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PREDESIGN STUDY WORK PLAN

WESTCHESTER COLPROVIA CORPORATION
BEDFORD, NEW YORK

DECEMBER 4, 1987

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1.0 INTRODUCTION

1.1 GENERAL

Westchester Colprovia Coporation operates an asphalt production plant in the Town of Bedford, Westchester County, New York. See Figure 1-1 for a map of the site. In December 1986 trichloroethylene (TCE) contamination was detected in a monitoring well (MW-3) on property of Colonial Sand & Gravel, located near the western boundary of Westchester Colprovia. In anticipation of the sale of its property, Westchester Colprovia retained Malcolm Pirnie to explore the relationship of the TCE contamination to its property.

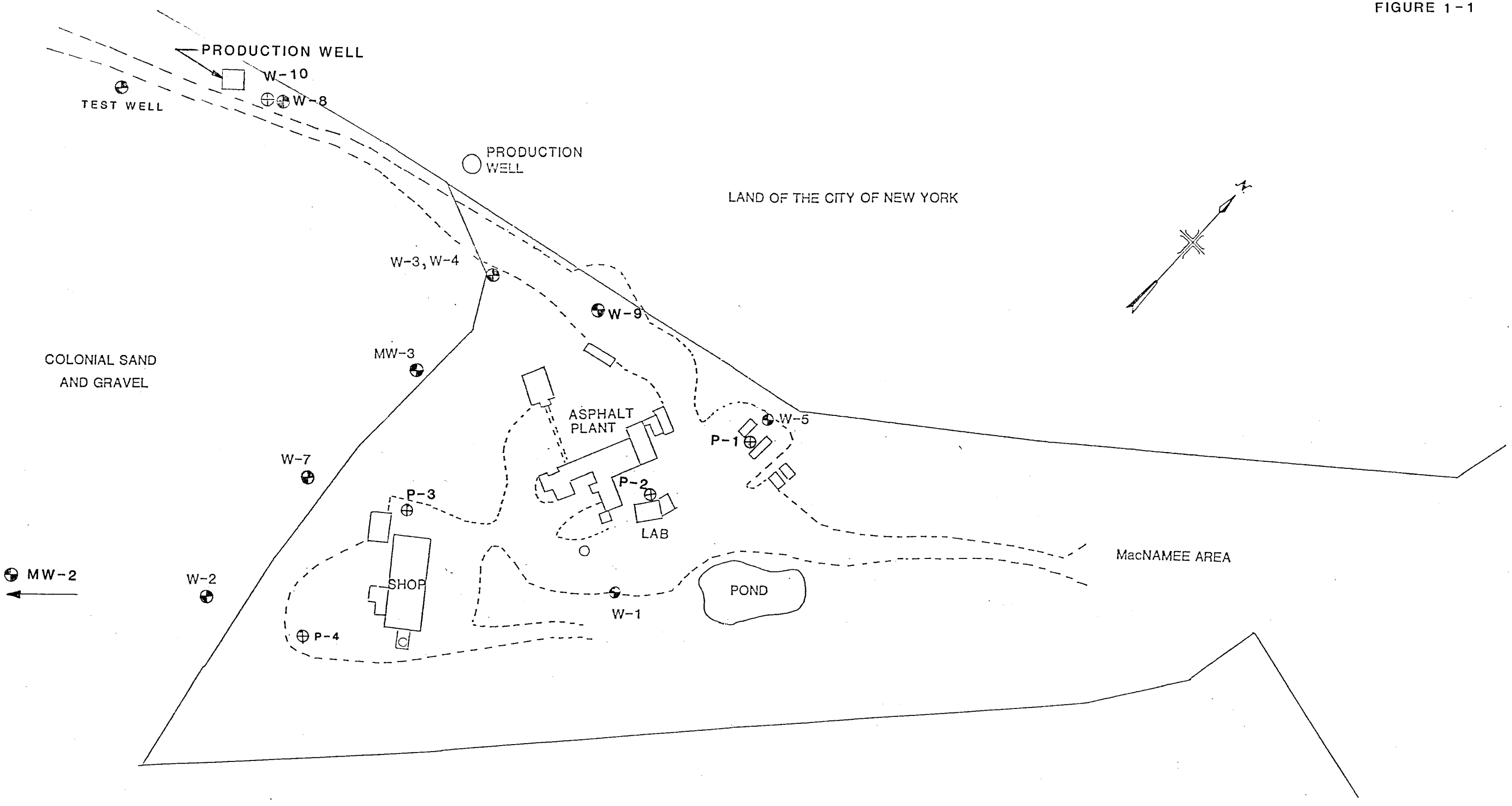
Based on investigatory findings previously detailed in Malcolm Pirnie's November 23, 1987 report entitled "Report of Site Investigations, Westchester Colprovia Corporation, Bedford, New York", interim site remediation has been proposed. However, additional field work is recommended to complete the design of these remedial measures. This work plan describes the additional investigatory field work.

1.2 GROUND WATER QUALITY FINDINGS

In general, the levels of volatile organics found in monitoring wells were low. However, TCE was detected at significant levels in MW-3 (1,570 ug/l), W-2 (34 ug/l), and W-7 (220 ug/l). The value in MW-3 was consistent with that found by Geraghty & Miller in December 1986 (1,400 ug/l). Of the metals analyzed for in ground water, only lead was detected in a significant concentration. The maximum contaminant level for lead in drinking water (USEPA National Interim Primary Drinking Water Regulations) is 50 ug/l. Lead was detected in two of the six wells sampled. It was found in MW-3 at 59 ug/l and in W-1 at 37 ug/l. Geraghty & Miller previously reported lead in MW-3 to be less than the detection limit of 50 ug/l.

The levels of TCE detected in W-2 and W-7 and westerly direction of ground water flow in this area do not indicate the principal source of TCE contamination in MW-3 to be on Colonial Sand and Gravel's property. W-1, located upgradient on Westchester Colprovia's property, showed no contamination that might be attributed to the corrections facility. During Geraghty & Miller's sampling, no TCE was detected in Westchester Colprovia's

FIGURE 1-1



WESTCHESTER COLPROVIA CORPORATION

BEDFORD HILLS, NEW YORK

SITE MAP

production well which is downgradient of MW-3. During the May 22, 1987 sampling, no TCE was detected in W-3 or W-4, which are also downgradient of MW-3, though they are not directly in the anticipated line of flow, as the production well is. TCE was not detected in W-8 or W-9. It appears that significant contamination has not migrated past the area of investigation towards the east, south, or west.

