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ENVIRONMENTAL ENGINEERS, SCIENTISTS & PLANNERS

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BUREAU OF WESTERN REMEDIAL ACTI
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WASTE REMEDIATION

July 21, 1989

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N.Y.S. DEPT. OF
ENVIRONMENTAL CONSERVATION
DIV. ENVIRONMENTAL ENFORCEMENT
BUFFALO FIELD UNIT

Mr. E. Joseph Sciascia, P.E.
Senior Sanitary Engineer
Division of Environmental Enforcement
New York State Department of
Environmental Conservation
600 Delaware Avenue
Buffalo, New York 14202-1073

Dear Mr. Sciascia:

Enclosed please find six (6) copies of the revised Remedial Investigation/ Feasibility Study (RI/FS) work plan for the I. Shulman and Son site in Elmira, New York (Site # 808013). The original RI/FS work plan, submitted during March 1989, has been amended to incorporate the NYSDEC and NYSDOH comments that were included in your May 16, 1989 letter to Irving Rinde, Esq.

In order to highlight the corrections that have been made in the text of the work plan, we have listed the comment number below and followed the comment number with either a response or directions as to where to find the correction in the text. In addition, revised pages in the text have been indicated as such in the lower right-hand corner and new wording in the text has been underlined.

Comment #1

Page 2-9. Effective porosity of 0.1 was assumed for previous ground water seepage velocity caluclations. The porosity should be measured for new monitoring well locations. Corresponding organic carbon analyses are also needed. This information may be needed for determining contaminant flow velocity.

**Response:** In order to assist in the estimation of the potential for PCB migration to the saturated zone, MPI will collect samples for a laboratory determination of the porosity and total organic matter content of the soil. The test methods and a description of where the samples will be collected have been added into the work plan on page 6-5 and page 6-22.

890 SEVENTH NORTH ST. LIVERPOOL, NEW YORK 13088 315-457-4105 TELEX 137364 FAX 315-457-4959

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## New York State Department of Environmental Conservation

## MEMORANDUM

**TO:** M. Brinkman - DHWR Albany
**FROM:** Joe Sciascia - DEE Buffalo JS
**SUBJECT:** I. Shulman & Son
Site #8-08-013
**DATE:** August 7, 1989

Enclosed is a revised RI/FS proposal for the subject site. Hopefully the proposal satisfactorily addresses all concerns expressed in our last comment letter. Please review the revised proposal and call me (716-847-4582) with any comments by August 23, 1989.

EJS/mf

Enclosure

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WASTE REMEDIATION

Comment #2

Page 3-1 second paragraph. Reference appears to be Crusher #1 rather than #3.

**Response:** Page 3-1 paragraph two has been corrected to indicate Crusher #1 as opposed to Crusher #3.

Comment #3

Page 3-2. The second paragraph understates the extent of groundwater contamination for volatiles and PCB's. DEC sample results of June 3, 1987 should also be discussed.

**Response:** Page 3-2 paragraph two has been modified to incorporate the NYSDEC sample results from June 3, 1987.

Comment #4

Page 3-6. We were under the impression that tributary sewers are combined sanitary-storm. The proposal shows both being present. Please clarify this point.

**Response:** The tributary sewers on site are combined sanitary/storm. Therefore, page 3-6 has been corrected to eliminate confusion.

Comment #5

Page 5-4. The narrative should be modified to reflect the need for public meeting as part of a required Citizen Participation Plan and that the contractor will be expected to participate in such presentations. There may be more than one.

**Response:** The text on page 5-4 has been changed to reflect MPI's participation in any required public hearings and meetings.

Comment #6

The scales on Figure 2-3 and 6-1 are not consistent.

**Response:** After rechecking the scales indicated on Figures 2-3 and 6-1, we have determined that the scales are correct. The outline of the Shulman "site" shown on Figure 2-3 includes approximately 1000 L.F. of property that is not included on Figure 6-1. This part of the property is not included on Figure 6-1 since it is not involved in the RI/FS.

Comment #7

Page 6-5 second paragraph. Please clarify the circumstances in which grain size analysis and Atterberg limits will be needed.

**Response:** This comment has been addressed in paragraphs two and three on page 6-5.

Comment #8

Page 6-5 last paragraph. Please explain how the thickness of any clay layer would affect the need for a laboratory determination of the ion exchange capacity.

**Response:** The need for laboratory determinations of the ion exchange capacity is not affected by the thickness of the clay layer. However, the thickness of the unit may dictate whether enough samples can be collected to perform both the saturated vertical hydraulic conductivity and ion exchange capacity tests. The first paragraph on page 6-6 has been amended in an attempt to clarify this scenario.

Comments #9
and #10

Page 6-9. In the event monitoring wells cannot be developed to less than 50 NTU, the contractor will document in detail his well development efforts. This Department will reserve the right to request additional development and if improper well construction has occurred, the reinstallation of new wells.

Water level measurements will be taken over a 6 month period. Please eliminate the word approximately.

Page 6-9. All existing wells must be redeveloped to 50 NTU.

**Response:** The parts of these comments that pertain to well development of new and existing wells to the 50 NTU target level have been addressed on page 6-9 and page 6-11.

Water level measurements will be taken over a six month period (see page 6-11).

Comment #11

Figure ~~6-5~~ is very difficult to read. A larger scale is necessary.

**Response:** Figure 6-5 has been enlarged to allow easier reading. This figure can now be found in the back pocket of the work plan.

Comment #12

Please generate all test pit locations and show them on Figure 6-5 and show which samples will be composited for analysis initially.

