The electronic version of this file/report should have the file name:

Type of document.Spill Number.Year-Month.File *Year-Year* or Report name.pdf

letter._______________.________-______.File spillfile ___.pdf

report.hw915164 ____.1994-1019.work plan ____.pdf

Project Site numbers will be proceeded by the following:

Municipal Brownfields - b
Superfund - hw
Spills - sp
ERP - e
VCP - v
BCP - c

non-releasable - put .nf.pdf
Example: letter.sp9875693.1998-01.Filespillfile.nf.pdf

MALCOLM PIRNIE

RECEIVED
OCT 19 1994
N.Y.S. DEPT. OF
ENVIRONMENTAL CONSERVATION
REGION 9

# WORK PLAN FOR PLANT 11 REMEDIAL EVALUATION

MOOG INC.
EAST AURORA, NEW YORK

OCTOBER 1994

MALCOLM PIRNIE, INC.

S-3515 Abbott Road
P. O. Box 1938
Buffalo, New York 14219

PR41741/MOOG-WP.

MALCOLM PIRNIE

# WORK PLAN FOR PLANT 11 REMEDIAL EVALUATION

MOOG INC.
EAST AURORA, NEW YORK

OCTOBER 1994

MALCOLM PIRNIE, INC.

S-3515 Abbott Road
P. O. Box 1938
Buffalo, New York 14219

PR41741/MOOG-WP.

## INTRODUCTION

An environmental site assessment report prepared by Blasland, Bouck, and Lee, Inc. (July 1994) for an independent third party has documented the occurrence of volatile organic compounds (VOCs) in groundwater and subsurface soil near an underground storage tank (UST) at Plant 11 on the Moog Inc. East Aurora campus (see Figure 1). Moog Inc. leases a portion of Plant 11 to Moog Controls, Inc. Moog Controls, Inc. owns and operates the UST for the storage of waste cutting oils. The existing UST has been in use since 1990, when a previous UST was removed from the same location. The previous UST was used during its lifetime by both Moog Controls, Inc. and Moog Inc.

Malcolm Pirnie, Inc. has been retained to develop a remedial response for the UST site. Remedial technologies that may be feasible for the site are identified and discussed in this Work Plan based on a review of existing site information and discussions with Moog, Inc. Site characterization activities are planned in order to support evaluation of the identified potentially feasible technologies.

A remedial response will be developed for:

- Hydrocarbon and solvent contaminated soil near the existing 1000 gallon UST that may present a continuing release of contaminants to groundwater. The existing tank replaced an older tank at the same location and is reportedly four years old. Analytical data on the soils underlying the original tank were not obtained during tank removal. Contaminated soils may have originated as a result of leakage from the previous tank installed at the same location, or as a result of spills which occurred during the past four years. The volume of contaminated soils has not been determined.

- Solvent contaminated groundwater downgradient of the UST. Existing data indicate that the lateral extent of groundwater impact is limited. The depth of contaminated groundwater has not been determined.

## PREVIOUS INVESTIGATIONS

Previous subsurface investigations performed at Plant 11 include subsurface soil and groundwater sampling at 11 locations illustrated on Figure 2. Table 1 lists the analytical results for locations where VOCs were detected in soil and groundwater.

Sampling results indicate the presence of five chlorinated organics and two freon compounds in the shallow groundwater at MC-2 adjacent to the existing UST, and at MW-2, approximately 40 feet downgradient from the UST. Chlorinated VOCs and petroleum products were also detected in soil samples collected adjacent to the existing UST.

Based on sampling results at locations downgradient of MW-2, the potential impact to groundwater quality in off-site areas from the shallow flow zone appears to be minimal. However, the vertical extent of VOCs in groundwater has not been determined.

Monitoring wells hydraulically upgradient of the UST were not installed, because no ground water was observed in the borings at the time of the well installations (June 1994). However, groundwater was observed and collected from a temporary upgradient sampling location in May 1994. No VOCs were detected at that time.

The UST is located adjacent to a below grade service road that provides access to the Plant 11 loading dock. A storm water drain located in the service road is downgradient of the UST. The stormwater sewer and granular fill that may have been used as bedding material for the sewer pipe are potential migration pathways for solvent contaminated groundwater.