The results from the shallow soil gas investigation conducted indicate that there are two areas that are possible sources contributing to the ground water contamination underlying the site. The area on the north of the asphalt plant and the area on the northwest of the shop are possible sources of contamination.

1.3 PROPOSED REMEDIAL MEASURES

Ground water should be collected in the area of MW-3 and treated by air stripping to remove volatile organics. Recovery of this ground water may be accomplished by installation of one or more recovery wells or possibly an intercepting trench. We believe that flows of 5 to 10 gpm can be developed.

Treatment for removal of the volatile organics found in the ground water can be best accomplished by use of packed column air stripping. With this technique water is pumped to the top of the column and allowed to trickle downward over packing material which has great surface area. Air is blown upward through the column and volatiles leave the water and enter the air stream, exiting at the top of the column. We estimate that a column with a diameter of one foot and a packing height of over 33 feet will be required to reduce TCE concentrations below the USEPA drinking water maximum contaminant level (MCL) of 5 ppb.

Air leaving the column will contain volatile organics. However, emissions will be quite low. For example, at a water flow rate of 10 gpm and a water VOC concentration of 1,500 ppb, emissions to the air would be less than 0.2 pounds per day. The treated water should be recharged to the ground in the area previously used as a scrubber water recharge pond on the Westchester Colprovia property.

If volatile contamination of soils in the area of the Westchester Colprovia office and plant requires remediation, this can be accomplished either by

use of a soil gas extraction system or by excavation and treatment in the asphalt plant. With the soil gas extraction technique, an 8-inch diameter perforated pipe is installed as a soil gas vent and a vacuum is induced by a blower attached to the vent. Air moves through the pore spaces in the soil in the unsaturated zone and takes volatile organics with it. The almost complete paving of the Westchester Colprovia plant and the sandy nature of the soils will tend to increase the effectiveness of this method.

The soil vent is expected to have a radius of influence of at least 100 feet. An air flow rate of about 1,200 cfm (2,000 m^3/hr) would be utilized. At this flow rate and an average initial soil gas VOC concentration of 50 ug/l, a total of 5 pounds per day would be emitted. This concentration is expected to decrease rapidly with time.

With the excavation and onsite treatment technique, soil would be excavated and screened to remove gravel greater than 2 inches. Soil would be placed in the cold feed bins of the plant and fed to the rotary dryer. In the dryer, the soil would be tumbled at a temperature of 325 F which would drive off VOCs. Air from the dryer is directed to a baghouse for control of particulates. Emissions of VOCs to the air could be controlled by adjusting feed rates and mixing with clean soils at the cold feed bins. If the soil exhibited a suitable grain size distribution, it would be used in formulating bituminous concrete mixes. If not, it would be used for fill onsite.

2.0 FIELD INVESTIGATION

2.1 SOIL BORINGS, PIEZOMETER AND MONITORING WELL

Four soil borings are proposed to obtain more information on the areas where soil gas extraction is being considered and to correlate soil gas data with actual soil concentrations of VOCs. Piezometers will be installed in these borings to better define ground water elevations on the Westchester Colprovia property. The locations of these borings and piezometers are shown on the Site Plan, Figure 1-1. Locations are based on the results of the soil gas investigation conducted as part of the previous investigations.

Previous investigatory work has defined the extent of the TCE plume in the upper portion of the shallow sand and gravel aquifer. To ensure the TCE contamination has not migrated downward, a deeper monitoring well will be installed near W-8, on Colonial Sand and Gravel property, to provide a well cluster there.

Drilling and well installations will be conducted by a driller licensed in New York. A Malcolm Pirnie hydrogeologist will be present during the operations.

2.1.1 Soil Sampling During Piezometer Boring

1. Auger first one foot. Continuously drive decontaminated split spoons to 11 feet, advancing augers as necessary. Each spoon is to be opened on plastic sheeting and screened with the air monitoring instrument. After all the spoons have been screened, a sample will be collected from the spoon exhibiting the highest volatile organic reading. If no readings are obtained above background, the deepest sample will be collected and analyzed for VOCs and petroleum hydrocarbons.

2. Transfer a portion of the split spoon sample to be analyzed for volatile organics and petroleum hydrocarbons directly to sample containers using a stainless steel trowel.

3. Attach labels and seal, record all pertinent data in the field log book, complete the sample analysis request and chain of custody record before taking the next sample.

4. Place sample bottles in the sample cooler with ice.

5. Repeat the above at the next staked position.

6. After following the proper decontamination procedures, deliver samples to the laboratory for analysis.

2.1.2 Piezometer Construction

Each borehole will be converted into a piezometer by advancing the auger about 5 feet past the water table and installing 4-inch PVC casing and screen. This may not be possible behind the shop due to shallow bedrock in that area. Piezometers will conform to NYSDEC specifications for unconsolidated monitoring wells; typical construction is provided in Appendix A. Casings will be surveyed to the nearest one-hundreth foot.

2.1.3 Monitoring Well Construction

Monitoring well W-10 will be installed by hollow stem auger drilling to approximately thirty feet below the water table. The well will be cased to 20 feet below the static water level and the screen will be installed in the interval 20 to 30 feet below the static water level. Four-inch PVC screen and casing will be used.

The monitoring well will conform to NYSDEC specifications for unconsolidated monitoring wells; typical construction is provided in Appendix A. Following installation, the monitoring well will be developed by pumping and purging to remove fines, clean the well screen, and properly develop the gravel pack. Well casings will be surveyed to the nearest one-hundredth foot to establish elevations for ground water level measurements.

2.2 GROUND WATER SAMPLING

Approximately two weeks after the new monitoring well has been developed, a single sampling event is proposed to determine VOC concentrations and elevations at significant monitoring points at a single point in time utilizing consistent sampling and analytic protocols. Sampling points include:

- Malcolm Pirnie Wells W-1, W-2, W-3, W-4, W-5, W-7, W-8, W-9 and W-10
- Geraghty & Miller Wells MW-2, MW-3 and the shallow test well
- The concrete plant production well and asphalt plant production well

Field measurements will include pH, temperature, and specific conductivity, as well as the presence of organic vapors as measured with an organic vapor analyzer (OVA) or HNU photoionization detector.

Ground water samples will be analyzed for petroleum hydrocarbons and VOCs. Analytical methods are described in Section 3.5.

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2.2.1 Ground Water Sampling Procedure

1. After removing the well cap, measure the organic vapor concentration by placing the probe of the monitoring instrument above the well casing. Measurements will indicate the appropriate level of respiratory protection.

2. Measure the elevation of the air/water interface with an electronic water level indicator. All readings should be taken with respect to the top of the well casing and measured to 1/100 foot.

