure point. If any one of these elements is missing, the pathway is not complete, and exposures do not occur. In accordance with the most recent USEPA guidance, both current and hypothetical future pathways of exposure will be identified.

  The results of the exposure assessment and comparison of chemicals of interest with appropriate standards will be used to decide whether significant health risks are probable, whether it is necessary to further quantify risks and, if so, what information will be necessary to quantify these risks. In general, if all of the chemicals of interest which are associated with a pathway of exposure are present at concentrations which fall below the appropriate standards and guidelines, then risks are unlikely to be significant and further risk characterization is unnecessary. However, if any chemicals are present at concentrations in excess of a standard, or if not all chemicals have standards, the results of the screening level assessment will be used to help decide what additional information will be necessary to conduct a more quantitative risk assessment.

- Conclusions and Recommendations - This section will present a summary of findings from the Task II RI and identify any additional data requirements including justification for the additional data needs to be obtained during a Task III expanded field investigation.
- References - This section will present a list of the references used to assist in the RI efforts at the site.

- Tables - This section will include tabulated results from residue, soil, sediment, and ground-water sampling.
- Figures - This section will include figures showing geologic profiles; ground-water contours; monitoring well and piezometer locations; and sampling locations. In addition, this section will include profiles showing the extent (vertical and horizontal) of the chemical of interest present in each environmental media, if appropriate.
- Appendices - The appendices will include, at a minimum, the analytical data (also provided on floppy disk DFX format); monitoring well, boring test pit/trench logs; the analytical data reporting package; and a floppy disk with the surveyed sampling point locations and elevations (CADD format).

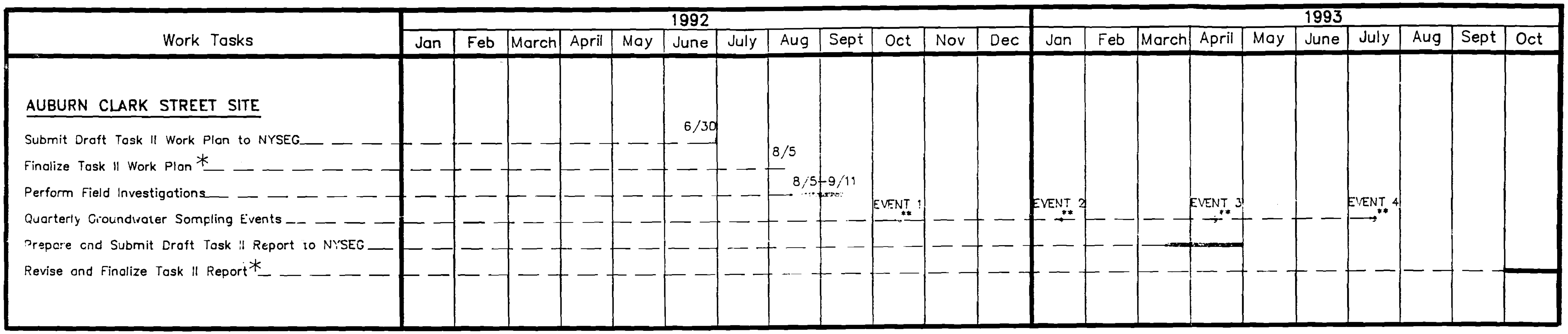
The proposed project schedule for implementing the Remedial Investigation activities at the Clark Street site is presented on the following page.

4.0 Schedule

NEW YORK STATE ELECTRIC & GAS CORPORATION

CLARK STREET SITE
AUBURN, NEW YORK

TASK II REMEDIAL INVESTIGATION SCHEDULE



* ITEM SUBJECT TO NEW YORK STATE ELECTRIC & GAS CORPORATION REVIEW TIMES.
** GROUNDWATER SAMPLING WILL BE PERFORMED IN THE MONTH INDICATED ABOVE.

8/4/92 PGL 60
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5.0 Cost Estimate

This section of the Work Plan presents Blasland & Bouck's cost estimate to implement the Remedial Investigation at the Clark Street site.

DETAILED COST ESTIMATE
REMEDIAL INVESTIGATION
CLARK STREET MGP SITE
AUBURN, NEW YORK

A. Personnel	Estimated Manhours	Salary Rates	Total
Site Manager	300	$24.00	$7,200.00
Field Geologist	450	16.00	7,200.00
Field Service Director	30	22.00	660.00
Field Technician	30	14.00	420.00
Surveyor (2 person team)	50	14.00	700.00
		Subtotal Personnel	$16,180.00
	x	Personnel Markup w/o Fixed Fee	x 3.1
		Subtotal	$50,158.00
		Fixed Fee 10%	5,015.80
		Total Personnel	$55,173.80

B. Technical Services by Others (TSO)

Drilling Services - Parratt Wolff, Inc.

Mobilization				$300.00
Test Pits	24	hrs. x $85/hr.		2,040.00
Test Borings/Grout	300	ft. x $28/ft.		8,400.00
Steam Cleaning	15	hrs. x $135/hr.		2,025.00
Soil Borings	150	ft. x $20/ft.		3,000.00
Soil Borings	100	x $15/ft.		1,500.00
Well Screen	100	ft. x $65/ft.		6,500.00
Well Riser	150	ft. x $22/ft.		3,300.00
Stilling Wells	3	x $150/ea.		450.00
Locking Casing	10	x $175/ea.		1,750.00
Steam Cleaning	25	hrs. x $135/hr.		3,375.00
Well Development	40	hrs. x $85/hr.		3,400.00
Guard Posts	15	x $40/ea.		600.00
Miscellaneous (recharge pit, materials)				500.00
			Subtotal TSO	$37,140.00
			Multiplier	x 1.05
			Total TSO	$38,997.00

C. Direct Expenses (DE)

Travel		$2,500.00
Subsistence/Lodging		0.00
Equipment & Supplies		8,000.00
Telephone/Fax		500.00
Other		3,000.00
	Total DE	$14,000.00
	TOTAL COST	**$108,170.80**

DETAILED COST ESTIMATE
REMEDIAL INVESTIGATION
CLARK STREET MGP SITE
AUBURN, NEW YORK

BACKGROUND INFORMATION REVIEW

A. Personnel	Estimated Manhours	Salary Rates	Total
Site Manager	30	$24.00	$720.00
Field Geologist	20	16.00	320.00
		Subtotal Personnel	$1,040.00
		x Personnel Markup w/o Fixed Fee	x 3.1
		Subtotal	$3,224.00
		Fixed Fee 10%	322.40
		Total Personnel	$3,546.40

B. Technical Services by Others (TSO)

None

Total TSO	$0.00

C. Direct Expenses (DE)

None

Total DE	$0.00
TOTAL COST	**$3,546.40**

DETAILED COST ESTIMATE
REMEDIAL INVESTIGATION
CLARK STREET MGP SITE
AUBURN, NEW YORK

SOURCE INVESTIGATION

A. Personnel	Estimated Manhours	Salary Rates	Total
Site Manager	130	$24.00	$3,120.00
Field Geologist	130	16.00	2,080.00
		Subtotal Personnel	$5,200.00
		x Personnel Markup w/o Fixed Fee	x 3.1
		Subtotal	$16,120.00
		Fixed Fee 10%	1,612.00
		Total Personnel	$17,732.00

B. Technical Services by Others (TSO)

Drilling Services - Parratt Wolff, Inc.

Mobilization			$300.00
Test Pits	24	hrs. x $85/hr.	2,040.00
Test Borings/Grout	300	ft. x $28/ft.	8,400.00
Steam Cleaning	15	hrs. x $135/hr.	2,025.00
		Subtotal TSO	$12,765.00
		Multiplier	x 1.05
		Total TSO	$13,403.25

C. Direct Expenses (DE)

Travel	$1,000.00
Subsistence/Lodging	0.00
Equipment & Supplies	4,500.00
Telephone/Fax	250.00
Other	1,000.00
Total DE	$6,750.00
TOTAL COST	**$37,885.25**

DETAILED COST ESTIMATE
REMEDIAL INVESTIGATION
CLARK STREET MGP SITE
AUBURN, NEW YORK

SURFACE SOIL INVESTIGATION

A. Personnel	Estimated Manhours	Salary Rates	Total
Site Manager	10	$24.00	$240.00
Field Geologist	10	16.00	160.00
		Subtotal Personnel	$400.00
		x Personnel Markup w/o Fixed Fee	x 3.1
		Subtotal	$1,240.00
		Fixed Fee 10%	124.00
		Total Personnel	$1,364.00

B. Technical Services by Others (TSO)

Total TSO	$0.00

C. Direct Expenses (DE)

Total DE	$0.00
TOTAL COST	**$1,364.00**

DETAILED COST ESTIMATE
REMEDIAL INVESTIGATION
CLARK STREET MGP SITE
AUBURN, NEW YORK

HYDROGEOLOGIC INVESTIGATION

A. Personnel	Estimated Manhours	Salary Rates	Total
Site Manager	130	$24.00	$3,120.00
Field Geologist	290	16.00	4,640.00
Surveyor (2-person team)	50	14.00	700.00
		Subtotal Personnel	$8,460.00
	x	Personnel Markup w/o Fixed Fee	x 3.1
		Subtotal	$26,226.00
		Fixed Fee 10%	2,622.60
		Total Personnel	$28,848.60

B. Technical Services by Others (TSO)

Drilling Services - Parratt Wolff, Inc.

			Total
Soil Borings	150	ft. x $20/ft.	$3,000.00
Soil Borings	100	x $15/ft.	1,500.00
Well Screen	100	ft. x $65/ft.	6,500.00
Well Riser	150	ft. x $22/ft.	3,300.00
Stilling Wells	3	x $150/ea.	450.00
Locking Casing	10	x $175/ea.	1,750.00
Steam Cleaning	25	hrs. x $135/hr.	3,375.00
Well Development	40	hrs. x $85/hr.	3,400.00
Guard Posts	15	x $40/ea.	600.00
Miscellaneous (recharge pit, materials)			500.00
		Subtotal TSO	$24,375.00
		Multiplier	x 1.05
		Total TSO	$25,593.75

C. Direct Expenses (DE)

Travel	$1,500.00
Subsistence/Lodging	0.00
Equipment & Supplies	3,500.00
Telephone/Fax	250.00
Other	2,000.00
Total DE	$7,250.00
TOTAL COST	**$61,692.35**

DETAILED COST ESTIMATE
REMEDIAL INVESTIGATION
CLARK STREET MGP SITE
AUBURN, NEW YORK

SEDIMENT INVESTIGATION

A. Personnel	Estimated Manhours	Salary Rates	Total
Field Service Director	30	$22.00	$660.00
Field Technician	30	14.00	420.00
		Subtotal Personnel	$1,080.00
		x Personnel Markup w/o Fixed Fee	x 3.1
		Subtotal	$3,348.00
		Fixed Fee 10%	334.80
		Total Personnel	$3,682.80

B. Technical Services by Others (TSO)

Total TSO	$0.00

C. Direct Expenses (DE)

Total DE	$0.00
TOTAL COST	**$3,682.80**

6.0 References

Atlantic Environmental Services, Inc. Manufactured Gas Plant Site Screening Report, Clark Street Site, Auburn, New York (Colchester, Connecticut, May 1991).

ASTM 1992 Annual Book of ASTM Standards, Section 4 Construction, Volume 04.08 Soil and Rock; Dimension Store; Geosynthetics (Philadelphia, Pennsylvania, 1992).

Campell, J.B. et al Water Resources Data New York Water Year 1988, Volume 3, Western New York United States Geological Survey Water Data - Water Report NY-88-3, 1988.

Ellingworth, Michael E., Parratt-Wolff, Inc. Personal communication with Nancy Gensky, Blasland & Bouck Engineers, P.C. (Syracuse, New York, June 18, 1992).

Kantrowitz, I.H. Ground-Water Resources in the Eastern Oswego River Basin, New York, Basin Planning Report, ORB-2, State of New York Conservation Department of Water Resources Commission, 1970.

New York State Department of Environmental Conservation Official compilation of Codes, Rules, and Regulations of the State of New York, Title 6, Chapter X, Subchapter B, Article 14, Part 898.

USEPA 1990 Test Methods for Evaluating Solid Waste, SW-846. Third Edition.

USEPA 1984 Sampling and Analysis Methods for Hazardous Waste Combustion, EPA 600/8-84-002.

Appendix A
Field Sampling Procedures Remedial Investigation

Clark Street MGP Site
Auburn, New York

New York State Electric & Gas Corporation
Binghamton, New York

August 1992

BLASLAND & BOUCK ENGINEERS, P.C.
6723 TOWPATH ROAD
SYRACUSE, NEW YORK 13214

APPENDIX A-1

Test Pit/Trench Excavation Procedures

APPENDIX A-1

Test Pit/Trench Excavation Procedures

I. Introduction

The test pits/trenches will be excavated using a backhoe equipped with a bucket. If residues are visually observed in the test pit/trenches, the contents will also be sampled.

II. Materials

- Backhoe with bucket
- Shovel
- Plastic sheeting
- Stainless steel hand trowel
- Stainless steel pan
- Appropriate sample containers and packing materials
- Tap water
- Steam cleaning equipment
- Appropriate Health and Safety equipment (Appendix B)
- Photoionization detector (PID), HNu or equivalent
- Camera/videocamera
- Test pit/trench log

III. Procedure

1. Identify the test pit/trench number on the log, Attachment 1, along with the temperature, weather, date, time, and personnel at the site.

2. Set up decontamination station and decontaminate the backhoe, bucket, shovel, and other sampling apparatus with a high-pressure steam rinse using a tap water source. Contain decontamination water and residual materials.

3. Put on applicable health and safety equipment.

4. Place the plastic sheeting on the ground next to the test pit/trench location.

5. Position backhoe and personnel at upwind (to the extent feasible) locations of the test pit/trench area.

6. Turn on the PID. Measure and record on the test pit/trench log (Attachment 1) background PID readings.

7. Excavate the soil with the backhoe in approximately one-foot increments. At each interval, examine and classify the soils according to the United Soil Classification System (USCS). Record these observations in the test pit/trench log. Also screen the soil samples with a PID. These measurements will also be recorded in the test pit/trench log (Attachment 1).

8. If the contents of the test pit/trench visually appear to consist of site residues, the test pit/trench contents will be sampled. The test pit/trench will be sampled with a shovel if the test pit/trench is less than three feet deep. If the test pit/trench is greater than three feet deep, then the test pit/trench will be sampled with the backhoe bucket. The contents of the bucket will then be sampled with a cleaned stainless steel hand trowel.

9. The samples will be collected in the appropriate containers and placed immediately in a cooler of wet ice to maintain a 4°C temperature for preservation. Volatile organic samples will be collected immediately after sample retrieval. Next, a sufficient amount of the remaining soil will be removed from the sampling device and homogenized by mixing thoroughly in a clean stainless steel pan with a clean stainless steel trowel. Samples will be selected only if visible residues are present and/or relatively high PID screening readings are measured.

10. The test pit/trench will be terminated when residues are encountered, the water table is reached, or to the maximum reach of the backhoe, whichever occurs first.

11. Soils generated during drilling will be staged on plastic, segregated based on PID readings and visual observations, then transferred to 55-gallon drum containers, or placed back into the borehole mixed with bentonite. Clean fill will be placed at the surface.

12. A labeled stake will be placed at the test pit/trench location.

13. A photograph of each location before, during, and after each test pit/trench is excavated will be taken. During the excavation, videotapes of the operations may be obtained to provide visual documentation.

14. The backhoe, backhoe bucket, and all tools used at the test pit/trench area will be decontaminated using a high-pressure steam rinse using a tap water source. Decontamination water and residual materials will be contained.

APPENDIX A-1

Attachment 1

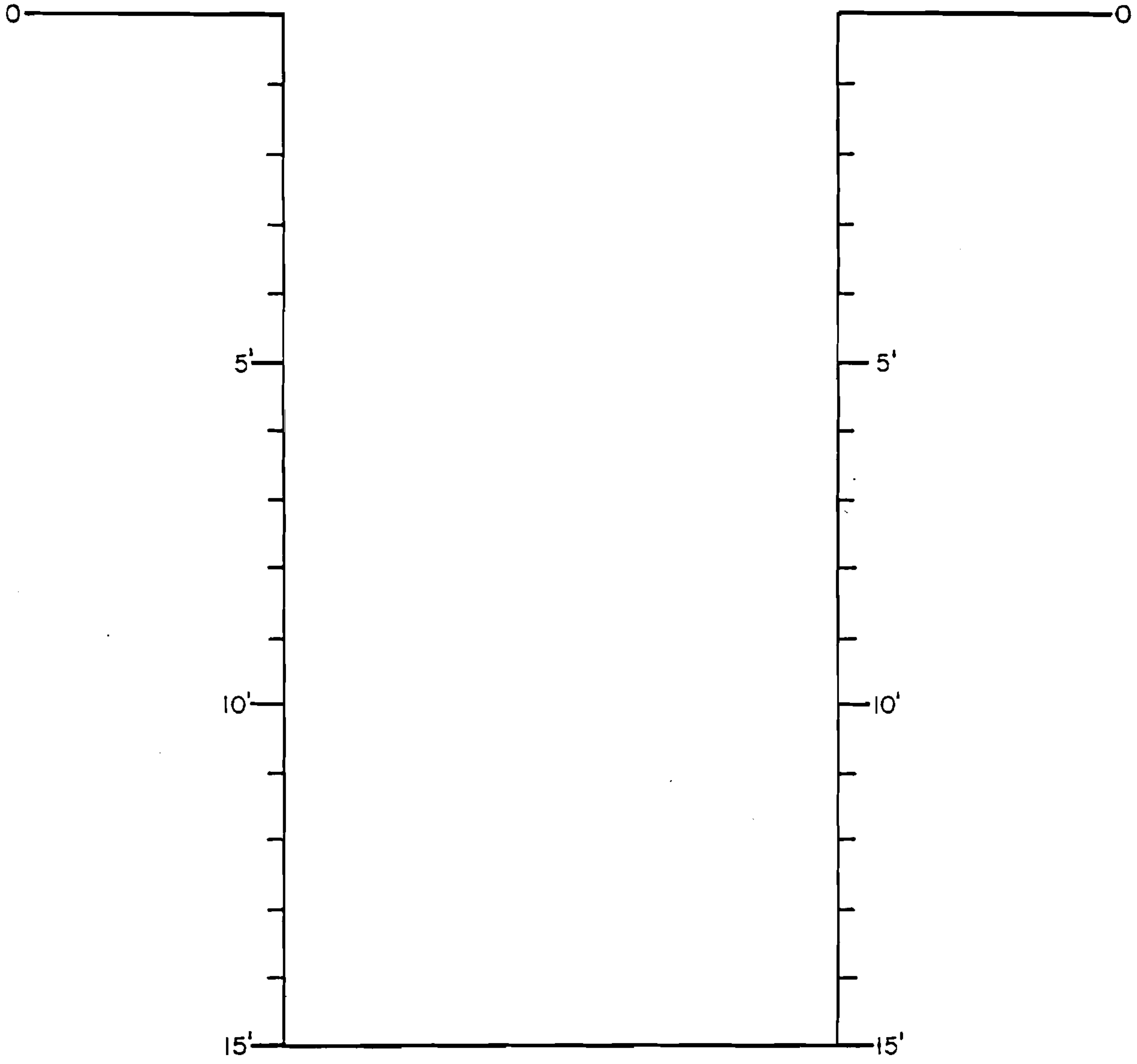
Test Pit/Trench Log

ATTACHMENT 1

BLASLAND & BOUCK ENGINEERS, P.C.

PROJECT NAME ____________________
PROJECT NUMBER ____________________
LOCATION ____________________
LOGGED BY __________ DATE __________

TEST PIT LOG



NOTES: ____________________

APPENDIX A-2

Drilling Procedures for Collecting and Screening of Soil and Rock Samples

APPENDIX A-2

Drilling Procedures for Collecting and Screening of Soil and Rock Samples

I. Introduction

Soil borings shall be completed with a truck- or track-mounted drill rig using the hollow-stem auger drilling method, and rock corings will be completed using a core barrel.

II. Soil Sampling

Samples of the encountered subsurface material will be collected continuously unless otherwise specified. The sampling method employed will be ASTM D-1586/Split-Barrel Sampling (Standard Method for Penetration Test and Split-Barrel Sampling of Soils, ASTM D 1586-84, published in Annual Book of ASTM Standards, Volume 04.08). Upon retrieval of the split-barrel sampler, representative portions of each soil sample will be placed in a 1-pint container, labeled, and stored on-site. This container will be labeled with: 1) site; 2) boring number; 3) interval sample/interval date; 4) date; and 5) initials of sampling personnel. All split-barrel samples will be screened for organic vapors with a photoionization detector (PID), using the procedures described in number III below. In addition, a supervising geologist will be on-site during the drilling operations to fully describe each soil sample including: 1) soil type; 2) color; 3) percent recovery; 4) moisture content; 5) texture; 6) grain size and shape; 7) consistency; 8) visible evidence of residues; and 9) miscellaneous observations. The descriptions will be according to the Unified Soil Classification System (USCS) and will be recorded on a subsurface log form (Attachment 1). The supervising geologist will be responsible for documenting drilling events in a daily field log or in the field notebook.

The Drilling Contractor will be responsible for obtaining accurate and representative samples, informing the supervising geologist of changes in drilling pressure and loss of circulation, and keeping a separate general log of soils encountered, including blow counts (i.e., the number of blows from a soil sampling drive weight [140 pounds] required to drive the split-barrel sampler in 6-inch increments).

III. Field Screening Procedures

All soil samples will be field screened upon collection with the PID for a relative measure of the total volatile concentration. In addition, field screening will be conducted on the head space of soil samples with a PID. A representative portion of the sample will be obtained to fill approximately one half of a 1-pint container. These samples will be screened as follows:

1. The headspace of the sample will be measured directly from the sample container with the PID;

2. The readings will be recorded on the soil boring/rock coring logs (Attachment 1).

The PID meter will be calibrated to isobutylene daily or more frequently if field conditions warrant.

IV. Sampling for Laboratory Analysis Procedures

Samples will be selected for laboratory analysis based on:

1. Their position in relation to identified source areas;
2. The visual presence of source residues;
3. The relative levels of volatile organics based on PID measurements; and/or
4. The judgment of the field manager.

Samples designated for laboratory analysis will be placed in the appropriate containers. Sample containers for volatile organic analysis will be filled first. Next, a sufficient amount of the remaining soil will be homogenized by mixing in a stainless steel tray with a clean stainless steel trowel. For every 20 soil samples obtained, a duplicate soil sample will be obtained by splitting the sample into two sets of sample containers.

V. Bedrock Coring Procedures

Bedrock cores will be completed using a NX size core barrel in accordance with ASTM D 2113, Standard Practice for Diamond Core Drilling for Site Investigation, ASTM D 2113-83, as published in Annual Book of Standards, Volume 04.08. Continuous 5 to 10-foot rock cores will be obtained in the uppermost bedrock.

Prior to core barrel introduction into the hole, circulation of water will be maintained for a short time to remove any cuttings that may clog the barrel. Drilling rods will be carefully centered to prevent core breakage. Drilling bit pressure and water pressure will be maintained at a level consistent throughout the runs and the runs will be completed without interruption such that penetration rates can be determined.

Core samples will be rinsed with tap water (as necessary) and placed in wood boxes. Obvious man-made breaks will be marked with a pen across the break. Wood blocks will be labeled and placed at the end of each core run to indicate the run number. A wooden spacer will be inserted if no sample is recovered and labeled "L.C." (lost core) with corresponding depth. The core box will be labeled on the outside top and inside lid for: 1) site; 2) date; 3) job number; 4) boring number; 5) run number; and 6) run interval. A diagram of core box labeling is included in Attachment 2.

The supervising geologist will be responsible for recording mechanical and geologic characteristics of the rock core. The mechanical characteristics will include: 1) penetration rates; 2) RQD (rock quality degree); 3) percent recovery; 4) water loss; and 5) bit type and size.

A geologic classification will include the following parameters, as applicable: 1) lithology; 2) color; 3) grain size and shape; 4) estimated percent porosity; 5) presence of interstitial water; 6) bedding planes or foliation; 7) mineralogy; 8) degree of crystallinity; 9) properties of joints and fractures; 10) nature of voids, vugs, cavities; 11) hardness; 12) degree of weathering; and 13) degree of solution enlargement. A rock core subsurface log is provided in Attachment 1, and a key to the subsurface log is provided in Attachment 3.

The supervising geologist will be responsible for documenting drilling events in the daily field notebook. A documentation of drilling events will include: 1) start and finish dates of drilling; 2) name and location of project; 3) project number, client and site location; 4) sample number and depths; 5) type and size of samples; 6) depth to water; 7) type of drilling method; 8) size of casing; 9) names of contractor's drillers, inspectors, or people on-site; and 10) weather conditions.

VI. Survey

A field survey control program will be conducted by a qualified survey crew using standard instrument survey techniques to document boring and coring locations and the ground elevations to the National Geodetic Vertical Datum (NGVD) of 1929.

VII. Equipment Decontamination

Equipment decontamination will occur prior to use on the site, between each drilling location, and upon completion of the drilling prior to leaving the site. All drilling equipment and associated tools including augers, drill rods, sampling equipment, wrenches, core barrel, core rods, and any other equipment or tools that may have come in contact with the soils and bedrock will be cleaned with high-pressure steam cleaning equipment using a tap water source. The drilling equipment will be decontaminated for each boring or coring in an area designated by the supervising geologist. Decontamination water and residual materials will be contained.

APPENDIX A-2

Attachment 1

Subsurface Log

SUBSURFACE LOG

DEPTH (FT)	SAMPLES	SAMPLE / RUN NO.	SOIL DATA			ROCK DATA				WELL COLUMN	GEOLOGIC COLUMN	SOIL / ROCK CLASSIFICATION	ROCK FEATURES
			RECOVERY (FT.)	BLOWS / 6 IN.	HNU	FROM/TO	% RECOVERY	% RQD	AVERAGE RATE (MIN./FT.)				

SURFACE ELEVATION ______
DATE STARTED ______
DATE COMPLETED ______
CLASSIFIED BY ______

PROJECT ______
LOCATION ______
PROJECT NO. ______
SHEET ____ OF ____

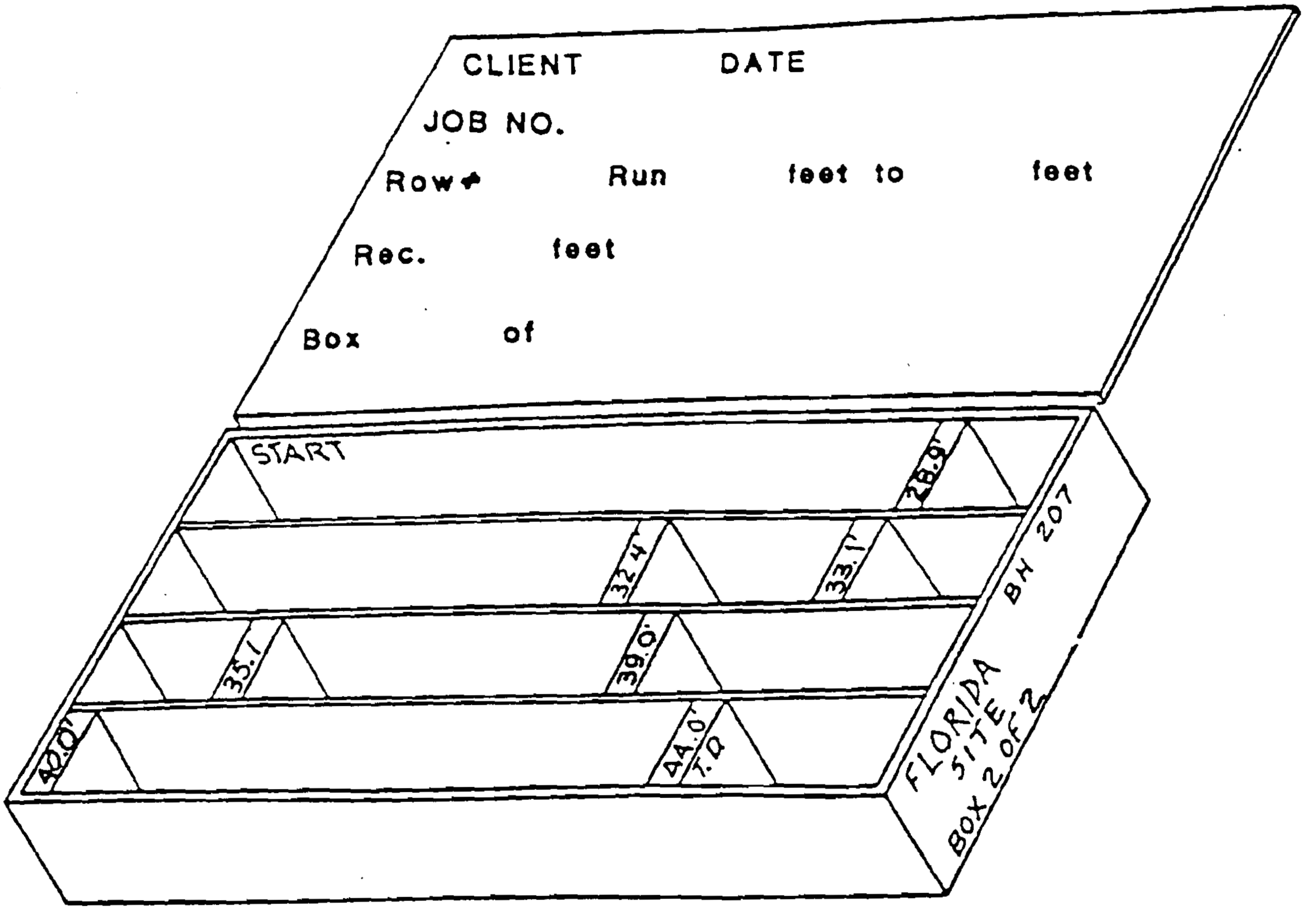
BLASLAND & BOUCK ENGINEERS, P.C.

APPENDIX A-2

Attachment 2

Sample Core Box Layout

SAMPLE CORE BOX LAYOUT



NOT TO SCALE

APPENDIX A-2

Attachment 3

Subsurface Log Key

KEY TO SUBSURFACE LOGS

Core Conditions

% Recovery - length of core recovered divided by length of core run.

RQD - Rock Quality Degree, a percent, the sum of the length of pieces four inches long or greater divided by the length of the core run.

Rock Hardness Scale

VERY HARD - surface cannot be scratched by a knife.

HARD - difficult to scratch with a knife.

MODERATELY HARD - surface is easily scratched by a knife. Difficult to scratch with a fingernail.

SOFT - surface is easily scratched by a fingernail.

Morphology

S - straight

C - curved

I - irregular

Surface Condition

1 - slick

2 - smooth

3 - rough

Core Descriptions

N° - angle of fracture surface from horizontal.

hf/ - horizontal fracture

vf/ - vertical fracture

wz - weathered zone

v - vuggy

bp/ - bedding plan

l/ - laminae

s/ - stylolite

/o - oxidized

/w - weathered

/is - iron stained

/s - solution enlargement

/p - solution enlargement with a patina

/m - mud in opening

/rm - red mud in opening

/gm - green mud in opening

/bkzn - broken zone

JxF - joint (fracture) crosses foliation

JIIF - joint is parallel to foliation

U - joint in unfoliated rock

MB - mechanical break

APPENDIX A-3

Vessel/Tank Sampling Procedures

APPENDIX A-3

Vessel/Tank Sampling Procedures

I. Introduction

Prior to sampling the vessel/tank, all available information concerning the vessel will be recorded in the field log book including: type of vessel material, capacity of vessel, and condition of the vessel.

II. Materials

The following materials, as required, shall be available during sampling:

- Photoionization detector (PID)
- Appropriate health and safety equipment
- Plastic sheeting
- Peristaltic pump and tubing
- Oil/water interface probe
- Appropriate cleaning materials (Alconox or equivalent, tap water, solvent, and analyte-free water)
- Appropriate sample containers and packing materials
- pH meter
- Temperature/conductivity meter
- Associated tools including a non-sparking metal saw

III. Procedures

A. The procedures will be as follows:

1. Identify site and location to be sampled in a bound field notebook, along with date, time, temperature, and weather conditions. Identify the personnel and equipment utilized and other pertinent data in the field notebook.

2. Set up an equipment cleaning station and clean equipment with a soapy water wash, a tap rinse, solvent, and an analyte-free water rinse.

3. Put on applicable health and safety equipment.

4. Turn on PID. Measure and record background PID readings.

5. Place plastic sheeting adjacent to the vessel.

6. Set out on plastic sheeting all sampling equipment that has been cleaned.

7. Insert PID probe approximately 4 to 6 inches above the access opening of the vessel. Note the PID reading in the field notebook.

8. Place a cleaned oil/water interface probe into the access opening and lower it down to the top of the fluid level, and note any floating product that may be on top of the fluid present within the vessel. If the oil/water interface probe does not indicate the presence of a non-aqueous phase liquid, use a clear bailer for confirmation. Note the top of fluid level in the field notebook. Then lower the oil/water interface probe slowly through the fluid in the vessel, noting any changes in the phase and the depth of these changes as the probe is lowered to the bottom. Retrieve the probe after the depth of the bottom of the tank is determined.

9. a. Place the sample containers down next to the access opening. If the contents of the tank consist of one liquid phase, divide each sample container into thirds using an indelible marker. This will allow for compositing of each sample container as it is being filled from the various levels (top, middle, bottom) of the tank.

   b. Based on the previous top of fluid measurement, cut off the appropriate length of tubing to be placed in the peristaltic pump. Lower the tubing to the surface of the fluid and fill each sample container one-third full, including the one gallon field sampling container which will be used for obtaining field measurements. Note the physical appearance of the fluid in the field notebook. Dispose of tubing properly.

   c. Cut off the appropriate length of tubing to obtain a sample from the middle of the tank. Evacuate enough fluid to fill the sample containers two-thirds full, including the field sampling container. Note the physical appearance of the fluid in the field notebook. Dispose of tubing properly.

   d. Cut off the appropriate length of tubing to obtain a sample from the bottom of the tank. Evacuate enough fluid to fill all the sample containers including the field sampling container. Note the physical appearance of the fluid in the field notebook. Dispose of tubing properly.

10. If separate phases are identified, obtain a distinct sample from each phase by lowering the appropriate length of tubing to the depth of each phase. Evaluate enough fluid to fill all the sample containers including the field sampling container. Note the physical appearance of the fluid in the field notebook. Dispose of tubing properly.

11. Obtain the pH, conductivity, and temperature readings from the one gallon glass container that has been filled consecutively along with the sample containers. Note any layering or separation that has occurred.

12. Secure the access opening.

13. Dispose of all sampling materials properly.

APPENDIX A-4

Calibration, Operation, and Maintenance Procedures for Ground-Water and Surface Water Investigation

A-4-1	HNu Photoionization Detector Calibration, Operation, and Maintenance Procedures
A-4-2	pH Meter Calibration, Operation, and Maintenance Procedures
A-4-3	Temperature/Conductivity Meter Calibration, Operation, and Maintenance Procedures
A-4-4	Water Level Probe Calibration Procedures
A-4-5	Turbidity Meter Calibration, Operation, and Maintenance Procedures
A-4-6	MicroTIP Photoionization Detector Calibration, Operation, and Maintenance Procedures
A-4-7	Organic Vapor Analyzer Calibration, Operation, and Maintenance Procedures

APPENDIX A-4-1

HNu Photoionization Detector Calibration, Operation, and Maintenance Procedures

I. Introduction

The HNu meter measures relative concentrations of total organic and inorganic vapors and will be calibrated daily prior to use. The HNu meter is certified by Factory Mutual for use in Class 1, Division 2, Group A, B, C, and D environments. The HNu will be used to monitor breathing zones and work zones as specified in the Health and Safety Plan.

II. Materials

- HNu Photoionization Detector (PID), (10.6 ev lamp)
- Isobutylene calibration gas tank with pressure regulator
- Plastic tubing to connect the PID probe to the calibration gas tank
- PID calibration and maintenance log

III. Calibration Procedures

1. Turn the HNu meter dial to the standby position and zero the meter needle with the zero dial.

2. Switch the meter dial to the appropriate concentration range so as to be able to accurately read the calibration gas value.

3. Loosen the dial on the regulator allowing the calibration gas to flow from the tank, through the plastic tubing to the HNu probe.

4. Adjust the HNu calibration dial so that the meter value is equal to the calibration gas concentration.

5. Record the calibration dial value and the other information on the PID Calibration and Maintenance Log (Attachment 1).

IV. Operation Procedure

1. Don health and safety equipment (as required by the Health and Safety Plan).

2. Turn the FUNCTION switch to the BATTERY CHECK position. Check that the indicator is within or beyond the green battery arc. If the indicator is below the arc or the red LED is lit, the battery must be charged.

3. Turn the FUNCTION switch to the STANDBY position and rotate the ZERO POTENTIOMETER until the meter reads zero. Wait 15 to 20 seconds to confirm the adjustment. If unstable, readjust.

4. Check to see that the SPAN POTENTIOMETER is set for the appropriate setting for the probe being used (5.0 for 9.5 eV probe, 9.8 for 10.2 eV, and 5.0 for 11.7 eV).

5. Set the FUNCTION switch to the desired ppm range (0-20, 0-200, or 0-2,000). A violet glow from the UV source should be visible at the sample inlet of the probe/sensor unit.

6. Listen for the fan operation to verify fan function (HNu only).

7. Measure and record the background PID reading.

8. Use PID as specified in the Health and Safety Plan.

V. Maintenance Procedures

1. At the end of each day or after 8 hours of monitoring with the HNu, recharge the batteries for 12 hours.

2. Store the instrument in protective case when not in use.

3. Keep records of operation, maintenance, calibration, problems, and repairs.

4. After use, the instrument will be inspected and the inspection recorded in the field notebook.

5. A replacement instrument will be available on-site or ready for overnight shipment, if necessary.

6. The HNu will be sent back to the manufacturer for service, if needed.

7. Record calibration information on the PID Calibration and Maintenance Log (Attachment 1).

APPENDIX A-4-2

pH Meter Calibration, Operation, and Maintenance Procedures

I. Introduction

The pH meter will be calibrated daily prior to use.

II. Materials

- 10.0, 7.0, 4.0 pH buffer solutions
- Thermometer
- Distilled water
- Disposable plastic beakers
- Calibration and maintenance log

III. Calibration Procedures

The pH meter will be calibrated as follows:

1. Switch on instrument.

2. Connect electrode to meter and remove protective cap.

3. Rinse electrode in distilled water and dry completely.

4. Measure and record temperature of buffer solutions.

5. Immerse pH electrode in pH buffer 7.00, set the temperature control to that of the buffer 7.00 and allow sufficient time for the electrode to stabilize. Adjust the Standardize Control for the correct readout.

6. Rinse electrode with distilled water and dry completely.

7. Immerse pH electrode in buffer 4.0, set the temperature control to that of the buffer 4.0 and allow sufficient time for the electrode to stabilize. Adjust the Slope Control for the correct readout.

8a. Rinse the electrode with distilled water. The meter is calibrated and ready for use.

8b. (Optional step) If the pH is expected or could be between 7.0 to 10.0, then immerse the pH electrode in buffer 10.0, set temperature control, and allow sufficient time for the electrode to stabilize. Adjust the slope control for the correct readout.

9. Record calibration information on the Temperature/pH/Conductivity Meter Calibration and Maintenance Log (Attachment 2).

IV. Operation Procedures

1. Calibrate pH meter.
2. Rinse probe in distilled water.
3. Fill two disposable beakers with the water sample.
4. Insert probe in each sample beaker and obtain a reading. The meter will read between 0 and 14, in 0.01 increments.
5. Log results in field notebook and the average will be the actual result.
6. Rinse probe off in distilled water.

V. Maintenance Procedures

1. Replace batteries on a regular basis.
2. Store electrode in protective casing when not in use.
3. Keep records of operation, maintenance, calibration, problems, and repairs.
4. After use, the meter will be inspected and the inspection recorded in the field notebook.
5. A replacement meter will be available on-site or ready for overnight shipment, if necessary.
6. The pH meter will be sent back to the manufacturer for service, if needed.
7. Record maintenance information on the Temperature/pH/Conductivity Meter Calibration and Maintenance Log (Attachment 2).

APPENDIX A-4-3

Temperature/Conductivity Meter Calibration, Operation, and Maintenance Procedures

I. Introduction

The temperature/conductivity meter (HACH Model 44600 or equivalent) will be calibrated daily prior to use.

II. Materials

- Beaker capable of submerging the entire probe in a calibration liquid standard
- Calibration liquid standard (NaCL, 1,000 mg/L or equivalent)
- Fine screw driver
- Disposable plastic beakers
- Distilled water
- Calibration and maintenance log

III. Calibration Procedures

The conductivity meter will be calibrated as follows:

1. Be sure the probe is clean.

2. Soak the probe in distilled water for at least 30 minutes.

3. Remove the probe from the water and shake off distilled water.

4. Immerse the probe to or beyond the vent holes in a disposable beaker containing Sodium Chloride Standard Solution, 1,000 mg/L. Agitate vertically to remove trapped air.

5. Repeat Step 3 and 4 at least once more.

6. Press the Power key and CND key. Verify that the LO BAT indicator does not appear.

7. Press the 2 milliSiemens per centimeter (mS/cm) range key.

8. Check the reading on the display. It should be 1.990 mS/cm. If adjustment is needed, use a small screwdriver to adjust the CAL control next to the display. Counterclockwise adjustment increases the reading.

9. Record calibration information on Temperature/pH/Conductivity Meter Calibration and Maintenance Log (Attachment 2).

IV. Operation Procedures - Temperature/Conductivity

1. Calibrate the conductivity meter.
2. Rinse probe in distilled water.
3. Fill two disposable beakers with water.
4. Turn meter to read temperature and record the temperature of the water twice.
5. Turn meter on to the 2 mS/cm scale.
6. Insert probe into each sample beaker and obtain a reading. The meter will read between 0 and 20 mS/cm, in 0.001 increments.
7. Record results in the field notebook and the average will be the actual result.
8. Rinse probe off in distilled water.

VI. Maintenance Procedures

1. Replace batteries on a regular basis.
2. Store electrode in protective casing when not in use.
3. Keep records of operation, maintenance, calibration, and of any problems and repair.
4. After use, the meter will be inspected and the inspection recorded in the log book.
5. A replacement meter will be available on-site or ready for overnight shipment, if necessary.
6. The conductivity meter will be sent back to the manufacturer for service when needed.

APPENDIX A-4-4

Water Level Probe Calibration Procedures

I. *Introduction*

The water level probe cable will be checked once to a standard to assess if the meter has been correctly calibrated by the manufacturer.

II. *Materials*

- Water level probe and cable
- Six-foot engineer's rule
- Water level probe maintenance log

III. *Procedures*

1. Each water level probe will be calibrated prior to using.
2. To calibrate, the lengths between each increment markers on the cable will be measured with a six-foot engineer's rule. The cable will be checked for the first 150 feet.
3. If markers are incorrect, the probe will be sent back to the manufacturer.
4. Record verification on form (Attachment 3).

APPENDIX A-4-5

Turbidity Meter Calibration, Operation, and Maintenance Procedures

I. Introduction

The turbidity meter, a Cole-Parmer Model 8391-35 or equivalent, will be calibrated daily prior to use.

II. Materials

- Portable turbidity meter
- 0.5, 5.0, 40 Formazin standard solutions
- Calibration and maintenance log

III. Calibration Procedures

The turbidity meter will be calibrated as follows:

Zero Adjust

1. With the instrument turned off, check the meter needle position. If the needle does not read zero, adjust the mechanical zero screw.

2. Turn on the instrument and allow to warm up for 5 minutes.

3. Insert the black body into the sample well.

4. Turn the set standard control fully clockwise.

5. Place the NTu range switch to the x 0.01 position.

6. Adjust the circuit board mounted potentiometer to read zero on the meter (an access hole is marked on the right hand side of the instrument).

   Note: An insulated, non-magnetized calibration screwdriver is required for both adjustments.

Calibrations of Secondary Standards

1. Make the Formazin standard or obtain a commercially available standard.

2. Set the NTu range switch to x 1 (0-100 NTu full scale).

3. Pour the 40 NTu Formazin or commercial standard into the chosen sample cuvette. Make certain that the sample cuvette is wiped clean of all dirt and finger prints. Insert the cuvette into the sample well and align properly. Cover with the light shield.

4. Use the SET STANDARD knob to adjust the meter needle to read exactly 40 NTu.

5. Remove the sample cuvette and insert the 40 NTu standard. Align the cuvette properly and cover with the light shield. Note the exact reading and record this value on the calibration and maintenance log (Attachment 4). This is the value that should now be used for the 40 NTu sealed standard.

6. Rinse the sample cuvette thoroughly and dry completely inside and out.

7. Fill the sample cuvette with the 5 NTu Formazin or commercial standard. Insert the sample cuvette into the test well. Align the cuvette properly and cover with the light shield.

8. Turn NTu RANGE knob to x 0.1 (0-10 NTu full scale). Use the SET STANDARD knob to adjust the meter needle to read exactly 50 (actually 5 NTu).

9. Remove the sample cuvette and insert the 5 NTu sealed standard. Align the cuvette properly and cover with the light shield. Note the exact reading and record this value on the calibration and maintenance log (Attachment 4). This is the value that should now be used for the 5 NTu sealed standard.

10. Rinse the sample cuvette thoroughly and dry completely inside and out.

11. Fill the sample cuvette with the 0.5 NTu Formazin or commercial standard. Insert the sample cuvette into the test well, align properly and cover with the light shield.

12. Turn NTu RANGE knob to x 0.01 (0-1 NTu full scale). Use the SET STANDARD knob to adjust the meter needle to read exactly 50 (actually 0.5 NTu).

13. Remove the sample cuvette and insert the 0.5 NTu sealed standard. Align the cuvette properly and cover with the light shield. Note the exact reading and record this value on the calibration and maintenance log (Attachment 4). This is the value that should be used for the NTu sealed standard.

14. Record calibration information on the Turbidity Calibration and Maintenance Log (Attachment 4).

IV. Operation Procedures

1. Calibrate turbidity meter.

2. All samples should be measured using the same sample cuvette. Samples are read by inserting the sample cuvette, properly aligned with the key, into the test well. Cover with the light shield and take the reading off of the correct scale on the meter. Make certain to take the range factor (x 1, x 0.1, or x 0.01) into account when calculating the actual NTu value of the sample.

V. Maintenance Procedures

1. Replace batteries on a regular basis.

2. Store instrument in protective carrying case when not in use.

3. Keep records of operation, maintenance, calibration, problems and repairs.

4. After use, the meter will be inspected and the inspection recorded in the field book.

5. A replacement meter will be available on-site or ready for overnight shipment, if necessary.

6. The turbidity meter will be sent back to the manufacturer for service when needed.

7. Record maintenance information on the Turbidity Calibration and Maintenance Log (Attachment 4).

APPENDIX A-4-6

MicroTIP Photoionization Detector Calibration, Operation, and Maintenance Procedures

I. Introduction

The MicroTIP measures relative total concentrations of organic and inorganic vapors in the field and will be calibrated daily prior to use. The MicroTIP does not carry an Intrinsic Safety Rating and will be used in a controlled environment only. The MicroTIP will be used to screen soil samples, the head space of soil/water samples, and to monitor the breathing and work zones as specified in the Health and Safety Plan.

II. Materials

- Photovac MicroTIP (PID).
- Isobutylene calibration gas tank with pressure regulator and up to four other selected span gases.
- Zero span gas (clean outdoor air or zero grade gas).
- Gas sampling bag with plastic tubing to connect PID probe to calibration gas.
- Flow regulator.
- PID calibration and maintenance log.

III. Calibration Procedures

1. Turn on the MicroTIP and monitor the ambient air. If there is any doubt of the air quality, then zero grade gas will be obtained.

2. Connect the regulator to the span gas cylinder. Hand tighten the fittings.

3. Open the valve on the gas bag by turning the valve stem fully counterclockwise.

4. Attach the gas bag to the regulator. Hand tighten the fittings.

5. Turn the regulator knob counterclockwise about half a turn to start the gas to flow.

6. Fill gas bag about half full and then close the regulator fully clockwise to turn off the flow of gas.

7. Disconnect the bag from the adaptor and empty it.

8. Repeat one to three times to fully purge the gas bag.

9. Fill the gas bag, then turn the valve clockwise.

10. Press "CAL" and expose MicroTIP to zero gas. Press "ENTER" and MicroTIP sets its zero point.

11. MicroTIP then asks for the Span Gas concentration. Enter the known Span Gas concentration and then connect the Span Gas bag adaptor to the inlet.

12. Press "ENTER" and MicroTIP sets its response factor.

13. When MicroTIP's, display reverts to normal, the MicroTIP is calibrated and ready to use. Remove the Span Gas from the inlet.

14. After seven hours of use, recharge the battery pack. Record the time the battery pack was charged on the MicroTIP Calibration and Maintenance Log (Attachment 1).

15. Record the date, time, your initials, calibration gas and concentration on the Calibration and Maintenance Log (Attachment 1).

IV. Operation Procedures

1. Don the health and safety equipment as required by the Health and Safety Plan.

2. Calibrate the instrument as previously described.

3. Measure and record the background PID reading.

4. Use PID as specified in the Health and Safety Plan.

5. If the PID will be used for more than seven hours during optimal weather conditions (50° or greater), during extreme cold or precipitation, have a fully charged battery available for use.

6. In the event of precipitation, fully cover the instrument, leaving the probe accessible for measurements.

V. Maintenance Procedures

1. At the end of each day or when the battery is fully discharged, recharge batteries overnight.

2. Store the instrument in the protective case when not in use.

3. Keep records of operation, maintenance, calibration problems, and repairs.

4. During the course of normal operation, a film builds up on the window of the detector ultraviolet lamp. This window should be cleaned every 24 hours of operation. The rate at which the film builds up depends on the type and concentration of gases and vapors being sampled. Typically, "sticky" substances, i.e., petroleum hydrocarbons, cause films to develop quicker. Clean the lamp with spectrograde methanol and a lint-free tissue or cloth. Refer to the user manual for instrument disassembly instructions for the specific PID model.

5. The MicroTIP has a dust filter to reduce detector contamination. As the filter collects dust, the inlet flow rate and sensitivity decreases. Replace filter every 240 hours of operation, or more frequently if MicroTIP is used in a dusty environment. Refer to the user manual for disassembly instructions for the specific PID model.

6. A replacement instrument will be available on site or ready for overnight shipment, if necessary.

7. The MicroTIP will be sent back to the manufacturer for service if needed.

APPENDIX A-4-7

Organic Vapor Analyzer (OVA) Calibration Procedures

I. Introduction

The organic vapor Analyzer (OVA) meter calibration will be conducted prior to initiating field activities. Calibration checks will be made daily during the operation of the OVA. All calibrations and calibration checks will be recorded on the OVA Calibration and Maintenance Log in Attachment 5.

II. Materials

- Organic Vapor Analyzer meter, Foxboro^R Model 128
- Methane calibration gas (10,000 and 100 ppm methane)
- Regulator, Tedlar gas bag with nozzle and plastic tubing
- OVA Calibration and Maintenance Log
- Small screw driver
- Crescent wrench

III. Calibration Procedures

1. Switch the pump switch to the on position (warm instrument for five minutes).
2. Stand the OVA meter up vertically and observe the pump flow rate. If the flow rate is not 2 liters per minute, the pump may need cleaning or replacement.
3. Open the hydrogen supply valve and tank valve.
4. Depress the ignitor button for no more than six seconds.
5. Observe the meter needle on the OVA. If the needle peaks and remains at a relatively high value after the depression of the ignitor button, the OVA is lit and ready for use. If the needle does not peak, wait two or three minutes and depress the ignitor button again for six seconds.
6. After the instrument is operating, allow the instrument to warm up for 15 minutes prior to calibrating.
7. Prepare two known concentrations of methane gas in air, preferably 100 ppm and 10,000 ppm (1%).
8. Place the OVA in normal operating position and permit it to warm up for at least 15 minutes.
9. Introduce the 100 ppm sample and rotate the Calibration Adjust knob for 100 ppm on the meter.
10. Introduce the 10,000 ppm mixture and adjust R-4 on the electronics board for 10,000 ppm.
11. Repeat steps until no further adjustment is necessary.
12. Close the Hydrogen Supply Valve and wait until the flame is extinguished.

13. Place the Calibrate Switch in the low position and rotate the Gas Select knob until the meter reads 10 ppm.

14. Place the Calibrate Switch in the high position and adjust R-16 on the electronics board for 10,000 ppm.

15. Repeat steps until no further readjustment is necessary.

16. Record the data and calibration adjustment on the OVA Calibration and Maintenance Log in Attachment 5.

IV. Operation Procedures

1. Don the health and safety equipment as required by the Health and Safety Plan.

2. Calibrate the instrument as previously described.

3. Measure and record the background OVA reading.

4. Use OVA as specified in the Health and Safety Plan.

5. In the event of precipitation, fully cover the instrument.

V. Maintenance Procedures

1. The column can become contaminated with compounds having long retention times resulting in high background readings. To check for contamination move the machine to clean ambient air and place the sample inject valve in the "in" position (GC Mode). Observe the background reading on the meter and after 1 to 2 minutes, change the position of the backflush valve and again observe the reading. If the background reading decreased, then started to increase in 1 to 2 minutes, the column is probably contaminated.

2. Contaminated columns can be avoided by backflushing the column after every analysis.

3. The activated charcoal filter should be checked periodically. To check effectiveness, operate OVA with sample inject valve "in" and pass probe near a concentrated sample. If the readout does not remain steady (0 to 2 ppm), replace charcoal.

4. Always put the OVA on the charger when not in use to prolong life of the battery pack.

5. Always make certain that both the pump and instrument switches are in the off position when instrument is not in use.

6. The OVA will be sent to the factory for service if needed.

Attachment 1

PHOTOIONIZATION DETECTOR CALIBRATION AND MAINTENANCE LOG

INSTRUMENT MANUFACTURER ______________________________
INSTRUMENT MODEL ______________________________
IDENTIFICATION NUMBER ______________________________
LAMP (Circle One) 9.5eV 10.2eV 11.7eV

DATE/ TIME	INITIALS	BATTERY CHECK	CALIBRATION STANDARD			SPAN POTENTIOMETER SETTING	COMMENTS
			SOURCE	TYPE	CONCENTRATION		

Attachment 2

TEMPERATURE/pH/CONDUCTIVITY METER CALIBRATION AND MAINTENANCE LOG

INSTRUMENT MANUFACTURER ______________________

INSTRUMENT MODEL ______________________

IDENTIFICATION NUMBER ______________________

DATE/TIME	INITIALS	TEMPERATURE	pH STANDARD USED/ EXPIRATION	CONDUCTIVITY STANDARD USED/ EXPIRATION	BATTERY CHECK	COMMENTS

Attachment 3

Water Level Probe Maintenance Log

Instrument Serial Number

			Check					
Date/ Time	Date Batteries Installed	Date Decontaminated	Sound Indicator	Light Indicator	Case	Six Foot Rule	Weight	Initials

ATTACHMENT 4

TURBIDITY CALIBRATION AND MAINTENANCE LOG

Instrument Manufacturer ____________________

Instrument Model ____________________

Identification Number ____________________

		Calibration/Standard		Standard	Reading	(NTu)
Date/Time	Initials	Type	Concentration	40	5	0.5

ATTACHMENT 5

ORGANIC VAPOR ANALYZER

CALIBRATION AND MAINTENANCE LOG

Instrument Model Number ____________________

Instrument Serial Number ____________________

Project No. ____________________

Calibration Gas _______ @ _______ ppm

Calibration Gas _______ @ _______ ppm

Battery Charging			Cleaning	Calibration				Initials
Date/ Time	Time Off	Time On	Tubing Casing	Background Value	True Gas Value	Measured Gas Value	Adjust	

APPENDIX A-5

Photoionization Detector (PID) Field Screening Procedures

APPENDIX A-5

Photoionization Detector (PID) Field Screening Procedures

Photoionization Detector (PID)

I. *Introduction*

Field screening with the photoionization detector (PID) is a procedure to measure relative concentrations of volatile organic compounds (VOCs). Field screening can be conducted on the headspace of soil samples (as described below) with the PID.

II. *Materials*

- Appropriate health and safety equipment
- Photoionization detector (PID)
- Air-tight sample containers, 16-oz. glass Mason jars or driller's jars, and aluminum foil
- Extra batteries for the PID
- Calibration gases and regulators
- Spare filter cartridges
- Field notebook and appropriate Screening Form

III. *Procedures*

Soil Headspace Screening

Soil samples will be collected with a split-barrel sampler. All soil samples will be field screened upon collection with a PID for a relative measure of the total VOCs. Initial PID readings will be recorded in the field book. The true soil sample will be separated from the wash material (if any) by using disposable gloves and a pre-cleaned stainless steel spoon. A representative portion of the sample will be placed in a pre-cleaned air-tight sampling container (as quickly as possible to avoid loss of VOCs), filling the container half full to allow for the accumulation of vapors above the soil. If a glass jar is used, an aluminum foil seal will be placed between the glass and metal cap and the cap will be screwed on tightly. The sample containers will be stored in a cooler chilled to 4°C until screening.

Upon completion of sample collection:

1. Samples will be taken to a warm work space and allowed to equilibrate to room temperature for at least one hour.
2. Prior to measuring the soil vapor headspace concentration, the jar will be shaken.
3. The headspace of the sample will then be measured directly from the sample container with the PID by piercing the aluminum foil seal with the probe of the PID and measuring the relative concentration of VOCs in the headspace of the soil sample. The initial (peak) reading must be recorded.

The PID will be calibrated to a benzene-related compound (isobutylene). The PID must be calibrated according to the manufacturer's specifications at a minimum frequency of once per day prior to collecting PID readings. The time, date, and calibration procedure must be clearly documented in the field notebook and/or the calibration log book. If at any time the PID results appear erratic or inconsistent with field observations, then the unit will be recalibrated. If calibration is difficult to achieve, then the unit's lamp should be checked for dirt or moisture and cleaned. During humid or wet conditions, the unit should be calibrated on a more frequent basis as determined by field personnel. In addition, a blank and a field duplicate will be performed every 10 samples. Maintenance and calibration records will be kept as part of the field quality assurance program.