Because solvents and hydrocarbons have been detected in the soil adjacent to the existing UST, there is a possibility the contaminated soil is an on-going contribution to the observed groundwater contamination. Therefore, the lateral extent of solvent contaminated soil near the UST will be determined and this data will be used to determine the approximate volume of contaminated soil which must be addressed as part of the remedial program.

## REMEDIAL ALTERNATIVES

A limited number of remedial alternatives will be evaluated for the Plant 11 UST site in order to streamline the investigation and clean-up actions. This approach is consistent with the Presumptive Remedy Selection Process adapted by the U.S. Environmental Protection Agency (USEPA) to speed up feasibility studies conducted for superfund sites. Presumptive remedies are preferred technologies for common categories of sites that are selected based on historical patterns of remedy selection, and scientific and engineering evaluation of performance data.

### Source Area Remediation

Potential remedial alternatives that will be considered for contaminated soil in the source area underlying the UST are soil excavation and disposal, and vacuum extraction/groundwater withdrawal as discussed below:

- Soil Excavation and Disposal - This option includes the excavation of contaminated soil, backfilling with clean soil, and removal and possible reinstallation or replacement of the existing UST. Soil disposal options that will be evaluated include direct disposal at an approved landfill if solvent concentrations in soil are below Land Disposal Restrictions. The treatment of soil that cannot be landfilled will also be evaluated. The most likely soil treatment technologies include thermal desorption or bioremediation with subsequent on-site or off-site disposal. Potential air pollution impacts and the need for air emission controls will be evaluated for soil excavation and soil treatment options.

- Vacuum Extraction and Groundwater Withdrawal - This option includes vacuum extraction of air from the unsaturated zone to volatilize solvents and volatile hydrocarbons. Due to the shallow depth to groundwater and the density of some of the solvents, it may be necessary to perform vacuum extraction in concert with groundwater withdrawal in order to enlarge the volume of the unsaturated zone. An alternative cover material over the vicinity of the UST may be required to enhance the efficiency of the vacuum extraction system. Vacuum extraction may accomplish remediation of the source area with out disturbing the existing UST.

### Groundwater Collection/Treatment

Groundwater remediation will likely include groundwater collection and groundwater treatment. The alternative technologies for groundwater collection are controlled by the hydraulic properties of the subsurface and the extent of groundwater contamination. Based on regional geologic and site specific geologic information, the site is underlain by 4 to 8 feet of unconsolidated material comprised of fill and native till overlying a highly weathered black shale bedrock. Hydraulic conductivity tests reported in the environmental site assessment report indicate that the till/weathered shale interface is moderately permeable. However, based on typical characteristics of unweathered black shale, the hydraulic conductivity is expected to decrease below the zone of weathering, where hydraulic conductivity primarily originates from groundwater flow through fractures. Therefore, the options for groundwater collection include:

- Shallow groundwater interception trench. Locate a trench alignment to intercept contaminated groundwater flow, excavate a trench using a backhoe, place a perforated pipe in a granular media and backfill to grade. Groundwater would be collected for on-site or off-site treatment/disposal.

- Deep groundwater fracture zone. Locate an alignment to intercept contaminated groundwater, fracture the competent low permeability shale using a controlled underground blasting procedure, install a groundwater extraction well in the fracture zone and collect the groundwater for on-site or off-site treatment/disposal. A single extraction well installed in the artificial fracture zone can yield groundwater at rates up to five to ten times greater than a well installed in competent rock.

A review of available treatment technologies and the existing groundwater analytical data summarized in Section 3.0 indicates that no single technology provides adequate removal efficiencies for all compounds. For example, the use of air stripping may be limited by trichloroethene (TCE) and tetrachlorethene (PCE); the use of AOP is limited by removal efficiencies for chlorinated ethanes and Freon 113. Therefore, the evaluation of groundwater treatment alternatives will include the following:

- On-site treatment using air stripping with pretreatment by AOP to remove trichloroethylene (TCE) and tetrachloroethylene (PCE).

- On-site treatment using air stripping followed by granular activated carbon to remove TCE and PCE.

- Off-site transport and disposal at a TSDF.

## SITE CHARACTERIZATION PLAN

The following tasks will be performed:

- Perform an elevation survey of existing monitoring wells and the on-site cooling pond. Measure groundwater levels and evaluate the groundwater flow direction reported in the July 1994 environmental assessment report.