3. Calculate the water volume in the casing using the following equation:

$$V = \pi r^2 h \ (7.48 \ gal/ft^3)$$

Where:

V = standing water volume (gallons)
r = well casing radius (feet)
h = depth of water (feet)

4. Remove three to five times the standing water volume from the well by bailing or pumping. If bailing is employed, use a dedicated Teflon bailer for each well. If pumping is employed, submersible or centrifugal pumps equipped with dedicated polypropylene tubing may be used.

5. Collect ground water samples within two feet of the static water level using a dedicated Teflon bailer cleaned in accordance with the required decontamination procedures. Lower bailer gently into the well to avoid disturbance of the sample. Fill sample containers with care. Fill volatiles samples so that no headspace remains in the bottles.

6. Attach labels and seal, record all pertinent data in the field log book, complete the sample analysis request and chain of custody record before taking the next sample.

7. Place sample bottles in the sample cooler with ice.

8. Measure the temperature, pH, and specific conductivity of the ground water using appropriate field equipment and record results in the field log book.

9. Secure the well cap.

10. After following proper decontamination procedures, deliver samples to the laboratory for analysis.

Note:

Disposable gloves must be worn when handling sampling devices and during cleaning procedures. Refer to health and safety plan for additional requirements.

2.3 SLUG TESTS

Slug tests to determine aquifer characteristics will be conducted on wells W-8, W-9, MW-3 and the four piezometers installed. A known volume of water will be displaced in the wells and the time-drawdown of the water level will be monitored. Estimates of hydraulic conductivity will be made by the Hvorslev (1951) method which has been expanded to include a variety of field situations by NAVFAC (1971), Cedergren (1977) and Bonwer and Rice (1976).

2.4 RECOVERY WELL

After completion of the above soil and ground water sampling and the slug tests, a location for a recovery well or wells will be selected and construction details finalized. The alternative of a recovery trench in lieu of wells will also be considered at this time. The recovery system will be installed so as to intercept the plume of VOCs found at well MW-3 and is likely to be in the vicinity of that monitoring well.

After installation of the recovery system, a pump test will be conducted to determine the appropriate pumping rate to recover contaminated ground water without pumping excess clean water. Pumping will be carried on at various rates for 24 to 72 hours while water levels are measured in monitoring wells and piezometers. Based on the area of influence found during pumping, an appropriate pumping rate will be identified. This pumping rate, as well as water quality information gathered earlier, will be used in finalizing design of the ground water treatment system.

3.0 QUALITY ASSURANCE/QUALITY CONTROL

3.1 Quality Assurance Objectives

The purpose of following quality assurance/quality control (QA/QC) guidelines is to provide reliable sampling data. The quality of measurements made throughout the soil sampling/ground water sampling will be determined by the following characteristics: accuracy, precision, representativeness, completeness, and comparability. Adherence to Malcolm Pirnie's and the analytical laboratory's standard operating procedures will ensure high quality data. The site-specific quality assurance objectives formulated for each data-generating activity are summarized below:

Activity	General Tasks	QA Objectives
Sampling	Soil Sampling Ground Water Sampling	Collect representative samples. Prevent cross-contamination through the use of proper shipping, sampling, and decontamination procedures.
Field Measurements	Air Monitoring Soil Scanning Water Elevations Temp., pH, and Conductivity	Control findings through calibration, field tests, maintenance and data entry into field logbooks.
Laboratory Analysis	Soil Analysis Water Analysis	Provide high data quality through approved methodologies, accuracy protocols, precisions protocols, sensitivity goals, comparability and over-all data completeness.

3.2 Sampling Equipment and Procedures

3.2.1 General

Representative sampling of environmental matrices for chemical analysis depends on proper collection, preservation, shipping, custody, and preparation techniques. Unpreserved or improperly shipped samples may jeopardize sample

integrity and reduce data quality. To provide reliable sampling data, Malcolm Pirnie will adhere to operating procedures provided in this section and in the appendices.

3.2.2 Procurement and Preparation of Sample Containers

Containers for soil and ground water samples will be provided by the analytical laboratory. Container closures will be screw-on type and made of inert materials. Sample containers will be cleaned and prepared by the laboratory prior to being sent to the field. Trip blanks will be used to check against any false positives due to laboratory cleaning procedures or cross contamination during sample shipment.

3.2.3 Labeling of Samples

The sample label is a white label with black lettering and an adhesive backing. A sample label is attached to each bottle that contains a sample. In addition, the label is covered with clear plastic tape to ensure that it does not peel off or become damaged. A unique sample number is assigned to the waste source under inspection and any samples taken from it.

3.2.4 Decontamination of Sampling Equipment

Soil and ground water sampling devices (trowels, split spoons, bailers, scoops) will be decontaminated by the following procedure:

1. Wash with nonphosphate detergent and water solution.
2. Rinse with tap water.
3. Rinse with distilled/deionized water.

3.2.5 Preservation/Holding Times

The laboratory will analyze soil and ground water samples for petroleum hydrocarbons and volatile organic compounds (VOCs). Information on sample containers, preservation techniques, and holding time limits is presented below:

Medium	Analysis	Container	Preservative	Refrigerate	Hold Time
Soil	VOC	Jar	None	Yes	14 days
Soil	TPH	Jar	None	Yes	28 days
Ground water	VOC	Septum vial	None	Yes	7 days
Ground water	TPH	Bottle	HCl to pH <2	Yes	28 days

3.2.6 Field Logbook

Field logs will be kept by sampling personnel to record pertinent information about the field investigation. The data recorded will be essential to the evaluation and interpretation of sample analytical results, as well as pointing out any problems encountered during sampling. A sampling log will be included in the field log book for each soil and ground water sample. The sampling log will document:

(For Soil Samples)

- Date/time/weather
- Personnel
- Sample identification
- Sample location
- Sample depth
- Soil profile
- Sample description
- Sampling equipment used
- Other relevant information, including air and soil monitoring measurements

(For Ground Water Samples)

- Date/time/weather
- Personnel
- Sample and well identification
- Sample description
- Static water level
- Total well depth
- Purged volume
- Purging method/equipment
- Sampling equipment used
- Presence and thickness of any free product layer
- Other relevant information, including air monitoring measurements

3.3 Quality Control Samples

Quality control procedures will be employed to check that sampling and transport activities do not bias sample chemical quality. Trip blanks, field blanks, and duplicate samples will provide a quantitative basis for validating the data reported.

