WORK PLAN

BROWNFIELDS SITE INVESTIGATION/REMEDIAL ALTERNATIVES REPORT

Former Mohasco Mill Complex
Amsterdam, New York

CITY OF AMSTERDAM, NEW YORK

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3518001

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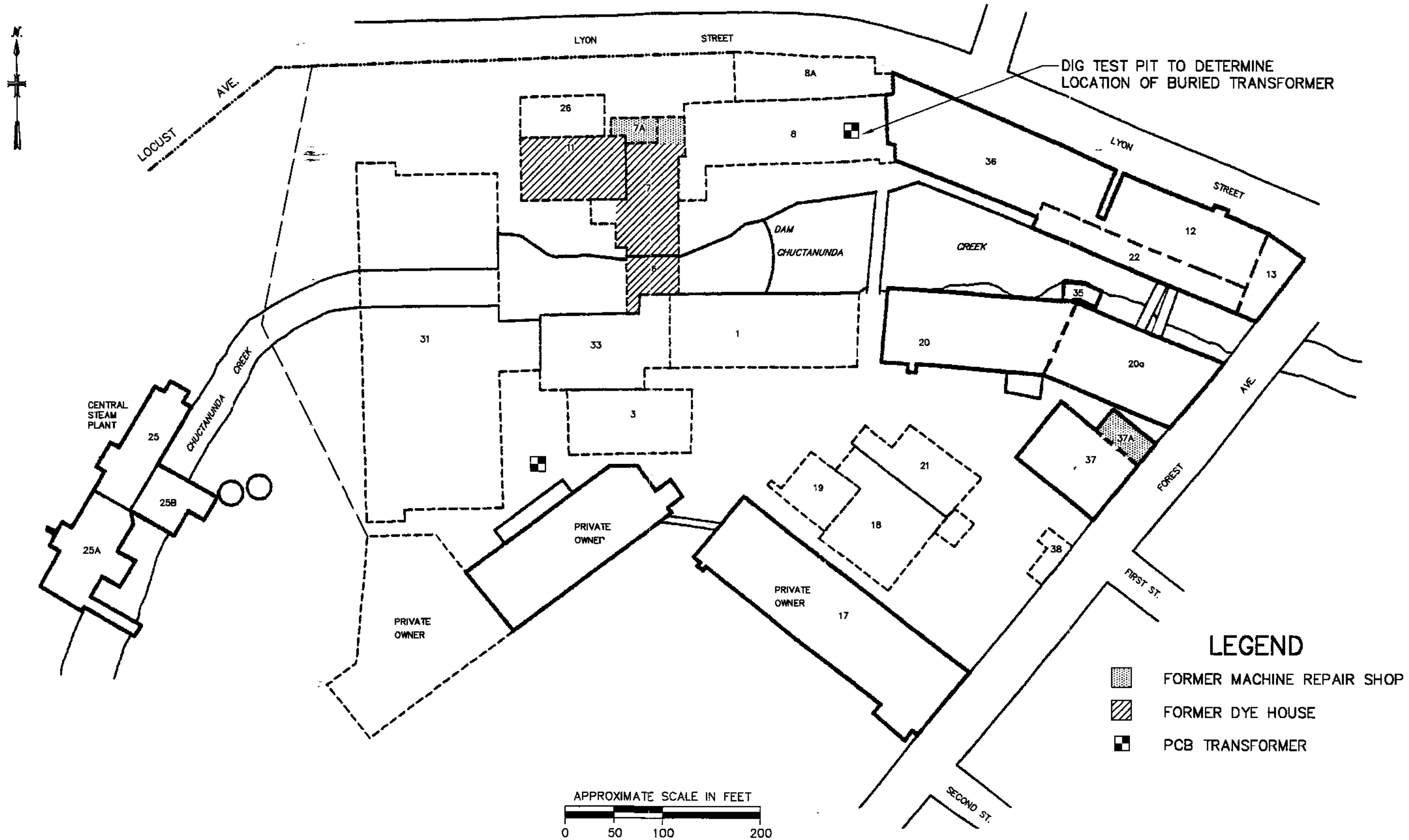
1.0 INTRODUCTION

The City of Amsterdam has been awarded a grant under the 1996 New York State Brownfields Redevelopment Plan to conduct a Site Investigation/Remedial Alternatives Report (SI/RAR) for the former Mohasco Mill Complex in the City of Amsterdam. Figure 1-1 shows the location of the site. Figure 1-2 is a plan of the former Mohasco Mill Complex. The Mohasco Mill Complex was a carpet manufacturing facility from the late 1880s through 1984. Carpet manufacturing activities ceased in 1984 and the site was leased for use as storage and office space from 1984 through 1992. Several of the buildings at the site were destroyed by fires in 1992 and 1994. The City of Amsterdam acquired the site in 1994. The site is currently unoccupied.

This Work Plan summarizes the scope of work for the SI/RAR. The goal of the SI/RAR is to assess the nature and extent of soil and groundwater contamination, if any, and to evaluate potential remedial alternatives. This Work Plan and the associated Quality Assurance Project Plan (QAPP), Citizen Participation Plan (CPP), and Health and Safety Plan (HSP) will be submitted to the New York State Department of Environmental Conservation (NYSDEC) for regulatory approval.



NOTE: ADAPTED FROM SARATOGA ASSOCIATES.

MALCOLM PIRNIE

MOHASCO COMPLEX
AMSTERDAM, NEW YORK

SITE PLAN

FIGURE 1-2

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2.0 SITE DESCRIPTION AND BACKGROUND

2.1 SITE LOCATION AND DESCRIPTION

The former Mohasco Mill Complex is located at the southwest corner of the intersection of Forest Avenue and Lyon Street in the City of Amsterdam, Montgomery County, New York (Figure 1-1). To the north, the 21.6-acre site is bordered by Lyon Street, to the east by Forest Avenue, to the west by Locust Avenue, and to the south by Esquire Novelty Corporation, The Noteworthy Company, and residential properties. The site is bisected by North Chuctanunda Creek. Most of the central and northern section of the property is covered with demolition debris, building foundations, and the remains of buildings destroyed during the 1992 fire. Large multi-story buildings still exist in the northeast and southwest corners of the site.

2.2 GEOLOGY/HYDROGEOLOGY

The former Mohasco Mill complex lies at an elevation of approximately 550 feet above mean sea level (amsl). Bedrock beneath the site is Middle Ordovician (approximately 450 million years old) limestone of the Amsterdam Formation. Bedrock is exposed at the surface along the North Chuctanunda Creek and at various locations throughout the site. Surficial deposits, consisting of unconsolidated sediments, are typically absent or less than five feet thick in the area of the site.

Area residences and businesses receive drinking water from the City of Amsterdam municipal supply. There are no known wells on the site or the surrounding properties. Based on water levels within the North Chuctanunda Creek, groundwater is assumed to occur under unconfined conditions in the shallow bedrock within 15 to 20 feet of the ground surface. The direction of groundwater flow is expected to be towards to the North Chuctanunda Creek (which bisects the site and acts as a local discharge feature) and/or to the south, towards the Mohawk River.

2.3 SITE HISTORY

Based on a preliminary review of historical information, the operational history of the site was as follows: The site was used for carpet manufacturing from the late 1880s through 1984. Manufacturing processes conducted at the site consisted primarily of milling and weaving of raw materials and dye operations. Based on reviews of existing documents, it is believed that chemicals shipped to, used, and stored at the site included, but may not have been limited to, sulfuric acid, acetic acid, hydrogen peroxide, hydrosulfites, PCBs, and some metalized dyes.

Sanborn Company Fire Insurance Maps reviewed for the former Mohasco Mill Complex are provided in Appendix A. The following is a sequential description of site use based on a review of the following Sanborn Maps:

- ***1895 Sanborn Map*** - The 1895 map shows three companies occupying the site. The McCleary, Wallin, and Crouse Carpet Factory occupied the southern section of the site along the southeast bank of the Chuctanunda Creek. The Seymour, Birch and Co. Redstar Knitting Company occupied the northern portion of the site at the intersection of Forest Avenue and what is now Lyon Street. The Amsterdam Knitting Company was located in the northern section of the site, across the Creek from Seymour, Birch and Co. Residences and small buildings occupied most of Forest, First, and Second Avenues.

- ***1901 Sanborn Map*** - McCleary, Wallin, and Crouse continued to operate a carpet factory in the southern portion of the site. The Seymour, Birch and Co. Redstar Knitting Company and the Amsterdam Knitting Company have merged to become the Eagle Knitting Company.

- ***1906 Sanborn Map*** - The entire site was owned by McCleary, Wallin, and Crouse, Inc. Carpet and Rug Mills. Several new buildings, including a new weave mill, have been added on both sides of the Chuctanunda Creek.

- ***1911 Sanborn Map*** - McCleary, Wallin, and Crouse continued to operate a rug and carpet factory. Several buildings, consisting of new dye houses, weave mills, and shop building have been added. Railroad tracks owned by the A.C.&N. Railroad are shown leading up to Building 20.

- ***1926 Sanborn Map*** - McCleary, Wallin, and Crouse merged to become part of Mohawk Carpet Mills, Inc. Building 20A was added to replace older buildings originally part of the Amsterdam Knitting Company.

- ***1950 Sanborn Map*** - Mohawk Carpet Mills has grown to encompass the west side of Forest Avenue along First, Second, and Third Streets. These new buildings are not part of the subject site, but were part of the complex.

- ***1972 Sanborn Map*** - The site appeared much as it did in 1950. The site was owned by Mohasco Industries at this time.

2.4 AREAS OF CONCERN

Based on the preliminary site visit and a review of available information regarding site activities, areas of concern for the former Mohasco Mill Complex are described below. Figure 1-2 shows the location of the areas of concern.

- ***Dye Houses*** - Dye chemicals such as sulfuric acid, acetic acid, hydrogen peroxide, hydrosulfides, and metalized dyes (including lead) were used in Buildings 6, 7, 11, and 22.

- ***Machine/Repair Shops*** - Machine/Repair shops were located in Buildings 8 and 37A. Chemicals used in these buildings likely included solvents and petroleum products.

- ***PCB Transformers*** - Due to the age of the site, it is likely that transformers used there contained PCB oils. One such transformer is rumored to be beneath the debris pile at the former location of Building 8. Another transformer exists in the southwest section of the site. Areas of stained soils have been noted around the existing transformer.

- ***Buildings 20A and 36*** - While asbestos and lead-based paint surveys have been conducted at most of the remaining buildings at the site, the presence or absence of asbestos-containing material (ACM) and lead-based paint has not been characterized in Buildings 20A and 36.

3.0 SITE INVESTIGATION

3.1 SITE INVESTIGATION

The focus of this work is to identify the distribution of potential chemical contamination in the soil and groundwater in areas of concern, where chemicals were previously stored, handled, and transported. This information will be used to identify potential sources of contamination to soil and groundwater stemming from the former handling and storage of chemicals on the site. This information will also be utilized in the Remedial Alternatives Report to evaluate remedial alternatives for the contaminated soil and groundwater, if any.

3.1.1 Existing Mapping

Sanborn Maps of the complex dated 1895, 1901, 1906, 1911, 1926, 1950, and 1972 were reviewed and discussed in Section 2.3. Maps of the complex provided by the Saratoga Associates as part of their Adaptive Reuse Analysis were also reviewed (Saratoga Associates 1995).

3.1.2 Bedrock Field Mapping

Field mapping of on-site bedrock outcrops (i.e., along the banks of the North Chuctanunda Creek) will be conducted as part of the site investigation activities. Mapping will be conducted to determine the orientation of the bedrock fractures and bedding planes. All measurements will be made using a Brunton compass. The information gathered from the mapping will be used to aid in the evaluation of potential migration pathways in the event contamination is found. Rose diagrams and/or stereo plots may be constructed as part of the analysis.

3.1.3 Soil Borings

Approximately 21 soil borings will be drilled to investigate the vertical and horizontal extent of the soil contamination on the site, if any. Soil borings will be advanced using a conventional truck-mounted drill rig equipped with hollow-stem augers. The locations of the soil borings will be biased toward potential areas of concern (i.e., where dyes, PCBs, and acids may have been used or stored), based on an understanding of the former site operations. In addition, one boring will be located in an on-site area which is anticipated to represent background conditions. Based on review of available information, it is expected that the overlying soil material at the site is approximately five feet thick. Soil boring locations are shown in Figure 3-1.

Soil borings which will not be converted to groundwater monitoring wells will be advanced using 4.25-inch inner-diameter (ID) hollow-stem augers. Soil borings which will be completed as groundwater monitoring wells will be drilled using 6.25-inch ID hollow-stem augers. Soil samples will be collected from grade to the top of bedrock using standard split-spoon soil samplers. Soil boring locations will be surveyed and referenced to an on-site datum. The procedures for advancing the soil borings, as well as monitoring well installation and construction, and soil sampling and screening are discussed in detail in the Quality Assurance Project Plan (QAPP).

Approximately 20 subsurface soil samples will be collected for laboratory analysis from the soil borings. The procedures for subsurface soil sample collection are provided in the QAPP. The selection of soil samples for laboratory analysis will be based on visual observations of staining, odors, and PID readings. Laboratory analysis of subsurface soil samples for TCL/TAL parameters are discussed in the QAPP.

In addition to the subsurface soil samples collected from the borings, four grab surface soil samples will be collected from the area of the present transformer where stained soils have been identified. These samples will be analyzed for PCBs only. The procedures for surface soil sample collection are provided in the QAPP.

3.1.4 Monitoring Well Installation

To provide information on the hydrogeology and groundwater quality of the site, approximately 11 of the soil borings will be converted to monitoring wells following completion. Due to the shallow depth to bedrock at the site, and the expected lack of groundwater within the overburden/fill deposits, all monitoring wells will be completed in bedrock. To determine upgradient groundwater quality for the site, one monitoring well will be placed along Lyon Street within the site property line. This location is assumed to be upgradient of the complex, based on local topography. Monitoring wells will also be installed along the southern property boundary of the site and the banks of the Chuctanunda Creek to confirm the presence or absence of contaminated groundwater, which may be migrating off-site or discharging to the creek. The remaining monitoring wells will be installed at potential areas of concern where dyes, PCBs, or acids may have been used or stored which are accessible to a drilling rig. The proposed monitoring well locations are shown in Figure 3-1.

It is assumed that each monitoring well will be drilled to a depth of approximately 20 feet and will have an open bedrock section approximately 10 feet in length. Detailed procedures for monitoring well installation are discussed in the QAPP. All wells will be developed following installation following the procedures outlined in the QAPP.

3.1.5 Groundwater Sampling

Groundwater samples will be collected from the monitoring wells within approximately one week following the completion of well development activities. The groundwater samples will be collected according to procedures provided in the QAPP. All groundwater samples will be analyzed for TCL/TAL parameters. An additional round of groundwater samples will be collected approximately one month following the receipt of analytical results from the initial sampling event.

3.1.6 Test Pit Excavation

A series of test pits will be excavated in the area of the Building 8 debris pile to address the NYSDEC and the City's concerns regarding the possible existence of a buried electrical transformer which is suspected to contain PCBs. Each test pit will be excavated through the debris pile to the top of the underlying native soils. If the transformer is located, an evaluation will be made as to whether the transformer contains PCB oils. The procedures used to evaluate the transformer if it is found will include: checking the transformer for labels, serial numbers, and dates; and contacting the transformer manufacturer. One soil sample will be collected from one of the test pits regardless of whether or not the transformer is found. The soil sample collected from the test pit will be analyzed for PCBs only. The proposed test pit area is shown in Figure 3-1.

3.1.7 Air Monitoring

Real-time air monitoring will be performed during any intrusive site activities. A photoionization detector (PID) and particulate dust monitor (Miniram or equivalent) will be used to measure the concentration of organic vapors and particulates, respectively, in the work zone. Dust suppression techniques will be utilized during all intrusive activities. If concentrations of organic vapors or particulates are detected in the work zone, real-time air monitoring will be performed at the site perimeter in accordance with Technical and Administrative Guidance Memorandum (TAGM) 4041.

3.1.8 Sediment Sampling

A total of four sediment samples will be collected from the North Chuctanunda Creek to assess any potential environmental impacts from the site. One sediment sample will be collected from each of the following locations: at the mouth of the creek, between the mouth and the site, near the former steam plant, and upstream of the site (either above the on-site dam or the Forest Avenue dam). All sediment samples will be analyzed for TCL/TAL parameters. The procedure for sediment sample collection is provided in the QAPP. The

approximate sediment sampling locations are shown on Figure 3-2. Actual sediment sampling locations will be determined in the field based on access to the creek.

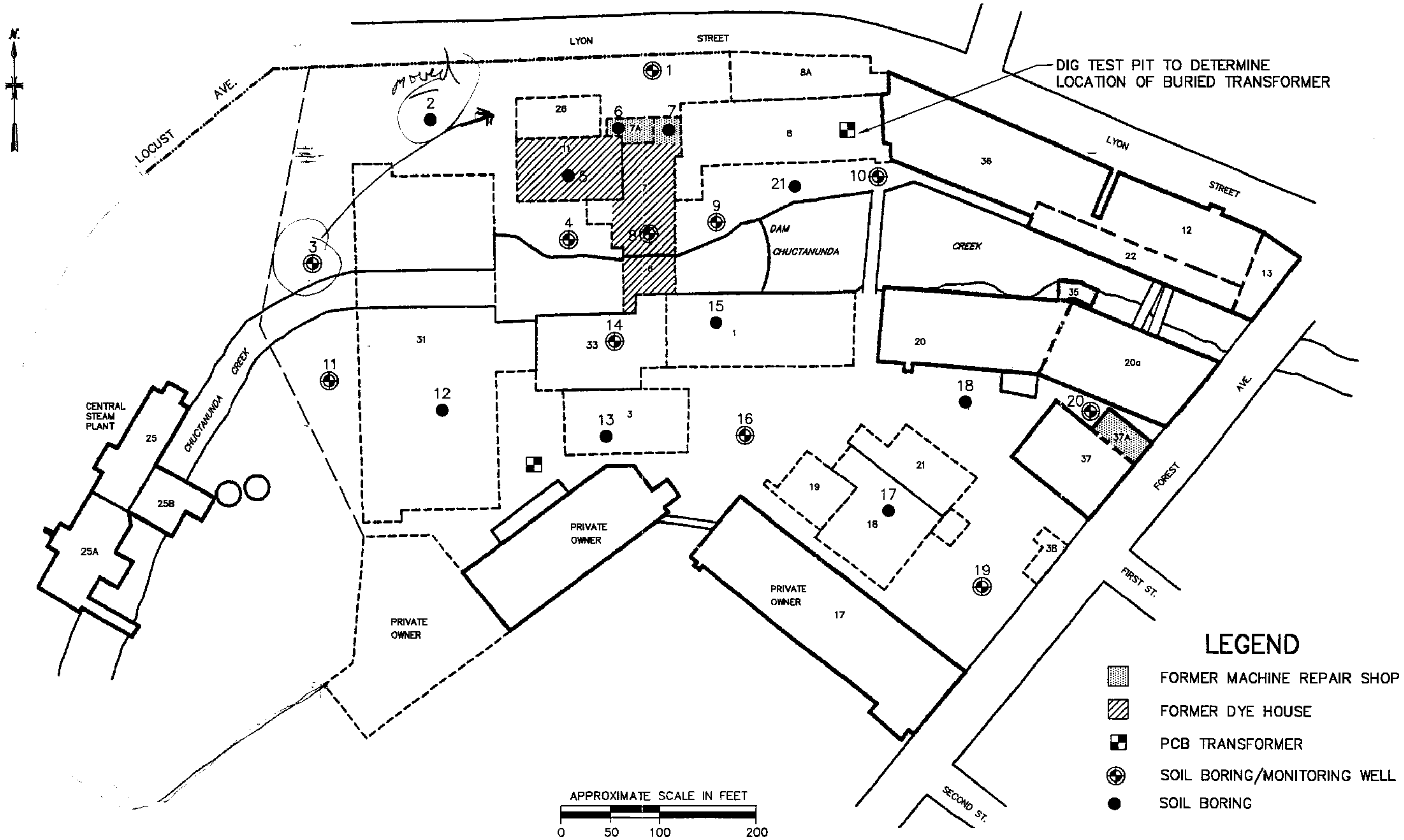
3.1.9 Lead Paint/Asbestos Survey

While the other buildings at the site have been characterized for the presence of asbestos containing materials (ACM), the presence or absence of ACM have not been evaluated in Buildings 20A and 36. In order to evaluate remedial requirements within the building prior to future use, a detailed asbestos and lead-based paint survey will be conducted at Buildings 20A and 36. The survey will include the following activities:

- A Malcolm Pirnie employee certified as a New York State Licensed Asbestos Inspector will enter the buildings and locate, quantify, and assess suspected ACM which is exposed and readily accessible.
- The inspector will group materials based on color, texture, use, and apparent construction history.
- The inspector will identify locations, quantities, and conditions of each group.
- Based on the results of the inspection, a maximum of 60 samples of suspected ACM will be collected and analyzed according to the procedures outlined in the QAPP.
- The inspector will also identify areas of cracked, chipped, or otherwise deteriorated paint on interior and exterior surfaces of the buildings. A maximum of 15 paint chip samples will be collected for analysis of lead using Atomic Absorption Spectroscopy (AAS).

3.1.10 Survey and Site Mapping

Key physical features near or on the site, including streets, building corners, and the banks of the North Chuctanunda Creek will be surveyed and used to create a base map. The locations and associated vertical elevations of all monitoring wells, soil borings, and test pits will also be surveyed.



NOTE: ADAPTED FROM SARATOGA ASSOCIATES.

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SOIL BORING AND MONITORING WELL LOCATION PLAN

FIGURE 3-1

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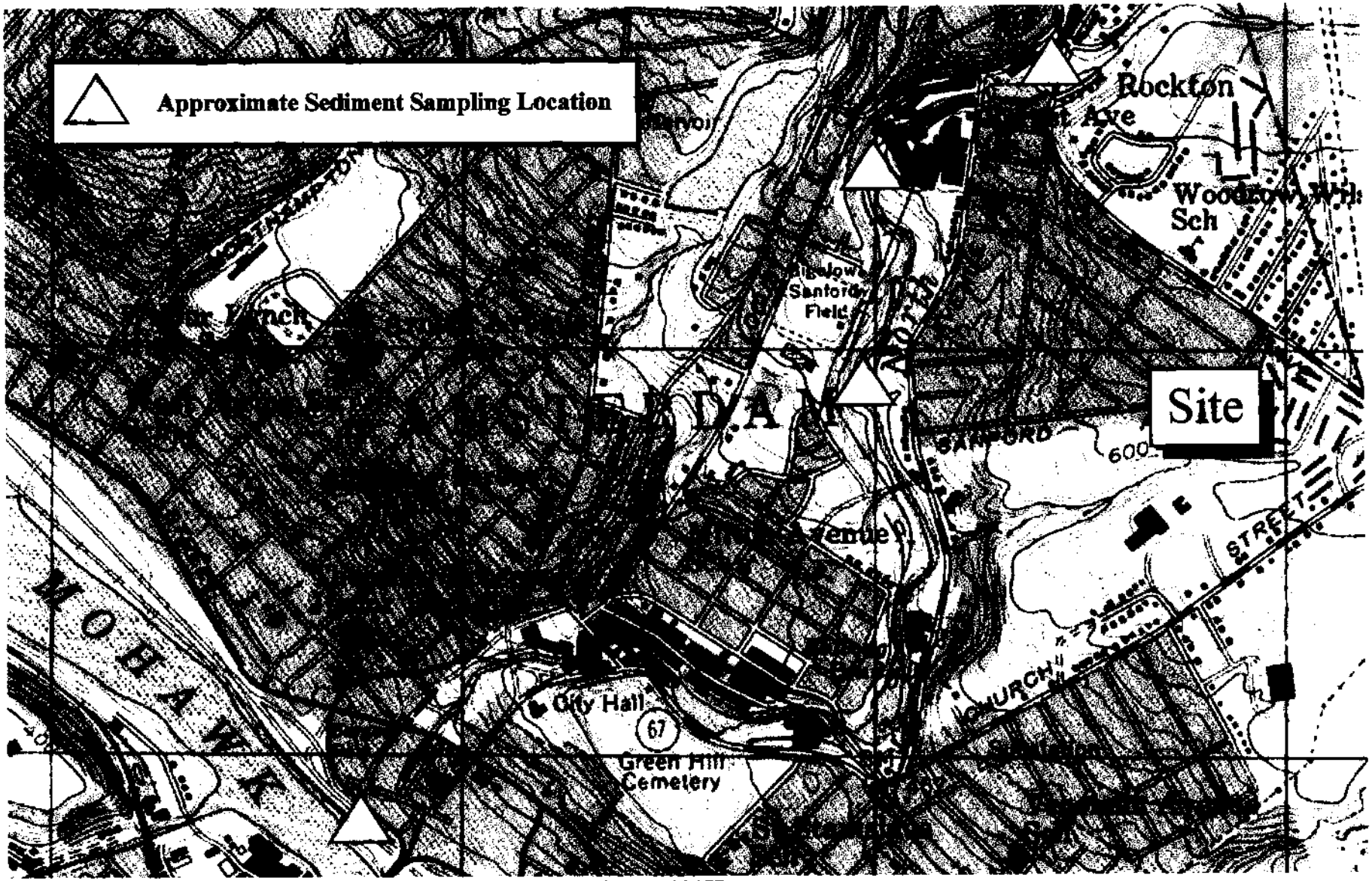

SOURCE: U.S.G.S 7.5 MIN. AMSTERDAM QUAD, 1980

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MOHASCO MILL COMPLEX
AMSTERDAM, NEW YORK

Approximate Sediment Sampling Locations

Figure 3-2

3.2 BASELINE RISK ASSESSMENT

3.2.1 Ecological Risk Assessment

A qualitative ecological risk assessment will be prepared to characterize the site with regard to natural resources and ecological receptors existing or potentially existing on the site. This assessment will integrate information gathered from the Site Investigation with toxicological information to determine whether contamination presents potential risks to ecological receptors. The baseline ecological risk assessment for the Mohasco Complex will be performed in accordance with applicable New York State and USEPA guidance for ecological assessments at hazardous waste sites, including the NYSDEC's Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites (FWIA). The baseline ecological risk assessment will be comprised of the following six components:

- Ecological characterization
- Identification of chemicals of concern
- Exposure and effects assessment
- Ecological risk characterization
- Summary and conclusions
- Assessment of uncertainties and limitations.

3.2.2 Human Health Risk Assessment

A qualitative assessment will be conducted to determine if the presence and concentrations of chemicals in the various environmental media investigated pose human health concerns. The results of the exposure analysis will be one of the criteria used to determine the most appropriate future actions at the site. These may range from no further action, to additional data collection, to site-specific health risk assessment and the establishment of risk-based action levels. The assessment will begin with the construction of a conceptual site model, a graphic illustration that outlines chemical source areas, possible chemical release mechanisms, environmental media that currently show or may show in the future the presence of chemicals, possible exposure pathways, possible points of exposure for human receptors, possible exposure routes, and possible human receptors. The conceptual model will be based on current site conditions and surrounding land use as well as the most likely future site and surrounding land uses. For environmental media that may

be of concern, qualitative evaluations will made for the four components that typically comprise a health risk assessment: data evaluation; exposure assessment; toxicity assessment; and risk characterization/uncertainty analysis. In the data evaluation, chemical concentrations in the various media will be compared to appropriate NYSDEC risk-based standards and criteria (e.g., NYSDEC Soil Cleanup Objective and Cleanup Levels, Water Quality Standards, etc.). Chemicals detected in concentrations greater than these standards and criteria will be identified as chemicals of potential concern. In the exposure assessment, an evaluation will be made of the likelihood and magnitude of exposure to the chemicals of potential concern in environmental media of concern. This will involve outlining possible exposure routes and plausible exposure times, frequencies, and durations. In the toxicity assessment, the toxicity of the chemicals of potential concern will be outlined. This will include identifying known or suspected carcinogens and/or the target organ/system of concern for noncarcinogenic effects. In the risk characterization, information from the three components will be integrated, to estimate the likelihood and magnitude of possible health risks.

4.0 REMEDIAL ALTERNATIVES ANALYSIS

Following completion of the Site Investigation, alternatives for remediation of the former Mohasco Mill Complex will be developed. The alternatives will be designed to attain the remedial objectives, which are to be established during the SI to address identified risks to human health and the environment, and the site's State Standards Criteria and Guidance Values (SCGs). An initial screening of remedial alternatives will be performed according to the procedures recommended in NYSDEC's TAGM, Selection of Remedial Actions at Inactive Hazardous Wastes Sites and the Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (EPA/540/G89/004).

The tasks to be conducted during the screening process will include the following:

- Development of general response actions.
- Identification of applicable remedial technologies and process options.
- Development of remedial alternatives.

4.1 DEVELOPMENT OF GENERAL RESPONSE ACTIONS

Remedial action objectives will be developed during the SI based on the data collected. Prior to the development of these objectives, any significant site problems and contaminant pathways will be identified, routes of exposure considered and SCGs identified. The remedial response objectives that will eliminate or minimize substantial risks to public health and the environment will be developed in detail.

Based on the response objectives, general response actions will be delineated to address each of the site's areas of concern. The response actions will form the foundation for the screening of remedial technologies. General response actions considered will include the No Action alternative as a baseline against which all other alternatives can be compared.

Based on the remedial action objectives and each identified general response action, potential treatment technologies and their associated containment or treatment and disposal

requirements will be identified. A prescreening of these potential treatment technologies for suitability as part of a remedial alternative will be conducted. Where several process options exist for a particular technology, the process option for which most data exists and whose capacities/constraints most closely match site conditions will be selected for further detailed evaluation.

Technologies which could prove extremely difficult to implement, which might not achieve the remedial objective in a reasonable time, or which might not be applicable or feasible based on the site-specific conditions will be eliminated from further consideration. Surviving technologies will then be combined into remedial alternatives which meet the response objectives.

4.2 PRELIMINARY SCREENING OF REMEDIAL ALTERNATIVES

Following identification, the list of potential remedial alternatives will be screened. The objective of this effort is to reduce the number of technologies and alternatives for further analysis while preserving a range of options. This screening will be accomplished by evaluating alternatives on the basis of effectiveness, implementability and cost. These screening criteria are briefly described below:

- ***Effectiveness Evaluation*** - The effectiveness evaluation will consider the capability of each remedial alternative to protect human health and the environment. Each alternative will be evaluated as to the protection it would provide and the reductions in toxicity, mobility or volume of contaminants it would achieve.

- ***Implementability Evaluation*** - The implementability evaluation will be used to measure both the technical and administrative feasibility of constructing, operating and maintaining a remedial action alternative. In addition, the availability of the technologies involved in a remedial alternative will be considered.

  Innovative technologies will be considered throughout the screening process if there is a reasonable belief that they offer potential for better treatment performance or implementability, few or lesser adverse impacts than other available approaches, or lower costs than demonstrated technologies.

- ***Cost Evaluation*** - Cost evaluation will include estimates of capital costs, annual operation and maintenance (O&M) cost, and present worth analysis. These conceptual cost estimates are order-of-magnitude estimates, and will be prepared based on:
  - Preliminary conceptual engineering for major construction components.
  - Unit costs of capital investment and general annual operation and maintenance costs available from USEPA documents and from Malcolm Pirnie in-house files.

4.3 DETAILED ANALYSIS OF ALTERNATIVES

The remedial alternatives which pass the initial screening will be further evaluated. The evaluation will conform to the requirements of the NYSDEC's TAGM (#4030), Selection of Remedial Actions at Inactive Hazardous Waste Sites. It will consist of a technical, environmental and cost evaluation, as well as an analysis of other factors, as appropriate. The detailed evaluation will also follow the general process specified in the "Guidance on Feasibility Studies Under CERCLA" (USEPA, 1985a), as updated in the December 1986 and July 1987 Memoranda on "Interim Final Guidance on Superfund Selection of Remedy", and the "Interim Guidance for Conducting RI/FS under CERCLA" (USEPA, October 1988).

The NYSDEC has established specific objectives which must be addressed by the remedial alternatives. These alternatives must:

- Be protective of human health and the environment.
- Attain SCGs.
- Satisfy the preference for treatment that significantly and permanently reduces toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants.
- Be cost effective.

To meet these goals a series of seven specific screening criteria have been established. These include:

1. ***Short-Term Effectiveness*** - This criterion addresses the effects of the alternative during the construction and implementation phase until the remedial actions have been completed and the selected level of protection has been achieved. Each alternative is evaluated with respect to its effects on the community and on-site workers during the remedial action, environmental impacts resulting from implementation, and the amount of time until protection is achieved.

2. ***Long-Term Effectiveness and Performance*** - This criterion addresses the results of a remedial action in terms of the risk remaining at the site after the response objectives have been met. The primary focus of this evaluation is to determine the extent and effectiveness of the controls that may be required to manage the risk posed by treatment residuals and/or untreated wastes. The factors to be evaluated include the magnitude of remaining risk (measured by numerical standards such as cancer risk levels), and the adequacy, suitability and long-term reliability of management controls for providing continued protection from residuals (i.e., assessment of potential failure of the technical components).

3. ***Reduction of Toxicity, Mobility, or Volume*** - This criterion addresses the statutory preference for selecting remedial actions that employ treatment technologies that permanently and significantly reduce toxicity, mobility or volume of the contaminants. The factors to be evaluated include the treatment process employed, the amount of hazardous material destroyed or treated, the degree of reduction expected in toxicity, mobility or volume, and the type and quantity of treatment residuals.

4. ***Implementability*** - This criterion addresses the technical and administrative feasibility of implementing an alternative and the availability of various services and materials required during its implementation. Technical feasibility considers construction and operational difficulties, reliability, ease of undertaking additional remedial action (if required), and the ability to monitor its effectiveness. Administrative feasibility considers activities needed to coordinate with other agencies (e.g., state and local) in regard to obtaining permits or approvals for implementing remedial actions.

5. ***Cost*** - This criterion addresses the capital costs, annual operation and maintenance costs, and present worth analysis.

   Capital costs consist of direct (construction) and indirect (non-construction and overhead) costs. Direct costs include expenditures for the equipment, labor and material necessary to perform remedial actions. Indirect costs include expenditures for engineering, financial and other services that are not part of actual installation activities but are required to complete the installation of remedial

alternatives. Annual operation and maintenance costs are post-construction costs necessary to ensure the continued effectiveness of a remedial action. These costs will be estimated to provide an accuracy of +50 percent to -30 percent.

A present worth analysis will be used to evaluate expenditures that occur over different time periods by discounting all future costs to a common base year, usually the current year. This allows the cost of remedial action alternatives to be compared on the basis of a single figure representing the amount of money that would be sufficient to cover all costs associated with the remedial action over its planned life. As suggested in the USEPA's guidance (1988), a discount rate of five percent will be considered, unless the market values indicate otherwise, during the performance of the RAR.

6. ***Compliance With SCGs*** - This criterion is used to determine how each alternative complies with State Standards, Criteria and Guidance values as established during the SI.

7. ***Overall Protection of Human Health and the Environment*** - This criterion provides a final check to assess whether each alternative meets the requirement that it is protective of human health and the environment. The overall assessment of protection is based on a composite of factors assessed under the evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with SCGs.

The alternatives will be evaluated using these criteria. Alternatives with extremely low cost/benefit values will be deleted from further consideration. Alternatives which provide similar levels of protection, yet which have significantly different cost will be compared. The least costly of these will be selected for further study. Eventually, an alternative will be recommended which is protective of public health and the environment, attains the SCGs, satisfies the established remedial objectives, is cost-effective, reflects consideration for the preference for permanent remedies and represents the best balance of all evaluation factors.

5.0 SITE INVESTIGATION/REMEDIAL ALTERNATIVES REPORT AND RISK ASSESSMENT

A SI/RAR will be prepared and submitted to the NYSDEC for review and comment. The report will include the following:

- Discussion of field investigation activities.
- Presentation of analytical results for all media sampled.
- Quality assurance/quality control evaluation of the analytical data including the results of the data validation.
- Discussion of the nature and extent of any contaminants identified.
- Contaminant fate and transport.
- Geologic cross-sections.
- Baseline risk assessment (if appropriate).
- Conclusions and recommendations drawn from the interpretation of the data.
- Supporting data, including analytical data packages, field log forms, and monitoring well construction diagrams.

The RA portion of the report will include the following discussions:

- ***Identification and Screening of Remedial Technologies*** - The feasible technologies and process options for site remediation will be identified for each general response action, and the results of the remedial technologies screening will be described.
- ***Development and Initial Screening of Remedial Alternatives*** - Remedial alternatives will be developed by combining the technologies identified in the previous screening process. The results of the initial screening of remedial alternatives, with respect to effectiveness, implementability and cost, will be described.
- ***Description and Detailed Analysis of Alternatives*** - A detailed description of the cost and non-cost features of each remedial action alternative passing the

initial screening of the previous section will be presented. A detailed evaluation of each remedial alternative with respect to each of the evaluation criteria will be presented. A comparison of these alternatives will also be presented.

6.0 UTILIZATION PLAN

6.1 MINORITY/WOMEN-OWNED BUSINESS ENTERPRISE (M/WBE)

This M/WBE Plan documents the good faith efforts to be undertaken to comply with the requirements of New York State Funded Clean Water/Clean Air Bond Act under the Brownfields Program to subcontract with minority- and women-owned business enterprises and to employ minorities and women. The purpose of the M/WBE Plan is to demonstrate and document Malcolm Pirnie's intention to make a good faith effort to meet the goals as stated in the Environmental Restoration Projects (Brownfields) document. This goal is as follows:

> The Contractor agrees to make good faith efforts to subcontract certain percentages of the total contract value to New York State certified MBE and WBE firms.

6.1.1 Malcolm Pirnie Corporate Affirmative Action Statement

6.1.1.1 Affirmative Action Statement

Malcolm Pirnie supports the NYSDEC's commitment to minority- and women-owned business enterprises. The firm will make good faith efforts to meet or exceed the goals for this contract. Malcolm Pirnie is in compliance with Title VII of the Civil Rights Acts of 1964, as amended by the Equal Employment Opportunity Act of 1972.

6.1.2 Good Faith Efforts Undertaken to Ensure M/WBE Participation

6.1.2.1 General

As part of the New York State Clean Water/Clean Air Bond Act Brownfields Investigation Grant, the City of Amsterdam has retained Malcolm Pirnie to perform the following Tasks:

- Perform a Site Investigation (SI).
- Prepare an SI Report.
- Prepare a Remedial Alternatives Report (RAR).

Subcontractors/Suppliers will be needed to assist or provide services in the following areas.

1. Soil Boring and Groundwater Monitoring Well Installation.
2. Test Pit Excavation.
3. Well Development and Groundwater Sampling.
4. Data Validation Services.
5. Laboratory Analyses.

6.1.2.2 M/WBE Participation

- ***Soil Boring and Ground Water Monitoring Well Installation*** - Malcolm Pirnie has procured American Auger, a certified WBE company, for the completion of all soil borings and the installation of all groundwater monitoring wells. The estimated fee for these service is approximately $14,300.

- ***Well Development and Groundwater Sampling*** - Malcolm Pirnie has procured Star Environmental, a certified MBE company, for the development of all groundwater monitoring wells and the associated groundwater sampling of those wells. The estimated fee for these service is approximately $2,100.

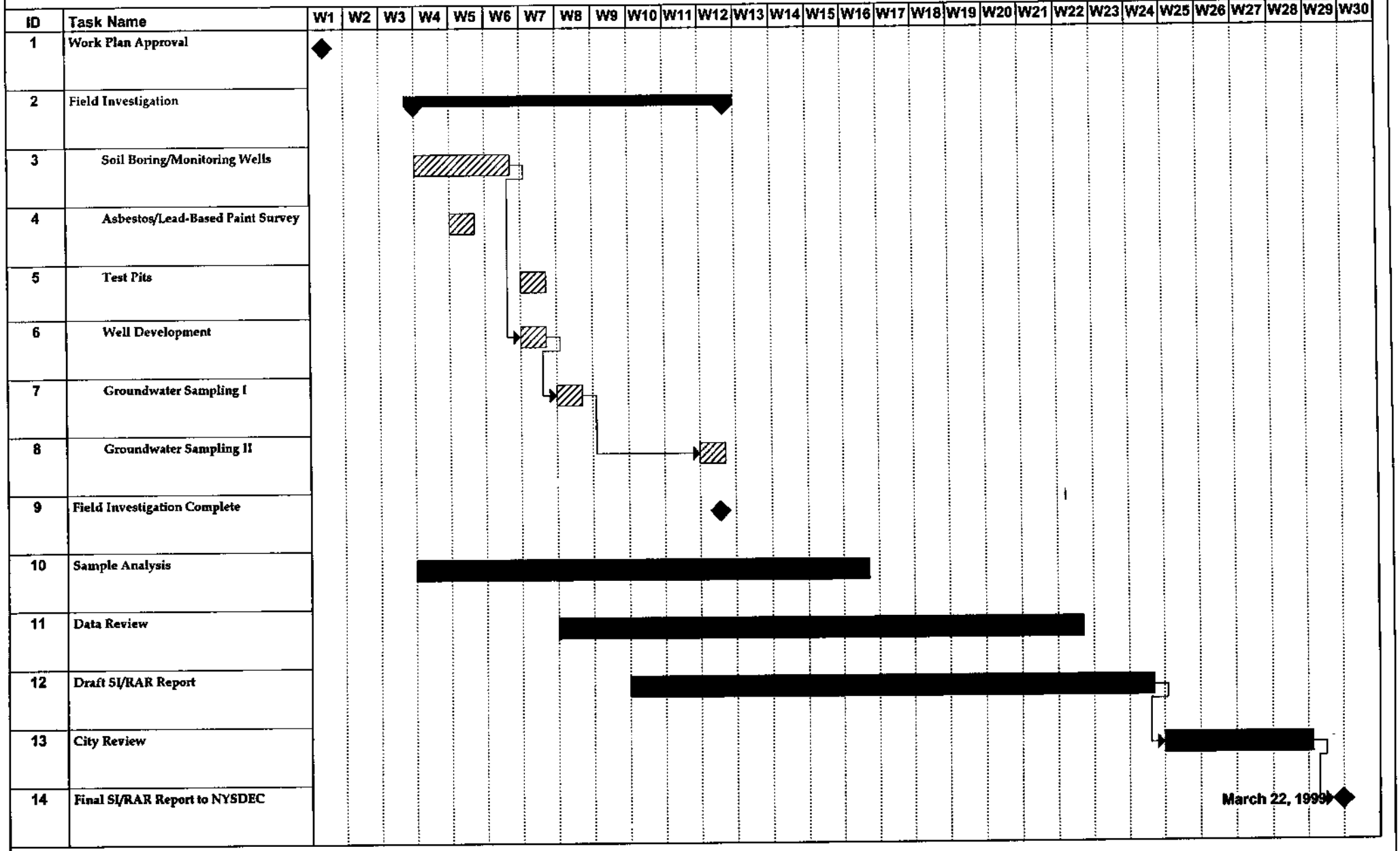
- ***Data Validation Services*** - Malcolm Pirnie has procured Data Validation Services, a certified WBE company, for professional data validation services. The data validator will review analytical data to determine if the data is accurate and defensible and prepare a data usability summary report (DUSR). The estimated fee for these services is approximately $4,500.