APPENDIX A-6

Surface Soil Sampling Protocol

APPENDIX A-6

Surface Soil Sampling Protocol

I. *Introduction*

This appendix presents protocols by which surface soil samples will be collected at the site.

II. *Materials*

- Health and safety equipment (as required by the Health and Safety Plan):
- Decontamination equipment;
- Aluminum or stainless steel tray;
- Dedicated stainless steel scoops;
- Measuring device;
- Appropriate sample containers and forms;
- Coolers with ice;
- Field book;
- Shovel; and
- Photoionization Detector (PID).

III. *Procedures*

The following procedures will be employed to collect surface soil samples:

1. Put on personal protective equipment (as required by the Health and Safety Plan).

2. Identify sample locations from sample location plan and note locations in field notebook.

3. If the sample location is a vegetated area, the vegetation should be removed prior to sample collection.

4. Samples will be collected by carefully cutting into the soil to the desdired depth with a precleaned stainless steel scoop; cut a large enough area to obtain the required sample volume.

5. Obtain one surface soil sample and place it into a 8-ounch glass jar and screen the headspace with a PID. Record PID reading in field book. Visually characterize the soil and classify according to USCS soil classification procedures.

6. Obtain samples in appropriate containers.

7. Label containers and place in a transportation cooler.

8. At one in every 20 sample locations, a rinse blank and a duplicate sample will be obtained. Obtain duplicate sample by dividing the sample into two sets of containers.

9. Handle, pack, and ship the samples with appropriate chain-of-custody procedures.

10. Record all other appropriate information in the field book.

IV. Field Cleaning Procedures

A. Materials

- Health and safety equipment (as required in the Health and Safety Plan)
- Laboratory-supplied analyte-free water or equivalent
- Non-phosphate soap; (Alconox^R, or equivalent)
- Tap water
- Appropriate decontamination solvent
- Rinse collection plastic containers
- Brushes
- Aluminum foil
- Garbage bags
- Spray bottles for solvent
- Ziploc^R type bags

B. Procedures

1. Follow health and safety procedures specified in the Health and Safety Plan.

2. Decontamination of reusable sampling equipment (e.g., trays, spatulas, scoops and core driver) will follow the decontamination procedures presented below:

   a. Alconox^R and tap water wash;
   b. Tap water rinse;
   c. Solvent spray rinse;
   d. Analyte-free water rinse; and
   e. Allow to air dry and wrap in aluminum foil.

3. Decontamination will be conducted in plastic containers that will be transported to each sampling location (or group of locations). These containers will also be used to collect all decontamination rinsate that will be transferred to an on-site container.

APPENDIX A-7

Installation Procedures for Monitoring Wells and Piezometers at Former Coal Gasification Site

NEW YORK STATE ELECTRIC & GAS CORPORATION

ENVIRONMENTAL MATTERS GROUP

INSTALLATION PROCEDURES FOR MONITORING WELLS AND PIEZOMETERS AT FORMER COAL GASIFICATION SITES

REVISION 3
June 1989

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INSTALLATION PROCEDURES
FOR
MONITORING WELLS AND PIEZOMETERS
AT
FORMER COAL GASIFICATION SITES

1.0 GENERAL

These procedures have been developed to ensure that monitoring wells and piezometers at NYSEG's former coal gasification sites are installed in a consistent manner that both meets New York State regulations and provides representative groundwater measurements. All monitoring well and piezometer installations shall be done under the supervision of NYSEG or its Agent in accordance with these procedures.

2.0 PLACEMENT AND SPACING

2.1 Monitoring wells and piezometers may be placed individually or as clusters. Each well or piezometer grouped in a cluster must be installed in its own borehole.

2.2 At a minimum, well spacing must provide at least one upgradient and two downgradient monitoring wells or well clusters for each site.

2.3 Upgradient wells should be installed first, if possible.

2.4 Monitoring wells that require a curb box-type installation shall not be located in low areas which are subject to flooding or ponding of surface runoff.

3.0 ON-SITE WELL ACCESS

3.1 Wells and piezometers should be located in areas that are accessible by vehicle with minimal disruption of the site.

3.2 If wells or piezometers must be located in areas accessible only on foot, a clear pathway must be constructed by the consultant or contractor. This may include planked crossings of small creeks or swampy areas. Landowner permission must be obtained at sites not owned by NYSEG.

3.3 Where necessary, a cleared area of sufficient size to allow development and sampling of the wells is to be provided by the consultant or contractor. Landowner permission must be obtained at sites not owned by NYSEG.

3.4 Private property adjacent to a former coal gasification site shall not be entered or occupied by men, equipment, or materials without prior written consent of the landowner. Care shall be exercised in conducting operations on private property to minimize the amount of disturbance and damage related to gaining access to, and working at the locations.

4.0 DRILLING PRECAUTIONS

4.1 Contaminants must not be introduced into the borehole during drilling. Only potable water may be used when drilling or installing wells and piezometers unless otherwise approved by NYSEG.

4.2 All tools, materials and equipment that are placed into a borehole or well must be decontaminated with a steam cleaner. Decontamination must be done prior to the start of drilling, and between each hole.

4.3 Air systems or drilling lubricants must not introduce contaminants into a borehole.

4.4 The use of drilling muds should be avoided. If their use is unavoidable, no stray contaminants may be introduced into the subsurface along with the mud. Under no circumstances are drilling muds to be used within ten feet of the screened interval.

5.0 MATERIALS

5.1 Monitoring well casings and screens must be flush-jointed stainless steel, with nominal 2-inch inside diameter. All casings and screens shall be of threaded and coupled construction. Well screens must be factory slotted. Piezometers should be constructed of schedule 40 PVC.

5.2 Casing joints and end plugs must be secured by welds or threads with teflon tape. The use of solvents, glues or other adhesives is prohibited. Well caps must be vented.

5.3 Bentonite pellets or slurry must be used as well seal material. Other suitable, low-permeability material may be utilized if approved in advance by NYSEG.

5.4 Guard pipes must be schedule 40 PVC with nominal 6-inch inside diameter, unless otherwise specified by NYSEG.

5.5 Royer aluminum locking caps (Attachment A) are to be installed on each guard pipe. The cap locking hole must be redrilled to 7/16 inch.

5.6 Bollards (guard posts) must be galvanized steel, nominal 4-inch inside diameter (or greater) and filled with cement grout.

5.7 Well locks will be provided by the consultant. Duplicate keys are to be provided to NYSEG upon installation of the locks.

5.8 The filter pack surrounding a well screen must be clean, inert, siliceous material of relatively uniform size (Section 7.5.a).

5.9 Curb box wells should be provided with non-rusting (e.g., galvanized, brass) lockable riser caps capable of accepting a 7/16 inch diameter lock shank. If present, bolts on curb box lids should be 1/4 inch or larger.

6.0 SAMPLING AND TESTING

6.1 Samples must be collected for all borings. In unconsolidated sediments, samples will be taken from each 5 feet of penetration at a minimum and at every change of formation. In bedrock, sample intervals will be specified by NYSEG.

6.2 For well clusters, the deepest well must be sampled at 5-foot intervals at a minimum and at every change in formation. Other wells in the cluster may be sampled at significant stratigraphic changes and at the screened interval.

6.3 Continuous sampling may be required in any boring that is necessary for determining the subsurface conditions of a site.

6.4 Samples shall be taken using a split-barrel sampler conforming to the requirements of ASTM D 1586. Other sampling methods must receive prior approval from NYSEG. Bedrock must be sampled by coring with NX-size or larger diameter core bits.

6.5 Samples must be retained in labeled glass jars or wooden core boxes and returned to NYSEG for storage. Unconsolidated samples will be retained for three years and cores will be retained indefinitely.

6.6 A representative number of undisturbed samples from soil borings must be analyzed in the laboratory for Atterberg limits, gradation curves, permeabilities, and visual descriptions.

6.7 Complete and accurate drilling logs must be provided for all soil borings. Logs must provide detailed soil classification according to the Unified Soil Classification System (USCS) (ASTM D 2487). Logs must record the date started and completed, descriptions of materials penetrated, depth to significant stratigraphic changes, elevation of water table, points where loss or gain of water occurred; penetration resistance (blow counts) of split spoon sampler; and other pertinent comments.

6.8 Rock core logs must describe the lithology, mineralogy, degree of cementation, color, grain size, and any other physical characteristics of the rock; percent recovery and the rock quality designation (RQD); other primary and secondary features, and contain all drilling observations and appropriate details required for soil boring logs. A clear photographic record of all labeled cores must also be taken and submitted with the logs.

6.9 Well completion diagrams must be submitted for all monitoring wells and piezometers. These must show details of well construction, description of materials, and elevations or depths of all well features.

6.10 In-situ hydraulic conductivity testing must be done in all monitoring wells and piezometers unless otherwise specified by NYSEG. Hydraulic conductivities may be determined by pump tests, packer tests, slug tests or other suitable methods.

7.0 CONSTRUCTION PROCEDURES

7.1 Well borings must have an inside diameter at least 2 inches larger than the outside diameter of the well casing to ensure proper placement of filter pack and annular seal.

OPTIONAL
DEPENDS ON
SOILS

7.2 Each monitoring well must be equipped with a 5-foot blank section of ~~PVC~~ STAINLESS STEEL casing (with end cap) below the well screen. This is intended to act as a sediment trap during well development. The annular space around the sediment trap will be backfilled with native material or bentonite.

7.3 All casing and screens shall be straight as assembled and shall be installed true and vertical.

7.4 Screen Placement

a. Factory-slotted well screens are required for all monitoring wells. Piezometers may be field slotted if prior approval is obtained from NYSEG.

b. The slot size of the screen must be small enough to retain 90% of the filter pack (d_{10} grain size). In most installations, a 0.010 inch slot will be appropriate.

c. Well screens must be confined to discrete stratigraphic or hydrologic intervals and cannot be placed so that they act as conduits through aquicludes and aquitards.

d. Screens must be placed so that sampling can occur during seasonal water table variations.

e. Screen length will depend on water table depth variations, site stratigraphy, expected contaminant behavior and groundwater flow; but no well screen can exceed 20 feet in length.

7.5 Filter Pack Procedures

a. The filter pack must minimize the influx of fine material into the well while not inhibiting water inflow to the screen. The filter pack grain size should have a d_{30} that is 4 to 6 times greater than the d_{30} of the formation material to be screened. NYSEG may require a sieve analysis of the zone to be screened to determine correct filter pack grain size.

FINE PARTICLES
USE FINE SAND
PACK

b. The uppermost 6 inches of the sand pack, between the sand and bentonite seal, must consist of a finer-grained sand. This capping layer must have 100% pass a #30 sieve and less than 2% pass a #200 sieve.

2 STAGE
SAND PACK

c. The filter pack must be placed using the tremie method to avoid bridging of the material. Alternate methods may be used if written procedures demonstrating their effectiveness are submitted and approved by NYSEG prior to filter pack placement.

d. The filter pack may not extend more than 2 feet above the top, or 6 inches below the bottom of the screen.

e. The filter pack level must be checked for proper placement with a weighted measuring tape or equivalent method.

b. The guard pipe must be drilled with 3/4-inch diameter holes (minimum of 10) below grade to restrict movement prior to grout hardening. A single 3/8-inch diameter weep hole must be drilled just above grade to allow drainage of accumulated water. (Attachment B)

c. The guard pipe must be centered around the riser and extend no more than 2.5 feet ± 3 inches above grade. The riser top must be 8 inches ± 1 inch below the top of the guard pipe.

d. The guard pipe must be secured in place by a surface seal of cement grout. The grout must extend 2 feet below ground level to prevent heaving of the guard pipe.

8.2 Monitoring wells or piezometers installed near roadways or in areas affected by operation and maintenance activities may need additional protection. NYSEG may require the consultant or designated subcontractor to provide a minimum of 3 bollards or guard posts around each well or well cluster (Attachment D).

a. Bollards must consist of 4-inch (or greater) galvanized steel pipe filled with cement grout.

b. The cement grout must extend above the pipe and must be rounded to prevent accumulation of water in the bollard.

c. Bollards should be located from 5 to 10 feet from the well or well cluster.

d. Bollards must be set in a 2 feet x 2 feet x 2 feet deep concrete footing or grouted in a 6-inch diameter hole augered to a depth of 3 feet.

e. Bollards should extend 5 feet ± 6 inches above grade, and will be painted with yellow enamel suitable for outdoor machinery.

8.3 Monitoring wells and piezometers must be equipped with aluminum locking caps (Section 5.6) and locked as soon as possible after installation.

9.0 DEVELOPMENT AND SAMPLER INSTALLATION

9.1 All wells and piezometers will be developed as soon as possible after installation but not before the well seal has set. NOT NECESSARY

9.2 Development will be by surging with a block or bailer, or over pumping, with the goal of reducing turbidity below 5 NTU, as recommended by the USEPA RECRA Groundwater Technical Enforcement Guidance Document.

9.3 A NYSEG representative shall have the right to observe the consultant's well development operation.

9.4 Dedicated, chemically inert (e.g., teflon, stainless steel) bailers are to be provided by the consultant and installed in each monitoring well.

10.0 WELL IDENTIFICATION

10.1 Each well must be painted with red enamel paint suitable for outdoor machinery.

10.2 The exterior of each well must be marked in large white letters with its NYSEG I.D. code, which can be found on the field sampling request.

10.3 The locking cap and curb box lid (where appropriate) of each well also must be indelibly marked on its inside surface with the appropriate NYSEG I.D. Code.

10.4 A red-painted, 6-foot high metal stake or Carsonite marker must be placed adjacent to every well or cluster to ensure its visibility in deep snow or thick underbrush. Where this is not possible, measurements to nearby permanent landmarks are to be provided.

10.5 New monitoring wells and piezometers shall be surveyed to obtain precise elevations and locations. Vertical measurements of the ground surface elevation, and the elevation of top of the monitoring well casing or piezometer riser must be accurate to the nearest one hundredth foot.

11.0 GUARANTEE AND INSPECTION

11.1 The contractor or consultant shall guarantee that materials and workmanship will be as specified and that unsatisfactory workmanship or materials will be repaired or replaced at his expense for one year after completion of work.

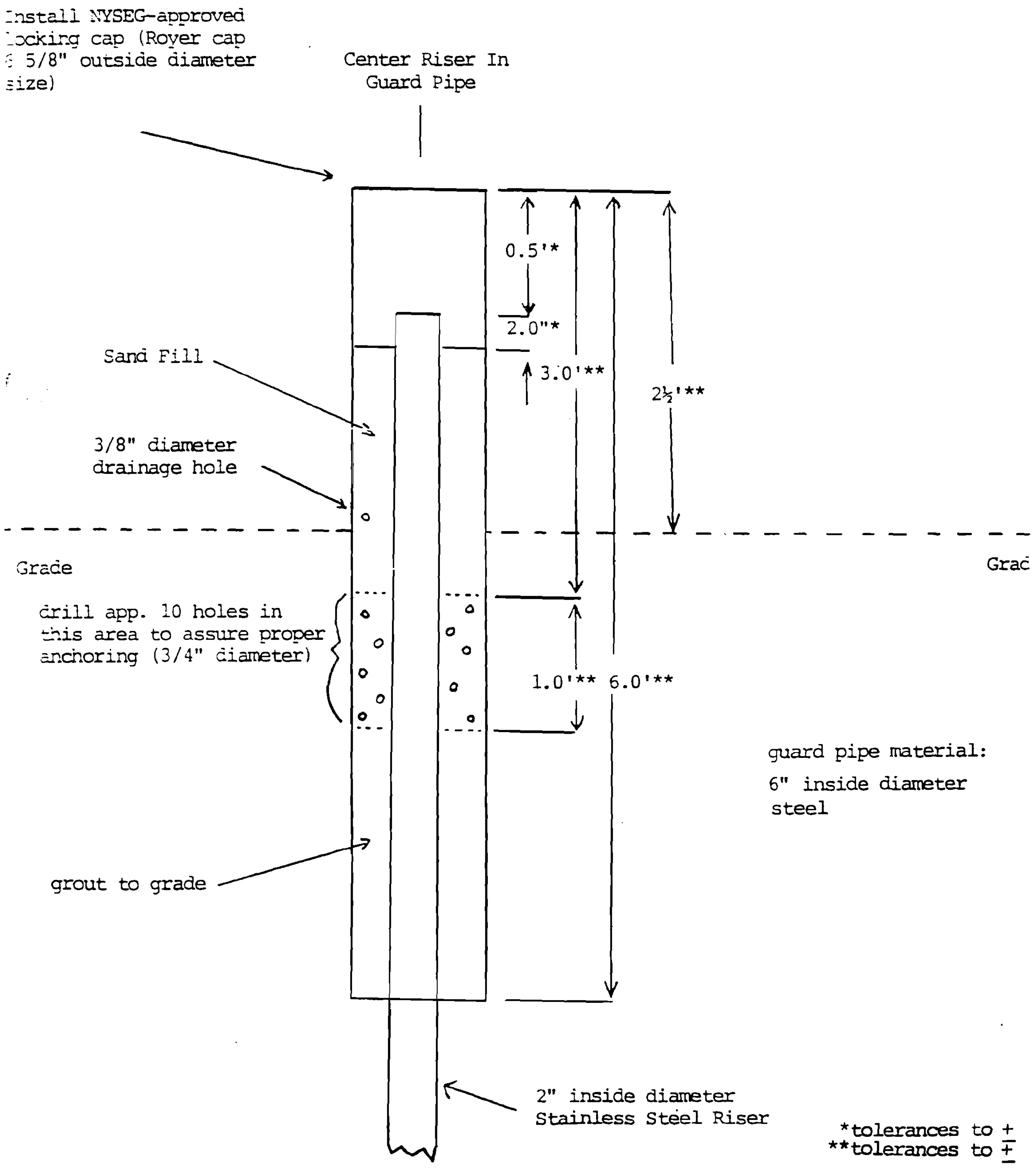
11.2 A NYSEG representative shall have the right to inspect all materials and observe all work during the installation.

11.3 A NYSEG representative will be notified of changes in work schedule or problems that arise on-site during the installation.

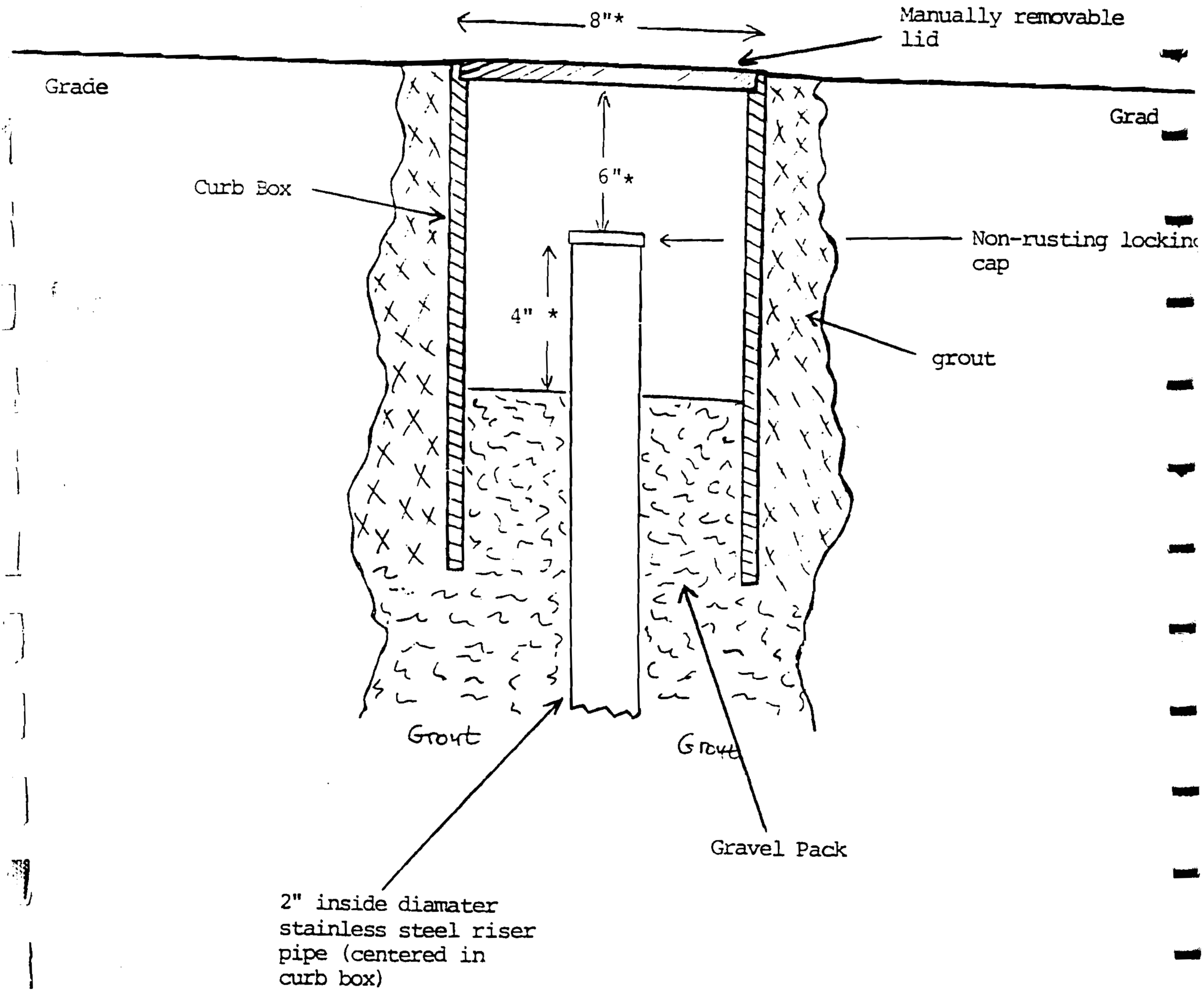
11.4 The contractor or consultant shall protect all structures on site such as walks, pipelines, trees, shrubbery, and lawns during the progress of this work; shall remove from the site all debris and unused materials; and shall, upon completion of the work, restore the site as nearly as possible to its original condition. Paper, cans, bags, and other trash shall be disposed of daily. Excess auger cuttings must be drummed for later disposal by NYSEG.

11.5 Following completion of all items in this procedure, an acceptance inspection will be conducted by NYSEG (one member field sampling group, the project requestor and the field inspector).

MONITORING WELL GUARD PIPE INSTALLATION



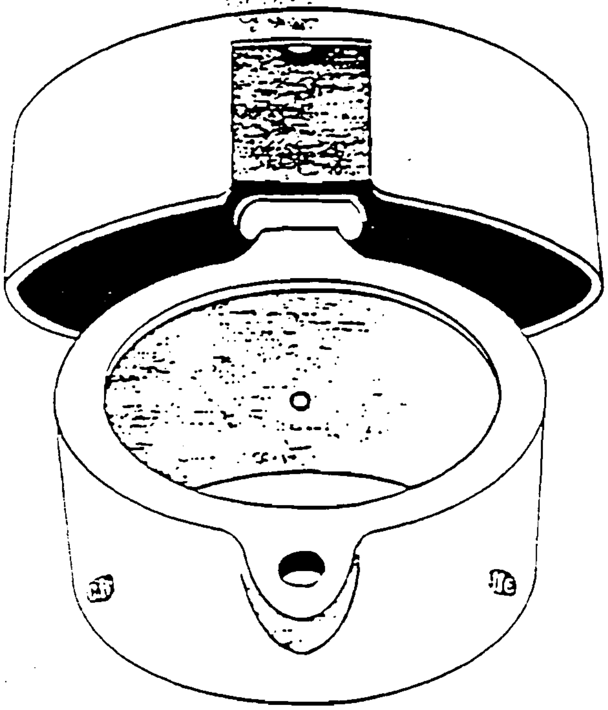
MONITORING WELL
CURB BOX INSTALLATION

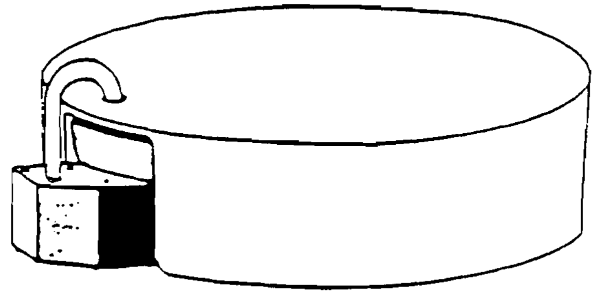


*tolerances ± 1/2"

Locking Well Cap
Well Casing Cover Cap (Aluminum)
PREVENTS VANDALISAM
IDEAL FOR MONITORING WELLS

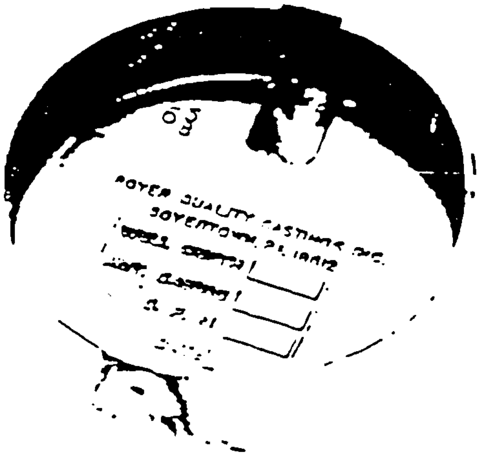
Royer
MARK OF QUALITY





FIVE SIZES AVAILABLE

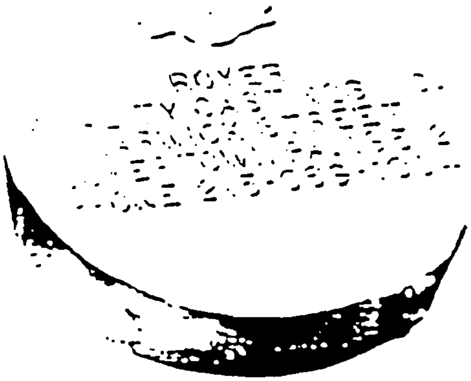
NEW FEATURE - At no additional Cost
PERMANENT WELL LOG PAD
RECORDS ★ Well Depth
★ Amount of casing
★ Gallons per minute
★ Date
Use 3/16" Punch Set
Pad cast on inside of cap.



NO - MINIMUM ORDER REQUIRED FOR LOCKING CAPS

AVAILABLE - At a small additional cost.
PERSONALIZED IMPRINTING
YOUR - Name, Phone and Address cast as illustrated for a small additional charge per cap in addition to the plain cap price.
MINIMUM ORDER FOR IMPRINTED CAPS 50
A 10% deviation of order possible on imprinted caps.

IT'S SMART ADVERTISING
AND IDENTIFICATION



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SIZES AVAILABLE
Order all sizes by O.D. of casing
Well Cap or Regular We[illegible]

I.D. CASING OR PIPE	O.D. CASING OR PIPE	[illegible]
[illegible]	[illegible]	
6" 5⅝	6⅝"	[illegible]
6⅝ [illegible]	[illegible]	[illegible]

APPENDIX A-8

Well Development Procedures

APPENDIX A-8

Well Development Procedures

I. Introduction

Before a newly constructed well can be used for water-quality sampling, measuring water levels, or aquifer testing, it must be developed. Well development refers to the procedure used to clear the well and formation around the screen of fine-grained materials (sands, silts, and clays) produced during drilling or naturally occurring in the formation. Well development continues until the well responds to water-level changes in the formation (i.e., a good hydraulic connection is established between the well and formation) and the well produces clear, sediment-free water to the extent practical. The turbidity of the water will be tested using a portable nephelometric turbidity meter, and development will continue until a turbidity of 5 Nephelometric Turbidity units (NTu's) or less is attained. In the event monitoring wells cannot be developed to 5 NTu's, development will proceed until such time as the pH, conductivity, and temperature of development waters stabilize to within 10 percent over three consecutive measurements. Well development water will be collected in a central container for subsequent infiltration in an on-site recharge pit.

Depending on the drilling technique used, composition of the formation screened, and well diameter and construction materials, well development may include one or more of the following techniques.

a. Bailing.
b. Pumping (centrifugal, submersible, or air).
c. Surging (mechanical).
d. Jetting.
e. A combination of the above.

After development, the well will not be sampled for at least one week.

II. Materials

A. Materials for monitoring well development using a pump include:

- Appropriate health and safety equipment.
- Knife.
- Power source (Generator).
- Field Book.
- Well Keys.
- Graduated Pails.
- Pump (centrifugal, submersible, etc.).
- Decontamination supplies (including non-phosphate [Alconox or equivalent] laboratory grade detergent, buckets, brushes, analyte-free water, tap water, cleaning solvent, aluminum foil, plastic sheeting, etc.).
- Water Level Meter.

- pH Meter.
- Temperature/Conductivity Meter.
- Turbidity Meter.

B. Materials for monitoring well development using a bailer include:

- Appropriate health and safety equipment.
- Bottom Loading Bailer.
- Polypropylene Rope.
- Plastic Sheeting.
- Graduated Pails.
- Well Keys.
- Field Book.
- Knife.
- Water Level Meter.
- pH Meter.
- Temperature/Conductivity Meter.
- Decontamination supplies (including non-phosphate [Alconox or equivalent] laboratory grade detergent, buckets, brushes, analyte-free water, tap water, cleaning solvent, aluminum foil, plastic sheeting, etc.).
- Turbidity Meter.

III. Development Procedures

When developing a well using the pumping method, new, cleaned polypropylene tubing from the pump is extended to the screened portion of the well and will be moved up and down the screened interval until the well yields clear water. A procedure that may be used for well development entails moving ground water through the well screen using a centrifugal pump and/or a submersible pump. The centrifugal pump uses atmospheric pressure to lift water from the well and therefore can only be used where the depth to water is less than twenty-five feet. The submersible pump is attached to the end of the tubing that goes into the well, pushing the water to the surface, and is effective for all wells particularly where ground water is greater than 25 feet below land surface. The tubing will be manually lifted and lowered within the screened interval to pull in fine sand and silt. To lift water from the well, the pump will be turned on forcing silty water up through the tubing. Surging will be repeated as many times as necessary within the well screen interval until the ground water is relatively clear. Any tubing will be disposed of between wells. Clean, new tubing will be used at each well.

A detailed procedure for ground-water well development will be as follows:

1. Don appropriate safety equipment.

2. All equipment entering each monitoring well will be cleaned using a soapy wash, tap rinse, solvent rinse (methanol or hexane), and an analyte-free water rinse.

3. Attach appropriate pump and lower tubing into well.

4. Turn on pump. If well runs dry then shut off pump and allow to recover.

5. Surging by raising and lowering the tubing in the well will be performed several times to pull in fine grained material.

6. Steps 4 and 5 will be repeated until ground water is relatively silt free.

7. The developing equipment will be raised two feet and then Step 4 through Step 5 will be repeated.

8. Step 6 will be repeated until entire well screen has been developed.

The procedure for developing a well using the bailer method is outlined below:

1. Don appropriate safety equipment.
2. Bailers and new rope will be cleaned with a soapy water rinse, tap water rinse, solvent rinse, and an analyte-free water rinse.
3. Place plastic sheeting around well.
4. Determine depth of well through examination of drilling log data and measure at least 10 feet greater of rope than the total depth of the well.
5. Secure one end of the rope to the well casing, secure the other end of the rope to the bailer. Test the knots and make sure the rope will not loosen. Check bailers to be sure all parts are intact and will not be lost in the well.
6. Lower bailer into well until bailer reaches total depth of the well.
7. Surge by raising and lowering the bailer at two-foot intervals, at least ten times.
8. Lower bailer back into well and repeat raising and lowering at an interval two feet above the previously surged interval.
9. Repeat Step 7 through Step 9 until entire screen has been surged.
10. If silt is still in purge water after surging entire screen repeat Step 6 through Step 9.
11. Upon completion of surging of the well, remove the bailer from the well and remove the rope from the bailer.
12. Secure lid and lock back on well.
13. Dispose of plastic sheeting and polypropylene rope in plastic garbage bags and clean bailer as specified.

APPENDIX A-9

Sediment Probing and Sampling Procedures

APPENDIX A-9

Sediment Probing and Sampling Procedures

I. Introduction

This protocol describes the procedures to collect soil/sediment core samples.

II. Materials

The following materials will be available, as required, during sediment sampling activities.

- Health and safety equipment (as required by the Health and Safety Plan);
- Cleaning equipment (Section V);
- Boat and/or waders;
- Aluminum or stainless steel tray;
- Duct tape;
- Lexan^R tubing with end caps;
- Metal rod calibrated for sediment depth measurement;
- Hacksaw;
- Stainless steel core driver;
- Vacuum pump;
- Piston sampler;
- 200-foot measuring tape;
- 6-foot rule or survey rod;
- Flagging;
- Transport container with ice;
- Appropriate sample containers and forms; and
- Field book.

III. Procedures for Probing

1. Identify the site;

2. Don personal protective equipment (as required by the Health and Safety Plan);

3. Begin physically probing for sediments with a metal rod by floating in a boat and/or by wading along the stream. Probe the stream bottom at regular intervals along the side of the stream channel adjacent to the site to identify the location of significant sediment deposits. Soft areas which are penetratable with the rod will be considered sediment deposits. As sediment deposits are located, each will be marked with flagging;

4. Probe the sediment deposit area to determine the approximate average sediment depth;

5. Obtain the approximate dimensions of the sediment deposits to determine surface area; and

6. Record the following information in the field book: approximate location, date, personnel, weather, average sediment depth, length and width of sediment deposit, average water depth cover, stream width, sediment type, type of depositional environment, and any other pertinent comments.

IV. Procedures for Lexan^R Tube Sampling

1. Identify the proposed sample location in the field notebook along with other appropriate information collected during soil/sediment sampling activities. Samples locations will be selected based on the following:

    a) areas of potential source residues;
    b) areas receiving or areas that received on-site surface water runoff;
    c) areas of fine grained and/or organic type sediment deposits;

2. Don personal protective equipment (as required by the Health and Safety Plan);

3. At each sample location, lower a section of Lexan^R tube until it just reaches the top of sediment. Measure the depth of water;

4. Push the Lexan^R tube into the sediment by hand until refusal. Measure the depth of sediment;

5. Drive the tube several more inches using a stainless steel core driver block and measure the distance. This procedure is performed to obtain a "plug" at the bottom of the core and prevent the loose sediment from escaping;

6. Place a vacuum pump on the top end of the Lexan^R tube and create a vacuum to prevent the sediments/plug from escaping;

7. Slowly pull the tube from the sediment, twisting it slightly as it is removed (if necessary);

8. Before the tube is fully removed from the water, place a cap on the bottom end of the tube while it is still submerged;

9. Keeping the tube upright, wipe the bottom end dry and seal the cap with duct tape and label. Measure the length of sediment recovered and evaluate the integrity of the core. If the core is not suitably intact, repeat coring procedure within 5 to 10 feet of the first location attempted;

10. While still keeping the core upright, use a hacksaw to make a horizontal cut in the tube approximately one inch above the sediment;

11. Re-cap the cut end of the tube, seal the cap with duct tape, and mark this end as "top";

12. Wipe the tube dry;

13. Record the following information on both the tube and on the cap: 1) sample number; 2) sampling date; and 3) sampling time;

14. Place the core sample upright in a container with ice;

15. Repeat the above procedures until the appropriate number of core samples are collected;

16. Extrude the sediment cores from the Lexan^R tubing onto an aluminum or stainless steel tray. Describe and record sample description.

17. Section the cores into the uppermost 6-inch increment based on the ratio of the measured sediment depth to the recovered sediment depth to account for sample compression or expansion during collection. The saw or knife used to section the core should be cleaned (Section V) between each cut. Core sections may be frozen to facilitate sectioning when sediment is extremely loose. Place the sediment into the appropriate laboratory-supplied containers;

18. Label all sample containers and place in the transport container;

19. At one in every 20 sediment sample locations, a rinse blank and a duplicate sample will be obtained. Obtain a duplicate sediment sample by dividing the uppermost 6-inches of the sample into two sets of containers; and

20. Handle, pack, and ship the samples using the chain-of-custody procedures.

V. *Field Cleaning Procedures*

A. *Materials*

- Health and safety equipment (as required in the Health and Safety Plan)
- Laboratory-supplied analyte-free water or equivalent
- Non-phosphate soap; (Alconox^R, or equivalent)
- Tap water
- Appropriate cleaning solvent (methanol or hexane)
- Rinse collection plastic containers
- Brushes
- Aluminum foil
- Garbage bags
- Spray bottles for solvent
- Ziploc^R type bags

B. *Procedures*

1. Follow health and safety procedures specified in the Health and Safety Plan.

2. Cleaning of reusable sampling equipment (e.g., trays, spatulas, scoops and core driver) will follow the decontamination procedures presented below:

   a. Alconox^R and tap water wash;
   b. Tap water rinse;
   c. Solvent spray rinse;
   d. Analyte-free water rinse; and
   e. Allow to air dry and wrap in aluminum foil.

3. Cleaning will be conducted in plastic containers that will be transported to each sampling location (or group of locations). These containers will also be used to collect all decontamination rinsate that will be transferred to an on-site container.

APPENDIX A-10

Ground-Water Sampling Procedures for Monitoring Wells

APPENDIX A-10

Ground-Water Sampling Procedures for Monitoring Wells

I. Introduction

This protocol describes the procedures to be used to collect ground-water samples. No wells will be sampled until well development has been performed. During precipitation events, ground-water sampling will be discontinued until precipitation ceases.

II. Materials

The following materials, as required, shall be available during ground-water sampling:

- Photoionization detector (PID)
- Appropriate health and safety equipment as specified in the Health and Safety Plan.
- Plastic sheeting (for each sampling location)
- Dedicated bailers (teflon or stainless steel)
- Polypropylene rope
- Buckets to measure purge water
- Water level well probe
- 6' rule with gradation in hundredths of a foot
- Conductivity/temperature meter
- pH meter
- Appropriate water sample containers
- Appropriate blanks (trip blank supplied by the laboratory)
- Appropriate transport containers (coolers) with ice and appropriate labeling, packing, and shipping materials
- Ground-water sampling logs
- Chain-of-Custody forms
- Indelible ink pens
- Site map with well locations and ground-water contours maps
- Keys to wells

III. Procedures

A. The procedures to sample monitoring wells will be as follows:

1. Review materials check list (Part II) to ensure the appropriate equipment has been acquired.

2. Identify site and well sampled on sampling log sheets, along with date, arrival time, and weather conditions. Identify the personnel and equipment utilized and other pertinent data requested on the logs (Attachment 1).

3. Label all sample containers using the label in Attachment 2 (or the equivalent).

4. Don safety equipment, as required in the Health and Safety Plan.

5. Place plastic sheeting adjacent to well to use as a clean work area.

6. Establish the background reading with the PID and record the reading on the field log (Attachment 1).

7. Remove lock from well and if rusted or broken replace with a new brass keyed-alike lock.

8. Unlock and open the well cover while standing upwind of the well. Remove well cap and place on the plastic sheeting. Insert PID probe in the breathing zone above the well casing following instructions in the Health and Safety Plan.

9. Set out on plastic sheeting the dedicated sampling device (stored in the well above the water surface) and meters.

10. Obtain a water level depth and bottom of well depth using an electric well probe and record on sampling log sheet. Clean the well probe after each use with a soapy (Alconox) water wash and a distilled water rinse. [Note: water levels may be measured at all wells prior to initiating any sampling activities].

11. Calculate the number of gallons of water in the well using the length of water column (in feet) and the table found in Attachment 3. Record the well volume on the ground-water sampling field log.

12. Remove the required purge volume of water from the well (measure purge water volume in measuring buckets). The required purge volume shall be three well volumes, unless the well runs dry, in which case the water that comes into the well will be sampled (RCRA Ground-Water Monitoring Technical Enforcement Guidance Document, EPA, September 1986). Collect purge water and place into the collection tank or into the on-site purge water recharge pit if constructed. The purge water recharge pit will be installed during the installation of the test pits by putting 6-inch diameter PVC pipe (hand slotted) 4 to 6 feet deep in a gravel-filled hole (approximately 3 feet in diameter). Zebar will be placed at the bottom of the pipe. A Royer locking cap labelled as "Recharge Pit" will be secured on the top of the pipe.

13. After the appropriate purge volume of ground water in the well has been removed or if the well has been bailed dry and allowed to recover, obtain the ground water sample needed for analysis with the dedicated bailer and pour the ground water directly from the sampling device in the appropriate container and tightly screw on the caps.

14. Place the custody seal around the cap and the sampler container. Note the time on the sample label. Secure with packing material and store at 4°C on wet ice in an insulated transport container provided by the laboratory.

15. After all sampling containers have been filled, remove an additional volume of ground water. Check the calibration of the pH meter and then measure and record on the field log physical appearance, pH, temperature, and conductivity.

16. Replace dedicated bailer in the well and the well cap and lock well.

17. Record the time sampling procedures were completed on the field logs.

18. Place all disposable sampling materials (plastic sheeting and health and safety equipment) in an appropriately marked 55-gallon containers. Go to next well and repeat Step 1 through Step 17 until all wells are sampled.

19. Complete the procedures for packaging, shipping, and handling with associated chain-of-custody.

ATTACHMENT 1

GROUND-WATER SAMPLING FIELD LOG

Project ______________________
Sampling Purpose ______________________
Well No. ______________________
Key No. ______________________
HNu Background ______ Well ________

Project No. ______________________
Site Name ______________________
Sampling Personnel ______________________
Date/Time ____ In ____ Out ________
Weather ______________________

I. Well Information

Reference Point Marked
on Casing Y N
Well Diameter ____ ID ____ OD
Well depth ________ from RP
Water table depth _____ from RP
Slug test Y N

Length of Inner Casing
____ above grade
Length of Outer Casing
____ above grade
Redevelop Y N

II. Well Water Information

Length of water column ______________________
Volume of water in well ______________________
Volume of bailer ______________________

III. Evacuation Information

Volume of water removed
from well ____________
Did well go dry? Y N

Evacuation method
Bailer ( )
Evacuation rate ____________

IV. Well Sampling

Container	Preservative	Time Sampled	Lab Sample No.	Analysis

V. Ground-Water Characteristics/After Well Evacuation

Temperature ______
Conductivity ______
pH ______

Film ______
Redline? Y N
____ 10; ____ 4; ____ 7
(calibration standard readings)

VI. Miscellaneous Observations/Problems

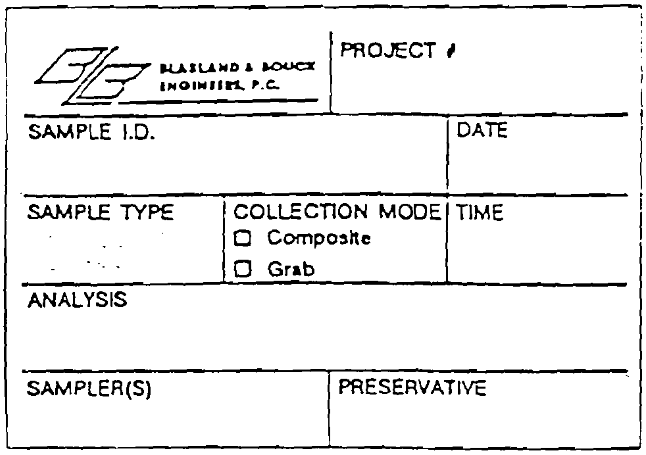
VII. Sample Destination

Laboratory Via ________ By ________

____
Field Personnel

ATTACHMENT 2

SAMPLE LABEL



BLASLAND & BOUCK ENGINEERS, P.C.

PROJECT #

SAMPLE I.D.

DATE

SAMPLE TYPE

COLLECTION MODE
☐ Composite
☐ Grab

TIME

ANALYSIS

SAMPLER(S)

PRESERVATIVE

APPENDIX A-13

In-Situ Hydraulic Conductivity Test Procedures

APPENDIX A-13

In-Situ Hydraulic Conductivity Test Procedures

I. Introduction

In-situ hydraulic conductivity tests will be conducted at each newly installed monitoring well. The tests will be used to calculate hydraulic conductivity of the geologic formation immediately surrounding the screened interval of each newly-installed monitoring well. These tests consist of creating an "instanteous" water level change in the well and monitoring the water level through time as the well is allowed to recover to static or near-static conditions.

The type of test conducted will be one or a combination of the following: 1) a falling head test accomplished by using solid cylinder ("slug") that will be submerged below the water table in a well to displace a known volume of water; 2) a rising head test accomplished by inserting a slug into the well allowing the water to equilibrate, then removing the slug and recording data immediately; 3) a rising head test utilizing a pressure system which lowers the static water level by a specified amount of displacement under positive air pressure. Falling head tests are not valid in wells whose screened intervals straddle the water table, because the elevated water level would flow out of the well into the previously unsaturated material above the water table. The field water level data will be evaluated using Hvorslev's and/or the Bouwer-Rice method.

II. Materials

- Cement weighed PVC slug.
- Polypropylene rope.
- Water level indicator and extra batteries.
- Masking or electrical tape to secure transducer cable to well standpipe.
- Waterproof marker.
- Engineer's rule.
- Decontamination supplies including non-phosphate laboratory grade detergent (Alconox or equivalent), brushes, buckets, analyte-free water, tap water, aluminum foil, plastic sheeting, etc.
- Garbage bags.
- Disposable gloves.
- Flashlight.
- Stopwatch.
- Well keys.
- Extra locks.
- Hacksaw.
- Field notebook.
- Pressure system well head assembly and a hand pump or a compressed air supply with regulator and a pressure gauge.
- Data aquisition unit (Data logger) and pressure transducer.
- Portable personal computer (PC), appropriate cables, software, floppy disks.
- Extra batteries for PC.

III. Procedures

1. Identify site and well number in the field notebook along with date, time, personnel and weather conditions. Include the type of test conducted and the range and pressure of the transducer in pounds per square inch (PSI). (Two persons will be required to conduct this test.)

2. Make sure all equipment that enters the well is decontaminated before use (i.e., slug, pressure transducer and cable). Use new, clean materials when decontamination is not appropriate (i.e., polypropylene rope, disposable gloves). Document decontamination procedures in the field notebook.

3. Place the cleaned equipment and instruments on plastic sheeting near the well.

4. Measure the static water level of the well with a water level indicator and record the measurement in the field notebook. This measurement will aid in determining the depths for the placement of the pressure transducer and the slug.

5. If using a solid slug to conduct the test continue with step 5. If using the pressure system to conduct the test go directly to step 13. Install the precleaned pressure transducer in the well to a predetermined depth making sure it will be below the slug once the slug is fully submerged. Record this depth in the field notebook. The installation depth also depends on the amount of water displacement and the range of the pressure transducer. If the transducer is installed at a depth below its maximum range, damage may occur to the sensor and the output reading will not be correct. One PSI is equal to approximately 2.31 feet of water. If a 5 PSI pressure transducer is utilized, the range is 11.55 feet of water and the pressure transducer should not be installed at a depth below 11.55 feet. Tape the transducer cable to the well to eliminate any movement of the pressure transducer and ensure stability.

6. Connect the pressure transducer cable to the data logger, and verify that the equipment is working properly. Program the data logger accordingly using the PC and appropriate software. Monitor the water level displayed on the PC screen to ensure the pressure transducer sensor is not below its maximum range and to ascertain when the water level has reached static conditions after the insertion of the pressure transducer and cable. Record the equilibrated water level reading displayed on the PC in the field notebook.

7. Measure out a length of rope and attach it to the slug. It is important that the slug does not come in contact with the transducer sensor once it is inserted in the well.

8. Run a rising head slug test by inserting the precleaned slug and allowing the water level to equilibrate (i.e., return to static or near-static conditions). Remove the slug and begin recording the data immediately. Collect the water level data according to a predetermined schedule while water levels rise and the aquifer returns to static or near-static conditions.

   OR

   Run a falling head test by inserting the precleaned slug and immediately collecting the water level data according to a predetermined schedule while the water levels fall and the aquifer returns to static or near-static conditions. Do not disturb the slug following its introduction into the well because this will adversely affect the test results.

9. Review the data to determine if a meaningful test has been conducted and perform a duplicate test if deemed necessary (Results of duplicate test should be within a half order of magnitude). Record the start and finish time of the test.

10. Transfer the data from the data logger to the PC and create a spreadsheet compatible file. Copy recorded data to a floppy disk.

11. Remove the pressure transducer and cable from the well. Clean all test equipment that came into contact with the ground water with soapy water (Alconox or equivalent), tap water rinse, solvent rinse, and analyte-free water rinse.

12. Secure the test well prior to leaving by replacing the well cap and/or cover and lock it. Place all disposable equipment (i.e., rope, plastic sheeting, and disposable gloves, etc.) in a plastic bag and dispose in an appropriate manner. Go to next well and repeat step 1 through 12.

13. The pressure system well head assembly consists of 2-inch I.D. PVC pipe with a cap at one end, with air tight fittings for the air line and pressure transducer cable. A 2-inch I.D. quick release ball valve is attached to a Y-connector (a T-connector can also be used) in-line with the well head assembly. The well head assembly is attached to the well riser pipe by a rubber sleeve and hose clamps. A diagram of the well head assembly is shown in Attachment 1.

14. Pass the precleaned pressure transducer through the well head assembly cap and suspend the transducer at a predetermined depth below the water table. Record this depth in the field notebook. The appropriate depth will depend on the amount of water displacement and the transducer pressure rating (refer to Step 5). Secure the well head assembly to the well riser by tightening the hose clamps. Check the seals and make sure the seals are air tight.

15. Connect the pressure transducer cable to the data logger, and verify that the equipment is working properly. Program the data logger accordingly, using the PC and appropriate software. Monitor the water level displayed on the PC screen to ensure the pressure transducer sensor is not below its maximum range and to ascertain when the water level has reached static conditions after the insertion of the pressure transducer and cable. Record the equilibrated water level reading displayed on the PC in the field notebook.

16. Close the quick release valve. A simple hand pump can be used to supply the appropriate amount of air pressure to achieve the desired change in water level. This change is monitored on a gauge connected to the well head assembly which displays air pressure in inches of water. A tank of compressed air with a regulator equipped with a pressure gauge can also be used. This is accomplished by connecting an air line from the regulator to the fitting on the top of the well head assembly.

17. Monitor the change in pressure and water level displayed on the PC until the water and air pressure equilibrates and is equal to the static total head recorded prior to pressurizing the well.

18. Begin recording data while simultaneously opening the quick release valve. Collect the water level data according to a predetermined schedule while water levels rise and the aquifer returns to static or near-static conditions.

19. Review the data to determine if a meaningful test has been conducted and perform a duplicate test if deemed necessary. Record the start and finish time of the test.

20. Transfer the data from the data logger to the PC and create a spreadsheet compatible file. Copy recorded data to a floppy disk.

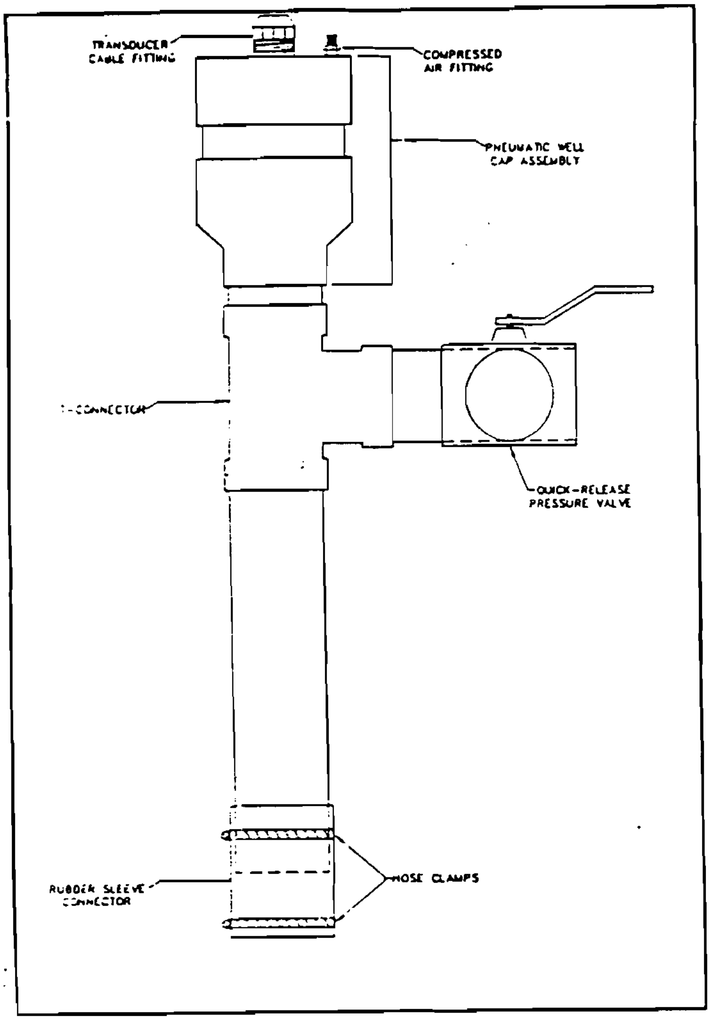
21. Remove the well head assembly and the pressure transducer and cable from the well. Clean all test equipment with a soapy water rinse, tap water rinse, solvent rinse, and analyte-free water rinse.

22. Secure the test well prior to leaving by replacing the well cap and/or cover and lock it. Place all disposable equipment (i.e., rope, plastic sheeting, and disposable gloves, etc.) in a plastic bag and dispose in an appropriate manner. Go to next well and repeat Step 1 through Step 4 and Step 13 through Step 22.

APPENDIX A-13

Attachment 1

In-Situ Hydraulic Conductivity Pressure System Well Head Assembly



Pneumatic Well Head Assembly

APPENDIX A-14

Analytical Sample Handling Procedures for MGP Sites

NYSEG

Interoffice Memorandum

New York State Electric & Gas Corporation
Binghamton, New York 13903

December 30, 1991
GEMIO-91-1001
GEM.320.CGAS

To: R.I.G. Staff

From: T. M. O'Meara (4036) TMO

Subject: **Analytical Sample Handling Procedures for MGP sites**

The Remedial Investigation Group and Environmental Technical Service Group has revised their sampling handling procedures for manufactured gas plant (MGP) investigations. The changes are listed below and are illustrated in the attached flow chart.

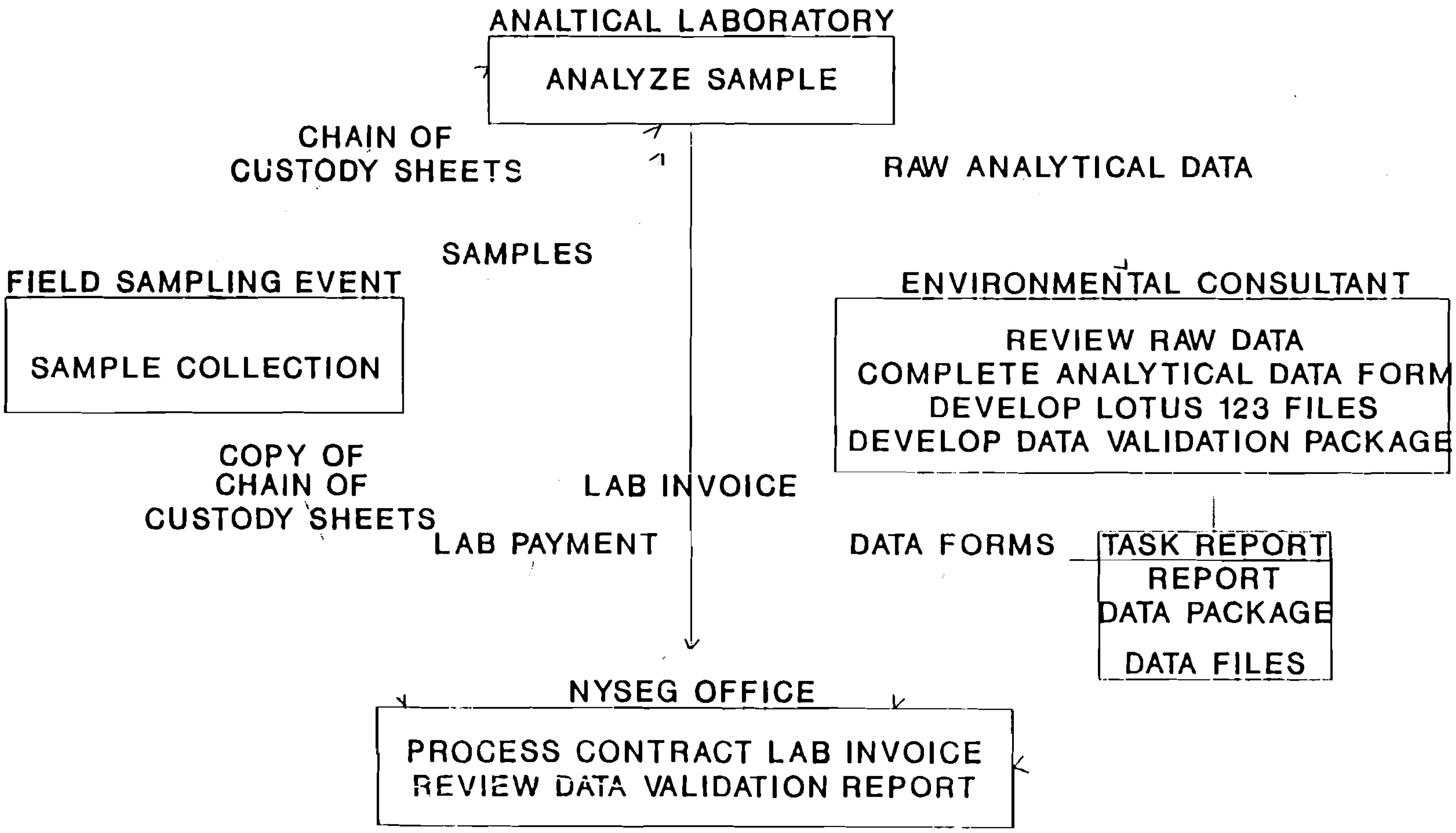
- If the NYSEG lab cannot process the samples, the consultant can forward the samples directly to the NYSEG contract lab.
- Chain of custody forms will be reviewed and approved in the field by the NYSEG field representative and a copy of the chain of custody should be forwarded to B.C. Trimm.
- The NYSEG lab or the contract lab will send all raw data directly to the environmental consultant.
- Upon receipt of the raw analytical data, the environmental consultant will complete the Analytical Data Checklist Form (see Attachment A) and forward the completed form to the NYSEG Project Manager. Upon receipt, the NYSEG Project Manager will forward to B.C. Trimm. When contract labs are used, this completed form will allow NYSEG to verify and process the contract lab's invoice.
- The consultant will process the analytical data and prepare summary files (Lotus 123 format see attachment B) and the Analytical Data Package (see attachment C). The Lotus files and Analytical Package will be submitted to the NYSEG Project Manager along with the Task Investigation Report.