3.3.1 Trip Blanks

Trip blanks consist of a set of sample containers which are filled with distilled/deionized, analyte free water and shipped to the site with the other sample containers. One trip blank is included for each day's shipment of

ground water samples scheduled for analysis. The trip blanks will be analyzed for VOCs in order to determine shipment contamination.

3.3.2 Field Blanks

A field blank consists of an empty set of laboratory-cleaned sample containers. At the field location, distilled/deionized, analyte free water is passed through decontaminated sample equipment and placed in the empty set of sample containers for analysis. One field blank for each matrix sampled must accompany each day's sample shipment. Analysis will be for the parameters under evaluation, petroleum hydrocarbons and VOCs.

3.3.3 Duplicates

Duplicates of soil and ground water will be submitted for analysis of all parameters specified for those samples according to the following schedule:

Medium	Number
Ground water	5 percent of samples analyzed (minimum of one per sampling event)
Soils	5 percent of samples analyzed (minimum of one per sampling event)

Duplicates will be collected concurrently with the samples. The numbering sequence for all samples will include provisions for duplicates. The identity of the duplicate samples will not be revealed to the laboratory.

3.4 Sample Custody

The objectives of sample custody, identification, and control are:

- All samples scheduled for collection, as appropriate for the data required, are uniquely identified.
- The correct samples are tested, and are traceable to their records.
- Important sample characteristics are preserved.
- Samples are protected from loss or damage.
- Any alteration of samples (e.g., filtration, preservation) is documented.
- A record of sample integrity is established for legal purposes.

Malcolm Pirnie will follow an established program of sample chain-of-custody during all sampling efforts in both field and laboratory operations. This program is designed to see that each sample collected is accounted for at all times. To maintain this level of sample monitoring, sample container labels, field logbooks, chain-of-custody records, shipping manifests, and laboratory receipt sheets must be completed by the appropriate sampling and laboratory personnel.

The chain-of-custody protocol followed by the sampling crews involves:

- Documenting procedures and amounts of reagents or supplies which become an integral part of the sample (e.g., filters and reagents) for sample preparation and preservation.

- Recording sampling locations and specific sample acquisition measures in the field logbook.

- Using pre-prepared sample labels to document information necessary for effective sample tracking.

- Completing standard field tracking report forms to establish sample custody in the field before sample shipment.

Labels are developed for each sample to be collected. Each label is numbered to correspond with the appropriate sample(s) to be collected. The sample numbers coincide with those recorded in the field logbook. The field logbook is used to record sample location, sampling method, type of sample, date of sample collection, weather conditions, temperature, name of the sampling crew member responsible for the sample, and other relevant information.

The chain-of-custody record is used to: 1) document sample handling; including sample locations, sample number and amount of containers corresponding to each number; 2) describe the sample; and 3) describe the chain-of-custody process. The chain-of-custody description section requires: 1) the sample number; 2) the names of the sampler and of the person shipping the samples; 3) the date and time that the samples were delivered for shipping; and 4) the names of those responsible for receiving the samples at the terminal and at the laboratory. The chain-of-custody record is completed in triplicate. One copy accompanies the samples to the laboratory, another is kept by the sample crew chief, and the third is maintained in the project file.

3.5 Laboratory Analyses

Laboratory analyses will be performed by Envirotest Laboratories, Inc. in Newburg, New York. Soil and ground water samples will be analyzed for the parameters indicated following methods provided in the 1987 edition of USEPA SW 846.

A laboratory QA/QC program will be followed which defines procedures for the evaluation and documentation of subsampling, analytical methodologies, and reduction and reporting of data. Laboratory Standard Operating Procedures have been developed.

Quality control procedures which will be routinely performed during sample analyses include method blank analysis to establish analyte levels, duplicate analysis to establish analytical precision, and spiked and blank sample analysis to determine analytical accuracy. Tier II quality assurance and deliverable requirements will be met.

3.6 Data Validation

Data packages provided by the laboratory will be validated by Malcolm Pirnie. Data will be reviewed in accordance with the USEPA CLP review document, "Laboratory Data Validation - Functional Guidelines for Evaluating Organic Analyses," TDD No. HQ-8410-01, 1985.

Data will be assessed for the following QA parameters:

- Sample holding times
- GC and GC/MS tuning and performance
- Calibration
- Blanks
- Surrogate recovery
- Matrix spike/matrix spike duplicate
- Compound identification
- System performance
- Overall assessment of data

4.0 HEALTH AND SAFETY PLAN

4.1 GENERAL

This Health and Safety Plan has been developed for investigatory actions to be conducted at the Westchester Colprovia and Colonial Sand and Gravel sites. The plan provides procedures for use by field personnel to minimize the potential for exposure to chemical contaminants and the potential for accidents from physical hazards. Project objectives, background information, and the scope of work are found elsewhere.

The investigatory actions will involve installation of a monitoring well and piezometers, sampling of soils and ground water, conducting additional slug tests, installation of a recovery well and pumping tests. All operations will comply with the requirements of the Occupational Safety and Health Administration (OSHA) Safety and Health Regulations for Construction, 29 CFR 1926 Subpart C, General Safety and Health Provisions, and with the applicable requirements of OSHA Occupational Safety and Health Standards, 29 CFR 1910. Guidance provided in the Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities[1] has been incorporated, as appropriate, into this plan.

Work will be conducted in a safe and environmentally acceptable manner, and all field personnel shall be required to comply with the health and safety requirements specified herein. All personnel participating in the field investigations shall be required to read and familiarize themselves with the contents of this plan and to document this activity through the entry of a signature and date in the Project Log Book. Each person, including subcontractor personnel, must be able to demonstrate that he or she has undergone the appropriate training and medical monitoring and is fit to wear respiratory

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1. This manual was prepared by the National Institute for Occupational Safety and Health, the Occupational Safety and Health Administration, the U.S. Coast Guard, and the U.S. Environmental Protection Agency and is distributed by the U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, NIOSH (October 1985).

protection if respiratory protection is required. The Health and Safety Plan Review Form is provided on Figure 4-1. Copies of the approved Health and Safety Plan shall be maintained on-site during all field activities.

4.2 KEY PERSONNEL AND THEIR SAFETY-RELATED FUNCTIONS

4.2.1 Health and Safety Officer (Richard Califano)

The Health and Safety Officer supervises development of health and safety guidelines and ensures that all personnel are aware of the provisions of the Health and Safety Plan, have been informed of the nature of the risk of chemical exposure, and are trained in the proper use of safety equipment and protective clothing. He may audit safety procedures employed at the site. The Health and Safety Officer will designate qualified on-site personnel to carry out safety-related functions. The Health and Safety Officer is authorized to direct any person to stop work if safety requirements are not being met. He is also authorized to direct resumption of work when satisfied that any hazardous conditions are corrected.