- ***Laboratory Analyses Services*** - Malcolm Pirnie has procured Chemtech, a certified MBE firm, to perform requested laboratory services in accordance with NYSDEC ASP CLP. The estimated fee for these services is approximately $29,200.

7.0 PROJECT SCHEDULE

Figure 7-1 presents the project schedule for the former Mohasco Mill Complex SI/RAR. As shown in Figure 7-1, Malcolm Pirnie will begin field investigation activities within three weeks of Work Plan approval by the City of Amsterdam and the NYSDEC. It is expected that the final SI/RAR report can be submitted to the NYSDEC no later than April 1, 1999.

Fig 7-1
Proposed Pr. ect Schedule
Former Mohasco Mill Complex



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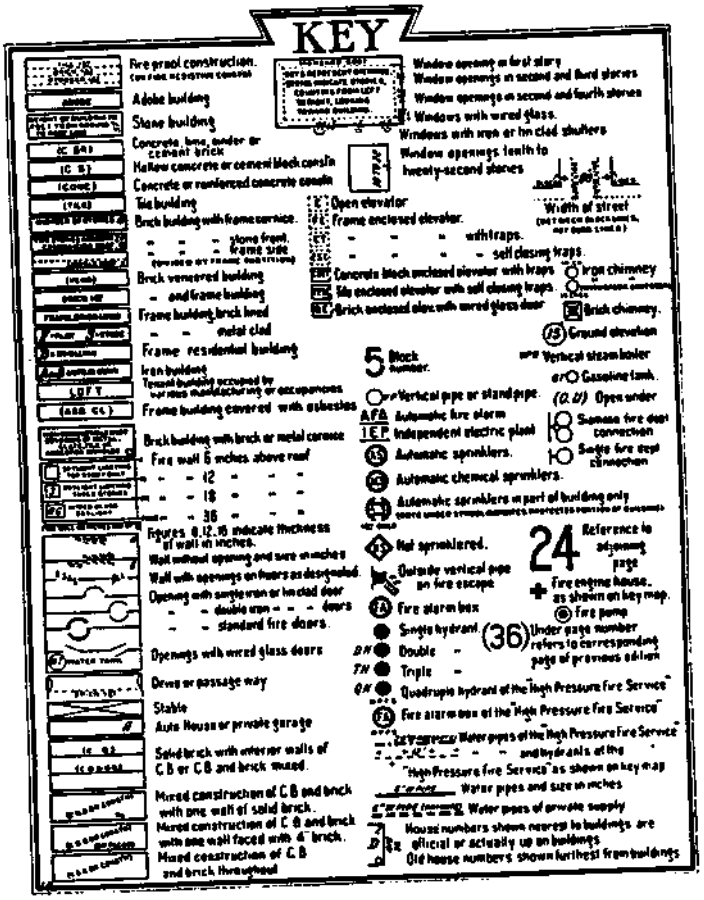
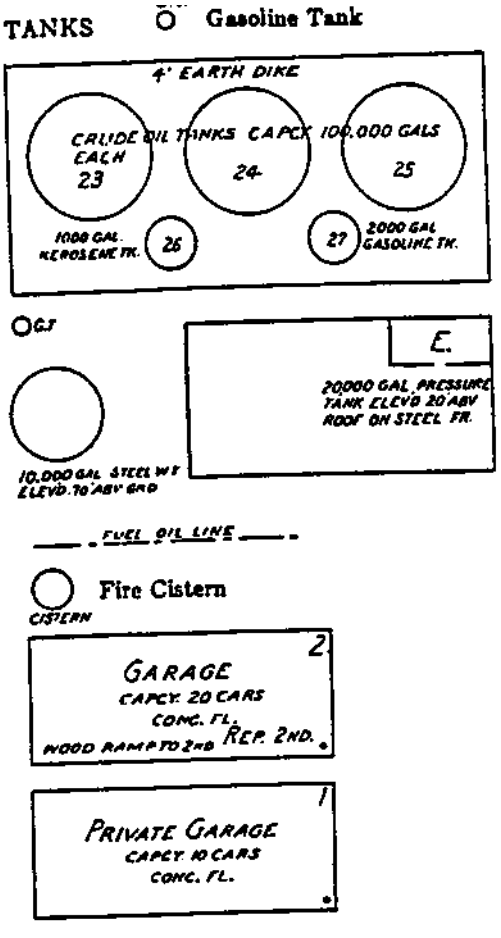




CODING OF STRUCTURAL UNITS FOR FIREPROOF AND NON-COMBUSTIBLE BUILDINGS

FRAMING

CODE	STRUCTURAL UNIT
A.	Reinforced Concrete Frame.
B.	Reinforced Concrete Joists, Columns, Beams, Trusses, Arches, Masonry Piers.
C.	Protected Steel Frame.
D.	Individually Protected Steel Joists, Columns, Beams, Trusses, Arches.
E.	Indirectly Protected Steel Frame.
F.	Indirectly Protected Steel Joists, Columns, Beams, Trusses, Arches.
G.	Unprotected Steel Frame.
H.	Unprotected Steel Joists, Columns, Beams, Trusses, Arches.
O.	Masonry Bearing Walls.

FLOORS

CODE	STRUCTURAL UNIT
1.	Reinforced Concrete. Reinforced Concrete with Masonry Units. Pre-cast Concrete or Gypsum Slabs or Planks.
2.	Concrete on Metal Lath, Incombustible Form Boards, Paper-backed Wire Fabric, Steel Deck, and Cellular, Ribbed or Corrugated Steel Units.
3.	Open Steel Deck or Grating.

R		M	
RT		P	
C		U	UTILITY
W		T	

ROOF

CODE	STRUCTURAL UNIT
a.	Reinforced Concrete. Reinforced Concrete with Masonry Units. Reinforced Gypsum Concrete. Pre-cast Concrete or Gypsum Slabs or Planks.
b.	Concrete or Gypsum on Metal Lath, Incombustible Form Boards, Paper-backed Wire Fabric, Steel Deck, and Cellular, Ribbed or Corrugated Steel Units.
c.	Incombustible Composition Boards with or without Insulation. Masonry or Metal Tiles.
d.	Steel Deck, Corrugated Metal or Asbestos Protected Metal with or without Insulation.

The coding for framing, floor and roof structural units as shown above is used in describing the construction of fire-resistive buildings. In addition, reports for fire-resistive buildings will show the date built and wall construction when other than brick.

F P buildings have masonry floors and roof; concrete and/or directly or indirectly protected steel framing; and clay brick, stone or poured concrete walls.

F P X buildings are F P buildings with inferior walls such as concrete block, cement brick, metal or glass panels, etc.

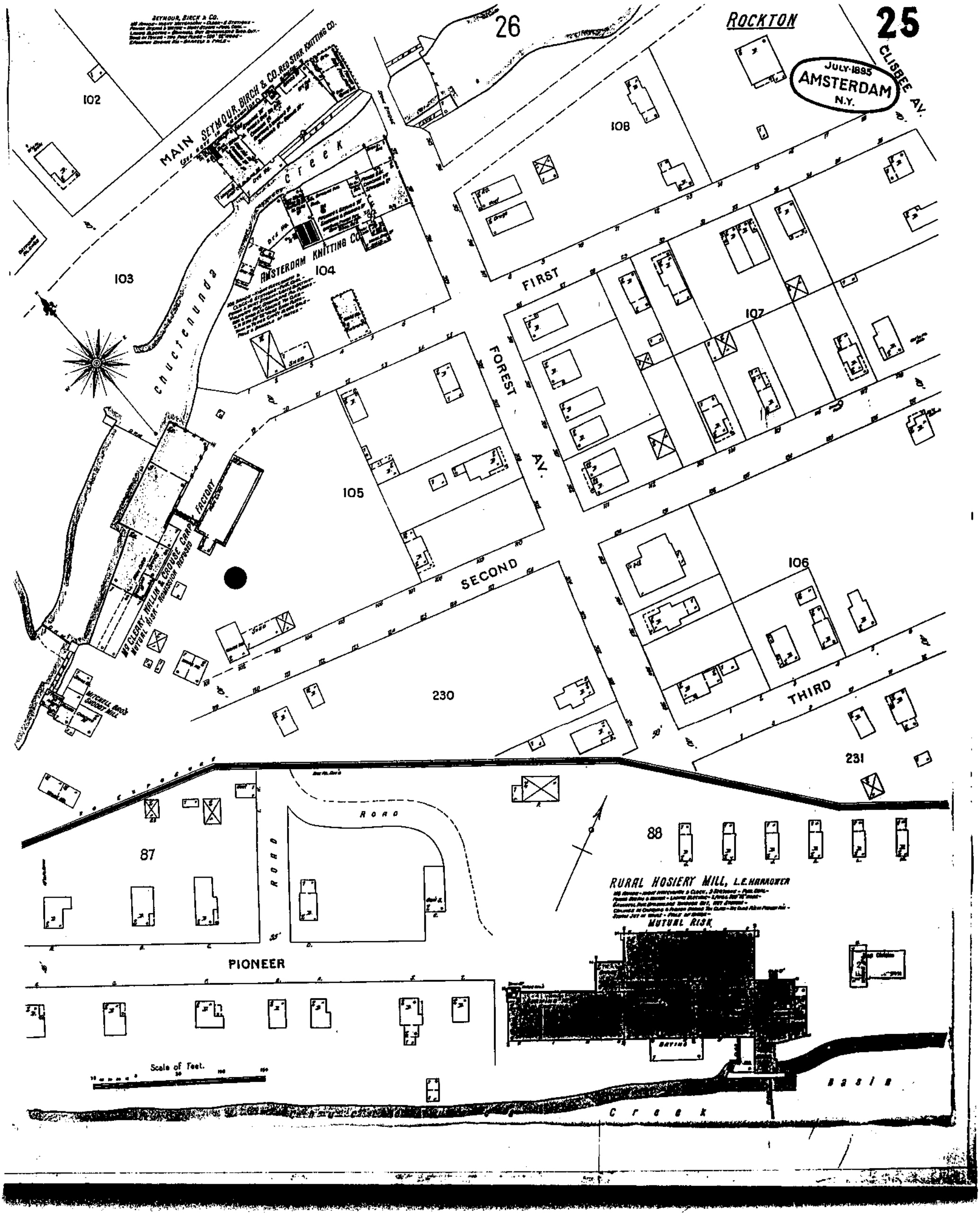
N C buildings have unprotected steel framing and fire-resistive but non-masonry floors and roof.

FP-1962 (CONC.) A-1-a — A fire-resistive building built in 1962 with concrete walls and reinforced concrete frame, floors and roof.

FPX-1962 (METAL PANELS) E-2-b — A fire-resistive building built in 1962 with metal panel walls, indirectly protected steel frame, concrete floors and roof on metal lath, noncombustible ceilings.

NC-1962 (C. B.) H-2-d — A noncombustible building built in 1962 with concrete block walls; unprotected steel columns and beams; concrete floors on metal lath and steel deck roof.

5-62



1895

ROCKTON.

CLISBEE AV.

FEB. 1901
AMSTERDAM
N.Y.

26

102

MAIN

EAGLE KNITTING CO.

RED STAR MILL.

Creek.

EAGLE KNITTING CO.
EAGLE MILL.

104

103

Chuctenunda

108

40. AV.

ST.

1ST

FOREST

107

105

2ND

106

M.E. CHURCH.

5T.

3RD

230

231

MITCHELL BROS.
SHUDDY MILL

Road.

87

88

PIONEER

RURAL HOSIERY MILL, L.E. HARROWER.

Drying

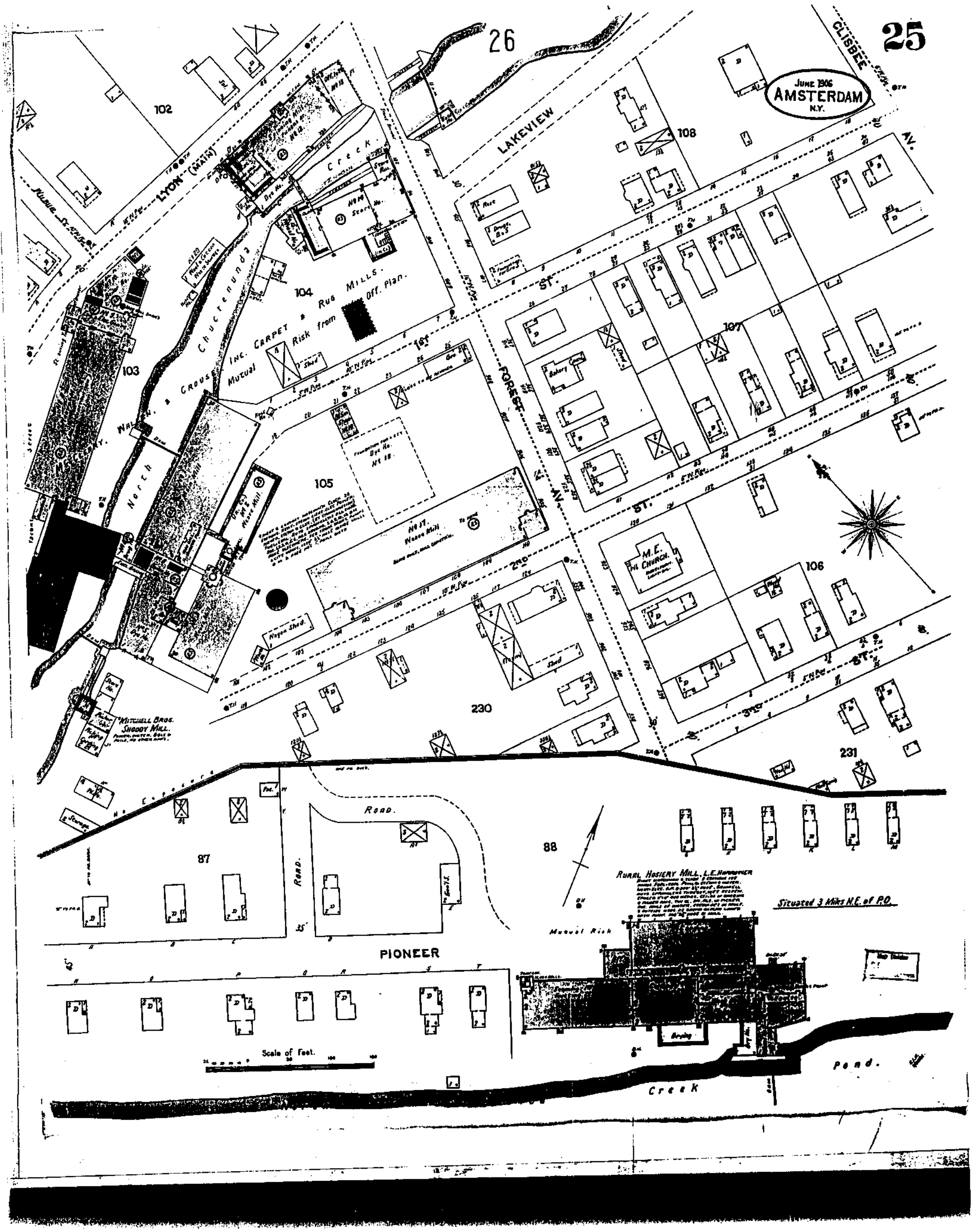
Basin.

Scale of Feet.

North.

Chuctenunda Creek

1901



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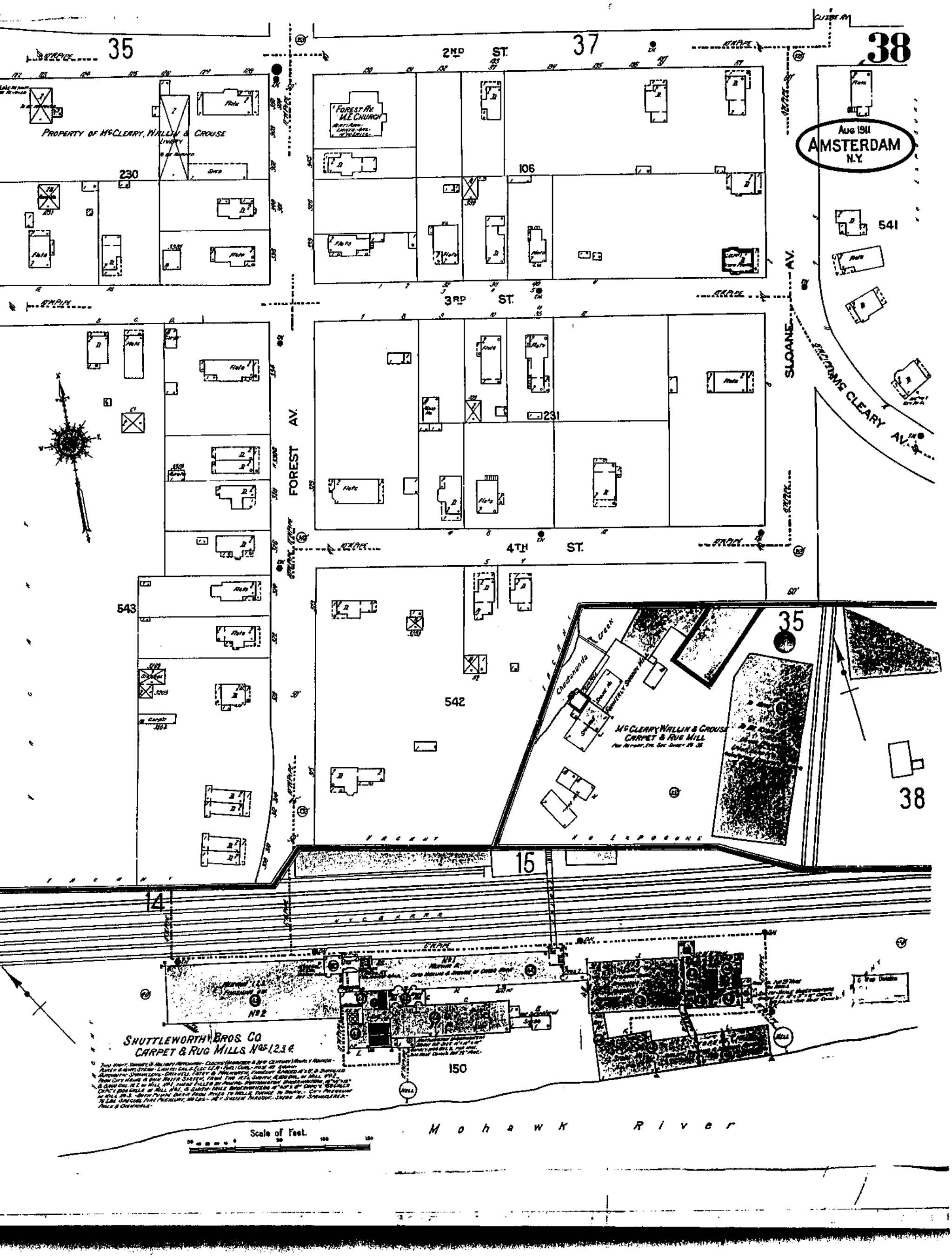

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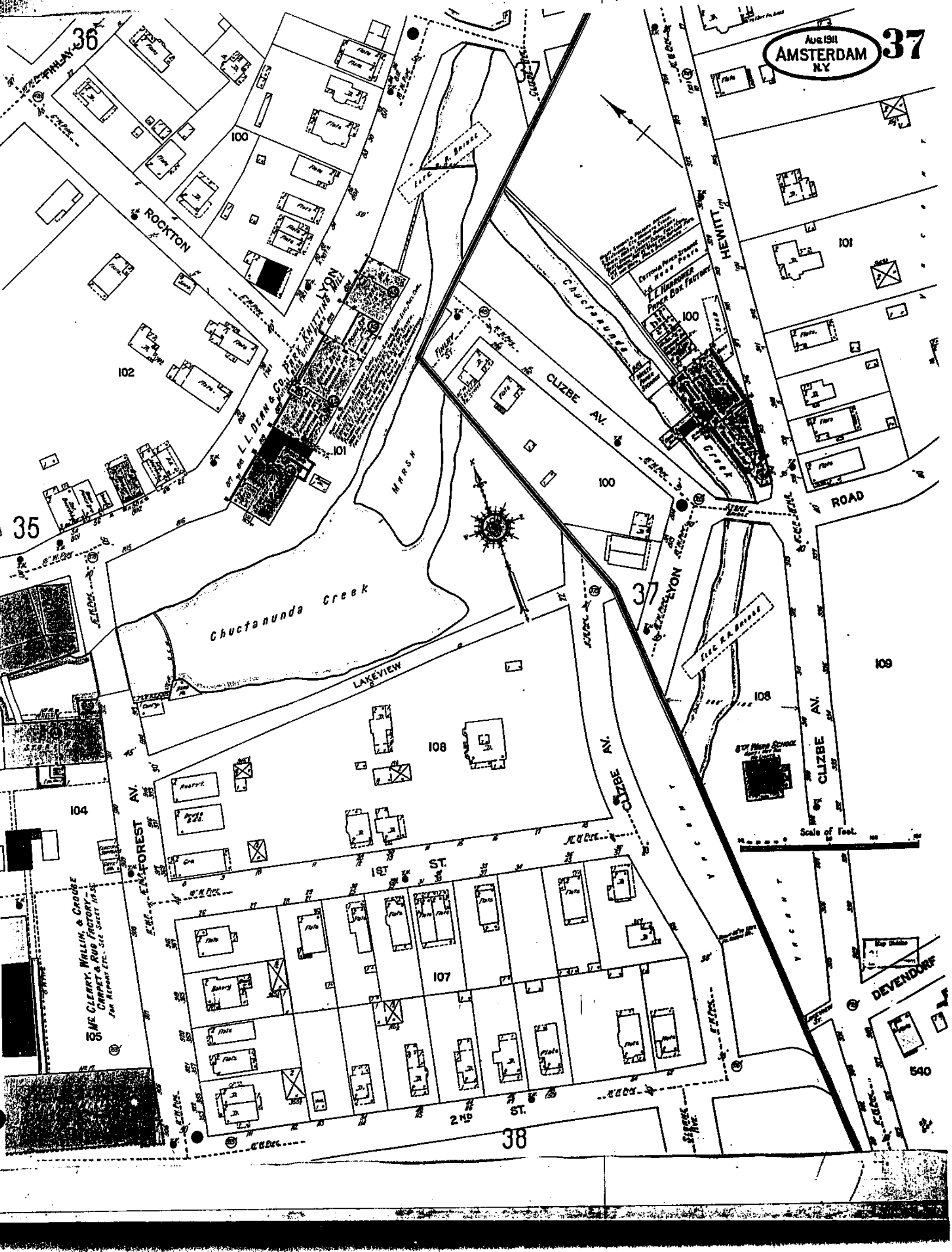

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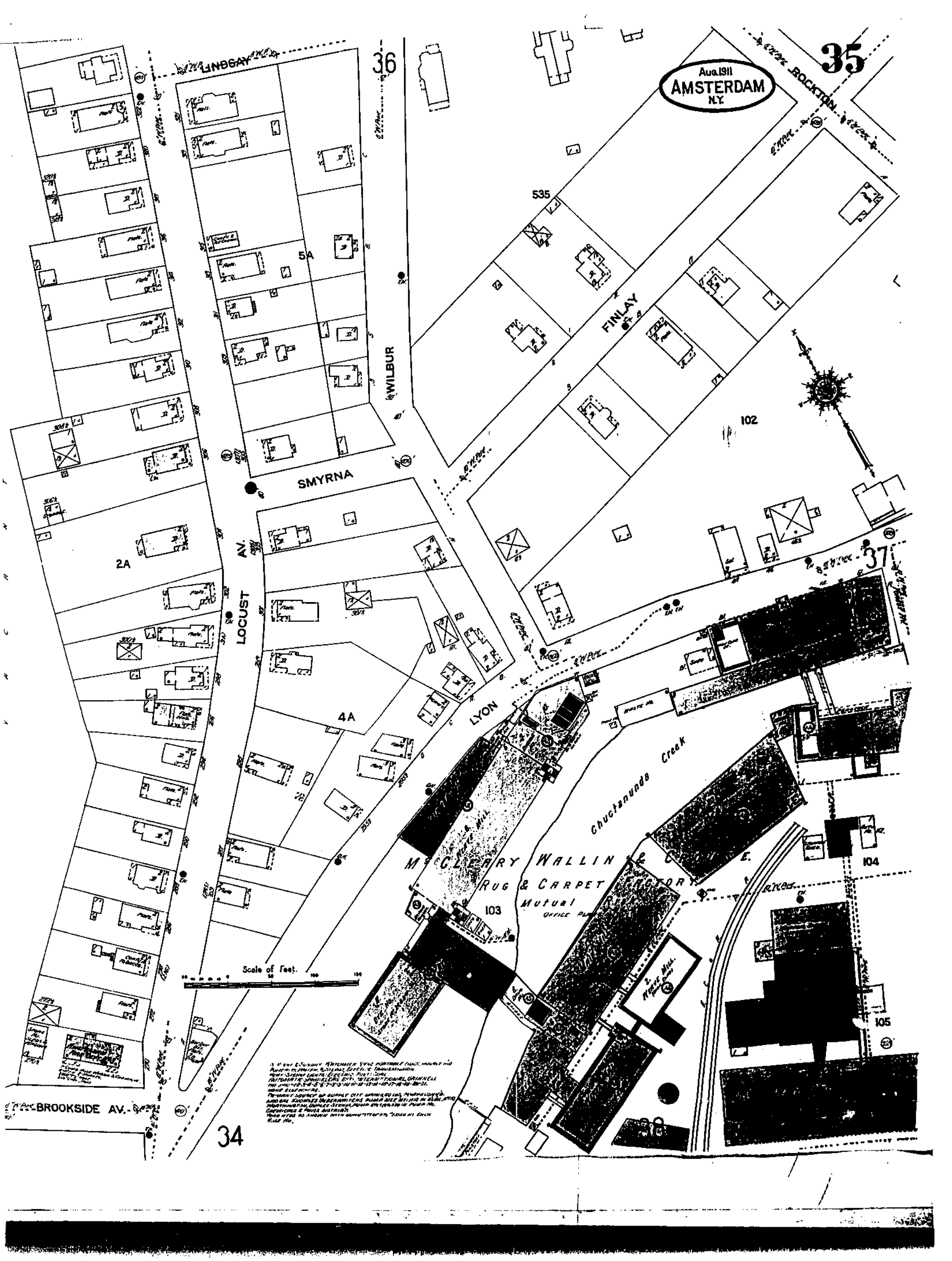

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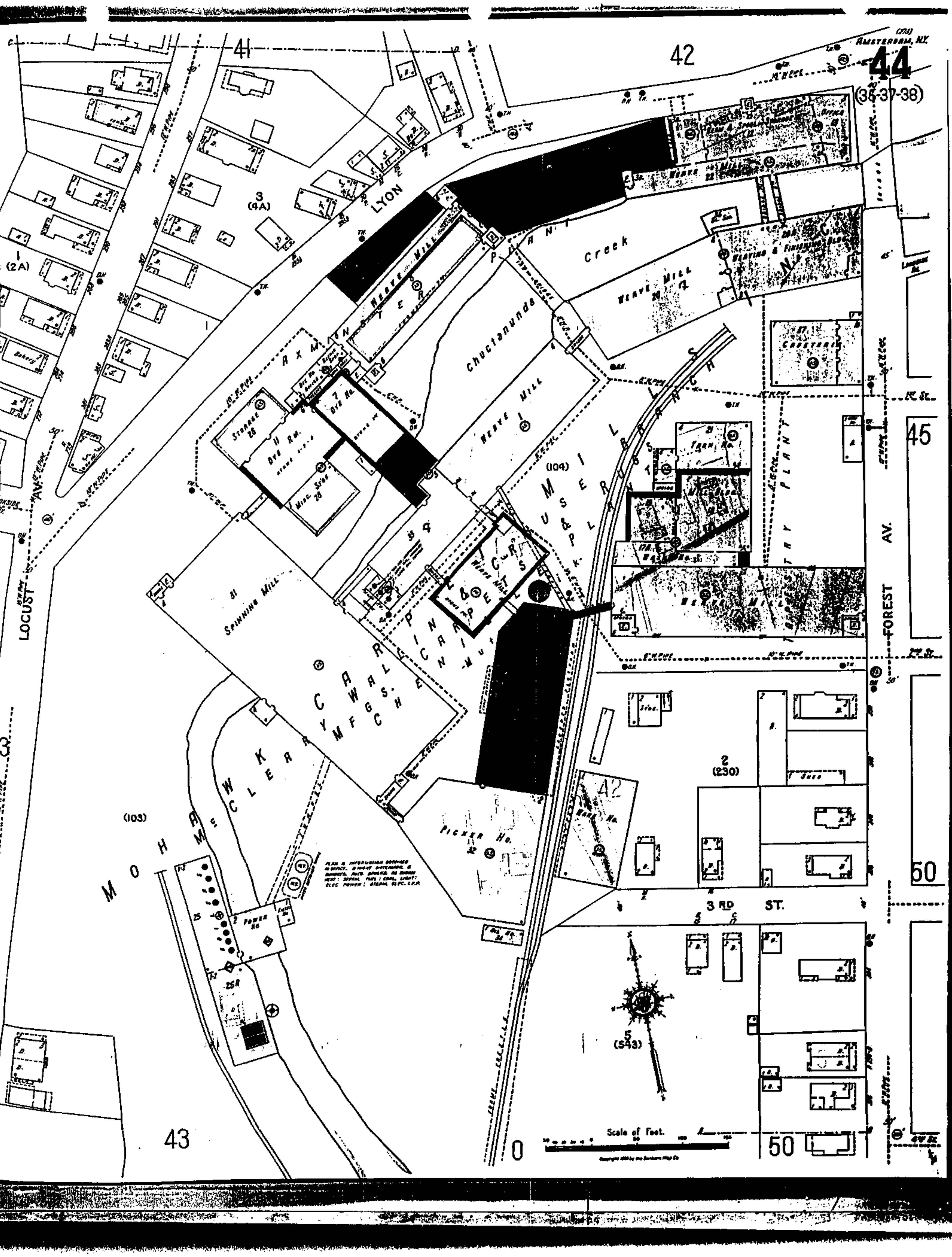
1911



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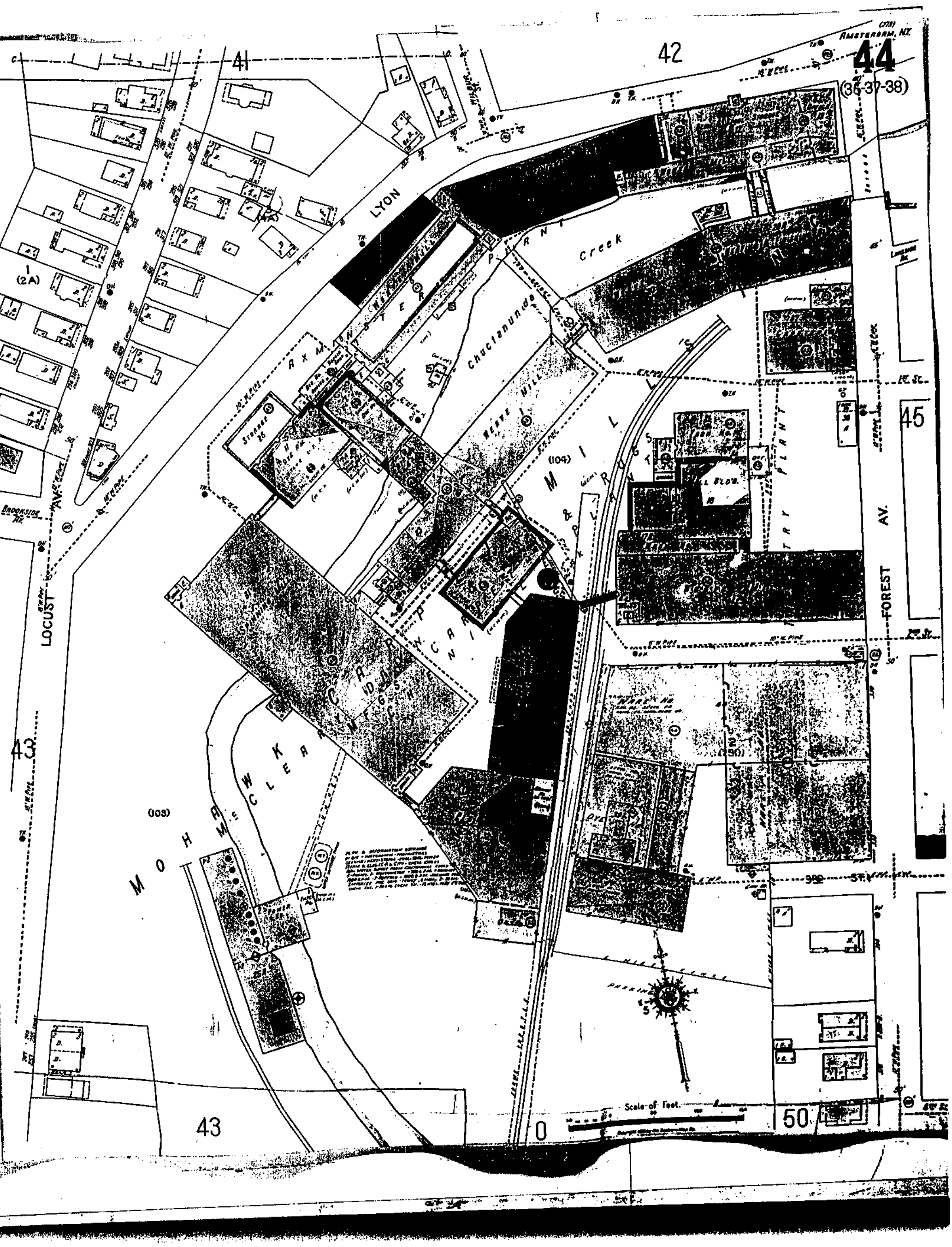
ERIIS

1926



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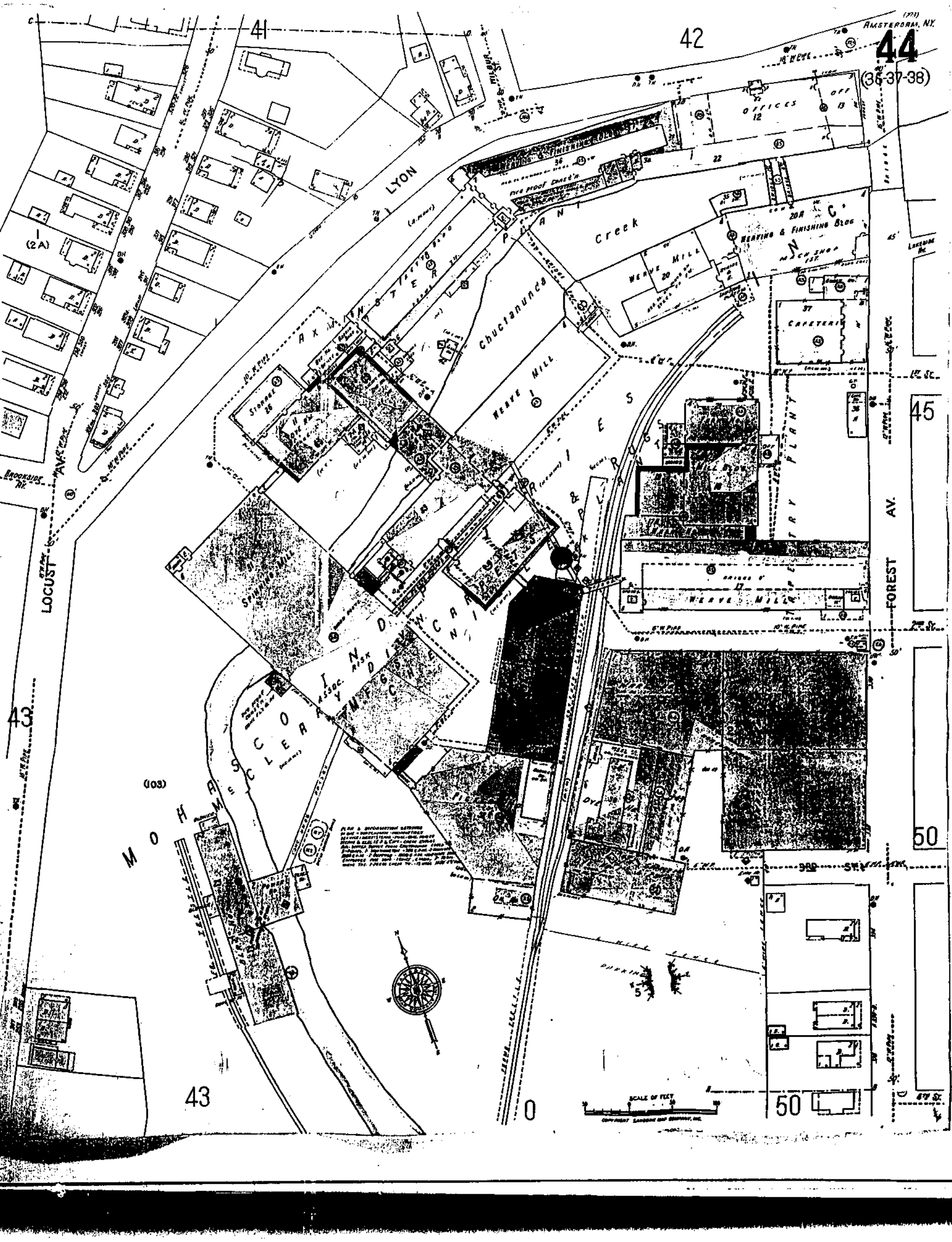
1950



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B	Equipment Maintenance & Calibration
C	Project Organization and Personnel Responsibilities

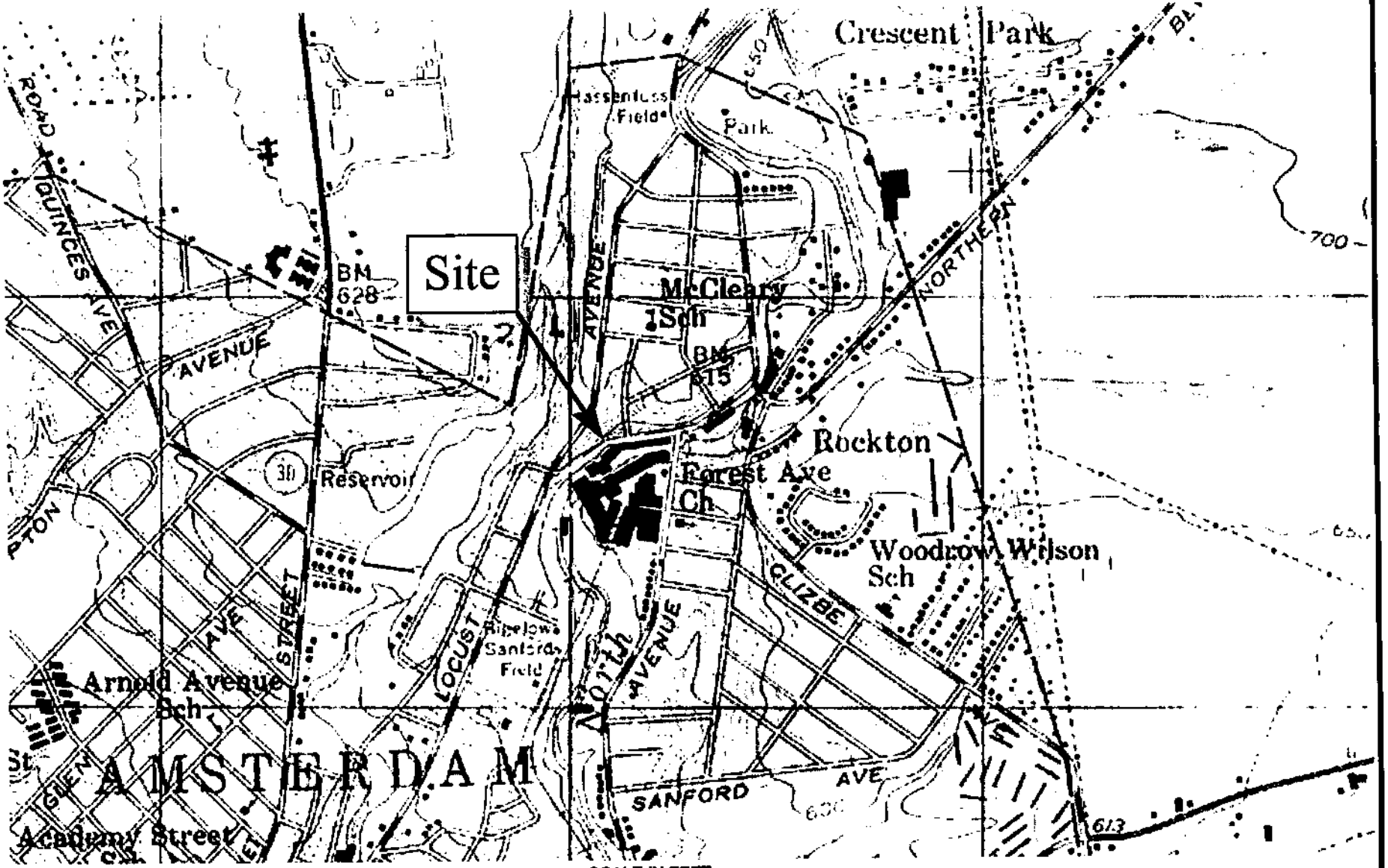
1.0 INTRODUCTION/BACKGROUND

1.1 BACKGROUND/OBJECTIVES

As part of the New York State Brownfields Redevelopment Plan, the City of Amsterdam has retained Malcolm Pirnie, Inc. (Malcolm Pirnie) to perform a Site Investigation/ Remedial Alternatives Report (SI/RAR) for the former Mohasco Mill Complex in the City of Amsterdam. The location of the site is shown in Figure 1-1. The site is located in an industrial/residential area. Carpet manufacturing and wool processing activities took place at the site from the late 1800s through the 1970s.