- The integrity of the existing UST will be evaluated by a review of installation and monitoring records obtained through Moog, Inc. Compliance with waste oil regulations will be factored into the evaluation.

- Install one ground water monitoring well to determine background groundwater quality. The well location will be determined based on the results of groundwater level monitoring.

Because no groundwater was observed above bedrock south of the UST during June 1994, the monitoring well will be constructed in bedrock using rotary drilling techniques. The boring will be advanced using 4 1/4 inch diameter hollow-stem augers to five feet below the top of weathered bedrock or to auger refusal, which ever is shallower. A five foot NX core will be collected from the uppermost bedrock to determine the competency of the rock and to screen the rock fractures for total volatile organics using a photoionization detector. The hole will be cored to a depth sufficient to encounter groundwater. The core hole will be reamed to 3 7/8 inches diameter to facilitate the installation of a screened monitoring well constructed of two inch diameter SCH 40 PVC. Well installation procedures are described in Appendix A. Well installation will be performed by Earth Dimensions, Inc. of Elma, New York. Malcolm Pirnie will provide on-site inspection during well installation.

- Install one groundwater monitoring well adjacent to MW-2 to determine the vertical extent of VOC contamination in groundwater, and the potential for downward migration of VOCs. The hole will be augered to refusal and cored to a depth at least fifteen feet below the existing well.

- In situ hydraulic conductivity tests will be performed in each new well and in existing wells MW-2 and MW-5. Water level recovery vs. time data, collected in these tests, will be analyzed by the method of Bouwer and Rice (1978). The test results will supplement existing hydraulic conductivity data reported by Blasland, Bouck,and Lee (July 1994). The mean of the hydraulic conductivity test results will be used to estimate hydraulic properties of the geologic formation in the monitored intervals.

- Complete two to three soil borings with continuous split spoon sampling on a line perpendicular to each side and each end of the existing UST (a total of eight to twelve soil borings). Each soil sample will be screened for total organic vapors (TVO) in the sample jar headspace using the procedure provided in Appendix B. Additional soil borings will be completed opposite each side and each end of the UST until the jar headspace TVO concentrations substantially decline. One soil sample from a total of eight boring having the greatest concentrations of TVO (a total of eight soil samples) will be submitted for analysis of Total Petroleum Hydrocarbons (USEPA Method 418) and Target Compound List (TCL) organics, and Freon 113 using SW-846 Method 8260.

- Conduct a soil gas survey along the alignment of the storm sewer to determine whether volatile contaminants are preferentially migrating along the sewer bedding. If present in the sewer bedding (or dissolved in groundwater in the sewer bedding), solvents may volatilize into the air filled porosity of the storm sewer backfill material. Preferential migration in the sewer bedding would be detected by a localized increase in TVO concentrations near the sewer.

The soil gas survey will be performed as follows:

a. Determine the storm sewer alignment from existing site plans and layout the alignment in the field.

b. Layout sampling locations at ten foot spacings on lines perpendicular to the sewer at three or four locations along the alignment.

c. Advance a 7/8" diameter hole approximately three to four feet using slam hammer at each sample location. Seal the top of the hole until the gas can be extracted.

d. Purge each hole through a Tygon tube for approximately two minutes using a 12-volt portable vacuum pump.

e. Monitor the airstream for TVO using an HNu photoionization meter equipped with a 10.2 electron volt lamp. The HNu will be calibrated before the initial test hole using isobutylene gas according to manufacturers specifications.

- Collect and analyze six ground water samples to confirm previous sampling results, assess the potential for an upgradient source of VOCs, and evaluate the vertical extent of VOCs in groundwater. One groundwater sample will be analyzed for oil and grease, TSS, hardness, alkalinity, sulfate, iron, manganese, magnesium, and calcium to determine pretreatment needs. Analytical services will be provided by General Testing, Inc. of Rochester, New York.

- Collect and analyze a water sample from the storm sewer, if there is flow in the sewer. This sample will be collected from the drain near the loading dock if accessible, or from the sewer outfall, if accessible.

  Analyses will be performed for TCL organics using SW-846 Method 8260. Freon 113 will be included in the parameter list.

  Quality control samples that will be analyzed will include one duplicate field sample, a matrix spike, and a matrix spike duplicate, and the internal laboratory quality control samples required by Method 8260.