These changes were made to enhance the ability to meet analytical turn-around periods, enhance productivity, delineate areas of responsibility, and enhance the data validation process.

Please forward this information to your consultants for future field sampling activities. As always, feel free if you wish to discuss this item further.

TMO/fl
cc: L. R. Tuttle
P. G. Carney
B. C. Trimm
J. A. Lamphere

SAMPLING DOCUMENTATION PROCEDURE
MGP SITE FIELD SAMPLING



ANALTICAL LABORATORY

ANALYZE SAMPLE

CHAIN OF
CUSTODY SHEETS

RAW ANALYTICAL DATA

SAMPLES

FIELD SAMPLING EVENT

SAMPLE COLLECTION

ENVIRONMENTAL CONSULTANT

REVIEW RAW DATA
COMPLETE ANALYTICAL DATA FORM
DEVELOP LOTUS 123 FILES
DEVELOP DATA VALIDATION PACKAGE

COPY OF
CHAIN OF
CUSTODY SHEETS

LAB INVOICE

LAB PAYMENT

DATA FORMS

TASK REPORT
REPORT
DATA PACKAGE
DATA FILES

NYSEG OFFICE

PROCESS CONTRACT LAB INVOICE
REVIEW DATA VALIDATION REPORT

Attachment A

NYSEG
Analytical Data Form*

Site Name ____________________ NYSEG Project Manager ________________________

Task # ____________________

	SAMPLE ID NO.	MATRIX	DATE COLLECTED	DATE ANALYZED	ANALYSIS PERFORMED	ANALYSIS MEETS D.Q.O.**	COMMENTS
1)							
2)							
3)							
4)							
5)							
6)							
7)							
8)							
9)							
10)							
11)							
12)							
13)							
14)							
15)							
16)							
17)							
18)							
19)							
20)							
21)							
22)							

Consultant Firm Name ________________________

Project Manager Name ________________________

Project Manager Signature ________________________

* To be completed within five work days of receipt of analytical Data.
Mail completed form to NYSEG Project Manager.

** Data Quality Objectives Answer YES or NO. If NO, please complete comment section.

RIG 12/91

Attachment B

Submission Guidelines for Contractors Doing Groundwater Sampling for NYSEG

Preparation of Sampling Event Data:

A. Analytical Data:

Groundwater sampling data obtained for NYSEG needs to be submitted to NYSEG in electronic form. After lab work has been performed, and the data has been blank-corrected, the results of these tests should be entered into a Lotus 1-2-3 spreadsheet form in the following order: (See Table 1)

DATE: The date of the sampling event.

SITEID: The 10-digit NYSEG code for this well.

WELLID: The MW site designator for the well (i.e., MW-1).

CLASS: The class of substance that this is, (i.e., PAH, VOLATILE AROMATIC, etc.) This field is discretionary.

CATEGORY: The category of substance that this sample belongs to. Categories include VOLATILE ORGANICS, SEMI-VOLATILE ORGANICS, OTHER VOLATILES, CYANIDES and METALS.

NAME: The commonly accepted name for this substance. For a list of approved spellings of these substances see Appendix A.

CONCENTRATION: The concentration in mg/l. Non-detects should report the minimum detection level and insert a "U" into the IsMDL field described below. Amounts detected but below the minimum detection level should be reported as actual values and insert a "J" into the IsMDL field.

CAS#: The CAS Number for this substance, as defined in the EPA Book of Lists, or as available from NYSEG. This number should omit any hyphens.

MDL: The minimum detection level in mg/l of your equipment for this substance. In the absence of any standard, the value reported in the 1988 EPA Book of Lists should be entered.

ISMDL: Indicate whether this sample resulted in a non-detect for this substance by entering a "U". If the sample exceeded your Minimum Detection Level then enter a "N". If the sampling resulted in a detection that was below your minimum detection level then enter a "J".

B. Groundwater Elevation/Monitoring Well Data:

Water elevation data from the wells should be made available for each sampling event:

SURFACE: The ground (not top of riser) elevation of this well, in feet above sea level.
TOP OF SCREEN: the top of the screening interval for this well, in feet above sea level.
WATER ELEVATION: the water elevation in the well, in feet above sea level.
BOTTOM OF SCREEN: The bottom of the screening interval, in feet above sea level.

Data shall be placed in the supplied template. Please enter ONLY blank-corrected data. Notify NYSEG if you are unable to blank-correct this information. Submit the results of one sampling event in a single spreadsheet. You will need to avoid submitting duplicate sampling data. Much work on your part can be avoided by using this template and filling it out with blank or default data, and then filling out the exceptions. Assistance can be made available in converting other reporting formats to this line-oriented version. The final finished report can be submitted in either 3.5" or 5.25", high or low density format as a Lotus version 2.2 .WK1 file. This file will be directly imported into NYSEG's database system, avoiding errors and lost information.

Attachment C

6. By fraction (VOA, SV, and PEST) - QC Check Sample/Standard Recovery Summary - If required by method.

7. By fraction (INORG and CONV only) - duplicate sample results (Form VI-IN)

8. By fraction (INORG and CONV only) - spike sample results (Form V-IN)

9. By fraction (VOA, SV, PEST, INORG, CONV) - blank data (Form IV-ORG and Form III-IN) and tabulated results (Form I-ORG and Form I-IN) including tentatively identified compounds (Form I-ORG, TIC)(VOA and BNA only).

10. By fraction (VOA and SV only) - internal standard area data (Form VIII-ORG).

E. - SAMPLE DATA PACKAGE

The Sample Data Package is divided into the eight major units described below. The last six units are each specific to an analytical fraction (volatiles, semivolatiles, pesticides/Aroclors, GC organics, inorganics, and conventional wet-chemistry). If the analysis of a fraction is not required, then that fraction-specific unit is not required as a deliverable.

The Sample Data Package shall include data for analyses of all samples in one Sample Delivery Group, including field samples, reanalyses, blanks, duplicates, spikes, matrix spikes, matrix spike duplicates, and matrix spike blanks.

All data produced in support of Superfund investigations/remediations as identified by checked boxes under the Contract Laboratory Section of the Contract Laboratory Sample Information Sheet (See Exhibit A)shall be reported as specified for the Superfund Catagory (paragraph 1.). All data generated in support of the SPDES program as identified by a CASE # beginning with the letter "E" shall be reported using ASP Catagory-B (paragraph 3.). All other samples shall be reported using either ASP Catagory A or ASP Catagory B described in paragraphs 2. and 3. The specific reporting level to be used shall be specified by the Contract Laboratory Sample Information Sheet, unless otherwise specified in a project workplan.

The Laboratory shall retain a copy of the Sample Data Package for 365 days after final acceptance of data. After this time, the Laboratory may dispose of the package.

1.4.1.1 System Monitoring Compound Summary (Form II-CLP-VOA)

1.4.1.2 Matrix Spike/Matrix Spike Duplicate/Matrix Spike Blank Summary (Form III-CLP-VOA)

1.4.1.3 Method Blank Summary (Form IV-CLP-VOA)

(If more than a single form is necessary, forms must be arranged in chronological order by date of analysis of the blank, by instrument.)

1.4.1.4 GC/MS Instrument Performance Check (Form V-CLP-VOA).

BFB in chronological order; by instrument.

1.4.1.5 Internal Standard Area and RT Summary (Form VIII-CLP-VOA)

In chronological order; by instrument.

1.4.1.6 Instrument Detection Limits

1.4.2 Sample Data

Sample data shall be arranged in packets with the Organic Analysis Data Sheet (Form I-CLP-VOA, including Form I-CLP-VOA-TIC), followed by the raw data for volatile samples. These sample packets should then be placed in increasing NYSDEC sample number order, considering both letters and numbers in ordering samples.

1.4.2.1 Target Compound Results - Organic Analysis Data Sheet (Form I-CLP-VOA).

Tabulated results (identification and quantitation) of the specified Superfund-CLP target compounds (Exhibit C). The validation and release of these results is authorized by a specific, signed statement in the SDG Narrative (reference C.1). In the event that the Laboratory Manager cannot validate all data reported for each sample, the Laboratory Manager shall provide a detailed description of the problems associated with the sample in the SDG Narrative.

On Form I-CLP-VOA, the appropriate concentration units shall be entered. For example, μg/L for water samples or μg/Kg for soil/sediment samples. No other units are acceptable. **NOTE:** Report analytical results to one significant figure if the value is less than 10; to two significant figures above 10.

procedures, a laboratory "raw data sheet", which contains the following information, must be included in the sample data package in addition to the chromatogram.

- NYSDEC sample number
- Date and time of analysis
- RT or scan number of identified Superfund-TCL compounds
- Ion used for quantitation with measured area
- Copy of area table from data system
- GC/MS instrument ID
- Lab file ID

In all instances where the data system report has been edited, or where manual integration or quantitation has been performed, the GC/MS operator must identify such edits or manual procedures by initialing and dating the changes made to the report.

1.4.2.4 For each sample, by each compound identified, the following shall be included in the data package:

1.4.2.4.1 Copies of raw spectra and copies of background-subtracted mass spectra of target compounds listed in Exhibit C (Superfund-TCL) that are identified in the sample and corresponding background-subtracted TCL standard mass spectra. Spectra must be labeled with NYSDEC sample number, lab file ID, date and time of analysis, and GC/MS instrument ID; compound names must be clearly marked on all spectra.

1.4.2.4.2 Copies of mass spectra of organic compounds not listed in Exhibit C (Superfund-TCL) (Tentatively Identified Compounds), with associated best-match spectra (three best matches), labeled as in 1.4.2.4.1 above.

1.4.3 Standards Data

1.4.3.1 Initial Calibration Data (Form IV-CLP-VOA) - in order by instrument if more than one instrument used.

1.4.4.2.4 Superfund-TCL spectra with lab generated standard, labeled as in 1.4.2.4. Data systems which are incapable of dual display shall provide spectra in the following order:

- Raw Superfund-TCL compound spectra
- Enhanced or background subtracted spectra
- Laboratory generated Superfund-TCL standard spectra

1.4.4.2.5 GC/MS library search spectra for Tentatively Identified Compounds (TIC), labeled as in 1.4.2.4.

1.4.4.2.6 Quantitation/Calculation of Tentatively Identified Compound(s) (TIC) concentrations

1.4.4.3 Matrix Spike Blank Data

1.4.4.3.1 Tabulated results (Form I-CLP-VOA) of all Superfund-TCL compounds. Form I-CLP-VOA-TIC is required.

1.4.4.3.2 Reconstructed ion chromatogram(s) and quantitation report(s) or legible facsimile (GC/MS), labeled as in 1.4.2.4. Spectra are required.

1.4.4.4 Matrix Spike Data

1.4.4.4.1 Tabulated results (Form I-CLP-VOA) of all Superfund-TCL compounds. Form I-CLP-VOA-TIC is <u>not</u> required.

1.4.4.4.2 Reconstructed ion chromatogram(s) and quantitation report(s) or legible facsimile (GC/MS), labeled as in 1.4.2.4. Spectra are <u>not</u> required.

1.4.4.5. Matrix Spike Duplicate Data

1.4.4.5.1 Tabulated results (Form I-CLP-VOA) of all Superfund-TCL Compounds. Form I-CLP-VOA-TIC is <u>not</u> required.

1.4.4.5.2 Reconstructed ion chromatogram(s) and quantitation report(s) or legible facsimile (GC/MS), labeled as in 3.3.2.4. Spectra are <u>not</u> required.

increasing DEC sample number order, considering both letters and numbers in ordering samples.

1.5.2.1 TCL Results - Organic Analysis Data Sheet (Form I-CLP-SV-1, SV-2).

Tabulated results (identification and quantitation) of the specified Superfund-CLP target compounds (Exhibit C). The validation and release of these results is authorized by a specific, signed statement in the SDG Narrative (reference C.1). In the event that the Laboratory Manager cannot validate all data reported for each sample, the Laboratory Manager shall provide a detailed description of the problems associated with the sample in the SDG Narrative.

On Form I-CLP-SV-1,-SV-2, the appropriate concentration units shall be entered. For example, µg/L for water samples or µg/Kg for soil/sediment samples. No other units are acceptable. **NOTE:** Report analytical results to one significant figure if the value is less than 10; to two significant figures above 10.

1.5.2.2 Tentatively Identified Compounds (Form I-CLP-SV-TIC)

This form must be included even if no compounds are found. If so, indicate this on the form by entering "0" in the field for "Number found".

Form I-CLP-SV-TIC is the tabulated list of the highest probable match for up to 20 of the nonsurrogate organic compounds not listed in Exhibit C (Superfund-TCL). It includes the CAS (Chemical Abstracts Registry) number, tentative identification and estimated concentration. For estimating concentration, assume a response factor of 1, and estimate the concentration by comparison of the compound peak height or total area count to the peak height or total area count of the nearest internal standard free of interferences on the reconstructed ion chromatogram. **NOTE:** The Laboratory must be consistent, i.e., use peak height for all comparisons <u>or</u> use total area count for all comparisons.

1.5.2.3 Reconstructed total ion chromatograms (RIC) for each sample, sample extract, standard, blank, and spiked sample.

RICs must be normalized to the largest nonsolvent component, and must contain the following header information:

- NYSDEC sample number

listed in Exhibit C (Superfund-TCL) that are identified in the sample and corresponding background-subtracted Superfund-TCL standard mass spectra. Spectra must be labeled with NYSDEC sample number, lab file ID, date and time c analysis, and GC/MS instrument ID; compound nam must be clearly marked on all spectra.

1.5.2.4.2 Copies of mass spectra of nc rrc e organic compounds not listed in Exhibit C (Superfu TC (Tentatively Identified Compounds) with associate est-match spectra (three best matches), labeled as i 5.2.4.1.

1.5.2.4.3 GPC chromatograms (if GPC performed).

1.5.3 Standards Data

1.5.3.1 Initial Calibration Data (Form VI-CLP-SV-1, SV-2) - in order by instrument, if more than one instrument used.

1.5.3.1.1 Semivolatile standard(s) reconstructed ion chromatograms and quantitation reports (or legible facsimile) for the initial (five point) calibration, labeled in 1.5.2.3. Spectra are not required.

1.5.3.1.2 All initial calibration data that pertain to samples in the data package must be included, regardless of when it was performed and for which SDG. When more than one initial calibration is performed, the data must be put in chronological order, by instrument.

1.5.3.2 Continuing calibration (Form VII-CLP-SV-1, SV-2) - in order by instrument, if more than one instrument used.

1.5.3.2.1 Semivolatile standard(s) reconstructed ion chromatograms and quantitation reports (or legible facsimile) for all continuing (12 hour) calibrations, labeled as in 1.5.2.3. Spectra are not required.

1.5.3.2.2 When more than one continuing calibration is performed, forms must be in chronological o er, by instrument.

1.5.3.3 Semivolatile GPC Calibration Data - UV detectc traces showing peaks that correspond to the compounds in the semivolatile GPC calibration mixture. Traces must be labeled with GPC column identifier, date of calibration, and with compound names labeled either directly out from the peak, or on a printout of

1.5.4.3 Matrix Spike Blank Data

1.5.4.3.1 Tabulated results (Form I-CLP-SV-1, SV-2) of all Superfund-TCL compounds. Form I-CLP-SV-TIC not required.

1.5.4.3.2 Reconstructed ion chromatogram(s) and quantitation report(s) or legible facsimile (GC/MS), labeled as in 1.5.2.3. Spectra are required.

1.5.4.4 Matrix Spike Data

1.5.4.4.1 Tabulated results (Form I-CLP-SV-1, SV-2) of all Superfund-TCL compounds. Form I-CLP-SV-TIC not required.

1.5.4.4.2 Reconstructed ion chromatogram(s) and quantitation report(s) or legible facsimile (GC/MS), labeled as in 1.5.2.3. Spectra are <u>not</u> required.

1.5.4.5 Matrix Spike Duplicate Data

1.5.4.5.1 Tabulated results (Form I-CLP-SV-1, SV-2) of all Superfund-TCL compounds. Form I-CLP-SV-TIC not required.

1.5.4.5.2 Reconstructed ion chromatogram(s) and quantitation report(s) or legible facsimile (GC/MS), labeled as in 1.5.2.3. Spectra are <u>not</u> required.

1.5.5 Copy of Calculations

The Laboratory must provide a copy of the calculations work sheet showing how final results are obtained from values printed on the quantitation report. If manipulations are performed by a software package, a copy of the formula used must be supplied as well as values for all terms in the formula.

1.5.6 Copy of Extraction Logs

These logs must include: (1) date, (2) sample weights and volumes, (3) sufficient information to unequivocally identify which QC samples (i.e. matrix spike, matrix spike duplicate, matrix spike blank) correspond to each batch extracted, (4) comments describing any significant sample changes or reactions which occur during preparation, and (5) final volumes and vial identification numbers.

- Volume injected (µL).

- Date and time of injection.

- GC column identification (by stationary phase and internal diameter).

- GC instrument identification.

- Positively identified compounds must be labeled with the names of compounds, either directly out from the peak, or on a print-out of retention times if retention times are printed over the peak.

1.6.2.3 Copies of pesticide chromatograms from second GC column confirmation. Chromatograms to be labeled as in 1.6.2.2 above.

1.6.2.4 GC integration report or data system printout.

1.6.2.5 Manual work sheets.

1.6.2.6 If pesticide/Aroclors are confirmed by GC/MS, the Laboratory shall submit copies of reconstructed ion chromatograms, raw spectra and copies of background-subtracted mass spectra of Superfund target compounds listed in Exhibit C (Superfund-TCL) that are identified in the sample and corresponding background-subtracted Superfund-TCL standard mass spectra. Compound names must be clearly marked on all spectra. For multicomponent pesticides/Aroclors confirmed by GC/MS, the Laboratory shall submit mass spectra of 3 major peaks of multicomponent compounds from samples and standards.

1.6.3 Standards Data

1.6.3.1 Initial Calibration of Single Component Analytes (Form VI-CLP-PEST-1 and PEST-2) - all GC columns, all instruments, in chronological order by GC column and instrument.

1.6.3.2 Initial Calibration of Multicomponent Analytes (Form VI-CLP-PEST-3) - all GC columns, all instruments, in chronological order by GC column and instrument

1.6.3.3 Analyte Resolution Summary (Form VI CLP-PEST-4) - all GC columns and instruments, in chronological order by GC column and instrument.

- All mid point concentrations of Individual Standard Mixtures A and B used for calibration verification.

- Florisil cartridge check solution, all lots.

- Pesticide GPC Calibration Check Solution, all calibrations relating to samples in the SDG.

- All multicomponent analyte standards analyzed for confirmation.

1.6.3.12 A printout of retention times and corresponding peak areas or peak heights must accompany each chromatogram. In addition, all chromatograms are required to be labeled with the following:

- NYSDEC Sample Number for the standard, i.e., INDA1, INDA2, etc. (See Forms Instructions for details).

- Label all standard peaks for all individual compounds either directly out from the peak or on the printout of retention times if retention times are printed over the peak.

- Total nanograms injected for each standard.

- Date and time of injection.

- GC column identification (by stationary phase and internal diameter).

- GC instrument identification.

1.6.3.13 Pesticide GPC Calibration Data - UV detector traces showing peaks that correspond to the compounds in the pesticide GPC calibration mixture. Traces must be labeled with GPC column identifier, date of calibration, and with compound names labeled either directly out from the peak, or on a printout of retention times, if retention times are printed over the peak.

1.6.4 Raw QC Data

1.6.4.1 Blank Data - in chronological order, by type of blank (method, instrument, sulfur cleanup). **NOTE:** This order is different from that used for samples.

1.6.4.1.1 Tabulated results (Form I-CLP-PEST).

1.7 Inorganic Data

Sample data shall be submitted with the Inorganic Analysis Data Reporting Forms for all samples in the SDG, arranged in increasing alphanumeric DEC sample number order, followed by the QC analyses data, Quarterly Verification of Instrument Parameters forms, raw data, and copies of the digestion and distillation logs.

1.7.1 Results -- Inorganic Analysis Data Sheet (FORM I-CLP-IN

Tabulated analytical results (identification and quantitation) of the specified analytes (Exhibit C). The validation and release of these results is authorized by a specific, signed statement on the Cover Page. If the Laboratory Manager cannot validate all data reported for each sample, he/she must provide a detailed description of the problems associated with the sample(s) on the Cover Page.

Appropriate concentration units must be specified and entered on Form I-CLP-IN. The quantitative values shall be reported in units of micrograms per liter (µg/L) for aqueous samples and milligrams per kilogram (mg/kg) for solid samples. No other units are acceptable. Results for solid sample must be reported on a dry weight basis. Analytical results must be reported to two significant figures if the result value is less than 10; to three significant figures if the value is greater than or equal to 10. Results for percent solids must be reported to one decimal place.

1.7.2 Quality Control Data

1.7.2.1 Initial and Continuing Calibration Verification [FORM II-CLP-IN (Part 1)]

1.7.2.2 CRDL Standard for AA and Linear Range Analysis for ICP [FORM II-CLP-IN (PART 2)]

1.7.2.3 Blanks [FORM III-CLP-IN]

1.7.2.4 ICP Interference Check Sample [FORM IV-CLP-IN]

1.7.2.5 Spike Sample Recovery [FORM V-CLP-IN (PART 1)]

1.7.2.6 Post Digest Spike Sample Recovery [FORM V-CLP-IN (PART 2)]

1.7.2.7 Duplicates [FORM VI-CLP-IN]

1.7.2.8 Laboratory Control Sample [FORM VII-CLP-IN]

1.7.4.1 Calibration standards, including source and prep date.

1.7.4.2 Initial and continuing calibration blanks and preparation blanks.

1.7.4.3 Initial and continuing calibration verification standards, interference check samples, ICP serial dilution samples, CRDL Standard for ICP and AA, Laboratory Control Sample and Post Digestion Spike.

1.7.4.4 Diluted and undiluted samples (by DEC sample number) and all weights, dilutions and volumes used to obtain the reported values. (If the volumes, weights and dilutions are consistent for all samples in a given SDG, a general statement outlining these parameters is sufficient).

1.7.4.5 Duplicates.

1.7.4.6 Spikes (indicating standard solutions used, final spike concentrations, volumes involved). If spike information (source, concentration, volume) is consistent for a given SDG, a general statement outlining these parameters is sufficient.

1.7.4.7 Instrument used, any instrument adjustments, data corrections or other apparent anomalies on the measurement record, including all data voided or data not used to obtain reported values and a brief written explanation.

1.7.4.8 All information for furnace analysis clearly and sequentially identified on the raw data, including DEC sample number, sample and analytical spike data, percent recovery, coefficient of variation, full MSA data, MSA correlation coefficient, full MSA data, MSA correlation coefficient, slope and intercepts of linear fit, final sample concentration (standard addition concentration), and type of background correction used: BS for Smith-Heiftje, BD for deuterium Arc, or BZ for Zeeman.

1.7.4.9 Time and date of each analysis. Instrument run logs can be submitted if they contain this information. If the instrument does not automatically provide times of analysis, these must be manually entered on all raw data for initial and continuing calibration verification and blanks, as well as interference check samples and linear range analysis.

1.7.4.10 Integration times for AA analyses.

Additionally, the SDG Narrative itself must be signed in original signature by the Laboratory Manager or his designee and dated.

2.2 Contract Lab Sample Information Sheets

A copy of the Contract Lab Sample Information Sheets (CLSIS) for all of th samples in the SDG. The CLSIS shall be arranged in increasing DEC sam number order, considering <u>both</u> letters and numbering in ordering sampl

2.3 NYSDEC Data Package Summary Forms

2.4 Chain-of-Custody Forms

Copies of both the external and internal chain-of-custody sheets for all samples within the SDG.

2.5 GC/MS Volatiles Data

2.5.1 Sample Data

Sample data shall be arranged in packets with the Organic Analysis Data Sheet. These sample packets should then be placed in increasing DEC sample number order, considering both letters and numbers in ordering samples.

2.5.1.1 TCL Results - Organic Analysis Data Sheet.

Tabulated results (identification and quantitation) of the specified target compounds (Exhibit C). The validation and release of these results is authorized by a specific, signed statement in the SDG Narrative (reference C.1). In the event that the Laboratory Manager cannot validate all data reported for each sample, the Laboratory Manager shall provide a detailed description of the problems associated with the sample in the SDG Narrative.

On Form I, the appropriate concentration units shall be entered. For example, µg/L for water samples or µg/Kg for soil/sediment samples. No other units are acceptable. **NOTE**: Report analytical results to one significant figure if the value is less than 10; to two significant figures above 10.

2.5.1.2 Tentatively Identified Compounds (Form 1-TIC).

This form must be included even if no compounds are found. If so, indicate this on the form by entering "0" in the field for "Number found".

identification and estimated concentration. For estimating concentration, assume a response factor of 1, and estimate the concentration by comparison of the compound peak height or total area count to the peak height or total area count of the nearest internal standard free of interferences on the reconstructed ion chromatogram. **NOTE**: The Laboratory must be consistent (i.e., use peak height for all comparisons or use total area count for all comparisons).

2.7 Pesticide/PCB Data

2.7.1 Sample Data

Sample data shall be arranged in packets with the Traffic Report copy, the Organic Analysis Data Sheet (Form I-PEST). The sample packets should then be placed in increasing DEC sample number order, considering both letters and numbers in ordering samples.

2.7.1.1 Superfund-TCL Results - Organic Analysis Data Sheet (Form I-PEST).

Tabulated results (identification and quantitation) of the specified Superfund target compounds (Exhibit C). The validation and release of these results is authorized by a specific, signed statement in the SDG Narrative (reference 3.1). In the event that the Laboratory Manager cannot validate all data reported for each sample, the Laboratory Manager shall provide a detailed description of the problems associated with the sample in the SDG Narrative.

The appropriate concentration units shall be entered. For example, µg/L for water samples or µg/Kg for soil/sediment samples. No other units are acceptable.

NOTE: Report analytical results to two significant figures for all pesticide/PCB samples.

2.8 GC Organic Data

2.8.1 Sample Data

Sample data shall be arranged in packets with the Organic Analysis Data Sheet. These sample packets should then be placed in increasing DEC sample number order, considering both letters and numbers in ordering samples.

Tabulated analytical results (identification and quantitation) of the specified analytes (Exhibit C). The validation and release of these results is authorized by a specific, signed statement on the Cover Page. If the Laboratory Manager cannot validate all data reported for each sample, he/she must provide a detailed description of the problems associated with the sample(s) on the Cover Page.

Appropriate concentration units must be specified and entered on Form I-TCLP. The quantitative values shall be reported in units of micrograms per liter (µg/L) for aqueous samples and milligrams per kilogram (mg/kg) for solid samples. No other units are acceptable. Results for solid sample must be reported on a dry weight basis. Analytical results must be reported to two significant figures if the result value is less than 10; to three significant figures if the value is greater than or equal to 10. Results for percent solids must be reported to one decimal place.

3. ASP CATAGORY B

3.1 SDG Narrative

This document shall be clearly labeled "SDG Narrative" and shall contain: Laboratory name; Case number; Sample Delivery Group number (SDG); sample numbers in the SDG, differentiating between initial analyses and re-analyses; Contract number; and detailed documentation of any quality control, sample, shipment and/or analytical problems encountered in processing the samples reported in the data package.

Whenever data from sample re-analysis are submitted, the Laboratory shall state in the SDG Narrative for <u>each</u> re-analysis, whether it considers the re-analysis to be billable, and if so, why.

The Laboratory must also include any problems encountered: both technical and administrative, corrective actions taken, and resolution and an explanation for all flagged edits (i.e., manual edits on quantitation lists.

The SDG Narrative shall contain the following statement, <u>verbatim</u>: "I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package and in the computer-readable data submitted on floppy diskette has been authorized by the Laboratory Manager or his designee, as verified by the following signature." This statement shall be directly followed by signature of the Laboratory Manager or his designee with a typed line below it containing the signer's name and title, and the date of signature.

Additionally, the SDG Narrative itself must be signed in original signature by the Laboratory Manager or his designee and dated.

3.5.2.1 TCL Results - Organic Analysis Data Sheet (Form I-VOA).

Tabulated results (identification and quantitation) of the specified target compounds (Exhibit C). The validation and release of these results is authorized by a specific, signed statement in the SDG Narrative (Paragraph 3.1). In the event that the Laboratory Manager cannot validate all data reported for each sample, the Laboratory Manager shall provide a detailed description of the problems associated with the sample in the SDG Narrative.

On Form I-VOA, the appropriate concentration units shall be entered. For example, µg/L for water samples or µg/Kg for soil/sediment samples. No other units are acceptable. **NOTE:** Report analytical results to one significant figure if the value is less than 10; to two significant figures above 10.

3.5.2.2 Tentatively Identified Compounds (Form I-VOA-TIC).

This form must be included even if no compounds are found. If so, indicate this on the form by entering "0" in the field for "Number found".

Form I-VOA-TIC is the tabulated list of the highest probable match for up to 10 organic compounds not system monitoring compounds and not listed in Exhibit C for the appropriate program under which the samples were submitted, including the CAS (Chemical Abstracts Registry) number, tentative identification and estimated concentrations. For estimating concentration, assume a response factor of 1, and estimate the concentration by comparison of the compound peak height or total area count to the peak height or total area count of the nearest internal standard free of interferences on the reconstructed ion chromatogram. **NOTE:** The Laboratory must be consistent, i.e., use peak height for all comparisons or use total area count for all comparisons.

3.5.2.3 Reconstructed Total Ion Chromatograms (RIC) for each sample or sample extract.

RICs must be normalized to the largest non-solvent component and contain the following header information:

- NYSDEC sample number
- Date and time of analysis

3.5.2.4.2 Copies of mass spectra of organic compounds not listed in Exhibit C (Tentatively Identified Compounds) with associated best-match spectra (three best matches), labeled as in 3.5.2.4.1 above.

3.5.3 Standards Data

3.5.3.1 Initial Calibration Data (Form IV-VOA) - in order by instrument if more than one instrument used.

3.5.3.1.1 VOA standard(s) reconstructed ion chromatograms and quantitation reports (or legible facsimile) for the initial calibration, labeled as in 3.5.2.3 above. Spectra are not required.

3.5.3.1.2 All initial calibration data that pertain to samples in the data package must be included, regardless of when it was performed and for which case. When more than one initial calibration is performed, the data must be put in chronological order, by instrument.

3.5.3.2 Continuing Calibration (Form VII-VOA) - in order by instrument, if more than one instrument used.

3.5.3.2.1 VOA standard(s) reconstructed ion chromatograms and quantitation reports (or legible facsimile) for all continuing (12 hour) calibrations, labeled as in 3.5.2.3. Spectra are not required.

3.5.3.2.2 When more than one continuing calibration is performed, forms must be in chronological order, within fraction and instrument.

3.5.4 Raw QC Data

3.5.4.1 BFB (for each 12-hour period, for each GC/MS system utilized)

3.5.4.1.1 Bar graph spectrum, labeled as in 3.5.2.3.

3.5.4.1.2 Mass listing, labeled as in 3.5.2.3.

3.5.4.1.3 Reconstructed total ion chromatogram (RIC), labeled as in 3.5.2.3.

3.5.4.5 Matrix Spike Duplicate Data

3.5.4.5.1 Tabulated results (Form I-VOA) of all TCL Compounds. Form I-VOA-TIC is not required.

3.5.4.5.2 Reconstructed ion chromatogram(s) and quantitation report(s) or legible facsimile (GC/MS), labeled as in 3.5.2.4. Spectra are not required.

3.5.4.6 QC Check Sample/Standard

3.5.4.6.1 Tabulated results (Form I-VOA) of all TCL Compounds. Form I-VOA-TIC is not required.

3.5.4.6.2 Reconstructed ion chromatogram(s) and quantitation report(s) or legible facsimile (GC/MS), labeled as in 3.5.2.4. Spectra are not required.

3.5.5 Copy of Calculations

The Laboratory must provide a copy of the calculations work sheet showing how final results are obtained from values printed on the quantitation report. If manipulations are performed by a software package, a copy of the formula used must be supplied as well as values for all terms in the formula.

3.5.6 Copy of Extraction Logs

These logs must include: (1) date, (2) sample weights and volumes, (3) sufficient information to unequivocally identify which QC samples (i.e. matrix spike, matrix spike duplicate, matrix spike blank) correspond to each batch extracted, (4) comments describing any significant sample changes or reactions which occur during preparation, and (5) final volumes and vial identification numbers.

3.6 GC/MS Semivolatiles Data

3.6.1 QC summary

3.6.1.1 Surrogate Percent Recovery Summary (Form II-SV)

3.6.1.2 Matrix Spike/Matrix Spike Duplicate Summary (Form III-SV)

3.6.1.3 QC Check Sample/Standard

3.6.1.4 Method Blank Summary (Form IV-SV) tentative identification and estimated concentration. For estimating concentration, assume a response factor of 1, and estimate the concentration by comparison of the compound peak height or total area count to the peak height or total area count of the nearest internal standard free of interferences on the reconstructed ion chromatogram. **NOTE:** The Laboratory must be consistent (i.e., use peak height for all comparisons or use total area count for all comparisons).

3.6.2.3 Reconstructed total ion chromatograms (RIC) for each sample, sample extract, standard, blank, and spiked sample.

RICs must be normalized to the largest nonsolvent component, and must contain the following header information:

- NYSDEC sample number
- Date and time of analysis
- GC/MS instrument ID
- Lab file ID

In all instances where the data system report has been edited, or where manual integration or quantitation has been performed, the GC/MS operator must identify such edits or manual procedures by initialing and dating the changes made to the report.

Internal standard and surrogate spiking compounds are to be labeled with the names of compounds, either directly out from the peak, or on a print-out of retention times if retention times are printed over the peak. If automated data system procedures are used for preliminary identification and/or quantification of the Target Compound List compounds, the complete data system report must be included in all sample data packages, in addition to the reconstructed ion chromatogram. The complete data system report shall include all of the information listed below. For laboratories which do not use the automated data system procedures, a laboratory "raw data sheet," containing the following information, must be included in the sample data package in addition to the chromatogram.

- NYSDEC sample number
- Date and time of analysis
- RT or scan number of identified TCL compounds

3.6.3.2.1 Semivolatile standard(s) reconstructed ion chromatograms and quantitation reports (or legible facsimile) for all continuing (12 hour) calibrations, labeled as in 3.6.2.3. Spectra are not required.

3.6.3.2.2 When more than one continuing calibration is performed, forms must be in chronological order, by instrument.

3.6.3.3 Internal Standard Area Summary (Form VIII-SV-1, SV-2) in order by instrument, if more than one instrument used.

When more than one continuing calibration is performed, forms must be in chronological order by instrument.

3.6.3.4 Semivolatile GPC Calibration Data - UV detector traces showing peaks that correspond to the compounds in the semivolatile GPC calibration mixture. Traces must be labeled with GPC column identifier, date of calibration, and with compound names labeled either directly out from the peak, or on a printout of retention times, if retention times are printed over the peak. Do not include Form IX Pest-2, as the compounds used on that form are not appropriate for semivolatile sample extracts.

3.6.4 Raw QC Data

3.6.4.1 DFTPP (for each 12-hour period, for each GC/MS system utilized)

3.6.4.1.1 Bar graph spectrum, labeled as in 3.6.2.3.

3.6.4.1.2 Mass listing, labeled as in 3.6.2.3.

3.6.4.1.3 Reconstructed total ion chromatogram (RIC), labeled as in 3.6.2.3.

3.6.4.2 Blank Data - in chronological order, by extraction date. **NOTE:** This order is different from that used for samples.

3.6.4.2.1 Tabulated results (Form I-SV-1, SV-2)

3.6.4.2.2 Tentatively Identified Compounds (Form I-SV-TIC) - even if none found.

3.6.4.2.3 Reconstructed ion chromatogram(s) and quantitation report(s) or legible facsimile (GC/MS), labeled as in 3.6.2.3.

3.6.4.6 QC Check Sample/Standard

3.6.4.6.1 Tabulated results (Form I-SV-1,SV-2) of all TCL compounds.

3.6.4.6.2 Reconstructed ion chromatogram(s) and quantitation report(s) or legible facsimile (GC/MS), labeled as in 3.6.2.3. Spectra are not required.

3.6.5 Copy of Calculations

The Laboratory must provide a copy of the calculations work sheet showing how final results are obtained from values printed on the quantitation report. If manipulations are performed by a software package, a copy of the formula used must be supplied as well as values for all terms in the formula.

3.6.6 Copy of Extraction Logs

These logs must include: (1) date, (2) sample weights and volumes, (3) sufficient information to unequivocally identify which QC samples (i.e. matrix spike, matrix spike duplicate, matrix spike blank) correspond to each batch extracted, (4) comments describing any significant sample changes or reactions which occur during preparation, and (5) final volumes and vial identification numbers.

3.7 GC/ECD Pesticide/Aroclor Data

3.7.1 QC Summary

3.7.1.1 Surrogate Percent Recovery Summary (Form II-PEST)

3.7.1.2 Matrix Spike/Matrix Spike Duplicate/Matrix Spike Blank Summary (Form III-PEST)

3.7.1.3 QC Check Sample/Standard Recovery

3.7.1.4 Method Blank Summary (Form IV-PEST)

(If more than a single form is necessary, forms must be arranged in chronological order by date of analysis of the blank.)

3.7.1.5 Instrument Detection Limits

3.7.2.3 Copies of pesticide chromatograms from second GC column confirmation. Chromatograms to be labeled as in 3.7.2.2 above.

3.7.2.4 GC integration report or data system printout and calibration plots (area vs. concentration) for 4-4'-DDT, 4,4'-DDD, 4,4'-DDE or toxaphene (where appropriate).

3.7.2.5 Manual work sheets.

3.7.2.6 UV traces from GPC (if GPC performed).

3.7.2.7 If pesticide/Aroclors are confirmed by GC/MS, the Laboratory shall submit copies of reconstructed ion chromatograms, raw spectra and copies of background-subtracted mass spectra of Superfund target compounds listed in Exhibit C (Superfund-TCL) that are identified in the sample and corresponding background-subtracted Superfund-TCL standard mass spectra. Compound names must be clearly marked on all spectra. For multicomponent pesticides/Aroclors confirmed by GC/MS, the Laboratory shall submit mass spectra of 3 major peaks of multicomponent compounds from samples and standards.

3.7.3 Standards Data

3.7.3.1 Initial Calibration of Single Component Analytes (Form VI-PEST-1 and PEST-2) - all GC columns, all instruments, in chronological order by GC column and instrument.

3.7.3.2 Initial Calibration of Multicomponent Analytes (Form VI-PEST-3) - all GC columns, all instruments, in chronological order by GC column and instrument

3.7.3.3 Analyte Resolution Summary (Form VI-PEST-4) - all GC columns and instruments, in chronological order by GC column and instrument.

3.7.3.4 Calibration Verification Summary (Form VII-PEST-1) - for all Performance Evaluation Mixtures and Instrument blanks, on all GC columns and instruments, in chronological order by GC column and instrument.

3.7.3.5 Calibration Verification Summary (Form VII-PEST-2) - for all mid point concentrations of Individual Standard Mixtures A and B and Instrument blanks used for calibration verification, on all GC columns and instruments, in chronological order by GC column and instrument.

3.7.3.12 A printout of retention times and corresponding peak areas or peak heights must accompany each chromatogram. In addition, all chromatograms are required to be labeled with the following:

- NYSDEC Sample Number for the standard, i.e., INDA1, INDA2, etc. (See Forms Instructions for details).
- Label all standard peaks for all individual compounds either directly out from the peak or on the printout of retention times if retention times are printed over the peak.
- Total nanograms injected for each standard.
- Date and time of injection.
- GC column identification (by stationary phase and internal diameter).
- GC instrument identification.

3.7.3.13 Pesticide GPC Calibration Data - UV detector traces showing peaks that correspond to the compounds in the pesticide GPC calibration mixture. Traces must be labeled with GPC column identifier, date of calibration, and with compound names labeled either directly out from the peak, or on a printout of retention times, if retention times are printed over the peak.

3.7.4 Raw QC Data

3.7.4.1 Blank Data - in chronological order, by type of blank (method, instrument, sulfur cleanup). **NOTE**: This order is different from that used for samples.

3.7.4.1.1 Tabulated results (Form I-PEST).

3.7.4.1.2 Chromatogram(s) and data system printout(s) (GC) for each GC column and instrument used for analysis, labeled as in 3.7.2.2 above.

3.7.4.2 Matrix Spike Data

3.7.4.2.1 Tabulated results (Form I-PEST) of <u>all</u> TCL compounds.

3.8 GC Organic Data

3.8.1 QC Summary

3.8.1.1 Surrogate Percent Recovery Summary (Form II-GC)

3.8.1.2 Matrix Spike/Matrix Spike Duplicate/Matrix Spike Blank Summary (Form III-GC)

3.8.1.3 QC Check Sample/Standard

3.8.1.3.1 Tabulated results (Form I-PEST) of all TCL compounds.

3.8.1.3.2 Chromatogram(s) and data system printout(s) (GC), labeled as in 3.8.2.2.

3.8.1.4 Method Blank Summary (Form IV-GC)

(If more than a single form is necessary, forms must be arranged in chronological order by date of analysis of the blank.)

3.8.1.5 Instrument Detection Limits

3.8.2 Sample Data

Sample data shall be arranged in packets with the Organic Analysis Data Sheet (Form I GC), followed by the raw data for pesticide samples. These sample packets should then be placed in increasing NYSDEC sample number order, considering both letters and numbers in ordering samples.

3.8.2.1 TCL Results - Organic Analysis Data Sheet (Form I-GC).

Tabulated results (identification and quantitation) of the specified target compounds (Exhibit C). The validation and release of these results is authorized by a specific signed statement in the SDG Narrative (Paragraph 3.1). In the event that the Laboratory Manager cannot validate all data reported for each sample, the Laboratory Manager shall provide a detailed description of the problems associated with the sample in the SDG Narrative.

On Form I-GC, the appropriate concentration units shall be entered. For example, µg/L for water samples or µg/Kg for soil/sediment samples. No other units are acceptable. **NOTE**: Report analytical results to one significant figure if value is less than 10; two significant figures above 10.

on the printout of retention times if retention times are printed over the peak.

- Label the chromatogram for multicomponent standards.
- List total ng injected for each standard.
- A printout of retention times and corresponding peak areas must accompany each chromatogram.
- Date and time of injection.
- GC column identification (by stationary phase).
- GC instrument identification.

3.8.4 Raw QC Data

3.8.4.1 Blank Data - in chronological order. **NOTE:** This order is different from that used for samples.

3.8.4.1.1 Tabulated results .

3.8.4.1.2 Chromatogram(s) and data system printout(s) (GC) for each GC column and instrument used for analysis.

3.8.4.2 Matrix Spike Data

3.8.4.2.1 Tabulated results of <u>all</u> TCL compounds.

3.8.4.2.2 Chromatogram(s) and data system printout(s) (GC), labeled as in 3.8.2.2.

3.8.4.3 Matrix Spike Duplicate Data

3.8.4.3.1 Tabulated results of <u>all</u> TCL compounds.

3.8.4.3.2 Chromatogram(s) and data system printout(s) (GC), labeled as in 3.8.2.2.

figures if the value is greater than or equal to 10. Results for percent solids must be reported to one decimal place.

3.9.2 Quality Control Data

3.9.2.1 Initial and Continuing Calibration Verification [FORM II-IN (Part 1)]

3.9.2.2 CRDL Standard for AA and Linear Range Analysis for ICP [FORM II-IN (PART 2)]

3.9.2.3 Blanks [FORM III-IN]

3.9.2.4 ICP Interference Check Sample [FORM IV-IN]

3.9.2.5 Spike Sample Recovery [FORM V-IN (PART 1)]

3.9.2.6 Post Digest Spike Sample Recovery [FORM V-IN (PART 2)]

3.9.2.7 Duplicates [FORM VI-IN]

3.9.2.8 Quality Control Sample [FORM VII-IN]

3.9.2.9 Standard Addition Results [FORM VIII-IN]

3.9.2.10 ICP Serial Dilutions [FORM IX-IN]

3.9.2.11 Holding Times [FORM X-IN]

3.9.3 Verification of Instrument Parameters

3.9.3.1 Instrument Detection Limits (Semiannually) [FORM XI-IN]

3.9.3.2 ICP Interelement Correction Factors (Annually) [FORM XII-IN (PART 1)]

3.9.3.3 ICP Interelement Correction Factors (Annually) [FORM XII-IN (PART 2)]

3.9.3.4 ICP Linear Ranges (Quarterly) [FORM XIII-IN]

(Note that copies of Verification of Instrument Parameters forms for the current quarter must be submitted with each data package.)

3.9.4.7 Instrument used, any instrument adjustments, data corrections or other apparent anomalies on the measurement record, including all data voided or data not used to obtain reported values and a brief written explanation.

3.9.4.8 All information for furnace analysis clearly and sequentially identified on the raw data, including NYSDEC sample number, sample and analytical spike data, percent recovery, coefficient of variation, full MSA data, MSA correlation coefficient, full MSA data, MSA correlation coefficient, slope and intercepts of linear fit, final sample concentration (standard addition con-centration), and type of background correction used: BS for Smith-Heiftje, BD for deuterium Arc, or BZ for Zeeman.

3.9.4.9 Time and date of each analysis. Instrument run logs can be submitted if they contain this information. If the instrument does not automatically provide times of analysis, these must be manually entered on all raw data for initial and continuing calibration verification and blanks, as well as interference check samples and linear range analysis.

3.9.4.10 Integration times for AA analyses.

3.9.5 Digestion Logs

Logs shall be submitted in the following order: digestion logs for ICP, flame AA, furnace AA and mercury preparations, followed by a copy of the distillation log for cyanide. These logs must include: (1) date, (2) sample weights and volumes, (3) sufficient information to unequivocally identify which QC samples (i.e. laboratory control sample, preparation blank) correspond to each batch digested, (4) comments describing any significant sample changes or reactions which occur during preparation, and (5) indication of pH <2 or >12, as applicable.

3.10 Wet Chemical Data

Sample data shall be submitted with the Conventional Analysis Data Reporting Forms for all sample in the SDG, arranged in increasing alphanumeric NYSDEC sample number order, followed by the QC analyses data, Quarterly Verification of Instrument Parameters forms, raw data, and copies of the digestion and distillation logs.

3.10.1 Results -- Wet-Chemical Analysis Data Sheet

Tabulated analytical results (identification and quantitation) of the specified analytes (Exhibit C). The validation and release of these results is authorized by a specific, signed statement on the Cover Page. If the Laboratory Manager cannot validate all data reported for each sample,

3.10.3.1 Calibration standards, including source and prep date.

3.10.3.2 Initial and continuing calibration blanks and preparation blanks.

3.10.3.3 Initial and continuing calibration verification standards.

3.10.3.4 Diluted and undiluted samples (by NYSDEC sample number) and all weights, dilutions and volumes used to obtain the reported values. (If the volumes, weights and dilutions are consistent for all samples in a given SDG, a general statement outlining these parameters is sufficient).

3.10.3.5 Duplicates.

3.10.3.6 Spikes (indicating standard solutions used, final spike concentrations, volumes involved). If spike information (source, concentration, volume) is consistent for a given SDG, a general statement outlining these parameters is sufficient.

3.10.3.7 Instrument used, any instrument adjustments, data corrections or other apparent anomalies on the measurement record, including all data voided or data not used to obtain reported values and a brief written explanation.

3.10.3.8 Time and date of each analysis. Instrument run logs can be submitted if they contain this information. If the instrument does not automatically provide times of analysis, these must be manually entered on all raw data for initial and continuing calibration verification and blanks, as well as interference check samples and linear range analysis.

3.10.4 Digestion and Distillation Logs

These logs must include: (1) date, (2) sample weights and volumes, (3) sufficient information to unequivocally identify which QC samples (i.e., laboratory control sample, preparation blank) correspond to each batch digested, (4) comments describing any significant sample changes or reactions which occur during preparation, and (5) indication of pH <2 or >12, as applicable.

3.11 Toxicity Characteristic Leaching Procedure (TCLP) Data

Sample data shall be submitted with the Toxicity Characteristic Leaching Procedure Analysis Data Reporting Forms for all samples in the SDG, arranged

3.11.3 Verification of Instrument Parameters

3.11.3.1 Instrument Detection Limits (Semiannually) [FORM XI-IN]

3.11.3.2 ICP Interelement Correction Factors (Annually) [FORM XII-IN (PART 1)]

3.11.3.3 ICP Interelement Correction Factors (Annually) [FORM XII-IN (PART 2)]

3.11.3.4 ICP Linear Ranges (Quarterly) [FORM XIII-IN]

(Note that copies of Verification of Instrument Parameters forms for the current quarter must be submitted with each data package.)

3.11.4 Raw Data

For each reported value, the Laboratory shall include in the data package all raw data from the instrument used to obtain that value. This applies to all required QA/QC measurements, instrument standardization, as well as sample results. This statement does not apply to the Verifications of Instrument Parameters submitted as part of each data package. Raw data must contain all instrument readouts used for the sample results, including those readouts that may fall below the IDL. All AA and ICP instruments must provide a legible hard copy of the direct real-time instrument readout (i.e., stripcharts, printer tapes, etc.). A photocopy of the direct sequential instrument readout must be included. A hardcopy of the instrument's direct instrument readout for cyanide must be included if the instrumentation has the capability.

The order of raw data in the data package shall be: ICP, Flame AA, Furnace AA, Mercury, and Cyanide. All raw data shall include intensities (ICP) and absorbances with concentration units for flame AA, furnace AA, Mercury and Cyanide. All flame and furnace AA data shall be grouped by element.

Raw data must be labeled with NYSDEC sample number and appropriate codes, shown in Table 1 following to unequivocally identify:

3.11.4.1 Calibration standards, including source and prep date.

3.11.4.2 Initial and continuing calibration blanks and preparation blanks.

3.11.4.3 Initial and continuing calibration verification standards, interference check samples, ICP serial dilution samples,

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1.0 Introduction

1.1 General

This Health and Safety Plan (HASP) has been prepared to identify the health and safety procedures, methods and requirements for activities performed during the Remedial Investigation (RI) at the former Clark Street Manufactured Gas Plant (MGP) Site in Auburn, New York (Figure 1). This plan applies to the activities to be performed by employees of Blasland & Bouck Engineers, P.C. (Blasland & Bouck) during the implementation of RI activities, in support of the RI Work Plan submitted to the New York State Electric & Gas Corporation (NYSEG) in August 1992. This HASP sets forth the minimum safety requirements pursuant to OSHA regulations. The employees of other contracted companies will work in accordance with their own independent Health and Safety Plans, and the site-specific requirements of this HASP.

This HASP addresses those health and safety issues related to the presence of specific physical and/or chemical hazards potentially present during the performance of RI activities. An Emergency Response/Contingency Plan (Section 9.0 of this HASP) outlines the procedures to be followed in the event of an emergency or unusual situation. During development of this HASP, consideration was given to current health and safety standards as defined by the Occupational Safety and Health Administration and/or National Institute for Occupational Safety and Health (OSHA/NIOSH), health effects data and standards known for chemical constituents, and also by consulting procedures designed to account for the exposure potential to unknown substances. Specifically, the following reference sources have been consulted:

- OSHA 29 CFR 1910 and 1926
- OSHA/NIOSH/EPA/Coast Guard "Occupational Health and Safety guidelines for Activities at Hazardous Waste Sites"
- NIOSH Pocket Guide to Chemical Hazards
- American Conference of Governmental Industrial Hygienists (ACGIH), Threshold Limit Values (TLV)

This document will be periodically reviewed to ensure that it is current and technically correct. Any changes in site conditions and/or the scope of work will require a review and modification of this HASP. Such changes will be completed in the form of an addendum.

1.2 Project Background

A detailed description of the Clark Street MGP Site is presented in the RI Work Plan. The overall objectives of the RI are to evaluate the presence and extent of MGP residues in the environment, and assess whether those residues have the potential to significantly impact human health or the environment. Table 1 summarizes the chemical constituents reported during prior investigation activities at the Clark Street MGP Site performed by others.

The reports, documents, and data that were reviewed to determine the constituents of concern for the environmental media are referenced in the RI Work Plan.

1.3 Definitions

The following definitions will apply to this HASP:

a. Site - The area where the work is to be performed.

b. Project - All work performed at the Clark Street MGP Site and presented in the RI Work Plan.

c. Subcontractor - Includes on-site subcontractor personnel hired by Blasland & Bouck.

d. On-Site Personnel - All NYSEG representatives, Blasland & Bouck, and subcontractor personnel involved with the project.

e. Visitor - All other personnel, except the on-site personnel. Visitors will need to receive approval to enter the Work Zone.

f. Health and Safety Supervisor (HSS) - is a Blasland & Bouck employee so designated that will be primarily responsible for the implementation and enforcement of the HASP. The HSS is trained to be familiar with applicable state and federal occupational safety and health regulations and has formal training in occupational safety and health.

g. Work Zone - Any portion of the project where hazardous substances are, or may reasonably be suspected, to be present in the air, water or soil/sediment.

h. Decontamination Zone - Area between the Work Zone and Support Zone that provides a transition between contaminated and clean areas. Decontamination stations are located in this Zone.

i. Support Zone - The rest of the site. Support equipment is located in this Zone.

j. Monitoring - The use of field instrumentation to provide information regarding the levels of chemical constituents. Monitoring will be conducted to evaluate employee exposures to potential chemical and physical hazards.

k. HASP - Health and Safety Plan approved for this Project.

l. Buddy System - A system of grouping workers in hazardous areas developed to ensure that workers are able to provide assistance when needed, observe partner for signs of chemical or heat exposure and contact the HSS or others if emergency assistance is needed.

2.0 Identification of Key Health and Safety Personnel

2.1 Key Personnel

Implementation of this HASP will be accomplished through an integrated team effort. The names of key personnel involved with this project are provided below:

KEY PERSONNEL		
New York State Electric & Gas Corporation		
Thomas M. O'Meara Supervisor of Remedial Investigation	4500 Vestal Parkway East P.O. Box 3607 Binghamton, New York 13902	(607) 729-2551 or (607) 729-4242
Margaret "Chris" Hebdon Contract Program Manager	4500 Vestal Parkway East P.O. Box 3607 Binghamton, New York 13902	(607) 762-4305
Blasland & Bouck Engineers, P.C.		
Edward R. Lynch, P.E. Project Officer	P.O. Box 66 6723 Towpath Road Syracuse, New York 13214	(315) 446-9120 (w) (315) 445-1029 (h)
Nancy E. Gensky Project Manager	P.O. Box 66 6723 Towpath Road Syracuse, New York 13214	(315) 446-9120 (w) (315) 637-3959 (h)
Vita A. DeMarchi Site Manager and Health & Safety Supervisor	P.O. Box 66 6723 Towpath Road Syracuse, New York 13214	(315) 446-9120 (w) (315) 682-8891 (h)
Richard P. DiFiore Sediment Investigation Field Coordinator	P.O. Box 66 6723 Towpath Road Syracuse, New York 13214	(315) 446-9120 (w) (315) 622-2714 (h)
Marc B. Evans, CIH/CSP Manager, Environmental Safety & Industrial Hygiene	P.O. Box 66 6723 Towpath Road Syracuse, New York 13214	(315) 446-9120 (w) (315) 476-6833 (h)

2.2 Assignment of HASP Responsibilities

2.2.1 Blasland & Bouck Engineers, P.C.-Roles and Responsibilities

Blasland & Bouck will perform all work outlined in the RI Work Plan in a manner consistent with generally accepted professional principles and practices. Blasland & Bouck will provide for the health and safety of all on-site personnel during any work effort covered by this HASP. It is the responsibility of Blasland & Bouck to:

- Name a HSS who has the health and safety responsibility for tasks listed in this HASP;
- Assure medical examinations and training requirements for all Blasland & Bouck personnel are current and comply with 29 CFR 1919.120 and 134;
- Be responsible for the pre-investigation indoctrination of all on-site personnel with regard to this HASP and other safety requirements, including but not limited to: (a) potential hazards; (b) personal hygiene principles; (c) personal protective equipment (PPE); (d) respiratory protection equipment usage; and (e) emergency procedures dealing with fire and medical situations;
- Be responsible for the implementation of the HASP, special safety considerations, and the emergency response/contingency plan;
- Ensure that all Blasland & Bouck on-site personnel are properly protected and equipped;
- Comply with OSHA health and safety regulations; and
- Maintain a daily field report of Blasland & Bouck on-site personnel, subcontractors, and visitors who enter the site during field activities (Attachment 1 of this HASP).

2.2.2 HSS Roles and Responsibilities

The Blasland & Bouck-designated HSS for this RI is Ms. Vita A. DeMarchi or a designated alternate. It is the responsibility of the HSS and/or designated alternate to:

- Maintain a daily logbook for recording all significant health and safety activities and incidents;
- Have authority to suspend work due to health and/or safety related concerns;
- Provide on-site technical assistance;
- Conduct routine air monitoring (if required), including equipment maintenance and calibration;
- Assure that a basic first aid kit is on-site during the investigation;
- Conduct periodic health and safety audits;
- Ensure that site personnel have received the necessary training, including safety equipment and personal protective equipment;
- Provide regular pre-task health and safety briefings;
- Ensure that site personnel have received the necessary physical examinations;
- Review the adequacy of the HASP;
- Draft necessary amendments to the HASP for review;
- Assure that all site, oversight, project and authorized personnel including subcontractors are made aware of the provisions of the HASP and have been informed of the nature of any physical and/or chemical hazards associated with the site activities; and
- Maintain control of required documents for recordkeeping purposes.