This Quality Assurance Project Plan (QAPP) presents, in specific terms, the policies, organizations, objectives, functional activities, and quality assurance (QA) and quality control (QC) activities designed to achieve the data quality goals of the SI/RAR at the former Mohasco Mill Complex.

The QA addressed herein is applicable to both the field sampling activities and the laboratory analyses of field samples. Most of the laboratory analyses and QC procedures will be in accordance with the 1989 New York State Department of Environmental Conservation (NYSDEC) Analytical Services Protocol/Contract Laboratory Protocol (ASP/CLP)(1995 rev.). The analytical laboratory that will be employed to analyze the field samples collected during the SI will be certified by the NYS Department of Health Environmental Laboratory Approval Program (ELAP) for NYSDEC ASP/CLP analyses.



SOURCE: U.S.G.S 7.5 MIN. AMSTERDAM QUAD, 1980

MALCOLM PIRNIE

MOHASCO MILL COMPLEX
AMSTERDAM, NEW YORK

Site Location Map

Figure 1-1

2.0 QUALITY ASSURANCE OBJECTIVES

2.1 PURPOSE

The purpose of this QAPP is to ensure that data collected as part of the SI at the former Mohasco Mill Complex are of sufficient quality to make sound project decisions. In this section, the specific quality assurance objectives are identified and developed by establishing Data Quality Objectives (DQOs). The intended use of the data, the procedures available for laboratory and field analyses, and the available resources are used to establish DQOs . The end result of this process is the development of specific quality requirements for each data collection activity. Once the DQOs have been established, the analytical methods which are capable of supporting the DQOs are selected. Specific quality assurance objectives for the analytical methods are then determined.

2.2 DATA REQUIREMENTS/LEVELS OF CONCERN

The purpose of the SI is to characterize the nature and extent of contaminants in the soil and groundwater at the site in accordance with the SI Work Plan. SI analytical sampling results will be used to determine if contaminant concentrations in groundwater exceed State Standards Criteria and Guidance Values (SCGs). Analytical results for soil samples will be compared to state guidance values presented in TAGM HWR-94-4046. Data gathered during the SI will be used to identify cost-effective, environmentally sound, long-term measures for remediation of the site, if required.

The work plan includes sampling procedures, analytical methods, and special analyses for quantitatively assessing the site. The investigation process includes quality assurance goals and QA procedures to measure data quality. To ensure that the data quality goals are met, certain DQOs are established for the data to be gathered.

2.3 DATA QUALITY OBJECTIVES AND QUALITY ASSURANCE OBJECTIVES

The DQOs are specific, pre-determined goals for data quality that must be achieved for this data to be useful in supporting project decisions. The DQOs have been developed to ensure that the various investigation activities and analyses produce data that is valid and useful for this project. The DQOs need to be supported by a certain level of data quality which varies based on the intended use of the data. The USEPA has defined certain analytical levels and associated confidence levels, which are used to support the DQOs. The analytical levels required for specific data uses and the types of analyses needed to achieve a particular analytical level are defined as follows:

1. ***Level I*** - Field screening or analysis using portable instruments. Results are often not compound specific and not quantitative but results are available in real-time.

2. ***Level II*** - Field analyses using more sophisticated portable analytical instruments; in some cases the instruments may be set up in a mobile laboratory on-site. There is a wide range in the quality of data that can be generated. It depends on the use of suitable calibration standards, reference materials, and sample preparation equipment; and the training of the operator. Results are available in real-time or within several hours.

3. ***Level III*** - Analyses performed in a mobile or an off-site analytical laboratory. Level III analyses may or may not use CLP procedures, but do not usually utilize the validation or documentation procedures required of CLP Level IV analysis. The off-site laboratory may or may not be a CLP laboratory.

4. ***Level IV*** - CLP routine analytical services. Level IV is characterized by rigorous QA/QC protocols and documentation.

5. ***Level V*** - Non-standard methods. Analyses may require method modification and/or development. Method development or method modification may be required for specific constituents or detection limits.

To measure and control the quality of analysis and to ensure that the DQOs are met, certain QA parameters are defined and utilized in data analysis activities in this project. They are defined as follows:

- ***Precision*** - is a measure of mutual agreement among individuals of the same property, usually under prescribed similar conditions. Precision is expressed in terms of standard deviation and is evaluated based on the calculated relative percent difference (RPD) of standard matrix spikes, sample matrix spikes, and sample duplicates (field duplicates and laboratory duplicates). The evaluation of precision for this project will be based on the RPD between duplicate standard matrix spikes, duplicate sample matrix spikes, and sample duplicates.

- ***Accuracy*** - is the degree of difference between measured or calculated values and true values. The difference is expected to be within the precision interval for the measurement to be deemed accurate. For this project, accuracy will be measured based on the average percent recovery of standard matrix control spikes.

- ***Representativeness*** - expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. To assure that the samples delivered to the laboratory for analysis are representative of the site conditions, quality assurance procedures for sample collection and handling (discussed below) will be followed whenever samples are collected.

- ***Completeness*** - is a measure of the amount of the data obtained from a measurement system compared to the amount that was expected to be obtained under correct normal conditions. The goal and objective is 100 percent completeness. However, due to unforeseen field conditions, laboratory conditions and analytical limitations (such as matrix interference or required dilution) which could result in data qualification, it may not be possible to achieve 100 percent completeness. The minimum level of laboratory completeness is expected to be 95 percent for each analytical parameter. The minimum level of project completeness will be 90 percent. This is expected to be achieved by ensuring proper sample packaging and extraction procedures. The project manager has the responsibility of deciding whether re-sampling and reanalysis are required to meet the data quality objectives. The project manager will then inform the laboratory coordinator and the QA supervisor of the decision.

- ***Comparability*** - is the confidence with which one data set can be compared with another. All data will be calculated and reported in units consistent with standard procedures so that the results of the analyses can be compared with those of other laboratories. The objectives of the analytical laboratory for comparability are to:

1. Demonstrate traceability of standards to NIST or EPA sources,

2. Use standard methodology,

3. Report results from similar matrices in standard units,

4. Apply appropriate levels of quality control within the context of the laboratory QA program, (Level III, EPA Data Objectives for Remedial Response Activities, 1987), and

5. Participate in inter-laboratory studies to document laboratory performance.

- ***Sensitivity*** - The data generated during the SI will be sensitive enough to meet SCG criteria. Table 1 provides the analytical detection limits for the project analytes.

2.4 DATA QUALITY OBJECTIVES DEVELOPMENT

In this section the DQOs for each data collection activity are described along with the necessary QA/QC requirements. Anticipated QA/QC samples for these data collection activities are presented in Tables 2 through 4.

Air

Air monitoring is performed for site characterization and monitoring during SI/RAR activities to provide information concerning the health and safety of the workers at the site and for the population in nearby residences and businesses. The air monitoring results will be used to select appropriate personal protective equipment or to stop work in the event that perimeter levels exceed those indicated in the Health and Safety Plan. The air monitoring will be conducted using portable field instrumentation to screen the site. To meet the DQOs of screening the site for particulates, Level I analytical support will be required. In Level I analysis, results are available in real-time and the instruments used are sensitive enough to screen for contaminant levels that threaten health and safety.

TABLE 1

SAMPLE ANALYSIS METHODS
FORMER MOHASCO MILL COMPLEX
CITY OF AMSTERDAM, NEW YORK

Analyte	CRQLs Water (µg/l)	CRQLs Soil (µg/kg)
TAL Metals		
Aluminum	9.1	1820
Antimony	6.4	1300
Arsenic	4.3	900
Barium	0.5	100
Beryllium	0.5	100
Cadmium	1.3	300
Calcium	31.2	6240
Chromium	1.6	320
Cobalt	6.5	1300
Copper	3	600
Iron	14	2800
Lead	2.4	500
Magnesium	46.7	9340
Manganese	0.5	100
Mercury	0.20	100
Nickel	5.8	1200
Potassium	119	23800
Selenium	2.9	600
Silver	1.7	340
Sodium	113	22600
Thallium	5.8	1200
Vanadium	2.5	500
Zinc	3.8	800
Cyanide	10	500

TABLE 1 (Continued)

SAMPLE ANALYSIS METHODS
FORMER MOHASCO MILL COMPLEX
CITY OF AMSTERDAM, NEW YORK

Analyte	CRQLs Water (µg/l)	CRQLs Soil (µg/kg)
Pesticides and PCBs (8080)		
Alpha-BHC	0.05	1.7
Beta-BHC	0.05	1.7
Delta-BHC	0.05	1.7
Gamma-BHC (Lindane)	0.05	1.7
Heptachlor	0.05	1.7
Aldrin	0.05	1.7
Heptachlor epoxide	0.05	1.7
Endosulfan I	0.05	1.7
Dieldrin	0.10	3.3
4,4-DDE	0.10	3.3
Endrin	0.10	3.3
Endosulfan II	0.10	3.3
4,4-DDD	0.10	3.3
Endrin Aldehyde	0.10	3.3
Endosulfan sulfate	0.10	3.3
4,4-DDT	0.10	3.3
Methoxychlor	0.50	17
alpha-Chlordane	0.05	1.7
gamma-Chlordane	0.05	1.7
Toxaphene	5	170
AROCLOR-1016	0.1	33
AROCLOR-1221	0.2	67
AROCLOR-1232	0.1	33
AROCLOR-1242	0.1	33
AROCLOR-1248	0.1	33
AROCLOR-1254	0.1	33
AROCLOR-1260	0.1	33

TABLE 1 (Continued)

SAMPLE ANALYSIS METHODS
FORMER MOHASCO MILL COMPLEX
CITY OF AMSTERDAM, NEW YORK

Analyte	CRQLs Water (µg/l)	CRQLs Soil (µg/kg)
Volatile Organics (8240)		
Acetone	10	10
Benzene	0.7	5
Bromodichloromethane	5	5
Bromoform	5	5
Bromomethane	5	5
2-Butanone	10	10
Carbon disulfide	5	5
Carbon tetrachloride	5	5
Chlorobenzene	5	5
Chloroethane	5	5
Chloroform	5	5
Chloromethane	10	10
Dibromochloromethane	5	5
1,1-Dichloroethane	5	5
1,2-Dichloroethane	5	5
1,1-Dichloroethene	5	5
1,2-Dichloroethene	5	5
1,2-Dichloropropane	5	5
cis-1,3-Dichloropropene	5	5
trans-1,3-Dichloropropene	5	5
Ethylbenzene	5	5
2-Hexanone	10	10
Methylene chloride	5	5
4-Methyl-2-pentanone	10	10
Styrene	10	10
1,1,2,2-Tetrachloroethane	5	5
Tetrachloroethene	5	5
Toluene	5	5
1,1,1-Trichloroethane	5	5
1,1,2-Trichloroethane	5	5
Trichloroethene	5	5
Vinyl acetate	10	10
Vinyl chloride	2	5
Xylene, total	5	5

TABLE 1

SAMPLE ANALYSIS METHODS
FORMER MOHASCO MILL COMPLEX
CITY OF AMSTERDAM, NEW YORK

Analyte	CRQLs Water (µg/l)	CRQLs Soil (µg/kg)
Semi-Volatile (8270)		
Acenaphthene	10	330
Acenaphylene	10	330
Anthracene	10	330
Benzo(a)anthracene	2	100
Benzo(b)fluoranthene	2	330
Benzo(k)fluoranthene	2	330
Benzo(a)pyrene	2	330
Benzo(ghi)perylene	10	330
Butylbenzylphthalate	10	330
bis(2-Chloroethyl)ether	5	330
bis(2-Chloroethoxy)methane	5	330
bis(2-Ethylhexyl)phthalate	10	330
4-Bromophenylphenylether	10	330
2-Chloronapthalene	5	330
4-Chlorophenylphenylether	2	330
Chrysene	2	330
Dibenzo(a,h)anthracene	10	330
di-n-Butylphthalate	10	330
1,3-Dichlorobenzene	5	330
1,2-Dichlorobenzene	5	330
1,4-Dichlorobenzene	5	330
Diethylphthalate	10	330
Dimethylphthalate	10	330
2,4-Dinitrotoluene	5	330
2,6-Dinitrotoluene	5	140
di-n-Octylphthalate	10	330

TABLE 1

SAMPLE ANALYSIS METHODS
FORMER MOHASCO MILL COMPLEX
CITY OF AMSTERDAM, NEW YORK

Analyte	CRQLs Water (µg/l)	CRQLs Soil (µg/kg)
Semi-Volatiles (8270) (Cont'd)		
Fluoranthene	10	330
Fluorene	10	330
Hexachlorobenzene	2	330
Hexachlorobutadiene	5	330
Hexachlorocyclopentadiene	5	1000
Hexachloroethane	10	330
Indeno(1,2,3-cd)pyrene	2	330
Isophorone	10	330
Naphthalene	10	330
Nitrobenzene	5	330
4-Nitrophenol	10	800
n-Nitrosodi-n-propylamine	5	330
n-Nitrosodiphenylamine	10	330
Pentachlorophenol	20	800
Phenanthrene	10	330
Phenol	2	100
Pyrene	10	330
1,2,4-Trichlorobenzene	5	330
2-Methylnapthalene	10	330
2,4,5-Trichlorophenol	10	1600
2-Nitroaniline	25	800
3-Nitroaniline	25	800
Dibenzofuran	10	330
4-Nitroaniline	25	800

TABLE 2

SOIL AND SEDIMENT SAMPLES

LOCATION	TOTAL NUMBER OF SAMPLING LOCATIONS	TCL	TAL	PCBs
INVESTIGATIVE SAMPLES				
Soil Borings	21	21	21	---
Surface Soil Samples (Transformer Area)	4	---	---	4
Test Pit (Suspected PCB Transformer Area)	1	---	---	1
Sediment Samples	4	4	4	---
QA/QC SAMPLES				
Field Duplicates		2	2	---
Matrix Duplicates		2	2	---
Matrix Spike Duplicates		2	2	---
Field Blanks		4	4	---
TOTALS	30	35	35	5

TABLE 3

GROUNDWATER SAMPLES

LOCATION	TOTAL NUMBER OF SAMPLING LOCATIONS	TCL	TAL
INVESTIGATIVE SAMPLES			
Monitoring Wells'	11	22*	22*
QA/QC SAMPLES			
Field Duplicates		2	2
Matrix Duplicates		2	2
Matrix Spike Duplicates		2	2
Field Blanks		2	2
Trip Blanks		4**	0
TOTALS	11	34*	34*

* Includes two groundwater sampling events
** Trip blanks analyzed for TCL volatile organics only

TABLE 4

SAMPLE CONTAINER, PRESERVATION AND HOLDING TIME REQUIREMENTS

MATRIX	ANALYSIS	CONTAINER	PRESERVATION	HOLDING TIME
Soil	TCL Volatiles	2-60 ml glass	Cool to 4°C	7 days
	TCL Semi-Volatiles	8 oz. glass jar	Cool to 4°C	5 days from verified time of sample receipt (VTSR) to extraction; 40 days from VTSR to analysis
	TCL Pesticides/ PCBs			
	TAL Metals	8 oz. glass jar	Cool to 4°C	180 days
	Mercury			26 days
	Cyanide			12 days
Groundwater	TCL Volatiles	2-40 ml glass w/septum cap	Cool to 4°C	7 days
	TCL Semi-Volatiles	2-2 liter amber glass	Cool to 4°C	5 days from VTSR to extracting; 40 days from VTSR to analysis
	TCL Pesticides/ PCBs			
	TAL Metals	1 liter polyethylene	HNO_3 to pH 2 Cool to 4°C	180 days
	Mercury			26 days
	Cyanide	1 liter polyethylene	NaOH to pH > 2 Cool to 4°C	12 days

Groundwater

Groundwater will be sampled and analyzed to characterize the nature and extent of groundwater contamination at the site. The data will be used to identify the amount of any groundwater contamination, to aid in determining contaminant source locations, and to determine if any SDGs have been exceeded. In order to meet these objectives, the data from the groundwater samples must be of known quality. Therefore data quality objective Level IV has been chosen. This level is characterized by rigorous QA/QC protocols and documentation, which historically have provided high quality data able to meet the DQOs. To meet the Level IV DQO, sample analysis data will be reported with NYSDEC ASP Category B deliverables packages.

Soil

The objective of the soil sampling program is to define the nature and extent of contamination in soils. To be useful in meeting these objectives, the data from the soil samples must be of known quality. To support the DQOs, analytical Level IV will be used. This level is capable of producing high quality data characterized by rigorous QA/QC protocols and documentation.

3.0 FIELD INVESTIGATION PROCEDURES

3.1 SAMPLING PROCEDURES AND EQUIPMENT

The field investigation procedures which will be followed during this Site Investigation are summarized below.

3.1.1 Decontamination of Sampling Equipment

Cross contamination of samples from any source is to be avoided. All sampling equipment must be clean and free from the residue of any previous samples. To accomplish this, the following procedures will be followed:

- All non-dedicated sampling equipment must be cleaned initially and prior to being reused. The following procedure for decontamination does not apply to heavy equipment or drilling equipment, with the exception of split-spoon samplers. All heavy equipment and drilling equipment will be steam cleaned in a predesignated location prior to use and between locations. Well point casings and screens will also be steam cleaned.
- Wash and scrub with low phosphate detergent;
- Rinse with tap water;
- Rinse with 10 percent HNO_3, ultra-pure (1 percent HNO_3 for carbon steel);
- Rinse with tap water;
- Rinse with hexane (solvents shall be pesticide grade or better);
- Rinse thoroughly with deionized water;
- Air dry; and
- Wrap in aluminum foil for transport.

Groundwater evacuation tubing and equipment such as peristaltic pumps will be decontaminated by thoroughly washing all internal and external surfaces with soapy water and rinsing with deionized water prior to use. All tubing must be dedicated to individual monitoring wells (i.e., tubing cannot be reused).

Field instrumentation should be cleaned per manufacturer's instructions. Probes, such as those used in pH and conductivity meters, and thermometers must be rinsed with deionized water prior to and after each use.

3.1.2 Soil Borings, Soil Sampling, and Sediment Sampling

3.1.2.1 Soil and Sediment Sampling Objectives

Soil samples will be collected to evaluate the vertical and horizontal extent of contamination at the site and to document the underlying stratigraphy. Sediment samples will be collected from the North Chuctanunda Creek to assess any potential environmental impacts from the site to the creek. Specific sampling objectives are outlined in the Work Plan.

3.1.2.2 Soil Sampling Equipment

The following equipment will be used to collect soil and sediment samples:

- Photoionization Detector (PID)
- Roll of polyethylene sheeting
- Stainless steel spatula or spoon
- Stainless steel bowl
- Eckman® or Ponar®dredge
- Latex gloves (disposable)
- Neoprene gloves
- Certified, precleaned sample containers
- Aluminum foil
- Field logbook and pen
- Decontamination equipment

3.1.2.3 Subsurface Soil Sampling Procedures

Subsurface soil samples will be collected in advance of four and one-quarter-inch hollow stem augers from each soil boring drilled using standard two-inch outside diameter (O.D.) split-spoon samplers by ASTM Standard D 1586-84. Soil borings which will be converted to groundwater monitoring wells will drilled using six and one-quarter-inch hollow stem augers. After a sample is collected, the split-spoon sampling tool will be opened and laid on a piece of clean polyethylene sheeting, and the soil cut along its length into two equal halves. The field staff will screen the sample for organic vapors by passing the probe of a PID over the length of the sample. Soils will be visually classified according to the Unified Soils Classification System (USCS).

A typical Boring Log field form is presented in Attachment A. Data to be recorded in the field log will include the information contained in Section 3.4 and method of drilling and sample acquisition, blow counts, soil description and PID readings. The cuttings generated at each soil boring will be handled in accordance with the procedures outlined in Section 3.5.

3.1.2.4 Surface Soil Sampling Procedures

Four grab surface soil samples will be collected from the area of stained soils near the existing transformer using a decontaminated stainless-steel spoon or hand auger. Upon collection, the grab sample will be homogenized in a stainless steel bowl and classified according to the USCS. The sample will then be transferred to the appropriate laboratory-supplied bottle. Surface soil samples will be analyzed for PCBs only.

3.1.2.5 Sediment Sampling Procedures

Four sediment samples will be collected from the North Chuctanunda Creek. Sediment sampling locations are outlined in the Work Plan. At locations where the stream bed is accessible, sediment samples will be collected using a decontaminated stainless-steel spoon. Upon collection, the grab sample will be homogenized in a stainless steel bowl (the TCL VOC sample will not be homogenized) and classified according to the USCS. Where

the stream is not directly accessible (i.e., where the banks are too steep for safe access), a decontaminated Eckman® or Ponar® dredge will be used to collect the sample. Upon collection, the sediment sample will be visually classified according to the USCS and transferred to the appropriate laboratory-supplied bottle. Sediment samples will be analyzed for TCL/TAL parameters.

3.1.3 Monitoring Well Installation

3.1.3.1 Installation Objectives

Monitoring wells will be installed at the site for the purpose of collecting groundwater samples for chemical quality analysis and the collection of groundwater elevation data to determine groundwater flow direction.

3.1.3.2 Installation Equipment

The following equipment will be used for the installation of monitoring wells:

- Electronic water level indicator
- Photoionization Detector (PID)
- Field log book and pen

3.1.3.3 Installation Procedures

It is assumed that each monitoring well will be drilled to a depth of approximately 20 feet and will have an open bedrock section following completion. The overburden at each location will be advanced using six and one-quarter inch inside diameter (6-1/4 inch I.D.) hollow-stem augers. Continuous two-inch split-spoon samples will be collected using ASTM Method D-1586-84. Soil sampling procedures are discussed in Section 3.1.2.

Upon encountering the bedrock, the augers will be set into the bedrock approximately two feet until competent bedrock is penetrated (if possible). A 5-7/8 inch O.D. roller bit will then be inserted in the hollow stem augers and used to drill at least five feet into competent bedrock, creating a "rock socket" in which to set the casing. The "rock socket" will be flushed with potable water to remove rock cuttings. A one to two-foot thick layer of bentonite pellets will be placed in the bottom of the "rock socket" prior to setting the casing

to prevent grout from entering the casing. Four-inch I.D. schedule 40 PVC casing fitted with an end cap and centralizers will then be placed in the augers and pushed to the bottom of the "rock socket". Cement-bentonite grout will then be tremie pumped from the top of the bentonite plug to three feet below the ground surface. The augers will be incrementally withdrawn as the grout is emplaced. The remaining three feet of annular space will be sealed with bentonite pellets. After the grout has cured for 24 hours, the well will be completed to the final depth using air rotary drilling methods.

Daily drilling activities will be logged on a Daily Drilling Report, also shown in Attachment A, and in the field log book, keeping track of materials used and time taken during the boring process. All field supervision activities and logging will be conducted by a qualified geologist. All entries on logs and in the field log book will be signed and dated by the person preparing the document. A typical Bedrock Monitoring Well Construction detail, and a typical Field Log are presented in Attachment A.

The drilling fluid and cuttings generated during the installation of the monitoring wells will be handled in accordance with the Procedures outlined in Section 3.5.

3.1.4 Water Level Measurements

3.1.4.1 Measurement Objectives

Water levels in groundwater monitoring wells will be measured and used in conjunction with horizontal and vertical ground survey data to determine horizontal and vertical components of groundwater flow. Water level measurements will also be used to determine the volume of standing water in the monitoring wells for development and purging activities.

3.1.4.2 Measurement Equipment

The following equipment will be used for the measurement of water levels:

- Electronic water level indicator
- Field logbook and pen
- Photoionization Detector (PID)
- Deionized Water
- Low Phosphate Detergent

3.1.4.3 Measurement Procedure

At each monitoring well, the PVC cap will be removed and the head space and breathing zone air quality will be monitored with a PID. This step may be omitted in subsequent sampling events in those monitoring wells which yielded no detectable amounts of vapors or gases during previous sampling events.

The battery of the electric water level indicator will be checked by pushing the battery check button, and waiting for the audible signal to sound or the instrument light to come on. The water level indicator will be decontaminated before collecting a measurement in each monitoring well by using an alconox wash and deionized water rinse. The instrument will then be turned on and the probe will be slowly lowered into the monitoring well, until the audible signal is heard or the instrument light goes on, indicating that the sensor in the probe has made contact with the water surface in the monitoring well.

The depth to water will be recorded to the nearest one-hundredth of a foot from the measuring mark on the well riser. The date, time, monitoring well number, and depth to water will be recorded in the field book.

3.1.5 Monitoring Well Development

3.1.5.1 Development Objectives

Monitoring wells installed at the site will be developed to improve their hydraulic properties by removing sediment from the monitoring well and clearing the monitoring well screen of fine particles.

3.1.5.2 Development Equipment

The following equipment will be needed to develop the monitoring wells:

- Electric water level indicator
- Centrifugal or positive displacement pump
- Polyethylene or nalgene tubing
- Bottom-filling PVC bailer
- Bailer cord
- Temperature, pH, dissolved oxygen, specific conductivity and turbidity meters
- Photoionization Detector (PID)
- Field logbook and field logs

- Roll of polyethylene sheeting
- Decontamination equipment

3.1.5.3 Development Procedures

Monitoring well development will be conducted using one or more of the following techniques:

- Bailing
- Inertial Pumping
- Manual Pumping
- Suction-Lift Pumping

Monitoring well development will be conducted at least 24 hours after installation. Prior to developing each monitoring well, the initial water level and total depth will be measured. Following well development, the total depth will again be measured to determine the quantity of sediment removed.

All equipment placed into the monitoring well will be either decontaminated prior to its introduction into the monitoring well, in accordance with Section 3.1.1 or will be dedicated. Monitoring well development will proceed with repeated alternating sequences of surging and removal of water from the monitoring well, until the discharge water is relatively sediment free.

The effectiveness of the development procedure will be monitored after each well volume has been removed by field parameter measurements such as turbidity, pH, temperature, and conductivity measurements. These field measurements and other observations will be recorded on a Well Development/Purging Log, presented in Appendix A.

In general, monitoring well development will be discontinued after a minimum of 10 well volumes have been removed and stabilization of field parameter measurements has occurred, or when the turbidity of the discharge water reaches 50 Nephelometric Turbidity Units (NTUs) or less.

Water generated during the development process will be handled in accordance with the procedures outlined in Section 3.5.

3.1.6 Groundwater Sampling

3.1.6.1 Sampling Objectives

Groundwater samples will be collected for chemical quality analysis. Specific sampling objectives are outlined in the Work Plan. Samples will be collected approximately one week after the monitoring wells have been developed. An additional sampling event will take place approximately one month after the receipt of analytical results from the first sampling event.

3.1.6.2 Sampling Equipment

The following equipment will be needed to collect groundwater samples for analysis:

- Electric water level indicator
- Centrifugal or positive displacement pump
- Polyethylene or nalgene tubing and foot-valve
- Bottom-filling PVC bailer
- Dedicated, disposable bailer cord
- Temperature, pH, dissolved oxygen, specific conductivity and turbidity meters
- Photoionization Detector (PID)
- Field logbook and field logs
- Preservatives
- Laboratory prepared sample containers
- Roll of polyethylene sheeting
- Decontamination equipment

3.1.6.3 Sampling Procedures

A piece of polyethylene sheeting will be fitted over the monitoring well and laid on the ground. The sampling equipment will be placed on the polyethylene sheeting. The well cap will be removed, and the concentration of volatile organic vapors emanating from the monitoring well will be measured with the photoionization detector. This step may be omitted in those monitoring wells which contained no or insignificant concentrations of vapors or gases during previous sampling events. The PID will be calibrated before the start of each sampling event following the procedures described in Section 5.0.

The water volume in the monitoring well will be calculated using the following equation:

$$V = 7.48\ \pi r^2 h$$

(NOTE: 1 ft^3 = 7.48 gal)

where:

v = volume of water in monitoring well casing (gal.)

h = height of water column (feet)

r = casing internal radius (feet)

Clean, new polyethylene tubing will be attached to the centrifugal or positive placement pump, which will be decontaminated between monitoring well locations, as described in Section 3.1.1. The tubing will be lowered into the monitoring well to the top of the water column. A foot-valve will be used in conjunction with the tubing to eliminate back flushing from the pump to the monitoring well. The monitoring well will be purged from the top of the water column. A typical Well Development/Purging Log Field Form is presented in Appendix A.

Each monitoring well will be purged until a minimum of three to five volumes of standing water are evacuated or until the monitoring well is dry. Steps, such as an adjustment of the flow rate, will be taken to prevent the monitoring well from purging to dryness. The volume of water removed from each monitoring well that is not purged dry is dependent upon field measurements of pH, temperature, turbidity, and specific conductivity. The monitoring wells may also be purged with tubing with a foot valve or a PVC bailer in place of a pump. When the field parameters have stabilized, the volume of water will be recorded and groundwater in the monitoring well will be sampled. The purge water will be handled in accordance with the procedures outlined in Section 3.5.

Water level recovery will be monitored on an hourly basis for any wells which have been purged to dryness. If sufficient volume is present in the monitoring well, all samples will be collected within two hours after completion of purging (not to exceed three hours). If insufficient volume is present for all samples to be collected, samples for volatile organic analysis will be collected first and additional time will be provided for water level recovery.

The remaining samples will be collected as soon as sufficient water is present in the monitoring well. The order of sample collection at each monitoring well is discussed below.

The groundwater samples will be collected by gently lowering a new or dedicated, decontaminated bailer into the well. Upon retrieval of the bailer, the sample will be transferred to the appropriate sample containers. Two 40 ml vials for volatile organic analysis will be filled first, without leaving any head space. All other sample bottles will be filled such that some headspace remains in the bottle. The analytical parameters and order of sample collection for groundwater samples will be:

1. In-situ measurements: temperature, pH, specific conductance, turbidity, and PID;

2. Volatile organics;

3. Extractable organics: semi-volatiles and pesticides/PCBs; and

4. Total metals, etc.

The sample bottles will be pre-preserved by the laboratory. The preservation requirements are presented on Table 4. The sample bottles will be immediately placed in a cooler held at 4°C.

Field measurements of pH, specific conductance, temperature and water level will be made in each monitoring well prior to, during, and after purging (just before sampling). Both the pH and the specific conductivity meters will be calibrated for water temperature before each sampling event. The calibration procedures are provided in Section 5.0.

Disposable gloves will be worn by the sampling personnel and changed between sampling points. While performing any equipment decontamination, phthalate-free gloves (neoprene or natural rubber) will be worn in order to prevent phthalate contamination of the sampling equipment by interaction between the gloves and the organic solvent(s).

Data to be recorded in the field logbook will include the information presented in Section 3.4 and purging and sampling methods, depth to water, volume of water removed during purging, pH, temperature and specific conductivity values, and PID readings.

3.1.7 Air Monitoring

3.1.7.1 Monitoring Objectives

Real-time air monitoring will be performed in the work zone during any intrusive site activities to prevent exposure of on-site personnel and off-site residents to organic vapors and/or particulate matter.

3.1.7.2 Monitoring Equipment

The following equipment will be needed for air monitoring:

- Photoionization Detector (PID)
- Particulate dust monitor (Mimiram or equivalent)
- Field logbook

3.1.7.3 Monitoring Procedures

A PID and particulate dust monitor will be used to monitor air quality in the work zone. Organic vapor concentrations and particulate levels will be periodically monitored immediately in the work zone over a period not to exceed 15 minutes. Air monitoring data will be recorded in the field logbook. Dust suppression techniques will be used at all times to prevent the generation of fugitive dust, however, if total dust levels in excess of the action level are detected over the monitoring period, then additional dust suppression techniques will be employed and site perimeter monitoring will be performed in accordance with Technical and Administrative Guidance Memorandum 4041. Action levels and procedures for both organic vapors and particulates are outlined in the Health and Safety Plan.

3.2 FIELD QUALITY CONTROL SAMPLES

Quality control procedures will be employed to check that sampling, transportation and laboratory activities do not bias sample analytical quality. Trip blanks, field blanks, duplicate samples, matrix spike samples and matrix spike duplicates will provide a quantitative basis for validating the analytical data. A summary of the anticipated QA/QC samples for each media is included in Table 2 through 4.

3.2.1 Trip Blanks

The trip blanks will be prepared by the laboratory by filling 40 ml vials with a Teflon-lined septum with deionized, analyte-free water. The trip blank will accompany the sample containers at all times. One trip blank will be returned to the laboratory with each cooler containing aqueous samples for VOC analysis. The trip blank will be analyzed for volatile organic compounds to detect possible contamination during shipment.

3.2.2 Field Blanks

A field blank consists of an empty set of laboratory-cleaned sample containers. At the field location, deionized, analyte-free water is passed through decontaminated sampling equipment and placed in the empty set of sample containers for analysis of the same parameters as the samples collected with the sampling equipment. One field blank will be collected per decontamination event per day, per type of equipment, not to exceed one per day.

3.2.3 Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample pairs are analyzed by the laboratory to provide a quantitative measure of the laboratory's precision and accuracy. When performing NYSDEC ASP/CLP volatile organic or organic extractable analysis, the laboratory must be supplied with triple sample volume for each Sample Delivery Group (SDG) in order to perform matrix spike and matrix spike duplicate analyses. This does not include field or trip blanks. Blanks do not require separate matrix spike or duplicate analyses regardless of their matrix.

The limits on an SDG are:

- Each Case for field samples, or
- Each 20 field samples within a Case, or
- Each fourteen calendar day period during which field samples in a Case are received (said period beginning with receipt of the first sample in the SDG), whichever comes first.

Non-ASP/CLP analyses will include MS/MSDs at an equal rate. Field personnel will specify samples for MS/MSD analysis.

Aqueous samples for extractable organics (semi-volatiles and pesticides/PCBs) require that three times the volume of the sample selected for each MS/MSD sample be collected and submitted to the laboratory for analysis. Extra sample volume is not required for volatile organic analysis unless low level detection methods are used. Extra volume is not required for aqueous samples for inorganic analysis. A matrix spike and matrix duplicate can be obtained from standard sample volumes. Non-aqueous samples (soils/sediment) do not require that any extra volume of sample be submitted to the laboratory for MS/MSD samples.

3.2.4 Field Duplicates

For each sample matrix, a field duplicate sample will be collected at a rate of one sample per twenty environmental samples. The duplicate sample is collected at the same location as the environmental sample. The field duplicate sample is identified using the sample designation system described in Section 3.3. The identity of the field duplicate is not revealed to the laboratory. The analytical results of the environmental sample will be compared to the field duplicate sample, to evaluate field sampling precision.

3.3 SAMPLE DESIGNATION

A sample numbering system will be used to identify each sample. This system will provide a tracking procedure to allow retrieval of information about a particular sample, and will assure that each sample is uniquely numbered. The sample identification will consist of at least three components as described below. Identification numbers for soil boring samples will also have a fourth component.

- ***Project Identification:*** The first component consists of a two letter designation which identifies the project site. For this project, the two letter designation will be MC, for Mohasco Complex.

- ***Sample type:*** The second component, which identifies the sample type, will consist of a two letter code as follows:

  MW - Monitoring well (Groundwater Sample)
  SB - Soil Boring
  SS - Surface Soil

- ***Sample Location:*** The third component identifies the sample location using a two digit number.

- ***Sample Identification:*** The fourth component will only be used for soil boring samples, to indicate the interval from which the sample was collected.

- ***Quality Assurance/Quality Control Samples***: The samples will be labeled with the following suffixes:

  FB - Field Blank
  MS - Matrix Spike
  MSD - Matrix Spike Duplicate
  TB - Trip Blank.

Duplicate samples will be numbered uniquely as if they were samples. A record of identification for duplicate samples will be maintained.

Examples of identification numbers are given below:

MC-SB-02-5: Soil boring, boring location number 2, 5 feet below ground surface.

MC-MW-3-MSD: Monitoring well groundwater sample, monitoring well 3, matrix spike duplicate.

MC-MW-TB: Trip blank for groundwater sample.

3.4 FIELD DOCUMENTATION

3.4.1 Introduction

Documentation of an investigative team's field activities often provides the basis for technical site evaluations and other such related written reports. All records and notes generated in the field will be considered controlled evidentiary documents and may be subject to scrutiny in litigation. Consequently, it is essential that the site manager or his/her

designee, either of whom may be called to testify, pay attention to detail, and document to the extent practicable every aspect of the inspection.

Personnel designated as being responsible for documenting field activities must be aware that all notes may provide the basis for preparing responses for legal interrogatories. Field documentation must provide sufficient information and data to enable reconstruction of field activities. Numerically serialized field logbooks provide the basic means for documenting field activities. The following information must be provided on the inside front cover of each field logbook:

- Project Name (Site Name)
- Site Location
- Site Manager
- Date of Issue

Control and maintenance of field logbooks is the responsibility of the Field Team Leader.

3.4.2 Documentation of Field Activities

Field logbook entries must be legibly written and provide an unbiased, concise, detailed picture of all field activities. Use of preformatted data reporting forms must be identifiable and referenced to field notebook entries.

Step-by-step instructions and procedures for documenting field activities are provided below and in following sub-sections. These instructions and procedures are organized as follows:

Instruction and procedures relating to the format and technique in which field logbook entries are made are as follows:

- Leave the first two pages blank. They will provide space for a table of contents to be added when the field logbook is complete.

- The first written page for each day identifies the date, time, site name, location, MPI personnel and their responsibilities, other on-site personnel, and observed weather conditions. Additionally, during the course of site activities, deviations from the work plan must also be documented.

- It is recommended that entries be made on a new page at the start of each day's field activities.
- All photos taken must be traceable to field logbook entries. It is recommended to reference photo locations on the site sketch or map.
- All entries must be made in ink. Waterproof ink is recommended.
- All entries must be accompanied by the appropriate military time (such as 1530 instead of 3:30).
- Errors must be lined through and initiated. No erroneous notes are to be made illegible.
- The person documenting must sign and date each page as it is completed.
- Isolated logbook entries made by a team member other than the team member designated responsible for field documentation, must be signed and dated by the person making the entry.
- Additions, clarifications, or corrections made after completion of field activities must be dated and signed.

3.4.3 General Site Information

General site characteristics must be recorded. Information may include

- Type of access into facility (locked gates, etc.)
- Anything that is unexpected on site (e.g., appearance of drums that have not been previously recorded)
- Information obtained from interview with access or responsible party personnel (if applicable), or other interested party contact on site.
- Names of any community contacts on site.
- A site map or sketch may be provided. It can be sketched into the logbook or attached to the book. If it is attached, make sure that the project name is on the map.

3.4.4 Sample Activities

A chronological record of each sampling activity must be kept.

- Explanation of sampling at the location identified in the sampling plan (e.g., discolored soil, stressed vegetation).
- Exact sample location, using permanent recognizable landmarks and reproducible measurements.
- Sample matrix
- Sample descriptions, i.e., color, texture, odor (e.g., soil type, murky water) and any other important distinguishing features.
- Decontamination procedures, if used.

As part of chain-of-custody procedures, recorded on-site sampling information must include sample number, date, time, sampling personnel, sample type, designation of sample as a grab or composite, and any preservative used. Sample locations should be referenced by sample number on the site sketch or map. The offer and/or act of providing sample split samples to a thirty party (e.g., the responsible party representative; state, county, or municipal, environmental and/or health agency, etc.) must be documented.

3.4.5 Sample Dispatch Information

When sampling is complete, all sample documentation such as chain-of-custody forms shall be copied and copies placed in the project files. A notation of numbers of coolers shipped, carrier and time delivered to pick-up point should be made in one field notebook, preferably that of the Field Operations Leaders.

3.5 CONTROL AND DISPOSAL OF INVESTIGATION DERIVED WASTE

Investigation derived wastes will be handled in accordance with the NYSDEC Proposed Decision Technical and Administrative Guidance Memorandum (TAGM). Disposal of contaminated groundwater generated during Site Investigations and the Final TAGM - Disposal of Drill Cuttings. As borings are advanced, spillage and disposal of

potentially contaminated soils and water will be minimized through the implementation of the procedures described below.

Drill cuttings and spoils generated at each boring will be placed (shoveled) on polyethylene sheeting (6 mil.) After completing the boring, the cuttings/spoils will be disposed of within the borehole provided that the borehole will not be used for the installation of a monitoring well, that it did not penetrate an aquitard or aquiclude and that the cuttings/spoils do not contain oily (product) substances. The boring will then be topped off with a cement/bentonite grout cap.

Excess cuttings/spoils which are not returned to the borehole will be spread out and dewatered (dewatering will be allowed to infiltrate the ground) next to the borehole. Groundwater that is purged from monitoring wells or discharged during drilling activities may be disposed of at each site and allowed to infiltrate into the ground based on the following conditions:

1. There is a defined site which is the source of the groundwater contamination;

2. There is no free product observed such as LNAPLs and DNAPLs;

3. The infiltrating groundwater is being returned to the same water bearing zone from which it is being purged.

If the above criteria are not met the materials will be containerized in U.S. Department of Transportation (DOT)-approved, 55-gallon steel drums. Soils and water will be drummed separately; the contents will be identified on weather-resistant labels attached to drum exteriors. Open-topped drums will be used to containerize soils and close-topped drums will be used to containerize water.

Depending on the levels of personal protection used during the field investigation, some disposable personal protective equipment (PPE) and decontamination fluids will be generated. Attempts will be made to wash surface contamination off so that PPE (e.g., Tyvek coveralls, gloves, and other disposable items) may be disposed of as ordinary solid waste. If contamination is suspected, these materials will be collected and containerized in DOT-approved, 55-gallon steel drums (separately from contaminated soils and water); the contents will be identified with weather-resistant labels attached to drum exteriors.

Decontamination fluids, except those containing solvents and/or nitric acid, will be disposed of with drilling fluids and cuttings generated at the site. Decontamination fluids containing solvents or nitric acid will be containerized separately from drilling fluids.

Containerized materials will be transported to, and staged at, a designated location. Malcolm Pirnie will maintain a log of the containers and their contents; the contents will be evaluated upon receipt of results of the analytical data obtained during field investigations. Handling, transportation, and disposal of these materials will be in accordance with requirements of RCRA and other applicable federal, state, and local regulations. Nonhazardous disposable items will be contained and disposed of in a dumpster or via a licensed waste hauler, as appropriate.