**Response:** The test pit locations for Sections 3 and 5 will be generated in the field in order to take into account debris which may be covering some of the sample locations. If debris covers one of the generated sampling locations, a new sample point will be generated.

In sections 1, 2 and 4, where contamination has been documented based on previous test pit results, the sampling plan has been modified to take into account information which currently exists.

The compositing procedure for the planned sampling areas has been incorporated into the work plan (pages 6-15 and 6-16). For sections 1, 2 and 4, the samples that will be composited for initial analysis are described, in detail, in the text of the work plan (page 6-16) and on Figure 6-6.

Comment #13

Page 6-19 and comment #8 in our 9/30/88 letter.

The quantification limit of 0.28 ppm for each aroclor or 2.0 ppm in total does not provide a margin of safety for the composite action level of 2.0 ppm which you proposed. Under your composite scenario a quantification limit of one tenth the action level will be needed or 0.03 ppm for each Aroclor. Also, please specify the sample cleanup procedure.

We do not agree that the only objective of analysis is to ensure that cleanup meet EPA guidelines. There are other considerations which may drive the cleanup effort, i.e. level of groundwater contamination and rate of movement, etc. Therefore, a low level of detection will be required.

The proposal should attempt to identify any applicable, relevant and appropriate requirements (ARAR's) which may have to be considered in the assessment and/or remediation.

**Response:** As indicated in the response to Comment #15 and in the revised text, the sampling plan and compositing scheme have been modified to take into account previous analytical data. The overall number of samples to be collected during Phase I sampling has increased significantly and the composite action level has changed.

Chemist

Since we will now be compositing four samples into one, the composite action level will be 2.5 ppm. The action level for each Aroclor will be 0.36 ppm.

Normal CLP detection limits for PCBs, according to Weston Analytics, are 0.08 ppm for five Aroclors and 0.16 ppm for the remaining two Aroclors involved in the analysis.

MPI feels that these detection limits will provide a sufficient margin of safety during Phase I and any subsequent analyses.

Comment #14 JV

Pages 6-13 to 6-25 indicate that follow-up sampling may be undertaken but does not define what criteria will be used for triggering second round sampling. Please include wording which would require the submission of a site specific parameter list to this Department for acceptance prior to second round sampling. It should be made clear that this Department reserves the right to add or recommend dropping parameters from this list.

**Response:** The text of the work plan (see page 6-14 of the revised work plan) has been modified so that it now includes the submission of an analytical parameter list for NYSDEC approval prior to conducting second round ground water sampling, should second round sampling be necessary.

The criteria that will be utilized to determine if the second round samples are necessary include the results of the first round TCL analysis and other potential factors such as seasonal variations. For example, if the ground water is initially sampled during a wet period of the year and the analytical results indicate that contamination was present during that period of time it may be advisable to collect samples in an ensuing dry period. The level of contamination, relevant to applicable standards or guidance values, will also factor into the decision-making process. The NYSDEC will be involved in all levels of this process.

Comment #15

Page 6-13 to 6-19. The computations related to the statistical method for arriving at sample numbers should be shown in an appendix.

The random soil sampling program proposed does not take into consideration previous test pit results. Your sampling scenario should be modified to expand on the information which currently exists. Random sampling on the scale proposed seems to be appropriate for areas previously not shown to be highly contaminated, however, areas of concern, i.e. Crusher #1 and Building #3, should have additional sampling. I have enclosed hand-drawn isopleths for various sample depths which illustrate this point.

**Response:** The computations for arriving at the statistically generated sample numbers for areas previously not shown to be highly contaminated (Sections 3 and 5) are included in Appendix D.

The sampling plan for areas of concern at the site (e.g. around Crusher #1 and Building #3) has been modified to include additional sampling points.

The new sampling plan for Sections 1,2 and 4 is explained on pages 6-14 to 6-16 of the amended work plan.

Once the new data from the planned sampling program are available they will be correlated with previous test pit results to determine consistency between data. If the data are consistent, then all data will be utilized.

Comment #16 ✓

Page 6-26. The site specific air monitoring plan needs to be described in detail (i.e. sampling procedure, QA/QC, sample location, sample duration, etc.). Your proposal indicates USEPA method TO4 will be used. This procedure is acceptable; however, you should be aware that the DEC Division of Air and the NYS Department of Health (DOH) have recommended an alternative procedure which may be more cost effective (NYS DOH Method 311-1). I have enclosed a copy of the procedure for your use. The DOH has requested a shorter sampling period than the 24 hours in the procedure. Air sampling should be done during both normal conditions and test pit excavation, and start 1 hour before the consultant's working day begins and end 1 hour after work ceases. Sampling duration should be 10-12 hours and as such is expected to deliver a detection limit of 40mg/m$^3$. The DOH has also requested that a sample analysis turnaround time of 24 hours be provided. This will allow for the implementation of timely corrective measures if needed. The analytical detection limits specified in the procedure are critical. Therefore, the laboratory should provide assurance that they can deliver the needed results.

**Response:** The air monitoring will be conducted utilizing NYSDOH Method 311-1. The detection limit of 40 mg/cubic meter (per Aroclor) for a 12 hour sampling period will be used. A laboratory will be selected which can both meet this detection limit and a 24 hour turnaround time (from sample receipt at the laboratory). Since sampling will be collected at upwind and downwind locations, it is not possible to designate sampling locations at this time. Sample locations will be located at the property line at the time of sampling. Sampling will be conducted both prior to

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NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

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and during test pit excavations. Assuming a work day of 8:00 A.M. to 6:00 P.M., sampling will be conducted from 7:00 A.M. to 7:00 P.M.