- Prepare a report summarizing site characterization results, evaluating alternative remedial technologies identified herein and recommending remedial program. A preliminary remedial concept design will be developed that will:

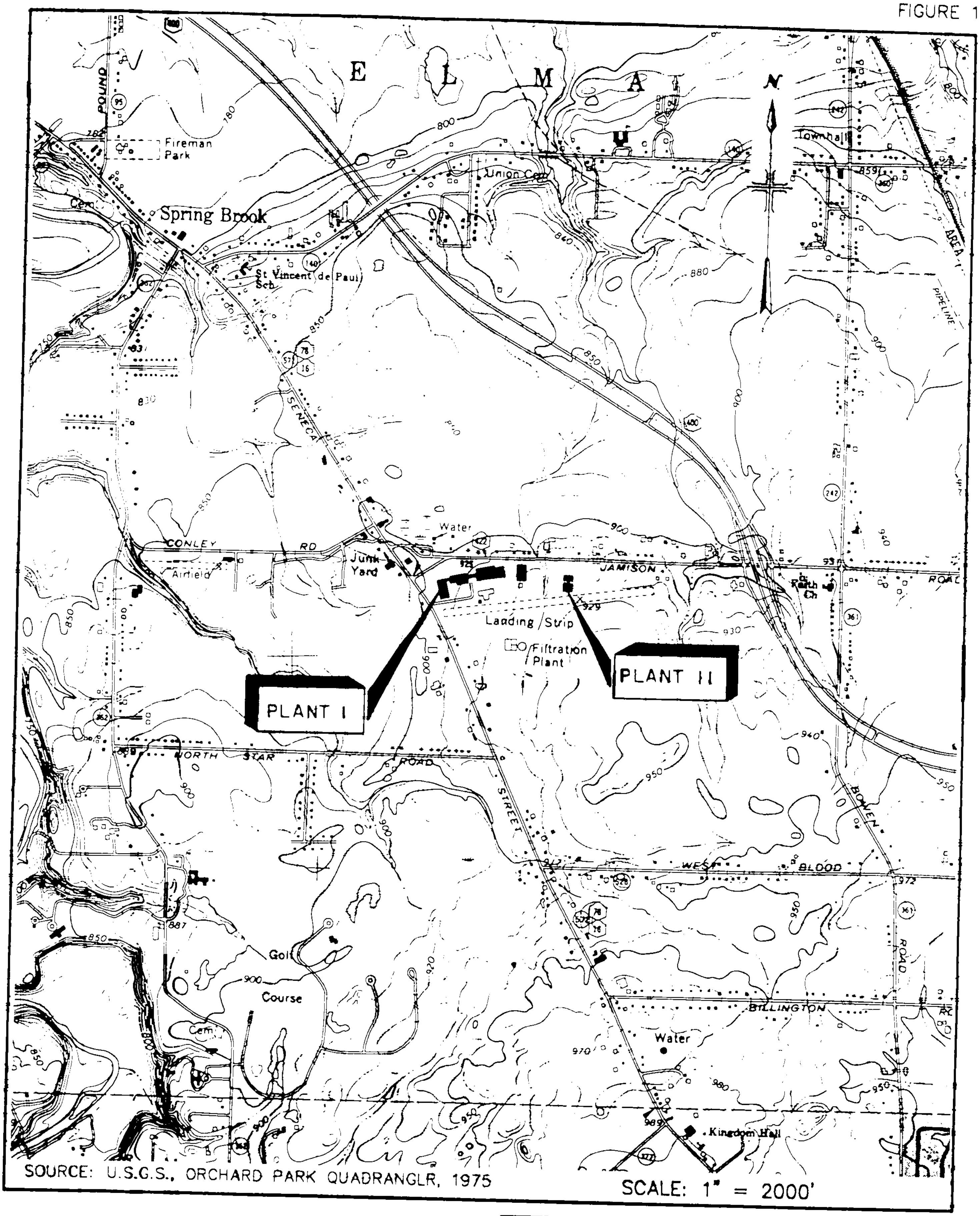
  a) identify major remedial elements

  b) identify the lateral and vertical extent of the soil excavation or a vacuum extraction system and a groundwater collection system

c) estimate groundwater extraction flow rates and treatment system capacity

d) provide a preliminary cost estimate

e) provide a preliminary schedule of construction.