4.0 SAMPLE AND DOCUMENT CUSTODY PROCEDURES

4.1 SAMPLE HANDLING

The analytical laboratory will provide the sample containers necessary for all soil, groundwater, and passive soil gas samples. Container closures will be screw-on type, made of inert materials. Sample containers will be cleaned and prepared by the laboratory prior to being sent to the site. Trip blanks will be used to check for false positives due to laboratory cleaning procedures or cross contamination during sample shipment.

All samples collected will be identified with a sample label. A label will be attached to each bottle and each sample will be identified with a unique sample number.

Immediately following sample collection, each sample container will be marked with the following information:

- Sample Code
- Project Number
- Date/Time
- Sample Type
- Preservative, if used
- Sampler's Initials

The sample code will indicate the site location, media sampled and the sample station.

After all sample identification information has been recorded, each sample label will be covered with waterproof clear plastic tape to preserve its integrity. All samples will be recorded and tracked under strict chain-of-custody protocols. Each sample will be checked for proper labeling. The samples will then be packed into coolers with ice and shipped to the laboratory via overnight express for receipt within 24 hours of sampling. A chain-of-custody form will be completed for each cooler. The form will be signed and dated by the person who collected the samples, the person the samples were relinquished to for transport to the laboratory, and the laboratory sample controller/custodian who receives the samples.

4.2 COMPLETION OF CHAIN-OF-CUSTODY RECORD

A chain-of-custody record is a printed form that accompanies a sample or group of samples as custody is transferred from person to person. A sample chain-of-custody form is included in Appendix A. It documents custody transfer from person to person and sample information recorded on bottle labels. A chain-of-custody record is a controlled document.

As soon as practicable after sample collection, preferably after decontamination, the following information must be entered on the chain-of-custody form. All information is to be recorded in black ink.

1. ***Malcolm Pirnie project number.*** Enter the seven-digit alphanumeric designation assigned by Malcolm Pirnie that uniquely identifies the project site.

2. ***Project name.*** Enter site name.

3. ***Samplers.*** Sign the name(s) of the sampler(s).

4. ***Station number.*** Enter the sample number for each sample in the shipment. This number appears on the Malcolm Pirnie, Inc. sample identification label.

5. ***Date.*** Enter a six-digit number, indicating the year, month, and day of sample collection; for example, 830115.

6. ***Time.*** Enter a four-digit number indicating the military time of collection; for example, 1354.

7. ***Composite or grab.*** Indicate the type of sample.

8. ***Station location.*** Describe the location where the sample was collected.

9. ***Number of containers.*** For each sample number, enter the number of sample bottles that are contained in the shipment.

10. ***Remarks.*** Enter any appropriate remarks.

4.2.1 Transferring Custody From Malcolm Pirnie, Inc. Shipper to Common Carrier

Instructions for Malcolm Pirnie, Inc. shipper transferring custody of samples to a common carrier are given below.

1. Sign, date, and enter time under "Relinquished by" entry.

2. Enter name of carrier (e.g., UPS, Federal Express) under "Received by."

3. Enter bill-of-lading of Federal Express airbill number under "Remarks."

4. Place the original of the chain-of-custody form in the appropriate sample shipping package. Retain a copy with field records.

5. Sign and date the custody seal. The custody seal is part of the chain-of-custody process and is used to prevent tampering with samples after they have been collected in the field.

6. Wrap the seal across filament tape that has been wrapped around the package at least twice.

7. Fold the custody seal over on itself so that it sticks together.

8. Complete other carrier-required shipping papers.

Common carriers will usually not accept responsibility for handling chain-of-custody forms; this necessitates packing the record in the sample package.

4.2.2 Transferring Custody From Malcolm Pirnie, Inc. Sampler Directly to Carrier

To transfer custody of samples from the Malcolm Pirnie, Inc. sampler directly to a carrier, proceed as above, except eliminate the Malcolm Pirnie, Inc. shipper's signature.

5.0 CALIBRATION PROCEDURES AND FREQUENCY

5.1 INTRODUCTION

Instruments must be properly calibrated to produce technically valid data. Documented calibration and calibration check results verify that the instruments used for measurement are in proper working order and the data produced is reliable. The calibration requirements described or referenced in this section are necessary to support the data quality objectives for this project. When calibration requirements are met, the data will support the focussed investigation decisions dealing with the nature and extent of contamination and safety concerns. In the event that the data is used in court, documented calibrations are necessary to ensure that the data is legally defensible.

5.2 CALIBRATION PROCEDURES FOR FIELD EQUIPMENT

5.2.1 Field Equipment

The following table provides a list of the tasks that will require field equipment, and the specific field instruments that will be used for each task and which require calibration.

TASK	FIELD INSTRUMENT
Soil Sampling	HNu Photoionization Detector
Groundwater Sampling	HNu Photoionization Detector pH Meter Temperature Probe Specific Conductivity Meter Turbidimeter

5.2.2 General Procedures

The operation and maintenance of the field equipment to be used during these tasks are provided in Appendix B. General calibration procedures and requirements are described below:

- All instruments will be calibrated at least once a month.
- All instruments will have the calibrations checked at a minimum at the start of each day before measurements are made.
- The calibration and calibration checks will indicate that the sensitivity of the instrument (practical detection limit) is adequate to meet project needs and that the instrument is accurate over the working range.
- All calibration information will be recorded in the field log book. This includes date and time, technician signature, calibration procedure, calibration results, calibration problems, recalibration and maintenance, and instrument serial numbers.
- All calibration standards will be of National Bureau of Standards (NBS) quality and their sources listed and documented so that standards are traceable. In addition, only technicians trained in the use of the field instruments will operate them. If the instrument readings are incorrect at the time of the initial calibration, the instrument will either be calibrated by the technician or returned to the manufacturer for calibration. If the instrument readings are incorrect after a continuing calibration check, the preceding sample results will be reviewed for validity, and reanalyzed if necessary.

5.3 LABORATORY CALIBRATION PROCEDURES

All samples analyzed according to the NYSDEC ASP/CLP shall follow the procedures described in the Statement of Work (SOW). The calibration procedures and frequency are specifically described for each analysis contained in the SOW. All calibration results shall be recorded and kept on file, and will be reviewed and evaluated by the data validator as part of analytical data validation procedures.

Instrument calibration will be checked with a reference standard prior to the analysis of any sample. The standards used for calibrations will be traceable to the National Bureau of Standards (NBS), and each calibration will be recorded in the laboratory notebook for the particular analysis. Any printouts, chromatograms, etc., generated for the calibration will be kept on file.

6.0 ANALYTICAL PROCEDURES

Environmental samples collected for laboratory analysis during the initial sampling phases of the focussed SI will be analyzed by the NYSDEC ASP/CLP certified laboratory for Target Compound List (TCL) compounds and Target Analyte List (TAL) compounds according to the latest SOW. The procedures are fully described in the SOW and are written specifically for environmental samples. Table 1 summarizes the analytical procedures and their sources that will be utilized for this site. The analytical methods listed in Table 1 are sufficient to support the DQOs for this project. In particular, the detection limits of these methods are adequate to support the DQOs.

7.0 DATA REDUCTION, VALIDATION AND REPORTING

7.1 INTRODUCTION

The purpose of this section is to ensure that the large amount of data produced by the laboratory are presented in a clear and useable format. In addition, data quality and technical validity must be verified prior to data use. All samples collected at this site will be analyzed according to the NYSDEC Analytical Services Protocol (ASP)/Contract Laboratory Protocol (CLP) in which data reduction and reporting schemes are well developed and clearly defined. The employment of these methods ensures comparability with other similarly analyzed environmental samples. Reduction, validation and reporting specifications for these analyses are detailed below.

7.2 DATA REDUCTION

Data reduction is the process by which raw analytical data generated from the analytical instrument systems is converted into useable concentrations. The raw data, which takes the form of area counts or instrument responses, is processed by the laboratory and converted into concentrations expressed in terms of mg/l or kg, parts per million (ppm), or µg/l or kg, parts per billion (ppb). These concentrations are the standard method for expressing the level of contamination present in environmental samples.

The process used to convert the instrument output into useable concentrations is clearly defined in the NYSDEC ASP/CLP-SOW for TCL and TAL analyses. The SOW presents in detail all information, equations, and calculations used. The resulting concentrations are comparable to other environmental samples in general and will be comparable to data previously collected for this site.

7.3 DATA VALIDATION

Although rigorous validation of the data generated by the laboratory will be performed by a third party data validation subcontractor, the laboratory will be responsible for reviewing data to determine if any analytical problems exist. Specifically, the laboratory will develop a case narrative describing how closely the data meet the DQOs presented in this QAPP.

7.4 DATA REPORTING

The laboratory will report TCL data consistent with ASP/CLP reporting requirements. The QA reporting for any non-ASP data packages will consist of the following accuracy and precision protocols as performed on the appropriate QA samples.

For precision, the relative percent difference (RPD) and the percent relative standard deviation (% RSD) will be calculated:

$$RPD = \frac{D_1 - D_2}{(D_1 + D_2)/2} \times 100$$

RPD = Relative Percent Difference
D_1 = First Sample Value
D_2 = Second Sample value (Duplicate)

For accuracy, the percent recovery (%R) of spikes will be calculated:

$$\%R = \frac{SSR - SR}{SA} \times 100$$

SSR = Spiked Sample Result
SR = Sample Result
SA = Amount Spike Added

Field sample precision will be assessed through analysis of duplicate samples and the above RPD equations. Accuracy will be assessed through the analysis of check standards

and the above percent recovery equation. Field data will also be assessed in relation to specific project needs.

One copy of the data package will be delivered to a third party data validation subcontractor for data assessment. The data package will include the case narrative. The data validation report and the data usability report will be submitted to the NYSDEC as part of the corresponding project reports. This package will include sampling analysis and summary forms. Section 14.0 provides greater details on the reporting requests for data assessment and validation.

8.0 INTERNAL QUALITY CONTROL CHECKS

8.1 INTRODUCTION

In order to monitor the quality of the analytical data generated for this focused investigation, an appropriate number of quality control (QC) methods will be employed for all field and laboratory measurement systems. The employment of QC methods permits the validation of the analytical methodology utilized and provides a measure of the suitability of the methodology to meet the DQOs prior to the beginning of measurement or analysis. Once the measurement and analysis has begun, the employment of QC methods permits the monitoring of the system output for quality. The QC results, presented with the environmental sample data, allows the data to be assessed for quality, and a determination made on how well the data has met the DQOs.

Laboratory generated data is used to accurately identify and quantify hazardous substances, while field generated data is used in conjunction with the laboratory data for further investigation of contamination at the site. Both laboratory and field internal QC programs include steps to assure the data are reliable for the extent they will be used in the focused investigation. In general, laboratory QC programs are more rigorous than field QC programs.

8.2 FIELD QUALITY CONTROL

The intended data uses have been identified and the DQOs established for all field measurement activities in Sections 3 and 5 of this QAPP. Section 3 contains SOPs which describe the use and calibration of field instruments. QC methods will be used to demonstrate that the instruments are capable of producing reliable data. The QC checks employed for field instruments are as follows:

QC METHOD	PURPOSE	FREQUENCY
Calibration Check Sample	Insures proper working order of instrument. Measures instrument accuracy and sensitivity.	Daily
Background Sample	Provides measure of instrument reliability.	Daily
Duplicate Sample	Measures instrument precision.	5%
Trip Blanks	Measures potential contamination from sample transport, the environment and/or shipping.	Minimum of one per cooler of aqueous volatile samples
Field Blanks	Measures potential contamination due to poor sampling device decontamination procedures.	One per decontamination event or one per day per matrix, whichever is less

The calibration check samples will be analyzed daily and duplicate samples will be analyzed at a minimum frequency of five percent. The calibration check verifies that the instrument is capable of accurately identifying and quantifying contaminants of concern. The duplicates provide a quantitative measurement of the precision of the instrument. Background samples are similar to blanks and provide information regarding instrument reliability. The information is recorded in field logbooks. The results from these QC methods are used by field technicians to monitor the instrument at the time of the analysis. If QC results indicate a problem with the instrument, corrective action will be taken and, if necessary, the samples will be reanalyzed. Because field measurements are generally easy to repeat, measurements should be repeated as necessary so the data are as complete as possible. The QC results are used as an indication of data quality and reliability when the data are being reviewed.

8.3 LABORATORY QUALITY CONTROL

8.3.1 ASP Samples

The scope and description of QC samples and QC methods are well detailed in the NYSDEC ASP/CLP Statement of Work (SOW) for the particular analysis. TCL and TAL samples are characterized by rigorous QC and documentation. The SOW for organic and inorganic analyses describe the type of QC samples and required QC methods, and the required frequency of analysis. QC limits have been established for standards, blanks, duplicates, matrix spikes, and surrogates, and are contained in the SOWs. QC data will be reviewed by Malcolm Pirnie personnel to assess the validity of the data and determine if the DQOs have been met.

8.3.2 Non-ASP/CLP Quality Control

All non-ASP/CLP analyses that are conducted for this investigation shall include the following QC procedures, if applicable:

		FREQUENCY
1.	Calibration	As required
2.	Standards	Daily
5.	Method Blanks	Daily
6.	Duplicates	5%
7.	Surrogates	Each sample
8.	QC Check Samples	Daily

8.3.3 Non-ASP/CLP Quality Control Checks

The specific laboratory QC procedures will be similar to the procedures outlined in the specific laboratory subcontract agreement whenever possible. For analyses where ASP/CLP QC procedures cannot be adapted to the analysis, a written procedure of quality control checks will be developed, referencing appropriate USEPA documents such as SW-846. Malcolm Pirnie will be responsible for ensuring that QA/QC objectives are equivalent to ASP objectives when possible. Data validation and review will be the same as data validation for ASP data. The validation process should ensure that quality assurance

objectives have been met by the QC procedures and will comply with the requirements of the State Superfund Contract. The laboratory internal QC checks will include the following:

(1) Duplicates
(2) Control Charts
(3) Blanks
(4) Internal Standards
(5) Reference Check Standards
(6) Surrogate Standards

9.0 QUALITY ASSURANCE AUDITS

9.1 INTRODUCTION

To monitor the capability and performance of all investigation activities, audits may be conducted by Malcolm Pirnie QA personnel. Audits are conducted to determine the suitability and capability of project activities to meeting project quality goals. On-site field audits will be conducted to monitor the field techniques, procedures and the overall implementation of the QAPP procedures. These may be conducted periodically by the Site Quality Assurance Officer (QAO). Data quality audits (DQAs), are conducted to determine if the data generated by the sampling and analysis satisfies the predetermined DQOs. The site QAO will be responsible for conducting DQAs of all data generated from project activities.

9.2 FIELD AUDITS

Field audits will include an evaluation of:

1. Sample collection and analytical activities.
2. Equipment calibration techniques and records.
3. Decontamination and equipment cleaning.
4. Equipment suitability and maintenance/repair.
5. Background and training of personnel.
6. Sample containers, preservation techniques and chain-of-custody.
7. Data log books.

Field audit forms are provided in Appendix A. A written QA audit report will be prepared by the Site QAO and submitted to the Project Officer and Project Manager. The

report will identify any deficiencies found and recommend corrective action. Follow-up reports describing corrective actions which have been completed will be submitted to the Project Officer and Project Manager.

9.3 PERFORMANCE AUDITS (PAs)

Data Quality Audits (DQAs) are conducted to determine if the data is adequate to support the DQOs and to determine the cause of deficiencies in the event that the data quality is not adequate. This audit will be conducted by the Site QAO after the data has been fully validated. The Site QAO will first determine to what extent the data can be used to support the decision-making process. Secondly, the Site QAO will identify the cause of any deficiencies in the data, whether technical, managerial, or both.

10.0 PREVENTATIVE MAINTENANCE

10.1 PURPOSE

The purpose of the preventative maintenance program is to ensure that the sampling, field testing and analytical equipment perform properly thereby avoiding erroneous results, and minimizing equipment downtime. The preventative maintenance program also provides for the documentation of all maintenance to be used as evidence of instrument maintenance and for scheduling of future maintenance. This section describes the equipment maintenance program for field instruments and those responsible for implementation of the program at the Mohasco Mill Complex. The specific equipment maintenance procedures are given in the equipment SOPs and the preventative maintenance SOPs presented in Appendix B. The laboratory preventative maintenance program is the responsibility of the laboratory and only the minimum requirements are mentioned here.

10.2 RESPONSIBILITIES

TITLE	RESPONSIBILITIES
Field Team Leader	Keeping all maintenance records. Development and implementation of maintenance program.
Equipment Manager	Maintaining storage of equipment within the Malcolm Pirnie equipment inventory. Carrying out all maintenance according to schedule. Informing field team members of specific maintenance requirements.
	Keeping records of all maintenance performed under his care. Sending out equipment for service/repair. Maintaining adequate supply of spare parts.

TITLE	RESPONSIBILITIES
Field Personnel	Maintenance of all equipment located on-site on a regular basis and after each use. Keeping supply of spare parts on-hand.

10.3 PREVENTATIVE MAINTENANCE PROGRAM

The preventative maintenance program consists of three parts, normal upkeep, service and repair, and formal recordkeeping. Normal upkeep consists of daily procedures that include cleaning, lubrication and checking the batteries of the equipment. The following is a partial list of normal upkeep procedures and a partial list of important spare parts:

- Normal upkeep for environmental monitoring equipment performed daily or after each use:
  1) Cleaning
  2) Lubrication of moving parts
  3) Check/charge battery
  4) Inspect for damage
  5) Check for operation problems
  6) Inspect all hoses and lines

- Partial list of important spare parts for environmental monitoring instruments planned for use at the former Mohasco Mill Complex site:
  1) Fuses
  2) HNu-UV lamp
  3) Probes
  4) Spare battery

The normal upkeep is performed daily after each use and includes inspecting for damage, signs of problems, and charging the batteries if necessary. Specific equipment upkeep procedures are described in the SOP for each instrument in Appendix B.

Minor service and repair will be performed by the Equipment Manager who is trained in the service and repair of field instruments. Equipment in need of major or more complex repair and service will be sent to the manufacturer.

All maintenance, servicing and repair of equipment shall be recorded and kept on file. Field personnel shall record maintenance and instrument problems in the field instrument

log books. These will ultimately be kept on file by the Field Team Leader. The Equipment Manager shall keep a record of all equipment released to the field and a record of all maintenance and service on file.

10.4 LABORATORY INSTRUMENT MAINTENANCE

For ASP laboratories, preventative maintenance procedures will be clearly defined and written for each measurement system. Maintenance activity, preventative or repair, will be documented on standard forms which are maintained in log books. Written procedures will include maintenance schedules, problem identification procedures, space for describing problems and repair notes, and failure analysis protocols. Service contracts and regularly scheduled in-house maintenance will be included, along with a list of critical spare parts.

10.5 RENTAL EQUIPMENT

Rental equipment will be obtained only from known, reputable rental suppliers. The equipment will require a pre-receipt to verify accuracy, maintenance and upkeep of the equipment.

11.0 DATA ASSESSMENT

11.1 OVERVIEW

All analytical data received by Malcolm Pirnie from the analytical laboratories will be assessed to determine to what extent the data can be used in making sound project decisions. The goal of data assessment is to characterize the data so that project decisions are made using data that is of sufficient quality to support those decisions. The levels of quality needed to support the various project decisions have been stated in the form of the DQOs. Where the DQOs are met, the data is useful in making necessary decisions.

In order to determine how well the DQOs have been met, all ASP Level IV and Level V data will be reviewed and validated by a qualified data validation. The data will be reviewed and validated with the intended data uses and DQOs being utilized to aid in decisions regarding data usefulness.

The data obtained through the ASP program, Level IV (TCL/TAL) and Level V will be subjected to rigorous review according to the following protocols. The uses of Level IV and Level V data require this rigorous review so that the data quality is known.

11.2 DATA ASSESSMENT

11.2.1 Task I – Completeness

Data assessment will include a review of the data package to determine completeness. A complete data package will consist of the following eight components.

1. All sample chain-of-custody forms.

2. The case narrative(s) including all sample/analysis summary forms.

   These forms appear as an addendum to the NYSDEC CLP forms package and will be required for all data submissions regardless of the protocol requested.

3. Quality Assurance/Quality Control summaries including all supporting documentation.

4. All relevant calibration data including all supporting documentation.

5. Instrument and method performance data.

6. Documentation showing the laboratory's ability to attain the contract specific method detection limits for all target analytes in all required matrices.

7. All data report forms including examples of the calculations used in determining final concentrations.

8. All raw data used in the identification and quantitation of the contract specified target compounds.

All deficiencies in the requirement for completeness shall be reported to the consultant immediately. The laboratory shall be contacted by the Project QAO or data validator and shall be given ten calendar days to produce the documentation necessary to remove the deficiencies.

11.2.2 Task II – Compliance

The Validator shall review the submitted data package to determine compliance with those portions of the work plan that pertain to the production of laboratory data. Compliance is defined by the following criteria.

1. The data package is complete as defined in Task 1 above.

2. The data has been produced and reported in a manner consistent with the data requirements of the QAPP and the laboratory subcontract.

3. All protocol required QA/QC criteria have been met.

4. All instrument tune and calibration requirements have been met for the time frame during which the analytes were completed.

5. All protocol required initial and continuing calibration data is present and documented.

6. All data reporting forms are complete for all samples submitted. This will include all sample dilution/concentration factors and all premeasurement sample cleanup procedures.

7. All problems encountered during the analytical process have been reported in the case narrative along with any and all actions taken by the laboratory to correct these problems.

The data validation task requires that the Validator conduct a detailed comparison of the reported data with the raw data submitted as part of the supporting documentation package. It is the responsibility of the Validator to determine that the reported data can be completely substantiated by applying protocol defined procedures for the identification and quantitation of the individual analytes. To assist the Validator in this determination the following documents are recommended; however, the EPA Functional Guidelines will be used for format only. The specific requirements noted in the Project Quality Assurance Project Plan are prerequisite, for example, holding times or special analytical project needs, to those noted in the Functional Guidelines.

1. The particular protocol(s) under which the data was generated, e.g., NYSDEC Contract Laboratory Protocol; EPA SW-846; EPA Series 500 Protocols.

2. Data validation guidance documents such as:
   a. "Functional Guidelines for Evaluation Inorganic Data" (published by EPA Region 2), or latest revision.
   b. "Functional Guidelines for Evaluation Organics Analyses" Technical Directive Document No. HQ-8410-01 (published by EPA), or latest revision.
   c. "Functional Guidelines for Evaluating Pesticides/PCB's Analyses" Technical Directive Document No. HG-8410-01 (published by EPA), or latest revision.

11.3 REPORTS

The Validator shall submit a final report covering the results of the data review process. This report shall include the following:

1. A general assessment of the data package as determined by the accomplishment of Section 11.2, above.

2. Detailed descriptions of any and all deviations from the required protocols. (These descriptions must include references to the portions of the protocols involved in the alleged deviations).

3. Any and all failures in the Validator's attempt to reconcile the reported data with the raw data from which it was derived. (Again, specific references must be included). Telephone logs should be included in the validation report.

4. A detailed assessment by the Validator of the degree to which the data has been comprised by any deviations from protocol, QA/QC breakdowns, lack of analytical control, etc., that occurred during the analytical process.

5. The report shall include, as an attachment, a copy of the laboratory's case narrative including the NYSDEC required sample and analysis summary sheets.

6. The report shall include an overall appraisal of the data package.

7. The validation report shall include a chart presented in a spreadsheet format, consisting of site name, sample numbers, data submitted to laboratory, year of CLP or analytical protocol used, matrix, fractions analyzed, e.g., volatiles, semi-volatiles, Pest/PCB, Metals, CN. Space should be provided for a reference to the NYSDEC CLP when non-compliancy is involved and a column for an explanation of such violation.

12.0 CORRECTIVE ACTION

12.1 NON-CONFORMANCE REPORTS

Corrective action will be undertaken when a non-conforming condition is identified. A non-conforming condition occurs when QA objectives for precision, accuracy, completeness, representativeness or comparability are not met, or when procedural practices or other conditions are not acceptable.

A non-conformance report will be prepared by the Site QAO, approved by the Technical Manager, and issued to the Project Manager and other appropriate parties. The non-conformance report will describe the unacceptable condition and the nature of corrective measures recommended. A schedule for compliance will also be provided.

12.2 CORRECTIVE ACTION

The non-conformance report will be transmitted to a responsible officer of the ASP laboratory, the City of Amsterdam representative, the Project Officer and the Project Manager. The non-conformance report will specify, in writing, the corrective action recommended including measures to prevent a recurrence of the original deficiency. Appropriate documentation of corrective action will also be prepared. The Site QAO will monitor implementation of the corrective action, and provide written record as to whether the original problem has been resolved.

12.3 STOP-WORK ORDER

A Stop-Work Order may be issued, upon authorization, by the Site QAO, if corrective action does not adequately address a problem or if no resolution can be reached. To issue a Stop-Work Order, written authorization is required from the Project Manager and

the City of Amsterdam representative. If disagreement occurs among these individuals, it will be brought before successively higher levels of management until the issue is resolved.

12.4 DOCUMENTATION OF THE STOP-WORK ORDER

The conditions and need for a Stop-Work Order will be documented in sufficient detail to permit evaluation of the deficiency and determination of proper corrective action. Pertinent communications will be attached to the Stop-Work Order and referenced in the appropriate spaces. Such communications include discussions, correspondences, or telephone conversations which pertain to evaluation of the problem and potential solutions, and implementation of the preferred solution.

12.5 RESUMPTION OF WORK

In order for work to resume following a Stop-Work Order, the Project Manager and the City of Amsterdam representative must rescind it in writing.

12.6 COURSE OF ACTION TO PREVENT RECURRENCE

The Site QAO is responsible for tracking non-conforming conditions, evaluating the effectiveness of corrective measures, and assuring that the necessary steps have been taken to prevent recurrence of the original problem.

12.7 FIELD CHANGES

The Project Manager is responsible for all site activities. In this capacity the Project Manager will at times be required to modify site programs in response to changing site conditions. At such times the responsible Field Team Leader will notify the Project Manager of the anticipated change, and obtain the approval of the Project Manager and implement the necessary changes. The Project Manager will notify in writing the Site QAO, the Project

Officer, and the City of Amsterdam representative. A copy of the notification will be attached to the file copy of the affected document. If an unapproved action has been taken during a period of deviation, the action will be evaluated to determine the significance of any departure from established procedures.

Changes in the program will be documented on a field change request which is signed by the Field Team Leader and the Project Manager. The Project Manager will maintain a log for the control of field change requests.

The Project Manager is responsible for controlling, tracking and implementing the identified changes. Completed field change requests are distributed to affected parties which will include as a minimum: Project Officer, Project Manager, Site QAO, Field Team Leader, and the City of Amsterdam representative.

13.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

13.1 FREQUENCY

Malcolm Pirnie field staff will promptly report any difficulties to the Project Manager. The laboratory will provide a written description on any quality assurance, problems to Malcolm Pirnie with submission of the analytical data packages.

Following quality assurance audits, the site QAO will submit a Quality Assurance report to the Project Manager describing the performance of the quality assurance program. Problems or issues which arise independent of audits may be identified to project management at any time.

13.2 CONTENTS

The Quality Assurance reports will contain:

- Results of system and performance audits;
- An assessment of the measurement data, including accuracy, precision, completeness, representativeness, and comparability;
- A listing of the non-conformance reports including stop-work orders issued related corrective actions undertaken, and an assessment of the results of these actions; and
- Identification of significant quality assurance problems and recommended solutions.

14.0 REFERENCES

USEPA, 1983, Methods for Chemical Analysis for Water and Wastes, EPA-600/8-79-020

USEPA, 1984, Soil Sampling Quality Assurance User's Guide, EPA-600\4-84-043.

USEPA, 1988, Region II CERCLA Quality Assurance Manual, Final Copy, Revision O.

USEPA, 1986, Test Methods for Evaluating Solid Waste, SW-846, Third Edition.

USEPA, Contract Laboratory Statement of Work for Organic Analysis, 3/90.

USEPA, Contract Laboratory Statement of Work for Inorganic Analysis, 3/90.

USEPA, 1987, Data Quality Objectives for Remedial Response Activities, CDM Federal Programs Corporation.

USEPA, 1988, Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses.

USEPA, 1988, Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final.

USEPA, 1988. User's Guide to the Contract Laboratory Program, Fourth printing.

USEPA, 1990, SOP No. HW-6, CLP Organics Data Review and Preliminary Review, Revision No. 7, 3/90.

USEPA, 1990, SOP NO. HW-2, Evaluation of Metals Data for the Contract Laboratory Program Revision X, 2/90.

QUALITY CONTROL FIELD AUDIT REPORT

SUMMARY INFORMATION

1. PROJECT NAME: _____

2. PROJECT ADDRESS: _____

_____

3. PRELIMINARY ASSESSMENT ___ RI/FS ___ RD ___ CONSTRUCTION ___

OTHER _____

4. DATE(S) OF QC FIELD AUDIT _____

5. AUDITOR'S NAME _____ PHONE _____

6. FACILITY CONTACT _____ PHONE _____

7. CONTRACTOR CONTACT _____ PHONE _____

8. PERSONNEL ON-SITE

NAME	REPRESENTING	PHONE

9. AUDITOR'S COMMENTS _____

_____

_____

Field Audits

10. WEATHER CONDITIONS

SUNNY PARTLY SUNNY PARTLY CLOUDY CLOUDY RAIN DRIZZLE SNOW SLEET

TEMPERATURE _____ WIND SPEED _____ WIND DIRECTION _____

11. LEVEL OF PERSONNEL PROTECTION REQUIRED IN WORK PLAN LEVEL OF PERSONNEL PROTECTION ACTUALLY DONNED:

A B C D A B C D

12. FIELD SURVEY EQUIPMENT

INSTRUMENT	MODEL	CALIBRATION CHECK	CALIBRATION STANDARD	SPAN SETTING
CONDUCTIVITY METER				
DISSOLVED OXYGEN METER				
pH METER				
COMBUSTIBLE GAS INDICATOR (LEL/O_2)				
FLAME IONIZATION DETECTOR (OVA)				
PHOTOIONIZATION DETECTOR (HNU)				
TOTAL GAS INDICATOR (CO, H_2S)				
OTHER				

OBSERVATIONS _____

13. DID THE SAMPLING TEAM TAKE PERIODIC SURVEYS OF THE AMBIENT AIR CONDITIONS YES NO N/A

14. DID THE SAMPLING TEAM PROVIDE A DECON ZONE DESIGNATING CLEAN AND CONTAMINATED AREAS YES NO N/A

15. WERE PHOTOGRAPHS TAKEN YES NO

16. AUDITOR'S COMMENTS _____

MONITORING WELL SAMPLING SETUP AND EVACUATION

EVACUATION PROCEDURES

1. WELL CASING CONSTRUCTION STAINLESS STEEL TEFLON PVC OTHER _____

2. DIAMETER OF WELL CASING 2" 4" 6" OTHER _____

3. LOCKING CAPS ON THE WELLS YES NO N/A PROTECTIVE CASING YES NO N/A

4. METHOD UTILIZED TO DETERMINE THE STATIC WATER LEVEL WATER LEVEL INDICATOR OTHER _____

5. REFERENCE POINT THAT THE STATIC WATER LEVEL WAS MEASURED FROM:

SURVEY POINT | TOP OF INNER CASING | TOP OF PROTECTIVE CASING | HEIGHT OF CASING ABOVE GROUND SURFACE

6. WAS THE WATER LEVEL INDICATOR DECONTAMINATED ACCORDING TO STANDARD PROCEDURES BETWEEN EACH WELL:

YES NO N/A

IF NO, METHOD UTILIZED: _____

_____

7. EVACUATION METHOD:

BAILER CENTRIFUGAL PUMP PERISTALTIC PUMP BLADDER PUMP SUBMERSIBLE PUMP

GAS DISPLACEMENT PUMP GAS LIFT PUMP OTHER _____

8. TYPE OF HOSE UTILIZED:

POLYETHYLENE (ASTM DRINKING WATER GRADE 2239) TEFLON SILASTIC N/A

OTHER _____

9. WAS THE HOSE DEDICATED TO EACH WELL LOCATION: YES NO N/A

IF NO, METHOD OF DECONTAMINATION _____

10. WAS THE PUMP DEDICATED TO EACH WELL LOCATION: YES NO N/A

11. WAS THE PUMP: LABORATORY DECONTAMINATED FIELD DECONTAMINATED N/A

12. WAS THE PUMP DECONTAMINATED ACCORDING TO STANDARD CERCLA PROCEDURES: YES NO

IF NO, METHOD OF DECONTAMINATION _____

13. WAS THE PUMP HEAD OR END OF HOSE WITHIN 6 FEET OF THE DYNAMIC WATER LEVEL DURING EVACUATION:

YES NO N/A

14. WAS THE DECONTAMINATION AREA LOCATED AWAY FROM THE SOURCE OF CONTAMINATION YES NO N/A

15. AUDITOR'S COMMENTS _____

_____

_____

Field Audits

AQUEOUS SAMPLING PROCEDURES

1. AQUEOUS MATRIX SAMPLED:

   POTABLE WELL GROUNDWATER SURFACE WATER LEACHATE RUNOFF STORM SEWER

   SANITARY SEWER OTHER: _____

2. TYPE OF SAMPLE: GRAB COMPOSITE IF COMPOSITE, # SAMPLES/COMPOSITE _____

3. WAS THE VOA SAMPLE COLLECTED FIRST: YES NO N/A

4. TYPE OF SAMPLING EQUIPMENT:

	MATERIAL OF CONSTRUCTION			
	STAINLESS STEEL	TEFLON	GLASS	OTHER
BAILER				
BLADDER PUMP				
SAMPLER				
COLIWASA				
KEMMERER DEPTH SAMPLER				
WHEATON DIP SAMPLER				
TUB SAMPLER				
BACON BOMB				

5. TYPE OF LEADER LINE THAT COMES IN CONTACT WITH THE WELL WATER:

   TEFLON TEFLON-COATED STAINLESS STEEL N/A OTHER _____

6. LENGTH OF THE LEADER LINE _____

7. WAS THE SAMPLING EQUIPMENT DEDICATED: YES _____ NO _____

8. WAS THE SAMPLING EQUIPMENT: LAB DECONTAMINATED FIELD DECONTAMINATED

9. WAS THE SAMPLING EQUIPMENT DECONTAMINATED ACCORDING TO STANDARD PROCEDURES: YES NO

   IF NO, METHOD OF DECONTAMINATION: _____

10. WAS THE DECONTAMINATION AREA LOCATED AWAY FROM THE SOURCE OF CONTAMINATION YES NO N/A

11. ARE DISPOSABLE GLOVES WORN AND CHANGED BETWEEN EACH SAMPLE LOCATION: YES NO

12. AUDITOR'S COMMENTS _____

_____

_____

_____

_____

Field Audits

NON-AQUEOUS SAMPLE INFORMATION

1. NON-AQUEOUS MATRIX SAMPLED:

SOIL SEDIMENT SLUDGE CHEMICAL SOLIDS WASTE PILE

OTHER _____

2. TYPE OF SAMPLE: GRAB COMPOSITE IF COMPOSITE, # SAMPLES/COMPOSITE _____

3. WAS THE VOA SAMPLE COLLECTED FIRST FROM A DISCRETE LOCATION PRIOR TO HOMOGENIZATION: YES NO N/A

4. WAS THE SAMPLE HOMOGENIZED PRIOR TO ACQUISTION INTO THE SAMPLE CONTAINERS: YES NO

5. TYPE OF SAMPLING EQUIPMENT:

	MATERIAL OF CONSTRUCTION			
	STAINLESS STEEL	TEFLON	GLASS	OTHER
SPOON/SPATULA				
TROWEL/SCOOP				
BUCKET AUGER				
SPLIT SPOON				
SHELBY TUBE				
TRIER				
PONAR DREDGE				

6. WAS THE DRILL RIG, AUGER FLIGHTS, RODS, ETC. DECONTAMINIATED ACCORDING TO STANDARD PROCEDURE BETWEEN EACH SAMPLE LOCATION.

YES NO N/A

IF NO, METHOD OF DECONTAMINATION _____

7. IF MUD ROTARY DRILLING WAS UTILIZED WHAT WAS THE SOURCE OF THE WATER: _____

8. WAS THE SAMPLING EQUIPMENT DEDICATED: YES _____ NO _____

9. WAS THE SAMPLING EQUIPMENT: LAB DECONTAMINATED FIELD DECONTAMINATED

10. WAS THE SAMPLING EQUIPMENT DECONTAMINATED ACCORDING TO STANDARD PROCEDURES: YES NO

IF NO, METHOD OF DECONTAMINATION: _____

11. WAS THE DECONTAMINATION AREA LOCATED AWAY FROM THE SOURCE OF CONTAMINATION YES NO N/A

12. ARE DISPOSABLE GLOVES WORN AND CHANGED BETWEEN EACH SAMPLE LOCATION: YES NO

13. AUDITOR'S COMMENTS _____

Field Audits

QA/QC INFORMATION

1. LABORATORIES:

NAME _____ PHONE _____

NAME _____ PHONE _____

CONTACT PERSON _____

CLP CLP CAPABLE CERTIFIED OTHER _____

2. SAMPLE INFORMATION:

MATRIX	PARAMETER	PRESERVATIVE	CONTAINER DESCRIPTION

3. WHAT ORDER, BY ANALYTICAL PARAMETER, ARE SAMPLES COLLECTED: _____

4. FIELD BLANKS: YES NO N/A FREQUENCY _____

METHOD: _____

WAS IDENTICAL BOTTLE TO BOTTLE TRANSFER OF WATER UTILIZED: YES NO

5. TRIP BLANKS: YES NO N/A FREQUENCY _____

6. WHAT WAS THE SOURCE OF THE BLANK WATER: LABORATORY DEMONSTRATED ANALYTE-FREE OTHER _____

7. SAMPLE PACKAGING AND HANDLING:

SAMPLE CONTAINERS LABELED	YES	NO	N/A
COC FORMS COMPLETED	YES	NO	N/A
CUSTODY SEALS	YES	NO	N/A
SAMPLES PERSERVED TO 4°C:	YES	NO	N/A

8. AUDITOR'S COMMENTS

_____

_____

_____

MALCOLM PIRNIE

TEST BORING LOG

BORING No.

PROJECT	LOCATION				SHEET 1 OF
'ENT					PROJECT No.
DRILLING CONTRACTOR					MEAS. PT. ELEV.
PURPOSE					GROUND ELEV.
WELL MATERIAL					DATUM
DRILLING METHOD(S)		SAMPLE	CORE	CASING	DATE STARTED
DRILL RIG TYPE	TYPE				DATE FINISHED
GROUND WATER DEPTH	DIA.		–		DRILLER
MEASURING POINT	WEIGHT				PIRNIE STAFF
DATE OF MEASUREMENT	FALL				

DEPTH FT.	SAMPLE TYPE, RECOVERY, NUMBER	BLOWS ON SAMPLE SPOON PER 6"	PID	GRAPHIC LOG	GEOLOGIC DESCRIPTION KEY - Color, Major, Minor Mositure, Etc.	ELEV. / DEPTH	WELL Constr.	REMARKS
2								
4								
6								
8								

MALCOLM PIRNIE

DAILY DRILLING REPORT

CONTRACTOR: _____ DATE: _____

DRILLING EQUIP.: _____ WEATHER: _____

CREW MEMBERS: _____

SITE NAME: _____ JOB NO.: _____

DRILL TIME LOG:

CATEGORY	TOTAL HOURS	A.M. 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 P.M. 1 2 3 4 5 6 A.M.
MOB/DEMOB		
DRILLING–OVERBURDEN		
DRILLING–ROCK		
WELL INSTALLATION		
DEVELOPMENT/TESTING		
GROUTING		
STEAM/DECON		
DOWN TIME		
STANDBY		
OTHER:		

REMARKS:

CONSUMABLE: DESCRIBE NATURE, QUANTITY, SIZE, ETC.

ITEM OR SERVICE	QTY.	NOTES

BOREHOLE NO.	FROM FEET	TO FEET	FOOTAGE DRILLED FEET	METHOD, SIZE, ETC.

PERSONNEL TIME LOG:

POSITION	NAME	HOURS
INSPECTOR		
DRILLER		
HELPER		

DRILLER MPI REP.

MALCOLM PIRNIE

OVERBURDEN MONITORING WELL SHEET

WELL NO. _____

PROJECT _____ START DATE _____ END DATE _____

PROJECT NO. _____ FIELD GEOLOGIST _____

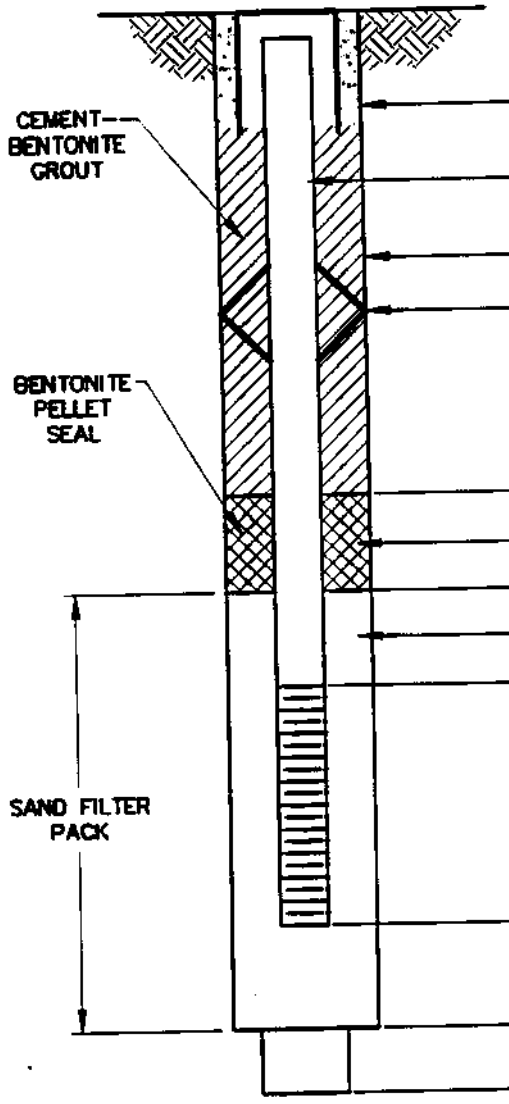
LOCATION _____

DRILLING CO. _____

DRILLER(S) _____

DRILLING METHOD(S) _____

DEVELOPMENT METHOD(S) _____



DEPTH TO TOP OF GROUT/ BOTTOM OF CEMENT _____

RISER DIAMETER AND MATERIAL _____

BOREHOLE DIAMETER _____

DEPTH TO CENTRALIZERS _____

_____

_____

_____

_____

DEPTH _____

PELLET SIZE _____

DEPTH _____

SAND SIZE _____

DEPTH _____

SCREEN DIAMETER, SLOT SIZE, AND MATERIAL _____

DEPTH _____

DEPTH _____

BACKFILL MATERIAL _____

BOTTOM OF BOREHOLE _____

NOTE: DEPTHS ARE FEET BELOW GRADE

MALCOLM PIRNIE

Well No. _____

Well Development/Purging Log

PROJECT NAME: _____

PROJECT NUMBER: _____

DATE: _____

SAMPLERS: _____

_____

			Well I.D.	Vol. Gal./Ft.
①	Total Casing and Screen Length (ft.)	_____	1"	0.04
			2"	0.17
②	Casing Internal Diameter (in.)	_____	3"	0.38
			4"	0.66
③	Water Level Below Top of Casing (ft.)	_____	5"	1.04
			6"	1.50
④	Volume of Water in Casing (gal.)	_____	8"	2.60

$v = 0.0408 (②)^2 \times (① - ③) = ④$

$v = 0.0408 (\quad)^2 \times (\quad - \quad) =$ _____ gal.