Comment #17

Page 6-26 to 6-29. The proposal describes a data validation procedure. The data validation review documentation along with conclusions should be included in the final report. Please provide a set of the forms that Malcolm Pirnie uses for data validation with the revised submission. In the event Malcolm Pirnie does not have standard forms for this purpose, those forms contained in EPA Region II CERCLA Quality Assurance Manual (3/88) can be used.

**Response:** Malcolm Pirnie will utilize the USEPA Region II forms for data validation. This requirement has been added to section 6.2.5.2 of the work plan. The requirement for the laboratory to complete the analytical summary forms has been added to section 6.2.5.1 of the work plan.

Comment #18a

Page 5. Volatile organic compounds (VOCs) should also be monitored during well construction and test pit excavation.

**Response:** The HSP (Appendix A page 4) has been modified to indicate that air monitoring for volatile organic compounds will be conducted during the well construction process and during the excavation of test pits.

Comment #18b

Real time particulate monitoring during dust creating operations is needed. Please include provisions for this.

**Response:** Section 7.0 of the HSP (Appendix A page 4) has been revised to reference the particulate monitoring program included in HSP Appendix B.

Comment #19

Appendix A, Page 6. All disposable personnel protective gear and decontamination rinses should be collected and drummed for appropriate disposal.

**Response:** Page 6 of Appendix A now includes a statement to the effect that all disposable PPE and decontamination rinsate will be contained for appropriate disposal.

Comment #20

Appendix B, Page 2-3. Please describe the extent to which census data would be verified in the field (3rd paragraph).

**Response:** As indicated on page 2-3 of Appendix B (the QAPP), census data will be verified in the field within a two block radius of the site. The verification process will include a listing of the names and number of occupants per address.

Comment #21

Appendix B, Page 2-11. The quantification limit for $Cr^{+6}$ needs to be added. Also the quantification limits for soils/sediments need to be included.

**Response:** The quantitation limit for hexavalent chromium is 0.02 mg/l. This limit has been added to Table 2-3 of the QAPP (page 5 of 6). The quantitation limits for soils/sediments have also been added to this table.

Comment #22

Appendix B, Page 2-6 and Page 2-10. The GA groundwater standards for PCBs is 0.1 ug/l. Therefore, quantification limits will have to be lower than those contained in CLP and the groundwater standard.

**Response:** The 0.1 ug/l GA standard for total PCBs correlates to 0.014 ug/l per Aroclor. This is considerably below the Practical Quantitation Limits of 0.065 ug/l given in USEPA Method 8080 for ground water. We know of no commercial analytical method to meet this detection limit.

Comment #23

Appendix B, Page 2-13. Section 2.3.7 should make it clear that if the laboratory is unable to provide the quantification limits specified in the proposal, the laboratory must provide a detailed explanation of the cleanup procedures used, problems encountered and steps which can be taken (if any) to provide the required quantification limits. Malcolm Pirnie will in turn provide this information with recommendations to DEC

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Radius acceptable

for concurrence. DEC reserves the right to request re-analysis or special analytical services if determined necessary.

**Response:** As part of the RFP to laboratory subcontractors, Malcolm Pirnie will specify that if the laboratory is unable to meet detection limits (after sample cleanup) due to matrix interferences, they will contact Malcolm Pirnie to discuss problems encountered, cleanup used and any recommended actions. Malcolm Pirnie will discuss this with the Department prior to deciding on a course of action. Malcolm Pirnie, however, will not unduly delay the laboratory in the event that the Department does not promptly respond. In addition, Malcolm Pirnie requests that the Department include a person who is experienced and knowledgeable in analytical procedures in any such discussions. Section 2.3.7 of the QAPP has been revised accordingly.

Comment #24

Appendix B, Page 3-2. Field monitoring of groundwater should include conductivity.

**Response:** Page 3-2 of Appendix B as been modified to indicate that the conductivity of the ground water will also be monitored.

Comment #25

Appendix B. The resumes of the QA/QC officer and persons doing data validation showing expertise and experience should be submitted.

**Reponse:** A resume of the QA/QC officer, who will also be doing the data validation, is included as Appendix E of the QAPP. Also included in Appendix E are resumes of other key project team personnel.

Comment #26

Appendix B. A copy of the contract between the laboratory and the consultant should be submitted for review by the DEC chemist. This will, of course, require that you select a technically acceptable lab that can deliver the CLP reportables and deliverables.

**Response:** It is our understanding, from discussions with your Mr. Perkins, that this requirement was established by the Department for consultants performing work directly for the State. Contracts between Malcolm Pirnie and its subcontractors are confidential business information, and have not been provided at this time.

Comment #27

Appendix B. The holding time for volatiles in NYS CLP is 7 days. Please adjust your procedure to conform with this constraint.

**Response:** The holding time for volatiles will be seven days from the day that the sample is taken. Section 5.2 of the QAPP has been revised to reflect this change.

We trust that these responses and the revisions made to the work plan and QAPP have adequately addressed your concerns.

Should you have any additional questions or comments, please contact me at your earliest convenience.

Very truly yours,

MALCOLM PIRNIE, INC.