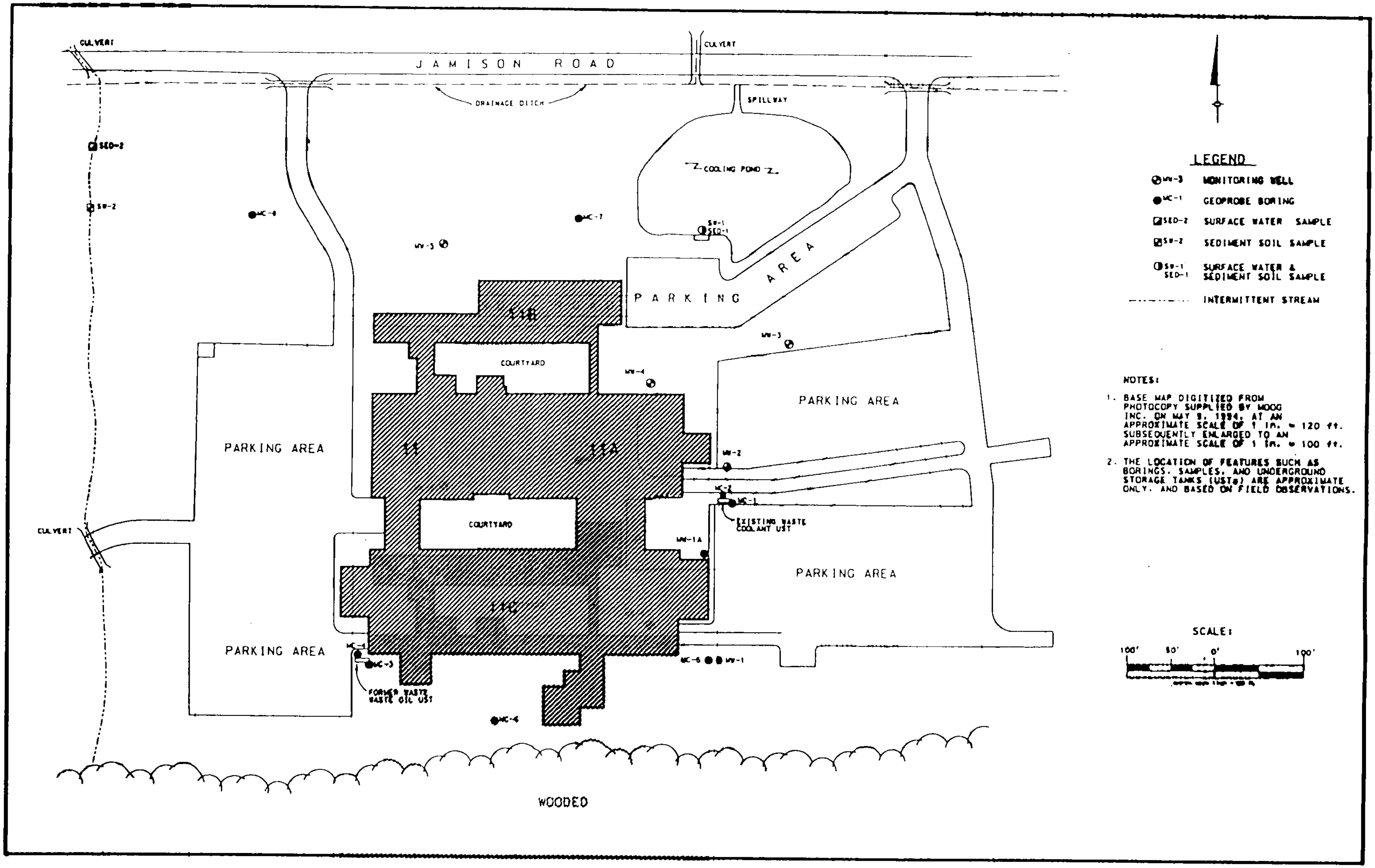



MALCOLM PIRNIE

MOO-PR-LOC

MOOG, INC.
SITE INVESTIGATION
**SITE LOCATION MAP**

MOOG, INC. | AUGUST 1994




MALCOLM PIRNIE

MOO-PR-PL2

MOOG, INC./MOOG CONTROLS, INC.
PLANT 11 SITE INVESTIGATION

SITE PLAN

MOOG, INC.