4.2.2 Site Safety Officer (to be assigned)

The Site Safety Officer, designated by the Health and Safety Officer, directs the implementation and field evaluation of the Health and Safety Plan and has the authority to order work to be stopped if health and safety requirements are not being met. Resumption of work will require concurrence of the the Site Manager. He will be in charge during any emergency.

4.2.3 Project Manager (Andrew Anderson)

The Project Manager provides overall direction for the implementation of field activities in accordance with this plan. He is to monitor operations at the site to assure that work is conducted in a safe manner and the potential for exposures and accidents are minimized. Incident reports and questions are to be directed to this individual.

4.2.4 Site Manager (to be assigned)

The Site Manager ensures that field work is conducted in accordance with the approved Remedial Action Plan and the approved Health and Safety Plan. He is authorized to call off work if adverse weather conditions affect the safety of field personnel. The Site Manager also is authorized to direct any person to stop work if safety requirements are not being met. Resumption of work

FIGURE 4-1

HEALTH AND SAFETY
PLAN REVIEW FORM

The following personnel have read this Health and Safety Plan and are familiar with its provisions.

Name	Title/Company	Signature	Date

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will require concurrence of the Site Safety Officer. The Site Manager will conduct a daily meeting with field personnel to coordinate work and designate responsibilities.

4.3 KNOWN HAZARDS AND RISKS

4.3.1 Chemical Exposure

Volatile organic compounds (VOCs) were detected in soil and ground water samples collected during the previous investigations. The following VOCs were detected in the soil gas samples (in decreasing order of predominance):

- 1,1,1,2-Trichloroethane
- Tetrachloroethylene
- Trichloroethylene

Petroleum hydrocarbons were detected in soils from where underground storage tanks were removed. Benzene, toluene and xylene were detected in low concentrations in some of the ground water samples.

Exposure to VOCs is the chief concern at the site. Because of their volatility, workers could be exposed through inhalation of vapors. The VOCs are considered to be potential carcinogens. VOCs are also irritating to the skin and mucous membranes, and are narcotic at high concentrations.

4.3.2 Physical Hazards

The potential for accidents exists whenever heavy equipment is in operation. Caution must be exercised when operating equipment and moving throughout the site.

4.4 LEVELS OF PROTECTION

Task-specific nominal levels of protection are outlined in Table 6-1. Items such as disposable tyvek coveralls, chemical resistant gloves, and disposable latex boots will be worn when contacting potentially contaminated soils. The need for respiratory protection from organic vapors or dusts will be determined in the field by the Site Safety Officer. The level of protection may be upgraded at the direction of the Site Safety Officer. Factors affecting this decision may include: 1) known or suspected presence of dermal hazards, 2) occurrence or likely occurrence of organic vapors, and 3) change in work task that will increase contact or potential contact with hazardous materials.

Personnel shall be properly respirator fit tested prior to upgrading to Level C protection, should that be required. Respirators are to be stored in a convenient, clean and sanitary location and be properly decontaminated at the end of each workday. Only OSHA-approved, full face, air purifying respirators may be used. Combination cartridges, such as MSA GMA-H, approved for respiratory protection against organic vapors and dusts, are to be used. Cartridges must be changed daily, at a minimum. No facial hair interfering with respirator fit will be permitted if Level C respiratory protection is required.

The ambient air will be monitored semi-continuously during each of the tasks listed in Table 4-1. A photoionization detector (PID) or an organic vapor analyzer (OVA) will be used to determine the level of organic vapors. Monitoring will be conducted in the breathing zone directly adjacent to areas of drilling and sampling activity. If any positive results are encountered, monitoring will be continued away from the area until backgroun levels are found and the distance from the source activity and wind direction will be noted. Calibration procedures for the OVA and PID are provided in Malcolm Pirnie's Standard Operating Procedures (SOP) Manual. Adjustments to the prescribed level of protection will be considered based on general guidelines associated with ambient air readings. These guidelines are as follows:

Air Reading	Level of Protection
1. Background	D
2. Background to 5 ppm above background	C
3. 5 ppm above background to 500 ppm above background	B

Although total vapor/gas concentration measurements are useful for the selection of protective equipment, the protection level should not be based solely on the total vapor/gas criterion. Rather, the level should be selected case by case, with special emphasis on potential exposure and chemical and toxicological characteristics of the known or suspected material(s). The 5 ppm action level is for unknown compounds. If specific constituents are identified, the level may be adjusted based on established exposure guidelines.

TABLE 4-1

RECOMMENDED LEVELS OF PROTECTION

Task	Respiratory[1]	Clothing			
		Coveralls	Gloves	Boots	Other
Air Monitoring	C	C/T	L/N	W/L	H
Soil Sampling	D	C/T	L/N	W/L	H,G
Piezometer/Monitoring Well Installations	D	C/T	L/N	W/L	H,G
Ground Water Sampling	D	C/T	L/N	W/L	H,G
Slug Tests	D	C/T	L/N	W/L	H,G
Decontamination	D	C/T	L/N/B	W/L	H,G

Notes:

1. Provisions shall be made to upgrade the level of respiratory protection based on air monitoring results and dust conditions.

B = Butyl rubber
C = Cotton or cotton/polyester
T = Tyvek
L = Latex
N = Nitrile
W = Work boots (steel toe and shank)
G = Chemical splash goggles or face shield
H = Hard hat

4.5 CONTROLLING SITE ACCESS

The Site Safety Officer is responsible for maintaining procedures to prevent unauthorized personnel from entering the work area and all personnel from entering the work area without the prescribed level of protection.

4.6 DECONTAMINATION PROCEDURES

Procedures for decontaminating protective clothing and equipment are as follows:

4.6.1 Protective Clothing

All personal protective clothing will be either washed and rinsed or discarded. Detergent and water will be used as the decontamination solution.

4.6.2 Sampling Equipment

Sampling equipment shall be decontaminated by the following procedure:

1. Scrub with nonphosphate detergent and water solution.
2. Rinse with tap water.
3. Rinse with distilled/deionized water.

4.6.3 Respirators

Certain parts of contaminated respirators, such as the harness assembly and leather or cloth components, are difficult to decontaminate. If grossly contaminated, they may have to be discarded. Rubber components can be soaked in soap and water and scrubbed with a brush as per the manufacturer's instructions.

4.6.4 Heavy Equipment

Drill rigs will be employed for piezometer and monitoring well installations. Augers will be steam cleaned between sampling locations and before leaving the site.