PARAMETER	ACCUMULATED VOLUME PURGED										
Gallons											
Time											
Conductivity (mohm/cm)											
Dissolved Oxygen (ppm)											
Eh (mV)											
pH											
Temp (°C)											
Turbidity (NTUs)											

_____

COMMENTS:

PAGE___OF___

MALCOLM PIRNIE

TEST EXCAVATION LOG

MALCOLM PIRNIE INC.

DATE STARTED _____ TIME _____ JOB NO. _____

DATE FINISHED _____ TIME _____ TEST EXCAVATION NO. _____

CLIENT _____ SITE _____

SURFACE ELEVATION _____ CONTRACTOR _____

LOCATION _____ EQUIPMENT _____

_____ INSPECTOR _____

DEPTH	SAMPLE	PPM	DESCRIPTION OF SOIL	REMARKS
0				

LOCATION SKETCH

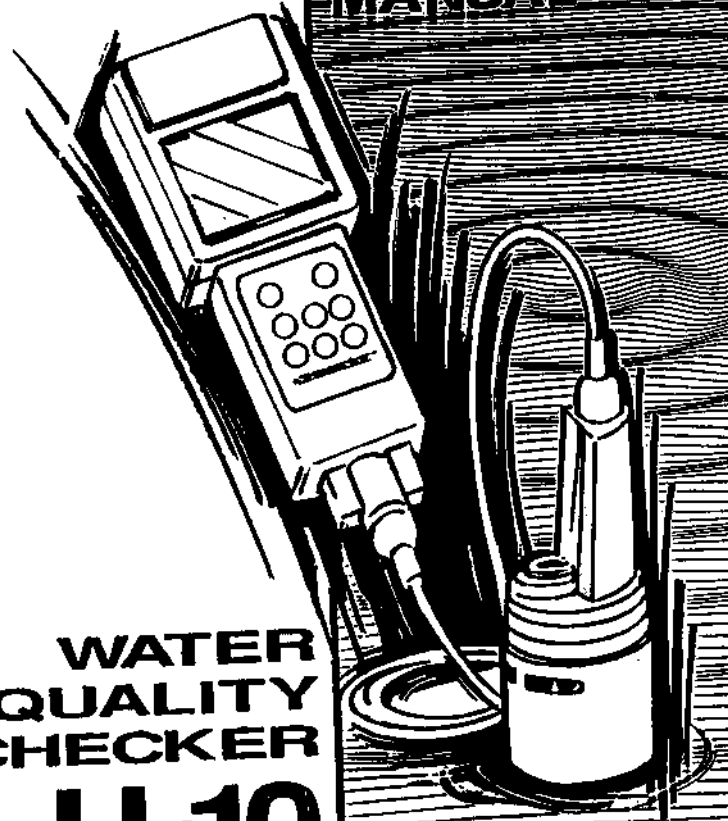
NOTES:

WIND NORTH

HAUSMANN : 0' \01900\TEST-LOG SCALE: 1:1| 01/23, 1992 at 14:52

HORIBA

INSTRUCTION MANUAL



WATER QUALITY CHECKER U-10

CODE: 040801000HK-5

WARNING

The DO sensor contains a strong alkaline solution. Should any of this solution come in contact with your clothing or skin, wash it away immediately with plenty of water.

Be especially careful not to allow any of the alkaline liquid in the DO sensor to get in your eyes.

⚠CAUTION

Insert the battery with ample care to the polarity. Reverse insertion on the polarity will make damage to the inner PCB.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provede reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

e U-10 Water Quality Checker is state-of-the-art instrument for simultaneous multiparameter measurement of water quality. The HORIBA U-10 measures six different parameters of water samples: *pH, conductivity, turbidity, dissolved oxygen, temperature,* and *salinity*.

The U-10 is compact enough to be held in one hand while taking measurements. It has a large easy-to-read LCD readout. Measurements are taken simply by immersing the probe right into the water sample.

The U-10 is extremely versatile and sophisticated, yet easy to use. You will find it a valuable addition to on-site water control operations, whatever your needs – from testing factory discharges to urban drainage, river water, lake and marsh water, aquatic culture tanks, agricultural water supplies, and sea water.

To get the most out of you[illegible] Water Quality Checker, please r this *Instruction Manual* carefully before you begin to take measurements.

Note that Horiba cannot be held responsible for any equipment malfunction or failure should the U-10 Water Quality Checker be operated incorrectly or in a manner other than specified in this *Instruction Manual*.

Horiba's aim is to produce the best possible equipment and documentation for our products. We welcome comments, questions, or suggestions for improvement concerning both our products and the accompanying documentation, such as this *Instruction Manual*.

Second edition: November, 1991
First edition: July, 1991

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Section **1**

Getting Started

This section first gives an overview of the U-10. It then shows how to set up your U-10 by inserting the DO sensor and the battery.

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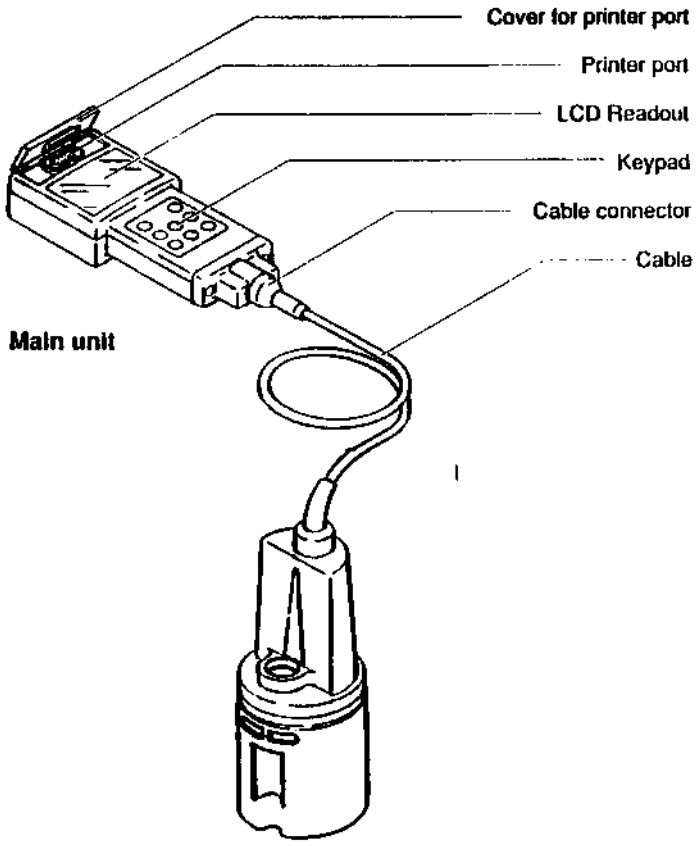
Configuration of the U-10

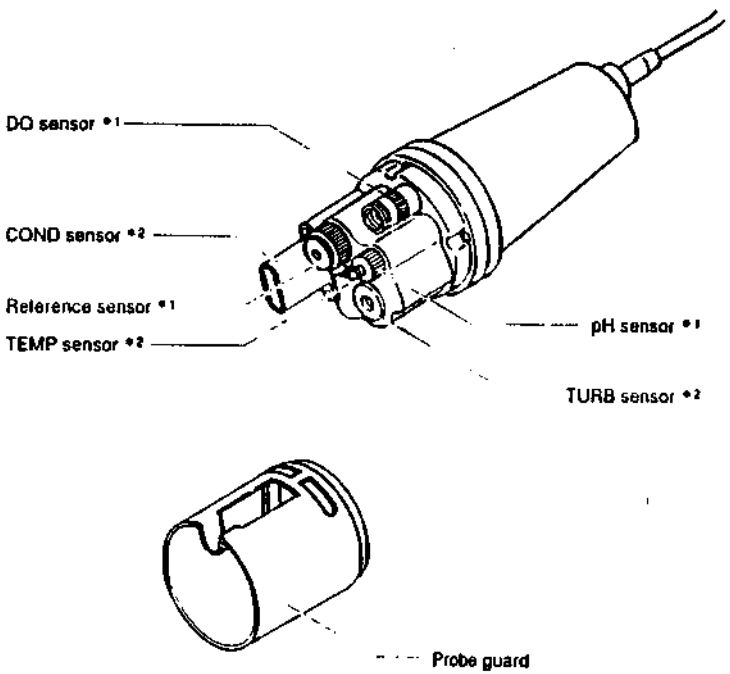
Main unit



Main unit

Probe

Probe

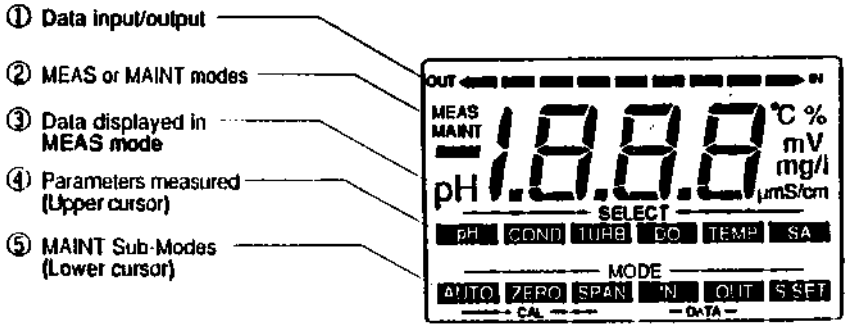


*1. Removable
DO (Dissolved oxygen)
Reference
pH

*2. Non-removable
COND (Conductivity)
TEMP (Temperature)
TURB (Turbidity)

The Readout

The readout has two main functions: (1) it displays the results of measurements, and (2) it serves as a message board to show the operating status of the U-10.



① Data input/output

OUT — Data output

— IN Data input

② MEAS or MAINT modes

The U-10 may be used in one of two modes: Measurement (MEAS) mode or Maintenance mode.

MEAS the U-10 is ready to make 6-parameter measurements

MAINT the U-10 is ready for other operations, e.g., calibration, data input/recall, or salinity setting

③ **Data displayed in MEAS mode**

- 6-parameter results:
  pH, conductivity, turbidity, DO, temperature, and salinity
- Designated value for salinity setting
- Error codes

④ **Parameters measured**

Value displayed on readout is highlighted by upper cursor.

pH	pH
COND	Conductivity
TURB	Turbidity
DO	Dissolved-Oxygen
TEMP	Temperature
SAL	Salinity

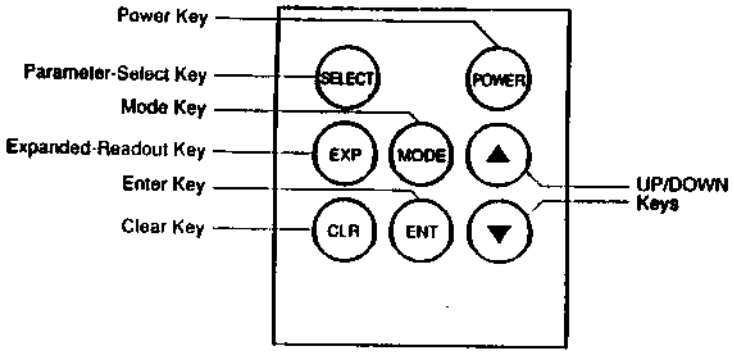
⑤ **MAINT Sub-Modes**

One of six Sub-Modes selected is highlighted by lower cursor.

AUTO	Automatic 1-point calibration
ZERO	Manual zero calibration
SPAN	Manual span calibration
IN	Data input
OUT	Data output (recall)
S.SET	Salinity setting correction

The Keypad

The U-10 is operated by the keypad on the main unit, which has eight surface-sealed keys, as illustrated.



POWER

Power Key (POWER)
Turns the main unit ON/OFF.
When this key is pressed to turn the U-10 ON, the readout comes in the MEAS mode, showing the parameter last displayed in the previous measurement. If the U-10 is left with the power ON for 30 minutes without any of the keys being activated, the power will be turned OFF automatically.

SELECT

Parameter-Select Key (SELECT)
Use this key to move the upper cursor to the measured parameter you want to show on the readout. It toggles through the six parameters in order:

pH → COND → TURB → DO → TEMP → SAL

MODE

Mode Key (MODE)
Toggles back and forth between MEAS and MAINT modes. When in the MAINT mode, this key toggles the lower cursor through the six maintenance Sub-Modes.

AUTO → ZERO → SPAN → IN → OUT → S.SET

Expanded-Readout Key (EXP)
Toggles between (1) standard readout value and (2) expanded readout, for greater resolution, with decimal point moved one digit to the left.

Enter Key (ENT)
This acts like the RETURN Key or Enter Key on a computer keyboard. The U-10 Enter Key has four main functions, depending on which mode the unit is in.

1. In the AUTO Sub-Mode: Press this key to start automatic calibration.
2. In either the ZERO or SPAN Sub-Modes: Used in manual calibration to set the value for the standard solution being used.
3. In the IN Sub-Mode: Inputs data being measured to memory.
4. In the OUT Sub-Mode: Recalls values from one of the 20 Data-Set Nos. that is now shown on the readout. Prints data when a printer is connected.

Clear Key (CLR)
This acts like the ESCAPE Key on a computer keyboard. It has three main functions, depending on which mode the unit is in.

1. In the AUTO Sub-Mode: Aborts the auto-calibration now in progress.
2. In the IN Sub-Mode: Deletes data in memory from all 20 Data-Sets.
3. When the readout shows an error code: Clears the error code from the readout.

UP/DOWN keys
Use these keys to select values when in one of the MAINT Sub-Modes. They have two main functions.

1. In either the ZERO or SPAN Sub-Modes: Use these keys to select value for the standard solution.
2. In the OUT mode: Used to toggle through the 20 Data-Set Nos. to select the one you wish to recall.

Setting up the U-10

Preparations of the pH sensor and the reference sensor

1. Remove the protective rubber cap from the pH sensor.
2. Remove the sealing tape from the reference sensor.

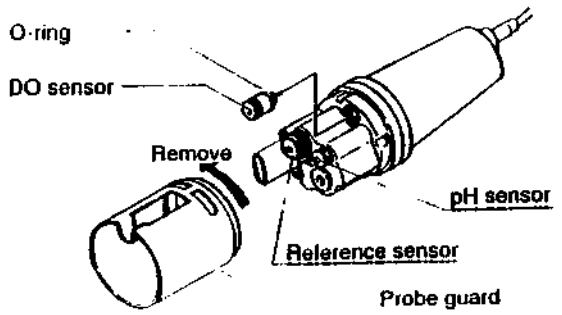
Inserting the DO sensor

WARNING

The DO sensor contains a strong alkaline solution. Should any of this solution come in contact with your clothing or skin, wash it away immediately with plenty of water. Be especially careful not to allow any of the liquid in the DO sensor to get in your eyes.

The Dissolved-Oxygen (DO) sensor has a delicate membrane that can easily be ruptured. For safety's sake, the U-10 is shipped to you with the DO sensor packed separately. You should insert the DO sensor when you unpack your U-10 unit.

1. Make sure that the DO sensor has the correct O-ring, as shown.
2. First, fit the DO sensor lightly into its socket, and then put on the probe guard to align it correctly.
3. Then, tighten the DO sensor securely to the probe body. When doing this, be especially careful not to damage the membrane, which is located in the front of the DO sensor.



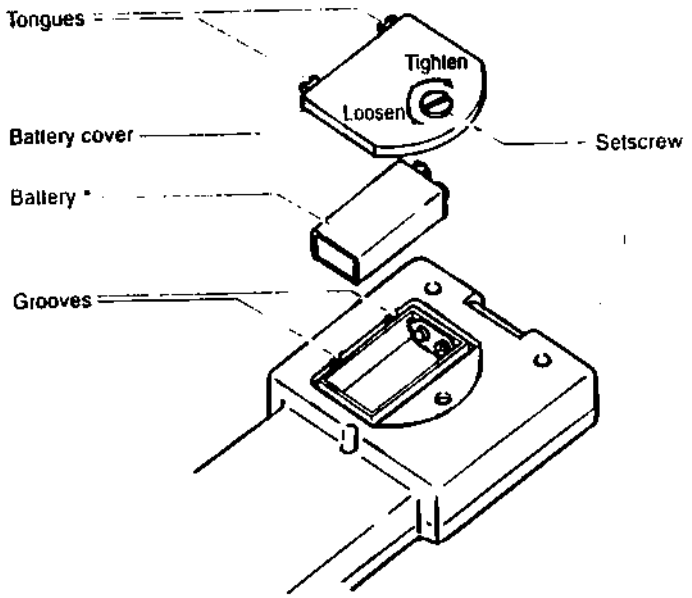
Inserting the battery

The U-10 is shipped from the factory with the battery packed separately.

The battery may be inserted by loosening the set-screw on the battery cover and pulling up the cover. Make sure that the plus and minus poles of the battery match the terminals correctly.

If the readout shows the message Er 1, it means that the battery is defective or exhausted and should be replaced.

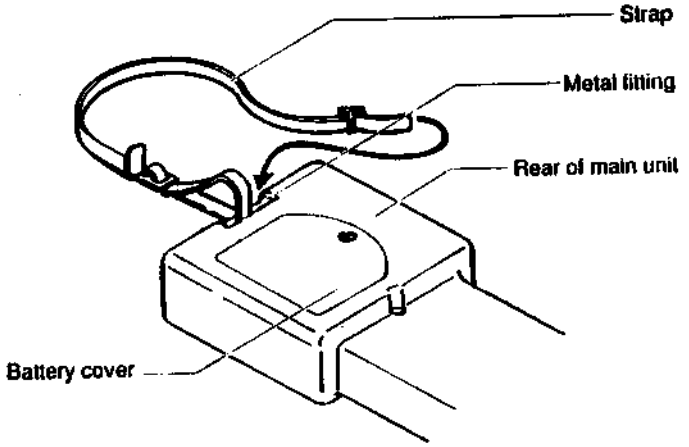
If you are replacing the battery and already have data stored in the U-10 memory that you wish to save, be sure to turn OFF the POWER Key before you remove the old battery. This will assure that data stored in memory will be maintained by the internal backup battery.



* Use a 9V-battery

Attaching the carrying strap

Hook both ends of the strap through the metal fitting on back of the main unit, as illustrated.



Section 2

Making Measurements

Making a measurement with the U-10 Water Checker is extremely simple. Just turn on the power and place the probe in the sample of water you wish to measure.

All six parameters are measured simultaneously. These parameters may be stored in memory, printed out, or viewed one-by-one on the LCD readout. For printing and data storage, see the appropriate sections following this one. To view the parameters one-by-one on the readout, use the SELECT Key to toggle the upper cursor through them.

While the U-10 is both rugged and precise, the key to accurate measurements is cleanliness and frequent calibration. It is essential to clean the U-10 thoroughly after each measurement, and it is recommended that you re-calibrate your U-10 as frequently as possible. For best results, you should recalibrate it before each measurement session. Cleaning and calibration procedures are described below in this section and in the following one.

How to make a measurement 12
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Measuring fresh water 16
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H to make a measurement

POWER **1** Turn the power on.

2 Gently place the probe into the water sample.

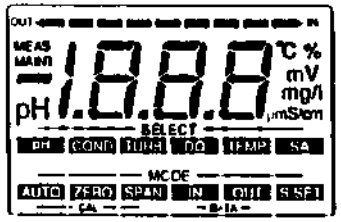
Basically, that's all there is to it: just turn it on and put the probe in the sample. Of course, the U-10 can do many sophisticated things with the sample data, and for best results, you should be careful about calibrating the unit and maintaining it in good condition. This is explained in detail below and in the next section.

Be careful!
Never drop or throw the probe into the water. It is a precision instrument containing five delicate sensors and five pre-amps; you can damage it beyond repair by unnecessary rough handling.

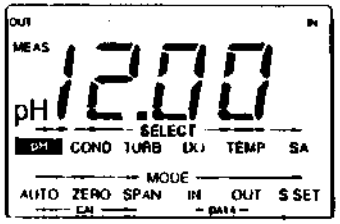
Initial readout

POWER

When you first turn the power on, the U-10 will be in the MEAS mode, the readout will look like this, with all the LCD segments activated.



After about two seconds, the readout will change to show that a new measurement is being made. The readout will show the last parameter that the upper cursor was on when the previous measurement was made, i.e., pH as illustrated here.



(Expanded readout shown)

The display of the decimal point in the readout mode will also be in the same format as was selected with the EXP Key in the previous measurement, i.e., standard or expanded (as illustrated here).

4 *Select the parameter*

Select the parameter you want shown on the readout of the measured data

SELECT

All six parameters are automatically measured at once. Use the SELECT Key to toggle the upper cursor to the parameter you want.

pH	: pH
COND	: Conductivity
TURB	: Turbidity
DO	: Dissolved oxygen
TEMP	: Temperature
SAL	: Salinity

To get a uniform reading, slowly move the probe up and down to circulate the water through it. (Move it 1 foot (30 cm) per sec.) Then wait for the readout to stabilize while doing this.

Expanded readout

EXP

Use the EXP readout mode when you wish to see the results with one additional decimal place of accuracy. The EXP Key toggles the readout back and forth between standard to expanded display. The table below shows the result of using the EXP readout mode for each of the six parameters.

Table 1. Accuracy of expanded readout

Parameter	Range of measurement	Accuracy	
		Standard readout	Expanded readout
pH	0-14 pH	0.1 pH	0.01 pH
COND	0-1 mS/cm	0.01 mS/cm	0.001 mS/cm
	1-10 mS/cm	0.1 mS/cm	0.01 mS/cm
	10-100 mS/cm	1 mS/cm	0.1 mS/cm
TURB	0-800 NTU	10 NTU	1 NTU
DO	0-19.9 mg/l	0.1 mg/l	0.01 mg/l
TEMP	0-50°C	1°C	0.1°C
SAL	0-4%	0.1%	0.01%

Note that the salinity parameter is the only value not measured directly with its own sensor. The U-10 obtains salinity by converting the conductivity value. If large amounts of conductive ions other than salt-water components are present in the sample, an error may occur. Be cautious when interpreting the salinity results.

Measuring fresh water or salt water?

The U-10 can be set to the salinity for either fresh water or salt water when measuring DO. This is done by using the S.SET Sub-Mode.

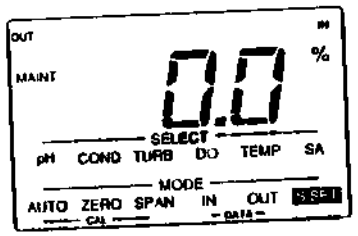
Measuring fresh water

MODE

1. First, use the MODE Key to put the U-10 in the MAINT mode. Keep pressing the MODE Key to toggle the lower cursor to the S.SET Sub-Mode.

▲ ▼

2. Once you are in the S.SET Sub-Mode, use the UP/DOWN Keys to select the salinity value. For fresh water, set the salinity to 0.0%.



ENT

3. Finally, press the ENT Key to complete the salinity setting while in the S.SET Sub-Mode.

MODE

4. When the salinity setting has been made, switch back to the MEAS mode by pressing the the MODE Key.

Measuring salt water

1. First, use the MODE Key to put the U-10 in the MAINT mode. Keep pressing the MODE Key to toggle the lower cursor to the S.SET Sub-Mode.

2. For salt water, set it to *A* (*i.e.*, for auto-salinity).
   The *A* setting should be sufficient for measurements of normal sea water with a salinity value close to 3.3%. For sea water of an unusual salinity, however, and where the value is otherwise known, you may wish set the value manually to any salinity within the range of 0.0%-4.0%. (You may also possibly want to use a manual setting if, for example, the COND sensor is malfunctioning but it is still desirable to take readings of the other parameters.)

3. Finally, press the ENT Key to complete the salinity setting while in the S.SET Sub-Mode.

4. When the salinity setting has been made, switch back to the MEAS mode by pressing the the MODE Key.

After measurement: Cleaning and storing the U-10

1. Turn OFF the power.

2. Wash the probe thoroughly with tap water. Be sure to flush off all of sample solution from the probe.

Storing the U-10 for briel periods, *i.e.*, about 1 week or less:
Fill the calibration beaker with tap water and fit the probe over it.

For longer storage
The pH sensor must always be kept moist. Fill the small rubber cap with water and use it to cover the pH sensor.
The KCl internal solution in the reference sensor may seep out over time. Place vinyl tape around the O-ring portion to prevent this.
If you are going to store the U-10 for a prolonged period without using it, remove the battery from the main unit.

Section **3**

Calibrating the U-10

The U-10 Water Checker may be calibrated either manually or automatically. **The 4-parameter auto-calibration procedure is quite handy and should be** sufficient for most measurement operations.

Manual calibration for each of the four parameters is more accurate but, of course, also more time-consuming. This method should be used for more precise measurement. The manual calibration procedure is explained below in detail, following the description of the auto-calibration procedure.

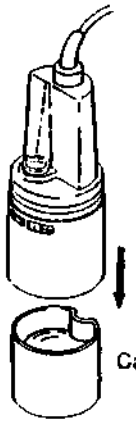
The auto-calibration procedure is extremely simple. The U-10 Water Checker uses just a single solution to do a simultaneous calibration of four parameters: *pH, COND, TURB,* and *DO*. Your U-10 comes with a bottle of standard phthalate pH solution and a calibration beaker for this purpose.

Auto-calibration procedure 20
Manual (2-point) calibration procedures 23
pH Calibration 24
1.Zero calibration 24
2.Span calibration 25
COND Calibration 26
1.Zero calibration 28
2.Span calibration 29
TURB Calibration 30
1.Zero calibration 31
2.Span calibration 31
DO Calibration 32
1.Zero calibration 33
2.Span calibration 33

Auto-calibration procedure

Fill the calibration beaker to about 2/3 with the standard solution. Note the line on the beaker.

Fit the probe over the beaker, as illustrated. Note that the beaker is specially shaped to prevent the DO sensor from being immersed in the standard solution. This is because the DO auto-calibration is done using atmospheric air.

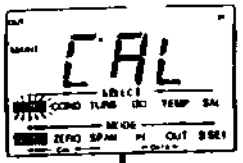


Calibration beaker

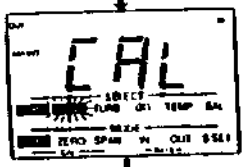
MODE With the power on, press the MODE Key to put the unit into the MAINT mode. The lower cursor should be on the AUTO Sub-Mode; if it is not, use the MODE Key to move the lower cursor to AUTO.

ENT With the lower cursor on AUTO, press the ENT Key. The readout will show CAL. Wait a moment, and the upper cursor will gradually move across the four auto-calibration parameters one-by-one: *pH, COND, TURB,* and *DO*. When the calibration is complete, the readout will briefly show End and then will switch to the MEAS mode.

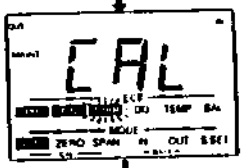
The upper cursor will blink while the auto-calibration is being made. When the auto-calibration has stabilized, the upper cursor will stop blinking.



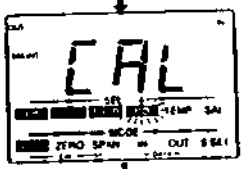
First, pH is being auto-calibrated



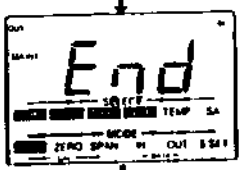
Then, COND is being auto-calibrated



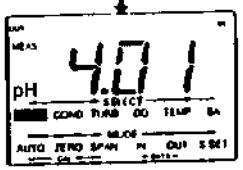
Next, TURB is being auto-calibrated



Finally, DO is being auto-calibrated



Auto-calibration now ends

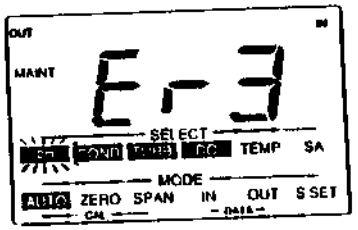


And the readout switches to the MEAS mode

Note: If you wish to abort the auto-calibration for any reason, press the CLR Key. The parameters auto-calibrated so far will be stored in memory.

Auto-calibration error

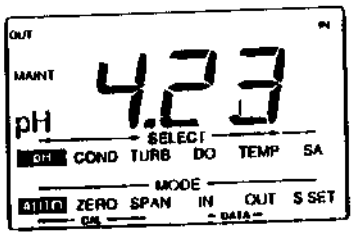
After the DO auto-calibration, if the unit does not switch to the MEAS mode as it should, and the readout shows either Er3 or Er4, an auto-calibration error has occurred. Parameters will blink where an error occurred.



pH auto-calibration error

CLR

If this happens, re-do the auto-calibration. First, press the CLR Key to cancel the error code.



ENT

Then press the ENT Key to re-start the auto-calibration. Restart the auto-calibration beginning again with pH.

Manual (2-point) calibration procedures

For normal measurements, the 4-parameter auto-calibration described above is sufficiently accurate. However, you may wish to do a parameter-by-parameter, 2-point manual calibration of one or more of the four parameters. This is recommended either for high-accuracy measurements, especially when using the expanded readout mode. It is necessary if a new probe is being used for the *first time*.

Parameters to be calibrated manually.

pH	• Zero	(see page 24.)
	• Span	(see page 25.)
COND	• Zero	(see page 28.)
	• Span	(see page 29.)
TURB	• Zero	(see page 31.)
	• Span	(see page 31.)
DO	• Zero	(see page 32.)
	• Span	(see page 33.)

Parameters not to be calibrated.

Sample temperature
Salinity

pH calibration

pH calibration on the U-10 is done using two commercially-available standard solutions of different pH values, one for the zero calibration, the other for the span calibration. Note that the temperature characteristics of the various standard solutions that are available may differ; therefore, before using these two solutions to make the pH calibration, carefully measure the temperature and determine the temperature characteristics of each.

Preparation

Wash the probe 2-3 times, using de-ionized or distilled water. Place it in a beaker of each standard solution.

1. Zero calibration

Use a pH7 standard solution for the zero calibration.

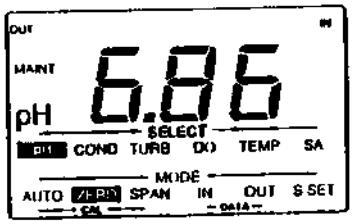
Operation

1. With the power on, press the MODE Key to put the unit into the MAINT mode.

2. Press the MODE Key again to move the lower cursor to ZERO.

3. Use the SELECT Key to move the upper cursor to pH.

4. When the readout has stabilized, use the UP/DOWN Keys to select the value of the pH 7 standard solution at the temperature of the sample. Refer to Table 2 for pH values of standard solutions at various temperatures.



5. Press the ENT Key to complete the zero calibration for pH.

2. Span calibration

Use either a pH4 or a pH9(10) standard solution for the span calibration.

Operation

MODE

1. Use the MODE Key to move the lower cursor to SPAN.

▲ ▼

2. As in Step 4. above in zero calibration, when the readout has stabilized, use the UP/DOWN Keys to select the value of the standard solution (i.e., either pH4 or pH9) at the temperature of the sample. Again, refer to Table 2 for pH values of standard solutions at various temperatures.

ENT

3. Press the ENT Key to complete the span calibration for pH.

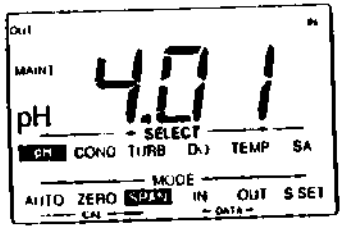


Table 2 pH values of standard solutions at various temperatures*

Temperature °C / °F	pH2[a]	pH4[b]	pH7[c]	pH9[d]	pH10[e]	pH12[f]
0 / 32	1.67	4.01	6.98	9.46	10.32	13.43
5 / 41	1.67	4.01	6.95	9.39	10.25	13.21
10 / 50	1.67	4.00	6.92	9.33	10.18	13.00
15 / 59	1.67	4.00	6.90	9.27	10.12	12.81
20 / 68	1.68	4.00	6.88	9.22	10.06	12.63
25 / 77	1.68	4.01	6.86	9.18	10.01	12.45
30 / 86	1.69	4.01	6.85	9.14	9.97	12.30
35 / 95	1.69	4.02	6.84	9.10	9.93	12.14
40 / 104	1.70	4.03	6.84	9.07	9.89	11.99
45 / 113	1.70	4.04	6.83	9.04	9.86	11.84
	1.71	4.06	6.83	9.01	9.83	11.70

a : oxalate, b : phthalate, c : neutral phosphate, d : borax,
e : carbonate, f : Sat.calcium hydroxide solution

* These pH valves are for Japanese standard solutions. Should you prefer to use different standard solutions, be sure to make the proper adjustments in calibration.

COND calibration

The U-10 can measure conductivity in the range of 0-100 mS/cm. Depending on the sample concentration, however, the U-10 automatically selects the proper range out of its three possible ranges of 0-1 mS/cm, 1-10 mS/cm, and 10-100 mS/cm.

Therefore, if you are doing a manual calibration for COND, this must be done for each of the three ranges. However, since the zero point is common for all three ranges, only the three one-point span calibrations need be done separately.

Preparing the standard solution for COND span calibration

This solution uses a potassium chloride as a reagent. For greater accuracy, the solution should be freshly prepared each time. If it is unavoidable to use a stored solution, be sure to keep it tightly capped in a polyethylene or hard glass bottle. The shelf life of this solution is six months. Date-stamp the bottle for reference. Never use a KCl standard solution that has been stored for more than six months: the calibration accuracy may be adversely affected.

Use potassium chloride powder of the best quality commercially available. Dry the powder for two hours at 105°C, and cool it down, in a desiccator. Weigh out an appropriate amount of dried and cooled potassium chloride powder according to the table below. Make the potassium chloride standard solution as shown.

Table 3 Making the potassium chloride standard solution

KCl standard solution	KCl weight g	Conductivity* mS/cm	Range to be calibrated mS/cm
0.005N	0.373	0.718	0-1
0.05N	3.73	6.67	1-10
0.5N	37.28	58.7	10-100

* Value at the temperature, 25°C

To prepare the standard solution, use a 1-liter volumetric flask. First, dissolve the KCl in a small amount of de-ionized or distilled water. Then fill the flask with de-ionized or distilled water up to the 1-liter line. Finally, shake the solution to mix it thoroughly.

1. Zero calibration

This calibration is carried out in atmospheric air; no solution is needed.

Preparation

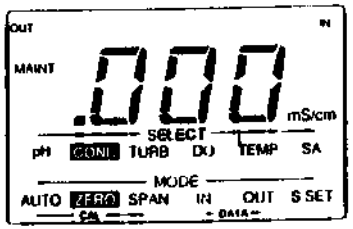
Wash the probe 2-3 times, using de-ionized or distilled water. Shake the probe to remove any water droplets from the COND sensor. Then allow it to dry by exposing it to fresh air.

Operation

1. Use the MODE Key to move the lower cursor to ZERO.

2. Use the SELECT Key to move the upper cursor to COND.

3. Use the UP/DOWN Keys to set the readout to zero.



4. Press the ENT Key. This completes the zero calibration for COND.

2. Span calibration

This procedure uses a standard solution of potassium chloride. For best results, a fresh batch of the solution should be prepared each time. See page 27 for details.

Preparation

Wash the probe 2-3 times using de-ionized or distilled water. Following this, wash it 2-3 times in the KCl standard solution you have prepared. Then place the probe in a beaker of the KCl solution maintained at a temperature of 25±5°C.

Operation

1. Use the MODE Key to move the lower cursor to SPAN.

2. After the readout stabilizes, as you did for the pH calibration, use the UP/DOWN Keys to select set the value of the KCl standard solution, referring to the KCl table.

3. Press the ENT Key to complete the span calibration for this COND range.

4. Repeat this procedure for the three ranges, using each of three values of KCl standard solutions.

TURB calibration

Use good-quality de-ionized water, which may be considered as having a turbidity of zero. If that is not readily available, distilled water may be used instead. When doing the turbidity zero calibration, it is particularly crucial that you clean the probe thoroughly. Never use a dirty probe; otherwise the calibration will be unreliable.

Preparing the standard solution for TURB span calibration

1. Weigh out 5.0 g of hydrazine sulfate.
2. Dissolve this in 400 m*l* of de-ionized or distilled water.
3. Then weigh out 50 g of hexamethylenetetramine, and dissolve it in 400 m*l* of de-ionized or distilled water.
4. Mix these two solutions, add enough de-ionized or distilled water to make 1,000 m*l*, and stir the mixed solution thoroughly.
5. Allow this solution to stand for 24 hours at a temperature of 25 ±3°C.

   The turbidity of this solution is equivalent to 4000 NTUs. The shelf-life of this solution is six months; i.e., this 4,000-NTU value will remain accurate for a maximum of six months.

   Each time you carry out this calibration, it is necessary to dilute the 4,000-NTU standard solution to prepare an 800-NTU standard solution for calibration. To do this, measure out 50 m*l* of the 4,000-NTU solution into a 250-m*l* measuring flask.

   It is recommended that you use a rubber pipette aspirator for this. Then add de-ionized or distilled water up to the 250-m*l* line.

   The standard solution used here for the turbidity calibration will precipitate easily. Therefore, be sure to stir the solution thoroughly before use.

1. Zero calibration

Preparation

Wash the probe thoroughly 2-3 times using de-ionized or distilled water. Shake off excess water droplets, and then place it in a beaker of de-ionized or distilled water.

Operation

1. Use the MODE Key to move the lower cursor to ZERO.

2. Use the SELECT Key to move the upper cursor to TURB.

3. After the readout has stabilized, set it to 0.0, using the UP/DOWN Keys.

4. Press the ENT Key to complete the zero calibration for TURB.

2. Span calibration

Preparation

Wash the probe thoroughly, using de-ionized or distilled water. Shake off excess water droplets. Then place it in a beaker of the 800-NTU solution you have prepared for this purpose.

Operation

1. Stir this 800-NTU span standard solution thoroughly.

2. Use the MODE Key to move the lower cursor to SPAN.

3. After readout has stabilized, i.e., about 60 to 90 seconds, set the readout to "800" NTU, which is the value for this standard solution.

4. Press the ENT Key to complete the span calibration for TURB.

DO calibration

Unlike the other calibration procedures, the solution for the DO calibration cannot be stored for use; because the amount of dissolved oxygen in the solution is crucial, a fresh batch must be prepared each time, just before it is used in the DO calibration.

1. Zero calibration

Use a solution of sodium sulfite dissolved in either de-ionized water or tap water.

Preparation

1. Add about 50g of sodium sulfite to 1,000 ml of water (either de-ionized water or tap water will do). Stir this mixtuer to dissolve.

2. Wash the probe 2-3 times in tap water, and place it in the zero standard solution.

Operation

1. Use the MODE Key to move the lower cursor to ZERO.

2. Use the SELECT Key to move the upper cursor to DO.

3. After the readout has stabilized, set it to 0.0, using the UP/DOWN Keys.

4. Press the ENT Key. This completes the zero calibration for DO.

2. Span calibration

Use either de-ionized water or tap water that has been saturated with oxygen in air.

Preparation

1. Put 1 or 2 liters of water in a container (either de-ionized water or tap water will do). Use an air pump to bubble air through the solution until it is oxygen-saturated.

2. Wash the probe 2-3 times in tap water, and put it in the span calibration solution.

Operation

1. First, be sure the U-10 is set for fresh water readings. To do this, set the S.SET Sub-Mode to 0.0%.

MODE

2. Then, use the MODE Key to move the lower cursor to SPAN.

3. After the readout has stabilized, while slowly moving the probe up and down in the solution, set the readout value to the appropriate DO value for the temperature of this solution. For DO values at various temperatures, refer to Table 4.

ENT

4. Press the ENT Key to complete the span calibration for DO.

Table 4 Amounts of saturated dissolved oxygen in water at various temperatures, salinity = 0.0%

Temperature	DO	Temperature	DO
0 °C	14.16 mg/l	21 °C	8.68 mg/l
1	13.77	22	8.53
2	13.40	23	8.39
3	13.04	24	8.25
4	12.70	25	8.11
5	12.37	26	7.99
6	12.06	27	7.87
7	11.75	28	7.75
8	11.47	29	7.64
9	11.19	30	7.53
10	10.92	31	7.42
11	10.67	32	7.32
12	10.43	33	7.22
13	10.20	34	7.13
14	9.97	35	7.04
15	9.76	36	6.94
16	9.56	37	6.86
17	9.37	38	6.76
18	9.18	39	6.68
19	9.01	40	6.59
20	8.84		

Section **4**

Data Storage and Printout

The U-10 can store up to 20 sets of data, 120 data points, of the values measured for each of the six parameters: pH, COND, TURB, DO, TEMP, and SALINITY. Values stored in memory can be recalled to the readout as desired.

If a printer is connected to the U-10 printer port, whenever a Data-Set is either stored in memory or recalled to the readout, it can also be simultaneously output to the printer.

Storing data 36
Recalling data 38
Deleting data 40
Printing out data 41

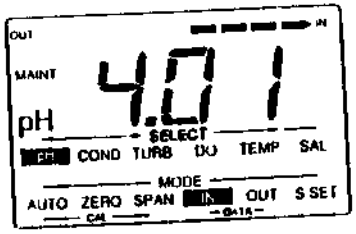
Storing data

MODE 1. Press the MODE Key to put the U-10 in the MAINT mode.