AUGUST 1994

FIGURE 2

TABLE 1

MOOG, INC.
PLANT 11 SITE INVESTIGATION

*SUMMARY OF PARAMETERS DETECTED*[(1)]

| Parameter | Groundwater (ug/l) | | | | | Soil (ug/kg) | | |
|---|---|---|---|---|---|---|---|---|
| | MC-2 | MC-3 | MC-8 | MW-2 | MW-4 | MC-1 | MC-2 | MC-4 |
| 1,1 Dichloroethane | 1,300 | 28 | 1.1 | 4,300 | 2 | | 9.1 | |
| 1,1,1 Trichloroethane | 2,600 | 73 | | 4,700 | | | 45 | 5.4 |
| 1,2 Dichloroethene | 1,600 | | | 1,900 | 59 | 70 | 49 | |
| Trichloroethene | 3,500 | | | 980 | | 12 | 27 | |
| Tetrachloroethene | 3,400 | | | 860 | | 120 | 91 | |
| Freon 11 | 110 | | | 91 | | | | |
| Freon 113 | 3,500 | 2 | | 1,200 | | | | |
| Xylene | | | | | | | | 1.3 |
| 4 Chloro 3 Methylphenol | | | | 13 | | | | |
| Fuel Oil #2 | | | | | | 71,000 | | |
| bis(2-Ethylhexyl)phthalate | | | | 16 | | | | |

Note:
(1) Obtained from "Summary of Hydrogeologic Site Conditions, 300 Jamison Road, East Aurora, New York." Prepared by Blasland, Bouck, and Lee, Inc. (July 1994).

MALCOLM PIRNIE

# APPENDIX A

# WELL INSTALLATION PROCEDURES

Appendix A: Item ________ - BEDROCK WELL CONSTRUCTION PROCEDURES

Applicability: NYSDEC SPECIFICATION Revision No.: ____ Date: ________

Prepared By: MKR Date: 11/28/89 Approved By: GHF Date: 12/6/89

## 1.0 INTRODUCTION

This guideline presents a method for the construction of monitoring wells and piezometers in consolidated materials.

## 2.0 METHODOLOGY

1. Review the borehole/well installation program with the drilling contractor to ensure that the contractor has the necessary equipment and supplies, and is familiar with the program requirements.

2. Advance borehole to the desired depth by means of hollow stem auger (HSA) drilling or advancement of temporary casing. Seat augers or casing as far as possible into the upper bedrock zone. HSA or casing should be a minimum of two (2) inches larger than the well OD.

3. Advance the boring into consolidated materials by standard rock coring procedures using a triple wall core barrel of NX or HQ size. Log bedrock core according to rock core logging guidance.

4. Perform packer permeability testing at this stage if the project requires such testing.

5a. If an NX core barrel is used, ream the hole to at least four (4) inches diameter using an appropriate rotary drilling bit. Flush the hole with potable water to clean out drill cuttings.

5b. If an HQ core barrel is used, giving a nominal four (4) inch diameter hole, proceed to step 6.

6. Construct the open hole or screened using appropriate Bedrock Well Design Guidance for materials and the following steps:

Appendix A: Item ________ - BEDROCK WELL CONSTRUCTION PROCEDURES

Applicability: NYSDEC SPECIFICATION Revision No.: ____ Date: ________

Prepared By: MKR Date: 11/28/89 Approved By: GHF Date: 12/6/89

A. Screened Installations

a. Verify borehole depth using weighted measuring tape. (Ensure that the rig is turned off and all equipment which may obstruct well installation or represent a safety hazard is removed.)

b. Add a minimum of two (2) inches to a maximum of six (6) inches of filter pack material of appropriate grade through the permanent or temporary casing to base of borehole. (Note: This step may be avoided if dense non-aqueous phase liquids are suspected to be present and it is desireable to have the screen at the base of the borehole.)

c. Insert well screen and riser pipe equipped with centralizers into borehole through the permanent or temporary casing.

d. Add filter pack materials to the screen section of well while slowly backing temporary casing out of the borehole (if used). The primary filter pack, when complete, should extend no more than two feet above the well screen within the borehole. Measure the depth of the sand pack carefully and frequently with weighted tape while adding sand.

e. Add a thin (6-inch) layer of secondary filter pack material above the primary filter pack.