4.6.5 Sanitizing of Personal Protective Equipment

Respirators, reusable protective clothing, and other personal articles not only must be decontaminated before being reused, but also sanitized. The insides of masks and clothing become soiled due to exhalation, body oils, and perspiration. The manufacturer's instructions should be used to sanitize the respirator mask. Protective clothing should be discarded, machine washed or cleaned by hand, as appropriate.

4.7 EMERGENCY PROCEDURES

4.7.1 Site Evacuation

In the event that an emergency necessitates evacuation of the work area or entire site, the site may be exited along the access road leading to Harris Road. If the site is evacuated due to an emergency, personnel shall not re-enter until:

1. The conditions resulting in the emergency have been corrected.
2. The hazards have been reassessed.
3. The Health and Safety Plan has been revised.
4. Site personnel have been briefed on any changes in health and safety equipment or procedures.

4.7.2 Emergency Response

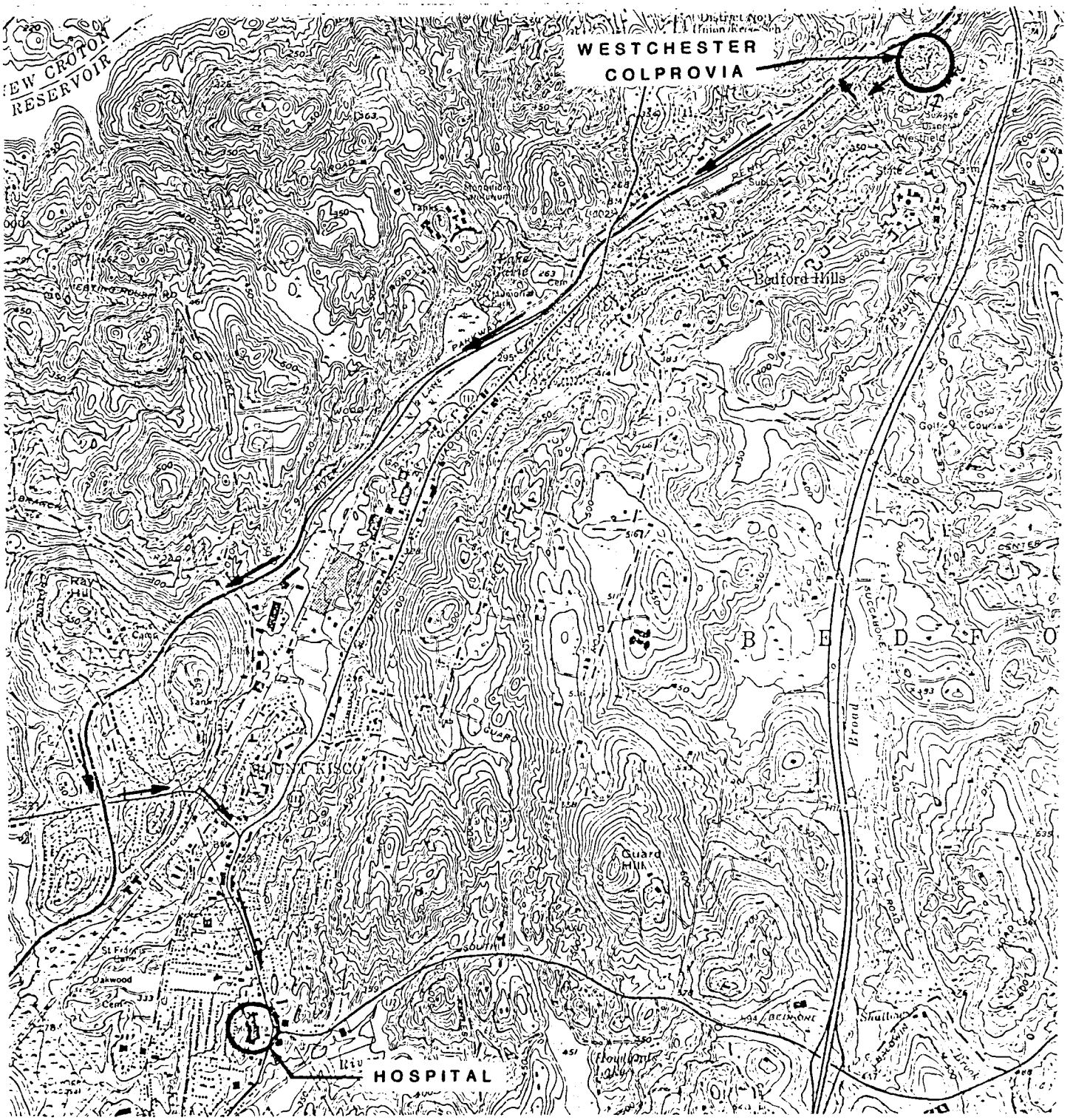
Emergency response in the project area is coordinated by the Bedford Police Department.

In the event of a serious medical emergency, victims may be treated at Northern Westchester Hospital in Mount Kisco, New York. The Emergency Room Supervisor should be contacted in the case of a serious medical emergency for determination of the appropriate mode of transportation (i.e., by personal vehicle, ambulance, or ambulance after on-site treatment by paramedics). The hospital is reached by turning right onto Harris Road, turning left (traveling south) onto Bedford Road and left onto the Sawmill River Parkway South, to the Mount Kisco Main Street exit. Turn left onto Main Street, travel south to the hospital entrance on the right. A map of the route to this facility is included herein (Figure 4-2). A copy of the map shall be maintained at the site during all activities.

Emergency Contacts

Police:	241-3111 (Town of Bedford)
Fire:	323-3000 (Katonah Fire Department)
Hospital:	666-1200 (Northern Westchester Hospital)
Poison Control Information:	1-800-962-1253 (Poison Control Center)
Nearest Phone:	Telephone inside Westchester Colprovia office trailer

FIGURE 4-2



DIRECTIONS TO
NORTHERN WESTCHESTER
HOSPITAL

4.7.3 Emergency First Aid

Emergency first aid treatment is only administered as a means of providing relief from injury and preventing further damage until professional treatment can be obtained. The following first aid equipment will be provided at the site:

- American National Red Cross First Aid Handbook
- Compresses
- Gauze and gauze roller bandage
- Triangular bandages
- Eye dressing packet
- Smelling salts
- Baking soda
- Salt or other emetic (syrup of ipecac)
- Eye wash
- Soap or waterless hand cleaner and towels
- Band aids
- Tape
- Scissors
- Tweezers
- Water
- Soap

4.7.4 Incident Reports

In the event of injury or exposure to any field personnel, the Site Safety Officer is responsible for the preparation and submission of an incident report. The Project Manager in consultation with the Health and Safety Officer is required to follow up on treatment and recovery. Figure 4-3 presents a sample Incident Report.