3.0 Task/Operation Health and Safety Risk Analysis

3.1 Scope

The purpose of this section is to identify the potential physical, chemical, and biological hazards associated with the investigation tasks/operations being performed during this project. A brief description of the project activities are contained in Section 1.2 of this HASP - Project Background. The following subsections discuss each task and/or operation in terms of the associated potential hazards. The protective measures to be implemented during completion of the specific activity are also identified herein.

3.2 Work Task Risk Analysis

A risk analysis for activities conducted under this HASP are discussed by task. The tasks covered are as follows:

- Test Pit Excavation, Drilling, Soil Sampling, and Monitoring Well Installation
- Ground-Water Sampling
- Sediment Sampling
- Vessel/Tank Sampling

Section 3.5 of this HASP (Physical Hazards) provides information about general physical hazards which require consideration during site activities. Physical hazards and associated protection mechanisms for each specific task are listed in Table 3. Identified chemical constituents and concentration ranges based on a prior site investigation are listed in Table 1. Chemical constituents typically detected at MGP sites are summarized on Table 2. Material Safety Data Sheets (MSDS) for MGP constituents and decontamination solvents are provided in Attachment 7. All tasks will be performed in the level of protection outlined in each of the following task-specific subsections. Section 4.0 of this HASP (Personal Protective Equipment (PPE) and Equipment Reassessment Program) provides information describing the protective equipment ensembles.

The potential routes of exposure for the constituents include inhalation, skin absorption, ingestion, and skin/eye contact. The potential for exposure through any of these routes will depend on the specific activity conducted by the worker. Because of general operating procedures (Section 7.5 of this HASP) (i.e., no eating or smoking), ingestion is not considered a likely exposure route. The other potential routes of exposure for the activities to be conducted during the RI are discussed in the following task-specific subsections.

3.3 Test Pit Excavation, Drilling, Soil Sampling, and Monitoring Well Installation

3.3.1 Description of Activity

The subsurface investigation activities will consist of: 1) characterizing potential source areas within the interior of the site using a backhoe and drill rig to collect residue and/or soil samples for physical classification and chemical analysis, and 2) installing monitoring wells near the perimeter to identify potential impacts on ground water. The soil samples will be placed in containers and shipped to a laboratory for analysis. Ground-water sampling is discussed in Section 3.4 of this HASP.

3.3.2 Hazard Assessment

Potential chemical hazards associated with soil sampling include inhalation of volatile organic compounds (VOCs) and particulate matter/dust containing chemical constituents and dermal contact with soil, ground water, and residue containing those constituents. Chemical hazards also include contact and inhalation of decontamination solvents. Potential physical hazards include trauma injuries from contact with mechanical equipment (backhoe, drill rig); trauma injuries and/or suffocation from entry into test pits; electric shock from improper grounding of electrical equipment or contact with overhead electrical lines; burns from hot engines on equipment; back strains and muscle fatigue due to lifting, slipping on wet surfaces, and tripping over obstructions; and injuries from contacting underground utilities (underground natural gas lines.)

3.3.3 Health and Safety Mitigation Activities

Workers will be required to wear Level D protection. Because there is a potential for the inhalation of organic vapors and soil particulate matter/dust, breathing zone monitoring will be conducted. The level of personal protection may be adjusted (upgraded to Level C or downgraded back to Level D) during soil sample collection in accordance with the reassessment program described in Section 4.0 of this HASP. Safety glasses and rubber gloves will be used to minimize the potential for dermal contact with soil containing chemical constituents during sampling. During equipment decontamination, rubber gloves and safety glasses/shields will be used to minimize direct contact with decontamination solvents. The work area will be kept dry and clean (to the extent possible) to avoid slipping and unnecessary exposure to soil and ground water potentially containing chemical constituents.

Workers shall utilize visual contact and hand signals to ensure that equipment operators are aware of their presence adjacent to the mechanical equipment (backhoes, drill rigs) when they are required to be present for soil sampling. Workers will stage their sampling equipment away from the work area to minimize their presence adjacent to the mechanical equipment. Project personnel will not enter test pits. Back strain can be prevented by proper lifting techniques. Electronic equipment will have the following safeguards: ground fault interrupters or properly grounded circuitry and protection of extension cords from damage. No equipment will be placed within 10 feet of the overhead electric lines at the site. At no time, will the site investigation personnel enter the on-site electric substation. Prior to drilling, test pitting, and other subsurface activities, all underground utilities will be located by NYSEG and other applicable utilities and public entities. Subsurface work will avoid those areas at and immediately surrounding subsurface utilities. If there is any uncertainty in the location of subsurface utilities, hand-excavation may be employed prior to the use of mechanical equipment. All personnel will remove unnecessary equipment and debris from the work area to reduce tripping hazards.

3.4 Ground-Water Sampling

3.4.1 Description of Activity

The ground-water sampling program will involve opening the well, measuring water levels, purging (removing water from a well with a bailer), and sampling monitoring wells. Water samples collected from the wells are then placed in containers and shipped to a laboratory for analysis.

3.4.2 Hazard Assessment

Potential chemical hazards associated with ground-water sampling include inhalation of VOCs emanating from the well after initial opening, and contact of ground water containing chemical constituents with skin or eyes. In addition, chemical hazards include contact and inhalation of decontamination solvents and sample preservatives. Potential physical hazards include electric shock from improper grounding of electrical equipment, back strain, slipping on wet surfaces, and tripping over obstructions.

3.4.3 Health and Safety Mitigation Activities

Workers will be required to wear Level D protection. Because there is a potential for the inhalation of organic vapors venting from the well cap upon opening, breathing zone monitoring will be conducted.

The level of personal protection may be adjusted (upgraded to Level C, or downgraded back to Level D) during ground-water sample collection in accordance with the reassessment program described in Section 4.0 of this HASP. Splash goggles and rubber gloves will be used to minimize the potential for dermal contact with ground water containing chemical constituents during sampling as well as with decontamination solvents and sample preservatives. The work area will be kept dry and clean (to the extent possible) to avoid slipping and unnecessary exposure to ground water potentially containing chemical constituents.

Back strain associated with ground-water sampling can be prevented by proper lifting and bailing techniques. Heat stress associated with bailing and moving drums will be managed in accordance with the procedures outlined in Section 3.7 of this HASP.

3.5 Sediment Sampling

3.5.1 Description of Activity

This task will involve the sampling of sediments from the adjacent stream. The sampling of sediments will be is performed by wading to a specific location and collecting sediment samples. Sediment samples will be obtained utilizing Lexan® tubing or stainless steel scoops.

3.5.2 Hazard Assessment

Chemical hazards associated with the above sampling task include potential contact with residue(s) (if any), surface water, and sediments containing chemical constituents. In addition, chemical hazards include contact and inhalation of decontamination solvents. The primary pathway of exposure for the identified constituents during the sediment sampling activities is dermal absorption.

Potential physical hazards associated with this task include back strain and muscle fatigue due to lifting; slip, trip, and fall hazards from working around vegetated areas; drowning due to slipping, tripping or falling while working near streambanks.

3.5.3 Health and Safety Mitigation Activities

Workers will be required to wear Level D protection. Nitrile and/or rubber gloves will be used during sampling activities to minimize the potential for dermal contact with surface water, and sediments potentially containing chemical constituents and decontamination solvents. Safety glasses/splash guards will also be used. Inhalation exposure is not anticipated to be a significant concern due to the sediments being water saturated. Hip or chest waders will be used when entering the surface water. When entering a surface water body, buoyancy devices will be utilized. A buddy system will be utilized during all water sampling work. Any work near, over, or in water should comply with OSHA 29 CFR 1926.106.

3.6 Tank/Vessel Sampling

3.6.1 Description of Activity

The tank/vessel sampling activities will consist of locating and accessing a subsurface tank/vessel in order to sample the contents. The tank/vessel is believed to be constructed of steel. Access to the tank/vessel for sample collection will be either by manway or by enlarging the above-referenced access point using a saw; the means for sampling access will be determined based on field observation. Since the matrix (solid or liquid) in the tank is unknown at this time, either the soil sampling (Section 3.3) or ground-water sampling (Section 3.4) health and safety risk analysis will be followed once the matrix is determined in the field.

3.6.2 Hazard Assessment

Chemical hazards associated with the above sampling task include potential inhalation of VOCs and particulate matter/dust containing chemical constituents and dermal contact with soil, ground water, and residue containing those constituents. Potential physical hazards include trauma injuries from contact with mechanical equipment; fire/explosion due to tank/vessel contents; trauma injury or suffocation from entry into the tank/vessel; electric shock from improper grounding of electrical equipment; back strain and muscle fatigue due to lifting, slipping on wet surfaces, and tripping over obstructions.

3.6.3 Health and Safety Mitigation Activities

Workers will be required to wear Level D protection. Because there is a potential for the inhalation of organic vapors venting from the tank/vessel access point, breathing zone monitoring will be conducted. The level of personal protection may be adjusted (upgraded to Level C or downgraded back to Level D) during collection in accordance with the reassessment program described in Section 4.0 of this HASP. The tank/vessel will be allowed to continuously vent during all work activities. While the tank access point is being enlarged and during sampling activities, oxygen/lowel explosive limit monitoring will be continuously conducted. Should cutting be required to gain access to the tank/vessel, non-spark (aluminum) saw blades will be utilized. Any light used to see the tank contents will be explosion-proof. The tank/vessel will not be entered.

Splash goggles and rubber gloves will be used to minimize the potential for dermal contact with solids and liquids containing chemical constituents during sampling as well as with decontamination solvents and sample preservatives. The work area will be kept dry and clean (to the extent possible) to avoid slipping and unnecessary exposure to soil and ground water potentially containing chemical constituents. Back strain can be prevented by proper lifting and bailing techniques. Electrical equipment will have the following safeguards: ground fault interrupters or properly grounded circuitry and protection of extension cords from damage. Workers must ensure that all power cords, etc., for sampling devices are in good working condition to minimize the hazard of electrocution. All personnel will operate in a manner to reduce exposure to these hazards.

3.7 Physical Hazards

Physical hazards and associated protective mechanisms are listed in Table 3. The purpose of this section is to provide information regarding health and safety approaches to general physical hazards associated with site-activities.

3.7.1 Heat Stress

One of the most frequently encountered problems during field investigations is heat stress. Heat stress manifests itself in two forms: heat stroke and heat exhaustion. Depending on ambient conditions, the worker, and the work being performed, heat stress can adversely affect a worker in as little as 15 minutes. This is especially important as ambient temperatures exceed approximately 70°F at high humidities. For this reason, all workers will be monitored for heat stress using the following indicators: worker appearance and responses. Monitoring for heat stress will be conducted by the field staff. The field staff will take care to monitor ambient conditions, the type of protective equipment, and personnel fitness. Work loads will be adjusted to account for potentially unsafe conditions.

Early symptoms of heat stress can include rashes, cramps, discomfort, irritability and drowsiness. These symptoms can cause impaired functional ability which may threaten the safety of operations. Advanced symptoms of heat exhaustion include pale, clammy skin, profuse perspiration, and extreme tiredness or weakness.

Heat stroke is a much more dangerous form of heat stress. Symptoms of heat stroke include high body temperatures and red or flushed, hot, dry skin. Other symptoms may include dizziness, nausea, headache, rapid pulse, and unconsciousness. First aid for all forms of heat stress includes cooling the body by removing PPE, moving to a safe zone, and allowing the worker to rest in a cooler environment.

3.7.2 Cold Stress

Persons working outdoors in temperatures at, or below, freezing may be frostbitten. Frostbite may be categorized into three types:

- Frostbite or incipient frostbite characterized by sudden blanching or whitening of the skin.
- Superficial frostbite - skin has a waxy or white appearance, is firm to the touch, but tissue beneath is resilient.
- Deep frostbite - tissues are cold and hard, indicating an extremely serious injury.

Sign and symptoms of frostbite include:

- The skin changes to white or grayish-yellow in appearance.
- Pain is sometimes felt early but subsides later (often there is no pain.)
- Blisters may appear later.
- The affected part feels intensely cold and numb.
- The person frequently is not aware of frostbite until someone tells him or he observes the pale, glossy skin.

As time passes, the affected worker may become confused, stagger, experience eyesight impairment, lose consciousness, and/or stop breathing.

First aid for frostbite includes protecting the frozen area from further injury, bringing the victim indoors, warming the affected areas quickly with warm water, and maintaining respiration according to first aid procedures. Medical help should be called immediately.

Frostbite may be prevented by the use of insulated gloves, socks and other protective clothing capable of keeping moisture away from the skin. All clothing should be chosen so that it is compatible with the PPE required for certain activities.

3.8 Potential Constituents of Concern

The constituents contained in MGP process residues and at MGP sites can be categorized within five primary chemical classes:

- Polycyclic aromatic hydrocarbons (PAHs);
- Volatile aromatics;
- Phenolics;
- Metals; and
- Non-metallic inorganics.

A list of wastes and specific chemical constituents previously detected at MGP sites is presented in Table 2. As previously mentioned in Section 1.2 of this HASP, constituents detected in on-site surface soils and near-site sediments during previous site investigation activities associated with the Clark Street MGP Site are summarized in Table 1. The reports, documents, and data for the Clark Street site that were reviewed to determine the constituents of concern for the environmental media are referenced in the RI Work Plan. Based on the concentrations of the constituents detected in the different environmental media on this site and knowledge of constituents typically found at MGP sites, the levels of PPE associated with each work task were selected by Blasland & Bouck and are discussed in Section 4.0 of this HASP.

4.0 Personal Protective Equipment (PPE) and Equipment Reassessment Program

4.1 PPE Selection Criteria

PPE ensembles chosen for each individual task were specified in Section 3.0 of this HASP - Task/Operation Health and Safety Risk Analysis. Equipment selection was based upon the mechanics of the task and the nature of the hazards which were anticipated. The following criteria were used in the selection of equipment ensembles:

- Chemical hazards known or suspected to be present;
- Routes of entry through which the chemicals could enter the body, e.g., inhalation, ingestion, skin contact; and
- Potential for chemical constituent/worker contact while performing the specific task or activity.

Based on available data, we anticipate that most on-site or near-site work activities will be performed at Level D protection; however, Level C protection will be available in the event an upgrade is required.

4.2 Selected PPE Ensembles

Level D PPE will be available and used as appropriate in accordance with the specifications presented in Section 4.2.1 of this HASP. The tasks which currently have the greatest potential for requiring upgrading to Level C is the excavation of test pits, drilling of soil borings, and tank/vessel sampling. If action levels are reached during air monitoring, an upgrade to Level C will be necessary.

4.2.1 Levels of Protection

In general, the following levels of protection will be used for specific work activities. Adjustments to these levels may be required given the site conditions encountered.

a. <u>Excavation of Test Pits, Drilling, Well Installation, and Soil Sampling</u>

Field activities associated with the excavation of test pits, drilling of borings, installation of ground-water monitoring wells, and the collection of soil samples will be conducted in Level D protective gear, including:

- Hard hat (test pit excavating and drilling);
- Disposable insert-type hearing protection, as necessary (test pit excavating and drilling);
- Safety glasses or faceshield;
- Cotton overalls and polylaminated Tyvek disposable coveralls (as necessary);
- Nitrile gloves and rubber gloves (as necessary);
- Steel-toed boots; and
- Disposable outer boot covers, chemical resistant (as necessary).

Air monitoring will be conducted during this work. If Level C is required based on air monitoring results, additional equipment will consist of:

- Full-face purifying respirator with combination organic vapor, acid gases, and particulate cartridges (NIOSH/MSHA-approved);
- Outer nitrile protective gloves; and
- Polylaminated Tyvek disposable coveralls.

b. Ground-Water Sampling

Ground-water sampling will be conducted in Level D protective gear, including:

- Safety glasses or faceshields;
- Cotton overalls and polylaminated Tyvek disposable coveralls (as necessary);
- Nitrile gloves and rubber gloves (as necessary);
- Steel-toed boots; and
- Disposable outer boot covers, chemical resistant (as necessary).

Upgrade to Level C is not anticipated to be necessary for this field activity. If Level C is required based on air monitoring results, additional equipment will consist of:

- Full-face purifying respirator with combination organic vapor, acid gases and particulate cartridges (NIOSH/MSHA-approved);
- Outer nitrile protective gloves; and
- Polylaminated Tyvek disposable coveralls.

c. Sediment Sampling

Sediment sampling will be conducted in Level D protective gear, including:

- Safety glasses or face shields;
- Outer JVC nylon jacket;
- Nitrile gloves and rubber gloves (as necessary);
- Rubber boots or hip waders (for selected sediment sampling locations); and
- Buoyancy devices/lifer preservers (when entering the Owasco Outlet).

Upgrade to Level C is not anticipated to be necessary for this field activity.

d. Tank/Vessel Sampling

Collection of a sample from the buried tank/vessel will be conducted in Level D protective gear, including:

- Safety glasses or faceshields;
- Cotton overalls and polylaminated Tyvek disposable coveralls;
- Nitrile gloves and rubber gloves (as necessary);
- Steel-toed boots; and
- Disposable outer boot covers, chemical resistant (as necessary).

If required based on air monitoring, additional equipment for upgrade to Level C would consist of:

- Full-face purifying respirator with combination organic vapor, acid gases, and particulate cartridges (NIOSH/MSA-approved); and
- Outer nitrile protective gloves.

4.3 Personal Protective Equipment Reassessment Program

The level of protection provided by selected PPE may be upgraded or downgraded based upon a change in site conditions or findings of investigations. When a significant change occurs, the potential hazards will be re-evaluated. Some indicators of the need for reassessment are:

- Commencement of a new work phase, such as the start of work that begins on a different portion of the site;
- Change in tasks during a work phase;
- Appearance of new chemicals constituents other than those previously identified;
- Change in ambient levels of chemical constituents; and
- Change in work scope which affects the degree of potential contact with chemical constituents.

Air monitoring will be conducted during all field activities except sediment sampling. Any upgrade or downgrade to the level of protection will be initiated based upon an observed change in the ambient concentrations of selected airborne chemical constituents. Airborne volatile constituents will be measured by use of a portable direct-reading instrument for total organic vapor concentrations, an HNu Photoionization Detector (PID) or equivalent. In addition, detector tubes (e.g., Draeger, Sensidyne, etc.) will be used as a quantitative sampling method for indicator chemical constituent(s) with low permissible exposure limits (PEL). For this site, benzene will be the indicator compound.

Action levels and the corresponding minimum response for site area monitoring have been established for the project. A flow diagram displaying the action levels and response steps for organic vapors is included as Figure 2.

During any subsurface work efforts, if purifier wastes are encountered, then air monitoring for cyanides/sulfides (as hydrogen cyanide/hydrogen sulfide) will be performed per the direction of the HSS or designated alternate. Action levels will be 5 ppm for hydrogen cyanide and 10 ppm for hydrogen sulfide. If the concentrations of these constituents measured in colorimetric detector tubes exceeds these levels, work will be terminated and the test pit/test boring backfilled.

It is important to consider the following factors when comparing monitor response to established action levels prior to upgrading or downgrading the level of protection:

- Transient peaks may exceed action levels, especially when measured at ground levels or in close proximity to a source of chemical constituents. Attempts should be made to measure chemical constituent concentrations in air within the approximate breathing zone of workers; and

- Action levels are in excess of "background" levels, as measured either prior to the start of the on-site activity or at a representative off-site location.

Background organic vapor levels must be established daily at each work station, as necessary. Each day, a minimum of four PID readings will be taken upwind and downwind at the perimeter established for the task. If, during the course of work area monitoring, an airborne concentration in excess of the action level (or airborne condition in excess of action criteria) is noted, any potentially impacted workers or other persons without proper protection must be removed from the work area or included in the appropriate PPE upgrade. Upon detection of a concentration above an action level, the site HSS or designee will implement monitoring between the active operations area and the perimeter to provide input for evaluating source strength and potential downwind impacts.

4.4 Daily Field Reports

A daily field report documenting the findings of all direct-reading measurements will be maintained by the HSS and/or the designated alternate. The daily field report will document the task, time, meter reading, and level of protection being worn by workers involved with the activity. Actions taken in response to releases or recordings above pre-established action levels will also be recorded in the daily field report. The daily field report will also document personnel conducting work activities, visitors, and activities completed (Attachment 1 of this HASP).

5.0 Personnel Training Requirements

5.1 Training Requirements

All Blasland & Bouck personnel, subcontractors, and visitors, will be trained commensurate with their responsibilities. Such training will be provided prior to being allowed to engage in site activities which could expose personnel to health and safety hazards. The HSS or designated alternate has the responsibility to assure that this training is provided as appropriate for site conditions, and is updated, as needed. Every worker including subcontractors is required to read and understand the HASP prior to commencement of the work activity. Workers are also required to sign a training acknowledgment form signifying their understanding of the activity to be carried out and the hazards involved and that they will abide by all the safety rules (Attachment 2 of this HASP).

5.1.1 Site Orientation

The following is a listing of general site information/training provided to all personnel during an initial site orientation:

- Names of all site health and safety personnel and alternates;
- Work rules and safe work practices;
- Use of personal protective equipment;
- Site chemical and physical hazards;
- Safe use of engineering controls and site equipment;
- Medical surveillance requirements;
- Symptoms associated with exposure to site hazards;
- Site control measures;
- Decontamination procedures;
- Provisions of the emergency response plan;
- Standard operating procedures, e.g., confined space entry, spill containment, etc.; and
- NYSEG Safety Rules and Regulations (Attachment 3).

This listing of health and safety topics essentially incorporates a thorough review of this HASP.

5.1.2 Preassigned Training

Blasland & Bouck personnel and visitors entering the Work and/or Decontamination Zones will have pre-assignment training in accordance with the provisions outlined in 29 CFR 1910.120(e) Training, prior to engaging in their work activities.

The HSS or designated alternate is responsible for ensuring that personnel assigned to this site are trained in accordance with the above 29 CFR 1910.120(e) Training. The HSS will ensure that all training certificates are current by checking company issued wallet training cards and/or actual training certificates.

5.1.3 First Aid/Cardiopulmonary Resuscitation (CPR)

The HSS and designated alternate must possess current certification in first aid and CPR. At least one of these individuals must be present during each work-shift while Blasland & Bouck personnel are on-site. Documentation of current certification must be filed with this HASP.

5.2 Periodic Health and Safety Meetings

The HSS or designated alternate will conduct periodic health and safety meetings. These meetings will be a review of existing protocols as well as a means to update personnel on new site requirements or conditions.

The meetings will also provide an opportunity for site personnel to express any health and safety concerns. Topics for discussion would include, but not be limited to, the following:

- Review of available analytical or other relevant data which may relate to a potential for worker exposure during task execution;
- Review of the type and frequency of environmental and personal monitoring (if any) to be performed;
- Task-specific levels of protection and anticipated potential for upgrading;
- Review of emergency procedures; and
- Review of existing and/or new health and safety issues.

5.3 Documentation/Recordkeeping

Attachment 2 of this HASP contains a Training Acknowledgement Form. This form will be utilized to document compliance with the training requirements specified in this section. All on-site Blasland & Bouck personnel and subcontractors are required to sign this training acknowledgement form.

6.0 Medical Surveillance

6.1 General Medical Program

Medical surveillance for this project will reflect the provisions established under Title 29 CFR 1910.120(f), OSHA's medical surveillance requirements for hazardous waste operations.[1]

Verification of the individuals current health status and medical restrictions must be provided to the HSS prior to the individual's first day at the site. Such verification must be in the form of company issued wallet cards or other equivalent documentation.

6.2 Respirator Certification

Prior to authorizing the use of any air-purifying or air-supplied respirator, OSHA under 29 CFR 1910.134, 29 CFR 1926.58, and Blasland & Bouck policy, requires that a determination be made regarding the prospective wearer's physical ability to safely use such equipment. Consequently, individuals scheduled to work in areas that may require the use of a respirator must provide the HSS with current documentation (not older than 24 months) regarding the individual's physical abilities to wear a respirator. The inability to provide current or complete documentation will be sufficient grounds to preclude any individual from areas or tasks requiring such protection. Any worker, who may be required to wear a respirator, is required to have been trained in the proper use of the respirator and have 40 hours of OSHA training, as well as be required to pass a respirator fit test that will include exposure to an irritant (smoke) and an aroma. Respirator testing will be conducted and appropriate documentation kept on file. A copy of the Respirator Inspection/Maintenance Log is provided as Attachment 4 of this HASP.

6.3 Exposure/Injury Medical Emergency

As a follow-up to an injury or illness or as a result of possible excessive exposure to either a chemical or physical hazard, all employees are entitled to and encouraged to seek appropriate medical attention. The HSS or designated alternate must be appraised of the need for seeking such medical attention and assist in determining the immediacy of the situation.

During and immediately following the emergency medical situation, the HSS or designated alternate have the following responsibilities:

- Ensure that the examining medical facility is fully appraised of the site condition and/or hazard which caused the medical emergency;
- Conduct an investigation of the site condition which caused the medical situation prior to reassigning the task;
- Complete the report of Accident Form (Attachment 5 of this HASP);
- Ensure the injured/ill worker receives written medical clearance prior to return to the site;
- Provide a copy of the medical clearance and accident investigation form for the employee's medical records; and
- Provide a copy of the accident investigation form to the Manager, Environmental Safety and Industrial Hygiene, Syracuse, New York and to NYSEG within 24 hours.

---

[1] Medical clearance is not required for individuals who will visit the Support Zone.

Injuries/illnesses and/or possible excessive exposure to either a chemical or physical hazard requiring emergency medical treatment and hospitalization must be reported within 24-hours to Manager, Environmental Health and Industrial Hygiene, Syracuse, New York and NYSEG. Fatalities must be reported immediately.

7.0 Site Control Measures

7.1 Site Control

Site control will minimize potential exposure of workers and observers to chemical constituents, protect the public from potential on-site hazards, and prevent vandalism of equipment and materials. Site control measures also enhance response in emergency situations.

Most, if not all, work under this program will be done under Level D conditions. If an upgrade is necessary, the site of field operations will be divided into three distinct areas. The actual extent of the areas are considered task and location specific and will be determined on a task-specific basis. When utilized, the work areas at each location will be divided into the three following zones: Work Zone, Decontamination Zone, and Support Zone. The only activities that will require the establishment of Work Zones are the excavation of test pits, drilling of soil borings, and monitoring well installation. Zones will not be set up for the ground-water, surface soil, and sediment sampling.

7.1.1 Work Zone

The Work Zone is the area in which the excavation of test pits, drilling, and well installation will occur. Workers entering this Zone are required to be protected as previously defined in Section 4.2 of this HASP. During work activities, only OSHA-trained workers, will be allowed into this Zone. Within this Zone, the levels of protection may be changed by the HSS or designated alternate based on the degree of hazard present.

7.1.2 Decontamination Zone

The Decontamination Zone is the area that is set up adjacent to the Work Zone where equipment and personnel are decontaminated. Decontamination Zones will be set up adjacent to each exploration/sampling location or group of locations to facilitate decontaminating equipment that is reused throughout the sampling procedures (e.g., split spoons, spatulas, scoops, beakers) and worker clean-ups. The location of the individual Decontamination Zones will depend on prevailing wind direction and physical site features.

7.1.3 Support Zone

A Support Zone may be set up outside the Decontamination Zone. The Support Zone will be used to store equipment and first aid supplies. Administrative and other support functions will occur within the Support Zone, including communications and documentation. Protective clothing worn in the Work Zone may not be worn in a Support Zone except in emergencies.

7.2 Site Security

It is the responsibility of the HSS or designated alternate to control access to the active work zones and assure proper security. Any evidence of unauthorized entry should be noted in the daily field report.

7.3 The Buddy System

Intrusive activities in contaminated or otherwise hazardous areas will be conducted with a buddy who is able to:

- Provide partner with assistance;
- Observe partner for signs of chemical or heat exposure;

- Periodically check the integrity of partner's protective clothing; and
- Notify the HSS or others if emergency help is needed.

The "buddy" may be another Blasland & Bouck employee or a subcontractor employee. Two Blasland & Bouck employees will be on site during the test pit excavating, soil and sediment sampling, and vessel/tank sampling. A drilling subcontractor employee will serve as the "buddy" during the installation of test borings and monitoring wells.

7.4 Site Communications

Communications will be conducted through verbal communications. When out of audible range, verbal communications will be assisted (if necessary) using portable telephones or a 2-way FM radio. Non-verbal communications will be conducted utilizing standard hand signals and air horn signals, as outlined in Attachment 6 of this HASP.

Communications between workers in the various zones shall consist of either the standard hand signals, voice, or radios. The portable telephone will be used to contact appropriate agencies in the event of an emergency.

7.5 Safe Work Practices

Operating procedures consist of general safety rules for all workers. All workers will be conscientious of others working around them and check that they are safe, and working in a safe manner.

General safety rules which will be enforced at, and near, the Clark Street MGP Site include the following:

1. Smoking will be prohibited in any area of the Clark Street MGP Site at all times;

2. Eating and chewing gum will be prohibited in any Work Zone and Decontamination Zone and during sampling activities;

3. Field work will only be conducted during daylight hours unless adequate light is provided;

4. Anyone authorized to enter any Work Zone or Decontamination Zone who does not participate in routine activities will be entered on the daily field report (Attachment 1 of this HASP) and will be required to follow all procedures in this HASP.

5. Workers must thoroughly wash their hands prior to leaving the Work Zone and Decontamination Zone, or after any other sampling activities, before eating, drinking, or any other activities; and

6. No excessive facial hair will be allowed on workers that may be required to wear respiratory equipment.

7.6 Visitors

Visitors will be permitted in the immediate area of active operations only with approval from the HSS. Approval for entry into Work Zones and Decontamination Zones will require physical examination and compliance with training requirements (OSHA 29 CFR 1910.120). All site visitors must be briefed on appropriate sections of the Emergency Response/Contingency Plan (Section 9.0 of this HASP) and the Task/Operation Health and Safety Risk Analysis (Section 3.0 of this HASP). Visitors will be documented on the daily log of all site activities prepared by the HSS or designated alternate for Blasland & Bouck. Visitor vehicles are restricted to Support Zones.

7.7 Nearest Medical Assistance

First Aid supplies will be located near the area of work activity and/or in the appropriate field vehicle. Additional medical assistance can be summoned from the Auburn Fire Department by dialing (315) 253-3211 or the Cayuga County Fire Patrol at (315) 252-7242.

The nearest medical assistance is Auburn Memorial Hospital, located at 17 Lansing Street, Auburn, New York (315) 255-7211, and is approximately one mile from the site. Figure 1 details the emergency route with directions to the hospital from the site. Additional information regarding medical assistance, evacuation routes, emergency procedures, etc., are contained in Section 9.0 of this HASP.

7.8 Safety Equipment

In addition to the PPE necessary to conduct work activities, the following inventory of safety equipment will be available:

1. Industrial first aid kit;
2. Scissors for emergency equipment removal;
3. Emergency eye wash;
4. Rope for securing objects and use as a lifeline;
5. Electrolyte replacement drink - stored in clean area and used to prevent heat stress; and
6. Fire extinguisher for Class A, B, and C fires.

7.9 NYSEG Safety Rules and Regulations

In addition to the above, Blasland & Bouck personnel and subcontractors will follow the NYSEG "Safety Rules and Regulations for Power Plant Contractors" presented in Attachment 3 of this HASP. The HSS or alternate will review these requirements with Blasland & Bouck and subcontractor personnel during the site orientation meeting (see Section 5.1.1 of this HASP) prior to commencing work on the site.

8.0 Decontamination

8.1 Decontamination Plan

The various tasks and specific levels of protection required for each task are put forth in Section 3 of this HASP. Consistent with the levels of protection required, Figure 3 provides a step-by-step representation of the personnel decontamination process for Levels C and D.

All reusable personnel gear which has been used will be cleaned with a detergent and water. Personnel gear may include overboots, hard hats, and respirators. Personnel with equipment working within the Clark Street MGP Site or any work area shall proceed directly to the Decontamination Zone upon completion of work.

Prior to removal of protective gear, personnel will remove soil from boots and gloves using designated wash basins. If other protective gear or clothing is thoroughly soiled, the HSS or designated alternate may decide to dispose of this equipment, rather than try to clean it.

8.2 Level(s) of Protection Required for Decontamination Personnel

The level(s) of protection required for personnel assisting with decontamination will be equivalent to the level of protection to the workers in the Work Zone.

8.3 Equipment Decontamination

Sampling equipment will be decontaminated in accordance with procedures defined in Appendix A to the Work Plan. Decontamination of equipment will be completed either in the Work Zone or in the Decontamination Zone.

Cleaning of small reusable equipment will be performed by hand washing. All sampling equipment will be cleaned prior to use and between samples using procedure identified in Appendix A to the Work Plan.

The disposal requirements for wastes generated during the decontamination procedures are presented in Appendix A to the Work Plan.

8.4 Emergency Decontamination Procedures

In the event of an emergency, the first priority is for all workers to move to a safe location before removing PPE. All workers will quickly and calmly remove disposable equipment and place all reusable equipment at a secured location within the Decontamination Zone for later cleaning. In the event of an injury, the person closest to the injured person will perform the appropriate emergency first aid procedures, and then will remove the injured person's PPE in the Decontamination Zone prior to transporting to an appropriate safe location.

9.0 Emergency Response/Contingency Plan

9.1 General

The following Emergency Response/Contingency Plan includes instruction and procedures for emergency vehicular access, evacuation procedures for personnel, methods of containing fires, and procedures for medical emergencies. All emergency conditions require concise and timely actions that are conducted in a manner that minimizes the health and safety risks.

9.2 Emergency Response/Contingency Plan

All workers shall be familiar with the Emergency Response/Contingency Plan described in this section. The following procedures shall be implemented in the event of an emergency:

1. First aid or other appropriate initial action will be administered by those closest to the accident/event. This assistance will be coordinated by the HSS or designated alternative and conducted in a manner to minimize health and safety risks to those rendering assistance to other workers;

2. Workers shall report all accidents and unusual events to:

    a. HSS; and
    b. Project Manger

3. The HSS or designated alternate is responsible for conducting the emergency response in a rapid and safe manner. The HSS or designated alternate will decide if outside assistance and/or medical treatment is required and shall be responsible for alerting local authorities and arranging for their assistance.

9.3 Incident Reporting Procedures

The HSS will provide to the Project Manager a Report of Accident (Attachment 5 of this HASP) which includes the following:

1. A description of the emergency (including date, time, and duration);

2. Date, time, and name of all persons/agencies notified and their response; and

3. A description of corrective actions implemented or other resolution of the incident.

9.4 Responsibilities

The HSS or designated alternate shall have the responsibility for directing response activities in the event of an emergency, specifically:

1. Assess the situation;
2. Determine required response measures;
3. Notify appropriate response teams; and
4. Determine and direct workers during the emergency.

The HSS or designated alternate shall coordinate any response activities with those of public agencies and is responsible for implementing the emergency response procedures for all workers.

All workers are responsible for conducting themselves in a mature, calm manner in the event of an accident/unusual event.

9.5 Public Response Agencies

A list of public response agencies, who may be contacted in an emergency, depending on the nature of the situation, is included in Table 4 of this HASP. This table presents the local emergency numbers including the local hospital, Cayuga County Health Department, ambulance service, fire and police departments, and utility numbers. In addition, nationwide hotline numbers provided by the United States Environmental Protection Agency (USEPA) for emergency assistance are included. These phone lists should be retained by all workers.

The route to the closest hospital is provided on Figure 1 of this HASP. The HSS will provide direction and/or maps to the hospital to all on-site personnel prior to commencement of on-site activities.

9.6 Accidents and Non-Routine Events

Several types of emergencies are outlined in the following subsections. These are not intended to cover all potential situations, and the corresponding response procedures should be followed using common sense. Every accident is a unique event that must be dealt with by trained personnel working in a calm, controlled manner. In the event of an accident/unusual event, the prime consideration is to provide the appropriate initial response to assist those in the accident while minimizing risks to other workers.

9.6.1 On-Site Personal Injury

If a worker is physically injured, appropriate first aid procedures shall be followed. Depending on the severity of the injury, emergency medical response may be sought. If the worker can be moved, he/she will be taken to the edge of the work area where protective clothing (if any) will be removed, emergency first aid administered, and transportation to a local emergency medical facility provided.

If the injury to the worker is exposure to chemicals, the following first aid procedures are generally initiated as soon as possible:

a. Eye Exposure - If solid or liquid gets into the eyes, wash eyes immediately using water and lifting the lower and upper lids occasionally. Obtain medical attention immediately.

b. Skin Exposure - If solid or liquid gets on the skin, wash skin immediately at the emergency wash station using water. Obtain medical attention immediately.

c. Inhalation - If a person inhales large amounts of organic vapor, move him/her to fresh air at once. If breathing has stopped, appropriately trained personnel should perform cardiopulmonary resuscitation. Keep the affected person warm and at rest. Obtain medical attention immediately.

d. Ingestion - If solid or liquid is swallowed, medical attention shall be obtained immediately.

The HSS or designated alternate shall inform the Blasland & Bouck Project Manager of the injury/accident, and provide a written report detailing the accident, its causes, and consequences within one day of the accident. A copy of the Report of Accident Form is provided as Attachment 5 of this HASP.

9.6.2 Temperature-Related Problems

Excessive heat or cold may affect workers' health and the ability to function. These are discussed in Section 3.8 of this HASP, including first aid procedures.

9.6.3 Fires

Workers will be knowledgeable in fire-suppression techniques. They shall be instructed in proper use of the fire extinguisher(s) supplied. Fire extinguishers should be used only for small fires in the early stages of development. When the fire cannot be controlled through extinguisher use, the area should be evacuated immediately. The local fire department should be called to actually fight the fire.

9.6.4 Precipitation

In general, field and sampling activities can be conducted during rain or snowfall, or light fog. If rain (or snow) becomes heavy it may be necessary to cease all activities. All on-site activities will be halted in the event of a thunder and lightning storm.

9.6.5 Water-Related Incidents

During sampling at the rivers, lakes, etc., personnel will be outfitted with flotation (USCG approved) devices. In addition, a floating safety line will be available in the event that a boat is used. General boat safety procedures will be followed and should comply with OSHA 29 CFR 1926.106. In the event of an incident, the general response considerations set forth in Sections 9.2 and 9.5 of this HASP will be followed.

9.6.6 Emergency Evacuation Procedures

The HSS or designated alternate will initiate emergency evacuation procedures, should an incident be determined to be sufficiently serious to require evacuation of an area. Air monitoring action levels which would require evacuation are discussed in Section 4.3 of this HASP. In addition, fire or other uncontrolled situations would require evacuation. In the event of an evacuation:

a. The HSS or designated alternate will contact all workers by voice or the 2-way FM radio. All workers are to stop work immediately and report to a designated area.

b. A worker count will be conducted.

c. The area in question will be evacuated through the Decontamination Zone, if feasible (provided that zone is not affected). All workers will reassemble at a safe distance.

d. The HSS or designated alternate will contact other response agencies, as warranted.

e. Engines and motorized equipment will be shut off before the site is evacuated.

Tables

TABLE 1

SUMMARY OF CONSTITUENTS DETECTED IN SEDIMENTS AND SURFACE SOILS CLARK STREET MGP SITE AUBURN, NEW YORK[1]

Parameter	Sediment Concentration (mg/kg)	Surface Soil Concentration (mg/kg)
Volatile Organics		
Benzene	ND-1.00	---
Toluene	ND-1.40	ND-0.70J
Ethylbenzene	ND-1.10	---
Total Xylenes	ND-3.50	---
Semi-Volatile Organics		
Bis(2-ethylhexylphthalate)	0.29J-2.10J	ND-0.23J
Pentachlorophenol	---	ND-0.38J
Non-Carcinogenic PAHs		
Acenaphthene	ND-0.19J	ND-3.90J
Acenaphthylene	---	ND-1.50J
2-Methylnaphthalene	---	ND-0.50J
Anthracene	0.51J-2.10J	0.30J-12.00
Dibenzofuran	ND-0.16J	ND-2.10J
Fluoranthene	3.70-17.00	0.63J-68.00
Fluorene	0.17J-0.79J	ND-4.30
Naphthalene	ND-4.90	ND-2.00J
Phenanthrene	2.40-15.00	0.38J-51.00
Pyrene	3.30-21.00	0.65J-63.00
Carcinogenic PAHs		
Benzo(a)anthracene	1.60-7.10	ND-30.00
Benzo(b)fluoranthene	0.835-2.90	0.45J-29.00
Benzo(k)fluoranthene	ND-1.20	ND-45.00
Benzo(a)pyrene	0.84J-4.20J	0.25J-20.00
Chrysene	1.60-6.90	0.38J-28.00
Indeno(1,2,3-cd)pyrene	0.45J-2.20J	0.15J-8.40

TABLE 1
(Cont'd.)

SUMMARY OF CONSTITUENTS DETECTED IN SEDIMENTS AND SURFACE SOILS
CLARK STREET MGP SITE
AUBURN, NEW YORK[1]

Parameter	Sediment Concentration (mg/kg)	Surface Soil Concentration (mg/kg)
Inorganics		
Aluminum	2900-3800	2600-4400
Antimony	ND-9.70	---
Arsenic	7.10-9.10	6.60-33.00
Barium	5.6-58	40-73
Beryllium	<1.00-1.10	ND-<1.00
Cadmium	<0.69-1	---
Calcium	<5,200-170,000	48,000-150,000
Chromium	6.4-16	5.6-12
Copper	50-98	21-94
Cyanide	ND-6.80	ND-9.70
Iron	12000-24000	7,800-20,000
Lead	100-160	34-120
Magnesium	9,500-18,000	1,200-40,000
Manganese	190-310	220-700
Mercury	ND-0.37	0.16-0.45
Nickel	10.00-22.00	15.00-22.00
Potassium	---	680-<1100
Silver	---	ND-4.00
Vanadium	11-16	11-15
Zinc	120-200	58-250

Notes:

[1] These analytical data were reported by Atlantic Environmental Services, Inc., "Manufactured Gas Plant Site Screening Report, Clark Street Site, Auburn, New York" (May 1991).
J = Constituent detected, but below quantification limit (estimated value).
< = Constituent detected, but at a concentration below this reported background concentration.
--- = Constituent not reported as being detected in any samples.

TABLE 2

RESIDUES AND CHEMICAL CONSTITUENTS ASSOCIATED WITH MGP SITES*

RESIDUES	• Free tars, oil, and lampblack • Organic-contaminated soils - Heavily contaminated - Lightly contaminated	• Organic-contaminated vessel, surface, and ground waters • Purifier wastes • Mixed wastes and fill

CHEMICALS				
Inorganics	**Metals**	**Volatile Aromatics**	**Phenolics**	**Polynuclear Aromatic Hyrdocarbons**
Ammonia	Aluminum	Benzene	Phenol	Acenaphthene
Chloride	Antimony	Ethyl Benzene	2,4-Dimethylphenol	Acenaphthylene
Cyanide	Arsenic	Nitrobenzene		Anthracene
Fluoride	Barium	N-Propylbenzene		Benzo(a)anthracene
Nitrate	Beryllium	Toluene		Benzo(a)pyrene
Phosphate	Boron	Total Xylenes		Benzo(b)fluoranthene
Silicon	Cadmium	Trimethylbenzene		Benzo(b,k)fluoranthene
Sulfate	Calcium			Benzo(g,h,i)perylene
Sulfide	Chromium			Benzo(k)fluoranthene
	Cobalt			Chrysene
	Copper			Dibenzo(a,h)anthracene
	Iron			Dibenzofuran
	Lead			Dimethylnaphthalene
	Magnesium			Fluoranthene
	Manganese			Fluorene
	Mercury			Indeno(1,2,3-cd)Pyrene
	Nickel			Naphthalene
	Potassium			Phenanthrene
	Selenium			Pyrene
	Silver			1-Chloronaphthalene
	Sodium			1-Methylnaphthalene
	Thallium			2-Methylnaphthalene
	Vanadium			
	Zinc			

* Gas Research Institute, 1987. Management of Manufactured Gas Plant Sites, Volume I, Wastes and Chemicals of Interest, Gas Research Institute, GRI-87/0260.1, October.

TABLE 3

PHYSICAL HAZARDS

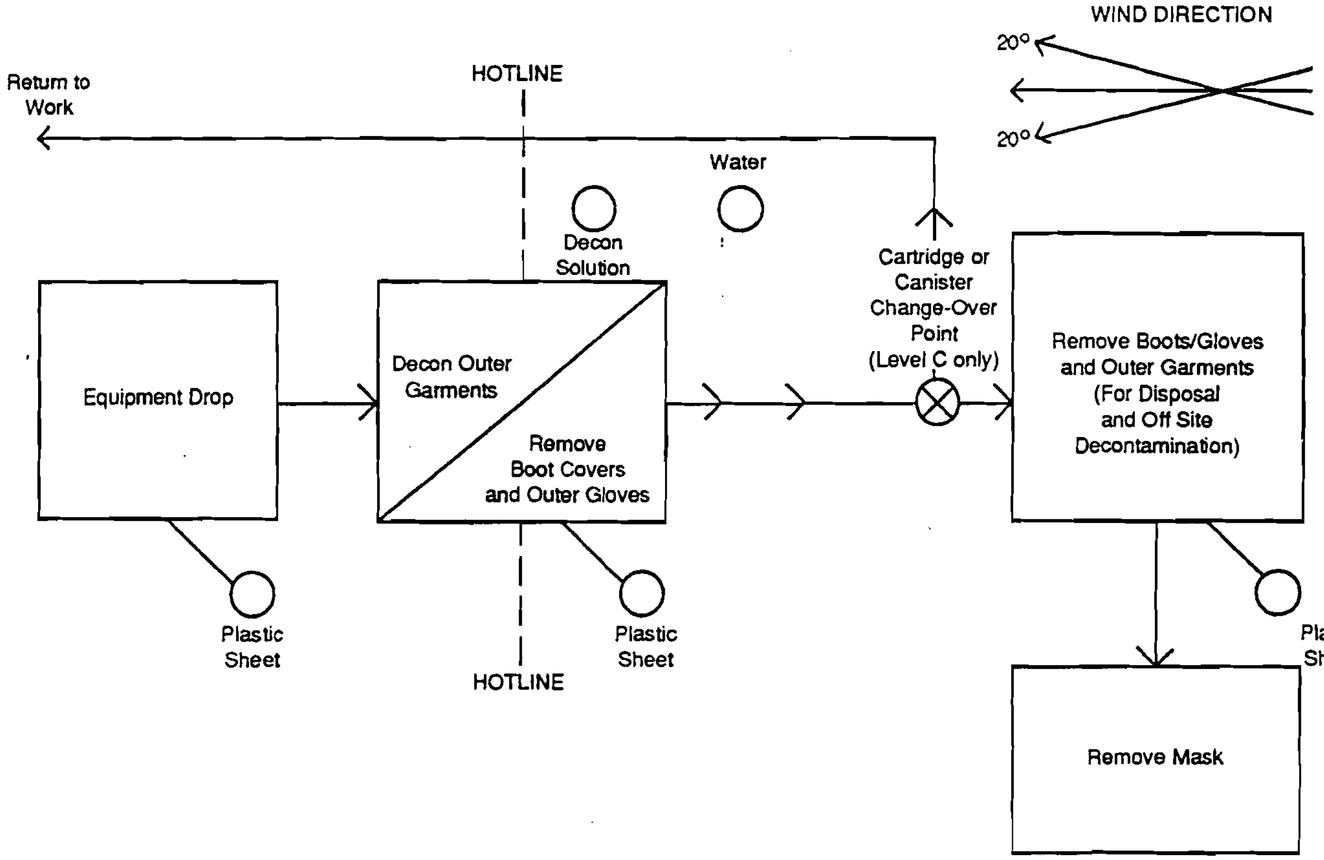
Physical Hazard	Protection Mechanism
Noise	Hearing protection when elevated noise level exist (test pitting/drilling)
Heavy Manual Lifting	Lift with legs; get assistance (all field activities)
Housekeeping	Store equipment properly Remove rubbish/scrap material from work area (all field activities)
Compressed Gases (calib. gas)	Store properly (test pitting/drilling)
Working over Water	USCG approved life jackets or vests available Ring Buoy with 90 feet of line available (sediment sampling)
Vehicle Traffic	Warning signs; away from work area (test pitting/drilling/ground-water sampling)
Heavy Equipment	Trained/licensed operators; warning signs Backup alarms (test pitting/drilling)
Using Ladders	Examine for defects prior to use (N/A)
Materials Handling	Material stacked/stored to prevent collapsing Machinery properly braced (test pitting)
Hazardous Material Storage	Segregate flammable/combustible liquid from ignition sources Store in approved containers Solvent waste, oily rags, and liquids kept in fire-resistant containers (test pitting/drilling/waste sampling)
Fire Prevention	Training in fire extinguisher use and classes (test pitting/drilling/waste sampling)
Electrical	Approved grounding and bonding procedures Electrical lines/cords/cables guarded and maintained Damaged equipment tagged/removed from service (test pitting/drilling) Equipment at least 10 feet from overhead electric lines
Hand/Power Tool	Guards and safety devices in place drilling/waste sampling)
Tools	Defective tools tagged/removed from service Tools maintained and inspected; intrinsically safe Proper eye protection used (ground-water and waste sampling)
Underground Utilites	Call UFPO to mark utilities Hand excavate in areas where utilities can not be clearly defined.

NA = Not applicable to tasks during these RI field activities.

FIGURE 3

MINIMUM DECONTAMINATION LAYOUT

LEVEL C AND MODIFIED D PROTECTION



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ATTACHMENT 1 - DAILY FIELD REPORTS

DAILY FIELD REPORT
ATTACHMENT 1

DATE ____________________

DAY ☐ S ☐ M ☐ T ☐ W ☐ TH ☐ F ☐ S

PROJECT ____________________

JOB NO. ____________________

CLIENT ____________________

CONTRACTOR ____________________

PROJECT MANAGER ____________________

WEATHER	Brite Sun	Clear	Overcast	Rain	Snow
TEMP.	To 32	32 50	50 70	70 85	85 up
WIND	Still	Moder	High	Report No.	
HUMIDITY	Dry	Moder	Humid		

AVERAGE FIELD FORCE

NAME			REMARKS

VISITORS

TIME	REPRESENTING	REPRESENTING	REMARKS

EQUIPMENT AT THE SITE

FIELD ACTIVITIES

PAGE 1 OF ____ PAGES

BY ____________________ TITLE ____________________

BLASLAND & BOUCK ENGINEERS, P.C.
ENGINEERS & GEOSCIENTISTS

ATTACHMENT 2 - TRAINING ACKNOWLEDGEMENT FORM

TRAINING ACKNOWLEDGEMENT FORM

Name: ______________________________

Address: ______________________________

Social Security No: ______________________________

Employer: ______________________________

Site Involvement: ______________________________

____

I have completed and understand the training program(s) for work to be performed at this project site. I have received training on the following subjects during my initial site orientation:

_______ A. Names of Site Health and Safety Personnel and Alternates.

_______ B. Work Rules and Safe Work Practices.

_______ C. Personal Protective Equipment.

_______ D. Site Chemical and Physical Hazards.

_______ E. Safe Use of Engineering Controls and Site Equipment.

_______ F. Medical Surveillance Requirements.

_______ G. Symptoms which may indicate overexposure to site hazards.

_______ H. Site Control Measures

_______ I. Decontamination Procedures

_______ J. Emergency Response Plan

_______ K. Standard Operating Procedures

Other (List): ______________________

____

____

Additionally, I certify that I have completed the necessary training required by 29CFR 1910.120 (e) Training as indicated below:

Level of Training:

24-hour _____ 40-hour _____ 8-hour Supervisory _____

Equivalent* _____

Certificate(s) Attached _____ Yes _____ No

Date(s) Completed: ______________________

Annual Refresher (8-hour) Date: ______________________

Certificate Attached: _____ Yes _____ No

Site Training Completed: _______ 3-day _______ 1-day

Date: __________

Employee Signature: ______________________ Date: _________

HSO Signature: ______________________ Date: ____

* See attached Supplemental Training Acknowledgment

SUPPLEMENTAL TRAINING ACKNOWLEDGEMENT

This form is to be completed as a supplement to the Training Acknowledgment Form and retained along with the training form on-site with the HASP. See section 5.6 - Equivalent Training

Name: ______________________________

Social Security No: _______________

Provide details which demonstrate your academic and/or work experience as it pertains to activities on hazardous waste sites (be specific):

Signature: ______________________________

Date: ______________________________

ATTACHMENT 3 - NEW YORK STATE ELECTRIC & GAS CORPORATION SAFETY RULES AND REGULATIONS FOR POWER PLANT CONTRACTORS

ATTACHMENT 3
NEW YORK STATE ELECTRIC & GAS

SAFETY RULES AND REGULATIONS
for
POWER PLANT CONTRACTORS

For the protection of workers and the public, power plant contractors will take all necessary and advisable precautions for the safety of all persons and property at, on, or near the work site and will erect and maintain all necessary and advisable safeguards, as required by the conditions and progress of the work.

Contractors will comply with all applicable Federal, State and Local laws, ordinances and regulations and the rules and regulations of any agency having jurisdiction on the premises.

Without limiting the foregoing, or the obligation of contractors, power plant contractors and their employees are required to take special notice of the following minimum safety rules when working for NYSEG.

A. PERSONAL SAFETY EQUIPMENT

1. Eye protection - All personnel MUST wear approved safety eye protection while working in or around generating stations (except in offices, control rooms and similar areas). Cover-all goggles shall be used when employees are using power operated tools to grind, chip, cut or breakup material.

2. Hard hats or hard caps must be worn while working at all generating station locations. Bump caps, metal hard hats, and metal hard caps are forbidden.

3. Clothing - All personnel working on NYSEG property shall be adequately clothed at at all times. It is recommended that safety shoes and other appropriate personal protective clothing be considered and its use encouraged. Cotton fabrics are recommended in all Generating Stations.

B. LADDERS

1. All straight and extension ladders must be equipped with approved safety feet.

2. Metal ladders are not to be used while working in proximity to energized electrical facilities at any time.

3. Contractor employees are not to use NYSEG ladders or tools at any time. Contractors are required to furnish their own ladders, tools and equipment. Specific exceptions to this rule shall be written and made part of the contract.

C. SCAFFOLDS

1. Safe and adequate scaffolding must be used. All scaffolding and scaffolding procedures shall be in compliance with current OSHA

standards and regulations.

D. OVERHEAD WORK

1. Overhead work is prohibited when employees working underneath are not protected from falling tools, equipment, and material.

2. All girders, beams and overhead surfaces shall be kept free of nuts, bolts, tools and other material unless actually in use.

3. Employees shall use appropriate safety belts and lanyards whenever they are exposed to a falling hazard.

E. ELECTRICAL

1. Only authorized and qualified personnel shall work on the installation of wiring, troubleshooting, or repair of electrical equipment. All wiring performed shall be in conformance with OSHA and National Electric Code specifications.

2. Equipment requiring lockout and/or tag-out shall be under the supervision of authorized NYSEG personnel.

F. FIRE REGULATIONS & HOT WORK PERMIT

1. The contractor shall provide a fire watch if the hazard dictates a need for one. All welding areas will be properly barricaded. Hot Work Permits are required except in welding shops or other authorized welding and cutting areas.

2. All acetylene and oxygen cylinders must be stored in an upright position and properly secured with chain or cable. Cylinders shall be used and stored in accordance with OSHA regulations.

3. Contractors shall provide adequate fire extinguishers in good working order and properly filled. Contractors shall abide by the NYSEG requirement that extinguishers be present at excavations and work sites where live gas work is being performed. Contractors shall be responsible for providing fire extinguishers and fire suppression equipment at building sites under construction.

4. Contractors may not use vaporizing liquid-type extinguishers containing carbon tetrachloride. Contractors are not to use NYSEG fire extinguishing equipment unless in an emergency. Where cutting, burning or welding is to be done overhead in plant, a person must be stationed below with an approved fire extinguisher. Suitable fire retardant blankets should be used to contain sparks and hot metal. Welding screens shall be used.

5. In-plant fire hydrants and hoses are not to be used for purposes other than fire fighting, without permission of NYSEG.

G. STORAGE OF FLAMMABLE LIQUIDS & GASES

1. Paints, paint thinners, gasoline, oil or other flammable materials

   shall be stored only in small quantities and in approved containers and areas. The area where such materials are stored must be accessible and clean at all times. "No Smoking" signs must also be placed at the storage site. Containers must be properly identified as to contents. NYSEG Safety Department personnel shall provide guidance for the selection of storage areas for flammables.

2. Compressed gas cylinders must be moved, stored, and handled in an upright position. Transporting horizontally or by means of "barrel rolling" tactics is forbidden. No cylinders shall be moved with the protective cap off or regulator attached except when secured in an approved welding cart or truck. All cylinders, whether charged or empty, must be secured in an upright position, remote from possible damage.

   Oxygen cylinders in storage shall be separated from fuel-gas cylinders or combustible materials a minimum distance of 20 feet or by a non-combustible barrier at least 5 feet high, having a fire resistance rating of at least ½ hour.

3. Painting, or any work procedure that may produce toxic fumes, shall not be permitted in employee work areas unless adequate ventilation can be provided.

H. GENERAL SAFETY PRACTICES

1. Intoxicants - Possession of or drinking of alcoholic beverages is strictly prohibited on company premises at all times. Reporting to work under the influence is prohibited and any person under the influence shall not be permitted on the premises.

2. Possession, use or transfer of controlled substances (as defined in section 220.00 of the New York State Penal Law) is forbidden.

3. Contractor personnel must not enter any building or area where work does not require their presence. Wandering about the plant is forbidden.

I. HOUSEKEEPING

1. Good housekeeping practices are to be adhered to with the work place kept clean and orderly. Trash shall be deposited in proper waste containers. Trash shall not accumulate but shall be removed promptly.