f. Add bentonite pellet seal above the secondary filter pack and again remove the temporary casing slowly (if used). The bentonite seal should extend at least three feet above the top of the filter pack section. Measure the depth with a weighted tape. (Note: If bentonite seal is placed above the ground water level within the borehole, potable water should be added to hydrate the bentonite pellets.) The required hydration time for the pellets should be established prior to setting the seal. (Note: The position of the bentonite seal is dependent on the program requirements.)

g. Tremie grout into the remaining annular space under pressure to about 2 to 3 feet below surface while slowly backing the HSA or temporary casing out of the borehole. Allow grout to set up for 6 to 12 hours, install protective casing, with weep holes, cap and lock; and cement in place. Under circumstances where the borehole is deep and the formation has a low hydraulic conductivity it may be desirable to add potable water to the well prior to grouting to offset the pressure (weight ) of the grout to minimize the potential for the grout to penetrate the sand pack. The well number should be permanently painted or stamped on the protective casing or placed on a marker post.

h. Document construction details in the Project Field Book.

B. Open Bedrock Installations

a. Open bedrock boreholes should only be used where the length of the open borehole is less than about twenty (20) feet.

b. Once bedrock is encountered during conventional drilling using hollow stem augers or temporary casing the hollow stem augers or temporary casing should be seated into the top of rock. The rig should be converted to rock coring and the borehole advanced about five (5) feet into bedrock or until two (2) feet of competent bedrock is encountered based on inspection of the rock core. The core hole should then be reamed using an appropriate bit to create a socket into the top of rock.

c. Verify borehole depth using weighted measuring tape. (Ensure that the rig is turned off and all equipment which may represent a hazard is removed.)

d. Appropriately sized permanent casing (containing a drillable plug at its base if tremie grout methods are used) should then be centered in the socket. Using tremie pipe, pressure packer or other methods which introduce grout from the base of the annular space, grout the borehole annulus from bottom to top of hole. An optional method involves grouting the bedrock socket and inserting the casing to the base of socket prior to the grout setting up. If a bentonite pellet seal is used at the base of the annular space before placement of the grout, a minimum of 60 minutes should be allowed for the bentonite to swell before grouting. Select the size and shape of the seal such that the bentonite can reach the socket and form a complete seal around the casing.