Richard W. Klippel, P.E.
Senior Associate

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enclosures

Prepared For

**I. SHULMAN & SON INC.**
**ELMIRA, NEW YORK**

# WORK PLAN
# REMEDIAL INVESTIGATION / FEASIBILITY STUDY

MALCOLM
PIRNIE

ENVIRONMENTAL ENGINEERS, SCIENTISTS & PLANNERS

FEBRUARY 1989

REVISED JULY 1989

# WORK PLAN

# FOR

# REMEDIAL INVESTIGATIONS/ FEASIBILITY STUDY

I. SHULMAN & SON INC.
Elmira, New York

FEBRUARY 1989
REVISED JULY 1989

MALCOLM PIRNIE, INC.
ENVIRONMENTAL ENGINEERS,
SCIENTISTS & PLANNERS
890 Seventh North Street
Liverpool, New York 13088

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# 1.0 INTRODUCTION

## 1.1 PURPOSE OF REMEDIAL INVESTIGATION/FEASIBILITY STUDY

The purpose of this Remedial Investigation/Feasibility Study (RI/FS) is to present a systematic approach to identify the following:

a. The site specific remedial response objectives,
b. Applicable remedial technologies, and
c. The procedures needed to collect sufficient data to adequately evaluate the remedial action alternatives.

This approach leads to concurrent performances of the RI and FS portions of the report so that the FS data can be continuously evaluated and, if required, the RI activities modified accordingly.

## 1.2 EXPECTED RI/FS RESULTS

The results of the RI/FS will be the selection of a preferred remedial action alternative which will achieve the cleanup criteria established and be cost-effective. The information contained in the RI/FS should be in sufficient enough detail that a conceptual design of the preferred remedial action alternative can be prepared.

# 2.0 SITE BACKGROUND AND PHYSICAL SETTING

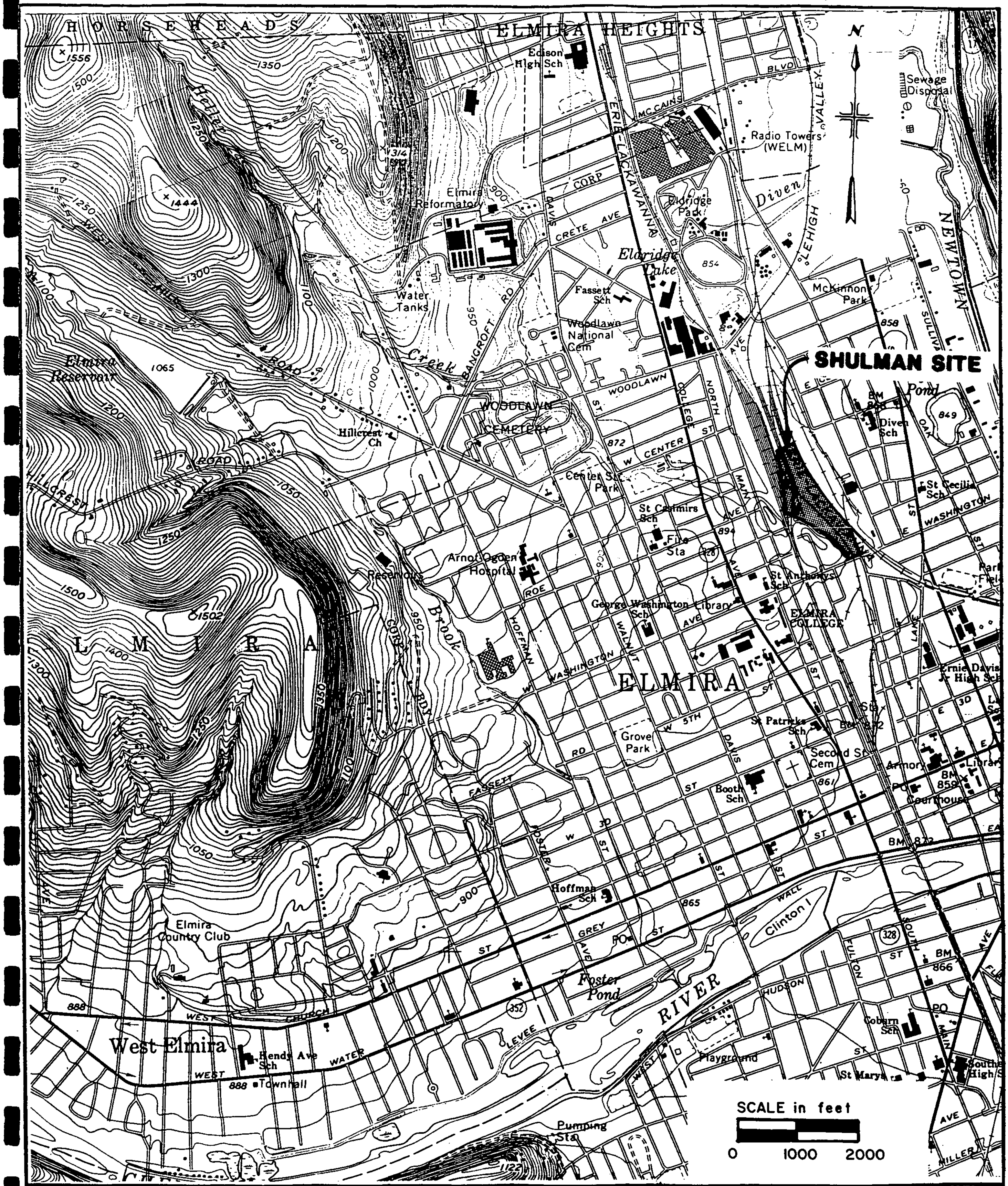
## 2.1 SITE LOCATION AND HISTORY

I. Shulman and Son, Inc. (Shulman) owns and operates a ferrous and non-ferrous metal salvaging facility comprising 24 acres located at One Shulman Plaza in the City of Elmira, Chemung County, New York (Figure 2-1).