MODE 2. Continue to press the MODE Key to move the lower cursor to IN, the *Input* Sub-Mode.

SELECT 3. Use the SELECT Key to move the upper cursor to the parameter you wish to see on the readout.

ENT 4. When the readout stabilizes on a value, press the ENT Key. This will automatically input the set of six parameters for this measurement into memory.



The readout will first show the Data-Set No. for about two seconds. At the top right-hand corner, a dashed arrow points to IN, showing that data is being input. Then each parameter is automatically read into memory, one-by-one from pH to salinity. The upper cursor skips along to show this. If a printer is connected, these six values will also be printed out at the same time.

The upper cursor then returns to pH, with the U-10 still in the IN Sub-Mode.

ENT 5. You may now continue and input another set of data: simply press the ENT Key again.

The Data-Set No. will automatically advance one digit, and the next set of six parameters will be read into memory in the same manner. This procedure can be repeated for up to a total of 20 Data-Sets.

If 20 Data-Sets have been read into memory, the storage capacity is full and no more data may be input. The U-10 will beep three times to indicate the memory is full.

MODE

6. To return the readout to the previous setting in the MEAS mode, press the MODE Key again.

..ecalling data

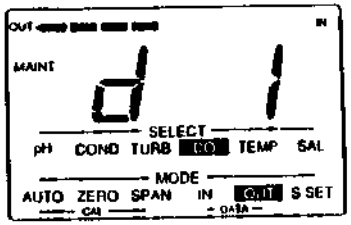
MODE

1. Press the MODE Key to put the U-10 in the MAINT mode.

MODE

2. Continue to press the MODE Key to move the lower cursor to OUT, the *Output* Sub-Mode. The readout will show d.1, meaning Data-Set No. 1.

   At the top left-hand corner, a dashed arrow points to OUT, showing that data can be output now to the readout.



▲ ▼

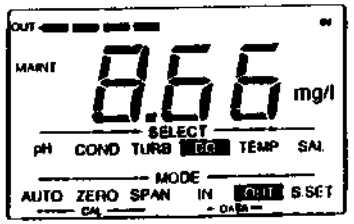
3. Use the UP/DOWN Keys to display the Data-Set No. of the values you wish to recall.

SELECT

4. Use the SELECT Key to move the upper cursor to the parameter you wish to view.

ENT

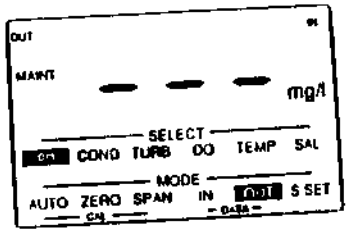
5. Press the ENT Key to display the data on the readout.



If a printer is connected, all six parameters in this Data-Set will also be printed out at the same time.

ENT

6. When the ENT Key is pressed again, the next Data-Set No. is displayed in order, i.e., d2, if two data sets are in memory. At this point, you can either press the ENT Key again to view the contents of this Data-Set, or you can use the UP/DOWN Keys to go up or down to another Data-Set No.
   If a particular Data-Set is empty, three dashes appear on the readout.



MODE

7. To return the readout to the previous setting in the MEAS mode, press the MODE Key again.

Deleting data

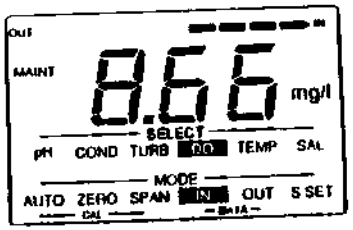
Set the U-10 as if you were going to input data:

MODE

1. Press the MODE Key to put the U-10 in the MAINT mode.

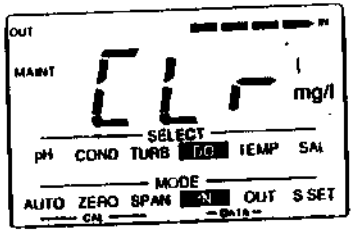
MODE

2. Continue to press the MODE Key to move the lower cursor to IN, the Input Sub-Mode.



CLR

3. Then, to erase all the data from all the Data-Sets in memory, press the CLR Key. The readout will show the message CLr for about two seconds.

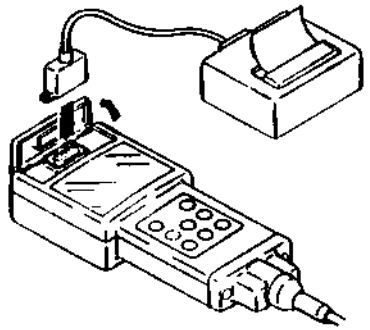


Be careful!
You cannot delete individual Data-Sets. The CLR Key always erases **all** data from memory.

Printing out data

If a printer is connected to the U-10 printer port, whenever a Data-Set is either stored in memory or recalled to the readout, it is also simultaneously output to the printer.

The U-10 printer port is a standard Centronics parallel port. To connect a parallel printer to the U-10: Open the rubber printer-port cover, located directly over the readout on the main unit, and connect the printer cable.



Note:
When a printer is not being used, disconnect the cable from the U-10 printer port, and close the cover tightly.

- **Sample printout**

```
NO. 1 DATE  /  /
 pH      5.0
 COND    1.5    mS/cm
 TURB 390       NTU
 DO      8.5    mg/l
 TEMP   23      °C
 SAL     3.0    %
NO. 2 DATE  /  /
 pH      5.1
 COND    1.3    mS/cm
 TURB 270       NTU
 DO      8.7    mg/l
 TEMP   25      °C
 SAL     0.1    %
NO. 3 DATE  /  /
 pH      5.1
```


Section **5**

Daily Maintenance and Troubleshooting

For accurate measurements and prevention of malfunction, routine careful maintenance of the U-10 is important. In particular, failure to maintain the sensors properly can lead to serious trouble or incorrect measurements. The U-10 is provided with error-code functions for the ready detection of potential problems.

Error codes 44
Normal probe maintenance 47
Replacing faulty sensors 49
Replacing a faulty probe 50

Error Codes

The U-10 has an easy-to-understand error message function so you can spot trouble readily. Error codes are displayed on the readout and the unit will beep if an error occurs.
(Note that if you press an incorrect sequence of keys, the unit will beep three times to indicate you have pushed the wrong key.)

Error Code	Cause	Action
Bad battery Er 1	• Defective or low battery	• Replace battery
Failure in main unit Er 2	• Malfunction of memory backup IC	• Push POWER Key to turn the U-10 ON again. If this error code is still displayed, contact your Horiba dealer for repair or replacement.
Zero-calibration error Er 3	*for all parameters*	
	• Poor connection in probe-to-main unit cable	• Connect the cable securely.
	• Water in one of the sensor sockets	• Dry out the sensor sockets.
	• Temperature of sample exceeds maximum scale of U-10	• Replace the probe.
	for pH	
	• Contaminated pH sensor.	• Clean the pH sensor.
	• Improper concentration of reference solution in reference sensor	• Replace the reference solution.
	for COND	
	• Contaminated COND sensor	• Clean the sensor, using tooth brush and neutral detergent.

Error Code	Cause	Action
	for TURB	
	• Contaminated or defective LED sensor	• Clean out the tube containing the LED turbidity sensor, using test tube brush and neutral detergent. Never use an abrasives or cleansers for this.
	for DO	
	• Broken DO sensor membrane.	• Check the LED turbidity sensor. If it defective, the entire probe must be replaced. Check DO sensor. If defective, replace.
Span-calibration error Er 4	*for all parameters*	
	• Poor connection in probe-to-main unit cable	• Connect the cable securely.
	• Water in one of the sensor sockets	• Dry out the sensor sockets.
	• Temperature of sample exceeds maximum scale of U-10	• Replace the probe.
	for pH	
	• Contaminated pH sensor.	• Clean the pH sensor.
	• Improper concentration of reference solution in reference sensor	• Replace the reference solution.
	for COND	
	• Contaminated COND sensor	• Clean the sensor, using tooth brush and neutral detergent.
	for TURB	
	• Contaminated or defective LED sensor	• Clean out the tube containing the LED turbidity sensor, using test tube brush and neutral detergent. Never use an abrasives or cleansers for this. • Check the LED turbidity sensor. If it defective, the entire probe must be replaced.

Error Code	Cause	Action
Span-calibration error E-4	*DO Auto-calibration* • Broken DO sensor membrane.	• Check DO sensor membrane. If defective, replace. • Leave DO sensor in atmosphere for 30-60 min.
	• Excessive difference between DO sensor temperature and atmospheric temperature.	
	DO aqueous solution calibration • Broken DO sensor membrane.	• Check DO sensor membrane. If defective, replace.
	• Contaminated electrode.	• Clean the electrode using a soft brush, taking care not to scratch membrane.
	• Insufficient agitation of solution.	• Agitate solution thoroughly.
Memory full E-5	• Data-sets for 20 samples are already in memory.	• To delete all data from memory, put the U-10 in the IN Sub-Mode mode and press the CLR Key.
Printer error E-6	• Jammed printer paper.	• Eliminate jamming of printer paper.
	• Poor cable connection. • Wrong printer.	• Replace the cable. • Use proper parallel Centronics printer.
	• Defective printer.	• Replace the printer as necessary.

Normal probe maintenance

Washing the turbidity sensor

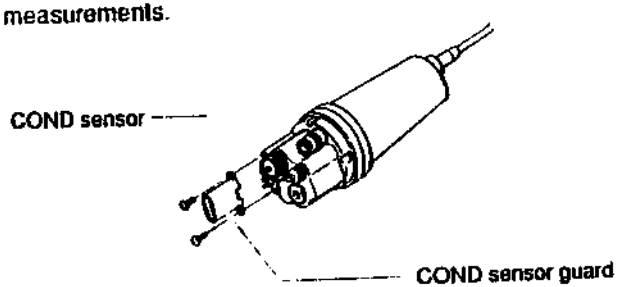
The sensor is a glass tube. Wash out the tube and remove stains carefully, using tap water and a test tube brush.

Be careful not to scratch the inside of the glass tube. Never use abrasives or cleansers.

Cleaning the conductivity sensor

Remove COND sensor guard, and carefully use a soft brush to clean off any dust from the sensor unit.

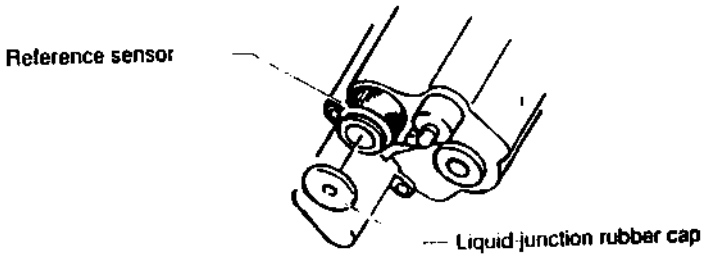
Be sure to replace the COND sensor guard before taking measurements.



Recharging the reference sensor with reference solution

Recharge the reference sensor with reference solution about once every two months, as follows.

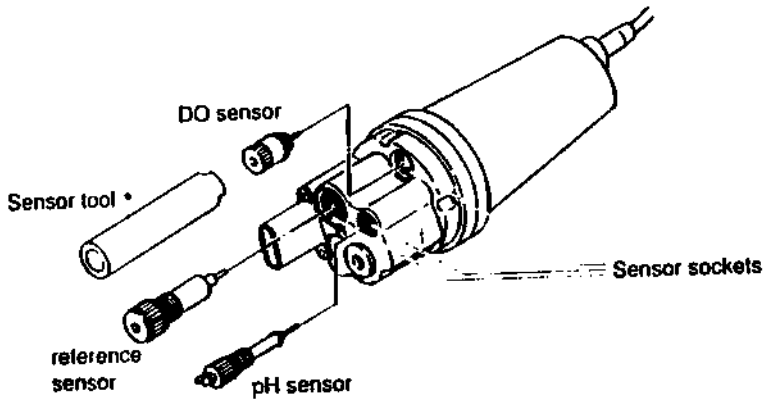
1. Remove the liquid-junction rubber cap from the reference sensor, and pour out the old solution.
2. Fill the reference sensor completely with new reference solution. Make sure there are no air bubbles.
3. Replace the liquid-junction rubber cap.
4. Carefully wash off all excess reference solution from the probe.



Replacing faulty sensors

Three of the U-10's sensors are replaceable: the *pH sensor*, the *reference sensor*, and the *DO sensor*.
These may be replaced as follows.

1. Wipe off any water droplets from the probe.
2. Remove faulty sensor.
3. Insert the new sensor carefully with your fingers.
4. Be careful not to let the sensor sockets get wet.

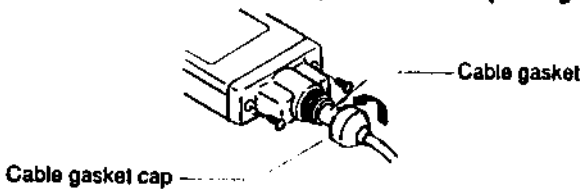


• When replacing the DO sensor, use the sensor tool provided as an accessory.

Replacing a faulty probe

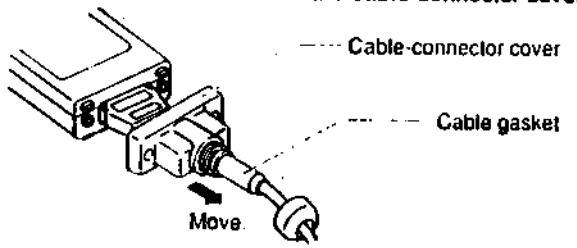
Disconnect the cable from the main unit

1. Loosen the cable gasket cap, and remove cap from gasket.



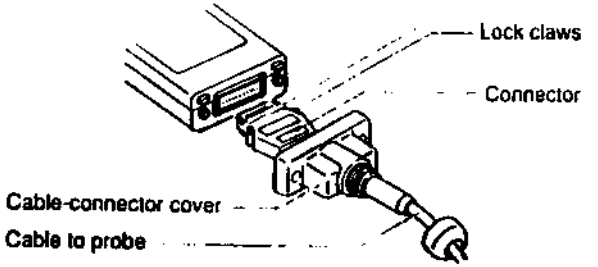
2. Slide back the gasket.

3. Back off the two screws on the cable-connector cover.



4. Slide off the cable-connector cover to expose the connector lock claws.

5. Press lock claws on both sides with your fingers to release the connector. Pull out the connector from the main unit.



Connect the new probe

1. Insert the connector until it clicks.

2. Re-attach the cable-connector cover to the main unit.

3. Slide the cable gasket toward the cable-connector cover, and screw on the cable gasket cap.

Before you use a new probe for the first time, it is necessary to calibrate it manually for all four parameters. Refer to Section 3, "Calibrating the U-10," for instructions on manual calibration.

APPENDIX C

PROJECT ORGANIZATION AND PERSONNEL RESPONSIBILITIES

An organization chart showing the Malcolm Pirnie discipline leaders and field team personnel for this project is presented on Figure C-1. All engineering and field operations shall be conducted by Malcolm Pirnie, Inc. Subcontractors for drilling, data validation, and analytical services are also listed on Figure C-1. Key Malcolm Pirnie personnel responsibilities are outlined below.

- *Project Manager* - The Project Manager (PM) is responsible for overall coordination of project activities including: managing the project staff, communicating with the client, and assuring that all project QC procedures are followed.

- *Technical Director* - The Technical Director (TD) reviews all outputs to ensure that the interpretation and presentation of data collected during the course of the project is technically accurate.

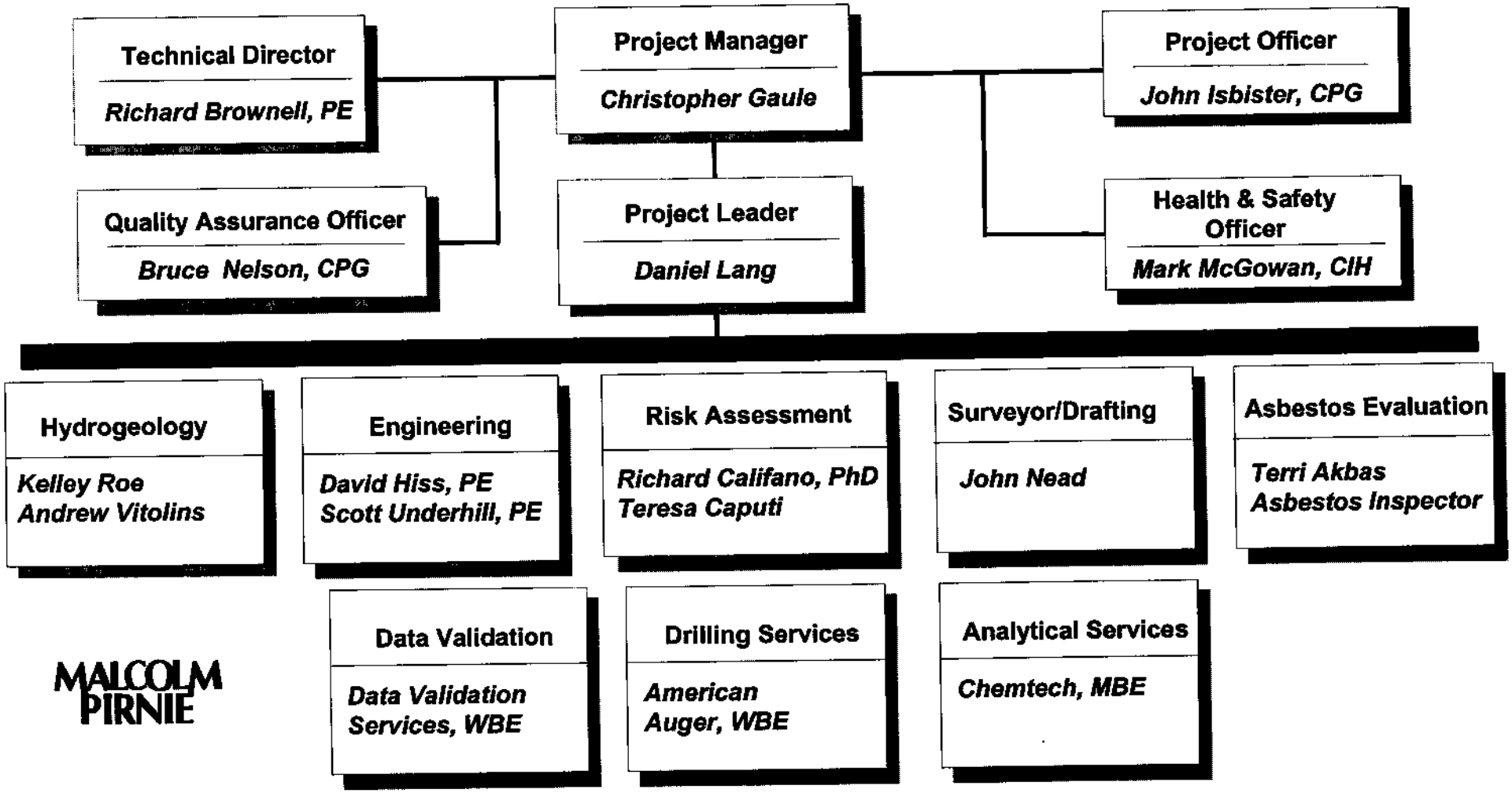
- *Project Officer* - The Project Officer provides corporate support to the project and reviews all outputs to ensure that all work is performed in accordance with the project objectives.

- *Quality Assurance Officer* - The Quality Assurance Officer (QAO) assures that the project is executed in accordance with Malcolm Pirnie's Quality Assurance program and reviews all project-specific QA/QC procedures and methods to ensure that data collected during the course of the project is sufficient to meet the project objectives.

- *Health and Safety Officer* - The Health and Safety Officer reviews all Health and Safety Plans and procedures to ensure that the project is performed in accordance with the appropriate workplace safety regulations.

- *Project Leader* - The Project Leader assists the PM in the coordination of project activities. The Project Leader's responsibilities include: supervision of field staff, communication with the analytical laboratory and other subcontractors, and coordination of data analysis and reporting.

Figure C-1
Project Team Organization
Mohasco Mill Complex SI/RAR
Amsterdam, New York



MALCOLM PIRNIE

F:/P/3518001/WP/ORGCHT.PPT

CHRISTOPHER GAULE
Project Hydrogeologist

EDUCATION

BS Honors (Geology), 1987; North London Polytechnic

ADDITIONAL TRAINING

OSHA Supervisory Training

SOCIETIES

National Ground Water Association - Technical Division

SUMMARY OF EXPERIENCE

Mr. Gaule has over ten years of experience in conducting hydrogeologic investigations for both private and public sector clients; evaluating data and preparing technical reports. His experience includes remedial investigations, feasibility studies, remedial designs, hydrogeologic characterization of potential disposal sites, aquifer protection studies, and facility siting studies. Mr. Gaule has completed numerous oversight projects which involved the review of field techniques completed by other environmental consultants, the projects included the review of aquifer test, hydraulic conductivity testing, and the review and evaluation of the test results. He is familiar with site investigation techniques and has worked in diverse hydrogeologic settings. Mr. Gaule has conducted a wide range of geophysical surveys utilizing various instruments including magnetometer, terrain conductivity meter and single channel seismic logger to evaluate depth to bedrock, fracture zone delineation, landfill profiles, buried sand and gravel lenses and the presence of buried drums.

DETAILED EXPERIENCE

1991 - Present Malcolm Pirnie, Inc.

- Responsible for RCRA investigations and RCRA Closure Plans at several areas of concern at a large military installation in the Albany area, where the bedrock aquifer has been contaminated with chlorinated solvents and petroleum products. The investigations have included packer testing within the bedrock and pumping tests to evaluate the area of influence for potential recovery efforts.

- Evaluated and aided in the preparation of a Phase II investigation and Phase I remediation at a petroleum spill site where the fractured bedrock aquifer was contaminated with NAPL. The investigation techniques used included the installation and pumping of large diameter wells and the analysis of the aquifer test results. Also assisted in the preparation of a feasibility study report and remedial treatment system design.

- Supervised and evaluated data from a 72-hour aquifer test to determine the area of influence/zone of capture, and performance of a recovery well, in a sole-source aquifer, to control the migration of groundwater contaminated with volatile organic compounds to a municipal supply well serving 45,000 residents.

- Responsible for the implementation of an Initial Site Assessment and Comprehensive Site Assessment (ISA/CSA) study for the inactive Brimbal Avenue Landfill in the City of Beverly, Massachusetts. The studies

DETAILED EXPERIENCE (continued)

1991 - Present Malcolm Pirnie, Inc. (Continued)

involve evaluation of existing site conditions, the preparation of an up-dated topographic map. The CSA includes the installation and sampling of groundwater monitoring wells, and the preparation of a Baseline Risk
Assessment for determination of corrective measures for the site. Mr. Gaule also evaluated use of alternative grading materials to reduce the cost of closure for the City.

- Conducted several Phase I Site Assessments throughout the United States in accordance with the ASTM guidance documents.

- At a 75-acre municipal/industrial landfill Federal Superfund site in Upstate New York, he participated in the installation of bedrock monitoring wells along with the completion of bedrock pumping tests. The monitoring wells were installed to investigate the extent of a non-aqueous phase liquid (NAPL) on the ground water.

- Evaluated and prepared Remedial Investigation Studies at a former brass foundry in the Albany Area, contaminants of concern are metals and chlorinated solvents. During the investigation DNAPL was detected and additional studies under the direction of Mr. Gaule were conducted to evaluate the nature and extent of DNAPL contamination. At the same site Mr. Gaule aided in the preparation of a Feasibility Study for the remediation of a foundry sand disposal area.

- Managed several Phase I and Phase II investigations at sites which have been contaminated with chlorinated solvents.

- Researched and prepared a report evaluating wellhead protection programs and regulations for the northeastern United States, aiding a municipal client in developing an aquifer protection program.

- Performed a Remedial Investigation of a pesticide formation and application facility. The investigation included grid-based surface soil sampling to identify potential source areas due to past operating practices, soil borings to investigate a former product disposal pit, and monitoring wells to evaluate the extent of groundwater contamination which had affected nearby residential wells; and evaluated the use of field screening techniques to reduce the cost of laboratory expenses.

- Prepared the Work Plan and Monitoring Well Installation Plan for the Remedial Investigation of several sites contaminated with petroleum products, solvents and pesticides at a large military facility in Upstate New York.

- Supervised and evaluated Phase I remediation activities at a former gas station. Tasks included recovery well installation and pumping of a bedrock aquifer to determine long-term pumping rates and aquifer performance.

1987 - 1991 Dunn Geoscience Corporation

- Conducted a subsurface investigation for the purposes of delineating NAPL at a terminal in the Port of

Rensselaer, New York, and implemented a remediation system for the collection of free-phase petroleum product.

(continued)

DETAILED EXPERIENCE (continued)

1987 - 1991 Dunn Geoscience Corporation (Continued)

- Managed several sub-surface investigations and geophysical surveys at industrial facilities in Texas, New York, Wisconsin, Maryland, Connecticut, Indiana, Vermont and New Jersey. Project management experience involved client contacts, subcontractor supervision, work plan preparation, report preparation and budget review.

- Conducted a Remedial Investigation, under the New York State Superfund Program, at a pesticide/herbicide spill site in western New York. The work involved the oversight of drilling and excavation activities, field screening of soils for pesticides, and drum sampling.

- Conducted and analyzed data generated from a fractured bedrock aquifer pumping test for the purposes of meeting the increased snow making capacity and condominium usage for Pico Ski resort in Vermont.

- At a site along the Niagara River which was contaminated with dense chlorinated solvents, evaluated the hydrogeologic data produced from several phases of work and assisted in the completion of the Remedial Investigation and Feasibility Study reports.

- Oversaw the soil sampling program and installation and sampling of monitoring wells at a large industrial facility in New Jersey which included lagoons and landfills. Evaluated hydrologic and chemical data generated during the Remedial Investigation and assisted in the preparation of the Remedial Investigation report.

- Project Manager for the hydrogeologic investigation of several construction and demolition waste landfills in Upstate New York, under the New York State Superfund Program.

- Conducted the installation of several monitoring wells at the underground storage tank facility at Albany County Airport for means of determining the presence or absence of NAPL on the water table.

- Prepared several preliminary assessment reports under the New York State Superfund Program.

- Responsible for hydrogeologic investigations for the environmental site assessment department and conducted investigations nationwide.

- Conducted sub-surface investigations and sampling at RCRA facilities, evaluated the data and prepared reports.

- Used geophysical methods and soil borings to evaluate the potential of a sand and gravel aquifer for a municipal wellfield.

CHRISTOPHER GAULE
Project Hydrogeologist

PUBLICATIONS/PRESENTATIONS

Eastern Regional Ground Water Issues, National Ground Water Association. Evaluation of Petroleum Hydrocarbon Contamination of a Fractured Bedrock Aquifer: A Case Study for Pump and Treat Remediation.

Technical Symposium, September 10-11, 1993, An Interim Remedial Measure for a Sole-Source Aquifer.

BRUCE R. NELSON
Associate

EDUCATION

BA (Geology), 1977; Carleton College
MA (Geological Sciences), 1979; State University of New York at Binghamton
Remediation of Hazardous Waste Sites (1985)
IBM PC Applications in Ground Water Pollution and Hydrology (1990)
Design of Groundwater Contaminant Capture Systems: Decision Analysis and Optimization (1993)

REGISTRATION

Certified Professional Geologist, American Institute of Professional Geologists

SOCIETIES

National Ground Water Association - Technical Division
Association of Ground Water Scientists and Engineers - Environmental Site Assessment
Committee Member

SUMMARY OF EXPERIENCE

Mr. Nelson has over 17 years experience in both the public and private sector and has evaluated a wide variety of solid and hazardous waste disposal sites. He has managed remedial investigations, feasibility studies, remedial designs, hydrogeologic characterization of potential disposal sites, aquifer protection studies, and facility siting studies. He is familiar with site investigation techniques and has worked in diverse hydrogeologic settings.

DETAILED EXPERIENCE

1988 - Present Malcolm Pirnie, Inc.

- Managed the Superfund RI/FS of a 75-acre municipal/industrial landfill contaminated with PCBs, solvents, and non-aqueous phase liquid (NAPL) in upstate New York. The RI included the characterization of contaminant migration in fractured bedrock by vertical borehole sampling. Managed the wetland delineation, biological sampling, human health and ecological risk assessments. The selection of the remedy included the use of the USEPA's Presumptive Remedy for municipal landfills for capping of the four separate waste areas. A fractured bedrock trench was selected to remediate the portion of the site where NAPL was present.

- Managed the design, installation, and testing of a recovery well system in a sole-source aquifer, to control the migration of VOC-contaminated ground water to a municipal supply well serving 45,000 residents in upstate New York. Managed the development of the recovery well monitoring program and the Environmental Monitoring Plan for the source of VOCs, an adjacent 60 acre municipal/industrial landfill.

- Developed and implemented the Environmental Monitoring Plan (EMP) for a 35 acre municipal/industrial landfill in upstate New York. The EMP focussed on reducing long-term operation costs by limiting the monitoring wells which were included and by focussing on low-flow purging methods. To date, the EMP results indicate that a multi-million dollar groundwater remedy can be avoided.

- Managed the groundwater assessment for a 10 million gallon lagoon system adjacent to a major tidal river. The work was conducted for two industries which jointly operate the lagoons, in anticipation of one industry withdrawing from the system. Work tasks included a soil gas survey, hydraulically installed temporary well points, field screening with a GC, and a tidal influence study.

DETAILED EXPERIENCE (continued)

1988 to Date — Malcolm Pirnie, Inc. (continued)

- Managed the RI/FS of a pesticide formulation and application facility, including grid-based surface soil sampling to identify potential source areas due to past operating practices, soil borings to investigate a former product disposal pit, and monitoring wells to evaluate the extent of ground water contamination which had affected several nearby residential wells. Assisted in negotiating a favorable long-term remedy of hot spot excavation and groundwater monitoring.

- Supervised the hydrogeologic investigations at a Department of Defense facility in Philadelphia which is underlain by approximately one million gallons of jet fuel. This work was in support of possible litigation and lead to the identification of an off-site source of the jet fuel. This work included NAPL bail-down tests, soil borings, monitoring wells, and petroleum fingerprinting.

- Analyzed aquifer test data for the expansion of a municipal landfill in the Albany Pine Bush. Conducted a hydrogeologic investigation of a wetland adjacent to the landfill expansion and assisted in the design of a wetland mitigation project.

- Conducted the hydrogeologic investigation and subsequent recovery of a release of product at the Port of Rensselaer petroleum terminal. Investigation included test pits, soils borings, monitoring wells, aquifer testing and installation of a recovery system.

- Participated in a major hydrogeologic investigation of a potential land disposal facility, in preparation for a New York State hazardous waste facility application. The investigation included soil borings, monitoring wells, aquifer tests, ground water and surface water sampling and geophysical surveys.

- Supervised the Site Investigation of an inactive hazardous waste site where a spill of solvents and paint wastes had occurred. The Site Investigation included a soil vapor survey, soil borings, monitoring wells, and sampling of soil, sediment and ground water. Based on the results of this work the site has been removed from the Registry of Inactive Hazardous Waste Disposal Sites.

- Conducted an aquifer protection study for a municipal wellfield in a sole-source unconfined aquifer. Designed and analyzed aquifer tests to determine aquifer protection zones.

- Evaluated the efficiency, including pumping rates and capture zone, of an existing ground water containment and treatment system for a hazardous waste site in upstate New York.

- Conducted the solid waste facility siting portion of a regional solid waste management plan. Developed and applied criteria for siting recycling, waste-to-energy, and disposal facilities in an approximately 500-square-mile planning unit comprised of diverse hydrogeologic settings.

- Supervised hydrogeologic investigation of a hazardous waste site in upstate New York. Coordinated soil boring and monitoring well installations and on-site health and safety. Conducted and evaluated geophysical surveys. Evaluated analytical and hydrogeologic data, prepared Remedial Investigation Report and participated in the Feasibility Study and selection of the recommended remedial alternative.

(continued)

DETAILED EXPERIENCE (continued)

1987 — Donohue and Associates, Inc.

- Participated in the investigation of federal and state Superfund sites in Michigan. Sites includes PCB-contaminated river sediments, abandoned drummed waste, underground storage tanks, and a pesticide manufacturing facility.

1980 - 1986 — Minnesota Pollution Control Agency

- As a Senior Hydrogeologist, directed and reviewed Remedial Investigations of federal and state superfund sites. Sites included major Twin Cities metropolitan municipal landfills.

- Evaluated data for disposal sites with suspected ground water contamination and initiated Superfund process, where appropriate. Reviewed hydrogeologic portions of permit applications for municipal and industrial waste landfills.

- Developed the surface and groundwater portions of the Minnesota's rules governing the location, design, and operation of hazardous waste disposal, storage, and treatment facilities. Assured compliance with federal rules so that EPA authorization of Minnesota's program was received.

- Developed criteria for evaluating the hydrogeology of hazardous waste disposal sites resulting from a legislatively mandated state-wide siting effort. Applied criteria and testified and received comments at public hearings.

PUBLICATIONS

Nelson, Bruce R. and P.R. Book, Monitoring for Volatile Organic Hydrocarbons at Minnesota Sanitary Landfills, Proceedings of the Ninth Annual Madison Waste Conference, September 9 - 10, 1986, University of Wisconsin - Madison.

Nelson, Bruce R., K.J. Goldstein and L.A. Hobert, Hydrogeologic Evaluation of Glaciolacustrine Sediments: A Case Study, Proceedings of the FOCUS Conference on Eastern Regional Ground Water Issues, October 29-31, 1991.

Association of Ground Water Scientists and Engineers, Guidance of Environmental Site Assessments, Contributing Author, May 1992.

HEALTH AND SAFETY PLAN

BROWNFIELDS SITE INVESTIGATION/REMEDIAL ALTERNATIVES REPORT

Former Mohasco Mill Complex
Amsterdam, New York

CITY OF AMSTERDAM, NEW YORK

Prepared by:

Malcolm Pirnie, Inc.
15 Cornell Road
Latham, New York 12110

September 1998
3518001

MALCOLM PIRNIE

SITE SPECIFIC SAFETY AND HEALTH PLAN

SECTION 1: GENERAL INFORMATION & DISCLAIMER

CLIENT NAME:	City of Amsterdam	PROJECT NAME:	Former Mohasco Mill Complex
PROJECT MANAGER:	Chris Gaule		
PROJECT LEADER:	Dan Lang	REVISION DATE:	
SITE HEALTH & SAFETY OFFICER:	Andy Vitolins		
PREPARED BY:	Nicole Foley	DATE:	July 1998

NOTE: This Site Specific Safety and Health Plan (SSSHP) has been prepared for use by Malcolm Pirnie, Inc. employees for work at this site. Malcolm Pirnie, Inc. is not responsible for its use by others. **The plan is written for the specific site conditions, purposes, tasks, dates and personnel specified and must be amended and reviewed by those named in Section 16 if these conditions change.**

Subcontractors shall be solely responsible for the health and safety of their employees and shall comply with all applicable laws and regulations. In accordance with 1910.120(b)(1)(iv) and (v), Malcolm Pirnie, Inc. will inform subcontractors of the site emergency response procedures, and any potential fire, explosion, health, safety or other hazards by making this Site Specific Safety and Health Plan and site information obtained by others available during regular business hours. All contractors and subcontractors are responsible for: (1) developing their own Health and Safety Plan including a written Hazard Communication Program and any other written hazard specific programs required by federal, state and local laws and regulations; (2) providing their own personal protective equipment; (3) providing documentation that their employees have been health and safety trained in accordance with applicable federal, state and local laws and regulations; (4) providing evidence of medical surveillance and medical approvals for their employees; and (5) designating their own site safety officer responsible for ensuring that their employees comply with their own Health and Safety plan and taking any other additional measures required by their site activities.

If an upgrade to Level "C" or above is anticipated, this Site Specific Safety and Health Plan must be reviewed/approved by Health and Safety, Corporate.

SECTION 2: PROJECT INFORMATION

(1) SITE INFORMATION

Site Name: Former Mohasco Mill Complex

Address: Forest Avenue and Lyon Street

Amsterdam, N.Y.

Site Project Client Contact: Karl Gustafson

Phone No.: (518) 843-5190

Site Health & Safety Contact: n/a

Phone No.: n/a

(2) SITE CLASSIFICATION: (check and circle all that apply)

	Hazardous (RCRA)	Brownfields	Other
	Construction		
	Sanitary or C and D Landfill	Explain:	
	First Entry		
	Hazardous (CERCLA/ State Superfund)		
	UST/LUST		
X	Manufacturing		
	Previously Characterized		
	Active		
X	Inactive		

(3) ENTRY OBJECTIVES AND DATES OF FIELD VISIT(S):
Malcolm Pirnie will enter the site from late summer 1998 to fall 1998 to conduct a Brownfields funded site investigation..

(4) MALCOLM PIRNIE TASKS:

Bedrock field mapping	Lead Paint/Asbestos Survey
Collect soil and groundwater samples	Measure groundwater levels
Oversee drilling activities	Survey well locations, tests pits and soil borings
Oversee test pit excavations	
Monitoring well development	

TASKS PERFORMED BY OTHERS:
Soil borings and well installation
Monitoring well development and groundwater sampling
Test pit excavation

(5) PROJECT ORGANIZATION AND COORDINATION - The following Malcolm Pirnie personnel are designated to carry out the stated project job functions on site. (Note: One person may carry out more than one job function.)

	PROJECT MANAGER	Chris Gaule
	SITE SAFETY OFFICER	Andy Vitolins
	ALTERNATE SITE SAFETY OFFICER	Nicole Foley
	PUBLIC INFORMATION OFFICER	Chris Gaule
	SITE RECORDKEEPER	Andy Vitolins
	ON-SITE PERSONNEL WITH CPR/FA	Andy Vitolins
	FIELD TEAM LEADER	Andy Vitolins
	FIELD TEAM MEMBERS	Nicole Foley
		Jason Kappel
		Dan Lang
		John Nead
VISITORS:	FEDERAL AGENCY REPS	
	STATE AGENCY REPS	Dan Davidson
	LOCAL AGENCY REPS	Erin Harzinski
		Karl Gustafson
SUBCONTRACTORS:-	SUBCONTRACTOR(S) SITE SAFETY OFFICERS	American Auger
		Star Environmental

All personnel arriving or departing the site should log in and out with the RECORDKEEPER.

(6) ONSITE CONTROL

Andy Vltolins has been designated to coordinate access control and security for Malcolm Pirnie operations on site. A safe perimeter has been established at approximately 20 feet around each site activity

No unauthorized person should be within this area.

The onsite Command Post and staging area have been established at site activity where field team members will be located

The prevailing wind conditions are NW. A wind direction indicator is used to determine daily wind direction. The Command Post is located upwind from the Exclusion Zone or at a sufficient distance to prevent exposure should a release occur.

Control boundaries have been established and Exclusion Zone(s) (the contaminated area) have been identified. (Attach site map)

These boundaries are identified by: 20 foot radius around each site activity

SECTION 3: PHYSICAL HAZARDS INFORMATION

(1) IDENTIFY POTENTIAL PHYSICAL HAZARDS TO WORKERS:

____ Confined Space	____ Steep/uneven terrain	____ Surface water
_X_ Heavy equipment	____ Heat stress	____ Drum handling
X Moving parts	____ Extreme cold	X Noise
____ Heavy Lifting	____ Ionizing Radiation	____ Non-Ionizing Radiation
____ Electrical	____ Traffic	____ Falls
_X_ Overhead Hazards	____ Biological Hazards	

Describe other unsafe environments

(2) SAFETY EQUIPMENT REQUIRED FOR MALCOLM PIRNIE EMPLOYEES

____ Explosimeter	_X_ Eye Wash	____ Snake Bite Kit
____ Fall Protection	____ Emergency Shower	____ Floatation Device (USCG Type III)
Equipment	_X_ Barrier Tape	X Emergency Air Horn
____ Confined Space	____ Traffic Cones	____ Lights
Equipment	____ Stretcher	____ Lights - emergency
____ Ladder	X A-B-C Fire Extinguisher	____ Communications - On Site
_X_ First Aid Kit	____ Tick Repellant	_X_ Communications - Off Site

Describe other

SECTION 4: CHEMICAL HAZARDS INFORMATION

(1) IDENTIFIED CONTAMINANTS

Known or suspected hazardous/toxic materials (attach historical information, physical description, map of contamination and tabulated data, if available)

Media	Substances Involved	Characteristics	Estimated Concentrations	PEL
GW/SL	acetic acid.	CC	unknown	10 ppm
	sulfuric acid.	CA	unknown	1 mg/m^3
	hydrogen peroxide.	RE	unknown	1 ppm
	hydrosulfides.	RE	unknown	
	metalized dyes.		unknown	
	PCBs.		unknown	
	solvnts/petr. products	VO	unknown	
	asbestos/lead		unknown	

Media types: GW (ground water), SW (surface water), WW (wastewater), AIR (air), SL (soil), SD (sediment), WL (waste, liquid), WS (waste, solid), WD (waste, sludge), WG (waste, gas), OT (other).

Characteristics: CA (corrosive, acid), CC (corrosive, caustic), IG (ignitable), RA (radioactive), VO (volatile), TO (toxic), RE (reactive), BIO (infectious), UN (unknown), OT (other, describe)

(2) DESCRIBE POTENTIAL FOR CONTACT WITH EACH MEDIA TYPE FOR EACH OF THE MPI TASKS LISTED IN SECTION 2.4:

MPI TASK #	ROUTE OF	POTENTIAL FOR	METHOD OF
Soil Sampling	SL-Contact	Low	PPE*
Well Devel.	GW - Contact	Low	PPE
GW Sampling	GW- Contact	Low	PPE
Test Pit Exc.	SL- Contact	Low	PPE
Abes/Pb Surv			PPE

* PPE = Personal Protective Equipment

The Site Safety Officer will brief the MPI field team on symptoms and signs of overexposure to chemical hazards.

SECTION 5: HAZARD COMMUNICATION PROGRAM

If chemicals are introduced to the site by Malcolm Pirnie, Inc. (e.g., decontamination liquids, preservatives, etc.), bring a copy of the Malcolm Pirnie, Inc. Hazard Communication Program and Material Safety Data Sheets (MSDSs) to the site. The Site Safety Officer will review this information with all field personnel prior to the start of the project. The Comprehensive List of Chemicals for this site is:

Alconox

Nitric Acid (10% solution)

Hexane

Notes:

- See Appendix A for MSDS
- Chemicals will only to be used during groundwater and soil sampling.