J. SMOKING

1. Smoking is forbidden in areas so marked.

K. BARRICADING

1. Open sided floors and temporary floor openings shall be adequately protected and barricaded to minimize the hazards to contractor and company personnel.

L. SUB-CONTRACTORS

1. The contractor is responsible for informing any sub-contractor which he may employ as regards the safety rules and regulations set forth here and those terms and conditions agreed to by contract.

M. ASBESTOS

1. Under no circumstances is the contractor to remove any asbestos insulation, unless otherwise directed in writing by the Company. When contractor encounters asbestos or other similar material of a suspicious nature, contractor shall immediately notify the designated NYSEG representative.

ATTACHMENT 4 - RESPIRATORY INSPECTION/MAINTENANCE LOG

RESPIRATOR INSPECTION/ MAINTENANCE LOG

FIT TEST

RESPIRATOR OWNER	INSPECTION DATE	POS./NEG. PRESSURE TEST	FIT TEST (PASS/FAIL)	DATE	INITIALS

ATTACHMENT 5 - HEALTH AND SAFETY REPORT OF ACCIDENT

HEALTH & SAFETY REPORT OF ACCIDENT

Date ____________________

DAY

S	M	T	W	TH	F	S

WEATHER	[illegible]	[illegible]	[illegible]	[illegible]	
TEMP.	To 32	32 50	50 70	70 85	85 up
WIND	[illegible]	[illegible]	[illegible]	[illegible]	

Project ____________________

Unit ____________________

Proj. No. ____________________ Contract No. ____________________

Contractor: ____________________

Sub-Contractor: ____________________

Date of Accident: ____________ Time: __________ AM/PM Location: ____________________

Description of Accident: ____________________

Primary Cause: ____________________

Contractor's Personnel or Equipment

Name of Injured Employee: ____________________ Age: ________

Occupation: ____________________ Sex: ________

Nature of Injury: ____________________

Degree of Injury: ________ First Aid ☐ Doctor Visit ☐ Hospital ☐ Fatality ☐

Type of Equipment: ____________________

Extent of Damage: ____________________

Other Persons or Property

Name of Injured Party: ____________________ Age: ________

Address: ____________________ City: ____________ State: ________

Nature of Injuries: ____________________

Name of Property Owner: ____________________ Address: ____________________

Nature and Extent of Damages: ____________________

Was Use or Lack of Safety Equipment a Factor in This Accident: ____________________

If so, Explain: ____________________

What Safety Regulations Were Violated: ____________________

What Corrective Action Has Been Taken by the Contractor: ____________________

DISTRIBUTION:
1. Project Manager
2. Legal Staff
3. Engineer/Architect
4. Project File

Report by: ____________________

Title: ____________________

Wiley-Fisk Form 6-13

ATTACHMENT 6 - STANDARD HAND SIGNALS, AIR HORN SIGNALS

STANDARD HAND SIGNALS

Hand gripping throat.	Can't breathe.
Grip partner's wrist or both hands around waist.	Leave area immediately.
Hands on top of head. Thumbs up.	OK, I'm all right, I understand.
Thumbs down.	No, negative.

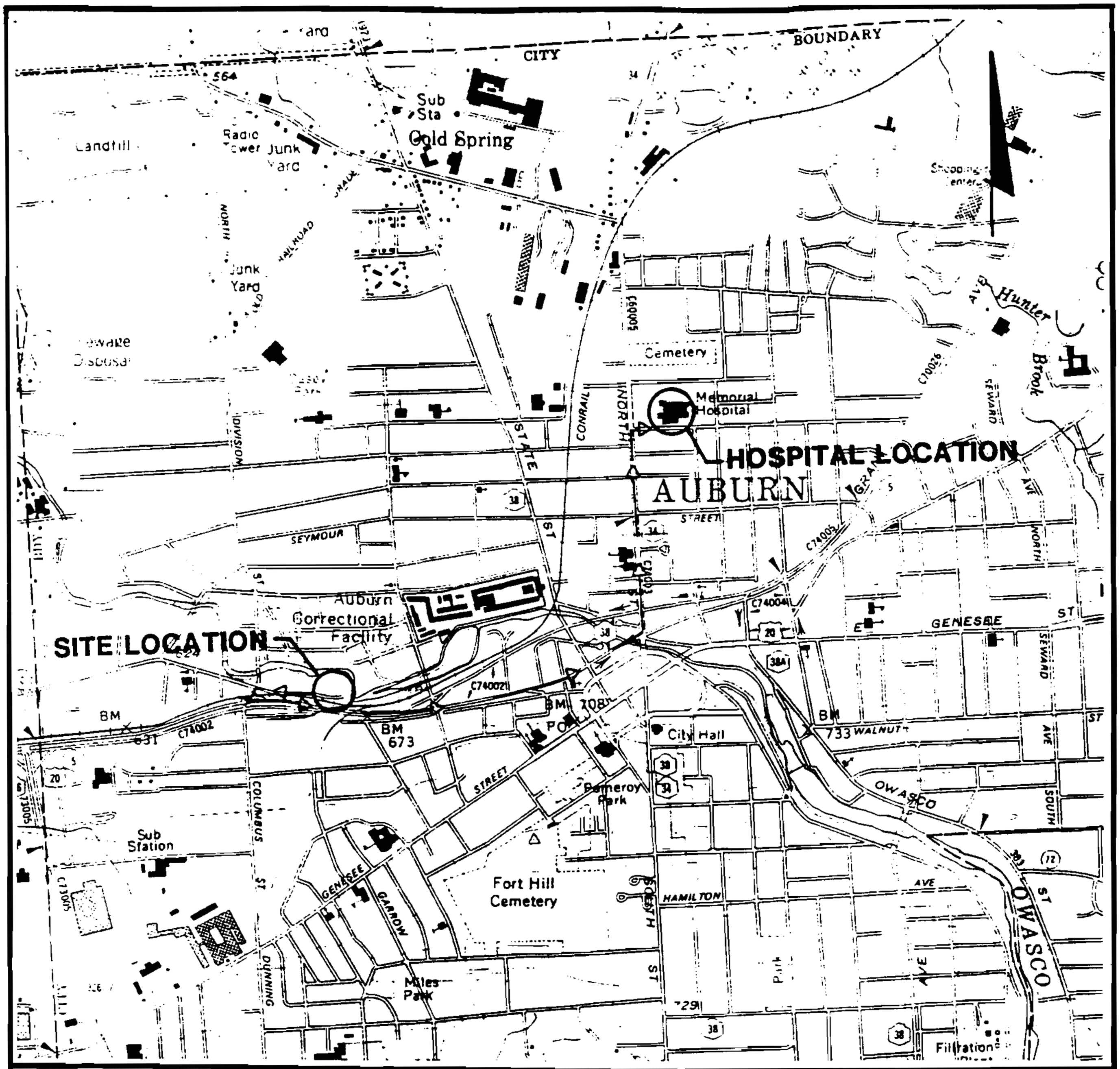
If immediate notification of evacuation of the workers is necessary, the HSO will use the air horn to alert the workers.

AIR HORN SIGNALS

Long blast.	Leave site immediately.
(Two second blast followed by two second break)	

ATTACHMENT 7 - MATERIAL SAFETY DATA SHEETS

FIGURE 1



EMERGENCY ROUTE DIRECTIONS

- Take the Clark Street access road to Clark Street.
- Take the Clark Street on-ramp for Route 5, heading east.
- Exit Route 5 at North Street.
- Head north on North Street until reaching Lansing Street.
- Turn right onto Lansing, Auburn Memorial is on the left.

SCALE

2,000' 0' 2,000'

NEW YORK STATE
ELECTRIC & GAS CORPORATION

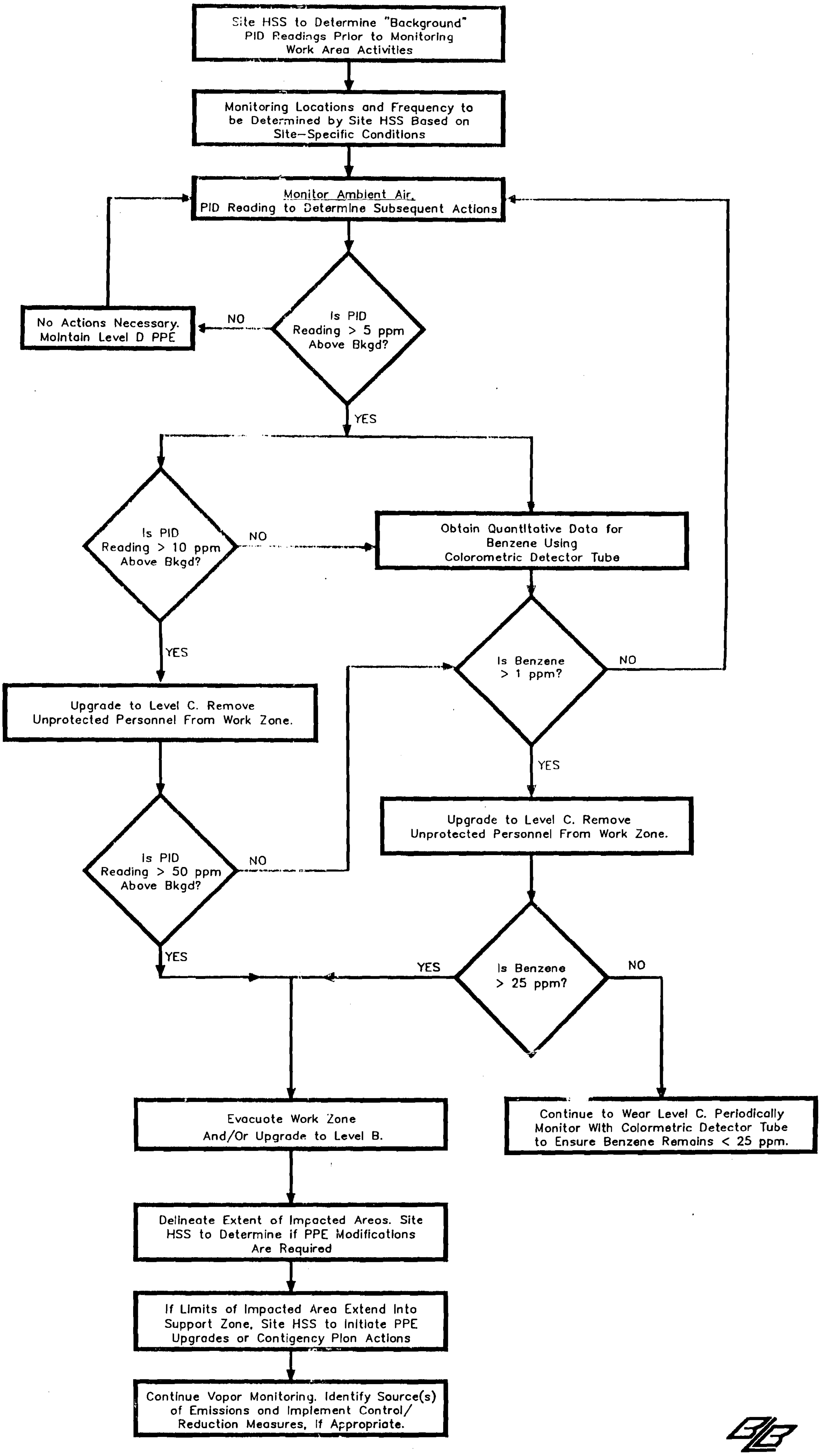
AUBURN, NEW YORK
CLARK STREET SITE

EMERGENCY ROUTE MAP

BLASLAND & BOUCK ENGINEERS, P.C.
ENGINEERS & GEOSCIENTISTS

FIGURE 2

VAPOR MONITORING ACTION LEVELS AND RESPONSES



06/92 DJH
1010204C/10102N02

BLASLAND & BOUCK ENGINEERS, P.C.
ENGINEERS & GEOSCIENTISTS

Material Safety Data Sheet

From Genium's Reference Collection
Genium Publishing Corporation
1145 Catalyn Street
Schenectady, NY 12303-1836 USA
(518) 377-8855

GENIUM PUBLISHING CORP.

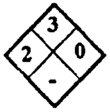
No. 316

BENZENE
(Revision D)
Issued: November 1978
Revised: April 1988

SECTION 1. MATERIAL IDENTIFICATION

25

Material Name: BENZENE



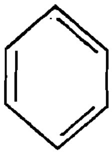
Description (Origin/Uses): Used in the manufacture of medicinal chemicals, dyes, linoleum, airplane dopes, varnishes, and lacquers; and as a solvent for waxes, resins, and oils.

Other Designations: Benzol; Phene; Phenylhydride; C_6H_6; NIOSH *RTECS* No. CY1400000; CAS No. 0071-43-2

Manufacturer: Contact your supplier or distributor. Consult the latest edition of the *Chemicalweek Buyers' Guide* (Genium ref. 73) for a list of suppliers.

HMIS			
H	2		
F	3	R	1
R	0	I	4
PPG*		S	2
*See sect. 8		K	4

SECTION 2. INGREDIENTS AND HAZARDS

SECTION 2. INGREDIENTS AND HAZARDS	%	EXPOSURE LIMITS
Benzene, CAS No. 0071-43-2  *See NIOSH, *RTECS*, for additional data with references to irritative, mutagenic, tumorigenic, and reproductive effects.	Ca 100	**OSHA PEL** 8-Hr TWA: 1 ppm 15-Min Ceiling: 5 ppm Action Level: 0.5 ppm **ACGIH TLV, 1987-88** TLV-TWA: 10 ppm, 30 mg/m³ **Toxicity Data*** Human, Inhalation, LC_{Lo}: 2000 ppm/5 Min Human, Oral, TD_{Lo}: 130 mg/kg Human, Inhalation, TC_{Lo}: 210 ppm

SECTION 3. PHYSICAL DATA

Boiling Point: 176°F (80°C)
Melting Point: 42°F (5.5°C)
Vapor Pressure: 75 Torrs at 68°F (20°C)
Vapor Density (Air = 1): >1

Water Solubility (%): Slight
% Volatile by Volume: 100
Molecular Weight: 78 Grams/Mole
Specific Gravity (H_2O = 1): 0.87865 at 68°F (20°C)

Appearance and Odor: A colorless liquid; characteristic aromatic odor.

SECTION 4. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temperature	Flammability Limits in Air	LOWER	UPPER
12°F (-11.1°C) CC	928°F (498°C)	% by Volume	1.3%	7.1%

Extinguishing Media: Use dry chemical, foam, or carbon dioxide to put out benzene fires. Water may be ineffective as an extinguishing agent because it can scatter and spread the fire. Use water to cool fire-exposed containers, flush spills away from exposures, disperse benzene vapor, and protect personnel attempting to stop an unignited benzene leak.

Unusual Fire or Explosion Hazards: Benzene vapor is heavier than air and can collect in low-lying areas such as sumps or wells. Eliminate all sources of ignition there to prevent a dangerous flashback to the original liquid benzene. **Danger:** Explosive and flammable benzene vapor-air mixtures can easily form at room temperature; always use this material in a way that minimizes dispersion of its vapor into general work areas.

Special Fire-fighting Procedures: Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode.

SECTION 5. REACTIVITY DATA

Benzene is stable in closed containers during routine operations. It does not undergo hazardous polymerization.

Chemical Incompatibilities: Hazardous chemical reactions involving benzene and the following materials are reported in Genium reference 84: bromine pentafluoride, chlorine, chlorine trifluoride, chromic anhydride, nitryl perchlorate, oxygen, ozone, perchlorates, perchloryl fluoride and aluminum chloride, permanganates and sulfuric acid, potassium peroxide, silver perchlorate, and sodium peroxide.

Conditions to Avoid: Avoid all exposure to sources of ignition and to incompatible chemicals.

Hazardous Products of Decomposition: Toxic gases like carbon monoxide (CO) may be produced during benzene fires.

SECTION 6. HEALTH HAZARD INFORMATION

Benzene is listed as a suspected human carcinogen by the ACGIH.
Summary of Risks: Prolonged skin contact with benzene or excessive inhalation of its vapor may cause headache, weakness, loss of appetite, and lassitude. Continued exposure can cause collapse, bronchitis, and pneumonia. The most important health hazards are cancer (leukemia), bone marrow effects, and injuries to the blood-forming tissue from chronic low-level exposure.
Medical Conditions Aggravated by Long-Term Exposure: Ailments of the heart, lungs, liver, kidneys, bl d, and central nervous system (CNS) may be worsened by exposure. Administer preplacement and periodic medical exams empha ing these organs' functions and reassign workers who test positive. **Target Organs:** Blood, CNS, bone marrow, eyes, and upper piratory tract (URT). **Primary Entry:** Skin contact, inhalation. **Acute Effects:** Dizziness, mental dullness, nausea, heac e, fatigue, and giddiness. **Chronic Effects:** Possible cancer (leukemia).

FIRST AID
Eyes: Immediately flush eyes, including under the eyelids, gently but thoroughly with plenty of running water least minutes.
Skin: Immediately wash the affected area with soap and water.
Inhalation: Remove the exposed person to fresh air; restore and/or support his or her breathing as needed.
Ingestion: Never give anything by mouth to someone who is unconscious or convulsing. Do not induce vomi because of the possibility of aspiration.

GET MEDICAL HELP (IN PLANT, PARAMEDIC, COMMUNITY) FOR ALL EXPOSURES. Seek prompt medical assistance for further treatment, observation, and support after first aid.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

Spill/Leak: Notify safety personnel, provide ventilation, and eliminate all sources of ignition immediately. Cleanup personnel need protection against contact with and inhalation of vapor (see sect. 8). Contain large spills and collect waste or absorb it with an inert material such as sand, earth, or vermiculite. Use nonsparking tools to place waste liquid or absorbent into closable containers for disposal. Keep waste out of sewers, watersheds, and waterways.
Waste Disposal: Contact your supplier or a licensed contractor for detailed recommendations for disposal. Follow Federal, state, and local regulations.

OSHA Designations
Air Contaminant (29 CFR 1910.1000 Subpart Z)
EPA Designations (40 CFR 302.4)
RCRA Hazardous Waste, No. U019
CERCLA Hazardous Substance, Reportable Quantity: 1000 lbs (454 kg)

SECTION 8. SPECIAL PROTECTION INFORMATION

Goggles: Always wear protective eyeglasses or chemical safety goggles. Where splashing is possible, wear a full face shield. Follow the eye- and face-protection guidelines in 29 CFR 1910.133. **Respirator:** Wear a NIOSH-approved respirator per the *NIOSH Pocket Guide to Chemical Hazards* for the maximum-use concentrations and/or the exposure limits cited in section 2. Follow the respirator guidelines in 29 CFR 1910.134. For emergency or nonroutine use (e.g., cleaning reactor vessels or storage tanks), wear an SCBA with a full facepiece operated in the pressure-demand or positive-pressure mode. **Warning:** Air-purifying respirators will *not* protect workers in oxygen-deficient atmospheres. **Other:** Wear impervious gloves, boots, aprons, gauntlets, etc., to prevent any possibility of skin contact with this suspected human carcinogen. **Ventilation:** Install and operate general and local ventilation systems powerful enough to maintain airborne levels of benzene below the OSHA PEL standard cited in section 2.
Safety Stations: Make eyewash stations, washing facilities, and safety showers available in use and handling areas. **Contaminated Equipment:** Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them. Do *not* wear contact lenses in any work area. Remove contaminated clothing and launder it before wearing it again; clean this material from shoes and equipment. **Comments:** Practice good personal hygiene; always wash thoroughly after using this material. Keep it off of your clothing and equipment. Avoid transferring it from your hands to your mouth while eating, drinking, or smoking. Do *not* eat, drink, or smoke in any work area. Do not inhale benzene vapor!

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Storage/Segregation: Store benzene in a cool, dry, well-ventilated area away from sources of ignition and incompatible chemicals.
Special Handling/Storage: Protect containers from physical damage. Electrically ground and bond all metal containers used in shipping or transferring operations. Follow all parts of 29 CFR 1910.1028.
Engineering Controls: All engineering systems (production, transportation, etc.) must be of maximum explosion-proof design (non-sparking, electrically grounded and bonded, etc.)
Comments: If possible, substitute less toxic solvents for benzene; use this material with extreme caution and only if it is absolutely essential.

Transportation Data (49 CFR 172.101-2)

DOT Shipping Name: Benzene	**DOT Label:** Flammable Liquid	**IMO Label:** Flammable Liquid
DOT Class: Flammable Liquid	**DOT ID No.** UN1114	**IMO Class:** 3.2

References: 1, 2, 12, 73, 84-94, 100, 103.

Prepared by PJ Igoe, BS
Industtrial Hygiene Review: DJ Wilson, CIH
Medical Review: MJ Hardies, MD

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Material Safety Data Sheets Collection:

Sheet No. 757
Coal Tar Creosote

Issued: 7/91

Section 1. Material Identification

34

Coal Tar Creosote (molecular formula varies with purity) Description: Three main derivations: by distillation of coal tar produced by high-temperature carbonization of bituminous coal; by mixing strained naphthalene oil, wash oil, and strained or light anthracene oil; as a by-product of conventional coal coking. It typically contains up to 160 chemicals, mainly aromatic compounds such as phenol, pyrol and pyridine. Used mainly as a wood preservative for railroad ties, poles, fence posts, marine pilings, and other lumber for outdoor use; as a water-proofing agent, fuel oil constituent, frothing agent for mineral separation, hop defoliant, and lubricant for die molds; in manufacturing chemicals; and in medicine as an antiseptic, disinfectant, antipyretic, astringent, germicide, and styptic.
Other Designations: CAS No. 8001-58-9, Awpa,® brick oil, Caswell No. 225,® coal tar oil, creosote, creosote oil, creosotum, cresylic creosote, heavy oil, liquid pitch oil, naphthalene oil, Preserv-o-sote,® Sakresote,® tar oil, wash oil.
Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*[73] for a suppliers list.
Cautions: Flammable, liquid coal tar creosote is toxic by inhalation, ingestion, and skin contact. The IARC and NTP classify it as *a human carcinogen.*

R 1
I 4
S 4*
K 2
* Skin absorption

NFPA


HMIS
H 2
F 2
R 0
PPG†
† Sec. 8

* Skin absorption can occur with phenol, a major component of coal tar creosote.

Section 2. Ingredients and Occupational Exposure Limits

Coal tar creosote, ca 100%

1990 OSHA PEL
8-hr TWA: 0.2 mg/m³*

1987 IDLH Level
700 mg/m³

1990-91 ACGIH TLV
TWA: 0.2 mg/m³*

1990 NIOSH REL
0.1 mg/m³ (cyclohexane extractable portion)

1985-86 Toxicity Data†
Rat, oral, LD_{50}: 725 mg/kg; toxic effects not yet reviewed
Dog, oral, LD_{Lo}: 600 mg/kg; toxic effects not yet reviewed
Rat, TD_{Lo}: 52,416 mg/kg administered during 91 days prior to mating produces reproductive effects on fallopian tubes and ovaries
Mouse, skin, TD_{Lo}: 99 g/kg produces tumors in skin and appendages

* As coal tar pitch volatiles.
† See NIOSH, *RTECS* (GF8615000), for additional mutation, reproductive, tumorigenic, and other toxicity data.

Section 3. Physical Data

Boiling Point: 381 to 752 °F (194 to 400 °C)
Distillation Range: 446 to 554 °F (230 to 290 °C)
Heat of Combustion: -12,500 Btu/lb
Heat of Vaporization: 107 Btu/lb
Molecular Weight: Varies with purity
Density/Specific Gravity: 1.07 to 1.08 at 68 °F (20 °C)
Water Solubility: Slightly soluble

Appearance and Odor: Pure coal tar creosote is colorless, but the industrial product is a yellow to black oily liquid with an aromatic smoky smell and a burning caustic taste.

Section 4. Fire and Explosion Data

Flash Point: 165.2 °F (74 °C), CC	**Autoignition Temperature:** 637 °F (336 °C)	**LEL:** None reported	**UEL:** None reported

Extinguishing Media: For small fires, use dry chemical, carbon dioxide (CO_2), or regular foam. For large fires, use fog or regular foam. Since water is least effective, use it as an extinguishing agent only when the preferred measures are unavailable. However, use water spray to cool fire-exposed containers.
Unusual Fire or Explosion Hazards: Vapors may travel to an ignition source and flash back. Containers may explode in heat of fire. Coal tar creosote presents a vapor explosion hazard indoors, outdoors, and in sewers.
Special Fire-fighting Procedures: Since fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Also, wear full protective clothing. Stay away from ends of tanks. For massive fire in cargo area, use monitor nozzles or unmanned hose holders; if impossible, withdraw from area and let fire burn. Immediately leave area if you hear a rising sound from venting safety device or notice any fire-caused tank discoloration. Isolate area for 1/2 mile in all directions if fire involves tank, rail car or tank truck. Be aware of runoff from fire control methods. Do not release to sewers or waterways. Fully decontaminate or properly dispose of personal protective clothing.

Section 5. Reactivity Data

Stability/Polymerization: Coal tar creosote is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.
Chemical Incompatibilities: Creosote oil mixed with chlorosulfonic acid in a closed container causes an increase in temperature and pressure.
Conditions to Avoid: Avoid excessive heat and contact with chlorosulfonic acid.
Hazardous Products of Decomposition: Thermal oxidative decomposition of coal tar creosote can produce oxides of carbon and thick, black, acrid smoke.

Section 6. Health Hazard Data

Carcinogenicity: In 1990 reports, the IARC, NTP, and OSHA list coal tar creosote as a carcinogen.
Summary of Risks: Coal tar creosote is toxic by inhalation, ingestion, and skin contact. It contains a variety of hydrocarbons such as phenol and polycyclic aromatic hydrocarbons such as benzo[a]pyrene, benzanthracene, and phenol derivatives. The range of toxicity depends on the exposure concentration, amount, and duration. Effects may include irritation, burns, and several forms of cancer.
Medical Conditions Aggravated by Long-Term Exposure: Chronic respiratory or skin diseases.
Target Organs: Eyes, skin, bladder, kidneys, and respiratory system.
Primary Entry Routes: Inhalation, ingestion, and skin contact.
Acute Effects: Skin contact may cause irritation, burning, itching, redness, pigment changes, dermatitis (a rash of redness and small bumps), or burns. Photosensitization (worsening of rash with exposure to sunlight) may occur. Inhalation may be irritating to the respiratory tract. Eye contact may cause conjunctivitis (inflammation of the eye's lining), keratitis (corneal inflammation), or corneal burns with scarring. Ingestion may result in nausea, vomiting, abdominal pain, rapid pulse, respiratory distress, and shock. Systemic absorption by any route (including skin absorption) may cause trouble breathing, thready (continuous or drawn out) pulse, dizziness, headache, nausea, vomiting, sal[illegible]n, and convulsions. Exposure to large doses (particularly by ingestion) may be fatal.
Chronic Effects: Dermatitis, skin cancer, and lung cancer.
FIRST AID
Eyes: Gently lift the eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. *Do not* let victim rub eyes or keep them tightly closed. Consult a physician immediately.
Skin: *Quickly* remove contaminated clothing. Wash affected area with soap and flooding amounts of water for at least 15 min. For reddened or blistered skin, consult a physician.
Inhalation: Remove exposed person to fresh air and support breathing as needed.
Ingestion: Never give anything by mouth to an unconscious or convulsing person. If ingested, have that *conscious* person drink 1 to 2 glasses of milk or water. *Do not induce vomiting!*
After first aid, get appropriate in-plant, paramedic, or community medical support.
Note to Physicians: Cresol may be detected in urine.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel. Isolate hazard area, deny entry, and stay upwind of spills. Shut off all ignition sources—no flares, smoking, or flames in hazard area. Cleanup personnel should protect against vapor inhalation and skin or eye contact. If possible with no risk, stop leak. Water spray may be used to reduce vapor but it may not prevent ignition in closed spaces. For small spills, take up with earth, sand, vermiculite, or other absorbent, noncombustible material and place in suitable containers for later disposal. For large spills, dike far ahead of liquid spill for later disposal. Follow applicable OSHA regulations (29 CFR 1910.120).
Environmental Degradation: Coal tar creosote is fouling to shoreline. Ecotoxicity values are: TL_{50}, goldfish (*Carassius auratus*), 3.51 ppm/24 hr (60:40) mixture of creosote and coal tar; LD_{50}, bob white quail (*Colinus virginianus*), 1,260 ppm/8 days (60:40) mixture of creosote and coal tar.
Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.
EPA Designations
Listed as a RCRA Hazardous Waste (40 CFR 261.33), Hazardous Material No. U051
Listed as a CERCLA Hazardous Substance* (40 CFR 302.4), Reportable Quantity (RQ): 1 lb (0.454 kg) [* per RCRA, Sec. 3001]
SARA Extremely Hazardous Substance (40 CFR 355): Not listed
Listed as a SARA Toxic Chemical (40 CFR 372.65)
OSHA Designations
Listed (as coal tar pitch volatiles) as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Since contact lens use in industry is controversial, establish your own policy.
Respirator: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.*
Other: Wear impervious gloves, boots, aprons, and gauntlets to prevent all skin contact. Applying a layer of petroleum jelly or lanolin castor oil ointment to the face reduces vapor contact and penetration through skin. Frequent change of protective garments is an additional protective measure.
Ventilation: Provide general and local exhaust ventilation systems equipped with high-efficiency particulate filters to maintain airborne concentrations below the OSHA PEL (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.(103)
Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.
Contaminated Equipment: Take particular care to avoid any contamination of drains or ventilation ducts. Remove this material from your shoes and equipment. Launder contaminated clothing before wearing.
Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Avoid physical damage to containers. Store in a cool, dry, well-ventilated area. Store coal tar creosote as close to area of use as possible to minimize transporting distance.
Engineering Controls: Use engineering controls to keep airborne concentrations below the OSHA PEL. Institute a respiratory protection program that includes regular training, maintenance, inspection, and evaluation. Always perform synthesis and purification procedures under a vertical ventilation hood and make regular operational safety checks. Label doors to rooms where coal tar creosote is produced, used, or stored as containing a carcinogen. Locate emergency equipment at well-marked and clearly identified stations in case emergency escape is necessary.
Other Precautions: Preplacement and periodic medical examinations of exposed workers emphasizing respiratory, skin, liver, and kidney disorders, including comprehensive work and medical history, physical examination, CXR, PFTs, urinalysis, LFT, and sputum cytology as the attending physician considers appropriate. Educate workers about coal tar creosote's carcinogenicity and proper handling procedures to avoid exposure.
Other Comments: Caution is in order when handling or sawing old creosote-treated lumber since it retains a considerable portion of creosote for up to 25 to 30 years.
Transportation Data (49 CFR 172.101)
DOT Shipping Name: Creosote
DOT Hazard Class: Flammable liquid
ID No.: UN1136
DOT Label: Flammable liquid

***MSDS Collection* References:** 26, 73, 100, 101, 103, 124, 126, 127, 132, 133, 136, 138, 139, 140, 142, 143, 146, 148, 153, 159
Prepared by: M Gannon, BA; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** Mark Upfal, MD, MPH; **Edited by:** JR Stuart, MS

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Material Safety Data Sheets Collection:

Sheet No. 789
Cyanide

Issued: 11/91

Section 1. Material Identification

36

Cyanide (CN⁻) Description: Derived by combining a carbon ion with a nitride ion. Used in rat and pest poisons, silver and metal polishes, photographic solutions, fumigating products, and electroplating solutions. Cyanide may also be liberated in burning of plastics, natural fabrics (wool or silk), polyurethane bedding or furniture, acrylic baths, nylon carpets, and melamine resin insulation.
Other Designations: CAS No. 57-12-5, carbon nitride ion, cyanide anion, isocyanide.
Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*⁽⁷³⁾ for a suppliers list.

Cautions: Cyanide is severely toxic by all routes of entry and its lethal dose is an estimated 1 µg/ml. Take necessary precautions to avoid all possible exposure to this material.

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Section 2. Ingredients and Occupational Exposure Limits

Cyanide, ca 100%

1990 OSHA PEL (Skin)
STEL: 4.7 ppm, 5 mg/m³, as hydrogen cyanide (gas)

1990 IDLH Level
50 mg/m³

1991-92 ACGIH TLV (Skin)
Ceiling: 10 ppm, 11 mg/m³, as hydrogen cyanide (gas)

1990 NIOSH REL (Skin)
STEL: 4.7 ppm, 5 mg/m³ as hydrogen cyanide (gas)

1990 DFG (Germany) MAK (*Danger of cutaneous absorption*)
TWA: 10 ppm, 11mg/m³ as hydrogen cyanide (gas)

1985-86 Toxicity Data*
Mouse, intraperitoneal, LD_{50}: 3 mg/kg; toxic effects not yet reviewed

* See NIOSH, *RTECS* (GS7175000), for additional toxicity data.

Section 3. Physical Data

Boiling Point: Varies with specific CN⁻ compound
Melting Point: Varies with specific CN⁻ compound
Molecular Weight: 26.02
Density: Varies with specific CN⁻ compound
Water Solubility: Varies with specific CN⁻ compound

Appearance and Odor: Varies with specific CN⁻ compound, but usually has an almond odor.

Section 4. Fire and Explosion Data

Flash Point: None reported	**Autoignition Temperature:** None reported	**LEL:** None reported	**UEL:** None reported

Extinguishing Media: Cyanide is combustible. For small fires, use dry chemical, water spray or foam. *Do not use carbon dioxide* (CO_2)*!* For large fires, use water spray, fog, or regular foam. *Do not scatter* material with more water than needed to extinguish fire.
Unusual Fire or Explosion Hazards: Combustible by chemical reaction with heat, moisture, or acid. Many cyanides readily evolve hydrogen cyanide (HCN), a toxic flammable gas.
Special Fire-fighting Procedures: Since fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighter's protective clothing *is ineffective* for fires involving cyanide. Wear chemical protective clothing that the shipper or manufacturer specifically recommends. If possible without risk, remove container from fire area. Fight fire from maximum distance. Stay away from ends of tanks. Be aware of runoff from fire control methods. Do not release to sewers or waterways. Remove and isolate contaminated clothing at the site.

Section 5. Reactivity Data

Stability/Polymerization: Cyanide is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.
Chemical Incompatibilities: Cyanide may react violently with hypochlorite solutions at pH 10 to 10.3, is explosive with nitrites if heated above 450 °C, and is incompatible with chlorates, fluorine, magnesium, nitrates, and all inorganic acids.
Conditions to Avoid: Avoid exposure to heat and contact with incompatibles.
Hazardous Products of Decomposition: Thermal oxidative decomposition of cyanide can produce carbon dioxide and toxic, flammable vapors of CN⁻.

Section 6. Health Hazard Data

Carcinogenicity: In 1990 reports, the IARC, NTP, and OSHA do not list cyanide as a carcinogen.
Summary of Risks: Cyanide is a potent, fast-acting, chemical asphyxiant (material which causes pulse and breathing obstruction) that prevents tissue utilization of oxygen by inhibiting the enzyme involved (cytochrome oxidase). Death can occur within seconds to minutes after inhalation of some cyanide gases, and may take as long as an hour after ingestion of a large amount of a cyanide salt due to a slower absorption. Toxicity is dependent on the form of cyanide the victim is exposed to. Mortality from acute exposures is high, but recovery is generally complete in nonfatal cases.
Medical Conditions Aggravated by Long-Term Exposure: None reported.

Continue next page

Section 6. Health Hazard Data, *continued*

Target Organs: Brain, heart, lungs, skin, blood.
Primary Entry Routes: Inhalation, ingestion, skin absorption.
Acute Effects: Inhalation of cyanide gases may cause rapid toxicity where the victim may only have time to utter a warning cry before succumbing to unconsciousness caused by asphyxiation. If exposure is small there may be a weak, rapid, irregular heartbeat with bright-pink coloration of the skin due to high oxyhemoglobin content in the veins before person loses consciousness. A telltale sign of inhalation or ingestion is the odor of bitter almonds on the breath, however up to half the population is genetically unable to detect this smell. Dialated pupils are common in severe poisonings. Contact with broken skin can cause cyanide absorption into the bloodstream. Cyanide ingestion can cause a bitter, burning taste, salivation, nausea, vomiting, anxiety, confusion, vertigo (dizziness), giddiness, sensation of stiffness in the lower jaw, and dyspnea (difficult respiration). In severe cases symptoms could progress to convulsions, paralysis, coma, cardiac arrhythmias, followed by death due to respiratory failure.
Chronic Effects: Chronic skin contact may cause cyanide rash, characterized by itching, and macular (blotches), papular (small, so[illegible]onical, elevation of the skin), and vesicular (blister-like) eruptions. Chronic cyanide inhalation may cause appetite loss, headache, weakness, [illegible] nausea, dizziness, and symptoms of irritation of the upper respiratory tract and eyes. Other symptoms of chronic exposure include goiter, B[illegible] and folate abnormalities, chest discomfort, epistaxis (nose bleed), poor appetite and sleeping, and functional changes in hearing.
FIRST AID: *Emergency personnel should protect against contamination!*
Eyes: Gently lift the eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.
Skin: *Quickly* remove contaminated clothing. Speed is extremely important. Rinse with flooding amounts of water for at least [illegible] min. Wash exposed area *extremely thoroughly* with soap and water. If irritation and pain persist, consult a physician.
Inhalation: Remove exposed person to fresh air and immediately begin administering 100% oxygen. Avoid mouth-to-mouth resuscitaton during CPR to prevent self-poisonings.
Ingestion: Obtain and prepare the Lilly cyanide antidote kit [Eli Lilly Co. (Stock No. M76)] for use in symptomatic patients. Never give anything by mouth to an unconscious or convulsing person. Do not induce vomiting with Ipecac syrup. Consider gastric lavage. Activated charcoal is said to be ineffective.
After first aid, get appropriate in-plant, paramedic, or community medical support.
Note to Physicians: If the victim is unconscious, bradycardia and absence of cyanosis may be key diagnostic signs. Consider administration of amyl nitrite followed by sodium nitrite and sodium thiosulfate (antidote kit). Consider use of 100% oxygen.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Immediately notify safety personnel, isolate area, deny entry, and stay upwind. Shut off all ignition sources—no flames, flares, or smoking in hazard area. Cleanup personnel should wear fully encapsulating, vapor-protective clothing for spills or leaks without fire. For small dry spills, carefully scoop into clean, dry, suitable container and cover loosely. For small solution spill, take up with earth, sand, vermiculite, or other absorbent, noncombustible material and place in suitable containers. For large spills, dike far ahead of solution spills for later disposal. Follow applicable OSHA regulations (29 CFR 1910.120).
Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

EPA Designations
Listed as a RCRA Hazardous Waste (40 CFR 261.33): Hazardous Waste No. P030
Listed as a CERCLA Hazardous Substance* (40 CFR 302.4), Reportable Quantity: *An RQ is not being assigned to the general class* [* per Clean Water Act, Sec. 307(a)]
SARA Extremely Hazardous Substance (40 CFR 355): Not listed
Listed as a SARA Toxic Chemical (40 CFR 372.65)

OSHA Designations
Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Since contact lens use in industry is controversial, establish your own policy.
Respirator: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. Select the respirator based on its suitability provide adequate worker protection for the given working conditions, level of airborne contamination, and presence of sufficient oxygen. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA with a full facepiece operated in pressure-demand or other positive-pressure mode. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.*
Other: Wear impervious gloves, boots, aprons, and gauntlets to prevent repeated or prolonged skin contact.
Ventilation: Provide general and local exhaust ventilation systems to maintain airborne concentrations below OSHA PEL (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.(103)
Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.
Contaminated Equipment: Separate contaminated work clothes from street clothes. Launder contaminated work clothing before wearing. Remove this material from your shoes and clean personal protective equipment.
Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics. Cyanide detoxifying kits and instructions should be available in use areas. Instruct employees working in these areas on how and when to use these kits.

Section 9. Special Precautions and Comments

Storage Requirements: Avoid physical damage to containers. Store in tightly closed and properly labeled containers in cool, dry, well-ventilated area away from heat and incompatibles.
Engineering Controls: To reduce potential health hazards, use sufficient dilution or local exhaust ventilation to control hazardous airborne contaminants and to maintain concentrations at the lowest practical level.
Other Precautions: If respirators are used, implement a respiratory protection program that includes regular training, maintenance, inspection, and evaluation. Consider preplacement and periodic medical examinations of exposed workers that emphasize the heart, blood, and respiratory system.

Transportation Data (49 CFR 172.101, .102)

DOT Shipping Name: Cyanide *or* cyanide mixture, dry
DOT Hazard Class: Poison B
ID No.: UN1588
DOT Label: Poison
DOT Packaging Exceptions: 173.364
DOT Packaging Requirements: 173.370

IMO Shipping Name: Cyanides, inorganic, n.o.s.
IMO Hazard Class: 6.1
ID No.: UN1588
IMO Label: Poison
IMDG Packaging Group: I/II; Stow 'away from' acids

MSDS Collection **References:** 73, 101, 103, 126, 127, 136, 143, 146, 148, 153, 159, 161, 163
Prepared by: M Gannon, BA; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** AC Darlington, MPH, MD; **Edited by:** JR Stuart, MS

Material Safety Data Sheet

from Genium's Reference Collection

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GENIUM PUBLISHING CORP.

No. 385

ETHYL BENZENE
(Revision A)
Issued: August 1978
Revised: November 1988

SECTION 1. MATERIAL IDENTIFICATION 27

Material Name: ETHYL BENZENE

Description (Origin/Uses): Used as a solvent and as an intermediate in the production of styrene monomer.

Other Designations: Phenylethane; Ethylbenzol; $C_2H_5C_6H_5$; CAS No. 0100-41-4

Manufacturer: Contact your supplier or distributor. Consult the latest edition of the *Chemicalweek Buyers' Guide* (Genium ref. 73) for a list of suppliers.

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*See sect. 8

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SECTION 2. INGREDIENTS AND HAZARDS

INGREDIENTS AND HAZARDS	%	EXPOSURE LIMITS
Ethyl Benzene, CAS No. 0100-41-4 *See NIOSH, *RTECS* (DA0700000), for additional data with references to reproductive, irritative, and mutagenic effects.	Ca 100	OSHA PELs 8-Hr TWA: 100 ppm, 435 mg/m³ 15- Min STEL: 125 ppm, 545 mg/m³ ACGIH TLVs, 1988-89 TLV-TWA: 100 ppm, 435 mg/m³ TLV-STEL: 125 ppm, 545 mg/m³ Toxicity Data* Human, Inhalation, TC_{Lo}: 100 ppm (8 Hrs) Rat, Oral, LD_{50}: 3500 mg/kg

SECTION 3. PHYSICAL DATA

Boiling Point: 277°F (136°C)
Melting Point: -139°F (-95°C)
Vapor Pressure: 7.1 Torrs at 68°F (20°C)
Vapor Density (Air = 1): 3.7
% Volatile by Volume: Ca 100

Molecular Weight: 106 Grams/Mole
Solubility in Water (%): Slight
Specific Gravity (H_2O = 1): 0.86258 at 77°F (25°C)

Appearance and Odor: A clear, colorless, flammable liquid; characteristic aromatic hydrocarbon odor.

SECTION 4. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temperature	LEL	UEL
64°F (18°C) CC	810°F (432.22°C)	1% v/v	6.7% v/v

Extinguishing Media: Use foam, dry chemical, or carbon dioxide to put out ethyl benzene fires. A water spray may be ineffective in extinguishing the fire, because it can scatter and spread the burning liquid. Use water spray to cool fire-exposed containers of ethyl benzene, to disperse ethyl benzene vapor, and to protect personnel attempting to stop an ethyl benzene leak. **Unusual Fire or Explosion Hazards:** This liquid can readily form explosive vapor-air mixtures, especially when heated. Ethyl benzene vapor is heavier than air and may travel a considerable distance to a low-lying source of ignition and flash back to its origin. **Special Fire-fighting Procedures:** Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode.

SECTION 5. REACTIVITY DATA

Stability/Polymerization: Ethyl benzene is stable in closed containers during routine operations. Hazardous polymerization cannot occur. **Chemical Incompatibilities:** Hazardous chemical reactions can occur between ethyl benzene and strong oxidizing agents, acids, ammonia, and bases. **Conditions to Avoid:** Avoid any exposure to sources of ignition such as heat, sparks, open flame, and lighted tobacco products, etc., and to incompatible chemicals. Use caution when entering confined spaces, particularly low-lying areas where explosive concentrations of ethyl benzene vapor may be present. Provide good ventilation to such areas to prevent the concentration of this vapor. **Hazardous Products of Decomposition:** Thermal-oxidative degradation can include toxic gases such as carbon monoxide and/or aromatic hydrocarbon gases.

SECTION 6. HEALTH HAZARD INFORMATION

Carcinogenicity: Ethyl benzene is not listed as a carcinogen by the NTP, IARC, or OSHA.
Summary of Risks: Ethyl benzene vapor is severely irritating to the eyes and to the mucous membranes of the respiratory system. Sustained inhalation of excessive levels can cause depression of the central nervous system (CNS) characterized by dizziness, headache, narcosis, and coma. Skin contact with liquid ethyl benzene causes irritation; dermatitis and defatting can also develop. The acute oral toxicity of ethyl benzene is low; however, ingestion of it presents a serious aspiration hazard. Aspirating even a small amount into the lungs can result in extensive edema (lungs filled with fluid) and hemorrhaging of the lung tissue. No systemic effects are expected at the levels that produce pronounced, unignorable, disagreeable skin and eye irritation. The TLVs cited in section 2 are set to prevent this intolerable irritation. **Medical Conditions Aggravated by Long-Term Exposure:** None reported. **Target Organs:** Skin, eyes, respiratory system, and CNS. **Primary Entry:** Inhalation, skin contact **Acute Effects:** Irritation of the skin, eyes, and respiratory system. Also, cardiac-rhythm disturbance due to sensitization; acute bronchitis, bronchospasm, pulmonary and laryngeal edema; euphoria; headache; giddiness; dizziness; and incoordination, as well as possible depression; confusion; and coma. **Chronic Effects:** None reported. **First Aid:** Eyes. Immediately

SECTION 6. HEALTH HAZARD INFORMATION, cont.

flush eyes, including under the eyelids, gently but thoroughly with flooding amounts of running water for at least 15 minutes. **Skin.** Rinse the affected area with plenty of water, then wash it with soap and water. **Inhalation.** Remove the exposed person to fresh air; restore and/or support his or her breathing as needed. Have qualified medical personnel administer oxygen as required. **Ingestion.** Unlikely. Should this type of exposure occur, the aspiration hazard must be considered. Do not induce vomiting unless directed to do so by a physician. To prevent aspiration by spontaneous vomiting, keep the victim's head low (between his or her knees). **Get medical help (in plant, p -medic, community) for all exposures.** Seek prompt medical assistance for further treatment, observation, and support after first Note to **Physician:** Professional judgment is required as to whether or not to induce vomiting because of the possibility of aspiration. stric lavage may be administered, followed by saline catharsis, if this procedure is appropriate to the specific incident. Monitor cardiac d pulmonary functions.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

Spill/Leak: Notify safety personnel, evacuate unnecessary personnel, eliminate all sources of ignition immediately, and prov dequate explosion-proof ventilation. Cleanup personnel need protection against skin or eye contact with this liquid as well as inhalat f its vapor (see sect. 8). Contain large spills and collect waste or absorb it with an inert material such as sand, earth, or vermiculite. U sparking tools to place waste liquid or absorbent into closable containers for disposal. Keep waste out of sewers, watersheds, and v ays. **Waste Disposal:** Contact your supplier or a licensed contractor for detailed recommendations. Follow Federal, state, and local r ions.

OSHA Designations

Listed as an Air Contaminant (29 CFR 1910.1000 Subpart Z).

EPA Designations (40 CFR 302.4)

CERCLA Hazardous Substance, Reportable Quantity: 1000 lbs (454 kg), per the Clean Water Act (CWA), §§ 311 (b) (4) and 307 (a).

SECTION 8. SPECIAL PROTECTION INFORMATION

Goggles: Always wear protective eyeglasses or chemical safety goggles. Where splashing is possible, wear a full face shield. Follow OSHA eye- and face-protection regulations (29 CFR 1910.133). **Respirator:** Wear a NIOSH-approved respirator per Genium reference 88 for the maximum-use concentrations and/or the exposure limits cited in section 2. Follow OSHA respirator regulations (29 CFR 1910.134). For emergency or nonroutine operations (spills or cleaning reactor vessels and storage tanks), wear an SCBA. **Warning:** Air-purifying respirators will *not* protect workers in oxygen-deficient atmospheres. **Other:** Wear impervious gloves, boots, aprons, and gauntlets, etc., to prevent prolonged or repeated skin contact with this material. **Ventilation:** Install and operate general and local maximum, explosion-proof ventilation systems powerful enough to maintain airborne levels of this material below the OSHA PEL standard cited in section 2. Local exhaust ventilation is preferred because it prevents dispersion of the contaminant into the general work area by eliminating it at its source. Consult the latest edition of Genium reference 103 for detailed recommendations. **Safety Stations:** Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work areas. **Contaminated Equipment:** Contact lenses pose a special hazard; soft lenses may absorb irritants, and all lenses concentrate them. Do *not* wear contact lenses in any work area. Remove contaminated clothing and launder it before wearing it again; clean this material from shoes and equipment. **Comments:** Practice good personal hygiene; always wash thoroughly after using this material and before eating, drinking, smoking, using the toilet, or applying cosmetics. Keep it off your clothing and equipment. Avoid transferring it from your hands to your mouth while eating, drinking, or smoking. Do *not* eat, drink, or smoke in any work area. Do not inhale ethyl benzene vapor.

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Storage/Segregation: Store ethyl benzene in closed containers in a cool, dry, well-ventilated area away from sources of ignition and strong oxidizers. Protect containers from physical damage. **Special Handling/Storage:** Outside, isolated, detached, or remote storage is recommended for large quantities of ethyl benzene. Isolate bulk storage areas from acute fire hazards. **Engineering Controls:** Make sure all engineering systems (production, transportation) are of maximum explosion-proof design. To prevent static sparks, electrically ground and bond all containers, pipelines, etc., used in shipping, transferring, reacting, production, and sampling operations. **Other:** Use safety cans for transferring small amounts of ethyl benzene.

Transportation Data (49 CFR 172.101-2)

DOT Shipping Name: Ethyl Benzene
DOT Hazard Class: Flammable Liquid
ID No. UN1175
DOT Label: Flammable Liquid
DOT Packaging Exceptions: 49 CFR 173.118
DOT Packaging Requirements: 49 CFR 173.119

IMO Shipping Name: Ethylbenzene
IMO Hazard Class: 3.2
IMO Label: Flammable Liquid
IMDG Packaging Group: II

References: 1, 26, 38, 84-94, 100, 116, 117, 120, 122.

Prepared by PJ Igoe, BS

Industrial Hygiene Review: DJ Wilson, CIH

Medical Review: W Silverman, MD

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Material Safety Data Sheets Collection:

Sheet No. 397
***n*-Hexane**

Issued: 8/83 Revision: C, 8/89

Section 1. Material Identification

29

***n*-Hexane Description:** *n*-Hexane is the chief constituent of petroleum ether or liqroin. Used to determine the refractive index of minerals; and as a mercury replacement in thermometers (usually with blue or red dye).
Other Designations: Normal-hexane; C_6H_{14}; CAS No. 0110-54-3.
Manufacturer: Contact your supplier or distributor. Consult the latest *Chemicalweek Buyers' Guide* (Genium ref. 73) for a suppliers list.
Comments: See *MSDS Colletion*, No. 397A, for isohexanes.

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* Sec. 8

Section 2. Ingredients and Occupational Exposure Limits

n-Hexane, ca 100%*

OSHA PEL	ACGIH TLV, 1988-89	Toxicity Data†
8-hr TWA: 50 ppm, 180 mg/m³	TLV-TWA: 50 ppm, 180 mg/m³	Human, inhalation, TC_{Lo}: 5000 ppm/10 min Rat, oral, LD_{50}: 28,710 mg/kg

* *n*-Hexane is this product's major component; however, possible contaminants are other isomers of hexane, C_5 to C_7 saturated hydrocarbons, C_5 to C_7 olefinic hydrocarbons, and aromatic hydrocarbons.
† See NIOSH, *RTECS* (MN9275000), for additional data with references to reproductive, irritative, and neurological effects.

Section 3. Physical Data

Boiling Point: 156.11 °F (68.95 °C)
Melting Point: ca -139 °F (-95 °C)
Vapor Pressure: 124 torr at 68 °F (20 °C)
Vapor Density (Air = 1): 3.0
Molecular Weight: 86 g/mol
Specific Gravity (H_2O = 1): 0.66 at 68 °F (20 °C)
Water Solubility: Insoluble

Appearance and Odor: A clear, colorless, mobile, volatile, flammable liquid: a mild hydrocarbon odor.

Section 4. Fire and Explosion Data

Flash Point: -22 °F (-30 °C) CC	Autoignition Temperature: 473 °F (223 °C)	LEL: 1.2% v/v	UEL: 8% v/v

Extinguishing Media: Use carbon dioxide (CO_2), foams, or dry chemical to put out *n*-hexane fires. Never direct solid streams of water into burning pools of liquid since this can scatter and spread the fire. Use water sprays to cool fire-exposed containers, prevent dangerous pressure rise and/or rupture, disperse vapors, and flush unignited spills away from sensitive exposures.
Unusual Fire or Explosion Hazards: *n*-Hexane is a very flammable, volatile liquid which burns like gasoline. It represents a dangerous fire and explosion hazard. Since it evaporates quickly, the resulting denser-than-air vapors can flow along surfaces, collect in low-lying or enclosed areas like sumps and utility rooms, reach distant sources of ignition, and flash back to the original liquid.
Special Fire-fighting Procedures: Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode.

Section 5. Reactivity Data

Stability/Polymerization: *n*-Hexane is stable at room temperature during routine operations. Hazardous polymerization cannot occur.
Chemical Incompatibilities: *n*-Hexane can react violently with strong oxidizing agents.
Conditions to Avoid: Never expose this liquid to any ignition source (heat, sparks, open flames, or uninsulated heating elements).
Hazardous Products of Decomposition: Thermal oxidative degradation of *n*-hexane can produce carbon dioxide and toxic carbon monoxide (CO).

Section 6. Health Hazard Data

Carcinogenicity: Neither the NTP, IARC, nor OSHA lists *n*-hexane as a carcinogen.
Summary of Risks: The metabolic products of *in vivo* partial oxidation of *n*-hexane include 2, 5-hexanedione. This metabolite is the most hightly neurotoxic compound formed from *n*-hexane. Occupational exposures to *n*-hexane are associated with chronic neurotoxic damage to the central nervous system (CNS) and the peripheral nervous system (PNS). The effects are not permanent; Genium reference 100 notes that recovery from neuropathy is usually complete within a year after the exposure. Methyl *n*-butyl ketone (MBK) (*MSDS Collection*, No. 425) produces the neurotoxic metabolite 2, 5-hexadione in even greater quantities than the *n*-hexane. Prevent simultaneous exposures to *n*-hexane and MBK. Genium reference 89 notes: "...concurrent exposure to methyl ethyl ketone, and possibly other chemicals or drugs which boost [illegible] oxidative mechanisms, reduces the time for neuropathy to appear as a result of exposure to both *n*-hexane and MBK." **Medical Conditions Aggravated by Long-Term Exposure:** CNS and PNS disorders, vision defects, and memory diminution. **Target Organs:** Skin, eyes, CNS, PNS. **Primary Entry:** Inhalation, skin contact. **Acute Effects:** Irritation of eyes, nose, and upper respiratory tract (URT); dermal erythema (abnormally red skin from capillary congestion), edema (abnormal accumulation of clear, watery fluid in body tissue), and vesiculation (blistering). Acute inhalation causes headache, dizziness, nausea, narcosis, and coma. High concentrations may act as asphyxiants. **Chronic Effects:** Anorexia, nausea, weight loss, malaise; muscular weakness, pain, and spasms in extremities; neurotoxic effects like sensorimotor polyneuropathy, generalized polyneuropathy, and other degenerative changes in the peripheral nervous system (PNS).

FIRST AID

Eyes: Flush immediately, including under the eyelids, gently but thoroughly with flooding amounts of running water for at least 15 min.
Skin: After rinsing affected area with flooding amounts of water, wash it with soap and water. **Inhalation:** Remove exposed person to fresh air and support breathing as needed. Have a qualified medical personnel adminsister oxygen as required. **Ingestion:** Never induce vomiting! Severe aspiration hazard exists. If vomiting occurs spontaneously, lower victim's head to the knee level. Never give anything by mouth to an unconscious or convulsing person. Administer several ounces of edible oil to drink.

After first aid, get appropriate in-plant, paramedic, or community medical attention and support.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: *Design and practice a* n*-hexane spill control and countermeasure plan (SCCP).* When a spill occurs, notify safety personnel, evacuate unnecessary personnel, eliminate heat and ignition sources, provide maximum explosion-proof ventilation, and implement the SCCP. Cleanup personnel should wear fireproof personal protective equipment (Sec. 8).
Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

OSHA Designations
Listed as an Air Contaminant (29 CFR 1910.1000, Subpart Z)
EPA Designations
Assigned the RCRA Hazardous Waste No. D001 (40 CFR 261.21, Ignitability)
Assigned as a CERCLA Hazardous Substance (40 CFR 302.4), Reportable Quantity (RQ): 100 lb (45.4 kg)
SARA Extremely Hazardous Substance (40 CFR 355): Not listed
SARA Toxic Chemical (40 CFR 372.65): Not listed

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Where splashing is possible, wear a full face shield. **Respirator:** Wear a NIOSH-approved respirator if necessary. Follow OSHA respirator regulations (29 CFR 1910.134). For emergency or nonroutine operations (spills or cleaning reactor vessels and storage tanks), wear an SCBA.
Warning: Air-purifying respirators do *not* protect workers in oxygen-deficient atmospheres. **Other:** Wear impervious gloves, boots, aprons, and gauntlets to prevent skin contact. **Ventilation:** Provide general and local explosion-proof ventilation systems to maintain airborne concentrations below the OSHA PEL standard (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by eliminating it at its source (Genium ref. 103). **Safety Stations:** Make available in the work area emergency eyewash stations, safety/quick-drench showers, washing facilities, and properly serviced fire extinguishers. **Contaminated Equipment:** Never wear contact lenses in the work area: soft lenses may absorb, and all lenses concentrate, irritants. Launder contaminated clothing before wearing. Remove this material from your shoes and equipment. **Other:** Preplacement and periodic medical exams focusing on the skin nd the central nervous system are advised.
Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics. Handle this flammable, volatile material with appropriate caution.