Metal salvaging operations have been performed on the site for approximately twenty years. In 1982, a shipment of drained transformers was received by Shulman for processing. The transformers were dismantled on-site and sold as scrap. It is suspected by the New York State Department of Environmental Conservation (NYSDEC) that these transformers were contaminated with PCB oil which was spilled onto the surface of the site during the dismantling operations. Consequently, the NYSDEC and Shulman entered into a Consent Agreement on September 16, 1986 which has resulted in the performance of a series of site investigations.

## 2.2 SITE DESCRIPTION

The Shulman site is located in the northeast portion of the town of Elmira, New York. The area is heavily industrialized and the site is bordered by the Clemens Central Parkway on the east, Industrial Service Corporation to the west, Consolidated Rail Corporation to the north and Washington Avenue to the south (Figure 2-1). The site is generally flat with surface water being drained to the center of the property where it empties into a storm drain which is tied into a 48-inch concrete sewer pipe, known as the reformatory line. The reformatory line travels through the center of the western portion of the property. The site has four permanent buildings located on it along with a weigh scale and scale house trailer. The facility takes in previously wrecked cars. Cars are dismantled and crushed and sold as scrap metal.



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# SITE LOCATION MAP

MALCOLM PIRNIE, INC.

FEBRUARY 1989

FIGURE 2-1

## 2.3 REGIONAL AND SITE HYDROGEOLOGICAL CHARACTERISTICS

### 2.3.1 Regional Geology

The Elmira area lies in a dissected plateau underlain by nearly flat-lying limestone, shale, siltstone, and fine-grained sandstone. Glacial deposits overlie bedrock everywhere except on steep hillsides where ice scoured the slopes creating truncated spurs.

### 2.3.2 Soil Characterization

The soils of the area on which the Shulman site is located are generally of the Howard-Chenango association (Figure 2-2). This association consists of nearly level to gently rolling or sloping soils on outwash plains, alluvial fans, stream terraces and floodplains. It principally occupies the large valley that extends from Big Flats to Horseheads and Elmira. This association covers about 13 percent of the county.

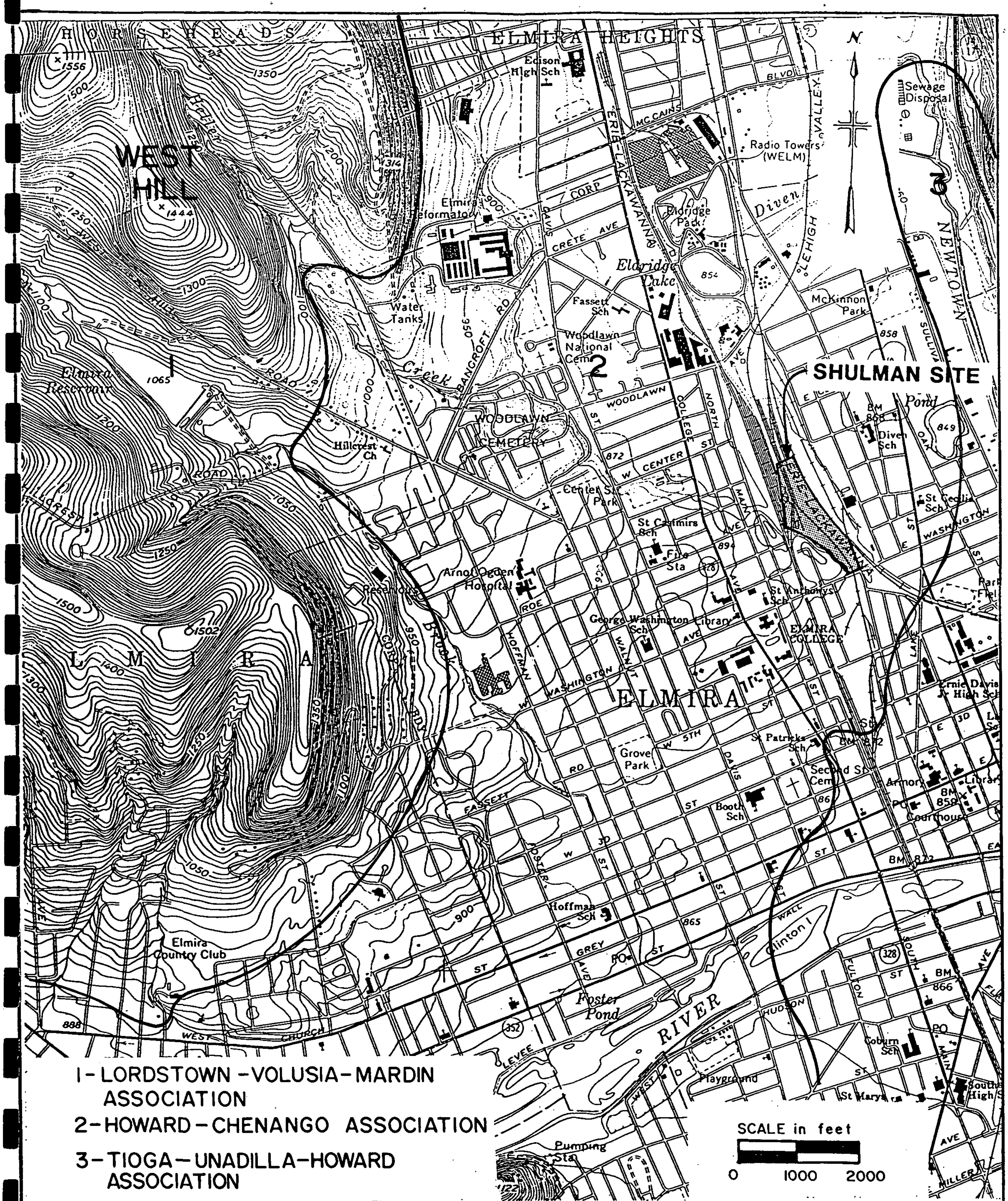
? → Howard soils are deep, well-drained to somewhat excessively drained, medium-textured and gravelly. They formed in glacial outwash material consisting of stratified sands and gravels. They occupy outwash terraces and are mainly nearly level to gently sloping.