4.8 MEDICAL MONITORING

4.8.1 Initial Medical Examinations

All personnel working on site are required to undergo initial medical examinations to establish the individual's state of health and fitness relative to their project assignments, baseline physiological data for future reference, and ability to wear personal protective equipment. Personnel who are currently participating in a medical monitoring program and have undergone a medical examination within the last year are not required to undergo an additional examination. The initial examination includes the following:

Medical and Occupational History

A confidential health questionnaire has been designed to elicit general and specific information concerning employee health. Emphasis has been placed

FIGURE 4-3

INCIDENT REPORT

TO: Health and Safety Officer Date _____

FROM: _____

Project: _____ Project No. _____

Name: _____ Employee No. _____

Location of Incident

_____

Brief description of incident: _____

_____

_____

Cause of incident: _____

_____

_____

_____

Medical treatment received: _____

_____

Physician's recommendations: _____

_____

_____

Date returned to work: _____

- -

Action taken: _____

_____

_____

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on any prior occupational exposures to chemical and physical hazards, any past illnesses and chronic diseases, and any symptoms, susceptibilities or life-style habits which may affect the individual's work. The questionnaire will allow the examining physician to determine appropriate tests and procedures.

Physical Examination

A comprehensive physical examination of all body organs, focusing on the pulmonary, cardiovascular and musculosketal systems will be conducted. The examination includes the following:

- Height, weight, temperature, pulse, respiration and blood pressure
- Head, nose and throat
- Eyes, including vision tests that measure refraction, depth perception and color vision
- Ears, including audiometric tests (pure-tone audiometers and sound-shielded booths are required. Tests are to be administered by qualified technicians and results are to be read by a certified audiologist.)
- Chest (heart and lungs)
- Peripheral vascular system
- Abdomen and rectum (including hernia exam)
- Spine and other components of the musculosketal system
- Urogential system
- Skin
- Nervous system

Tests

Electrocardiogram (EKG) - A standard, 12-lead, resting EKG as a minimum and interpreted by an internist or cardiologist. A stress test may be administered, to replace the resting EKG, at the discretion of the physician.

Pulmonary Function - Lung ventilation tests to measure forced vital capacity (FVC), forced expiratory volume (FEV_1) in some one second, and FEV_1 to FVC ratio, with interpretation and comparison to normal predicted values corrected for age, height, race and sex.

Blood - Hematologic analyses to establish liver, kidney and blood forming function. These tests should include a complete blood count (CBC) with differential and platelet evaluation, including white cell count (WBC), red cell count (RBC), hemoglobin (HGB) and hematocrit (HCT).

Reticulocyte count may be appropriate if exposure to hemolytic chemicals is likely. Other blood analyses should include:

Methemoglobin	Creatinine
Total protein	Cholesterol
Albumin	Triglycerides
Globulin	Glucose
Total bilirubin	Calcium
Alkaline phosphatase	Phosphorus
Lactic dehydrogenase	Sodium
SGOT	Potassium
SGPT	Chloride
GGTP	Iron
Urea nitrogen	T-4 by RIA
Uric acid	Serology ART

Other blood tests may be appropriate if it is anticipated that the employee will receive significant exposure to specific chemicals. For example, procedures are available to determine blood levels of arsenic, lead, cadmium, organophosphate pesticides and polychlorinated biphenyls. If exposure to organophosphate and carbamate pesticides is likely, blood cholinesterase levels may be measured.

Urine - Urinanalysis including color, appearance, specific gravity, pH, glucose, protein, bile, acetone, occult blood, albumin, reaction, leukocyte strip and microscopic examination of centrifuged sediment.

Chest X-ray - A baseline chest x-ray should be at least at 14 x 17-inch posterior/anterior exposure chest X-ray. The film will be interpreted by a board-certified radiologist or NIOSH certified "B" reader.

Vaccinations - Vaccinations for tetanus should be updated. Where potential exposure to infectious/pathological wastes exists, appropriate vaccinations/inoculations may be given.

Additional Tests - Additional tests may be included at the discretion of the physician.

4.8.2 Reexaminations

Medical examinations are also conducted:

1. After acute exposure to any toxic or hazardous material.

2. When an employee has been exposed to dangerous levels of toxic or hazardous materials.

3. Annually and at termination of employment.

4. At the discretion of the Health and Safety Officer and at the request of an employee with demonstrated symptoms of exposure to toxic or hazardous materials.

Comparison of sequential medical reports with baseline data is used to determine trends that may mark early signs of adverse health effects and thereby facilitate appropriate protective measures. The frequency and content of the periodic examinations may vary depending on work assignments and the discretion of the physician.

Reexaminations may include all the elements of the initial medical examination or may be less comprehensive depending upon the aforemention factors. The following items would typically be included:

Medical and Occupational History

A confidential health update questionnaire covering changes in health status since the initial medical examination focusing on possible occupational exposures will be completed.

Physical Examination

As described earlier.

Tests

Electrocardiogram (EKG) - An EKG, as described earlier, will be obtained annually for employees over 40 and every three years for all other employees or at the discretion of the physician pending the employee's medical history.

Pulmonary Function, Blood, Urine, Vaccinations - As described earlier.

Chest X-ray - Chest x-rays, as described earlier, will be obtained every three years or at the discretion of the physician pending the employee's medical history.

Additional Tests - Additional tests may be included at the discretion of the physician.

4.8.3 Reporting

Following the completion of each medical examination the following actions will be taken in accordance with good medical practice:

1. The physician or other appropriate representative of the physician group will discuss the results of such medical examination with the

individual examined. Such discussion shall include an explanation of the findings of the examination and, as appropriate, an explanation of any medical condition which the physician believes requires further evaluation or treatment and any medical condition which the physician believes would be adversely affected by such individual's employment.

2. A written report of such examination shall be transmitted to the individual or the individual's private physician upon written request by the individual. The examining physician or physician group shall notify the Health and Safety Officer in writing that the individual has received a medical examination and shall advise as to any specific limitations upon such individual's ability to work which were identified as a result of the examination.

4.9 TRAINING

Field personnel are required to undergo 40 hours of safety and health training. Training is provided to ensure that field personnel are:

- Cognizant of the hazards of their jobs and able to perform their work in a manner where risk to personal health and safety is reduced to the greatest extent feasible.
- Aware that maximum concern for the health and safety of other workers, the public, and environment is given.
- Knowledgeable in the tasks they must perform so they react responsibly and are able to correctly respond to emergency situations.