Section 9. Special Precautions and Comments

Storage Requirements: Store *n*-hexane in closed containers in a cool, dry, well-ventilated, fireproof area away from heat and ignition sources and incompatible chemicals. Protect these containers from physical damage; shield them from direct sunlight.
Engineering Controls: To prevent static sparks, electrically ground and bond all containers, tank cars, and pipes used in shipping, receiving, or transferring operations in production and storage areas. All electrical services, including lights, must be sparkproof.

Transportation Data (49 CFR 172.101-2)

DOT Shipping Name: Hexane	**IMO Shipping Name:** Hexane *(and its isomers)*
DOT Hazard Class: Flammable liquid	**IMO Hazard Class:** 3.1
DOT ID No.: UN1208	**IMO Label:** Flammable liquid
DOT Label: Flammable liquid	**IMDG Packaging Group:** II
DOT Packaging Requirements: 49 CFR 173.119	
DOT Packaging Exceptions: 49 CFR 173.118	

MSDS Collection **References:** 1, 6, 7, 84-94, 100, 116, 117, 119, 120, 122
Prepared by: PJ Igoe, BS; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** W Silverman, MD

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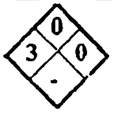
No. 30

HYDROGEN CHLORIDE

(Revision B)
Issued: October 1977
Revised: November 1988

SECTION 1. MATERIAL IDENTIFICATION 27

Material Name: HYDROGEN CHLORIDE



NFPA

Description (Origin/Uses): Used in the manufacture of pharmaceutical hydrochlorides, vinyl chloride from acetylene, alkyl chlorides from olefins, and arsenious chloride from arsenious oxide. Also used in the chlorination of rubber; as a gaseous flux for babbiting operations; and in many organic reactions involving isomerization, polymerization, and alkylation.

Other Designations: Anhydrous Hydrochloric Acid; HCl; CAS No. 7647-01-0

Manufacturer: Contact your supplier or distributor. Consult the latest edition of the *Chemicalweek Buyers' Guide* (Genium ref. 73) for a list of suppliers.

HMIS			
H	3	R	1
F	0	I	4
R	0	S	4
PPG*		K	0

*See sect. 8

SECTION 2. INGREDIENTS AND HAZARDS

SECTION 2. INGREDIENTS AND HAZARDS	%	EXPOSURE LIMITS
Hydrogen Chloride, CAS No. 7647-01-0 *See NIOSH, *RTECS* (MW4025000), for additional data with references to reproductive and mutagenic effects.	Ca 100	OSHA PEL Ceiling: 5 ppm, 7 mg/m³ ACGIH TLV, 1988-89 TLV-Ceiling: 5 ppm, 7 mg/m³ Toxicity Data* Human, Inhalation, LC_{Lo}: 1300 ppm (30 Mins) Rat, Inhalation, LC_{50}: 3124 ppm (1 Hr) Rabbit, Oral, LD_{50}: 900 mg/kg

SECTION 3. PHYSICAL DATA

Boiling Point: -121°F (-85°C)
Melting Point: -173°F (-114°C)
Vapor Density (Air = 1): 1.268
Molecular Weight: 36.27 Grams/Mole
Solubility in Water (%): Complete

Appearance and Odor: A colorless, corrosive, acidic, nonflammable gas; characteristic, suffocating, pungent odor. This material fumes strongly in moist air and provides good warning properties for voluntary removal from continued exposure. The odor is detectable at 1 to 5 ppm and becomes disagreeable and irritating at 5 to 10 ppm.

SECTION 4. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temperature	LEL	UEL
*	*	*	*
	% by Volume		

Extinguishing Media: *Hydrogen chloride gas does not burn. Use extinguishing agents that will put out the surrounding fire. **Unusual Fire or Explosion Hazards:** In the presence of water, hydrogen chloride can react with certain metals such as iron to produce highly flammable and explosive hydrogen gas. If hydrogen gas is produced, direct all fire-fighting techniques at it. If cylinders of hydrogen chloride are in the fire area, remove them, if feasible, or cool them with a water spray to prevent the release of the hydrogen chloride by way of the fusible plug and pressure-rupture disc on the cylinders. **Special Fire-fighting Procedures:** Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode. Special neutralization procedures, if applicable, include the application of chemically basic substances such as soda ash or slaked lime.

SECTION 5. REACTIVITY DATA

Stability/Polymerization: Hydrogen chloride is stable in closed, pressurized cylinders during routine operations at room temperature. Hazardous polymerization cannot occur. **Chemical Incompatibilities:** Hydrogen chloride gas is a very reactive, acidic, corrosive gas; use it with caution. Hazardous reactions occur between it and calcium carbide, cesium acetylene carbide, cesium carbide, lithium silicide, magnesium borate, mercuric sulfate, rubidium acetylene carbide, rubidium carbide, and sodium (Genium ref. 84). **Conditions to Avoid:** Avoid exposure to incompatible chemicals and to any other material whose compatibility with hydrogen chloride has not yet been established. Prevent accidental water contamination of any system that contains this material because it becomes corrosive to many metals in the presence of moisture. The corrosive action can liberate extremely flammable/explosive hydrogen gas. Avoid direct exposure of the hydrogen chloride gas to organic materials such as ethylene because exothermic (heat-producing) reactions are likely. Avoid excessive heat. **Hazardous Products of Decomposition:** During fires hydrogen chloride may decompose by reacting with certain metals to produce very flammable and explosive hydrogen gas (H_2).

SECTION 6. HEALTH HAZARD INFORMATION

Carcinogenicity: Hydrogen chloride is not listed as a carcinogen by the NTP, IARC, or OSHA.
Summary of Risks: Contact with hydrogen chloride causes corrosive damage to body tissue. Inhalation of hydrogen chloride at levels greater than 50 ppm for a short time causes choking, coughing, and severe irritation and damage to the mucous membranes of the upper

SECTION 6. HEALTH HAZARD INFORMATION

respiratory tract (URT), including ulcers of the nose, throat, and larynx. Anhydrous hydrogen chloride (HCl gas) is more damaging than hydrochloric acid mist because it severely dehydrates tissue. Laryngo spasm or pulmonary edema can result from severe exposure. Repeated or prolonged exposure may cause erosion of the teeth. **Medical Conditions Aggravated by Long-Term Exposure:** None reported. **Target Organs:** Skin, eyes, URT. **Primary Entry:** Inhalation, skin contact. **Acute Effects:** Corrosive skin and eye burns, tissue damage, and severe irritation of the URT. **Chronic Effects:** None reported. **FIRST AID:** **Eyes.** Immediately flush eyes including under the eyelids, gently but thoroughly with plenty of running water for at least 15 minutes. **Skin.** Rinse the affecte [illegible] ea with flooding amounts of water and then wash it with soap and water. Remove contaminated clothing under a safety shower. **Inhalation.** Remove the exposed person to fresh air; restore and/or support his or her breathing as needed. Have qualified med [illegible] per-sonnel administer oxygen as required. **Ingestion.** Unlikely. **Get medical help (In plant, paramedic, community) for all exp [illegible] s.** Seek prompt medical assistance for further treatment, observation, and support after first aid. **Note to physician:** Treatment [illegible] pira-tory effects following inhalation of hydrogen chloride includes using a 5% sodium bicarbonate solution as an aerosol; mainta [illegible] a proper fluid balance (diuretics may be useful); and decreasing the inflammatory response of the lungs by administering ster [illegible] on a short-term basis (2 to 4 days). Severe inhalation exposure requires hospitalization and observation (72-hour minimum) for t [illegible] elayed onset of pulmonary edema. Early intervention with serial chest X rays and respiratory support, including intubation, may b [illegible] quired.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

Spill/Leak: Treat any hydrogen chloride gas leak as an emergency. Notify safety personnel, evacuate unnecessary person [illegible], eliminate all sources of ignition immediately (hydrogen gas may be generated), and provide adequate ventilation. Cleanup personnel need a full set of protective clothing, including a self-contained breathing apparatus (SCBA). Try to stop the flow of the leaking hydrogen chloride gas; use a water spray to protect the personnel attempting this shutoff and to disperse the gas. If a cylinder leak cannot be stopped, remove it to a hood or open area. Detect small leaks by using concentrated ammonium hydroxide (NH_4OH) near a suspected leak area to show up a white fume. Avoid flushing waste directly to a sewer; flush it to a retention area and neutralize the hydrochloric acid with soda ash or limestone; then dilute it with a large amount of water. **Waste Disposal:** Contact your supplier or a licensed contractor for detailed recommendations. Mark any leaking cylinder "Defective" and return it to the supplier. Follow Federal, state, and local regulations.

OSHA Designations
Listed as an Air Contaminant (29 CFR 1910.1000 Subpart Z).
EPA Designations (40 CFR 302.4)
CERCLA Hazardous Substance, Reportable Quantity: 5000 lbs (2270 kg), per the Clean Water Act (CWA), §311 (b) (4).

SECTION 8. SPECIAL PROTECTION INFORMATION

Goggles: Always wear protective eyeglasses or chemical safety goggles. Where splashing is possible, wear a full face shield. Follow OSHA eye- and face-protection regulations (29 CFR 1910.133). **Respirator:** Wear a NIOSH-approved respirator per Genium reference 88 for the maximum-use concentrations and/or the exposure limits cited in section 2. Follow OSHA respirator regulations (29 CFR 1910.134). For emergency or nonroutine operations (spills or cleaning reactor vessels and storage tanks), wear an SCBA. All respirators must be acid resistant. **Warning:** Air-purifying respirators will *not* protect workers in oxygen-deficient atmospheres. **Other:** Wear impervious gloves, boots, aprons, gauntlets, etc., to prevent any contact with this material. Outer clothing of wool (or another acid-resistant fabric) has been recommended. **Ventilation:** Install and operate general and local, maximum- explosion-proof ventilation systems powerful enough to maintain airborne levels of this material below the OSHA PEL standard cited in section 2. Local exhaust ventilation is preferred because it prevents dispersion of the contaminant into the general work area by eliminating it at its source. Consult the latest edition of Genium reference 103 for detailed recommendations. Make ventilation system ductwork and exposed fan components acid resistant. **Safety Stations:** Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work areas. **Contaminated Equipment:** Contact lenses pose a special hazard; soft lenses may absorb irritants, and all lenses concentrate them. Do *not* wear contact lenses in any work area. Remove contaminated clothing and launder it before wearing it again; clean this material from your shoes and equipment. **Other:** Design all engineering systems to be acid resistant to prevent moisture from contacting the hydrochloric acid and to prevent the gas from entering the workplace. Totally enclosed, airtight systems are recommended for industrial processes that make use of HCl gas. **Comments:** Practice good personal hygiene; always wash thoroughly after using this material and before eating, drinking, smoking, using the toilet, or applying cosmetics. Keep it off your clothing and equipment. Avoid transferring it from your hands to your mouth while eating, drinking, or smoking. Do *not* eat, drink, or smoke in any work area. Do not inhale hydrogen chloride gas.

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Storage/Segregation: Store in closed, pressurized containers in a cool, dry, well-ventilated area away from sources of ignition, strong oxidizers, and incompatible chemicals (see sect. 5). Protect containers from physical damage. **Special Handling/Storage:** Install pressure-reducing regulators when connecting a cylinder to a lower-pressure piping system to prevent a backflow into the original cylinder (explosion hazard). **Engineering Controls:** Make sure all engineering systems (production, transportation) are of maximum-explosion-proof design. Ground and bond all containers, pipelines, etc., used in shipping, transferring, reacting, producing, and sampling operations to prevent static sparks. **Other Precautions:** Follow supplier's recommendations concerning the proper handling and storage procedures.

Transportation Data (49 CFR 172.101-2)

DOT Shipping Name: Hydrogen Chloride, Anhydrous
DOT Hazard Class: Nonflammable Gas
ID No. UN1050
DOT LABEL: Nonflammable Gas
DOT Packaging Requirements, Packaging Exceptions: 49 CFR 173.304.

IMO Shipping Name: Hydrogen Chloride, Anhydrous
IMO Hazard Class: 2.2
IMO Label: Nonflammable Gas, Corrosive

References: 1, 26, 38, 84-94, 100, 116, 117, 120, 122.

Prepared by PJ Igoe, BS
Industrial Hygiene Review: DJ Wilson, CIH
Medical Review: W Silverman, MD

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Material Safety Data Sheets Collection:

Sheet No. 686
Hydrogen Cyanide

Issued: 8/89

Section 1. Material Identification 29

Hydrogen Cyanide Description: Large-scale preparation by the catalytic oxidation of ammonia-methane mixtures. Used in the fumigation of ships, railroad cars, orchards, buildings, tabacco, and various foods. Can be produced in petroleum refining, electroplating, metallurgy, and photographic development.
Other Designations: Hydrocyanic acid; prussic acid; anhydrous hydrogen cyanide; HCN; CAS No. 0074-90-8.
Manufacturer: Contact your supplier or distributor. Consult the latest *Chemicalweek Buyers' Guide* (Genium ref. 73) for a suppliers list.

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NFPA

HMIS
H 4
F 4
R 2
PPG*
* Sec. 8

Section 2. Ingredients and Occupational Exposure Limits

Hydrogen cyanide, ca 100%

OSHA PEL (Skin*)
Ceiling: 10 ppm, 10 mg/m^3

ACGIH TLV (Skin*), 1988-89
TLV Ceiling: 10 ppm, 10 mg/m^3

NIOSH REL, 1976
10-min ceiling: 4.7 ppm CN, 5 mg CN/m^3

Toxicity Data†
Human, oral, LD_{Lo}: 570 µg/kg
Human, inhalation, LC_{Lo}: 200 mg/m^3/10 min
Rat, inhalation, LC_{50}: 484 ppm/5 min

* This material can be absorbed through intact skin, which contributes to overall exposure.
† See NIOSH, *RTECS* (MW6825000), for additional data with references.

Section 3. Physical Data

Boiling Point: 79 °F (29 °C)
Melting Point: 7.88 °F (-13.4 °C)
Vapor Pressure: 620 torr at 68 °F (20 °C)
Vapor Density (Air = 1): 0.941
Molecular Weight: 27 g/mol
Specific Gravity (H_2O = 1): 0.7
Water Solubility: Miscible
% Volatile by Volume: 100

Appearance and Odor: A colorless gas or blue-white liquid; a characteristic faint odor resembling bitter almonds for those individuals able to perceive its presence by smell.

Section 4. Fire and Explosion Data

Flash Point: 0 °F (-17.78 °C) CC	**Autoignition Temperature:** 1000 °F (538 °C)	**LEL:** 5.6% v/v	**UEL:** 40% v/v

Extinguishing Media: Hydrogen cyanide is an extremely toxic, flammable material. In advanced or massive fires, firefighting should be done from a safe, protected location. Use carbon dioxide (CO_2), dry chemical, or foams to put out hydrogen cyanide fires. Use water sprays to cool fire-exposed containers, protect the personnel attempting to seal the source of the leaking gas, flush spills away from sensitive exposures (heat, sources of ignition, or incompatible chemicals), disperse the vapors, and dilute spills to nonflammable mixtures.
Unusual Fire or Explosion Hazards: This gas is extremely poisonous and flammable. Consider evacuation of the incident area in large fires.
Special Fire-fighting Procedures: Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode. Fire fighters must wear a complete set of personal protective equipment to prevent virtually any contact with this deadly poison. They must not have exposed skin surfaces since their skin can absorb fatal amounts of hydrogen cyanide.

Section 5. Reactivity Data

Stability/Polymerization: Hydrogen cyanide is stable at room temperature in during routine operations.. Hazardous polymerization cannot occur.
Chemical Incompatibilities: Hydrogen cyanide can react dangerously with acetaldehyde.
Conditions to Avoid: *Specially trained personnel must handle hydrogen cyanide. Never permit inexperienced workers to handle it.* Never expose this material to any heat or ignition sources such as lighted cigarettes or pipes, open flames, or uninsulated heating elements.
Hazardous Products of Decomposition: Thermal oxidative degradation of hydrogen cyanide can produce carbon dioxide, toxic oxides of nitrogen (N_xO_y) and carbon monoxide (CO). Hydrogen cyanide is a very toxic material even when not decomposed during fires.

Section 6. Health Hazard Data

Carcinogenicity: Neither the NTP, IARC, nor OSHA lists hydrogen cyanide as a carcinogen.
Summary of Risks: Inhalation of high concentrations of hydrogen cyanide causes tachypnea (rapid breathing) resulting in increased cyanide intake; then dyspnea, paralysis, convulsions, and respiratory arrest. Death may occur within minutes. Lesser concentrations can cause headache, vertigo, nausea, and vomiting. Concentrations of 270 ppm are immediately fatal; 181 ppm in 10 min are fatal; 135 ppm in 30 min are fatal; 110 to 135 ppm in 1 hr are potentially fatal; 45 to 54 ppm are tolerable for 30 to 60 min without immediate or late effects; and 18 to 36 ppm cause slight symptoms after several hours of exposure. **Medical Conditions Aggravated by Long-Term Exposure:** None reported. **Target Organs:** All body cells. **Primary Entry:** Inhalation, skin contact/absorption. **Acute Effects:** Burning sensation in mouth and throat. Initially rapid pulse and high blood pressure followed by decreasing blood pressure and pulse. Cherry-red mucous membranes may be noted. Headache, weakness, mental

Continue on next page

Section 6. Health Hazard Data (continued)

confusion, nausea, vomiting, shock, convulsions, coma, and possible death. **Chronic Effects:** Enlargement of the thyroid gland, fatique, weakness, headache, changes in taste and smell, irritation of throat, effort dyspnea, nervous instability, lachrymation, abdominal colic, and precordial pain were reported in workers exposed at concentrations between 4 and 12 ppm for approximately 7 years.

FIRST AID

Eyes: Flush immediately, including under the eyelids, gently but thoroughly with flooding amounts of running water for at least 15 mir[illegible]n: Immediately remove all contaminated clothing. After rinsing affected area with flooding amounts of water, wash it with soap and water [illegible]oid contact with this chemical. **Inhalation:** Remove the exposed person to fresh air and support breathing as needed. Have qualified medic[illegible] personnel administer oxygen as required. **Ingestion:** Never induce vomiting or perform mouth-to-mouth respiration! Provide 100% ox[illegible] as soon as possible. Institute gastric lavage after endotracheal intubation. **After first aid, get appropriate in-plant, paramedic, or comr[illegible]y medical attention and support.** Seek prompt medical assistance for further observation and treatment.

Physician's Note: *Treat all exposures as life-threatening emergencies.* An antidote to hydrogen cyanide is sodium nitrite and sodium t[illegible]sulfate. Commercially available cyanide poisoning first-aid kits should be purchased. Competent medical personnel should carefully train appropriately selected workers on how to use these kits in emergencies. Several detailed medical treatments are available for cyanide poisoning. After reviewing the specific uses of hydrogen cyanide in their operation, the safety personnel and/or the industrial hygienists should develop a precise emergency first-aid treatment protocol before an incident occurs. Heart monitorings should be instituted.

Section 7. Spill, Leak, and Disposal Procedures

Spill Leak: *Design and practice a hydrogen cyanide spill control and countermeasure plan (SCCP). Immediately evacuate the incident area and alert the appropriate local officials to the specifics of the hydrogen cyanide release.* When a spill occurs, notify safety personnel, eliminate heat or ignition sources, provide optimum explosion-proof ventilation, and implement the SCCP. Cleanup personnel must wear a complete ensemble of personal protective equipment (Sec. 8), including self-contained breathing apparatus and total body-covering clothes, to prevent skin contact or inhalation. Use nonsparking tools and equipment. Use water sprays to protect personnel attempting to locate and seal the source of the escaping hydrogen cyanide gas. **Waste Management/ Disposal:** Contact your supplier or a licensed contrator for detailed recommendations. Follow applicable Federal, state, and local regulations.

OSHA Designations

Listed as Air Contaminant (29 CFR 1910.1000, Subpart Z)

EPA Designations

Listed as RCRA Hazardous Waste No. P063 (40 CFR 261.33)

Listed aa a CERCLA Hazardous Substance* (40 CFR 302.4), Reportable Quantity (RQ): 10 lb (4.54 kg) [* per CWA, Sec. 311(b)(4) and RCRA, Sec. 3001]

SARA Extremely Hazardous Substance (40 CFR 355), Threshold Planning Quantity (TPQ): 100 lb

SARA Toxic Chemical* (40 CFR 372.65) [* EPA Form R may apply to your facility; see 40 CFR 372.85 for instructions]

Section 8. Special Protection Data

Goggles: Always wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). **Respirator:** Wear a NIOSH-approved respirator if necessary. Follow OSHA respirator regulations (29 CFR 1910.134). For emergency or nonroutine operations (leaks or cleaning reactor vessels and storage tanks), wear an SCBA. **Warning:** Air-purifying respirators do *not* protect workers in oxygen-deficient atmospheres. **Other:** Wear impervious gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact. **Ventilation:** Provide general and local explosion-proof ventilation systems to maintain airborne concentrations below the OSHA PEL standard (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by eliminating it at its source (Genium ref. 103). **Safety Stations:** Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities. **Contaminated Equipment:** Never wear contact lenses in the work area: soft lenses may absorb, and all lenses concentrate, irritants. Launder contaminated clothing before wearing. Remove this material from your shoes and equipment. **Other:** Use hydrogen cyanide in closed-confinement, pressurized engineering systems. Automatic shutoff valves/sensors to the main feed lines are recommended in the event of a catastrophic pressure drop from the rupture of a pressurized HCN pipeline. **Comments:** Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Store hydrogen cyanide in tightly closed, airtight, moisture-proof containers in a cool, dry, well-ventilated, fireproof area away from heat or ignition sources and incompatible chemicals (Sec. 5.) Protect these containers from physical damage; shield them from direct sunlight. Limit access to the storage area to authorized personnel only. **Special Handling/Storage:** Proper stock rotation of hydrogen cyanide is vital for safety. Individual HCN cylinders should not be sored longer than 90 days. Check with your supplier for detailed recommendations concerning proper shelf rotation of stock, and proper dispensing equipment such as valves, flanges, and manifolds. **Engineering Controls:** To prevent static sparks, electrically ground and bond all containers, cylinders, and pipelines used in shipping, receiving, or transferring operations in production and storage areas. **Other Precautions:** Consider installing automatic sensing equipment which alerts workers to airborne concentrations of hydrogen cyanide greater than the 10 ppm ceiling (Sec. 2).

Transportation Data (49 CFR 172.101-2)

DOT Shipping Name: Hydrocyanic acid solution
DOT Hazard Class: Poison A *or* Poison B
DOT ID No.: UN1613 *or* NA1051
DOT Label: Poison gas and flammable gas

IMO Shipping Name: Hydrogen cyanide
IMO Hazard Class: 6.1
IMO Label: Poison and flammable liquid
IMDG Packaging Group: I

Proper shipping names, hazard classes, labels, and identification numbers vary with the hydrogen cyanide's concentration or strength.

MSDS Collection References: 1, 6, 7, 84-94, 100, 116, 117, 119, 120, 122

Prepared by: PJ Igoe, BS; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** W Silverman, MD

Material Safety Data Sheet

From Genium's Reference Collection
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GENIUM PUBLISHING CORP.

No. 52

HYDROGEN SULFIDE
(Revision A)
Issued: July 1979
Revised: April 1988

SECTION 1. MATERIAL IDENTIFICATION

25

Material Name: HYDROGEN SULFIDE

Description (Origin/Uses): Used as a reagent in analytical chemistry and in metallurgy; used to make heavy water.

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Other Designations: Sulfureted Hydrogen; H_2S; NIOSH *RTECS* No. MX1225000; CAS No. 7783-06-4

Manufacturer: Contact your supplier or distributor. Consult the latest edition of the *Chemicalweek Buyers' Guide* (Genium ref. 73) for a list of suppliers.

HMIS
H 4
F 4
R 3
PPG*
*See sect. 8

R 1
I 3
S 2
K 4

SECTION 2. INGREDIENTS AND HAZARDS

SECTION 2. INGREDIENTS AND HAZARDS	%	EXPOSURE LIMITS
Hydrogen Sulfide, CAS No. 7783-06-4	*	IDLH** Level: 300 ppm OSHA PEL Ceiling:*** 20 ppm ACGIH TLVs, 1987-88 TLV-TWA: 10 ppm, 14 mg/m³ TLV-STEL: 15 ppm, 21 mg/m³ NIOSH REL 10-Min Ceiling: 10 ppm, 15 mg/m³ Toxicity Data**** Human, Inhalation, LC_{Lo}: 600 ppm (30 Mins)

*Contact your supplier to determine the exact composition of this gas and if any contaminants are present.
**Immediately dangerous to life and health.
***OSHA sets the maximum peak above ceiling PEL as 50 ppm only in an 8-hour shift with no other measurable exposures.
****See NIOSH, *RTECS*, for additional data.

SECTION 3. PHYSICAL DATA

Boiling Point: -76°F (-60°C)
Melting Point: -117°F (-83°C)
Vapor Density: 1.2
Vapor Pressure: >760 Torrs (Normal Atmospheric Pressure)

Water Solubility (%): At 68°F (20°C), 1 gram of H_2S dissolves in 242 ml of water.
Molecular Weight: 34 Grams/Mole

Appearance and Odor: A colorless gas; odor of rotten eggs. **Warning:** Paralysis of olfactory sense occurs at 200 ppm.

SECTION 4. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temperature	Flammability Limits in Air	LOWER	UPPER
Not Applicable	500°F (260°C)	% by Volume	4.3	46

Extinguishing Media: Hydrogen sulfide gas is a severe fire and explosion hazard; treat any fire involving it as an emergency. Try to shut off the gas; use a water spray to protect personnel attempting this. **Unusual Fire or Explosion Hazards; Danger:** Fire-exposed cylinders containing hydrogen sulfide gas can rupture violently. If it is safe to do so, remove them from the fire area or try to cool them with a direct water spray. This gas is denser than air and can travel a considerable distance to a low-lying source of ignition and flash back. It is flammable or explosive over a wide range of gas/air mixtures (see LEL and UEL). **Special Fire-fighting Procedures:** Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode. Fire fighters must use the maximum personal protective equipment available. Fight fires from explosion-proof or unmanned locations.

SECTION 5. REACTIVITY DATA

Hydrogen sulfide is stable in closed, airtight, pressurized containers at room temperature under normal storage and handling conditions. It does not undergo hazardous polymerization.

Chemical Incompatibilities: This material is very reactive; hazardous reactions occur between it and strong oxidizing agents, nitric acid, soda lime, sodium, sodium peroxide, acetaldehyde, copper, and others (see Genium ref. 84, p. 491M-107).

Conditions to Avoid: Do not allow sources of ignition such as open flame, unprotected heaters, lighted tobacco products, electric sparks, or excessive heat in work areas because of the extreme flammability of hydrogen sulfide.

Hazardous Products of Decomposition: During fires hydrogen sulfide may produce toxic gases such as sulfur oxides (SO_x).

SECTION 6. HEALTH HAZARD INFORMATION

Hydrogen sulfide is not listed as a carcinogen by the NTP, IARC, or OSHA.

Summary of Risks: High concentrations (500-1000 ppm) of this material can cause systemic poisoning symptomized by respiratory paralysis, and unconsciousness, followed by death. Exposures of 50 to 500 ppm are characterized by respiratory irritation (coughing, difficulty in breathing). Eye and upper respiratory tract (URT) irritation start around 20 ppm; the severity increases with the duration and intensity of exposure. The sense of smell can be paralyzed immediately by exposure to 200 ppm. Collapse quickly followed by coma and possibly death can occur after breathing only a small amount at >1000 ppm.

Medical Conditions Aggravated by Long-Term Exposure: None reported. **Target Organs:** Eyes, respiratory system.

Primary Entry: Skin contact, inhalation. **Acute Effects:** Eye and URT irritation, dizziness, headache, and nausea.

Chronic Effects: None reported.

FIRST AID

Eyes: Immediately flush eyes, including under the eyelids, gently but thoroughly with plenty of running water for at least 15 minutes.

Skin: Treat for possible frostbite damage (cryogenic injury) if liquid hydrogen sulfide touches skin. Treat also for corrosive, acidic burns from either the gas or liquid. **Inhalation:** Remove the exposed person to fresh air; restore and/or support his or her breathing as needed. Rescuers must use good judgment to minimize their own personal risk. **Ingestion:** Unlikely.

GET MEDICAL HELP (IN PLANT, PARAMEDIC, COMMUNITY) FOR ALL EXPOSURES. Seek prompt medical assistance for further treatment, observation, and support after first aid.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

Spill/Leak: *Treat any hydrogen sulfide gas leak as an emergency.* Preplan for gas leaks and make these preparations known to all relevant personnel. Notify safety personnel, evacuate all nonessential personnel, provide maximum explosion-proof ventilation, and eliminate all sources of ignition immediately. Try to stop the flow of gas; use a water spray to protect personnel attempting to do this. Cleanup personnel require a complete set of protective clothing, including an SCBA.

Waste Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow Federal, state, and local regulations.

OSHA Designations

Air Contaminant (29 CFR 1910.1000 Subpart Z)

EPA Designations (40 CFR 302.4)

RCRA Hazardous Waste, No. U135

CERCLA Hazardous Substance, Reportable Quantity: 100 lbs (45.4 kg)

SECTION 8. SPECIAL PROTECTION INFORMATION

Goggles: Always wear protective eyeglasses or chemical safety goggles. Follow the eye- and face-protection guidelines in 29 CFR 1910.133. **Respirator:** Wear a NIOSH-approved respirator per the *NIOSH Pocket Guide to Chemical Hazards* for the maximum-use concentrations and/or the exposure limits cited in section 2. Follow the respirator guidelines in 29 CFR 1910.134. For emergency or nonroutine use (e.g., cleaning reactor vessels or storage tanks), wear an SCBA with a full facepiece operated in the pressure-demand or positive-pressure mode. **Warning:** Air-purifying respirators will *not* protect workers in oxygen-deficient atmospheres.

Other: Wear impervious gloves; boots; aprons; and clean, impervious, body-covering clothing to prevent any possibility of hydrogen sulfide's contact with skin. All clothing must be flame resistant. **Ventilation:** Install and operate general and local ventilation systems powerful enough to maintain airborne levels of hydrogen sulfide below the exposure limit cited in section 2. Make all ventilation systems of maximum explosion-proof design (e.g., nonsparking, electrically grounded and bonded, etc.)

Safety Stations: Make eyewash stations, washing facilities, and safety showers available in use and handling areas.

Contaminated Equipment: Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them. Do *not* wear contact lenses in any work area. **Other:** All piping and equipment used with this gas must be pressure checked and leak tight.

Comments: Practice good personal hygiene; always wash thoroughly after using this material. Avoid transferring it from your hands to your mouth while eating, drinking, or smoking. Do *not* eat, drink, or smoke in any work area.

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Storage/Segregation: Store hydrogen sulfide in a cool, dry, well-ventilated area away from oxidizing agents, sources of heat or ignition, any flammable/explosive materials, cylinders containing oxygen, and incompatible chemicals (see sect. 5). Use outside or detached storage. Store cylinders upright and secure them tightly. **Special Handling/Storage:** Hydrogen sulfide is shipped and stored as a pressurized gas in cylinders or tank cars. Protect them against physical damage and regularly inspect them for cracks, leaks, or faulty valves. Electrically ground and bond all containers used in shipping or transferring operations to prevent static sparks. Do not drag or slide cylinders; move them in a carefully supervised manner with a suitable hand truck. Do not smoke in any use or storage area. Shade containers from radiant heat and direct sunlight. **Engineering Controls:** Make all engineering systems (ventilation, production, etc.) of maximum explosion-proof design. Hydrogen sulfide must be used in closed engineering systems because of its explosibility (see sect. 4). Evacuate and purge all lines with an inert gas such as nitrogen (N_2) before and after using hydrogen sulfide. **Comments:** Perform all operations with hydrogen sulfide carefully to prevent accidental ignition. Keep the valve-protection cap in place until immediately before use. Insert a check valve or trap into the transferral line to prevent a dangerous backflow into the original container. Use pressure-reducing regulators when connecting a cylinder to a lower-pressure piping system. Obtain detailed handling, shipping, and storage information from your supplier. A trained chemist or safety specialist familiar with the physical and chemical properties of this material should be present during all work operations.

Transportation Data (49 CFR 172.101-2)

DOT Shipping Name: Hydrogen Sulfide

DOT ID No. UN1053

DOT Label: Flammable Gas and Poison

DOT CLass: Flammable Gas

IMO Class: 2.1

IMO Label: Flammable Gas and Poison Gas

References: 1, 2, 12, 73, 84-94, 100, 103.

Prepared by PJ Igoe, BS

Industrial Hygiene Review: DJ Wilson, CIH

Medical Review: MJ Hardies, MD

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Material Safety Data Sheets Collection:

Sheet No. 354
Methyl Alcohol

Issued: 11/77 Revision: D, 11/91

Section 1. Material Identification 36

Methyl alcohol (CH_3OH) Description: Derived from destructive distillation of wood, oxidation of hydrocarbons, or high-pressure catalytic synthesis from hydrogen and carbon dioxide or carbon monoxide. Used as a solvent in manufacturing industrial chemicals and chemical pharmaceuticals, a raw material for making formaldehyde and methyl esters, a softening agent for pyroxylin plastics, a dehydrator for natural gas, a feedstock for manufacturing synthetic proteins by continuous fermentation, an octane booster in gasoline, an extractant for animal and vegetable oils; in antifreeze for automotive radiators, air brakes, gasoline, and diesel oil; and in denaturing ethanol.
Other Designations: CAS No. 67-56-1, carbinol, Columbian spirits, methanol, methyl hydroxide, methylol, monohydroxymethane, pyroxylic spirit, wood alcohol, wood naphtha, wood spirit.
Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*(73) for a suppliers list.

Cautions: Methyl alcohol is moderately toxic by ingestion and mildly toxic by inhalation and skin absorption. It is flammable, volatile, and a dangerous fire hazard.

R 1
I 2
S 1*
K 4
* Skin absorption

NFPA

HMIS
H 2
F 3
R 0
PPG†
† Sec. 8

Section 2. Ingredients and Occupational Exposure Limits

Methyl alcohol, ca 100%

1990 OSHA PELs (Skin)
8-hr TWA: 200 ppm (260 mg/m^3)
15-min STEL: 250 ppm (310 mg/m^3)

1990 IDLH Level
25,000 ppm

1991-92 ACGIH TLVs (Skin)
TWA: 200 ppm (262 mg/m^3)
STEL: 250 ppm (328 mg/m^3)

1990 DFG (Germany) MAK
200 ppm (260 mg/m^3)

1990 NIOSH RELs (Skin)
TWA: 200 ppm (260 mg/m^3)
Ceiling: 250 ppm (325 mg/m^3)

1985-86 Toxicity Data*
Human, inhalation, TC_{Lo}: 300 ppm caused eye (visual field change), CNS (headache), and pulmonary effects
Human, oral, LD_{Lo}: 428 mg/kg causes CNS (headache) and pulmonary (respiratory change) effects
Rat, oral, TD_{Lo}: 7500 mg/kg administered continuously to the female during the 17th to 19th day of gestation produced behavioral effects on newborns
Rat, inhalation, TC_{Lo}: 20,000 ppm/7 hr administered continuously to the female during the 1st to 22nd day of gestation produced specific developmental abnormalities

* See NIOSH, *RTECS* (PC1400000), for additional toxicity data.

Section 3. Physical Data

Boiling Point: 148 °F (64.5 °C)
Freezing Point: -144.04 °F (-97.8 °C)
Vapor Pressure: 29 mm Hg at 68 °F (20 °C)
Vapor Density (air = 1): 1.11
Viscosity: 0.00593 P at 68 °F (20 °C)
Molecular Weight: 32.05
Density: 0.7924 at 68 °F (20 °C)
Water Solubility: Soluble
Other Solubilities: Soluble in ethanol, ether, benzene, ketones, and most organic solvents

Appearance and Odor: Clear, colorless, volatile liquid with a slight alcohol odor when pure, a disagreeably pungent odor when crude, and a low 10-ppm odor threshold.

Section 4. Fire and Explosion Data

Flash Point: 54 °F (12 °C), CC	**Autoignition Temperature:** 878 °F (470 °C)	**LEL:** 6% v/v	**UEL:** 36.5% v/v

Extinguishing Media: For small fires, use dry chemical, carbon dioxide (CO_2), water spray, or alcohol-resistant foam. For large fires, use water spray, fog, or alcohol-resistant foam. Do not scatter material with any more water than needed to extinguish fire.
Unusual Fire or Explosion Hazards: Methyl alcohol is a dangerous fire hazard when exposed to heat, flame, or oxidizers. It is explosive in its vapor form when exposed to heat or flame. Vapors may travel to an ignition source and flash back.
Special Fire-fighting Procedures: Since fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Also, wear full protective clothing. Structural firefighters' protective clothing is *ineffective* for fires involving methyl alcohol. If possible without risk, remove container from fire area. Apply cooling water to sides of fire-exposed container until fire is well out. Stay away from ends of tanks. Leave area immediately if you hear a rising sound from venting safety device or see any tank discoloration due to fire. Be aware of runoff from fire control methods. Do not release to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Methyl alcohol is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.
Chemical Incompatibilities: Methyl alcohol is incompatible with beryllium dihydride, metals (such as potassium or magnesium), oxidants (such as barium perchlorate, bromine, chlorine, hydrogen peroxide, and sodium hypochlorite), potassium tertbutoxide, carbon tetrachloride + metals; reacts explosively with chloroform + heat, and diethyl zinc; and reacts violently with alkyl aluminum salts, acetyl bromide, chloroform + sodium hydroxide, cyanuric chloride, and nitric acid.
Conditions to Avoid: Avoid vapor inhalation and contact with oxidizers and other incompatibles.
Hazardous Products of Decomposition: Thermal oxidative decomposition of methyl alcohol can produce carbon oxides (CO and CO_2), possible formaldehyde (HCHO) and acrid smoke, and irritating fumes.

Section 6. Health Hazard Data

Carcinogenicity: In 1990 reports, the IARC, NTP, and OSHA do not list methyl alcohol as a carcinogen.
Summary of Risks: Methyl alcohol is toxic mainly to the nervous system, particularly optic nerves, where damage can progress to permanent blindness. Poisoning may also result in metabolic acidosis. Methyl alcohol oxidizes in the body to form formaldehyde and formic acid. These derivatives are believed responsible for many of methyl alcohol's poisonous and toxic effects. Since it is eliminated slowly from the body, methyl alcohol is considered a cumulative poison. The fatal ingestion dose is 100 to 250 ml, although death is reported from less than 33 ml.
Medical Conditions Aggravated by Long-Term Exposure: None reported
Target Organs: Eyes, central nervous system, skin, and digestive tract.
Primary Entry Routes: Inhalation, ingestion, skin absorption.
Acute effects: Inhalation can cause irritation of eyes and nose, headache, fatigue, nausea, visual impairment (optic nerve neur y or visual field changes) or complete and possibly permanent blindness, acidosis, convulsions, circulatory collapse, respiratory failure, a th. Ingestion can cause gastrointestinal (GI) irritation followed by the symptoms described for inhalation and possible kidney impairment. ontact results in a feeling of coldness, dryness, and cracking possibly leading to dermatitis. Methyl alcohol can absorb through skin and may e headache, fatigue, and visual disturbances. Eye contact causes irritation and watering of eyes, inflamed lids, and painful sensitization to
Chronic Effects: Chronic inhalation or skin absorption may produce visual impairment or complete blindness.

FIRST AID

Eyes: Gently lift the eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Do not let victim rub or keep eyes tightly shut. Consult a physician immediately.
Skin: *Quickly* remove contaminated clothing. Since methyl alcohol is volatile and flammable, carefully dispose of contaminated clothing. Rinse with flooding amounts of water for at least 15 min. For reddened or blistered skin, consult a physician. Wash affected area with soap and water.
Inhalation: Remove exposed person to fresh air and support breathing as needed.
Ingestion: Never give anything by mouth to an unconscious or convulsing person. If ingested, have that *conscious and alert* person drink 1 to 2 glasses of water, then induce vomiting.
After first aid, get appropriate in-plant, paramedic, or community medical support.
Note to Physicians: Consider administering 10% ethanol in D5W intravenously to maintain ethyl alcohol blood level at 100 mg/dl. Check formic acid in urine and measure blood pH and plasma bicarbonate. After ingestion, there is typically an 18- to 48-hr latency period before clinical toxicity

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel, isolate area, deny entry, and stay upwind. Shut off all ignition sources—no flares, smoking, or flames in hazard area. Cleanup personnel should wear fully encapsulating, vapor-protective clothing for spills or leaks with no fire. Water spray may reduce vapor, but not prevent ignition in closed spaces. For small spills, use nonsparking tools to take up with earth, sand, vermiculite, or other absorbent, noncombustible material and place in suitable containers for later disposal. For large spills, dike far ahead of spill and await disposal. Follow applicable OSHA regulations (29 CFR 1910.120).
Environmental Degradation: Aquatic toxicity rating: TLm 96, over 1000 ppm.
Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

EPA Designations
Listed as a RCRA Hazardous Waste (40 CFR 261.33): Hazardous Waste No. U154
CERCLA Hazardous Substance (40 CFR 302.4): Not listed
SARA Extremely Hazardous Substance (40 CFR 355): Not listed
SARA Toxic Chemical (40 CFR 372.65): Not listed

OSHA Designations
Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Since contact lens use in industry is controversial, establish your own policy.
Respirator: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. Select the respirator based on its suitability to provide adequate worker protection for the given working conditions, level of airborne contamination, and presence of sufficient oxygen. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.*
Other: Wear impervious gloves, boots, aprons, and gauntlets to prevent all skin contact.
Ventilation: Provide general and local explosion-proof exhaust ventilation systems to maintain airborne concentrations below the OSHA PELs (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.[103]
Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.
Contaminated Equipment: Separate contaminated work clothes from street clothes. Launder contaminated work clothing before wearing. Remove this material from your shoes and clean personal protective equipment.
Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Avoid physical damage to containers. Store in cool, dry, well-ventilated flammables storage area, away from strong oxidizers and other incompatibles. To prevent static sparks, electrically ground all equipment used in methyl alcohol storage, manufacture, and transportation. Use nonsparking tools.
Engineering Controls: To reduce potential health hazards, use sufficient dilution or local exhaust ventilation to control hazardous airborne contaminants and to maintain concentrations at the lowest practical level.
Other Precautions: Consider preplacement and periodic medical examinations of exposed workers emphasizing neurological, kidney, liver, and visual function. Practice good personal hygiene and housekeeping procedures. If respirators are used, institute a respiratory protection program that includes regular training, maintenance, inspection, and evaluation.

Transportation Data (49 CFR 172.101, .102)

DOT Shipping Name: Methyl alcohol
DOT Hazard Class: Flammable liquid
ID No.: UN1230
DOT Label: Flammable liquid
DOT Packaging Exceptions: 173.118
DOT Packaging Requirements: 173.119

IMO Shipping Name: Methanol
IMO Hazard Class: 3.2
ID No.: UN1230
IMO Label: Flammable Liquid, Poison
IMDG Packaging Group: II

MSDS Collection References: 26, 38, 73, 89, 100, 101, 103, 124, 126, 127, 132, 133, 136, 140, 143, 146, 148, 149, 153, 159, 163
Prepared by: M Gannon, BA; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** AC Darlington, MD, MPH; **Edited by:** JR Stuart, MS

Material Safety Data Sheet

From Genium's Reference Collection
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GENIUM PUBLISHING CORP.

No. 624

NAPHTHALENE

Issued: November 1987

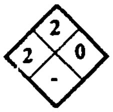
SECTION 1. MATERIAL IDENTIFICATION 24

Material Name: NAPHTHALENE

Description (Origin/Uses): Used as a moth repellant and in many industrial processes.

Other Designations: Naphthalin; Naphthene; Tar Camphor; $C_{10}H_8$; NIOSH *RTECS* No. QJ0525000; CAS No. 0091-20-3

Manufacturer: Contact your supplier or distributor. Consult the latest edition of the *Chemicalweek Buyer's Guide* (Genium ref. 73) for a list of suppliers.

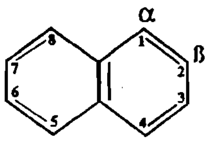


HMIS
H 2
F 2
R 0
PPG*
*See sect. 8

R 1
I 4
S 1
K 2

SECTION 2. INGREDIENTS AND HAZARDS

SECTION 2. INGREDIENTS AND HAZARDS	%	EXPOSURE LIMITS
Naphthalene, CAS No. 0091-20-3	ca 100	IDLH* Level: 500 ppm **ACGIH TLVs, 1987-88** TLV-TWA: 10 ppm, 50 mg/m³ **OSHA PEL** 8-Hr TWA: 10 ppm, 50 mg/m³ **Toxicity Data**** Child, Oral, LD_{Lo}: 100 mg/kg Man, Unknown, LD_{Lo}: 74 mg/kg Rat, Oral, LD_{50}: 1250 mg/kg



*Immediately dangerous to life and health
**See NIOSH *RTECS* for additional data with references to irritative, mutagenic, reproductive, and tumorigenic effects.

SECTION 3. PHYSICAL DATA

Boiling Point: 424°F (218°C)
Vapor Density (Air = 1): 4.4
Vapor Pressure: 0.087 Torr at 77°F (25°C)
Water Solubility: Insoluble

Specific Gravity (H_2O = 1): 1.162 at 68°F (20°C)
Melting Point: 176°F (80°C)
Molecular Weight: 128 Grams/Mole
% Volatile by Volume: ca 100

Appearance and Odor: White crystalline flakes; strong coal tar odor.

SECTION 4. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temperature	Flammability Limits in Air	LOWER	UPPER
174°F (79°C) OC; 190°F (88°C) CC	979°F (526°C)	% by Volume	0.9	5.9

Extinguishing Media: Use water spray, dry chemical, or carbon dioxide to fight fires involving naphthalene. **Caution:** Foam or direct water spray applied to molten naphthalene may cause extensive foaming.

Unusual Fire or Explosion Hazards: Naphthalene is a volatile solid that gives off flammable vapor when heated (as in fire situations). This vapor is much denser than air and will collect in enclosed or low-lying areas like sumps. In these areas an explosive air-vapor mixture may form, and extra caution is required to prevent any ignition sources from starting an explosion or fire.

Special Fire-fighting Procedures: Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode.

SECTION 5. REACTIVITY DATA

Naphthalene is stable in closed containers at room temperature under normal storage and handling conditions. It does not undergo hazardous polymerization.

Chemical Incompatibilities: Naphthalene is incompatible with strong oxidizing agents, chromic anhydride, and mixtures of aluminum trichloride and benzoyl chloride.

Conditions to Avoid: Ignition sources like open flame, unprotected heaters, excessive heat, lighted tobacco products, and electric sparks must not occur in work areas where naphthalene vapor may become concentrated.

Hazardous Products of Decomposition: Toxic gases like carbon monoxide are produced during fire conditions. Irritating, flammable vapor forms below the melting point because even solid naphthalene has a significant vapor pressure.

SECTION 6. HEALTH HAZARD INFORMATION

Nitric acid is not listed as a carcinogen by the NTP, IARC, or OSHA.
Summary of Risks: This material is corrosive to any body tissue it contacts. Dental erosion is also reported.
Medical Conditions Aggravated by Long-Term Exposure: None reported. **Target Organs:** Skin, eyes, mucous membranes of the respiratory tract, teeth. **Primary Entry:** Inhalation, skin contact. **Acute Effects:** Irritation and/or corrosive burns of skin, eyes, and upper respiratory tract (URT), delayed pulmonary edema, pneumonitis, bronchitis, and dental erosion. **Chronic Effects:** None reported.

FIRST AID: Eyes. Immediately flush eyes, including under the eyelids, gently but thoroughly with plenty of running water for [illegible]ast 15 minutes. Treat for eye burns. **Skin.** Immediately wash the affected area with soap and water. Watch for chemical skin burns treat them accordingly. **Inhalation.** Remove the exposed person to fresh air; restore and/or support his or her breathing as need[illegible]f the exposure is severe, hospitilization with careful monitoring by trained medical personnel to detect the delayed onset of severe pulmonary edema (lungs filled with fluid) is recommended for at least 72 hours. **Ingestion.** Call a poison control center. Never [illegible]ve anything by mouth to someone who is unconscious or convulsing. Do not induce vomiting. If the exposed person is responsive, [illegible] him or her one or two glasses of milk or water to drink as quickly as possible after exposure.
GET MEDICAL HELP (IN PLANT, PARAMEDIC, COMMUNITY) FOR ALL EXPOSURES. Seek prompt medical assistance for further treatment, observation, and support after first aid. NOTE TO PHYSICIAN: Wash affected skin areas with a 5% solution of sodium bicarbonate ($NaHCO_3$). If ingested, the risk versus the benefit of the passage of a naso-gastric tube is debatable. Activated charcoal is of *no* value. Do *not* give the exposed person bicarbonate to neutralize the material.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

Spill/Leak: Notify safety personnel, provide ventilation, and eliminate all sources of ignition immediately in case contact with metals should produce highly flammable hydrogen gas. Cleanup personnel need protection against contact with and inhalation of nitric acid (see sect. 8). Contain large spills and collect waste. Use water sprays to direct nitric acid away from incompatible chemicals (see sect. 5). Neutralize the spilled nitric acid with soda ash or sodium bicarbonate. Use an absorbent such as sand, earth, or vermiculite on the resulting slurry and place the neutralized nitric acid material into containers suitable for eventual disposal, reclamation, or destruction.
Waste Disposal: Consider reclamation, recycling, or destruction rather than disposal in a landfill. Contact your supplier or a licensed contractor for detailed recommendations. Follow Federal, state, and local regulations.
OSHA Designations
Air Contaminant (29 CFR 1910.1000 Subpart Z)
EPA Designations (40 CFR 302.4)
CERCLA Hazardous Substance, Reportable Quantity: 1000 lbs (454 kg), per Clean Water Act (CWA), Section 311 (b) (4)

SECTION 8. SPECIAL PROTECTION INFORMATION

Goggles: Always wear protective eyeglasses or chemical safety goggles. Where splashing of nitric acid solution is possible, wear a full face shield as a supplementary protective measure. Follow OSHA eye- and face-protection regulations (29 CFR 1910.133).
Respirator: Consult the *NIOSH Pocket Guide to Chemical Hazards* (Genium ref. 88) for general recommendations on proper respiratory procedures. Follow OSHA respirator regulations (29 CFR 1910.134). For emergency or nonroutine use (leaks or cleaning reactor vessels and storage tanks), wear an SCBA with a full facepiece operated in the pressure-demand or positive-pressure mode. **Warning:** Air-purifying respirators will *not* protect workers in oxygen-deficient atmospheres. **Other:** Wear impervious gloves, boots, aprons, gauntlets, etc., to prevent skin contact with nitric acid. Choose protective equipment carefully (see sect. 5, Conditions to Avoid).
Ventilation: Install and operate both general and local exhaust-ventilation systems powerful enough to maintain airborne concentrations of nitric acid below the OSHA PEL standard cited in section 2. Construct exhaust ducts and systems with material such as fiberglass, which resists attack by nitric acid. **Safety Stations:** Make emergency eyewash stations, washing facilities, and safety/quickdrench showers available in work areas. **Contaminated Equipment:** Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them. Do *not* wear contact lenses in any work area. Remove contaminated clothing and launder it before wearing it again; clean nitric acid from shoes and equipment. **Comments:** Practice good personal hygiene; always wash thoroughly after using this material. Keep it off of your clothing and equipment. Avoid transferring it from your hands to your mouth while eating, drinking, or smoking. Do *not* eat, drink, or smoke in any work area. Provide preplacement and annual medical exams with emphasis on skin irritation to workers who are regularly exposed to nitric acid. Workers must receive training before handling this material in the workplace; even experienced workers should undergo refresher training periodically.

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Storage/Segregation: Store nitric acid in a cool, dry, well-ventilated area away from incompatible chemicals (see sect. 5). Consider outside, isolated, or detached storage. Protect containers from direct sunlight.
Special Handling/Storage: Build all storage facilities of nonflammable materials that are resistant to chemical attack by nitric acid. Protect containers from physical damage. Preplan for routine use and emergency response.
Engineering Controls: Proper ventilation is essential in bulk storage areas; consider installing an automatic monitoring system to detect hazardous levels of nitrogen oxides that can develop from this material.
Comments: Separate nitric acid from hydrazine, diethylenetriamine, fluorides, and all other corrosives except sulfuric acid and sulfur trioxide when shipping or transferring it.
Transportation Data (49 CFR 172.101-2)
DOT Shipping Name: (I) Nitric Acid, Fuming or (II) Nitric Acid, Over 40% or (III) Nitric Acid, 40% or Less
DOT Label: (I) Oxidizer and Poison or (II) Oxidizer and Corrosive or (III) Corrosive
DOT Hazard Class: (I) and (II) Oxidizer or (III) Corrosive Material
DOT ID Nos. (I) UN2032; (II) UN2031; (III) NA1760
IMO Class: 8 (All Types of Nitric Acid)
IMO Label: (I) Corrosive, Oxidizer, Poison; or (II) and (III) Corrosive
References: 1, 2, 26, 38, 84-94, 100, 112, 113, 114.

Prepared by PJ Igoe, BS

Industrial Hygiene Review: DJ Wilson, CIH

Medical Review: MJ Hardies, MD

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Material Safety Data Sheets Collection:

Sheet No. 711
Pyrene

Issued: 4/90

Section 1. Material Identification 31

Pyrene Description: A condensed ring, polyaromatic hydrocarbon compound derived from coal tar. Also synthesized from o,o'-ditolyl. Used in biochemical research and as starting material for synthesizing benzo(a)pyrene. An ingredient of smoked and broiled meat, tobacco smoke, and air pollution.
Other Designations: CAS No. 0129-00-0; $C_{16}H_{10}$; beta-pyrene; benzo(d,e,f)phenanthrene; benzo(d,e,f)phenathrene.
Manufacturer: Contact your supplier or distributor. Consult the latest *Chemicalweek Buyers' Guide*(73) for a suppliers list.

R	1
I	3
S	2*
K	-

* Skin absorption

Genium

HMIS	
H	2
F	1
R	0
PPG†	

† Sec. 8

Section 2. Ingredients and Occupational Exposure Limits

Pyrene, ca 100%

OSHA PEL	ACGIH TLV, 1989-90	NIOSH REL, 1987	Toxicity Data*
8-hr TWA: 0.2 mg/m^3	None established	None established	Rat, oral, LD_{50}: 2700 mg/kg ingested produces conjunctiva irritation, excitement, and muscle contraction Rat, inhalation, LC_{50}: 170 mg/m^3 inhaled produces conjunctiva irritation, excitement, and muscle contraction Gene mutation in mammalian cells; human cell types: 12 µmol/l

* See NIOSH, *RTECS* (UR2450000), for additional mutative, tumorigenic, and toxicity data.

Section 3. Physical Data

Boiling Point: 759 °F/404 °C
Melting Point: 313 °F/156 °C
Vapor Pressure: 6.85 x 10^{-7} torr at 68 °F/20 °C
Molecular Weight: 202.26 g/mol
Specific Gravity (H_2O = 1 at 39 °F/4 °C): 1.271 at 73 °F/23 °C
Water Solubility: Insoluble (0.135 mg/l)

Appearance and Odor: Colorless solid or a slight blue florescent solution. Tetracene impurities give pyrene a yellow color.

Section 4. Fire and Explosion Data

Flash Point: None reported	Autoignition Temperature: None reported	LEL: None reported	UEL: None reported

Extinguishing Media: Use foam, dry chemical, and CO_2 to extinguish fire.
Unusual Fire or Explosion Hazards: Pyrene is a flammable and combustible material that heat and ignition sources may ignite. It burns rapidly with a flare-like effect.
Special Fire-fighting Procedures: Since fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode. Avoid skin contact. Be aware of runoff from fire control methods. Do not release to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Pyrene is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.
Hazardous Products of Decomposition: Thermal oxidative decomposition of pyrene can emit irritating fumes and acrid smoke.

Section 6. Health Hazard Data

Carcinogenicity: Neither the NTP, IARC, nor OSHA lists pyrene as a carcinogen.

Summary of Risks: Pyrene is irritating to exposed skin and eyes, moderately toxic by ingestion and intraperitoneal routes, and a poison by inhalation. Experimental studies show pyrene is a tumorigen in animals and a mutagen in humans. Workers exposed to concentrations between 3 and 5 mg/m^3 showed some unspecified teratogenic effects. In general, human exposure occurs mainly through inhalation of tobacco smoke and polluted air. Although ingesting smoked and broiled meats may expose humans to pyrene, there is little indication of serious health effects.

Medical Conditions Aggravated by Long-Term Exposure: None reported.

Target Organs: Skin, eyes, respiratory tract.

Primary Entry Routes: Inhalation, ingestion, skin contact.

Acute Effects: Vapor inhalation may irritate the nose mucosa and respiratory tract. Vapors may also cause conjunctival irritation Pyrene is absorbed through intact skin and causes dermal irritation. Ingestion may irritate and burn the esophagus and gastrointestinal tract.

Chronic Effects: None reported.

FIRST AID

Eyes: Flush immediately, including under the eyelids, gently but thoroughly with flooding amounts of running water for at least 15 min.

Skin: *Quickly* remove contaminated clothing. After rinsing affected skin with flooding amounts of water, wash it with soap and water.

Inhalation: Remove exposed person to fresh air and support breathing as needed.