Chenango soils formed in channery material (thin, flat course fragments of limestone or sandstone) deposited as old alluvial fans where side streams enter the main valleys. They are well-drained to somewhat excessively drained, deep soils that are nearly level to gently sloping. They occur around the edges of Howard soils.

Examination of the soils encountered during sampling of the test pits to a depth of two feet from the surface revealed brown to black gravelly sand with significant amounts of small scrap metal pieces, gray cinders, demolition debris and decaying railroad ties.

### 2.3.3 Regional Hydrogeology

The Elmira aquifer occupies a valley floor that is bordered by steep bedrock hills. The triangular valley system is separated by a nine-square-mile bedrock hill, known as West Hill (see Figure 2-2).



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## SOILS ASSOCIATION MAP

MALCOLM PIRNIE, INC.

FEBRUARY 1989

FIGURE 2-2

The northern reach of the aquifer occupies a preglacial valley now filled with sediment. The eastern reach from Elmira to Horseheads, and the northwestern reach from Horseheads to Big Flats, are fairly wide and in most places range from 1.5 to 2.5 miles in width. The reach along the Chemung River between Big Flats and Elmira, however, thins locally to less than 0.25 mile in width where the river passes through a bedrock gorge. The southern part of the aquifer is drained by the Chemung River, which is tributary to the Susquehanna River.

In downtown Elmira and south of Elmira, bedrock is 70 to 100 feet below land surface and is relatively flat. Aquifer material consists of sediments ranging from very fine sand to coarse gravel. The aquifer thickness (i.e. the saturated thickness from the water table to the top of the first relatively impermeable unit) in downtown Elmira and South Elmira suggests a thick outwash deposit containing 40 to 50 feet of saturated material, thus placing the water table at approximately 20 to 50 feet below land surface. This aquifer is overlain with soils of moderate to high permeability. Soils on adjacent hillsides are less permeable and allow large amounts of runoff to flow onto the valley floor, where infiltration and recharge occur.

Ground water in this aquifer system (which underlies the Shulman site) is presumed to move predominantly with the surface topography (southward). Ground water discharges to the streambeds and recharges an underflow that leaves the area south of Elmira. Recharge is derived from precipitation, from streams and from bedrock adjacent to and beneath the aquifer. Chemung County Department of Health representatives in the Elmira area stated that there are no drinking water wells located between the Shulman site and the Chemung River to the south or Newton Creek to the east. The closest producing well is northwest of the site.

### 2.3.4 Site Hydrogeology

The Shulman site is situated at the western edge of the valley floor of Newton Creek in the City of Elmira. The western boundary of the site corresponds to the eastern edge of an alluvial fan which occupies the former valley of Heller Creek (Figure 2-3). The edge of the fan is represented by the distinct rise in topography at the western property boundary.

Based on boring logs, there appear to be two hydrogeologic zones beneath the site; an upper shallow water table zone and a lower semi-confined ground water zone.