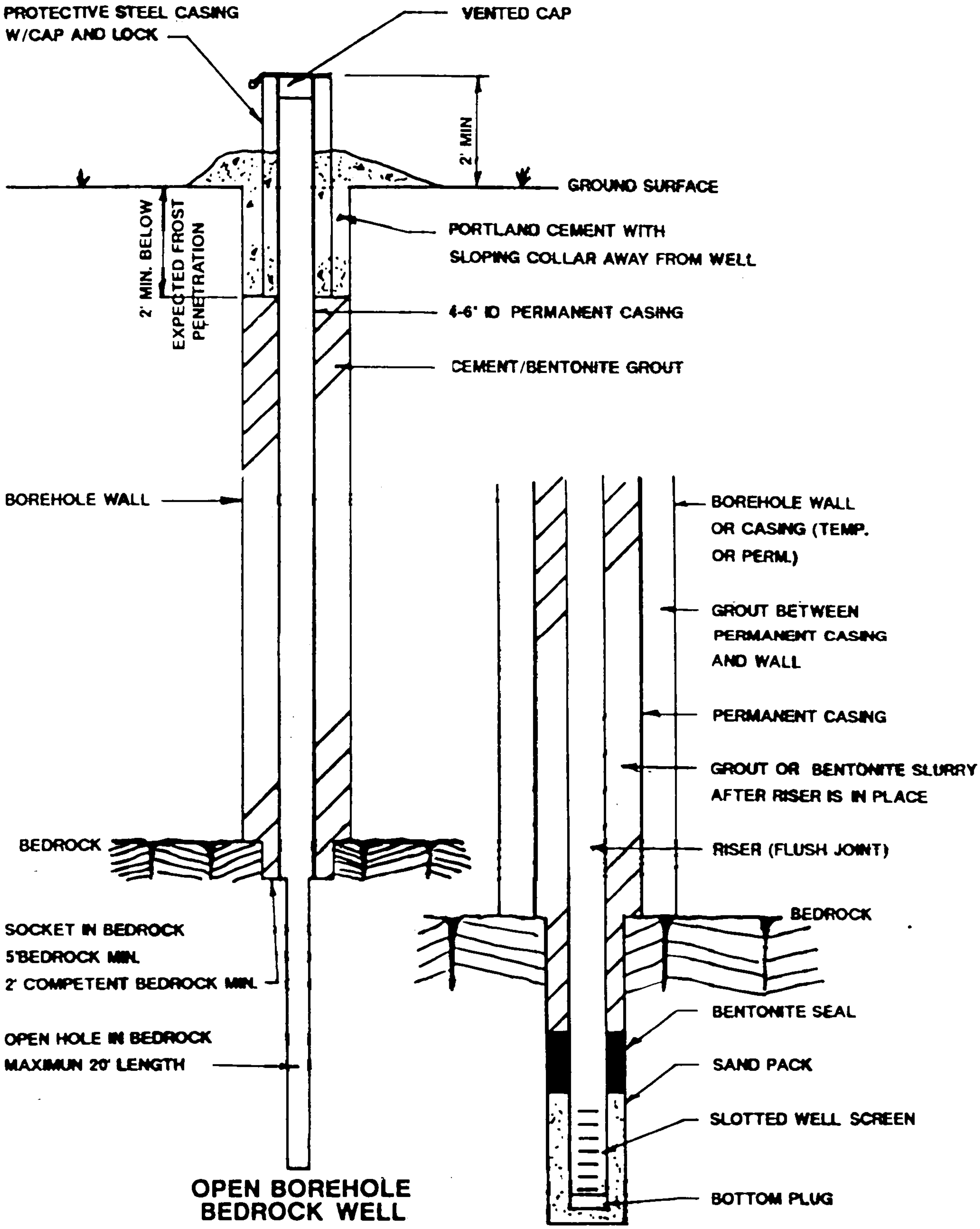
e. Allow 48 hours for the grout to set and assess the integrity of the grout seal by either filling the casing with potable water and monitoring water level decline or bailing the casing dry and monitoring any water level increase.

f. Drilling may proceed through the casing following testing of the grout seal, to create an open borehole to a predetermined depth. After drilling is complete, install protective casing, with weep holes, cap, and lock and cement in place. Construct a conical pad of cement which slopes away from the well. The well number should be permanently painted or stamped on the protective casing.

g. Document construction details in the Project Field Book.

## 3.0 REFERENCES

New York State Department of Environmental Conservation, July 1988, Drilling and Monitoring Well Installation Guidance Manual.




OPEN BOREHOLE
BEDROCK WELL

SCREENED BEDROCK WELL

MALCOLM
PIRNIE

# APPENDIX B

# JAR HEADSPACE PROCEDURES

Appendix B : Item ________ - SCREENING OF SOIL SAMPLES FOR ORGANIC VAPORS

Applicability: GENERAL    Revision No.: ____    Date: ________

Prepared By: MKR    Date: 12/3/89    Approved By: GHF    Date: 1/5/89

## 1.0 INTRODUCTION

This guideline presents a method for screening soil samples. During drilling activities, a total hydrocarbon vapor analyzer (HNu, OVA, or TIP) should be used to monitor the borehole and split spoon samples upon opening of each sampler. The monitoring results provide a vertical profile of soil contamination by volatile organic substances.

## 2.0 METHODOLOGY

1. Upon opening each split spoon sampler, place a subsample of the soil in a 40 ml, precleaned, glass VOA vial. Seal the vial with a teflon-lined septum cap, label, and place the vial immediately on ice in an ice chest.

2. Place the remainder of the sample in a labeled wide-mouthed glass jar. Seal the jar with aluminum foil and a screw top cap.

   a. Keep these samples at as near to 70°F as possible.
   b. At the end of each day check head space of each sample for any organic vapor present by inserting the probe of the organic vapor analyzer through the aluminum foil seal.
   c. The soil sample from each borehole will be noted where VOA's were detected and the corresponding VOA sample (#1 above) should be submitted to a laboratory for analysis.

## 3.0 EQUIPMENT REQUIREMENTS

- 40 ml. precleaned and prelabeled glass VOA vials with teflon-lined septum caps
- ice and ice chest
- wide mouthed glass jars with screw caps
- aluminum foil
- Organic Vapor Analyzer

024