Ingestion: Never give anything by mouth to an unconscious or convulsing person. If ingested, have a *conscious* person drink 1 to 2 glasses of milk or water. Do not induce vomiting.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Physician's Note: Observe patients with dermal exposure for systemic poisoning since pyrene is absorbed through intact skin.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel, evacuate all unnecessary personnel, and remove all heat and ignition sources. Cleanup personnel should protect against vapor inhalation and skin and eye contact. Scoop spilled material into appropriate disposal containers. Absorb liquid with inert, noncombustible material and place waste in appropriate disposal containers. Follow applicable OSHA regulations (29 CFR 1910.120).

Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

EPA Designations

RCRA Hazardous Waste (40 CFR 261.33): Not listed

Listed as a CERCLA Hazardous Substance* (40 CFR 302.4), Reportable Quantity (RQ): 5000 lb (2270 kg) [* per Clean Water Act, Sec. 307(a)]

Listed as SARA Extremely Hazardous Substance (40 CFR 355), Reportable Quantity: 5000 lb, Threshold Planning Quantity (TPQ): 1000/10,000 lb

SARA Toxic Chemical (40 CFR 372.65): Not listed

OSHA Designations

Air Contaminant (29 CFR 1910.1000, Subpart Z): Not listed

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133).

Respirator: Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA.

Warning: Air-purifying respirators do *not* protect workers in oxygen-deficient atmospheres.

Other: Wear impervious gloves, boots, aprons, and gauntlets to prevent skin contact.

Ventilation: Provide general and local explosion-proof ventilation systems to maintain airborne concentrations below the OSHA PEL (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.(103)

Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.

Contaminated Equipment: Never wear contact lenses in the work area: soft lenses may absorb, and all lenses concentrate, irritants. Remove this material from your shoes and equipment. Launder contaminated clothing before wearing.

Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Store in closed containers in a cool, well-ventilated area. Protect containers from physical damage.

Engineering Controls: Avoid vapor inhalation and skin contact. Practice good personal hygiene and housekeeping procedures. To prevent static sparks, electrically ground and bond all containers and equipment used in shipping, receiving, or transferring operations in production and storage areas. Provide preplacement and periodic medical examinations, including comprehensive medical histories with emphasis on the oral cavity, respiratory tract, bladder, and kidneys. Examine the skin for premalignant and malignant lesions.

Transportation Data (49 CFR 172.101, .102): Not listed

ISDS Collection References: 7, 73, 87, 103, 123, 124, 126, 127, 136

repared by: MJ Allison, BS; Industrial Hygiene Review: DJ Wilson, CIH; Medical Review: MJ Hardies, MD P8

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Material Safety Data Sheets Collection:

Sheet No. 3
Sodium Hydroxide

Issued: 10/77 Revision: C, 11/91

Section 1. Material Identification

36

Sodium Hydroxide (NaOH) Description: Derived by electrolysis of sodium chloride brines, by reacting calcium chloride with sodium carbonate, or by electrolytic production using the diaphragm cell. Sodium hydroxide often contains as impurities minimal amounts of sodium chloride, sodium carbonate, sodium sulfate, sodium chlorate, iron, or nickel. Used to hydrolyze fats and form soaps; in making plastics to dissolve casein; in treating cellulose to make rayon and cellophane; in explosives, dyestuffs, electrolytic extraction of zinc, reclaiming rubber, tin plating, oxide coating, etching and electroplating, laundering and bleaching, pulp and paper manufacture; in vegetable oil refining; in peeling of fruits and vegetables in the food industry; and in veterinary medicine as a disinfectant.

Other Designations: CAS No. 1310-73-2; Aetznatron; caustic soda; Collo-Grillrein; Collo-Tapette; Feurs Rohp; Lewis-Red Devil Lye; soda, hydrate; soda lye; sodium hydrate.

Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*[73] for a suppliers list.

Cautions: Sodium hydroxide is moderately toxic by ingestion and inhalation and can be seriously corrosive to eyes, skin, and mucous membranes.

R 0
I 2
S 4
K 0

NFPA

HMIS
H 3
F 0
R 1
PPG*
* Sec. 8

Section 2. Ingredients and Occupational Exposure Limits

Sodium hydroxide, ca 100%

1990 OSHA PEL
Ceiling: 2 mg/m³

1990 IDLH Level
250 mg/m³ (solution mists)

1991-92 ACGIH TLV
Ceiling: 2 mg/m³

1990 DFG (Germany) MAK
2 mg/m³

1990 NIOSH REL
Ceiling: 2 mg/m³

1985-86 Toxicity Data*
Rabbit, oral, LD_{Lo}: 500 mg/kg; no toxic effect noted
Rabbit, skin: 500 mg applied over 24 hr causes severe irritation
Mouse, intraperitoneal, LD_{50}: 40 mg/kg; toxic effects not yet reviewed

* See NIOSH, *RTECS* (WB4900000), for additional irritation, mutation, and toxicity data.

Section 3. Physical Data

Boiling Point: 2534 °F (1390 °C)
Melting Point: 605 °F (318.4 °C)
Vapor Pressure: 1 mm Hg at 1362 °F (739 °C)
pH (0.5% solution): 13
Molecular Weight: 40.01
Specific Gravity: 2.13 at 77 °F (25 °C)
Water Solubility: 1 g/0.9 ml water, 1 g/0.3 ml boiling water
Other Solubilities: 1 g/7.2 ml alcohol, 1 g/4.2 ml methanol, soluble in glycerol; insoluble in acetone and ether

Appearance and Odor: Odorless, hydroscopic (readily absorbs water) white flakes, cake, lumps, chips, pellets, or sticks.

Section 4. Fire and Explosion Data

Flash Point: None reported	**Autoignition Temperature:** None reported	**LEL:** None reported	**UEL:** None reported

Extinguishing Media: Although noncombustible as a solid, when in contact with moisture or water sodium hydroxide can generate enough heat to ignite surrounding combustibles. If possible without risk, remove containers from area. Use extinguishing agents suitable for surrounding fire. For small fire, use dry chemical, carbon dioxide (CO_2), or regular foam. Avoid water spray since water reacts with sodium hydroxide to generate substantial heat. If you must use water, be sure it is as cold as possible. For large fires, use fog or regular foam.

Unusual Fire or Explosion Hazards: Sodium hydroxide may melt and flow when heated.

Special Fire-fighting Procedures: Since fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Also, wear fully protective clothing. Structural firefighters' protective clothing provides limited protection. Apply cooling water to fire-exposed sides of container until fire is well out. *Do not* splatter or splash this material. Stay away from ends of tanks. Be aware of runoff from fire control methods. Do not release to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Sodium hydroxide is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur. Violent polymerization can occur when in contact with acrolein or acrylonitrile. Since sodium hydroxide readily absorbs water and carbon dioxide from air, keep containers tightly closed.

Chemical Incompatibilities: Sodium hydroxide generates large amounts of heat when in contact with water and may steam and splatter. It reacts with mineral acids to form corresponding salts; reacts with weak-acid gases like hydrogen sulfide, sulfur dioxide, and carbon dioxide; ignites when in contact with cinnamaldehyde or zinc; and has exploded when exposed to a mixture of chloroform and methane. Sodium hydroxide can be very corrosive to metals such as aluminum, tin, and zinc as well as to alloys such as steel, and may cause formation of flammable hydrogen gas. An increase in temperature and pressure occurs in closed containers when sodium hydroxide is mixed with: acetic anhydride, glacial acetic acid, chlorohydrin, chlorosulfonic acid, ethylene cyanohydrin, glyoxal, oleum, 36% hydrochloric acid, 48.7% hydrofluoric acid, 70% nitric acid, or 96% sulfuric acid.

Conditions to Avoid: Avoid generation of sodium hydroxide dusts, and contact with water, metals, and the chemicals listed above.

Hazardous Products of Decomposition: Thermal oxidative decomposition of sodium hydroxide can produce toxic sodium oxide (Na_2O) and sodium peroxide (Na_2O_2) fumes.

Section 6. Health Hazard Data

Carcinogenicity: In 1990 reports, the IARC, NTP, and OSHA do not list sodium hydroxide as a carcinogen (see Chronic Effects).

Summary of Risks: Sodium hydroxide is toxic by inhalation of dusts or mists, ingestion, or direct skin or eye contact. Damage is immediate and without prompt medical attention can become permanent. This strong, corrosive alkali dissolves any living tissue it contacts.

Medical Conditions Aggravated by Long-Term Exposure: None reported.

Target Organs: Eyes, digestive tract, respiratory system, and skin.

Primary Entry Routes: Ingestion, inhalation, and skin and eye contact.

Continue on next page

Section 6. Health Hazard Data, *continued*

Acute Effects: Ingestion causes immediate burning of mouth, esophagus, and stomach; painful swallowing; excessive salivation; edematous (excess fluid in surrounding tissue) lips, chin, tongue, and pharynx covered with exudate (fluid oozed from swollen tissue); esophageal edema (swelling from fluid buildup in esophagus walls that can prevent all swallowing within hours); possibly edematous, gelatinous, and necrotic (localized tissue death) mucous membranes; vomiting (sometimes coffee grounds-like material due to digestive hemorrhage); and rapid, faint pulse; and cold, clammy skin. Death results commonly from shock, asphyxia (oxygen loss due to interrupted breathing), or pneumonia by the second or third day after ingestion. Dust inhalation can cause many small burns, temporary hair loss (in nasal passages since sodium hydroxide breaks down keratin), and possibly pulmonary edema (fluid in lungs). Skin contact causes slippery, soapy feeling that is not usually painful for 3 min after contact—even though skin damage begins immediately. It causes burns, keratin (hair and nails) destruction, and intracellular edema (excess fluid in skin cells), with damage progressing to severe burns, tissue corrosion, deep ulcerations, and permanent scarring if not immediately washed off. The cornea begins to corrode on contact. Disintegration and sloughing of conjunctival and corneal epithelium may progress temporary or permanent corneal opacification (cloudiness, becoming impervious to light) or symblepharon (adhesion of lid to eyeball).

Chronic Effects: Dermatitis may result from repeated exposure to dilute solutions. Cases of squamous cell carcinoma (malignant tumors of epithelial origin) of the esophagus are reported 12 to 42 years after sodium hydroxide ingestion, although it is unclear whether the cancer results from scar formation caused by tissue destruction or directly from the chemical's possible carcinogenicity.

FIRST AID: Emergency personnel should protect against contamination.

Eyes: Gently lift the eyelids and flush immediately and continuously with flooding amounts of cold water until transported to an emergency medical facility. *Do not* allow victim to keep eyes tightly shut. *Warning!* Although splashed directly in only one eye, sodium hydroxide may affect the other eye's sight if prompt medical attention is not received. Consult a physician immediately.

Skin: *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. *Be aware* that this substance can become very hot when in contact with water. For reddened or blistered skin, consult a physician. Wash affected area with soap and water.

Inhalation: Remove exposed person to fresh air and support breathing as needed.

Ingestion: Never give anything by mouth to an unconscious or convulsing person. If ingested, have that *conscious and alert* person drink 1 to 2 glasses of water, followed by vinegar or fruit juice to neutralize the poison. *Do not induce vomiting!*

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Perform endoscopy in all suspected cases of sodium hydroxide ingestion. Perform blood analysis to determine if dehydration, acidosis, or other electrolyte imbalances have occurred.

Section 7. Spill, Leak and Disposal Procedures

Spill/Leak: Notify safety personnel, isolate hazard area, deny entry, and stay upwind of spills. Cleanup personnel should protect against vapor inhalation and skin or eye contact. Use water spray to disperse vapors, but do not spray directly on spills. For small dry spills, avoid excess dust generation by carefully scooping or vacuuming (with appropriate filter) into a suitable container (above 60 °C sodium hydroxide corrodes steel) for later disposal. For large dry spills, cover with plastic sheet or other impermeable layer and contain for later disposal. Follow applicable OSHA regulations (29 CFR 1910.120).

Environmental Transport: Sodium hydroxide is not mobile in solid form, although it absorbs moisture very easily. Once liquid, sodium hydroxide leaches rapidly into soil, possibly contaminating water sources.

Environmental Degradation: Ecotoxicity values: TLm, mosquito fish, 125 ppm/96 hr (fresh water); TLm, bluegill, 99 mg/48 hr (tap water).

Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

EPA Designations
Listed as a RCRA Hazardous Waste (40 CFR 261.22): Characteristic of corrosivity
Listed as a CERCLA Hazardous Substance* (40 CFR 302.4), Reportable Quantity (RQ): 1000 lb (454 kg) [* per Clean Water Act, Sec. 311 (b)(4)]
SARA Extremely Hazardous Substance (40 CFR 355): Not listed
SARA Toxic Chemical (40 CFR 372.65): Not listed

OSHA Designations
Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Since contact lens use in industry is controversial, establish your own policy.

Respirator: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. Select the respirator based on its suitability to provide adequate worker protection for the given working conditions, level of airborne contamination, and presence of sufficient oxygen. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.*

Other: Wear impervious gloves, boots, aprons, and gauntlets to prevent any skin contact.

Ventilation: Provide general and local exhaust ventilation systems to maintain airborne concentrations below the OSHA PEL (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.(103)

Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.

Contaminated Equipment: Separate contaminated work clothes from street clothes. Launder contaminated work clothing before wearing. Remove this material from your shoes and clean personal protective equipment.

Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Avoid physical damage to containers. Store in dry, well-ventilated area away from water, acids, metals, flammable liquids, and organic halogens. Keep containers tightly closed since sodium hydroxide can decompose to sodium carbonate and carbon dioxide upon exposure to air. Since corrosion occurs easily above 140 °F (60 °C), do not store or transport sodium hydroxide in aluminum or steel containers at temperatures near this level. Store containers in rooms equipped with trapped floor drains, curbs, or gutters.

Engineering Controls: To reduce potential health hazards, use sufficient dilution or local exhaust ventilation to control hazardous contaminants and to maintain concentrations at the lowest practical level.

Other Precautions: Consider preplacement and periodic medical examinations of exposed workers that emphasize eyes, skin, and respiratory tract. Consider a respiratory protection program that includes regular training, maintenance, inspection, and evaluation. Inform employees of the possible hazards in using sodium hydroxide.

Transportation Data (49 CFR 172.101, .102)

DOT Shipping Name: Sodium hydroxide; dry, solid, flake, bead *or* granular
DOT Hazard Class: Corrosive material
ID No.: UN1823
DOT Label: Corrosive
DOT Packaging Exceptions: 173.244
DOT Packaging Requirements: 173.245b

IMO Shipping Name: Sodium hydroxide, solid
IMO Hazard Class: 8
ID No.: UN1823
IMO Label: Corrosive
IMDG Packaging Group: II

MSDS Collection References: 26, 38, 73, 89, 100, 101, 103, 124, 126, 127, 132, 133, 136, 139, 140, 143, 146, 148, 149, 153, 159, 161, 163

Prepared by: M Gannon, BA; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** W Silverman, MD; **Edited by:** ER O'Connor, MS

Material Safety Data Sheet

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GENIUM PUBLISHING CORP.

No. 9
SULFURIC ACID, CONCENTRATED
Revision C
Issued: October 1980
Revised: February 1986

SECTION 1. MATERIAL IDENTIFICATION

19

MATERIAL NAME: SULFURIC ACID, CONCENTRATED

OTHER DESIGNATIONS: Oil of Vitriol, Hydrogen Sulfate; H_2SO_4; CAS #7664-93-9

MANUFACTURER/SUPPLIER: Available from many suppliers, including:
Allied Corporation, PO Box 2064R, Morristown, NJ 07960; Telephone: 800 631-8050

HMIS
H:3
F: 0
R: 2
PPE: *
* See Sect. 8

R 1
I 3
S 4
K 0

SECTION 2. INGREDIENTS AND HAZARDS

	%	HAZARD DATA
Hydrogen Sulfate (H_2SO_4)	93-98	8-hr TWA: 1 mg/m^3
Water	Balance*	Human, Mist Inhalation, TCLo: 3 mg/m^3, 24 wk. (Toxic Mouth Effects) Rat, Oral, LD_{50}: 2140 mg/kg

* Material is obtained by the reaction of SO_3 and water. Can contain low impurity levels, such as 0.02% max of iron as Fe. Properties vary with H_2SO_4 content.

Current OSHA standard and ACGIH (1985-86) TLV. NIOSH has a 10-hr TWA, 40-hr. work week, of 1 mg/m^3.

SECTION 3. PHYSICAL DATA

	93.19% H_2SO_4	98.33% H_2SO_4	100% H_2SO_4
Boiling Point, 1 atm, deg C	ca 281	ca 338	ca 330 (dc)
Specific Gravity (60/60°F)	1.8354	1.84	1.84
Volatiles, % @ 340°C	ca 100	ca 100	ca 100
Melting Point, deg C	ca -34	ca 3	10.4

Water Solubility ... Complete Miscible
Vapor Pressure, mm Hg @ 100°F ... <1 (93.19% H_2SO_4); Deg. Baume ... 66 (93.19% H_2SO_4) - Density of H_2SO_4 is often reported in degrees Baume Be). Formula is Be=145 [145/sp gr for liquids heavier than water].

Appearance and odor: Clear, colorless, hygroscopic, oily liquid with no odor. Mists greater than 1 mg/m^3 are easily recognizable. Those at 5 mg/m^3 are distinctly objectionable.

SECTION 4. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temp.	Flammability Limits In Air	LOWER	UPPER
None - Nonflammable	NA	NA	NA	NA

Sulfuric acid is nonflammable; however, it is a strong oxidizing agent and may cause ignition by contact with combustible materials. Small fires may be smothered with suitable dry chemical. Cool exterior of storage tanks of H_2SO_4 with water to avoid rupture if exposed to fire. Do not add water or other liquid to the acid! The acid, especially when diluted with water, can react with metals to liberate flammable hydrogen gas.
Sulfuric acid mists and vapors from a fire area are corrosive (see sect. 5).
Fire fighters must wear self-contained breathing equipment and fully protective clothing.

SECTION 5. REACTIVITY DATA

Sulfuric acid is stable under normal conditions of use and storage. It does not undergo hazardous polymerization. It is a strong mineral acid reacting with bases and metals. The concentrated acid is also a dehydrating agent, picking up moisture readily from the air or other materials. Hydrogen gas may be generated within a H_2SO_4 container. Vent drums cautiously.

This material reacts exothermically with water. (Acid should always be added slowly to water. Water added to acid can cause boiling and uncontrolled splashing of the acid.) Sulfur oxides can result from decomposition and from oxidizing reactions of sulfuric acid.

SECTION 6. HEALTH HAZARD INFORMATION | TLV

Concentrated sulfuric acid is a strong mineral acid, an oxidizing agent, and a dehydrating agent that is rapidly damaging to all human tissue with which it comes in contact. Ingestion may cause severe injury or death. Eye contact produces severe or permanent injury. Inhalation of mists can damage both the upper respiratory tract and the lungs. Sulfuric acid is not listed as a carcinogen by the NTP, IARC, or OSHA.

FIRST AID: EYE CONTACT: Immediately flush eyes (including under eyelids) with plenty of running water for at least 15 minutes. Speed in diluting and rinsing out acid with water is extremely important if permanent eye damage is to be avoided. Obtain medical help as soon as possible.* SKIN CONTACT: Immediately flush affected areas with water, removing contaminated clothing while under the safety shower. Continue washing with water and get medical attention.* INHALATION: Remove to fresh air. Restore breathing. Call a physician immediately. INGESTION: Dilute acid immediately with large amounts of milk or water, then give milk of magnesia to neutralize. Never give anything by mouth to an unconscious person. Do not induce vomiting; if it occurs spontaneously, continue to administer fluid. Obtain medical attention as soon as possible.*

Maintain observation of patient for possible delayed onset of pulmonary edema.

* GET MEDICAL HELP = In plant, paramedic, community.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

Handle major spills by a predetermined plan. Contact supplier for assistance in this planning, in meeting local regulations, and for disposing of large amounts. Notify safety personnel. Provide optimum ventilation; vapors are extremely irritating. Stop leak if you can do so without risk.

Cleanup personnel need protection against inhalation or contact. Keep upwind. Contain spill. Minor leaks or spills can be diluted with much water and neutralized with soda ash or lime. If water is not available, cover contaminated area with sand, ashes, or gravel and neutralize cautiously with soda ash or lime.

DISPOSAL: Follow Federal, state, and local regulations. Runoff to sewer may create hydrogen gas, which is a fire or explosion hazard. EPA (CWA) RQ 1000 lbs. (40 CFR 117).

SECTION 8. SPECIAL PROTECTION INFORMATION

Provide general ventilation to meet current TLV requirements in the workplace. Where mists are up to 50 mg/m^3, a high-efficiency particulate respirator with full facepiece is warranted; a type-C supplier-air respirator with full facepiece operated in pressure-demand mode is used to 100 mg/m^3.

Avoid eye contact by use of chemical safety goggles or face shield where splashing may occur. Acid-resistant protective clothing, such as rubber gloves, aprons, boots, and suits, is recommended to avoid body contact.

Eyewash fountain and safety showers with deluge type of heads should be readily available where this material is handled or stored.

Contact lenses pose a special hazard; soft lenses may absorb and all lenses concentrate irritants.

Comprehensive preplacement and annual medical examinations with emphasis on dental erosion, cardiopulmonary system, and mucous membrane irritation and cough are indicated.

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Sulfuric acid in carboys or drums should be stored in clean, ventilated storage areas having acid-resistant floors with good drainage. Keep out of direct sunlight, do not store above 89.6°F (32°C). Storage facilities are to be separate from organic materials, metallic powders, chromates, chlorates, nitrates, carbides, oxidizables, etc. Soda ash, sand, or lime should be kept in general storage or work areas for emergency use. Protect containers against physical damage. Glass bottles need extra protection. Sulfuric acid is highly corrosive to most metals, especially below 77% H_2SO_4. Avoid breathing mist or vapors. Avoid contact with skin or eyes. Do not ingest. Do not add water to concentrated acid. Drums may contain hydrogen gas, so open cautiously. Use nonsparking tools free of oil, dirt, and grit and vapor-proof electrical fixtures

DOT Classification: Corrosive Material. ID No.: UN1830 Label: Corrosive

Data Source(s) Code: 1-12, 19, 20, 24, 26, 31, 37-39, 42, 82. CK

Approvals 6/86.

Indust. Hygiene/Safety 6/86

Medical Review July 86

Material Safety Data Sheet

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GENIUM PUBLISHING CORP.

No. 317
TOLUENE
(Revision D)

Issued: August 1979
Revised: April 1986

SECTION 1. MATERIAL IDENTIFICATION 20

MATERIAL NAME: TOLUENE

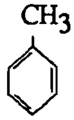
OTHER DESIGNATIONS: Methyl Benzene, Methyl Benzol, Phenylmethane, Toluol, C_7H_8, CAS #0108-88-3

MANUFACTURER/SUPPLIER: Available from many suppliers, including:
Allied Corp., PO Box 2064R, Morristown, NJ 07960; Telephone: (201) 455-4400
Ashland Chemical Co., Industrial Chemicals & Solvents Div., PO Box 2219,
Columbus, OH; Telephone: (614) 889-3844

HMIS
H: 2
F: 3
R: 0
PPE*
*See sect. 8

R 1
I 3
S 2
K 4

SECTION 2. INGREDIENTS AND HAZARDS % HAZARD DATA

SECTION 2. INGREDIENTS AND HAZARDS	%	HAZARD DATA
Toluene 	ca 100	8-hr TLV: 100 ppm, or 375 mg/m^3* (Skin)** Man, Inhalation, TCLo: 100 ppm: Psychotropic*** Rat, Oral, LD_{50}: 5000 mg/kg Rat, Inhalation, LCLo: 4000 ppm/4 hrs. Rabbit, Skin, LD_{50}: 14 gm/kg Human, Eye: 300 ppm

* Current (1985-86) ACGIH TLV. The OSHA PEL is 200 ppm with an acceptable ceiling concentration of 300 ppm and an acceptable maximum peak of 500 ppm/10 minutes.

** Skin designation indicates that toluene can be absorbed through intact skin and contribute to overall exposure.

*** Affects the mind.

SECTION 3. PHYSICAL DATA

Boiling Point ... 231°F (111°C)
Vapor Pressure @ 20°C, mm Hg ... 22
Water Solubility @ 20°C, wt. % ... 0.05
Vapor Density (Air = 1) ... 3.14

Evaporation Rate (BuAc = 1) ... 2.24
Specific Gravity (H_2O = 1) ... 0.866
Melting Point ... -139°F (-95°C)
Percent Volatile by Volume ... ca 100
Molecular Weight ... 92.15

Appearance and odor: Clear, colorless liquid with a characteristic aromatic odor. The odor is detectable to most individuals in the range of 10 to 15 ppm. Because olfactory fatigue occurs rapidly upon exposure to toluene, odor is not a good warning property.

SECTION 4. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temp.	Flammability Limits In Air	LOWER	UPPER
40°F (4°C) CC	896°F (480°C)	% by Volume	1.27	7.1

EXTINGUISHING MEDIA: Carbon dioxide, dry chemical, alcohol foam. Do not use a solid stream of water because the stream will scatter and spread the fire. Use water spray to cool tanks/containers that are exposed to fire and to disperse vapors.

UNUSUAL FIRE/EXPLOSION HAZARDS: This OSHA class IB flammable liquid is a dangerous fire hazard. It is a moderate fire hazard when exposed to oxidizers, heat, sparks, or open flame. Vapors are heavier than air and may travel a considerable distance to an ignition source and flash back.

SPECIAL FIRE-FIGHTING PROCEDURES: Fire fighters should wear self-contained breathing apparatus with full facepiece operated in a positive-pressure mode when fighting fires involving toluene.

SECTION 5. REACTIVITY DATA

CHEMICAL INCOMPATIBILITIES: Toluene is stable in closed containers at room temperature under normal storage and handling conditions. It does not undergo hazardous polymerization. This material is incompatible with strong oxidizing agents, dinitrogen tetraoxide, silver perchlorate, tetranitromethane, and uranium hexafluoride. Contact with these materials may cause fire or explosion. Nitric acid and toluene, especially in the presence of sulfuric acid, will produce nitrated compounds that are dangerously explosive.

CONDITIONS TO AVOID: Avoid exposure to sparks, open flame, hot surfaces, and all sources of heat and ignition. Toluene will attack some forms of plastics, rubber, and coatings. Thermal decomposition or burning produces carbon dioxide and/or carbon monoxide.

SECTION 6. HEALTH HAZARD INFORMATION | TLV

Toluene is not considered a carcinogen by the NTP, IARC, or OSHA. SUMMARY OF RISKS: Vapors of toluene may cause irritation of the eyes, nose, upper respiratory tract, and skin. Exposure to 200 ppm for 8 hours causes mild fatigue, weakness, confusion, lacrimation (tearing) and paresthesia (a sensation of prickling, tingling, or creeping on the skin that has no objective cause). Exposure to higher concentrations may cause headache, nausea, dizziness, dilated pupils, and euphoria, and, in severe cases, may cause unconsciousness and death. The liquid is irritating to the eyes and skin. Contact with the eyes may cause transient corneal damage, conjunctival irritation, and burns if not promptly removed. Repeated and/or prolonged contact with the skin may cause drying and cracking. It may be absorbed through the skin in toxic amounts. Ingestion causes irritation of the gastrointestinal tract and may cause effects resembling those from inhalation of the vapor. Chronic overexposure to toluene may cause reversible kidney and liver injury. FIRST AID: EYE CONTACT: Immediately flush eyes, including under eyelids, with running water for at least 15 minutes. Get medical attention if irritation persists.* SKIN CONTACT: Immediately flush skin (for at least 15 minutes) while removing contaminated shoes and clothing. Wash exposed area with soap and water. Get medical attention if irritation persists or if a large area has been exposed.* INHALATION: Remove victim to fresh air. Restore and/or support breathing as required. Keep victim warm and quiet. Get medical help.* INGESTION: Give victim 1 to 2 glasses of water or milk. Contact a poison control center. Do not induce vomiting unless directed to do so. Transport victim to a medical facility. Never give anything by mouth to a person who is unconscious or convulsing. * GET MEDICAL ASSISTANCE = In plant, paramedic, community. Get medical help for further treatment, observation, and support after first aid, if indicated.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

SPILL/LEAK: Notify safety personnel of large spills or leaks. Remove all sources of heat and ignition. Provide maximum explosion-proof ventilation. Limit access to spill area to necessary personnel only. Remove leaking containers to safe place if feasible. Cleanup personnel need protection against contact with liquid and inhalation of vapor (see sect. 8). WASTE DISPOSAL: Absorb small spills with paper towel or vermiculite. Contain large spills and collect if feasible, or absorb with vermiculite or sand. Place waste solvent or absorbent into closed containers for disposal using nonsparking tools. Liquid can be flushed with water to an open holding area for handling. Do not flush to sewer, watershed, or waterway. COMMENTS: Place in suitable container for disposal by a licensed contractor or burn in an approved incinerator. Consider reclaiming by distillation. Contaminated absorbent can be buried in a sanitary landfill. Follow all Federal, state, and local regulations. TLm 96: 100-10 ppm. Toluene is designated as a hazardous waste by the EPA. The EPA (RCRA) HW No. is U220 (40 CFR 261). The reportable quantity (RQ) is 1000 lbs/454 kg (40 CFR 117).

SECTION 8. SPECIAL PROTECTION INFORMATION

Provide general and local exhaust ventilation to meet TLV requirements. Ventilation fans and other electrical service must be nonsparking and have an explosion-proof design. Exhaust hoods should have a face velocity of at least 100 lfm (linear feet per minute) and be designed to capture heavy vapor. For emergency or nonroutine exposures where the TLV may be exceeded, use an organic chemical cartridge respirator if concentration is less than 200 ppm and an approved canister gas mask or self-contained breathing apparatus with full facepiece if concentration is greater than 200 ppm.
Safety glasses or splash goggles should be worn in all work areas. Neoprene gloves, apron, face shield, boots, and other appropriate protective clothing and equipment should be available and worn as necessary to prevent skin and eye contact. Remove contaminated clothing immediately and do not wear it until it has been properly laundered.

Eyewash stations and safety showers should be readily available in use and handling areas.

Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

STORAGE SEGREGATION: Store in a cool, dry, well-ventilated area away from oxidizing agents, heat, sparks, or open flame. Storage areas must meet OSHA requirements for class IB flammable liquids. Use metal safety cans for handling small amounts. Protect containers from physical damage. Use only with adequate ventilation. Avoid contact with eyes, skin, or clothing. Do not inhale or ingest. Use caution when handling this compound because it can be absorbed through intact skin in toxic amounts. SPECIAL HANDLING/STORAGE: Ground and bond metal containers and equipment to prevent static sparks when making transfers. Do not smoke in use or storage areas. Use nonsparking tools. ENGINEERING CONTROLS: Preplacement and periodic medical exams emphasizing the liver, kidneys, nervous system, lungs, heart, and blood should be provided. Workers exposed to concentrations greater than the action level (50 ppm) should be examined at least once a year. Use of alcohol can aggravate the toxic effects of toluene.
COMMENTS: Emptied containers contain product residues. Handle accordingly!
Toluene is designated as a hazardous substance by the EPA (40 CFR 116). DOT Classification: Flammable liquid. UN1294.
Data Source(s) Code: 1-9, 12, 16, 20, 21, 24, 26, 34, 81, 82. CR

Approvals J.O. Accrocco, 11/86.
Indust. Hygiene/Safety 10-86
Medical Review Oct 86

Material Safety Data Sheet

From Genium's Reference Collection
Genium Publishing Corporation
1145 Catalyn Street
Schenectady, NY 12303-1836 USA
(518) 377-8855

GENIUM PUBLISHING CORP.

No. 318

XYLENE (Mixed Isomers)
(Revision D)
Issued: November 1980
Revised: August 1988

SECTION 1. MATERIAL IDENTIFICATION

26

Material Name: XYLENE (Mixed Isomers)

Description (Origin/Uses): Used as a raw material for the production of benzoic acid, phthalic anhydride, isophthalic and terephthalic acids and their dimethyl esters in the manufacture of polyester fibers; in sterilizing catgut; with Canadian balsam as oil-immersion in microscopy; and as a cleaning agent in microscopic techniques.

Other Designations: Dimethylbenzene; Xylol; C_8H_{10}; CAS No. 1330-20-7

Manufacturer: Contact your supplier or distributor. Consult the latest edition of the *Chemicalweek Buyers' Guide* (Genium ref. 73) for a list of suppliers.

Comments: Although there are three different isomers of xylene (*ortho*, *meta*, and *para*), the health and physical hazards of all three isomers are very similar. This MSDS is written for a xylene mixture of all three isomers, which is usually commercial xylene.

3
2 0
-

NFPA

HMIS
H 2
F 3
R 0
PPG*
*See sect. 8

R 1
I 3
S 2
K 3

SECTION 2. INGREDIENTS AND HAZARDS

	%
Xylene (Mixed Isomers), CAS No. 1330-20-7*	**

*o-Xylene, CAS No. 0095-47-6
m-Xylene, CAS No. 0108-38-3
p-Xylene, CAS No. 0106-42-3

**Check with your supplier to determine if there are additions, contaminants, or impurities (such as benzene) that are present in reportable quantities per 29 CFR 1910.

***Immediately dangerous to life and health.

**** See NIOSH, *RTECS* (No. ZE2100000), for additional data with references to reproductive, irritative, and mutagenic effects.

EXPOSURE LIMITS

IDLH*** Level: 1000 ppm

OSHA PEL

8-Hr TWA: 100 ppm, 435 mg/m^3

ACGIH TLVs, 1987-88

TLV-TWA: 100 ppm, 435 mg/m^3
TLV-STEL: 150 ppm, 655 mg/m^3

Toxicity Data****

Human, Inhalation, TC_{Lo}: 200 ppm
Man, Inhalation, LC_{Lo}: 10000 ppm/6 Hrs
Rat, Oral, LD_{50}: 4300 mg/kg

SECTION 3. PHYSICAL DATA

Boiling Point: 275°F to 293°F (135°C to 145°C)*
Melting Point: -13°F (-25°C)
Evaporation Rate: 0.6 Relative to BuAc = 1
Specific Gravity (H_2O = 1): 0.86

Water Solubility (%): Insoluble
Molecular Weight: 106 Grams/Mole
% Volatile by Volume: Ca 100
Vapor Pressure: 7 to 9 Torrs at 68°F (20°C)
Vapor Density (Air = 1): 3.7

Appearance and Odor: A clear liquid; aromatic hydrocarbon odor.

*Materials with wider and narrower boiling ranges are commercially available.

SECTION 4. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temperature	Flammability Limits in Air	LOWER	UPPER
81°F to 90°F (27°C to 32°C)	867°F (464°C)	% by Volume	1%	7%

Extinguishing Media: Use foam, dry chemical, or carbon dioxide. Use water sprays to reduce the rate of burning and to cool containers.

Unusual Fire or Explosion Hazards: Xylene vapor is heavier than air and may travel a considerable distance to a low-lying source of ignition and flash back.

Special Fire-fighting Procedures: Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode.

SECTION 5. REACTIVITY DATA

Xylene is stable in closed containers during routine operations. It does not undergo hazardous polymerization.

Chemical Incompatibilities: This material may react dangerously with strong oxidizers.

Conditions to Avoid: Avoid any exposure to sources of ignition and to strong oxidizers.

Hazardous Products of Decomposition: Carbon monoxide (CO) may be evolved during xylene fires.

SECTION 6. HEALTH HAZARD INFORMATION

Xylene is not listed as a carcinogen by the IARC, NTP, or OSHA.

Summary of Risks: Liquid xylene is a skin irritant and causes erythema, dryness, and defatting; prolonged contact may cause blistering. Inhaling xylene can depress the central nervous system (CNS), and ingesting it can result in gastrointestinal disturbance; and possibly hematemesis (vomiting blood). Effects on the eyes, kidneys, liver, lungs, and the CNS are also reported. **Medical Conditions Aggravated by Long-Term Exposure:** Problems with eyes, skin, central nervous system, kidneys, and liver may be worsened by exposure to xylene. **Target Organs:** CNS, eyes, gastrointestinal tract, blood, liver, kidneys, skin. **Primary Entry:** Inhalation, skin contact/absorption. **Acute Effects:** Dizziness; excitement; drowsiness; incoordination; staggering gait; irritation of eyes, nose, and throat; corneal vacuolization; anorexia; nausea; vomiting; abdominal pain; and dermatitis. **Chronic Effects:** Reversible eye damage, headache, loss of appetite, nervousness, pale skin, and skin rash.

FIRST AID: Eyes. Immediately flush eyes, including under the eyelids, gently but thoroughly with plenty of running water for at least 15 minutes. **Skin.** Immediately wash the affected area with soap and water. **Inhalation.** Remove the exposed person to fresh air; restore and/or support his or her breathing as needed. Have a trained person administer oxygen. **Ingestion.** Never give anything by mouth to someone who is unconscious or convulsing. Vomiting may occur spontaneously, but do not induce it. If vomiting should occur, keep exposed person's head below his or her hips to prevent aspiration (breathing the liquid xylene into the lungs). Severe hemorrhagic pneumonitis with grave, possibly fatal, pulmonary injury can occur from aspiring very small quantities of xylene.

GET MEDICAL HELP (IN PLANT, PARAMEDIC, COMMUNITY) FOR ALL EXPOSURES. Seek prompt medical assistance for further treatment, observation, and support after first aid. If exposure is severe, hospitilization for at least 72 hours with careful monitoring for delayed onset of pulmonary edema is recommended.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

Spill/Leak: Notify safety personnel, provide ventilation, and eliminate all sources of ignition immediately. Cleanup personnel need protection against contact with and inhalation of xylene vapor (see sect. 8). Contain large spills and collect waste or absorb it with an inert material such as sand, earth, or vermiculite. Use nonsparking tools to place waste liquid or absorbent into closable containers for disposal. Keep waste out of sewers, watersheds, and waterways.

Waste Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow Federal, state, and local regulations.

OSHA Designations

Air Contaminant (29 CFR 1910.1000 Subpart Z)

EPA Designations (40 CFR 302.4)

RCRA Hazardous Waste, No. U239

CERCLA Hazardous Substance, Reportable Quantity: 1000 lbs (454 kg), per the Clean Water Act (CWA), section 311 (b) (9)

SECTION 8. SPECIAL PROTECTION INFORMATION

Goggles: Always wear protective eyeglasses or chemical safety goggles. Where splashing is possible, wear a full face shield as a supplementary protective measure. Follow OSHA eye- and face-protection regulations (29 CFR 1910.133). **Respirator:** Use a NIOSH-approved respirator per the *NIOSH Pocket Guide to Chemical Hazards* for the maximum-use concentrations and/or the exposure limits cited in section 2. Follow OSHA respirator regulations (29 CFR 1910.134). For emergency or nonroutine use (leaks or cleaning reactor vessels and storage tanks), wear an SCBA with a full facepiece operated in the pressure-demand or positive-pressure mode. **Warning:** Air-purifying respirators will *not* protect workers in oxygen-deficient atmospheres. **Other:** Wear impervious gloves, boots, aprons, gauntlets, etc., as required by the specifics of the work operation to prevent prolonged or repeated skin contact with xylene. **Ventilation:** Install and operate general and local maximum, explosion-proof ventilation systems powerful enough to maintain airborne levels of xylene below the OSHA PEL standard cited in section 2. Local exhaust ventilation is preferred because it prevents dispersion of xylene into general work areas by eliminating it at its source. Consult the latest edition of Genium reference 103 for detailed recommendations. **Safety Stations:** Make eyewash stations, safety/quick-drench showers, and washing facilities available in areas of use and handling. **Contaminated Equipment:** Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them. Do *not* wear contact lenses in any work area. Remove contaminated clothing and launder it before wearing it again; clean xylene from shoes and equipment. **Comments:** Practice good personal hygiene; always wash thoroughly after using this material. Keep it off of your clothing and equipment. Avoid transferring it from your hands to your mouth while eating, drinking, or smoking. Do *not* eat, drink, or smoke in any work area. Do not inhale xylene vapor.

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Storage/Segregation: Store xylene in a cool, dry, well-ventilated area away from sources of ignition and strong oxidizers. Protect containers from physical damage.

Special Handling/Storage: Make sure all engineering systems (production, transportation) are of maximum explosion-proof design. Ground and bond all containers, pipelines, etc., used in shipping, transferring, reacting, producing, and sampling operations.

Transportation Data (49 CFR 172.101-2)

DOT Shipping Name: Xylene
DOT ID No. UN1307

DOT Label: Flammable Liquid
DOT Hazard Class: Flammable Liquid

IMO Label: Flammable Liquid
IMO Class: 3.2 or 3.3

References: 1, 2, 12, 73, 84-94, 100, 103.

Prepared by PJ Igoe, BS

Industrial Hygiene Review: DJ Wilson, CIH

Medical Review: MJ Hardies, MD

Appendix C
Quality Assurance Project Plan

Former Manufactured Gas Plant Site
Clark Street MGP
Auburn, New York

New York State Electric & Gas Corporation
Binghamton, New York

August 1992

BLASLAND & BOUCK ENGINEERS, P.C.
6723 TOWPATH ROAD
SYRACUSE, NEW YORK 13214

QUALITY ASSURANCE PROJECT PLAN

FORMER MANUFACTURED GAS PLANT SITE
CLARK STREET
AUBURN, NEW YORK

Approved Edward M Lynch
Project Officer
Blasland & Bouck Engineers, P.C.

Date: 8/12/92

Approved Nancy E. Gensky
Project Manager
Blasland & Bouck

Date: 5/13/92

Approved Vita DeMarchi
Site Manager/Quality Assurance Manager
Blasland & Bouck Engineers, P.C.

Date: 8/13/92

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1.0 - PROJECT DESCRIPTION

1.1 INTRODUCTION

This Quality Assurance Project Plan (QAPP) provides a description of general and laboratory procedures, including quality assurance/quality control (QA/QC) procedures to be used to implement a Remedial Investigation (RI) at the Clark Street former manufactured gas plant (MGP) site located in Auburn, New York. This QAPP is an integral part of, and should be used in conjunction with, the RI Work Plan. Sections 1.0 and 2.0 of the RI Work Plan describe the site with respect to location, physical setting, history and potential source areas.

This QAPP has been formatted for use as a reference document for laboratory and data reporting protocols. The overall objective of the QAPP is to provide quality analytical data for each appropriate work task to be performed as part of the RI activities. The QAPP also identifies a Project Management Team and the responsibilities of individual team members in the execution of the QAPP.

Information contained in the QAPP has been organized into the following sections:

Section	Content
1	Project Description
2	Project Organization and Responsibilities
3	Quality Assurance Objectives for Data Measurement
4	Sampling Procedures
5	Sample and Document Custody
6	Calibration Procedures and Frequency
7	Analytical Procedures
8	Data Reduction, Validation, and Reporting
9	Field and Laboratory Quality Control Checks
10	Performance and System Audits
11	Preventive Maintenance
12	Data Assessment Procedures
13	Corrective Action
14	Quality Assurance Reports to Management

1.2 RI OBJECTIVES

The overall objectives of the RI are to:

1. Identify and delineate the contaminant source areas (i.e., MGP source materials), including characterization of residues present;
2. Define the extent of contaminants in various environmental media (soils, ground water, and sediments); and
3. Determine if the residues and associated contaminants present a potential significant threat to human health and/or the environment.

1.3 RI DATA QUALITY OBJECTIVES

1.3.1 General

Data quality objectives (DQOs) are statements, in either qualitative or quantitative terms, regarding the appropriate data quality for an investigation. DQOs are typically determined through an iterative process and refined as information becomes available, and established based on the end use of the data obtained. General project DQOs for the Clark Street former MGP site RI are summarized in this section, with detailed information provided throughout the QAPP and RI Work Plan.

The analytical methods to be used during the RI will be USEPA SW-846 methods with New York State Department of Environmental Conservation (NYSDEC) Analytical Services Protocol (ASP) Revision 12/91, QA/QC requirements and Category B reporting deliverables, except for BTU content analysis of residue samples, total organic carbon (TOC) analysis of sediment samples, and grain size analysis of soil samples as described in the QAPP.

To obtain information necessary to meet the RI objectives stated above in Section 1.2, the following four field sampling investigations will be conducted:

- Source Investigation;
- Surface Soil Investigation;
- Ground-Water Investigation; and
- Sediment Investigation.

A description of the DQOs for the Clark Street former MGP site RI is presented below.

1.3.2 Source Investigation DQOs

The source investigation is designed to verify the location of potential MGP-related source materials and confirm the presence and extent of MGP residues. The chemical composition of the MGP-related source materials will be used to aid in determining the analytical parameters for subsequent environmental sampling in other media. The components of the source investigation, including the number of samples to be obtained and analyzed and the analytical methods to be used are presented below.

Test Pits and Trenches

As described in the RI Work Plan, test pits and trenches will be performed in potential source areas to locate and identify the horizontal extent of MGP residues at the site to aid in determining the analytical parameters for subsequent environmental sampling. If residues are encountered, up to five representative source samples will be collected for laboratory analysis for the following:

- Method 8240 for volatile organic compounds (VOCs) (Tentatively identified compounds (TICs) included);
- Method 8270 for semi-volatile organic compounds (SVOCs, TICs included);
- Method 6010/7000 series for the following metals:

  aluminum
  antimony
  arsenic
  barium
  cadmium
  chromium
  copper
  iron
  lead
  manganese
  mercury
  nickel
  selenium
  silver
  vanadium
  zinc

- Method 9010 for cyanide (total and amenable);
- USEPA SW-846 Chapter 7.3 Methods for Reactivity (cyanide, sulfide);
- Method A006 for BTU content; and
- GC-FID fingerprinting.

Test Borings

Test borings will be installed to identify the vertical extent of MGP residues and to define potential source areas where test pits/trenches cannot be performed due to physical barriers. Up to five representative subsurface source samples will be collected for laboratory analysis for the following:

- Method 8240 for VOCs (Tentatively identified compounds (TICs) included);
- Method 8270 for SVOCs (TICs included);
- Methods 6010/7000 series for the following metals:

  aluminum
  antimony
  arsenic
  barium
  cadmium
  chromium
  copper
  iron
  lead
  manganese
  mercury
  nickel
  selenium
  silver
  vanadium
  zinc

- Method 9010 for cyanide (total and amenable);
- USEPA SW-846 Chapter 7.3 Methods for Reactivity (cyanide, sulfide);

- Method A006 for BTU content; and
- GC-FID fingerprinting.

Characterize Contents of Subsurface Tank

One or more representative samples of MGP residue (if any) will be collected from the tank located northwest of the former gas plant building. The MGP residue will be analyzed for the following:

- Method 8240 for VOCs (TICs included);
- Method 8270 for SVOCs (TICs included);
- Method 6010/7000 series for the following metals;

aluminum
antimony
arsenic
barium
cadmium
chromium
copper
iron
lead
manganese
mercury
nickel
selenium
silver
vanadium
zinc

- Method 9010 for cyanide (total and amenable);
- USEPA SW-846 Chapter 7.3 Methods for Reactivity (cyanide, sulfide);
- Method A006 for BTU content; and
- GC-FID fingerprinting.

In addition, up to five soil samples will be collected during the test borings for particle size analysis by ASTM D-422-63 to verify field visual classification of subsurface soils.

Table 1 presents the estimated number of samples to be collected during the source investigation.

Table 2 presents the parameters to be analyzed under each of the methods described above along with the laboratory quantitation limits.

1.3.3 Surface Soil Investigation DQO

The surface soil investigation is designed to evaluate the presence of MGP constituents in on-site surface soils. Surface soil data will be evaluated in the preliminary risk assessment.

As part of the surface soil investigation, up to five surface soil samples will be collected above identified MGP source areas and/or in drainage swales. In addition, at least one background surface soil sample will be collected. The six soil samples will be analyzed for the following:

- Method 8240 for VOCs (TICs included);
- Method 8270 for SVOCs (TICs included);

- Method 8080 for PCBs; and
- Applicable methods for other constituents detected in the source residues.

The number of samples to be collected during the surface soil investigation is presented in Table 1. Table 2 presents the parameters to be analyzed under each of the methods described above along with the laboratory quantitation limits. As stated in the Work Plan, the list of parameters to be analyzed for during the surface soil investigation will be determined based on the results of the source investigaiton and may be different from those listed above.

1.3.4 Ground-Water Investigation DQOs

The ground-water investigation will be conducted to evaluate the presence and extent of MGP residues and/or MGP-related constituents in ground water beneath the site. Ten ground-water monitoring wells will be installed in the site overburden. The RI Work Plan describes the ground-water elevation measurements to be obtained and in-situ hydraulic conductivity testing to be performed.

The ground-water investigation is designed to generate hydrogeologic and water quality data to support the following evaluations:

1. Investigate the dynamics of the ground-water system(s) in the vicinity of the Clark Street site (horizontal and vertical flow directions, gradients, and velocities, as well as discharge areas);
2. Investigate the lateral and vertical extent of the site-related constituents in the ground-water flow system(s) in the vicinity of the Clark Street site; and
3. Determine the extent to which the ground water could be a migration pathway for constituents associated with the Clark Street site.

The data obtained will be used primarily to characterize the ground-water with respect to the nature and extent of constituents associated with the site. These data will also be used to assess the risks to human health and the environment associated with the level of constituents (if any) detected in the ground water.

As set forth in the RI Work Plan and above, both hydrogeologic and water quality data are required to meet the objective of the ground-water investigation and subsequently, to use the ground-water data for its intended purposes. Hydrogeologic data will consist of water level information and in-situ hydraulic conductivity values which will be used to calculate other hydrogeologic parameters. Water quality data will consist of field parameters, including pH, temperature, conductivity, and turbidity, as well as laboratory parameters as described below. The rationale for the selection of these parameters is discussed in detail in the RI Work Plan and Section 3 herein.

The ground-water investigation will involve the collection of ground-water samples from the monitoring wells at the Clark Street site for field and laboratory analyses, as well as the measurement of ground-water levels. The well locations were selected to provide information on the water quality and movement of ground-water through the overburden at the Clark Street site. In addition, the wells will be sampled and analyzed quarterly for one year to assess any temporal trends in the constituents identified for ground water. The quantity of ground-water analytical data, including QA/QC samples, that will be collected during the RI is summarized in Table 1. This quantity of ground-water data is based on representing the overburden ground-water flow system spatially and temporally such that the extent of constituents in the ground-water system can be delineated.

The ground-water level measurement procedures, the field parameter measurement procedures, and the ground-water sampling methods are provided in Appendix A of the Work Plan. The laboratory analytical methods for the site constituents are listed in Table 2.

Ten ground-water samples will be collected during each event and will be analyzed for the following:

- Method 8240 for VOCs (TICs included);
- Method 8270 for SVOCs (TICs included);
- Method 8080 for PCBs (first sampling event only); and
- Applicable methods for other constituents detected in the source areas.

The number of samples to be collected during the ground-water investigation is presented in Table 1.

Table 2 presents the parameters to be analyzed under each of the methods described above with the laboratory quantitation limits. As stated in the Work Plan, the list of parameters to be analyzed for during the ground-water investigation will be determined based on the results of the source investigation and may differ from those listed above.

1.3.5 Sediment Investigation DQOs

A sediment investigation will be performed to determine the presence and characterize the nature of MGP residues and contaminants in the Owasco outlet sediments so that a preliminary risk assessment to determine whether significant risks are associated with the MGP residues and contaminants can be performed.

As part of the sediment investigation, up to 25 sediment samples will be collected using clear lexan tubes as described in the Work Plan. The sediment probe samples will be visually-examined to determine the potential presence of residues, the presence of sediment horizons, and the depth of sediments in the Owasco outlet near the site. The frequency of sediment probing will be increased in areas which yield potentially-contaminated sediment and/or sediment qualities (stained lenses, etc.) that might suggest residue deposition. Based on the sediment sample probing and visual examination activities, up to nine sediment samples will be collected for laboratory analysis for the following:

- Total Organic Carbon (TOC) by the Lloyd Kahn Method;
- Method 8240 for VOCs (TICs included);
- Method 8270 for SVOCs (TICs included);
- Applicable methods for other constituents detected in the source residues.

The number of sediment samples is presented in Table 1.

Table 2 presents the parameters to be analyzed under each of the methods described above along with the laboratory quantitation limits. As stated in the Work Plan, the list of parameters to be analyzed for during the sediment investigation will be determined based on the results of the source investigation and may differ from those listed above.

2.0 - PROJECT ORGANIZATION AND RESPONSIBILITIES

2.1 PROJECT ORGANIZATION

The Clark Street former MGP site will require integration of personnel from the organizations identified below, collectively referred to as the project team. A project organization chart depicting the project team personnel is included as Figure 1. A detailed description of the responsibilities of each member of the project team is presented in the following section.

2.1.1 Overall Project Management

Blasland & Bouck Engineers, P.C., (Blasland & Bouck) on behalf of the New York State Electric & Gas (NYSEG), has overall technical responsibility for the Clark Street former MGP site RI. Blasland & Bouck personnel will perform the MGP source, surface soil, ground-water, and sediment investigations; the air emissions assessment; and the preliminary risk assessment. In addition, Blasland & Bouck will be responsible for evaluating resultant investigation data, and preparing the RI deliverables specified in the RI Work Plan. Project direction and oversight will be provided by NYSEG personnel. A listing of project management personnel and their responsibilities is provided below.

Title	Company/Organization	Name	Phone Number
Supervisor of Remedial Investigations	NYSEG	Thomas M. O'Meara	(607) 729-2551
Contract Program Manager	NYSEG	Chris Hebdon	(607) 762-4305
Project Officer	Blasland & Bouck	Edward R. Lynch, P.E.	(315) 446-9120
Project Manager	Blasland & Bouck	Nancy E. Gensky	(315) 446-9120
Site Manager	Blasland & Bouck	Vita A. DeMarchi	(315) 446-9120

2.1.2 Task Managers

The staff performing the investigative and evaluation activities of the RI will be directed by representatives of Blasland & Bouck. Listed below are the personnel responsible for each of the RI tasks:

Title	Company/Organization	Name	Phone Number
Sediment Investigation Task Manager	Blasland & Bouck	Mark P. Brown, Ph.D	(315) 446-9120
Sediment Investigation Field Coordinator	Blasland & Bouck	Richard P. DiFiore	(315) 446-9120
Risk Assessment Task Manager	Blasland & Bouck	Michele A. Antra-Cordone, Ph.D.	(315) 446-9120

2.1.3 Analytical Laboratory Services and Subcontractors

Analytical services for the Clark Street site RI will be provided by a NYSEG-designated laboratory. Parratt-Wolff, Inc., of Syracuse, New York will perform drilling and excavation work during the RI. Laboratory and subcontractor management personnel are listed below.

Title	Company/Organization	Name	Phone Number
Laboratory Project Manager	NYSEG-designated laboratory		
Project Manager	Parratt-Wolff, Inc.	Mike Ellingworth	(315) 437-1429
Drilling/Excavation Supervisor	Parratt-Wolff, Inc.	Mike Ellingworth	(315) 437-1429

2.1.4 Quality Assurance Staff

The QA aspects of the RI will be conducted by Blasland & Bouck and the NYSEG-designated laboratory. The following personnel have been assigned to this project component:

Title	Company/Organization	Name	Phone Number
Quality Assurance Manager	Blasland & Bouck	Vita A. DeMarchi	(315) 446-9120
Quality Assurance Officer	NYSEG-desingated laboratory		
Independent Data Validator	Undefined	Undefined	Undefined

2.2 TEAM MEMBER RESPONSIBILITIES

This section of the QAPP discusses the responsibilities and duties of the project team members.

2.2.1 NYSEG

Supervisor of Remedial Investigations

1. Supervision and oversight of NYSEG's Contract Program Manager; and
2. Provide NYSEG input for major project deliverables.

Contract Program Manager

1. Overall direction of the RI; and
2. Review of Blasland & Bouck work products, including data packages and reports, memorandums, letters, and RI reports.

2.2.2 Blasland & Bouck Engineers, P.C.

Project Officer

Responsibilities and duties include:

1. Oversight of the Blasland & Bouck RI work products; and
2. Provide Blasland & Bouck approval for major project deliverables.

Project Manager

Responsibilities and duties include:

1. Management and coordination of all aspects of the project as defined in the RI Work Plan with an emphasis on adhering to the objectives of the RI;
2. Review RI Report and all documents prepared by Blasland & Bouck; and
3. Assure corrective actions are taken for deficiencies cited during audits of RI activities.

Site Manager

Responsibilities and duties include:

1. Oversight of field hydrogeologic efforts;
2. Oversight of field screening and collection of soil samples;
3. Review of field hydrogeologic records and boring logs;
4. Oversight of ground-water sampling;
5. Oversight of field analysis and collection of QA samples.
6. Reduction of field data calibration and maintenance;
7. Review of the field instrumentation, maintenance, and calibration to maintain quality data;
8. Preparation of draft reports and other key documents;
9. Maintenance of field files of notebooks and logs, and calculations;
10. Instruction of field staff; and
11. Coordination of field and laboratory schedules.

Sediment Investigation Field Coordinator

Responsibilities and duties include:

1. Identification sediment sampling locations;
2. Review of sediment laboratory data; and
3. Contribute to the preparation of reports and other key documents.
4. Oversight of sediment probing and sampling efforts;
5. Oversight of field sediment data reduction;
6. Review of field sediment sampling records;
7. Maintenance of field files, notebooks, and calculations.

Sediment Investigation Task Manager

1. Review sediment data and draft reports.

Risk Assessment Task Manager

Responsibilities and duties include:

1. Prepare preliminary risk assessment;
2. Review of analytical results; and
3. Contribute to the preparation of reports and other key documents.

Field Personnel

Responsibilities and duties include:

1. Perform field procedures associated with the source, surface soil, ground-water, and sediment investigations as set forth in the Work Plan;
2. Perform field analyses and collect QA samples;
3. Calibrate, operate, and maintain field equipment;
4. Reduce field data;
5. Maintain sample custody; and
6. Prepare field records and logs.

Quality Assurance Manager

Responsibilities and duties include:

1. Review laboratory data packages;
2. Oversee and interface with the analytical laboratories;
3. Coordinate field QA/QC activities with task managers, including audits of RI activities, concentrating on field analytical measurements and practices to meet DQOs;
4. Review field reports;
5. Review audit reports; and
6. Prepare QA/QC report which includes an evaluation of field and laboratory data and data validation reports.