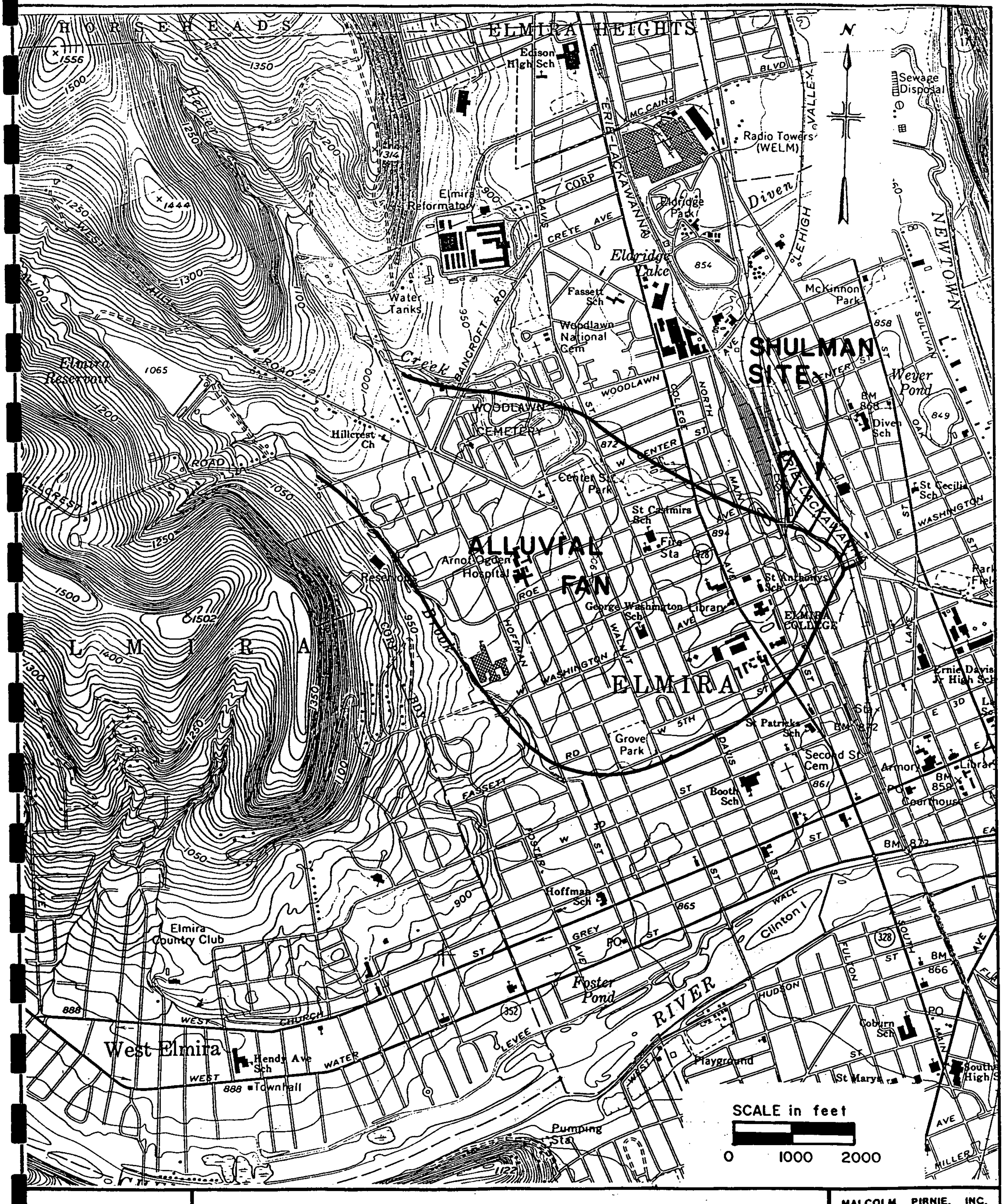
The upper zone consists of the following units:

- Surficial fill consisting of a variety of materials, such as dense brown sand, some gravel and dry fill.
- Recent alluvial fan materials at the western edge of the property, as encountered in boring MW-2S.
- Mixed deposits including peat underlain by glaciolacustrine silty clays and glacial lodgement till. The significant points regarding these lower glacial deposits are their fine-grained nature and their low hydraulic conductivity relative to underlying glacial outwash deposits. These deposits, by virtue of their physical characteristics, serve as a semi-confining layer in restricting the rate of infiltration from the shallow ground water zone.

The lower ground water zone consists of glaciofluvial outwash sand and gravel deposits which comprise a major aquifer within the valley. The upper limit of the zone is formed by the fine-grained glacial deposits described above.

The configuration of the water table within the upper ground water zone is presented on Figure 2-4. The direction of shallow ground water flow towards the center of the valley to the east is controlled primarily by topography. The steep hydraulic gradient in the western portion of the site is due to shallow ground water discharging from the sloping alluvial fan deposits into the flat-lying fill, peat and glacial deposits on the valley floor. The water table gradient (Figure 2-4) decreases between MW-1 and MW-4 towards the valley center and away from the edge of the alluvial fan.

Slug tests conducted on three shallow monitoring wells resulted in an average horizontal saturated hydraulic conductivity of $6 \times 10^{-4}$ cm/sec in the upper water table zone. In order to estimate horizontal