SECTION 6: ENVIRONMENTAL MONITORING

(1) The following environmental monitoring instruments shall be used on site at the specified intervals.

EQUIPMENT		MONITORING PERIOD		PEL/REL/TLV	ACTION LEVEL
Combustible Gas Indicator	-	continuous/hourly/daily/other		25%	10%
O_2 Monitor	-	continuous/hourly/daily/other		19.5 - 25%	19.5
Colorimetric Tubes (type)	-	continuous/hourly/daily/other			
	-				
	-				
	-				
PID (Lamp 10.2 eV)	-	continuous/hourly/daily/other	Continuous	See below	
FID	-	continuous/hourly/daily/other			
Radiation Meter	-	continuous/hourly/daily/other			
Total Dust Monitor	-	continuous/hourly/daily/other	hourly*	15 mg/m³	30 ug/m³
Toxic Gas Indicator	-				
(Type)	-	continuous/hourly/daily/other			
Other	-	continuous/hourly/daily/other			
	-	continuous/hourly/daily/other			

* If total dust in the work zone exceeds the action limit, site perimeter will be periodically monitored. The monitoring interval will a maximum of 15 minutes. If particulate levels are detected in excess of 150 ug/m³ in the work zone or at the site perimeter, site work will be halted.

(2) Monitoring equipment is to be calibrated according to manufacturers' instructions. Record calibration data and air concentrations in the Health and Safety on-site log book.

(3) Recommended Action Levels for Upgrade or Downgrade of Respiratory Protection or Site Shutdown and Evacuation. These are average values. Consideration should be given to the potential for release of highly toxic compounds from the waste or from reaction by-products. Levels are for persistent (> 10 min) breathing zone measurements.

Uncharacterized Airborne Vapors or Gases	Characterized Gases, Vapors, Particulates*
Level D Background*	Up to 50% of PEL, REL or TLV
Level C Up to 5 ppm above background	Up to 25 times PEL, REL or TLV
Level B 5 ppm to 500 ppm above background	Up to 500 times PEL, REL or TLV
Level A 500 ppm to 1000 ppm above background	Up to 1000 times PEL, REL or TLV
*Off-site "clean" air measurement.	*Use mixture calculations (% allowed = $\sum C_n$ / PEL_n) if more than one contaminant is present.

Oxygen Deficiency

Concentration	Action Taken
< 19.5% O_2	Leave Area. Reenter only with supplied-air respirators.
19.5 % to 25% O_2	Work may continue. Investigate changes from 21%.
> 25% O_2	Work must stop. Ventilate area before returning.

Flammability

Concentration	Action Taken
< 10% of LEL	Work may continue. Consider toxicity potential.
10% to 25% LEL	Work may continue. Increase monitoring frequency.
> 25% LEL	Work must stop. Ventilate area before returning.

Radiation

Intensity	Action Taken
< .5 mR/hr	Work may continue.
< 1 mR/hr	Work may continue. Continue to monitor. Notify Corporate Health and Safety and Corporate Health Physicist.
5 mR/hr	Radiation work zone. Work must stop.

SECTION 7: HEALTH AND SAFETY TRAINING AND MEDICAL MONITORING PROGRAM

The project staff is included in the Malcolm Pirnie Health and Safety training and medical monitoring programs. (See the Health and Safety Procedures Manual, Sections 3, 4 and 5.)

NAME	MEDICAL (Date)	HAZWOPER TRAINING INITIAL (Hrs/Date)	HAZWOPER TRAINING REFESHER (Date)	HAZWOPER TRAINING MGR/SUPV (Date)	CPR / FA / BBP (Dates)	FIT TEST (Make/Size/Type/Date)
Jason Kappel	06/98	40 | 10/95	10/97		07/98 | 07/98 |0798	MSA / L / FF / 10/95
Nicole Foley	6/98	40 | 08/97			07/98 | 07/98 |07/98	/ / /
Dan Lang	4/98	40 | 06/92	03/98		07/98 |07/98 | 07/98	MSA / M / FF / 03/96
Chris Gaule	07/97	40 | 05/88	10/97	06/91	03/97 | 3/97 | 3/97	MSA / L / FF /10/95
Andy Vitolins	06/98	40 | 10/95	10/97		07/98 | 07/98 | 07/98	North / -- / FF / 10/95

SECTION 8: PERSONAL MONITORING

The following personal monitoring will be in effect on site:

Personal exposure sampling:

Not applicable at this site.

Medical monitoring: The expected air temperature will be (1) F. If it is determined that heat stress monitoring is required (mandatory for heavy exertion in PPE at temperatures over 70°F) the following procedures shall be followed (describe procedures in effect, i.e., monitoring body temperature, body weight, pulse rate):
(1) - Ranges between 20 to 80 degrees Fahrenheit, depending on season. Heat stress monitoring is not expected to be required.

A copy of personal monitoring results is to be sent to Corporate Health and Safety for inclusion in the Employee's Confidential Exposure Record File.

SECTION 9: CONFINED SPACE ENTRY

(1) WILL CONFINED SPACE ENTRY TAKE PLACE? Yes ____ No X

If yes, attach **Confined Space Entry Program** available from your Branch Health and Safety Coordinator and complete the **Pre-Entry Inspection Checklist** and **Confined Space Entry Permit** prior to entering each confined space, each work shift. The Confined Space Permit must be posted outside the confined space.

Permits will be saved and logged with project documentation.

SECTION 10: COMMUNICATIONS PROCEDURES

The following standard hand signals will be used in case of failure of radio communications:

Hand gripping throat	-	Out of air, can't breathe
Grip partner's wrist or both hands around wrist	-	Leave area immediately
Hands on top of head	-	Need assistance
Thumbs up	-	OK, I am all right, I understand
Thumbs down	-	No, negative

If applicable, telephone communication to the Command Post should be established as soon as practicable. The stationary and/or mobile phone number(s) are N/A and N/A.

SECTION 11: DECONTAMINATION PROCEDURES

Personnel and equipment leaving the Exclusion Zone shall be thoroughly decontaminated. The Site Safety Officer is responsible for monitoring adherence with this decontamination plan. The standard level D decontamination protocol shall be used with the following decontamination stations*:

(1) Level "D" protection will be provided for all of the professionals working on this project. It will consist of work clothes, gloves,

(2) eye protection devices, and steel-toe shoes for the professionals working at or visiting the site. Upon exiting the work zone,

(3) obviously contaminated boots and gloves will be removed and cleaned or discarded as necessary.

(4) thoroughly wash outer boot covers with detergent-water solution and rinse with copious amounts of water.

(5)

(6)

(7)

(8)

(9)

(10)

Other

*See the Malcolm Pirnie Health and Safety Procedures Manual, Section 8, Personal Protective Equipment, for sample decontamination station descriptions.

The following decontamination equipment is required:

Detergent (Alconox)/Water solution will be used as the decontamination solution.

SECTION 12: EMERGENCY PROCEDURES

The following standard emergency procedures will be used by onsite personnel. The Site Safety Officer shall be notified of any onsite emergencies and be responsible for ensuring that the appropriate procedures are followed.

Personnel Injury in the Exclusion Zone: Upon notification of an injury in the Exclusion Zone, the designated emergency signal Airhorn shall be sounded. All site personnel shall assemble at the decontamination line. An outside rescue team summoned by the field team leader or SSO will enter the Exclusion Zone (if required) to remove the injured person to the hotline. The Site Safety Officer and Field Team Leader should evaluate the nature of the injury, and the affected person should be decontaminated to the extent possible prior to movement to the Support Zone. The onsite CPR/FA personnel shall initiate the appropriate first aid, and contact should be made for an ambulance and with the designated medical facility (if required). No persons shall reenter the Exclusion Zone until the cause of the injury or symptoms is determined.

Personal Protective Equipment Failure: If any site worker experiences a failure or alteration of protective equipment that affects the protection factor, that person and his/her buddy shall immediately leave the Exclusion Zone. Reentry shall not be permitted until the equipment has been repaired or replaced.

Fire/Explosion: Upon notification of a fire or explosion on site, the designated emergency signal Airhorn shall be sounded and all site personnel assembled at the decontamination line. The fire department shall be alerted and all personnel moved to a safe distance from the involved area.

Other Equipment Failure: If any other equipment on site fails to operate properly, the Field Team Leader and Site Safety Officer shall be notified and then determine the effect of this failure on continuing operations on site. If the failure affects the safety of personnel or prevents completion of the Work Plan tasks, all personnel shall leave the Exclusion Zone until the situation is evaluated and appropriate actions taken.

The following emergency escape routes are designated for use in those situations where egress from the Exclusion Zone can not occur through the decontamination line (attach map if available):

_____

_____

_____

_____

In all situations, when an onsite emergency results in evacuation of the Exclusion Zone, personnel shall not reenter until:

1. The conditions resulting in the emergency have been corrected.
2. The hazards have been reassessed by the SSO.
3. The Site Safety Plan has been reviewed by the SSO and Corporate Health and Safety Manager.
4. Site personnel have been briefed on any changes in the Site Safety Plan by the SSO.

SECTION 13. EMERGENCY INFORMATION

TO BE POSTED IN SITE-TRAILER/OFFICE AND IN FIELD VEHICLES

(1) LOCAL RESOURCES

Ambulance (name):	Montgomery County 911	Phone:	911
Hospital (name):	Montgomery County 911	Phone:	911
Police (local or state):	Montgomery County 911	Phone:	911
Fire Dept. (name):	Montgomery County 911	Phone:	911
HAZ MAT Responder:	Montgomery County 911	Phone:	911
Nearest phone:	Convenience Store on Forest Ave.		
On-Site CPR/FA(s):	Andy Vitolins		

The hospital is 10 minutes from the site and the ambulance response time is 10 minutes. Mr. Mike Mancini of St. Mary's Hospital was contacted on 07/31/98 and briefed on the situation, the potential hazards, and the substances involved. When IDLH conditions exist, arrangements should be made for onsite standby of emergency services.

(2) DIRECTIONS TO NEAREST HOSPITAL - ATTACH MAP:

Turn Left onto Lyon Street towards Locust Avenue

Turn Left onto Locust Avenue

Turn Left onto Prospect Street

Turn right onto State Route 67

Turn right at the intersection of State Route 5 to Stay on State Route 67. Look for Guy Park Avenue on the right. Turn Right onto Guy Park Avenue - Hospital is on the left.

(3) CORPORATE RESOURCES

Mark A. McGowan, CIH, CSP Manager, Corporate Health & Safety	914-641-2484 Work
Joseph M. Golden, CET, REMT-P	914-641-2978 Work
Alan Fellman, PhD Corporate Health Physicist	201-529-4700 Work
Bruce Nelson	(518) 786-7349 (W) ; (518) 861-6345 (H)
(Branch Health & Safety Coordinator)	
Elayne F. Theriault, M.D. Environmental Medicine Resources, Inc. (Corporate Medical Consultant)	800-229-3674 24 Hour Number
Occupational Medical Services	(518) 482-0666
(Branch Medical Consultant)	
MPI Emergency Contact Number:	**800-478-6870**

(4) WHOM TO NOTIFY IN CASE OF ACCIDENT:
Chris Gaule (518) 786-7349 (w) (518) 766-4981 (home)

Also notify: Brenda Verdesi, MPI Benefits Administrator (914) 641-2551
MPI Legal Department (914) 694-2100

SECTION 14: PROTECTIVE EQUIPMENT LIST

TASK*	RESPIRATORS & CARTRIDGE*	USE	CLOTHING	GLOVES	BOOTS	OTHER
Soil Boring/ Well Install	D	UP	C	L/T	S	L/H/N
GW, Soil Sampling	D	UP	C	L/T	S	L
Surveying	D	–	C	N/A	S	N/A
Water Level Msrmt	D	–	C	L	S	N/A
Test Pit	D	UP	C	L	S	H
Asbestos/Pb Survey	D	UP	C	L/T	S	L

*Same as in Section 4(2).

RESPIRATORS	APR CARTRIDGES	USE	CLOTHING	GLOVES	BOOTS	OTHER
B = SCBA	O = Organic vapor	Cont = Continuous	T = Tyvek	B = Butyl	F = Firemans	F = Face Shield
APR = APR	G = Organic vapor/acid gas	UP = Upgrade	P = PE Tyvek	L - Latex	L = Latex	G = Goggles
D = N/A	A = Asbestos (HEPA)		S = Saranex	N = Neoprene	N = Neoprene	L = Glasses
E = Escape	P = Particulate		C = Coveralls	T = Nitrile	S = Safety	H = Hardhat
AL = Airline	C = Combination organic vapor & particulate			V = Viton		N = Hearing Protection
	OTH = Other			CN = Cotton		
				P = PVC		
				PA = Polyvinyl Alcohol		
				SS = Silvershield		

SECTION 15: SAFE WORK PRACTICES

THE FOLLOWING PRACTICES MUST BE FOLLOWED BY PERSONNEL ON SITE

1. Smoking, eating, chewing gum or tobacco, or drinking are forbidden except in clean or designated areas.
2. Ignition of flammable liquids within or through improvised heating devices (e.g., barrels) is forbidden.
3. Contact with samples, excavated materials, or other contaminated materials must be minimized.
4. Use of contact lenses is prohibited at all times.
5. Do not kneel on the ground when collecting samples.
6. If drilling equipment is involved, know where the 'kill switch' is.
7. All electrical equipment used in outside locations, wet areas or near water must be plugged into ground fault circuit interrupter (GFCI) protected outlets.
8. A "Buddy System" in which another worker is close enough to render immediate aid will be in effect.
9. Good housekeeping practices are to be maintained.
10. Where the eyes or body may be exposed to corrosive materials, suitable facilities for quick drenching or flushing shall be available for immediate use.
11. In the event of treacherous weather-related working conditions (i.e., thunderstorm, limited visibility, extreme cold or heat) field tasks will be suspended until conditions improve or appropriate protection from the elements is provided.

Site Specific Safe Work Practices: All Malcolm Pirnie personnel within the limits of excavation/work shall wear the prescribed level of personnel protective equipment.

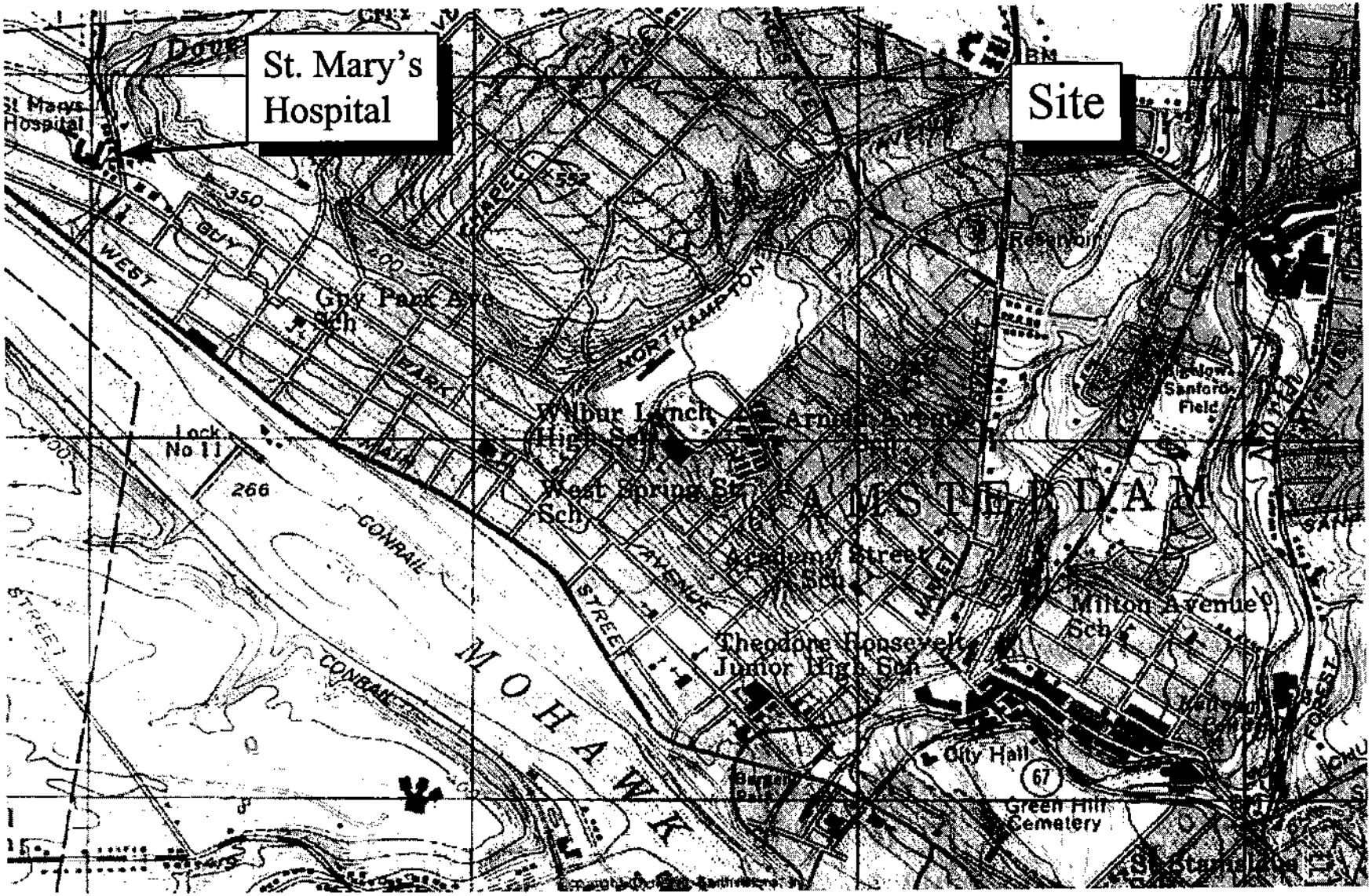
SECTION 16: EMPLOYEE ACKNOWLEDGEMENTS

PLAN REVIEWED BY:

		DATE
Corporate Health & Safety:		
Branch H&S Coordinator:		
Project Manager:		
Project Leader:		

I acknowledge that I have read the information on this Site Safety Plan Short Form and the attached Material Safety Data Sheets (MSDSs). I understand the site hazards as described and agreed to comply with the contents of this Plan.

EMPLOYEE (print name)	SIGNATURE	DATE



SOURCE: U.S.G.S 7.5 MIN. AMSTERDAM QUAD, 1980

MALCOLM PIRNIE

MOHASCO MILL COMPLEX
AMSTERDAM, NEW YORK

APPENDIX A

Material Safety Data Sheets

MEDS1011

Material Safety Data Sheet

be used to comply with
...IA's Hazard Communication Standard.
... CFR 1910.1200. Standard must be
consulted for specific requirements.

U.S. Department of Labor
Occupational Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

IDENTITY (As Used on Label and List): ALCONOX

Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.

Section I

Manufacturer's Name: ALCONOX, INC.

Emergency Telephone Number: (212) 473-1300

Address (Number, Street, City, State, and ZIP Code): 215 PARK AVENUE SOUTH
NEW YORK, N.Y. 10003

Telephone Number for Information: (212) 473-1300

Date Prepared: JANUARY 1, 1991

Signature of Preparer (optional):

Section II — Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity; Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (optional)
THERE ARE NO INGREDIENTS IN ALCONOX WHICH APPEARED ON THE OSHA STANDARD 29 CFR 1910 SUBPART Z.				

Section III — Physical/Chemical Characteristics

Boiling Point	N.A.	Specific Gravity (H_2O = 1)	N.A.
Vapor Pressure (mm Hg.)	N.A.	Melting Point	N.A.
Vapor Density (AIR = 1)	N.A.	Evaporation Rate (Butyl Acetate = 1)	N.A.

Solubility in Water: APPRECIABLE (GREATER THAN 10 PER CENT)

Appearance and Odor: WHITE POWDER INTERSPERED WITH CREAM COLORED FLAKES - ODORLESS

Section IV — Fire and Explosion Hazard Data

Flash Point (Method Used)	Flammable Limits	LEL	UEL
NONE		N.A.	N.A.

Extinguishing Media: WATER, CO_2, DRY CHEMICAL, FOAM, SAND/EARTH

Special Fire Fighting Procedures: FOR FIRES INVOLVING THIS MATERIAL DO NOT ENTER WITHOUT PROTECTIVE EQUIPMENT AND SELF CONTAINED BREATHING APPARATUS

Unusual Fire and Explosion Hazards: NONE

on V — Reactivity Data

y	Unstable		Conditions to Avoid NONE
	Stable	XX	

patibility (*Materials to Avoid*) AVOID STRONG ACIDS

ous Decomposition or Byproducts MAY RELEASE CO, GAS ON BURNING

eous merization	May Occur		Conditions to Avoid NONE
	Will Not Occur	XX	

tion VI — Health Hazard Data

es) of Entry: Inhalation? YES Skin? NO Ingestion? YES

th Hazards (*Acute and Chronic*) INHALATION OF POWDER MAY PROVE LOCALLY IRRITATING TO MUCOUS MEMBRANES. INGESTION MAY CAUSE DISCOMFORT AND/OR DIARRHEA.

rcinogenicity: NTP? NO IARC Monographs? NO OSHA Regulated? NO

ns and Symptoms of Exposure EXPOSURE MAY IRRITATE MUCOUS MEMBRANES. MAY CAUSE SNEEZING.

dical Conditions Generally Aggravated by Exposure RESPIRATORY CONDITIONS MAY BE AGGRAVATED BY POWDER

ergency and First Aid Procedures
ES-FLUSH WITH PLENTY OF WATER FOR 15 MINUTES SKIN-FLUSH WITH PLENTY OF WATER
GESTION-DRINK LARGE QUANTITIES OF WATER.GET MEDICAL ATTENTION FOR DISCOMFORT

ection VII — *Precautions for Safe Handling and Use*

ps to Be Taken in Case Material is Released or Spilled MATERIAL FOAMS PROFUSELY. SHOVEL AND RECOVER AS MUCH AS POSSIBLE. RINSE REMAINDER TO SEWER. MATERIAL IS COMPLETELY BIODEGRADABLE.

Waste Disposal Method SMALL QUANTITIES MAY BE DISPOSED OF IN SEWER. LARGE QUANTITIES SHOULD BE DISPOSED OF ACCORDING TO LOCAL REQUIREMENTS FOR NON-HAZARDOUS DETERGENT.

Precautions to Be Taken in Handling and Storing STORE IN A DRY AREA TO PREVENT CAKING.

Other Precautions NO SPECIAL REQUIREMENTS OTHER THAN THE GOOD INDUSTRIAL HYGIENE AND SAFETY PRACTICES EMPLOYED WITH ANY INDUSTRIAL CHEMICAL.

Section VIII — Control Measures

Respiratory Protection (*Specify Type*) DUST MASK

Ventilation	Local Exhaust NORMAL	Special N.A.	
	Mechanical (General) N.A.	Other N.A.	
Protective Gloves	USEFUL-NOT REQUIRED	Eye Protection	USEFUL-NOT REQUIRED

Other Protective Clothing or Equipment NOT REQUIRED

Work/Hygienic Practices NO SPECIAL PRACTICES REQUIRED

HEXANES

Material Safety Data Sheet

Mallinckrodt Chemical, Inc.
P.O. Box 800
Paris, Ky 40362 Emergency Phone # 314-539-1600

Effective Date: 02-17-95 Supersedes 11-09-92

PRODUCT IDENTIFICATION:

Synonyms: n-Hexane
Formula CAS No.: 110-54-3
Hazardous Ingredients:
n-Hexane, 3-Methylpentane

Molecular Weight: 86.18
Chemical Formula: $CH_3(CH_2)_4CH_3$

PRECAUTIONARY MEASURES

DANGER! EXTREMELY FLAMMABLE. HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS THE CENTRAL AND PERIPHERAL NERVOUS SYSTEMS.

Keep away from heat, sparks and flame. Keep container closed. Use with adequate ventilation. Wash thoroughly after handling. Avoid breathing vapor. Avoid contact with eyes, skin and clothing.

EMERGENCY FIRST AID

Aspiration hazard. If swallowed, DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. In all cases call a physician. SEE SECTION 5.

DOT Hazard Class: PSN: Hexane Class: 3.1 ID#: UN1208 PG II

Physical Data SECTION 1

Appearance: Faint odor.
Odor: Odorless.
Solubility: Insoluble in water.
Boiling Point: ca. 68C (154F)
Melting Point: ca. -95C (-139F)
Specific Gravity: ca. 0.7

Vapor Density (Air=1):3.0
Vapor Pressure (mm Hg):124 @ 20C (68F)
Evaporation Rate:No info found

NFPA Ratings: Health: 1 Flammability: 3 Reactivity: 0

Fire and Explosion Information — SECTION 2

Fire:	Extremely Flammable. Dangerous fire hazard when exposed to heat or flame. Flashpoint: -22 to -26 C (-7 to -15 F). Autoignition temperature: 240-260 C (464-500 F). Flammable limits in air, % by volume: lel: 1.1; uel: 7.5.
Explosion:	Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Contact with oxidizing materials may cause extremely violent combustion.
Fire Extinguishing Media:	Dry chemical, foam or carbon dioxide. Water spray may be used to keep fire exposed containers cool.
Special Information:	In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Water spray may be used to keep fire exposed containers cool. Use chemical safety goggles. Contact lenses should not be worn when working with this material. Vapors can flow along surfaces to distant ignition source and flash back.

Reactivity Data — SECTION 3

Stability:	Stable under ordinary conditions of use and storage. Heat will contribute to instability.
Hazardous Decomposition Products:	Toxic gases and vapors may be released if involved in a fire.
Hazardous Polymerization:	This substance does not polymerize.
Incompatibilities:	Strong oxidizers.

Leak/Spill Disposal Information — SECTION 4

Ventilate area of leak or spill. Remove all sources of ignition. Clean-up personnel require protective clothing and respiratory protection from vapors. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect as hazardous waste and atomize in a suitable RCRA approved combustion chamber, or absorb with vermiculite, dry sand, earth or similar material for disposal as hazardous waste in a RCRA approved facility. Do not flush to sewer!
Reportable Quantity (RQ)(CWA/CERCLA) : 1 lb.
Ensure compliance with local, state and federal regulations.

azard Information — SECTION 5

sure/Health Effects

on: Inhalation of vapors irritates the respiratory tract. Overexposure may cause lightheadedness, nausea, headache, and blurred vision. Greater exposure may cause muscle weakness, numbness of the extremities, unconsciousness and death.

›n: May produce abdominal pain, nausea. Aspiration into lungs can produce severe lung damage. Other symptoms expected to parallel inhalation.

:tact: May cause redness, irritation, with dryness, cracking.

:act: Vapors may cause irritation. Splashes may cause redness and pain.

Exposure: Repeated or prolonged skin contact may defat the skin and produce irritation and dermatitis. Chronic inhalation may cause peripheral nerve disorders.

:ion of :ting Conditions: Persons with pre-existing skin disorders or eye problems or impaired respiratory function may be more susceptible to the effects of the substance. May affect the developing fetus.

ST AID

ıon: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

›n: Aspiration hazard. If swallowed, DO NOT induce vomiting. Give large quantities of water or milk if available. Call a physician immediately. Never give anything by mouth to an unconscious person.

posure: Remove any contaminated clothing. Wipe off excess from skin. Wash skin with soap and water for at least 15 minutes. Get medical attention if irritation develops or persists.

›sure: Wash eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

ICITY (RTECS, 1994)

1 rat LD50: 28710 mg/kg. Irritation eye rabbit 10 mg mild
ga.ed as a tumorigen, mutagen and reproductive effector.

ıtrol Measures — SECTION 6

Limits: n-Hexane [110-54-3]: -OSHA Permissible Exposure Limit (PEL): 50 ppm (TWA) -ACGIH Threshold Limit Value (TLV): 50 ppm (TWA)

ɔn System: A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Respirators ɔproved) If the TLV is exceeded a full facepiece chemical cartridge respirator may be worn, in general, up to the maximum use concentration specified by the respirator supplier. Alternatively, a supplied air full facepiece respirator or airlined hood may be worn.

ɛection: Gloves and lab coat, apron or coveralls.

ɛction: Use chemical safety goggles and/or a full face shield where splashing is possible. Contact lenses should not be worn when working with this material. Maintain eye wash fountain and quick-drench facilities in work area.

and Special Information — SECTION 7

against physical damage. Store in a cool, dry well-ventilated location, m direct sunlight and any area where the fire hazard may be acute. tightly closed containers (preferably under nitrogen re).Outside or detached storage is preferred. Inside storage should be ndard flammable liquids storage room or cabinet. Separate from g materials. Containers should be bonded and grounded for transfers to atic sparks. Storage and use areas should be No Smoking areas. Use king type tools and equipment.

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Addendum to Material Safety Data Sheet
REGULATORY STATUS

This Addendum Must Not Be Detached from the MSDS
Identifies SARA 313 substance(s)

Any copying or redistribution of the MSDS must include a copy of this addendum

Hazard Categories for SARA
Section 311/312 Reporting

Acute	Chronic	Fire	Pressure	Reactive
X	X	X		

Product or Components of Product:	SARA EHS Sec. 302 RQ	SARA EHS Sec. 302 TPQ	SARA Sec. 313 Chemicals Name List	SARA Sec. 313 Chemicals Chemical Category	CERCLA Sec.103 RQ lbs	RCRA Sec. 261.33
HEXANES						
Hexane (110-54-3) > 95%	No	No	No	No	1	No
3-Methylpentane (96-14-0) < 1.2%	No	No	No	No	No	No

SARA Section 302 EHS RQ:
Reportable Quantity of Extremely Hazardous Substance, listed at 40 CFR 355.

SARA Section 302 EHS TPQ: Threshold Planning Quantity of Extremely Hazardous substance. An asterisk (*) following a Threshold Planning Quantity signifies that if the material is a solid and has a particle size equal to or larger than 100 micrometers, the Threshold Planning Quantity = 10,000 LBS.

SARA Section 313 Chemicals: Toxic Substances subject to annual release reporting

requirements listed at 40 CFR 372.65.

CERCLA Sec. 103: Comprehensive Environmental Response, Compensation and Liability Act (Superfund). Releases to air, land or water of these hazardous substances which exceed the Reportable Quantity (RQ) must be reported to the National Response Center, (800-424-8802); Listed at 40 CFR 302.4

RCRA: Resource Conservation and Recovery Act. Commercial chemical product wastes

designated as acute hazards or toxic under 40 CFR 261.33

HEXAN

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1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FOR LARGER FIRES, FLOOD AREA WITH WATER FROM A DISTANCE
(1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FIREFIGHTING:
MOVE CONTAINER FROM FIRE AREA IF POSSIBLE. COOL CONTAINERS EXPOSED TO FLAMES WITH WATER FROM SIDE UNTIL WELL AFTER FIRE IS OUT. STAY AWAY FROM STORAGE TANK ENDS. FOR MASSIVE FIRE IN STORAGE AREA, USE UNMANNED HOSE HOLDER OR MONITOR NOZZLES; ELSE WITHDRAW FROM AREA AND LET FIRE BURN (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4, GUIDE PAGE 44).

USE FLOODING AMOUNTS OF WATER AS FOG. COOL CONTAINERS WITH FLOODING AMOUNTS OF WATER, APPLY FROM AS FAR A DISTANCE AS POSSIBLE. AVOID BREATHING CORROSIVE VAPORS. KEEP UPWIND. CONSIDER EVACUATION OF DOWNWIND AREA IF MATERIAL IS LEAKING.

TRANSPORTATION DATA

DEPARTMENT OF TRANSPORTATION HAZARD CLASSIFICATION 49 CFR 172.101:
OXIDIZER

DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS 49 CFR 172.101 AND SUBPART E:
OXIDIZER AND CORROSIVE

DEPARTMENT OF TRANSPORTATION PACKAGING REQUIREMENTS: 49 CFR 173.268
EXCEPTIONS: NONE

TOXICITY

NITRIC ACID:
TOXICITY DATA:
ANHYDROUS: 110 MG/KG UNREPORTED-MAN LDLO; 430 MG/KG ORAL-HUMAN LDLO;
REPRODUCTIVE EFFECTS DATA (RTECS).
MONOHYDRATE: NO DATA AVAILABLE.
TRIHYDRATE: NO DATA AVAILABLE.
CARCINOGEN STATUS: NONE.
LOCAL EFFECTS: CORROSIVE- INHALATION, SKIN, EYES, INGESTION.
ACUTE TOXICITY LEVEL: INSUFFICIENT DATA.
'ARGET EFFECTS: NO DATA AVAILABLE.
T INCREASED RISK FROM EXPOSURE: PERSONS WITH IMPAIRED PULMONARY FUNCTION, PRE-EXISTING EYE AND SKIN DISORDERS.

HEALTH EFFECTS AND FIRST AID

INHALATION:
NITRIC ACID:
CORROSIVE. 100 PPM IMMEDIATELY DANGEROUS TO LIFE OR HEALTH.
ACUTE EXPOSURE- INHALATION OF ACIDIC SUBSTANCES MAY CAUSE SEVERE RESPIRATORY IRRITATION WITH COUGHING, CHOKING, AND POSSIBLY YELLOWISH BURNS OF THE MUCOUS MEMBRANES. OTHER INITIAL SYMPTOMS MAY INCLUDE DIZZINESS, HEADACHE, NAUSEA, AND WEAKNESS. PULMONARY EDEMA MAY BE IMMEDIATE IN THE MOST SEVERE EXPOSURES, BUT MORE LIKELY WILL OCCUR AFTER A LATENT PERIOD OF 5-72 HOURS. THE SYMPTOMS MAY INCLUDE TIGHTNESS IN THE CHEST, DYSPNEA, DIZZINESS, FROTHY SPUTUM, AND CYANOSIS. PHYSICAL FINDINGS MAY INCLUDE HYPOTENSION, WEAK, RAPID PULSE, MOIST RALES, AND HEMOCONCENTRATION. IN NON-FATAL CASES, COMPLETE RECOVERY MAY OCCUR WITHIN A FEW DAYS OR WEEKS OR, CONVALESCENCE MAY BE PROLONGED WITH FREQUENT RELAPSES AND CONTINUED DYSPNEA AND OTHER SIGNS AND SYMPTOMS OF PULMONARY INSUFFICIENCY. IN SEVERE EXPOSURES, DEATH DUE TO ANOXIA MAY OCCUR WITHIN A FEW HOURS AFTER ONSET OF THE SYMPTOMS OF PULMONARY EDEMA OR FOLLOWING A RELAPSE.
CHRONIC EXPOSURE- DEPENDING ON THE CONCENTRATION AND DURATION OF EXPOSURE, REPEATED OR PROLONGED EXPOSURE TO AN ACIDIC SUBSTANCE MAY CAUSE EROSION OF THE TEETH, INFLAMMATORY AND ULCERATIVE CHANGES IN THE MOUTH, AND POSSIBLY JAW NECROSIS. BRONCHIAL IRRITATION WITH COUGH AND FREQUENT ATTACKS OF BRONCHIAL PNEUMONIA MAY OCCUR. GASTROINTESTINAL DISTURBANCES ARE ALSO POSSIBLE.

FIRST AID- REMOVE FROM EXPOSURE AREA TO FRESH AIR IMMEDIATELY. IF BREATHING HAS STOPPED, GIVE ARTIFICIAL RESPIRATION. MAINTAIN AIRWAY AND BLOOD PRESSURE AND ADMINISTER OXYGEN IF AVAILABLE. KEEP AFFECTED PERSON WARM AND AT REST. TREAT SYMPTOMATICALLY AND SUPPORTIVELY. ADMINISTRATION OF OXYGEN SHOULD BE PERFORMED BY QUALIFIED PERSONNEL. GET MEDICAL ATTENTION IMMEDIATELY.

SKIN CONTACT:
NITRIC ACID:
CORROSIVE.
ACUTE EXPOSURE- DIRECT CONTACT WITH LIQUID OR VAPOR MAY CAUSE SEVERE PAIN, BURNS AND POSSIBLY YELLOWISH STAINS. BURNS MAY BE DEEP WITH SHARP EDGES AND HEAL SLOWLY WITH SCAR TISSUE FORMATION. DILUTE SOLUTIONS OF NITRIC ACID MAY PRODUCE MILD IRRITATION AND HARDEN THE EPIDERMIS WITHOUT DESTROYING IT.
CHRONIC EXPOSURE- EFFECTS DEPEND ON THE CONCENTRATION AND DURATION OF EXPOSURE. REPEATED OR PROLONGED CONTACT WITH ACIDIC SUBSTANCES MAY RESULT

IN DERMATITIS OR EFFECTS SIMILAR TO ACUTE EXPOSURE.

FIRST AID- REMOVE CONTAMINATED CLOTHING AND SHOES IMMEDIATELY. WASH AFFECTED AREA WITH SOAP OR MILD DETERGENT AND LARGE AMOUNTS OF WATER UNTIL NO EVIDENCE OF CHEMICAL REMAINS (AT LEAST 15-20 MINUTES). IN CASE OF CHEMICAL BURNS, COVER AREA WITH STERILE, DRY DRESSING, BANDAGE SECURELY, BUT NOT TOO TIGHTLY. GET MEDICAL ATTENTION IMMEDIATELY.

EYE CONTACT:
NITRIC ACID:
CORROSIVE.
ACUTE EXPOSURE- DIRECT CONTACT WITH ACIDIC SUBSTANCES MAY CAUSE PAIN AND LACRIMATION, PHOTOPHOBIA, AND BURNS, POSSIBLY SEVERE. THE DEGREE OF INJURY DEPENDS ON THE CONCENTRATION AND DURATION OF CONTACT. IN MILD BURNS, THE EPITHELIUM REGENERATES RAPIDLY AND THE EYE RECOVERS COMPLETELY. IN SEVERE CASES, THE EXTENT OF INJURY MAY NOT BE FULLY APPARENT FOR SEVERAL WEEKS. ULTIMATELY, THE WHOLE CORNEA MAY BECOME DEEPLY VASCULARIZED AND OPAQUE RESULTING IN BLINDNESS. IN THE WORST CASES, THE EYE MAY BE TOTALLY DESTROYED. CONCENTRATED NITRIC ACID MAY IMPART A YELLOW COLOR TO THE EYE UPON CONTACT.
CHRONIC EXPOSURE- EFFECTS DEPEND ON THE CONCENTRATION AND DURATION OF EXPOSURE. REPEATED OR PROLONGED EXPOSURE TO ACIDIC SUBSTANCES MAY CAUSE CONJUNCTIVITIS OR EFFECTS AS IN ACUTE EXPOSURE.

FIRST AID- WASH EYES IMMEDIATELY WITH LARGE AMOUNTS OF WATER, OCCASIONALLY LIFTING UPPER AND LOWER LIDS, UNTIL NO EVIDENCE OF CHEMICAL REMAINS (AT LEAST 15-20 MINUTES). CONTINUE IRRIGATING WITH NORMAL SALINE UNTIL THE PH HAS RETURNED TO NORMAL (30-60 MINUTES). COVER WITH STERILE BANDAGES. GET MEDICAL ATTENTION IMMEDIATELY.

INGESTION:
NITRIC ACID:
CORROSIVE.
ACUTE EXPOSURE- ACIDIC SUBSTANCES MAY CAUSE CIRCUMORAL BURNS WITH YELLOW DISCOLORATION AND CORROSION OF THE MUCOUS MEMBRANES OF THE MOUTH, THROAT AND ESOPHAGUS. THERE MAY BE IMMEDIATE PAIN AND DIFFICULTY OR INABILITY TO SWALLOW OR SPEAK. EPIGLOTTAL EDEMA MAY RESULT IN RESPIRATORY DISTRESS AND POSSIBLY ASPHYXIA. MARKED THIRST, EPIGASTRIC PAIN, NAUSEA, VOMITING AND DIARRHEA MAY OCCUR. DEPENDING ON THE DEGREE OF ESPOHAGEAL AND GASTRIC CORROSION, THE VOMITUS MAY CONTAIN FRESH OR DARK PRECIPITATED BLOOD AND LARGE SHREDS OF MUCOSA. SHOCK WITH MARKED HYPOTENSION, WEAK, RAPID PULSE, SHALLOW RESPIRATION, AND CLAMMY SKIN MAY OCCUR. CIRCULATORY COLLAPSE MAY ENSUE AND IF UNCORRECTED, LEAD TO RENAL FAILURE. IN SEVERE CASES, GASTRIC, AND TO A LESSER DEGREE, ESOPHAGEAL PERFORATION AND SUBSEQUENT PERITONITIS MAY OCCUR AND BE ACCOMPANIED BY FEVER AND ABDOMINAL RIGIDITY. ESOPHAGEAL, GASTRIC ANC PYLORIC STRICTURE MAY OCCUR WITHIN A FEW WEEKS, BUT MAY BE DELAYED FOR MONTHS OR EVEN YEARS. DEATH MAY RESULT WITHIN A SHORT TIME FROM ASPHYXIA, CIRCULATORY COLLAPSE OR ASPIRATION OF EVEN MINUTE AMOUNTS. LATER DEATH MAY BE DUE TO PERITONITIS, SEVERE NEPHRITIS OR PNEUMONIA. COMA AND CONVULSIONS SOMETIMES OCCUR TERMINALLY.
CHRONIC EXPOSURE- DEPENDING ON THE CONCENTRATION, REPEATED INGESTION OF ACIDIC SUBSTANCES MAY RESULT IN INFLAMMATORY AND ULCERATIVE CHANGES IN THE MUCOUS MEMBRANES OF THE MOUTH AND OTHER EFFECTS AS IN ACUTE INGESTION. REPRODUCTIVE EFFECTS HAVE BEEN REPORTED IN ANIMALS.

FIRST AID- DO NOT USE GASTRIC LAVAGE OR EMESIS. DILUTE THE ACID IMMEDIATELY BY DRINKING LARGE QUANTITIES OF WATER OR MILK. IF VOMITING PERSISTS, ADMINISTER FLUIDS REPEATEDLY. INGESTED ACID MUST BE DILUTED APPROXIMATELY 100 FOLD TO RENDER IT HARMLESS TO TISSUES. MAINTAIN AIRWAY AND TREAT SHOCK (DREISBACH, HANDBOOK OF POISONING, 12TH ED.). GET MEDICAL ATTENTION IMMEDIATELY. IF VOMITING OCCURS, KEEP HEAD BELOW HIPS TO HELP PREVENT ASPIRATION.