2.2.3 NYSEG-Designated Laboratory

General responsibilities and duties include:

1. Perform sample analyses;
2. Supply sample containers and shipping cartons;
3. Maintain laboratory custody of samples; and
4. Strictly adhere to laboratory protocols.

Laboratory Project Manager

Responsibilities and duties include:

1. Serve as primary communication link between Blasland & Bouck and laboratory staff;
2. Monitor work loads and ensure availability of resources;
3. Oversee preparation of analytical reports; and
4. Supervisor in-house chain-of-custody.

Quality Assurance Officer

Responsibilities and duties include:

1. Supervise technical staff in QA/QC procedures; and
2. Conduct audits of all laboratory activities.

2.2.4 Independent Data Validator

Responsibilities and duties include:

1. Provide independent validation of analytical data.

2.2.5 Parratt-Wolff, Inc.

General responsibilities and duties include:

1. Performance of ground-water monitoring well installations and test borings in accordance with the RI protocols;
2. Performance of test pits/trenches and tank opening;
3. Decontamination of drilling and sampling equipment; and
4. Well development.

3.0 - QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT OF DATA

3.1 SELECTION OF MEASUREMENT PARAMETERS, LABORATORY METHODS, AND FIELD TESTING METHODS

3.1.1 Field Parameters and Methods

3.1.1.1 Field Parameters

During the ground-water investigation, field parameters consisting of pH, conductivity, temperature, and turbidity will be measured to provide general water quality information. Field test methods to measure pH, conductivity, temperature, and turbidity are presented in Appendix A of the RI Work Plan.

3.1.1.2 Hydrogeologic Measurements

As described in the RI Work Plan, ground-water levels will be measured during each ground-water sampling event and in-situ hydraulic conductivity tests will be performed. Ground-water levels will be measured and hydraulic conductivity tests will be performed using the procedures presented in Appendix A of the RI Work Plan.

3.1.1.3 Source and Soil Screening Measurements

As described in the RI Work Plan, source materials and soil samples will be continuously screened for volatile organic vapors using a PID to determine the presence and relative concentration of VOCs in the samples. Procedures for screening of the samples with a PID are presented in Appendix A of the RI Work Plan.

3.1.2 Laboratory Parameters and Methods

3.1.2.1 Analytical Constituents

As described in the RI Work Plan, analyses of ground-water, source materials, soils, and sediments will be performed at the frequency set forth in Table 1. The analytical parameters selected for each media are described in the RI Work Plan. Table 2 presents the constituents identified by matrix, along with the selected analytical methods and quantitation limits. If other constituents are detected during the performance of the selected analytical methods (i.e., tentatively identified compounds), they will be identified in the laboratory report.

3.2 QUALITY ASSURANCE OBJECTIVES

The overall quality assurance objective for this RI is to develop and implement procedures for defensible sampling, chain-of-custody, laboratory analysis, instrument calibration, data reduction and reporting, internal quality control, audits, preventive maintenance, and corrective action. These procedures are presented or referenced in the following sections of the QAPP. Specific QC checks are discussed in Section 9.

Quality assurance objectives are generally defined in terms of five parameters:

1. Representativeness;
2. Comparability;
3. Completeness;

4. Precision; and
5. Accuracy.

Each parameter is defined below. Specific objectives for this RI are set forth in other sections of this QAPP as referenced below.

3.2.1 Representativeness

Representativeness is the degree to which sampling data accurately and precisely represent site conditions, and is dependent on sampling and analytical variability. The RI has been designed to assess the presence of the constituents at the time of sampling. The Work Plan presents the rationale for sample quantities and location. The Work Plan and this QAPP present field sampling methodologies and laboratory analytical methodologies, respectively. The use of the prescribed field and laboratory analytical methods with associated holding times and preservation requirements are intended to provide representative data. Further discussion of QC checks is presented in Section 9.

3.2.2 Comparability

Comparability is the degree of confidence with which one data set can be compared to another. Comparability between the investigations of the RI, and to the extent possible, with existing data will be maintained through consistent sampling and analytical methodology set forth in this QAPP, the Work Plan, and SW-846 analytical methods with NYSDEC ASP Revision 12/91 QA/QC requirements and Category B reporting deliverables; and through use of QA/QC procedures and appropriately trained personnel.

3.2.3 Completeness

Completeness is defined as a measure of the amount of valid data obtained from an event and/or investigation compared to the amount that was expected to be obtained under normal conditions. This will be determined upon assessment of the analytical results, as discussed in Section 12.

3.2.4 Precision

Precision is the measure of reproducibility of sample results. The goal is to maintain a level of analytical precision consistent with the objectives of the RI. To maximize precision, sampling and analytical procedures will be followed. All work for this RI will adhere to established protocols presented in the QAPP and Work Plan. Checks for analytical precision will include the analysis of matrix spike duplicates, laboratory duplicates and field duplicates. Checks for field measurement precision will include obtaining duplicate field measurements. Further discussion of precision QC checks is provided in Section 9.

3.2.5 Accuracy

Accuracy is the deviation of a measurement from the true value of a known standard. Both field and analytical accuracy will be monitored through initial and continuing calibration of instruments. In addition, internal standards, matrix spikes, blank spikes, and surrogates (system monitoring compounds) will be used to assess the accuracy of the laboratory analytical data. Further discussion of these QC samples is provided in Section 9.

4.0 - SAMPLING PROCEDURES

Source materials, ground-water, soil, and sediment samples will be collected as described in the Work Plan. In addition, Appendix A of the Work Plan contains the procedures for installing monitoring wells; measuring water levels; performing field measurements; and handling, packing, and shipping of RI samples.

5.0 - SAMPLE AND DOCUMENT CUSTODY

5.1 *FIELD PROCEDURES*

The objective of field sample custody is to assure that samples are not tampered with from the time of sample collection through time of transport to the analytical laboratory. Persons will have "custody of samples" when the samples are in their physical possession, in their view after being in their possession, or in their physical possession and secured so they cannot be tampered with. In addition, when samples are secured in a restricted area accessible only to authorized personnel, they will be deemed to be in the custody of such authorized personnel. A discussion of sample custody and directions for the field use of chain-of-custody forms are provided in the Work Plan. A sample field chain-of-custody form is also provided in Appendix A of the Work Plan.

5.2 *LABORATORY PROCEDURES*

5.2.1 General

Upon sample receipt, laboratory personnel will be responsible for sample custody. A field chain-of-custody form will accompany all samples requiring laboratory analysis. Samples will be kept secured in the laboratory until all stages of analysis are complete. All laboratory personnel having samples in their custody will be responsible for maintaining sample integrity.

5.2.2 Sample Receipt and Storage

Immediately upon sample receipt, the laboratory sample custodian will verify the package seal, open the package, and compare the contents against the field chain-of-custody. At this time, the laboratory sample custodian will also be responsible for logging the samples in, assigning a unique laboratory identification number to each, and labelling the sample bottle with the laboratory identification number. The project name, field sample code, date sampled, date received, analysis required, storage location and date, and action for final disposition will be recorded in the laboratory logbook. If the sample container is broken, the sample is in an inappropriate container, or has not been preserved by appropriate means, Blasland & Bouck will be notified.

5.2.3 Sample Chain-of-Custody and Documentation

Laboratory chain-of-custody and documentation will follow procedures consistent with Exhibit F of the NYSDEC ASP Revision 12/91.

5.2.4 Laboratory Project Files

During the RI, the laboratory will establish a file for all pertinent data. These files will include the chain-of-custody forms, raw data, chromatograms (required for all constituents analyzed by chromatography), and sample preparation information. The laboratories will retain project records until the conclusion of the RI, at which time they will be transferred to NYSEG, if requested.

5.3 PROJECT FILE

RI documentation will be placed in a single project file at the Blasland & Bouck office in Syracuse, New York. This file will consist of the following components:

1. Agreements (filed chronologically);
2. Correspondence (filed chronologically);
3. Memos (filed chronologically);
4. Notes and Data (filed by topic).

Reports (including QA reports) will be filed with correspondence. Analytical laboratory documentation (when received) and field data will be filed with notes and data. Filed materials may be removed by personnel on a temporary basis only.

6.0 - CALIBRATION PROCEDURES AND FREQUENCY

6.1 *FIELD EQUIPMENT CALIBRATION PROCEDURES AND FREQUENCY*

Specific procedures for performing and documenting calibration and maintenance for the equipment measuring conductivity, temperature, pH, ground water levels, and surface water levels are provided in Appendix A of the Work Plan. Calibration checks will be performed daily when measuring conductivity, turbidity, temperature, and pH. For ground-water sampling, the pH meter will be calibrated at each sampling location. Field equipment, frequency of calibration, and calibration standards are provided in Appendix A of the RI Work Plan.

6.2 *LABORATORY EQUIPMENT CALIBRATION PROCEDURES AND FREQUENCY*

Instrument calibration will follow the specifications provided by the instrument manufacturer or specific analytical method used. The analytical methods for target constituents are identified separately below.

Volatile Organics

Equipment calibration procedures will follow guidelines presented in NYSDEC ASP 12/91 Revisions, Exhibit E, Part III.

Semi-Volatile Organics

Equipment calibration procedures will follow guidelines presented in NYSDEC ASP 12/91 Revisions, Exhibit E, Part IV.

Metals

Equipment calibration procedures will follow guidelines presented in NYSDEC ASP 12/91 Revisions, Exhibit E, Part VII.

Cyanide (total and amenable)

Equipment calibration procedures will follow guidelines presented in NYSDEC ASP 12/91 Revisions, Exhibit E, Part VII.

GC-FID Screen

Equipment calibration procedures will follow guidelines presented in NYSDEC ASP 12/91 Exhibit D, for gas chromatography screening of residues.

Total Organic Carbon

Equipment calibration procedures will follow guidelines presented in Lloyd Kahn Method.

PCBs

Equipment calibration procedures will follow guidelines presented in NYSDEC ASP 12/91 Revisions, Exhibit E, Part V.

Reactivity (Cyanide/Sulfide)

Equipment calibration procedures will follow the guidelines presented in SW-846.

BTU Content

Equipment calibration procedures will follow the guidelines presented in Method A006.

7.0 - ANALYTICAL PROCEDURES

7.1 *FIELD ANALYTICAL PROCEDURES*

Field analytical procedures will include the measurement of temperature, conductivity, pH and ground water, and water levels. Specific field measurement protocols are provided in Appendix A of the Work Plan.

7.2 *LABORATORY ANALYTICAL PROCEDURES*

Laboratory analytical requirements presented in the sub-sections below include a general summary of requirements, specifics related to each sample medium to be analyzed, and details of the methods to be used for this project. SW-846 methods with NYSDEC, ASP, 12/91 Revisions, QA/QC and reporting deliverables requirements will be used with the following exceptions: sediment TOC, BTU content, and particle size distribution.

7.2.1 General

The following tables summarize general analytical requirements:

Table	Title
Table 1	Environmental and Quality Control Sample Analyses
Table 2	Parameters, Methods, and Quantitation Limits
Table 3	Sample Containers, Preservation Methods, and Holding Times Requirements

7.2.2 RI Sample Matrices

7.2.2.1 Ground Water

Matrices in this category consist of ground water. Analytical results for all analyses will be reported in units identified in Table 2.

7.2.2.2 Source Materials/Soil/Sediment

Analyses in this category will relate to source material, soil, and sediment samples. Results will be reported as dry weight, in units presented in Table 2. Moisture content will be reported separately.

7.2.3 Analytical Requirements

The primary sources to describe the analytical methods to be used during the investigation are provided in USEPA SW-846 Test Methods for Evaluating Solid Waste, Third Edition Methods with NYSDEC ASP 12/91 Revision, QA/QC and reporting deliverables requirements. Detailed information regarding quality control procedures including matrix spike, matrix spike duplicates, matrix spike blanks, and surrogate recoveries is provided in NYSDEC, ASP 12/91 Revisions, Exhibit E.

8.0 - DATA REDUCTION, VALIDATION, AND REPORTING

After field and laboratory data are obtained, these data will be subject to:

1. Validation of the data;
2. Reduction or manipulation of the data mathematically or otherwise into meaningful and useful forms; and
3. Organization, interpretation, and reporting of the data.

8.1 FIELD DATA REDUCTION, VALIDATION, AND REPORTING

8.1.1 Field Data Reduction

Information which is collected in the field through visual observation, manual measurement and/or field instrumentation will be recorded in field notebooks, datasheets, and/or other appropriate forms. Such data will be reviewed by the appropriate Task Manager for adherence to the Work Plan and consistency of data. Any concerns identified as a result of this review will be discussed with the field personnel, corrected if possible, and as necessary incorporated into the data evaluation process.

8.1.1.1 Ground-Water Investigation

Reduction of the field data collected during the ground-water investigation will include:

1. Calculation of water elevations by subtracting the depth-to-water data from the surveyed elevation of the measuring point;

2. Production of hydrogeologic contour maps by contouring lines of equal water elevations using linear interpolation through known elevation points; and

3. Calculation of in-situ hydraulic conductivity as described in the Work Plan.

8.1.1.2 Source Material/Soil/Sediment Investigation

Specific data reduction activities which will be performed for the source materials/soil/sediment investigation include:

1. Calculation and mapping of sediment deposition areas based on reconnaissance/probing measurements; and

2. Calculation and mapping of MGP source material areas based on the test pit/trenching activities and test boring activities.

8.1.2 Field Data Validation

Field data calculations, transfers, and interpretations will be conducted by the field personnel and reviewed for accuracy by the appropriate Task Manager and the Quality Assurance Manager. Task Managers will recalculate at least five percent of all data reductions. Field documentation and data reduction prepared by field personnel will be reviewed by the appropriate Task Manager and Quality Assurance Manager. All logs and documents will be checked for:

1. General completeness;
2. Readability;
3. Usage of appropriate procedures;
4. Appropriate instrument calibration and maintenance;
5. Reasonableness in comparison to present and past data collected;
6. Correct sample locations; and
7. Correct calculations and interpretations.

8.1.3 Field Data Reporting

Where appropriate, field data forms and calculations will be processed and included in appendices to the RI Report. The original field logs, documents, and data reductions will be kept in the project file at the Blasland & Bouck office in Syracuse, New York.

8.2 LABORATORY DATA REDUCTION, REVIEW, AND REPORTING

8.2.1 Laboratory Data Reduction

Laboratory analytical data will be directly transferred from the instrument to the computer or the data reporting form (as applicable). Calculation of sample concentrations will be performed using the appropriate regression analysis program, response factors, and dilution factors (where applicable).

8.3 INDEPENDENT DATA VALIDATION

Data validation entails a review of the QC data and the raw data to verify that the laboratory was operating within required limits, the analytical results are correctly transcribed from the instrument, and which, if any, environmental samples are related to any out-of-control QC samples. The objective of data validation is to identify any questionable or invalid laboratory measurements.

An independent data validator may be used to validate all or some of the laboratory data, identified above. The independent validator will not be directly associated with the RI work efforts or laboratory analyses, and as such, the validator's responsibility will be to objectively review the analytical data. Data validation will consist of data editing, screening, checking, auditing, review, and interpreting to document analytical data quality and determine if the quality is sufficient to meet the DQOs. In addition, data validation will include a review of completeness and compliance, including the elements provided in Table 4, as well as the actual validation.

The independent data validator will use the most recent versions of the USEPA functional guidelines for data validation with NYSDEC, ASP, 12/91 Revisions, QA/QC and reporting deliverables requirements available at the time of project initiation and for the entire duration of the project, as guidance, where appropriate.

The data validator will verify reduction of laboratory measurements and laboratory reporting of analytical parameters are in accordance with the procedures specified for each analytical method (i.e., perform laboratory calculations in accordance with the method-specific procedure).

Upon receipt of the laboratory data, the following reduction, validation and reporting scheme will be executed by the data validator:

1. Laboratory data will be screened to ensure that the necessary QC procedures (detection limit verification, initial calibration, continuing calibration, duplicates, spikes, blanks, etc.) have been performed. QC information not included or of insufficient frequency will be identified in the validation report along with a discussion of the implications.

2. QC supporting information will subsequently be screened to identify QC data outside established control limits. If out-of-control data are discovered, documentation of appropriate corrective action will be reviewed. Certain out-of-control data without appropriate corrective action shall result in designation of the affected data as qualified or rejected.

   It should be noted that the existence of qualified results does not automatically invalidate data. This point is repeatedly emphasized in the USEPA functional guidelines for data validation and is inherently acknowledged by the very existence of the data validation/flagging guidelines. The goal to produce the best possible data does not necessarily mean producing data without QC qualifiers. Qualified data can provide useful information.

Resolution of any issues regarding laboratory performance or deliverables will be handled between the data validator and the Blasland & Bouck Project Manager. Sample reanalysis may be required.

Upon completion of the data validation, a report addressing the following topics will be prepared.

1. Assessment of the data package;
2. Description of any protocol deviations;
3. Failures to reconcile reported and/or raw data;
4. Assessment of any compromised data;
5. Laboratory case narrative;
6. Overall appraisal of the analytical data; and
7. Table of site name, sample quantities, data submitted to the laboratory, year of protocol used, matrix, and fractions analyzed.

9.0 - FIELD AND LABORATORY QUALITY CONTROL CHECKS

Both field and laboratory quality control checks are proposed for the Clark Street former MGP site RI. In the event that there are any deviations from these checks, the Blasland & Bouck Project Manager and Site Manager/Quality Assurance Manager will be notified. The proposed field and laboratory control checks are discussed below.

9.1 FIELD QUALITY CONTROL CHECKS

9.1.1 Field Measurements

To verify the quality of data using field instrumentation, duplicate measurements will be obtained and reported for all field analytical measurements.

9.1.2 Sample Containers

Certified-clean sample containers in accordance with Exhibit I of the NYSDEC ASP Revision 12/91 (Eagle Picher pre-cleaned containers or equivalent) will be supplied by the NYSEG-designated laboratory.

9.1.3 Field Duplicates

Field duplicates will be collected for ground water and source materials/soil/sediment samples to check reproducibility of the sampling methods. Field duplicates will be prepared as discussed in the Work Plan. In general, source material/soil/sediment and ground-water sample field duplicates will be analyzed at a 5 percent frequency (every 20 samples). Table 1 provides an estimated number of field duplicates for each applicable parameter and matrix.

9.1.4 Rinse Blanks

Rinse blanks are used to monitor the cleanliness of the sampling equipment and the effectiveness of the cleaning procedures. Rinse blanks will be prepared and submitted for analysis at a frequency of one per day (when sample equipment cleaning occurs) or once for every 20 samples collected, whichever is less. Rinse blanks will be prepared by filling sample containers with analyte-free water (supplied by the laboratory) which has been routed through a cleaned sampling device. When dedicated sampling devices are used or sample containers are used to collect the samples, rinse blanks will not be necessary. Table 1 provides an estimated number of rinse blanks collected during the RI.

9.1.5 Trip Blanks

Trip blanks will be used to assess whether site samples have been exposed to non-site-related volatile constituents during storage and transport. Trip blanks will be analyzed at a frequency of once per day, per cooler containing ground-water samples to be analyzed for volatile organic constituents. A trip blank will consist of a container filled with analyte-free water (supplied by the laboratory) which remains unopened with field samples throughout the sampling event. Trip blanks will only be analyzed for volatile organic constituents. Table 1 provides an estimated number of trip blanks collected for each matrix and parameter during the RI.

9.2 ANALYTICAL LABORATORY QUALITY CONTROL CHECKS

Analytical laboratory quality control checks to be used include method blanks, matrix spikes/matrix spike duplicates, matrix spike blanks, surrogate spikes, laboratory duplicates, calibration standards, and internal standards.

9.3 SOIL/SEDIMENT CHARACTERIZATION QUALITY CONTROL CHECKS

Analyses of soil/sediment particle size will be performed in duplicate for one of the five soil samples collected for grain size analysis.

10.0 - PERFORMANCE AND SYSTEMS AUDITS

Performance and systems audits will be completed in the field and the laboratory during the RI as described below.

10.1 FIELD AUDITS

The following field performance and systems audits will be completed during this project.

10.1.1 Performance Audits

The appropriate Task Manager will monitor field performance. Field performance audit summaries will contain an evaluation of field measurements and field meter calibrations to verify that measurements are taken according to established protocols. The Blasland & Bouck Site Manager/Quality Assurance Manager will review all field reports and communicate concerns to the Blasland & Bouck Project Manager and/or Task Managers, as appropriate. In addition, the Blasland & Bouck Site Manager/Quality Assurance Manager will review the rinse and trip blank data to identify potential deficiencies in field sampling and cleaning procedures.

10.1.2 Internal Systems Audits

A field internal systems audit is a qualitative evaluation of all components of field QA/QC. The systems audit compares scheduled QA/QC activities from this document with actual QA/QC activities completed. The appropriate Task Manager and Site Manager will periodically confirm that work is being performed consistent with this RI Work Plan, the QAPP, and HASP.

10.2 LABORATORY AUDITS

The NYSEG-designated laboratory will perform internal audits consistent with NYSDEC ASP, 12/91 Revisions, Exhibit E.

11.0 - PREVENTATIVE MAINTENANCE

Preventive maintenance schedules have been developed for both field and laboratory instruments. A summary of the maintenance activities to be performed is presented below.

11.1 FIELD INSTRUMENTS AND EQUIPMENT

Prior to any field sampling, each piece of field equipment will be inspected to assure it is operational. If the equipment is not operational, it must be serviced prior to use. All meters which require charging or batteries will be fully charged or have fresh batteries. If instrument servicing is required, it is the responsibility of the Site Manager to follow the maintenance schedule and arrange for prompt service.

Field instrumentation to be used in this study includes meters to measure conductivity, temperature, pH, and ground-water levels. Field equipment also includes sediment samplers, and sampling devices for ground water. A logbook will be kept for each field instrument. Each logbook contains records of operation, maintenance, calibration, and any problems and repairs. The Site Manager will review calibration and maintenance logs.

Field equipment returned from a site will be inspected to confirm it is in working order. This inspection will be recorded in the logbook or field notebooks as appropriate. It will also be the obligation of the last user to record any equipment problems in the logbook.

Non-operational field equipment will be either repaired or replaced. Appropriate spare parts will be made available for field meters. A summary of preventive maintenance requirements for field instruments is provided in Appendix A of the Work Plan. Details regarding field equipment maintenance, operation, and calibration, are also provided in Appendix A of the Work Plan.

11.2 LABORATORY INSTRUMENTS AND EQUIPMENT

11.2.1 General

Laboratory instrument and equipment procedures will be documented by the laboratory. Documentation includes details of any observed problems, corrective measure(s), routine maintenance, and instrument repair (which will include information regarding the repair and the individual who performed the repair).

Preventive maintenance of laboratory equipment generally will follow the guidelines recommended by the manufacturer. A malfunctioning instrument will be repaired immediately by in-house staff or through a service call from the manufacturer.

12.0 - DATA ASSESSMENT PROCEDURES

The analytical data generated during the RI will be evaluated with respect to precision, accuracy, and completeness and compared to the data quality objectives set forth in Sections 1 and 3. The procedures utilized when assessing data precision, accuracy, and completeness are presented below.

12.1 DATA PRECISION ASSESSMENT PROCEDURES

Field precision is difficult to measure because of temporal variations in field parameters. However, precision will be controlled through the use of experienced field personnel, properly calibrated meters, and duplicate field measurements. Field duplicates will be used to assess precision for the entire measurement system including sampling, handling, shipping, storage, preparation, and analysis.

Laboratory data precision for organic analyses will be monitored through the use of matrix spike duplicate sample analyses. For other parameters, laboratory data precision will be monitored through the use of field duplicates and/or laboratory duplicates as identified in Table 1.

The precision of data will be measured by calculation of the standard deviation (SD) and the coefficient of variation (CV) of duplicate sample sets. The SD and CV are calculated for duplicate sample sets by:

$$SD = (A-B)/1.414$$
$$CV = SD/((A+B)/2) = 1.414(A-B)/(A+B)$$

Where:

A = Analytical result from one of two duplicate measurements
B = Analytical result from the second measurement.

Where appropriate, A and B may be either the raw measurement or an appropriate mathematical transformation of the raw measurement (e.g., the logarithm of the concentration of a substance).

Alternately, the relative percent difference (RPD) can be calculated by the following equation:

$$RPD = \frac{(A-B)}{(A+B)/2} \times 100$$

$$RPD = 1.414\,(CV)(100)$$

Precision objectives for matrix spike duplicate and laboratory duplicate analyses are identified in the NYSDEC ASP Revision 12/91.

12.2 DATA ACCURACY ASSESSMENT PROCEDURES

The accuracy of field measurements will be controlled by experienced field personnel, properly calibrated field meters, and adherence to established protocols. The accuracy of field meters will be assessed by review of calibration and maintenance logs.

Laboratory accuracy will be assessed via the use of matrix spikes, surrogate spikes, and internal standards. Where available and appropriate, QA performance standards will be analyzed periodically to assess laboratory accuracy. Accuracy will be calculated as a percent recovery as follows:

$$\text{Accuracy} = \frac{A-X}{B} \times 100$$

Where:

A = Value measured in spiked sample or standard
X = Value measured in original sample
B = True value of amount added to sample or true value of standard

This formula is derived under the assumption of constant accuracy over the original and spiked measurements. If any accuracy calculated by this formula is outside of the acceptable levels, data will be evaluated to determine whether the deviation represents unacceptable accuracy, or variable, but acceptable accuracy. Accuracy objectives for matrix spike recoveries and surrogate recovery objectives are identified in the NYSDEC, ASP, 12/91 Revisions.

12.3 DATA COMPLETENESS ASSESSMENT PROCEDURES

Completeness of a field or laboratory data set will be calculated by comparing the number of samples collected or analyzed to the proposed number.

$$\text{Completeness} = \frac{\text{No. Valid Samples Collected or Analyzed}}{\text{No. Proposed Samples Collected or Analyzed}} \times 100$$

As general guidelines, overall project completeness is expected to be at least 90 percent. The assessment of completeness will require professional judgement to determine data useability for intended purposes.

13.0 - CORRECTIVE ACTION

Corrective actions are required when field or analytical data are not within the objectives specified in this QAPP, or the Work Plan. Corrective actions include procedures to promptly investigate, document, evaluate, and correct data collection and/or analytical procedures. Field and laboratory corrective action procedures for the Clark Street former MGP site RI are described below.

13.1 FIELD PROCEDURES

When conducting the RI field work, if a condition is noted that would have an adverse effect on data quality, corrective action will be taken so as not to repeat this condition. Condition identification, cause, and corrective action implemented will be documented on a Corrective Action Report Form (Figure 3) and reported to the appropriate Blasland & Bouck Task Manager, Site Manager, and Project Manager.

Examples of situations which would require corrective actions are provided below:

1. Protocols as defined by the QAPP and Work Plan have not been followed;
2. Equipment is not in proper working order or properly calibrated;
3. QC requirements have not been met; and
4. Issues resulting from performance or systems audits.

Project personnel will continuously monitor ongoing work performance in the normal course of daily responsibilities.

13.2 LABORATORY PROCEDURES

13.2.1 General

In the laboratory, when a condition is noted to have an adverse effect on data quality, corrective action will be taken so as not to repeat this condition. Condition identification, cause, and corrective action to be taken will be documented, and reported to the appropriate project manager and Site Manager.

Corrective action may be initiated, at a minimum, under the following conditions:

1. Specific laboratory analytical protocols have not been followed;
2. Predetermined data acceptance standards are not obtained;
3. Equipment is not in proper working order or calibrated;
4. Sample and test results are not completely traceable;
5. QC requirements have not been met; and
6. Issues resulting from performance or systems audits.

Laboratory personnel will continuously monitor ongoing work performance in the normal course of daily responsibilities.

14.0 - QUALITY ASSURANCE REPORTS TO MANAGEMENT

14.1 INTERNAL REPORTING

The analytical laboratory will submit analytical reports to Blasland & Bouck for review. Blasland & Bouck may submit analytical reports to the data validator for review. Supporting data (i.e., historic data, related field or laboratory data) will also be reviewed to evaluate data quality, as appropriate. The Blasland & Bouck Site Manager/Quality Assurance Manager will incorporate results of data validation reports (if any) and assessments of data useability into a summary report that will be submitted to the Blasland & Bouck Project Manager and appropriate Task Managers. This report will be filed in the project file at Blasland & Bouck's office and will include the following:

1. Assessment of data accuracy, precision, and completeness for both field and laboratory data;
2. Results of the performance and systems audits;
3. Significant QA/QC problems, solutions, corrections, and potential consequences; and
4. Analytical data validation report.

14.2 RI REPORTING

Upon sample transport to the laboratory, a copy of the chain-of-custody for will be forwarded to NYSEG in accordance with NYSEG's "Analytical Sample Handling Procedures for MGP Sites" (presented in the Work Plan). Upon receipt of the ASP - Category B Data Package from the NYSEG-designated laboratory, the NYSEG "Analytical Data Checklist Form" (presented in the Work Plan) will be completed by the Site Manager. By completion of this form, the Site Manager will determine if the data package has met the required data quality objectives. The Site Manager will then process the analytical data and revise laboratory-prepared summary files (on Lotus 123) and the Analytical Data Package as described in NYSEG's "Analytical Sample Handling Procedures for MGP Sites" memorandum. The summary files and analytical data package will be submitted to the NYSEG Contract Project Manager and will also be incorporated into the RI Report.

TABLE 1

ENVIRONMENTAL AND QUALITY CONTROL ANALYSES

Environmental Sample Matrix/ Laboratory Parameters	Estimated Environmental Sample Quantity (Per Event)	Field QC Analyses							Laboratory QC Analyses								
		Trip Blank		Field Duplicate		Rinse Blank		Est. Matrix Total	MS		MSD		MSB		Lab Duplicate		Estimated Overall Total
		Freq	No.	Freq	No.	Freq.	No.		Freq.	No.	Freq.	No.	Freq.	No.	Freq.	No.	
Source Materials/Subsurface Soil																	
Volatile Organics Method 8240	12	--	--	1/20	1	--	--	13	1/20	1	1/20	1	1/20	1	--	--	16
Semi-Volatile Organics Method 8270	12	--	--	1/20	1	--	--	13	1/20	1	1/20	1	1/20	1	--	--	16
Metals 6010/7000 Series Methods	12	--	--	1/20	1	--	--	13	1/20	1	--	--	--	--	1/20	1	15
Cyanide (total and amenable) Method 9010	12	--	--	1/20	1	--	--	13	1/20	1	--	--	--	--	1/20	1	15
Moisture Content	12	--	--	1/20	--	--	--	13	--	--	--	--	--	--	--	--	13
Particle Size Distribution[2] ASTM D-422-63	5	--	--	1/20	1	--	--	6	--	--	--	--	--	--	--	--	6
Reactivity (Cyanide/Sulfide) SW-846 Chapter 7.3	12	--	--	1/20	1	--	--	13	--	--	--	--	--	--	--	--	13
BTU Content Method A006	12	--	--	1/20	1	--	--	13	--	--	--	--	--	--	--	--	13
GC-FID Screen	12	--	--	1/20	1	--	--	13	--	--	--	--	--	--	--	--	13

TABLE 1 (Cont.)

ENVIRONMENTAL AND QUALITY CONTROL ANALYSES

Environmental Sample Matrix/ Laboratory Parameters	Estimated Environmental Sample Quantity (Per Event)	Field QC Analyses							Laboratory QC Analyses								Estimated Overall Total
		Trip Blank		Field Duplicate		Rinse Blank		Est. Matrix Total	MS		MSD		MSB		Lab Duplicate		
		Freq	No.	Freq	No.	Freq.	No.		Freq.	No.	Freq.	No.	Freq.	No.	Freq.	No.	
Surface Soil																	
Volatile Organics Method 8240	6	--	--	1/20	1	--	--	7	1/20	1	1/20	1	1/20	1	--	--	10
Semivolatile Organics Method 8270	6	--	--	1/20	1	--	--	7	1/20	1	1/20	1	1/20	1	--	--	10
PCBs Method 8080	6	--	--	1/20	1	--	--	7	1/20	1	1/20	1	1/20	1	--	--	10
Metals 6010/7000 Series Methods	6	--	--	1/20	1	--	--	7	1/20	1	--	--	--	--	1/20	1	9
Cyanide (total and amenable) Method 9010	6	--	--	1/20	1	--	--	7	1/20	1	--	--	--	--	1/20	1	9
Moisture Content	9	--	--	1/20	1	--	--	7	--	--	--	--	--	--	--	--	7
Ground Water																	
Volatile Organics Method 8240	10	1/day	3	1/20	1	--	--	14	1/20	1	1/20	1	1/20	1	--	--	17
Semi-Volatile Organics Method 8270	10	--	--	1/20	1	--	--	11	1/20	1	1/20	1	1/20	1	--	--	14
PCBs (First Event Only) Method 8080	10	--	--	1/20	1	--	--	11	1/20	1	1/20	1	1/20	1	--	--	14
Metals 6010/7000 Series Methods	10	--	--	1/20	1	--	--	11	1/20	1	--	--	--	--	1/20	1	13

TABLE 1 (Cont.)

ENVIRONMENTAL AND QUALITY CONTROL ANALYSES

Environmental Sample Matrix/ Laboratory Parameters	Estimated Environmental Sample Quantity (Per Event)	Field QC Analyses							Laboratory QC Analyses								
		Trip Blank		Field Duplicate		Rinse Blank		Est. Matrix Total	MS		MSD		MSB		Lab Duplicate		Estimated Overall Total
		Freq	No.	Freq	No.	Freq.	No.		Freq.	No.	Freq.	No.	Freq.	No.	Freq.	No.	
Cyanide (total and amenable) Method 9010	10	--	--	1/20	1	--	--	11	1/20	1	--	--	--	--	1/20	1	13
Sediments																	
Volatile Organics Method 8240	9	--	--	1/20	1	1/day	1	11	1/20	1	1/20	1	1/20	1	--	--	14
Semi-Volatile Organics Method 8270	9	--	--	1/20	1	--	--	10	1/20	1	1/20	1	1/20	1	--	--	13
Metals 6010/7000 Series Methods	9	--	--	1/20	1	--	--	10	1/20	1	--	--	--	--	1/20	1	12
Cyanide (total and amenable) Method 9010	9	--	--	1/20	1	--	--	10	1/20	1	--	--	--	--	1/20	1	12
Moisture Content	9	--	--	1/20	1	--	--	10	--	--	--	--	--	--	--	--	10
TOC Lloyd Kahn Method	9	--	--	1/20	1	--	--	10	--	--	--	--	--	--	--	--	10

Notes:

1. Rinse blank collected only from split-spoon sampling device at a frequency of one per day of use.
2. Soil samples for particle size distribution will be collected during the monitoring well installations.
3. MS = matrix spike
4. MSD = matrix spike duplicate
5. MSB = matrix spike blank
6. Sample quantity for ground water does not include any samples from bedrock monitoring wells (if installed).
7. The number of laboratory QC analyses is based on the frequencies given for the number of environmental samples estimated not including field QC analyses.

TABLE 2

PARAMETER, METHODS, AND QUANTITATION LIMITS

Parameter	Quantitation Limit (ppb)
GROUND-WATER SAMPLES Volatile Organics - Method 8240	
Chloromethane	10
Bromomethane	10
Vinyl Chloride	10
Chloroethane	10
Methylene Chloride	10
Acetone	10
Carbon Disulfide	5
1,1-Dichloroethylene	5
1,1-Dichloroethane	5
1,2-Dichloroethylene (total)	5
Chloroform	5
1,2-Dichloroethane	5
2-Butanone	10
1,1,1-Trichloroethane	5
Carbon Tetrachloride	5
Bromodichloromethane	5
1,2-Dichloropropane	5
cis-1,3-Dichloropropene	5
Trichloroethene	5
Dibromochloromethane	5
1,1,2-Trichloroethane	5
Benzene	5
trans-1,3-Dichloropropene	5
Bromoform	5
4-Methyl-2-pentanone	10
2-Hexanone	10
Tetrachloroethene	5
Toluene	5
1,1,2,2-Tetrachloroethane	5
Chlorobenzene	5
Ethylbenzene	5
Styrene	5

TABLE 2

PARAMETER, METHODS, AND QUANTITATION LIMITS

Parameter	Quantitation Limit (ppb)
Total Xylenes	5
GROUND-WATER SAMPLES Semi-Volatile Organics - Method 8270	
Phenol	10
bis(2-chloroethyl) ether	10
2-Chlorophenol	10
1,3-Dichlorobenzene	10
1,4-Dichlorobenzene	10
1,2-Dichlorobenzene	10
2-Methylphenol	10
2,2-oxybis (1-chloropropane)	10
4-Methylphenol	10
N-Nitroso-di-n-procylamine	10
Hexachloroethane	10
Nitrobenzene	10
Isophorone	10
2-Nitrophenol	10
2,4-Dimethylphenol	10
bis(2-chloroethoxy)methane	10
2,4-Dichlorophenol	10
1,2,4-Trichlorobenzene	10
Naphthalene	10
4-Chloroaniline	10
Hexachlorobutadiene	10
4-Chloro-3-methylphenol	10
2-Methylnaphthane	10
Hexachlorocyclopentadiene	10
2,4,6-Trichlorophenol	10
2,4,5-Trichlorophenol	10
2-Chloronaphthalene	10
2-Nitroaniline	50
Dimethyl phthalate	10
Acenaphthylene	10
2,6-Dinitrotoluene	10

TABLE 2

PARAMETER, METHODS, AND QUANTITATION LIMITS

Parameter	Quantitation Limit (ppb)
3-Nitroaniline	50
Acenaphthene	10
2,4-Dinitrophenol	50
4-Nitrophenol	50
Dibenzofuran	10
2,4-Dinitrotoluene	10
Diethylphthalate	10
4-Chlorophenyl phenyl ether	10
Fluorene	10
4-Nitroaniline	50
4,6-Dinitro-2-methylphenol	50
N-nitrosodiphenylamine	10
4-Bromophenyl phenyl ether	10
Hexachlorobenzene	10
Pentachlorophenol	50
Phenanthrene	10
Anthracene	10
Carbazole	10
Di-n-butyl phthalate	10
Fluoranthene	10
Pyrene	10
Butyl benzyl phthalate	10
3,3-Dichlorobenzidine	10
Benz(a)anthracene	10
Chrysene	10
bis(2-Ethylhexyl)phthalate	10
Di-n-octyl phthalate	10
Benzo(b)fluoranthene	10
Benzo(k)fluoranthene	10
Benzo(a)pyrene	10
Indeno(1,2,3-cd)pyrene	10
Dibenzo(a,h)anthracene	10
Benzo(g,h,i)perylene	10

TABLE 2

PARAMETER, METHODS, AND QUANTITATION LIMITS

Parameter	Quantitation Limit (ppb)
GROUND-WATER SAMPLES **PCBs - Method 8080**	
Aroclors 1016 to 1248	0.5
Aroclors 1254 and 1260	1.0
GROUND-WATER SAMPLES **Metals - 6010/7000 Series**	
Aluminum	200
Antimony	60
Arsenic	10
Barium	200
Cadmium	5
Chromium	10
Copper	25
Iron	100
Lead	5
Manganese	15
Mercury	0.2
Nickel	40
Selenium	5
Silver	10
Vanadium	50
Zinc	20
Cyanide - Method 9010	40
SOURCE MATERIALS/SOIL/SEDIMENTS **Volatile Organics - Method 8270**	
Chloromethane	10 to 1,200
Bromomethane	10 to 1,200
Vinyl Chloride	10 to 1,200
Chloroethane	10 to 1,200
Methylene Chloride	10 to 1,200
Acetone	10 to 1,200
Carbon Disulfide	5 to 1,200
1,1-Dichloroethylene	5 to 1,200
1,1-Dichloroethane	5 to 1,200
1,2-Dichloroethylene (total)	5 to 1,200

TABLE 2

PARAMETER, METHODS, AND QUANTITATION LIMITS

Parameter	Quantitation Limit (ppb)
Chloroform	5 to 1,200
1,2-Dichloroethane	5 to 1,200
2-Butanone	10 to 1,200
1,1,1-Trichloroethane	5 to 1,200
Carbon tetrachloride	5 to 1,200
Bromodichloromethane	5 to 1,200
1,2-Dichloropropane	5 to 1,200
cis-1,3-dichloropropene	5 to 1,200
Trichloroethene	5 to 1,200
Dibromochloromethane	5 to 1,200
1,1,2-Trichloroethane	5 to 1,200
Benzene	5 to 1,200
trans-1,3-Dichloropropene	5 to 1,200
Bromoform	5 to 1,200
4-Methyl-2-pentanone	10 to 1,200
2-Hexanone	10 to 1,200
Tetrachloroethene	5 to 1,200
Toluene	5 to 1,200
1,1,2,2-Tetrachloroethane	5 to 1,200
Chlorobenzene	5 to 1,200
Ethylbenzene	5 to 1,200
Styrene	5 to 1,200
Total Xylenes	5 to 1,200

TABLE 2

PARAMETER, METHODS, AND QUANTITATION LIMITS

Parameter	Quantitation Limit Range (ppb)
SOURCE MATERIALS/SOIL/SEDIMENTS **Semi-Volatile Organics - Method 8270**	
Phenol	330 to 10,000
bis(2-chloroethyl)ether	330 to 10,000
2-Chlorophenol	330 to 10,000
1,3-Dichlorobenzene	330 to 10,000
1,4-Dichlorobenzene	330 to 10,000
1,2-Dichlorobenzene	330 to 10,000
2-Methylphenol	330 to 10,000
2,2-oxybis (1-chloropropane)	330 to 10,000
4-Methylphenol	330 to 10,000
N-Nitroso-di-n-procylamine	330 to 10,000
Hexachloroethane	330 to 10,000
Nitrobenzene	330 to 10,000
Isophorone	330 to 10,000
2-Nitrophenol	330 to 10,000
2,4-Dimethylphenol	330 to 10,000
bis(2-chloroethoxy)methane	330 to 10,000
2,4-Dichlorophenol	330 to 10,000
1,2,4-Trichlorobenzene	330 to 10,000
Naphthalene	330 to 10,000
4-Chloroaniline	330 to 10,000
Hexachlorobutadiene	330 to 10,000
4-Chloro-3-methylphenol	330 to 10,000
2-Methylnaphthane	330 to 10,000
Hexachlorocyclopentadiene	330 to 10,000
2,4,6-Trichlorophenol	330 to 10,000
2,4,5-Trichlorophenol	330 to 25,000
2-Chloronaphthalene	330 to 10,000
2-Nitroaniline	1600 to 25,000
Dimethyl phthalate	330 to 10,000
Acenaphthylene	330 to 10,000
2,6-Dinitrotoluene	330 to 10,000
3-Nitroaniline	1600 to 25,000

TABLE 2

PARAMETER, METHODS, AND QUANTITATION LIMITS

Parameter	Quantitation Limit Range (ppb)
Acenaphthene	330 to 10,000
2,4-Dinitrophenol	1600 to 25,000
4-Nitrophenol	1600 to 25,000
Dibenzofuran	330 to 10,000
2,4-Dinitrotoluene	330 to 10,000
Diethylphthalate	330 to 10,000
4-Chlorophenyl phenyl ether	330 to 10,000
Fluorene	330 to 10,000
4-Nitroaniline	1600 to 25,000
4,6-Dinitro-2-methylphenol	1600 to 25,000
N-nitrosodiphenylamine	330 to 10,000
4-Bromophenyl phenyl ether	330 to 10,000
Hexachlorobenzene	330 to 10,000
Pentachlorophenol	1600 to 25,000
Phenanthrene	330 to 10,000
Anthracene	330 to 10,000
Carbazole	330 to 10,000
Di-n-butyl phthalate	330 to 10,000
Fluoranthene	330 to 10,000
Pyrene	330 to 10,000
Butyl benzyl phthalate	330 to 10,000
3,3-Dichlorobenzidine	330 to 10,000
Benz(a)anthracene	330 to 10,000
Chrysene	330 to 10,000
bis(2-Ethylhexyl)phthalate	330 to 10,000
Di-n-octyl phthalate	330 to 10,000
Benzo(b)fluoranthene	330 to 10,000
Benzo(k)fluoranthene	330 to 10,000
Benzo(a)pyrene	330 to 10,000
Indeno(1,2,3-cd)pyrene	330 to 10,000
Dibenzo(a,h)anthracene	330 to 10,000
Benzo(g,h,i)perylene	330 to 10,000

TABLE 2

PARAMETER, METHODS, AND QUANTITATION LIMITS

Parameter	Quantitation Limit (ppb)
SOURCE MATERIALS/SOIL/SEDIMENT PCBs - Method 8080	
Aroclor 1016 to 1248	80
Aroclor 1248 and 1254	160
SOURCE MATERIALS/SOIL/SEDIMENT Metals - 6010/7000 Series	
Aluminum	200
Antimony	60
Arsenic	10
Barium	200
Cadmium	5
Chromium	10
Copper	25
Iron	100
Lead	5
Manganese	15
Mercury	0.2
Nickel	40
Selenium	5
Silver	10
Vanadium	50
Zinc	20
Cyanide - Method 9010	40
SOURCE MATERIALS/SOIL/SEDIMENT	
Reactivity (Cyanide/Sulfide)	100,000

Notes:

1. ppb = parts per billion; ug/l for water samples and ug/kg for solid samples.
2. Specific quantitation limits are highly matrix dependent. The quantitation limits listed are for guidance and may not always be achieveable due to matrix interference.
3. Quantitation limits for source materials/soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for source materials/soil/sediment (calculated on a dry weight basis) will be higher.
4. The full list of metals is given for source materials/soil/sediment/groundwater. The specific metals to be analyzed for under each investigation are discussed in the RI Work Plan.
5. A quantitation limit range is presented for the source materials/soil/sediment samples for volatile and semi-volatile organic analyses because matrix interference can be elevated by the quantitation limits. The lower number in the quantitation limit range is based on low-level samples, while the upper number is based on medium-level samples per ASP-Superfund category.

TABLE 3

SAMPLE CONTAINER, PRESERVATION, AND HOLDING TIME REQUIREMENTS

Parameter	Container	Preservation	Maximum Holding Time from VTSR
Ground-Water Samples			
Volatile Organics	(2) 40 ml teflon lined septa	Cool 4°C Cool 4°C HCl to pH <2	7 days (unpreserved) 10 days(preserved)
Semi-Volatile Organics	(2) 1 liter containers	Cool at 4°C	5 days extraction; 40 days analysis
PCBs	(1) 1 liter container	Cool 4°C	5 days extraction; 40 days analysis
Metals	(1) 500 ml container	Cool 4°C HNO_3 to pH <2	180 days (26 days for mercury; 24 hours for chromium)
Cyanide	(1) 500 ml container	Cool 4°C HNO_3 to pH <2	12 days
Source Materials/Soil/Sediment			
Volatile Organics	(1) 100 ml container	Cool 4°C	7 days
Semi-Volatile Organics	(2) 500 ml container	Cool 4°C	5 days extraction; 40 days analysis
PCBs	(1) 500 ml container	Cool 4°C	5 days extraction; 40 days analysis
Metals	(1) 500 ml container	Cool 4°C	180 days (26 days for mercury; 24 hours for chromium)
Cyanide	(1) 250 ml container	Cool 4°C	12 days
TOC	(1) 250 ml container	Cool 4°C	14 days

Notes:

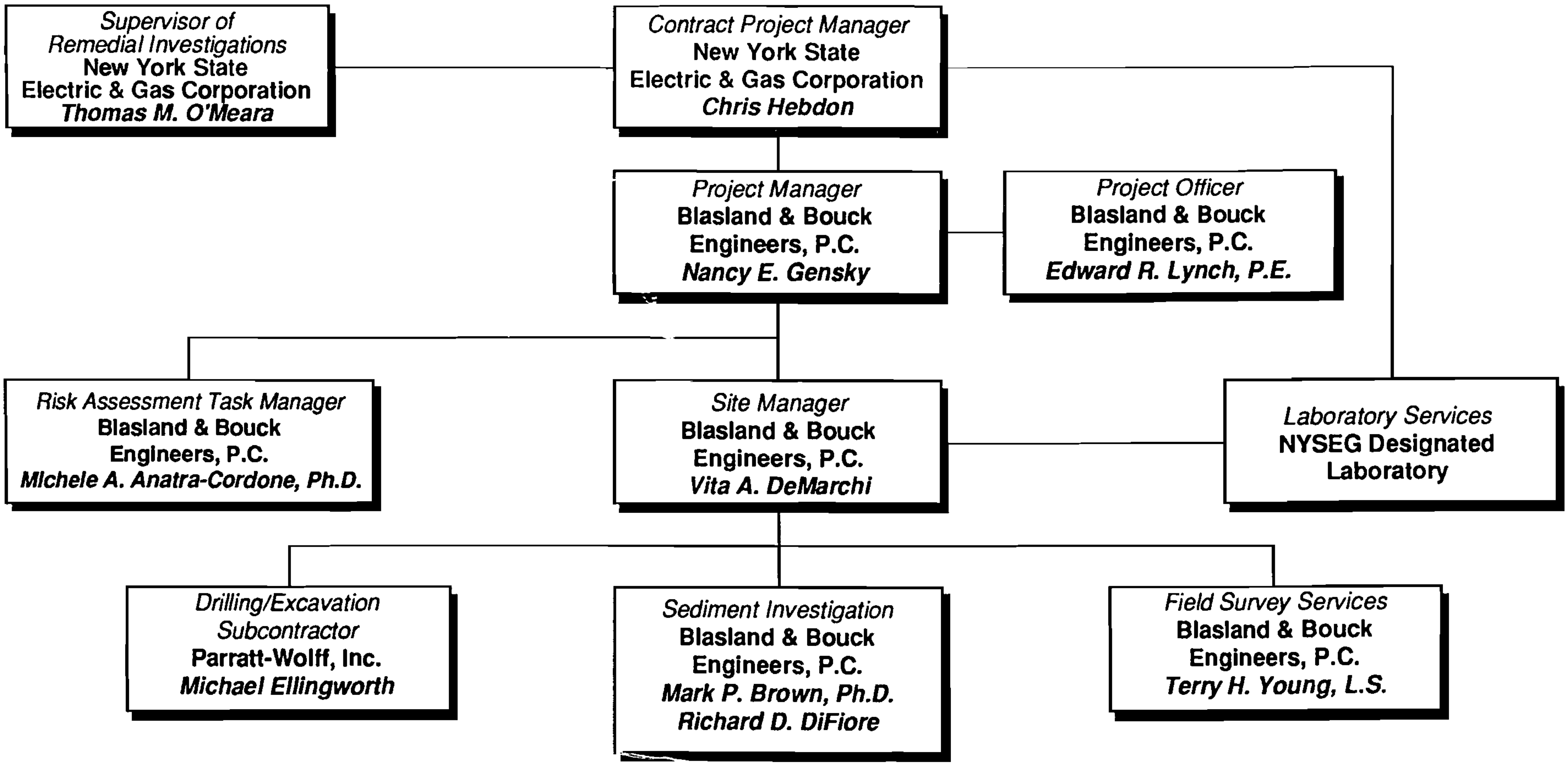
1. VTSR = Verifiable time of sample receipt. Samples must be delivered to laboratory within 48 hours from day of collection.

TABLE 4

DATA VALIDATION CHECKLIST
LABORATORY ANALYTICAL DATA

REVIEW FOR COMPLETENESS	
1.	Chain-of-custody forms included.
2.	Sample preparation and analysis summary tables included.
3.	QA/QC summaries of analytical data included.
4.	Relevant calibration data included with analytical data.
5.	Instrument and method performance data included.
6.	Method detection limits documented.
7.	Data report forms of examples for calculations of concentrations.
8.	Raw data used in identification and quantification of the analysis required.
REVIEW OF COMPLIANCE	
1.	Data package completed.
2.	QAPP requirements for data met.
3.	QA/QC criteria met.
4.	Instrument type and calibration procedures met.
5.	Initial and continuing calibration met.
6.	Data reporting forms completed.
7.	Problems and corrective actions documented.

FIGURE 1
PROJECT ORGANIZATION CHART
FORMER MANUFACTURED GAS PLANT SITE
REMEDIAL INVESTIGATION



Supervisor of Remedial Investigations
New York State Electric & Gas Corporation
Thomas M. O'Meara

Contract Project Manager
New York State Electric & Gas Corporation
Chris Hebdon

Project Manager
Blasland & Bouck Engineers, P.C.
Nancy E. Gensky

Project Officer
Blasland & Bouck Engineers, P.C.
Edward R. Lynch, P.E.

Risk Assessment Task Manager
Blasland & Bouck Engineers, P.C.
Michele A. Anatra-Cordone, Ph.D.

Site Manager
Blasland & Bouck Engineers, P.C.
Vita A. DeMarchi

Laboratory Services
NYSEG Designated Laboratory

Drilling/Excavation Subcontractor
Parratt-Wolff, Inc.
Michael Ellingworth

Sediment Investigation
Blasland & Bouck Engineers, P.C.
Mark P. Brown, Ph.D.
Richard D. DiFiore

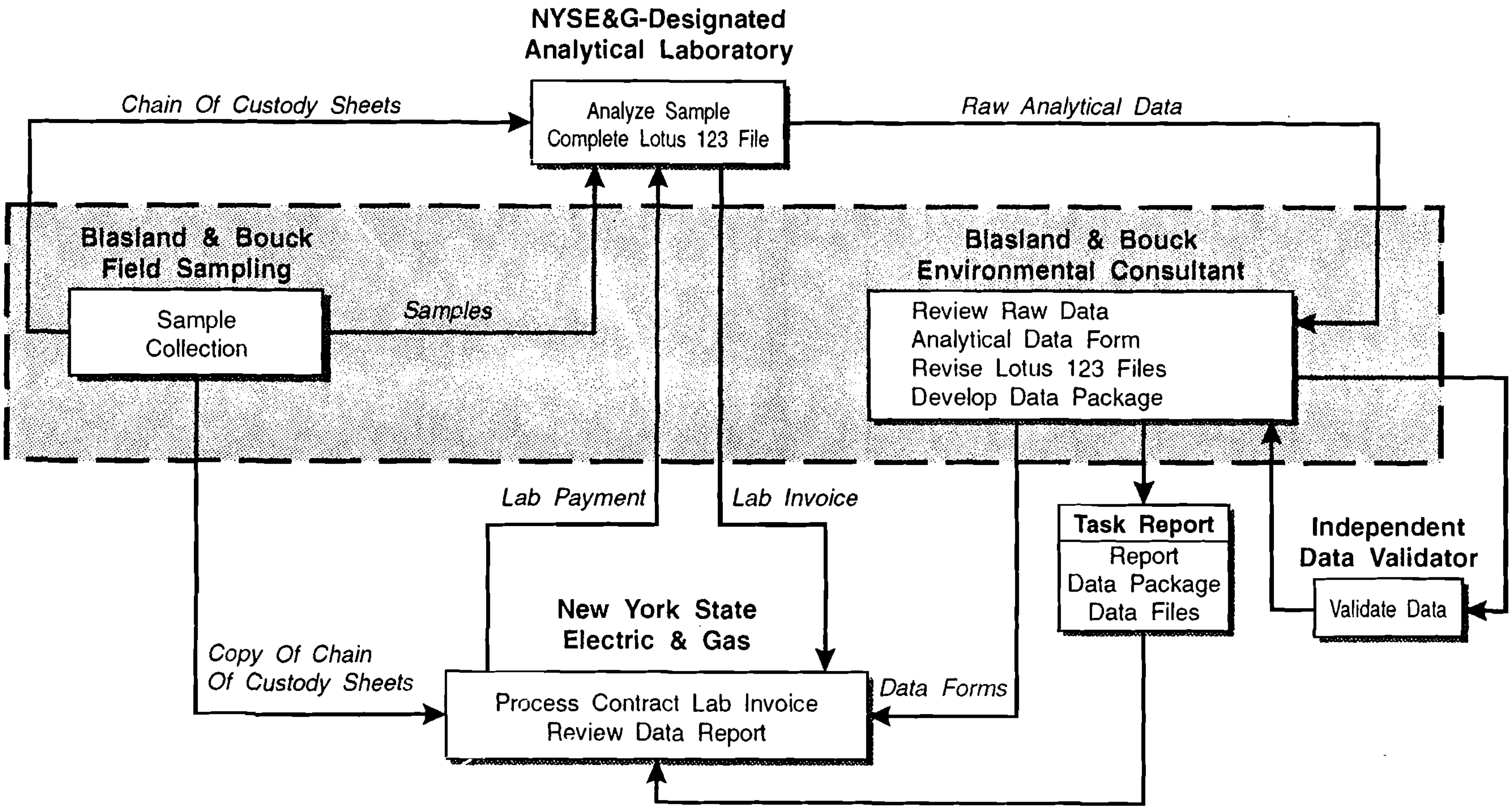
Field Survey Services
Blasland & Bouck Engineers, P.C.
Terry H. Young, L.S.

Note: Laboratory is contracted directly to New York State Electric & Gas Corporation. See Figure 2 for the organizational relationships between the NYSEG-designated laboratory, Blasland & Bouck Engineers, P.C., and New York State Electric & Gas Corporation.

FIGURE 2

ORGANIZATIONAL RELATIONSHIP BETWEEN THE NYSE&G-DESIGNATED LABORATORY; BLASLAND & BOUCK AND NEW YORK STATE ELECTRIC & GAS

FORMER MANUFACTURED GAS PLANT SITE
REMEDIAL INVESTIGATION



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BLASLAND & BOUCK ENGINEERS, P.C.
ENGINEERS & GEOSCIENTISTS

FIGURE 3

CORRECTIVE ACTION FORM

Car No. ______________________ Date: ______________________

To: ______________________ cc: Task Manager

You are hereby requested to take corrective actions indicated below and as otherwise determined by you (A) to resolved the noted condition, and (B) to prevent it from reoccurring. Your written response is to be returned to the Quality Assurance Manager (QAM).

Condition

Reference Documents

Recommended Corrective Actions

Originator	Date	QAM Approval Date	P.M. Approval Date

Response

Corrective Action

- A. Resolution
- B. Pretention
- C. Affected Documents

Signature ______________________ Date: ______________________

Followup

Corrective Action Verified:

By: ______________________ Date: ______________________