Training sessions include classroom instruction, demonstrations, and field exercises. The following subjects are covered in the training program:

- Safety and health program
- Chemical and physical hazards
- Toxicology/emergency preparedness
- Personal protective equipment/work practices
- Respiratory protection principles, workshop, and field exercise
- Risk assessment and site safety
- Site characterization and analysis
- Site operation and control
- Monitoring instruments
- Decontamination
- Sampling and shipping
- Community relations
- Quality assurance

A detailed safety manual is used as a learning aid for trainees. The application of common sense and good judgment are heavily emphasized as part of the training program. Annual refresher training and, as needed, site

specific training is provided to employees in addition to the 40-hour orientation training.

4.10 GENERAL SAFETY RULES AND EQUIPMENT

1. There shall be no eating, drinking, smoking, or chewing gum or tobacco in the work area.

2. Personnel should shower as soon as possible after any protective garments are removed and the activities for the day have terminated.

3. An adequately stocked first aid kit shall be available on site.

4. A portable fire extinguisher shall be available on site.

5. All sampling shall be performed in accordance with the standard operating procedures.

6. All injuries shall be reported to the Site Manager.

7. Contact lenses are not to be worn in the work area.

8. An emergency eye wash station shall be available on site.

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APPENDIX A

TYPICAL MONITORING WELL CONSTRUCTION

NEW YORK STATE

DEPARTMENT OF ENVIRONMENTAL CONSERVATION

MONITORING WELL SPECIFICATIONS

Groundwater Monitoring Well Specifications. (See Figure 1)

(1) All wells to be nominal four (4) inch diameter

(2) Boring logs shall be recorded for each boring. Soil samples shall be taken from each soil layer encountered or at a maximum five (5) foot intervals to give a general description of the underlying soils at the facility.

(3) Wells must be installed plum and straight.

(4) Flush threaded joints must be used to avoid contamination of well by glued joints.

(5) Well screens are to be machine slotted and be of adequate length and placement to accommodate seasonal variations in water table. (Length will generally be 10' to 15' with the mean water table in the middle of the screen).

(6) Filter pack must be compatible with soil around screened portion of well and with the screen opening. It must extend approximately one foot below the screen and three to five feet above the screen.

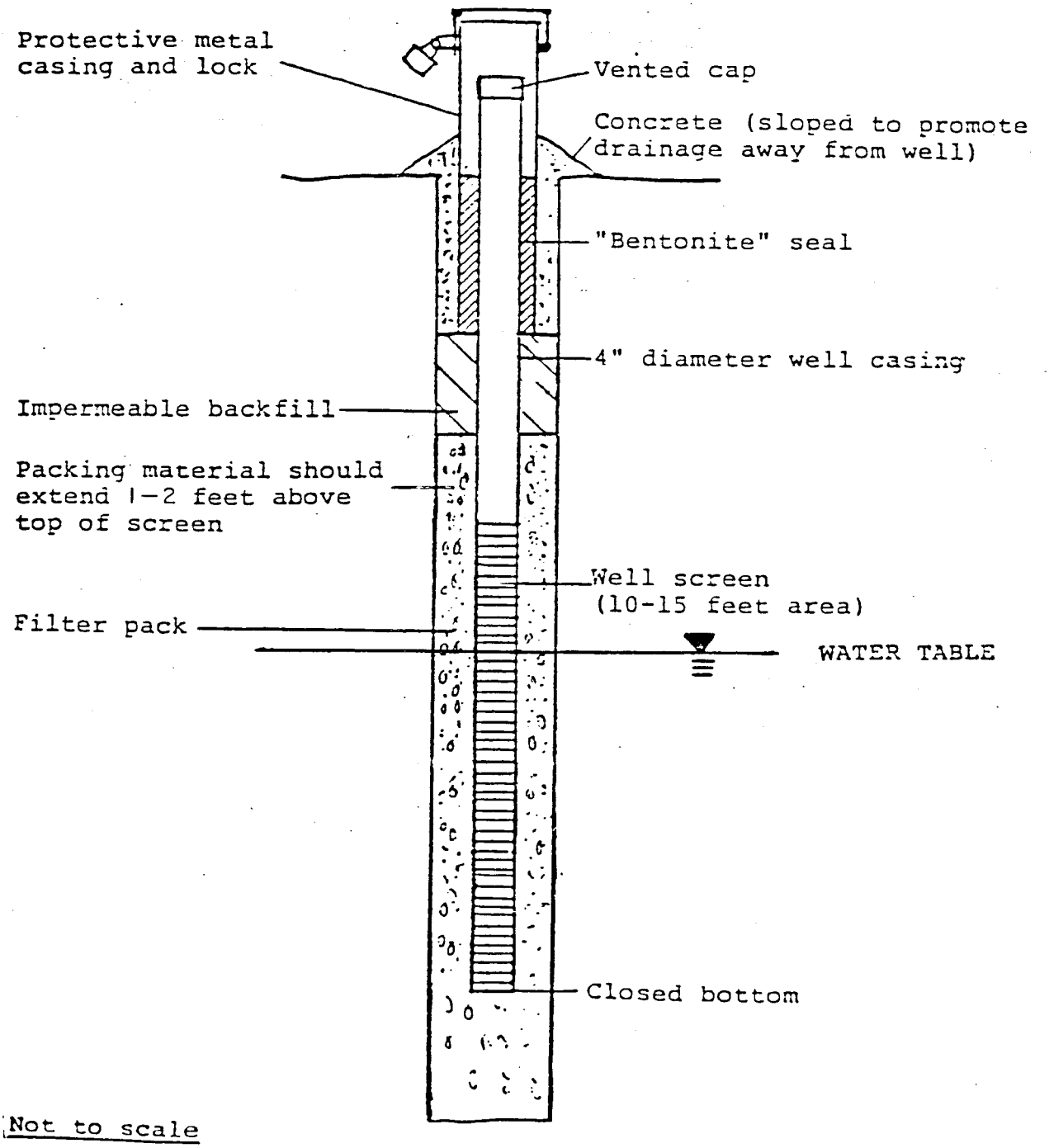
(7) The well must be sealed between the casing and the bore hole with an impermeable material and capped with concrete or other suitable material to prevent contamination from the surface.

(8) Wells must be sufficiently developed to ensure that samples will accurately represent the condition of the groundwater.

(9) Tops of wells must be enclosed by a protective metal casing and locked.

(10) All wells must be clearly marked as monitoring wells.

FIGURE 1



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MONITORING WELL