ANTIDOTE:
NO SPECIFIC ANTIDOTE. TREAT SYMPTOMATICALLY AND SUPPORTIVELY.

REACTIVITY

REACTIVITY:
REACTS EXOTHERMICALLY WITH WATER.

INCOMPATIBILITIES:
NITRIC ACID:
ACETIC ACID: MAY REACT EXPLOSIVELY.
ACETIC ANHYDRIDE: EXPLOSIVE REACTION BY FRICTION OR IMPACT.
ACETONE: MAY REACT EXPLOSIVELY.
ACETONITRILE: EXPLOSIVE MIXTURE.
4-ACETOXY-3-METHOXYBENZALDEHYDE: EXOTHERMIC REACTION.
ACROLEIN: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
ACRYLONITRILE: EXPLOSIVE REACTION AT 90 C.
ACRYLONITRILE-METHACRYLATE COPOLYMER: INCOMPATIBLE.
ALCOHOLS: POSSIBLE VIOLENT REACTION OR EXPLOSION; FORMATION OF EXPLOSIVE COMPOUND IN THE PRESENCE OF HEAVY METALS.
ALKANETHIOLS: EXOTHERMIC REACTION WITH POSSIBLE IGNITION.
2-ALKOXY-1,3-DITHIA-2-PHOSPHOLANE: IGNITION REACTION.
ALLYL ALCOHOL: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
ALLYL CHLORIDE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
AMINES (ALIPHATIC OR AROMATIC): POSSIBLE IGNITION REACTION.
2-AMINOETHANOL: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.

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2-AMINOTHIAZOLE: EXPLOSIVE REACTION.
AMMONIA (GAS): BURNS IN AN ATMOSPHERE OF NITRIC ACID VAPOR.
AMMONIUM HYDROXIDE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
AMMONIUM NITRATE: FORMS EXPLOSIVE MIXTURE.
ANILINE: IGNITES ON CONTACT.
ANILINIUM NITRATE: FORMS EXPLOSIVE SOLUTION.
ANION EXCHANGE RESINS: POSSIBLE VIOLENT EXOTHERMIC REACTION.
ANTIMONY: VIOLENT REACTION.
ARSINE: EXPLOSIVE REACTION.
ARSINE-BORON TRIBROMIDE: VIOLENT OXIDATION.
BASES: REACTS.
BENZENE: EXPLOSIVE REACTION.
BENZIDINE: SPONTANEOUS IGNITION.
BENZONITRILE: POSSIBLE EXPLOSION.
BENZOTHIOPHENE DERIVATIVES: FORMATION OF POSSIBLY EXPLOSIVE COMPOUNDS.
N-BENZYL-N-ETHYLANILINE: VIGOROUS DECOMPOSITION.
1,4-BIS(METHOXYMETHYL)2,3,5,6-TETRAMETHYLBENZENE: GAS EVOLUTION.
BISMUTH: INTENSE EXOTHERMIC REACTION OR EXPLOSION.
1,3-BIS(TRIFLUOROMETHYL)BENZENE: POSSIBLE EXPLOSION.
BORON: VIOLENT REACTION WITH INCANDESCENCE.
BORON DECAHYDRIDE: EXPLOSIVE REACTION.
BORON PHOSPHIDE: IGNITION REACTION.
BROMINE PENTAFLUORIDE: IGNITION REACTION.
N-BUTYL MERCAPTAN: IGNITION REACTION.
N-BUTYRALDEHYDE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
CADMIUM PHOSPHIDE: EXPLOSIVE REACTION.
CALCIUM HYPOPHOSPHITE: IGNITION REACTION.
CARBON (PULVERIZED): VIOLENT REACTION.
CELLULOSE: FORMS EASILY COMBUSTIBLE ESTER.
CHLORATES: REACTS.
CHLORINE: INCOMPATIBLE.
CHLORINE TRIFLUORIDE: VIOLENT REACTION.
CHLOROBENZENE: POSSIBLE EXPLOSION.
4-CHLORO-2-NITROANILINE: FORMS EXPLOSIVE COMPOUND.
CHLOROSULFONIC ACID: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
COAL: EXPLOSIVE MIXTURE.
COATINGS: MAY BE ATTACKED.
CRESOL: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
CROTONALDEHYDE: VIOLENT DECOMPOSITION WITH IGNITION.
CUMENE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
CUPRIC NITRIDE: EXPLOSIVE REACTION.
CUPROUS NITRIDE: VIOLENT REACTION.
CYANATES: POSSIBLE EXPLOSIVE REACTION.
CYCLOHEXANONE: VIOLENT REACTION.
CYCLOHEXYLAMINE: FORMS EXPLOSIVE COMPOUND.
CYCLOPENTADIENE: EXPLOSIVE REACTION.
1,2-DIAMINOETHANEBIS(TRIMETHYLGOLD): EXPLOSIVE REACTION.
DIBORANE: SPONTANEOUS IGNITION.
DI-2-BUTOXYETHYL ETHER: VIOLENT DECOMPOSITION REACTION.
2,6-DI-T-BUTYL PHENOL: FORMATION OF EXPLOSIVE COMPOUND.
DICHLOROETHANE: FORMS SHOCK AND HEAT SENSITIVE MIXTURE.
DICHLOROETHYLENE: FORMS EXPLOSIVE COMPOUND.
DICHLOROMETHANE: FORMS EXPLOSIVE SOLUTION.
DICYCLOPENTADIENE: SPONTANEOUS IGNITION.
DIENES: IGNITION REACTION.
DIETHYLAMINO ETHANOL: POSSIBLE EXPLOSION.
DIETHYL ETHER: POSSIBLE EXPLOSION.
3,6-DIHYDRO-1,2,2H-OXAZINE: EXPLOSIVE INTERACTION.
DIISOPROPYL ETHER: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
DIMETHYLAMINOMETHYLFERROCENE: VIOLENT DECOMPOSITION IF HEATED.
DIMETHYL ETHER: FORMS EXPLOSIVE COMPOUND.
DIMETHYL HYDRAZINE: IGNITES ON CONTACT.
DIMETHYL SULFOXIDE + 1,4-DIOXANE: EXPLOSION.
DIMETHYL SULFOXIDE + <14% WATER: EXPLOSIVE REACTION.
DINITROBENZENE: EXPLOSION HAZARD.
DINITROTOLUENE: EXPLOSIVE REACTION.
DIOXANE + PERCHLORIC ACID: POSSIBLE EXPLOSION.
DIPHENYL DISTIBENE: EXPLOSIVE OXIDATION.
DIPHENYL MERCURY + CARBON DISULFIDE: VIOLENT REACTION.
DIPHENYL TIN: IGNITION REACTION.
DISODIUM PHENYL ORTHOPHOSPHATE: VIOLENT EXPLOSION.
DIVINYL ETHER: POSSIBLE IGNITION REACTION.
EPICHLOROHYDRIN: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
ETHANESULFONAMIDE: EXPLOSIVE REACTION.
ETHOXY-ETHYLENE DITHIOPHOSPHATE: IGNITION ON CONTACT.
M-ETHYL ANILINE: IGNITION REACTION.
ETHYLENE DIAMINE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
ETHYLENE GLYCOL: FORMS SHOCK AND HEAT SENSITIVE MIXTURE.
ETHYLENEIMINE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
5-ETHYL-2-METHYL PYRIDINE: EXPLOSIVE REACTION.
ETHYL PHOSPHINE: IGNITION REACTION.
5-ETHYL-2-PICOLINE: FORMS EXPLOSIVE COMPOUNDS.
FERROUS OXIDE (POWDERED): INTENSE EXOTHERMIC REACTION.
FLUORINE: POSSIBLE EXPLOSIVE REACTION.
FORMIC ACID: EXOTHERMIC REACTION WITH RELEASE OF TOXIC GASES.
2-FORMYLAMINO-1-PHENYL-1,3-PROPANEDIOL: POSSIBLE EXPLOSION.
FUEL OIL (BURNING): EXPLOSION.
FULMINATES: REACTS.
FURFURYLIDENE KETONES: IGNITES ON CONTACT.
GERMANIUM: VIOLENT REACTION.

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GLYCEROL: POSSIBLE EXPLOSION.
GLYOXAL: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
HEXALITHIUM DISILICIDE: EXPLOSIVE REACTION.
HEXAMETHYLBENZENE: POSSIBLE EXPLOSION.
2,2,4,4,6,6-HEXAMETHYLTRITHIANE: EXPLOSIVE OXIDATION.
HEXENAL: EXPLODES ON HEATING.
HYDRAZINE: VIOLENT REACTION.
HYDRAZOIC ACID: ENERGETIC REACTION.
HYDROGEN IODIDE: IGNITION REACTION.
HYDROGEN PEROXIDE: FORMS UNSTABLE MIXTURE.
HYDROGEN PEROXIDE AND KETONES: FORMS EXPLOSIVE PRODUCTS.
HYDROGEN PEROXIDE AND MERCURIC OXIDE: FORMS EXPLOSIVE COMPOUNDS.
HYDROGEN PEROXIDE AND THIOUREA: FORMS EXPLOSIVE COMPOUNDS.
HYDROGEN SELENIDE: IGNITION REACTION.
HYDROGEN SULFIDE: INCANDESCENT REACTION.
HYDROGEN TELLURIDE: IGNITION AND POSSIBLE EXPLOSIVE REACTION.
INDANE AND SULFURIC ACID: EXPLOSIVE REACTION.
ISOPRENE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
KETONES (CYCLIC): VIOLENT REACTION.
LACTIC ACID + HYDROFLUORIC ACID: EXPLOSIVE REACTION.
LITHIUM: IGNITION REACTION.
LITHIUM SILICIDE: INCANDESCENT REACTION.
MAGNESIUM: EXPLOSIVE REACTION.
MAGNESIUM + 2-NITROANILINE: MAY IGNITE ON CONTACT.
MAGNESIUM PHOSPHIDE: INCANDESCENT REACTION.
MAGNESIUM SILICIDE: VIOLENT REACTION.
MAGNESIUM-TITANIUM ALLOY: FORMS SHOCK AND HEAT SENSITIVE MIXTURE.
MANGANESE (POWDERED): INCANDESCENCE AND POSSIBLE EXPLOSION.
MESITYL OXIDE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
MESITYLENE: POSSIBLE EXPLOSIVE REACTION.
METALS: VIOLENT REACTION WITH EXPLOSION OR IGNITION.
METAL ACETYLIDES: VIOLENT OR EXPLOSIVE REACTION.
METAL CARBIDES: VIOLENT OR EXPLOSIVE REACTION.
METAL CYANIDES: EXPLOSIVE REACTIONS.
METAL FERRICYANIDE OR FERROCYANIDE: VIOLENT REACTION.
METAL SALICYLATES: FORMS EXPLOSIVE COMPOUNDS.
METAL THIOCYANATES: POSSIBLE EXPLOSION.
2-METHYLBENZIMIDAZOLE + SULFURIC ACID: POSSIBLE EXPLOSIVE REACTION.
4-METHYLCYCLOHEXANONE: EXPLOSIVE REACTION.
2-METHYL-5-ETHYLPYRIDINE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
METHYL THIOPHENE: IGNITION REACTION.
NEODYMIUM PHOSPHIDE: VIOLENT REACTION.
NICKEL TETRAPHOSPHIDE: IGNITION REACTION.
NITRO AROMATIC HYDROCARBONS: FORMS HIGHLY EXPLOSIVE PRODUCTS.
NITROBENZENE: EXPLOSIVE REACTION, ESPECIALLY IN THE PRESENCE OF WATER.
NITROMETHANE: EXPLOSIVE REACTION.
NITRONAPHTHALENE: EXPLOSION HAZARD.
NON-METAL OXIDES : EXPLOSIVE REACTION.
OLEUM: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
ORGANIC MATERIALS: FIRE AND EXPLOSION HAZARD.
ORGANIC SUBSTANCES AND PERCHLORATES: POSSIBLE EXPLOSION.
ORGANIC SUBSTANCES AND SULFURIC ACID: POSSIBLE EXPLOSION.
PHENYL ACETYLENE + 1,1-DIMETHYLHYDRAZINE: VIOLENT REACTION.
PHENYL ORTHOPHOSPHORIC ACID DISODIUM SALT: FORMS EXPLOSIVE PRODUCTS.
PHOSPHINE + OXYGEN: SPONTANEOUS IGNITION.
PHOSPHONIUM IODIDE: IGNITION REACTION.
PHOSPHORUS (VAPOR): IGNITES WHEN HEATED.
PHOSPHOROUS HALIDES: IGNITION REACTION.
PHOSPHORUS TETRAIODIDE: VIGOROUS REACTION.
PHOSPHORUS TRICHLORIDE: EXPLOSIVE REACTION.
PHTHALIC ACID AND SULFURIC ACID: POSSIBLE EXPLOSIVE REACTION.
PHTHALIC ANHYDRIDE: EXOTHERMIC REACTION AND FORMS EXPLOSIVE PRODUCTS.
PICRATES: REACTS.
PLASTICS: MAY BE ATTACKED.
POLYALKENES: INTENSE REACTION.,
POLYDIBROMOSILANES: EXPLOSIVE REACTION.
POLY(ETHYLENE OXIDE) DERIVATIVES: POSSIBLE EXPLOSION.
POLYPROPYLENE: TEMPERATURE AND PRESSURE INCREASE IN A CLOSED CONTAINER.
POLY(SILYLENE): IGNITION.
POLYURETHANE (FOAM): VIGOROUS REACTION.
POTASSIUM HYPOPHOSPHITE: EXPLOSIVE REACTION.
POTASSIUM PHOSPHINATE: EXPLODES ON EVAPORATION.
B-PROPIOLACTONE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
PROPIOPHENONE + SULFURIC ACID: EXOTHERMIC REACTION ABOVE -5 C.
PROPYLENE GLYCOL + HYDROFLUORIC ACID + SILVER NITRATE: EXPLOSIVE MIXTURE.
PROPYLENE OXIDE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
PYRIDINE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
PYROCATECHOL: IGNITES ON CONTACT.
REDUCING AGENTS: POSSIBLE EXPLOSIVE OR IGNITION REACTION.
RESORCINOL: POSSIBLE EXPLOSION.
RUBBER: VIGOROUS REACTION, POSSIBLE EXPLOSION.
SELENIUM: VIGOROUS REACTION.
SELENIUM HYDRIDE: IGNITION OR INCANDESCENT REACTION.
SELENIUM IODOPHOSPHIDE: EXPLOSIVE REACTION.
SILICON: VIOLENT REACTION.
SILICONE OIL: POSSIBLE EXPLOSION.
SILVER BUTEN-3-YNIDE: EXPLOSION.
SODIUM: SPONTANEOUS IGNITION.
SODIUM AZIDE: EXOTHERMIC REACTION.

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SODIUM HYDROXIDE: TEMPERATURE AND PRESSURE INCREASE IN A CLOSED CONTAINER.
STIBINE: EXPLOSIVE REACTION.
SUCROSE (SOLID): VIGOROUS REACTION.
SULFAMIC ACID: VIOLENT REACTION WITH EVOLUTION OF TOXIC NITROUS OXIDE.
SULFIDES: REACTS.
SULFUR DIOXIDE: EXPLOSIVE REACTION.
SULFUR HALIDES: VIOLENT REACTION.
SULFURIC ACID + GLYCERIDES: EXPLOSIVE REACTION.
SULFURIC ACID + TEREPHTHALIC ACID: VIOLENT REACTION.
SURFACTANTS + PHOSPHORIC ACID: EXPLOSION HAZARD.
TERPENES: SPONTANEOUS IGNITION.
TETRABORANE: EXPLOSIVE REACTION.
TETRABORANE DECAHYDRIDE: EXPLOSIVE REACTION.
TETRAPHOSPHOROUS DIIODOTRISELENIDE: EXPLOSIVE REACTION.
TETRAPHOSPHOROUS IODIDE: IGNITES ON CONTACT.
TETRAPHOSPHOROUS TETRAOXIDE TRISULFIDE: VIOLENT REACTION.
THIOALDEHYDES: VIOLENT REACTION.
THIOKETONES: VIOLENT REACTION.
THIOPHENES: EXPLOSIVE REACTION.
TITANIUM: FORMS SHOCK-SENSITIVE COMPOUND.
TITANIUM ALLOYS: POSSIBLE EXPLOSIVE REACTION.
TITANIUM-MAGNESIUM ALLOY: POSSIBLE EXPLOSION ON IMPACT.
TOLUENE: VIOLENT REACTION.
TOLUIDENE: IGNITION REACTION.
1,3,5-TRIACETYLHEXAHYDRO-1,3,5-TRIAZINE + TRIFLUOROACETIC ANHYDRIDE:
EXPLOSIVE REACTION.
TRIAZINE: VIOLENTLY EXPLOSIVE REACTION.
TRICADMIUM DIPHOSPHIDE: EXPLOSIVE REACTION.
TRIETHYLGALLIUM MONOETHYL ETHER COMPLEX: IGNITION REACTION.
TRIMETHYLTRIOXANE: INTENSE REACTION.
TRIS(IODOMERCURI)PHOSPHINE: VIOLENT DECOMPOSITION.
TRITHIOACETONE: EXPLOSIVE REACTION.
TURPENTINE: EXPLOSIVE MIXTURE.
UNSYMMETRICAL DIMETHYL HYDRAZINE: SPONTANEOUS IGNITION.
URANIUM: EXPLOSIVE REACTION.
URANIUM ALLOY: VIOLENT REACTION.
URANIUM DISULFIDE: VIOLENT REACTION.
URANIUM-NEODYMIUM ALLOYS: EXPLOSIVE REACTION.
VINYL ACETATE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
VINYLIDENE CHLORIDE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
WOOD: POSSIBLE IGNITION.
P-XYLENE: INTENSE REACTION IN PRESENCE OF SULFURIC ACID.
ZINC: INCANDESCENT REACTION.
ZINC ETHOXIDE: POSSIBLE EXPLOSION.
ZIRCONIUM-URANIUM ALLOYS: EXPLOSIVE REACTION.

DECOMPOSITION:
THERMAL DECOMPOSITION PRODUCTS MAY INCLUDE TOXIC OXIDES OF NITROGEN.

POLYMERIZATION:
HAZARDOUS POLYMERIZATION HAS NOT BEEN REPORTED TO OCCUR UNDER NORMAL TEMPERATURES AND PRESSURES.

STORAGE AND DISPOSAL

OBSERVE ALL FEDERAL, STATE AND LOCAL REGULATIONS WHEN STORING OR DISPOSING OF THIS SUBSTANCE. FOR ASSISTANCE, CONTACT THE DISTRICT DIRECTOR OF THE ENVIRONMENTAL PROTECTION AGENCY.

STORAGE

PROTECT AGAINST PHYSICAL DAMAGE. SEPARATE FROM METALLIC POWDERS, CARBIDES, HYDROGEN SULFIDE, TURPENTINE, ORGANIC ACIDS, AND ALL COMBUSTIBLE, ORGANIC OR OTHER READILY OXIDIZABLE MATERIALS. PROVIDE GOOD VENTILATION AND AVOID DIRECT SUNLIGHT (NFPA 49, HAZARDOUS CHEMICALS DATA, 1975).

STORE AWAY FROM INCOMPATIBLE SUBSTANCES.

THRESHOLD PLANNING QUANTITY (TPQ):
THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) SECTION 302 REQUIRES THAT EACH FACILITY WHERE ANY EXTREMELY HAZARDOUS SUBSTANCE IS PRESENT IN A QUANTITY EQUAL TO OR GREATER THAN THE TPQ ESTABLISHED FOR THAT SUBSTANCE NOTIFY THE STATE EMERGENCY RESPONSE COMMISSION FOR THE STATE IN WHICH IT IS LOCATED. SECTION 303 OF SARA REQUIRES THESE FACILITIES TO PARTICIPATE IN LOCAL EMERGENCY RESPONSE PLANNING (40 CFR 355.30).

DISPOSAL

DISPOSAL MUST BE IN ACCORDANCE WITH STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE, 40 CFR 262, EPA HAZARDOUS WASTE NUMBER D002.
100 POUND CERCLA SECTION 103 REPORTABLE QUANTITY.

!**********

CONDITIONS TO AVOID

MAY IGNITE OTHER COMBUSTIBLE MATERIALS (WOOD, PAPER, OIL, ETC.). REACTS VIOLENTLY WITH WATER AND FUELS. FLAMMABLE, POISONOUS GASES MAY ACCUMULATE IN

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TANKS AND HOPPER CARS. RUNOFF TO SEWER MAY CREATE FIRE OR EXPLOSION HAZARD.

CONSULT NFPA PUBLICATION 43A, STORAGE OF LIQUID AND SOLID OXIDIZING MATERIALS, FOR STORAGE REQUIREMENTS.

****

SPILL AND LEAK PROCEDURES

SOIL SPILL:
DIG A HOLDING AREA SUCH AS A PIT, POND OR LAGOON TO CONTAIN SPILL AND DIKE SURFACE FLOW USING BARRIER OF SOIL, SANDBAGS, FOAMED POLYURETHANE OR FOAMED CONCRETE. ABSORB LIQUID MASS WITH FLY ASH OR CEMENT POWDER.

NEUTRALIZE SPILL WITH SLAKED LIME, SODIUM BICARBONATE OR CRUSHED LIMESTONE.

AIR SPILL:
APPLY WATER SPRAY TO KNOCK DOWN AND REDUCE VAPORS. KNOCK-DOWN WATER IS CORROSIVE AND TOXIC AND SHOULD BE DIKED FOR CONTAINMENT AND LATER DISPOSAL.

WATER SPILL:
ADD SUITABLE AGENT TO NEUTRALIZE SPILLED MATERIAL TO PH-7.

OCCUPATIONAL SPILL:
KEEP COMBUSTIBLES (WOOD, PAPER, OIL, ETC.) AWAY FROM SPILLED MATERIAL. DO NOT TOUCH SPILLED MATERIAL. STOP LEAK IF YOU CAN DO IT WITHOUT RISK. USE WATER SPRAY TO REDUCE VAPORS. DO NOT GET WATER INSIDE CONTAINER. FOR SMALL SPILLS, FLUSH AREA WITH FLOODING AMOUNTS OF WATER. FOR LARGER SPILLS, DIKE FAR AHEAD OF SPILL FOR LATER DISPOSAL. KEEP UNNECESSARY PEOPLE AWAY. ISOLATE HAZARD AREA AND DENY ENTRY. VENTILATE CLOSED SPACES BEFORE ENTERING.

REPORTABLE QUANTITY (RQ): 1000 POUNDS
THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) SECTION 304 REQUIRES THAT A RELEASE EQUAL TO OR GREATER THAN THE REPORTABLE QUANTITY FOR THIS SUBSTANCE BE IMMEDIATELY REPORTED TO THE LOCAL EMERGENCY PLANNING COMMITTEE AND THE STATE EMERGENCY RESPONSE COMMISSION (40 CFR 355.40). IF THE RELEASE OF THIS SUBSTANCE IS REPORTABLE UNDER CERCLA SECTION 103, THE NATIONAL RESPONSE CENTER MUST BE NOTIFIED IMMEDIATELY AT (800) 424-8802 OR (202) 426-2675 IN THE METROPOLITAN WASHINGTON, D.C. AREA (40 CFR 302.6).

PROTECTIVE EQUIPMENT

VENTILATION:
PROVIDE LOCAL EXHAUST OR PROCESS ENCLOSURE VENTILATION TO MEET PUBLISHED EXPOSURE LIMITS.

RESPIRATOR:
THE FOLLOWING RESPIRATORS AND MAXIMUM USE CONCENTRATIONS ARE RECOMMENDATIONS BY THE U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, NIOSH POCKET GUIDE TO CHEMICAL HAZARDS; NIOSH CRITERIA DOCUMENTS OR BY THE U.S. DEPARTMENT OF LABOR, 29 CFR 1910 SUBPART Z.
THE SPECIFIC RESPIRATOR SELECTED MUST BE BASED ON CONTAMINATION LEVELS FOUND IN THE WORK PLACE, MUST NOT EXCEED THE WORKING LIMITS OF THE RESPIRATOR AND BE JOINTLY APPROVED BY THE NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH AND THE MINE SAFETY AND HEALTH ADMINISTRATION (NIOSH-MSHA).

NITRIC ACID:

125 MG/M3- ANY SUPPLIED-AIR RESPIRATOR OPERATED IN A CONTINUOUS-FLOW MODE.

250 MG/M3- ANY SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE.
ANY SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE.
ANY AIR-PURIFYING FULL FACEPIECE RESPIRATOR (GAS MASK) WITH A CHIN-STYLE OR FRONT- OR BACK-MOUNTED CANISTER PROVIDING PROTECTION AGAINST NITRIC ACID.
ANY CHEMICAL CARTRIDGE RESPIRATOR WITH A FULL FACEPIECE AND CARTRIDGE(S) PROVIDING PROTECTION AGAINST NITRIC ACID.

ESCAPE- ANY AIR-PURIFYING FULL FACEPIECE RESPIRATOR (GAS MASK) WITH A CHIN-STYLE OR FRONT-OR BACK-MOUNTED CANISTER PROVIDING PROTECTION AGAINST NITRIC ACID.
ANY APPROPRIATE ESCAPE-TYPE SELF-CONTAINED BREATHING APPARATUS.

NOTE: ONLY NON-OXIDIZABLE SORBENTS ARE ALLOWED (NOT CHARCOAL).

FOR FIREFIGHTING AND OTHER IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONDITIONS:

SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

SUPPLIED-AIR RESPIRATOR WITH FULL FACEPIECE AND OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE IN COMBINATION WITH AN AUXILIARY SELF-CONTAINED BREATHING APPARATUS OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

CLOTHING:
EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE (IMPERVIOUS) CLOTHING AND EQUIPMENT TO PREVENT ANY POSSIBILITY OF SKIN CONTACT WITH THIS SUBSTANCE.

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GLOVES:
EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE GLOVES TO PREVENT CONTACT WITH THIS SUBSTANCE.

EYE PROTECTION:
EMPLOYEE MUST WEAR SPLASH-PROOF OR DUST-RESISTANT SAFETY GOGGLES AND A FACESHIELD TO PREVENT CONTACT WITH THIS SUBSTANCE.

EMERGENCY WASH FACILITIES:
WHERE THERE IS ANY POSSIBILITY THAT AN EMPLOYEE'S EYES AND/OR SKIN MAY BE EXPOSED TO THIS SUBSTANCE, THE EMPLOYER SHOULD PROVIDE AN EYE WASH FOUNTAIN AND QUICK DRENCH SHOWER WITHIN THE IMMEDIATE WORK AREA FOR EMERGENCY USE.

AUTHORIZED - FISHER SCIENTIFIC GROUP, INC.
CREATION DATE: 12/04/84 REVISION DATE: 04/23/90

-ADDITIONAL INFORMATION-

CITIZEN PARTICIPATION PLAN

BROWNFIELDS SITE INVESTIGATION/REMEDIAL ALTERNATIVES REPORT

Former Mohasco Mill Complex
Amsterdam, New York

CITY OF AMSTERDAM, NEW YORK

Prepared by:

Malcolm Pirnie, Inc.
15 Cornell Road
Latham, New York 12110

September 1998
3518001

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LIST OF APPENDICES

Appendix	Description
A	Contact List
B	Document Repository
C	Glossary
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1.0 INTRODUCTION

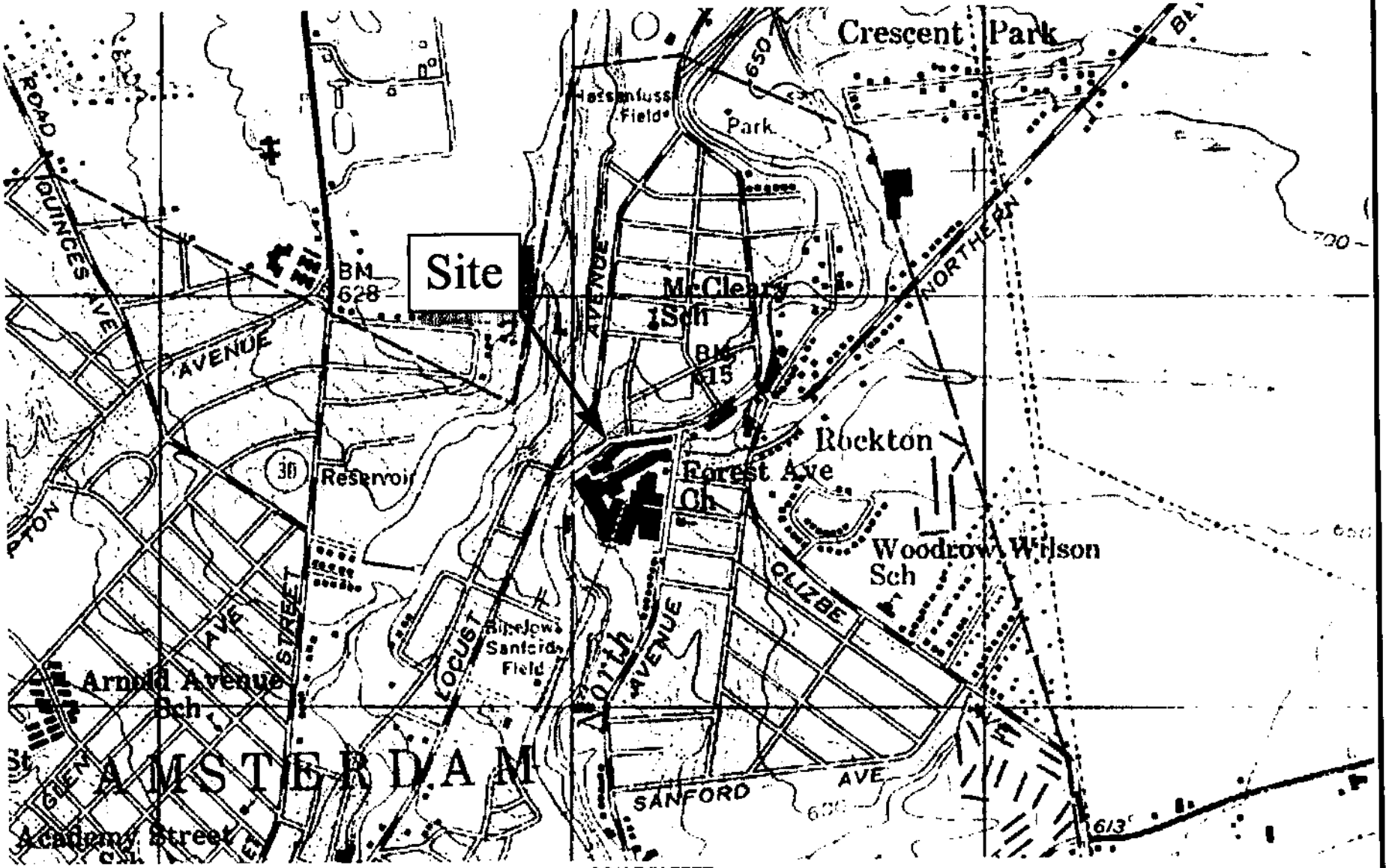
The Citizen Participation Plan (CPP) for the former Mohasco Mill Complex in Amsterdam, New York has been developed to provide a site-specific outline and guidance for citizen participation. The CPP was prepared in accordance with 6 NYCRR Part 375 and the New York State Department of Environmental Conservation (NYSDEC) guidance document, New York State Inactive Hazardous Waste Site Citizen Participation Plan (August, 1988).

The City of Amsterdam and the NYSDEC are committed to a citizen participation program as a part of the Site Investigation/Remedial Alternatives Report (SI/RAR) process at the former Mohasco Mill Complex. Citizen participation promotes public understanding of the responsibilities, planning activities, and remedial activities associated with this process. Citizen participation provides the City of Amsterdam and the NYSDEC with an opportunity to gain public input to support a comprehensive remedial program which is protective of both public health and the environment.

2.0 SITE BACKGROUND

2.1 Site Location

The former Mohasco Mill Complex is located at the southwest corner of the intersection of Forest Avenue and Lyon Street in the City of Amsterdam, Montgomery County, New York (Figure 2-1). The 21.6-acre site is bound to the north by Lyon Street, to the east by Forest Avenue, to the west by Locust Avenue, and to the south by Esquire Novelty Corporation, The Noteworthy Company, and residential properties. The site is bisected by the North Chuctanunda Creek. Most of the central and northern section of the property is covered with demolition debris, building foundations, and the remains of buildings destroyed during the 1992 fire. Large multi-story buildings still exist in the northeast and southwest corners of the site.



SOURCE: U.S.G.S 7.5 MIN. AMSTERDAM QUAD, 1980

MALCOLM PIRNIE

MOHASCO MILL COMPLEX
AMSTERDAM, NEW YORK

Site Location Map

Figure 1

2.2 Site History

Based on a preliminary review of historical information, the operational history of the site is as follows: The site was used for carpet manufacturing from the late 1880s through 1984. Manufacturing processes conducted at the site consisted primarily of milling and weaving of raw materials and dye operations. Based on reviews of existing documents, it is believed that chemicals shipped to, used, and stored at the site included, but may not have been limited to, sulfuric acid, acetic acid, hydrogen peroxide, hydrosulfites, PCBs, and some metalized dyes.

Carpet manufacturing activities ceased in 1984 and the site was leased for use as storage and office space from 1984 through 1992. The majority of the buildings at the site were destroyed by fires in 1992 and 1994. The City of Amsterdam acquired the site in 1994. The site is currently unoccupied.

3.0 PROJECT DESCRIPTION

The focus the SI is to identify the distribution of potential chemical contamination in the soil and groundwater in areas where chemicals were previously stored, handled, and transported. The SI will include the following activities:

- **Existing Mapping** - Sanborn Company Fire Insurance Maps will be reviewed to gain an understanding of the former site operations.

- **Bedrock Field Mapping** - Field mapping of on-site bedrock outcrops will be conducted to determine the orientation of the local bedrock fractures and bedding planes. The information gathered from the mapping will be used to aid in the determination of potential migration pathways in the event contamination is found.

- **Soil Borings** - Soil borings will be drilled to investigate the vertical and horizontal extent of the soil contamination across the site. The locations of the soil borings will be biased toward the potential areas of concern (i.e., where dyes, PCBs, and acids may have been used or stored), based on an understanding of the former site operations. In addition, one boring will be located in an on-site area which is anticipated to represent background conditions.

- **Monitoring Well Installation** - Monitoring wells will be installed on-site to provide information on site hydrogeology and groundwater quality.

- **Groundwater Sampling** - Groundwater samples will be collected from the newly installed monitoring wells and analyzed for TCL/TAL parameters.

- **Test Pit Excavation** - Test pits will be excavated to investigate the NYSDEC and the City's concern regarding the existence of a buried electrical transformer suspected to contain PCBs.

- **Lead Paint/Asbestos Survey** - Building 20A will be evaluated for presence or absence of asbestos containing materials (ACM) and lead paint.

- **Survey and Site Mapping** - Physical features near or on the site, including streets, building corners, and the banks of the North Chuctanunda Creek will be surveyed and used to create a base map. The locations and associated vertical elevations of all monitoring wells, soil borings, and test pits will also be surveyed.

This information will be used to identify potential sources of contamination to soil and groundwater stemming from the former handling and storage of chemicals on the site. This information will also be utilized in the RAR to evaluate remedial alternatives for the contaminated soil and groundwater, if any.

4.0 CITIZEN PARTICIPATION ACTIVITIES

Citizen participation activities are planned to promote communication, understanding and involvement between the community surrounding the former Mohasco Mill Complex, the City of Amsterdam, and the NYSDEC. The citizen participation activities are intended to address the following questions.

- What concerns does the public have about the site?
- Who is interested in or affected by the site?
- What information does the public need to know about the site?
- What information can the public contribute about the site?

These four questions will be re-addressed at the beginning of each major project element to determine if the planned citizen participation activities are adequate to meet the needs of the community or if additional activities should to be planned.

4.1 Document Repository

A local document repository (Appendix B) will be established at the Amsterdam Public Library at the start of SI activities. Documents related to the SI/RAR and citizen participation activities will be placed at the document repository for public review.

4.2 Site Investigation Work Plan

A copy of the Site Investigation Work Plan will be placed in the local document repository. A fact sheet which will briefly describe the site, SI objectives and activities planned for the SI will be mailed to the Contact List (Appendix A). In addition, the fact sheet will indicate the location of the local document repository and identify appropriate points of contact. Prior to initiating field work, a public meeting will be held to review the proposed Work Plan and to address any questions or concerns. This meeting will be attended by representatives of the City of Amsterdam and the NYSDEC.

4.3 Site Investigation/Remedial Alternatives Report

When the SI has been completed, an Site Investigation/Remedial Alternatives Report will be placed in the local document repository. This type of report typically presents the results of environmental sampling, describes conditions at the site, and evaluates the remedial alternatives for the contaminated soil and/or groundwater.

4.4 Proposed Remedial Action Plan

The NYSDEC will prepare the Proposed Remedial Action Plan (PRAP) which will summarize the remedial options for the site and propose a specific remedial alternative for implementation. A copy of the PRAP will be placed in the local document repository and a copy will be mailed to the Contact List (Appendix A). There will be a 45-day comment

period prior to implementing the proposed remedial alternative. A public meeting will be held during the comment period to review the PRAP and to address any questions or concerns. This meeting will be attended by representatives of the City of Amsterdam and the NYSDEC.

4.5 Responsiveness Summary

Following the 45-day comment period a brief Responsiveness Summary will be prepared by the NYSDEC. The Responsiveness Summary will address public comments about the PRAP and provide a brief analysis of the remedial program selected for implementation. The Responsiveness Summary will be appended to the Record of Decision (ROD) which will be available for review at the Document Respositories (Appendix B).

4.6 Record of Decision

Following the selection of a remedial alternative for the site, the NYSDEC will prepare the Record of Decision (ROD). A copy of the ROD will be placed in the local document repository and a fact sheet briefly describing the selected remedy will be mailed to the Contact List (Appendix A). The fact sheet will also indicate the location of the local document repository and identify appropriate points of contact.

5.0 SCHEDULE

The SI/RAR Project Schedule is presented below.

ACTIVITY	TIME FRAME
Mailing describing SI activities	Late summer 1998
Begin field activities	Late summer/early fall 1998
Mailing announcing availability of SI/RAR	Spring 1999
Mailing describing the Proposed Remedial Action Plan (PRAP) and announcing comment period	Late spring/early summer 1999

ACTIVITY	TIME FRAME
45-day comment period for PRAP	Completion of PRAP
Public Meeting to discuss PRAP	During 45-day PRAP Comment period
Mailing describing Selected Site Remedy and Response to Comments	After remedy is selected and Finalized

APPENDIX B

LOCATION FOR DOCUMENT REPOSITORY

Amsterdam Public Library
28 Church Street
Amsterdam, New York 12010
(518) 842-1080

Hours: Monday and Thursday	10:00 am - 8:00 pm
Tuesday, Wednesday and Friday	10:00 am - 5:30 pm
Saturday	10:00 am -4:00 pm (Closed July and August)
Sunday	Closed

New York State Department of Environmental Conservation
Region IV Office
1150 Westcott Road
Schenectady, NY 12306-1204
(518)357-2045

Hours: Monday - Friday	9 am - 4 pm

APPENDIX C

GLOSSARY OF COMMONLY USED CITIZEN PARTICIPATION TERMS

Community Participation - A process to inform and involve the interested/affected public in the decision-making process during identification, assessment and remediation of inactive hazardous waste sites. This process helps to assure that the best decisions are made from environmental, human health, economic, social and political perspectives.

Citizen Participation Plan - A document that describes the site-specific community participation activities that will take place to complement the "technical" (remedial) activities. It also provides site background and rationale for the selected community participation program at the site. A plan may be updated or altered as public interest or the technical aspects of the program change.

Consent Order - A legal and enforceable negotiated agreement between the NYSDEC and the potentially responsible party in which the potentially responsible party agrees to undertake investigation and remediation, if necessary, at the site. The Consent Order includes a description of the remedial actions to be taken and a schedule for implementation.

Contact List - Names, addresses and/or telephone numbers of individuals, groups, organizations and media interested and/or affected by an inactive hazardous waste site. The contact list is used to inform and involve the interested/affected public.

Document Repository - A location, typically a public building, near a particular site at which documents related to remedial and community participation activities at the site are available for public review. The document repository provides access to documents at times and a location convenient to the public.

Fact Sheet - A written discussion of the site's history, the status of the environmental study, or the remedial process. The fact sheet may be mailed to all or part of the contact list, distributed at meetings, or sent on an "as requested" basis.

Potentially Responsible Party (PRP) - Individuals, companies (e.g. site owners, operators, transporters or generators of hazardous waste) who may be responsible for an inactive hazardous waste disposal site.

Proposed Remedial Action Plan (PRAP) - A pubic document prepared by the NYSDEC after the Remedial Alternatives Report which summarizes the remedial options for a site and proposes a specific remedial alternative for implementation.

Public - The universe of individuals, groups and organizations: a) affected (or potentially affected) by the site and/or its remedial program; b) interested in the site and/or its remediation; c) having information about the site and its history.

Public Consultation/Community Meeting - A scheduled gathering which may present study findings, discuss alternatives, respond to questions and receive public comment.

Record of Decision (ROD) - A public document prepared by the NYSDEC following the selection of a remedy for a site. The ROD presents the rationale for the selected remedy and is prepared after a public comment period on the PRAP.

Registry - The NYSDEC Registry of Inactive Hazardous Waste Disposal Sites in New York State.

Remedial Alternatives Report (RAR) - A process for developing, evaluating and selecting remedial actions, using data gathered during the SI to: define objectives of the remedial program for the site and broadly develop remedial action alternatives; perform an initial screening of these alternatives; and perform a detailed analysis of a limited number of alternatives which remain after the initial screening stage.

Remedial Design - Once a remedial action has been selected, technical plans and specifications for remedial construction at a site are developed, as specified in the ROD. Design documents are used to bid and construct the selected remedial action.

Responsiveness Summary - A summary and response to public questions and comments.

Site Investigation (SI) - A process to determine the nature and extent of contamination by collecting data and analyzing the site. It includes sampling and monitoring, as necessary, and includes the gathering of sufficient information to determine the necessity for, and proposed extent of, a remedial program for the site.

APPENDIX D

POINTS OF CONTACT LIST

New York State

Public Information Office
New York Department of
Environmental Conservation
Attn: Gary Sheffer
50 Wolf Road
Albany, NY 12233
(518) 457-5400

Public Information Office
Region 4
New York State Department of
Environmental Conservation
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