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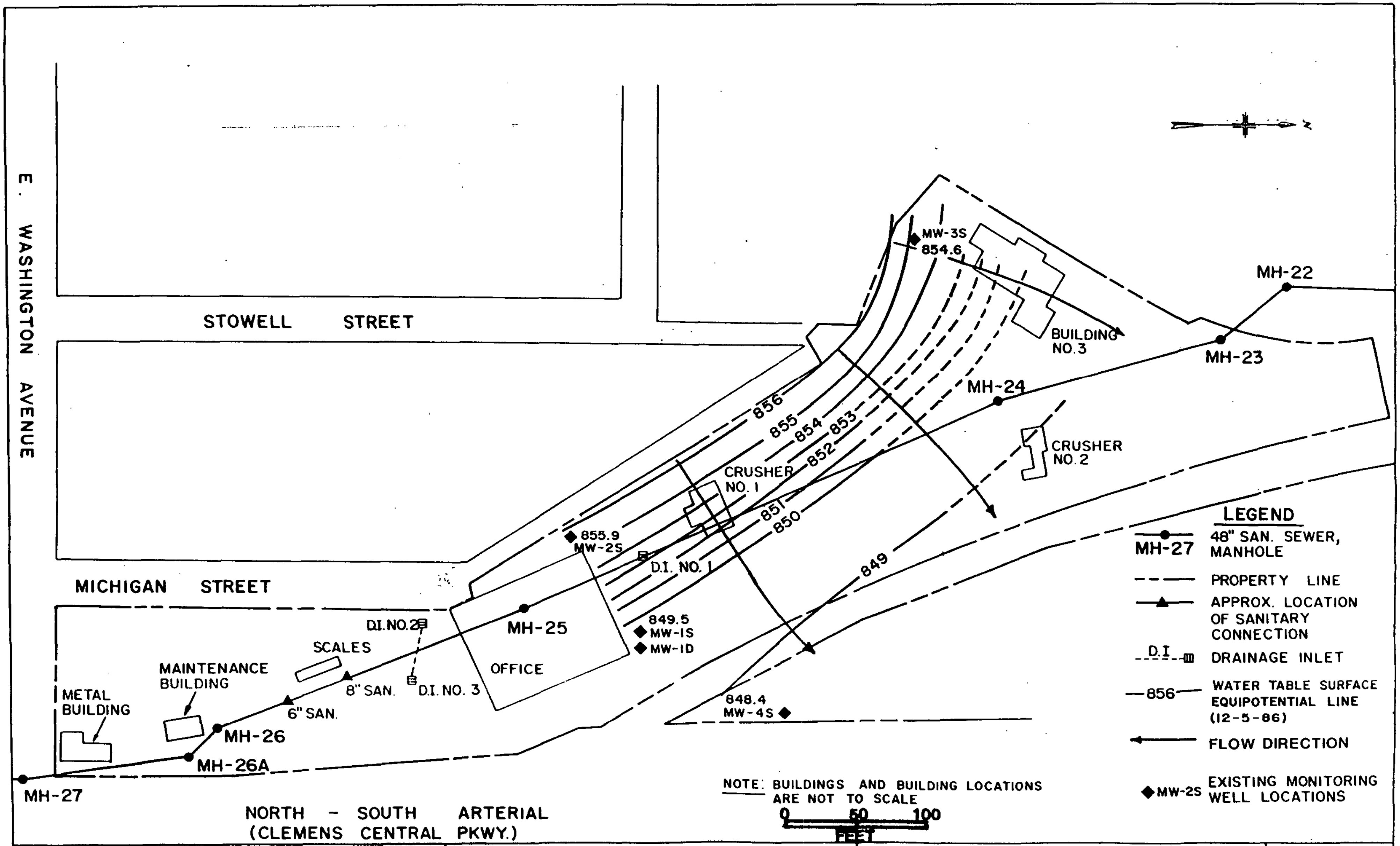
# MAP OF ALLUVIAL FAN NEAR SITE

MALCOLM PIRNIE, INC.

FEBRUARY 1989

FIGURE 2-3



MALCOLM PIRNIE

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**I. SHULMAN & SON, INC.**
**ELMIRA, NEW YORK**

## CONFIGURATION OF THE WATER TABLE SURFACE

MALCOLM PIRNIE, INC
DATE FEBRUARY 1989

FIGURE 2-4

seepage velocities in the water table zone, an effective porosity of 0.1 was assumed. The seepage velocity was calculated for the western portion of the site under a horizontal hydraulic gradient of about 0.03 and in the eastern portion of the site under a gradient of about 0.006. The horizontal seepage velocities were calculated to be: 120 ft/yr and 25 ft/yr for the western and eastern portions of the site, respectively.

Ground water elevations in MW-1S and MW-1D showed the downward hydraulic gradient between the upper and lower ground water zones to be approximately 0.16 ft/ft.

# 3.0 INITIAL EVALUATION

## 3.1 INVESTIGATION RESULTS - 1984

In 1984, the initial field investigation activities were undertaken which consisted of soil sampling in fourteen shallow test pits, sampling sediment from a surface drainage inlet (no water present) and sampling a pool of oil. All samples were analyzed for PCBs, cadmium, chromium, copper, lead, iron, nickel, selenium and zinc. One sediment sample was analyzed for all priority pollutant compounds except for asbestos, acrolein and acrylonitrile.

The analytical results showed test pit samples 1, 2, 3, and 4 and Drainage Inlet sample (DI) No. 1 had PCB concentrations over the 50 ppm level established by USEPA as being PCB contaminated. This area is the area between the office building and Crusher No. 1. Test pits 5, 6, 7, 8 and 10 had PCB concentrations in the 2 to less than 50 ppm range. This latter area could also require remediation according to the USEPA guidelines for soils which contain greater than 10 ppm of PCBs.

Heavy metals found in the test pit soil and DI No. 1 sediment samples, included high concentrations of iron, lead, copper and zinc, and lower concentrations of cadmium, chromium and nickel.

Other priority pollutants found in the drain sediment included chrysene, phenanthrene, pyrene, total cyanide and phenols.

The results of the 1984 investigation concluded with a conceptual remedial action program which called for soils containing greater than 50 ppm of PCBs to be removed and the remaining areas paved over with asphalt to cap the site and prevent further contact with the contaminants.

## 3.2 INVESTIGATION RESULTS - 1986

The results of the 1984 investigation identified other potential contaminant migration pathways such as vertical migration through the

Revised Text

subsurface soils into the ground water and off-site migration of contaminated sediments through the storm drains and connecting sewer. The supplemental field investigation in 1986 was designed to establish the presence or absence of contaminants in those areas. To accomplish these objectives a sewer investigation was conducted, two additional test pits were dug and sampled, an oil pit sample was taken from Area C, and four shallow and one deep monitoring well were installed and sampled in November of 1986.

The results of the supplemental investigation showed test pits 15 and 16 to be below the 10 ppm PCB cleanup levels established by USEPA. The resampling of the oil showed it to contain less than 50 ppm of PCBs. The ground water sampling results showed PCBs to be detected at monitoring well MW-3S. Analysis of the ground water for volatile organics revealed the presence of several chlorinated hydrocarbons at monitoring well MW-2S. These concentrations exceeded NYSDEC Class GA guidance levels or standards. In addition, one standard was exceeded at well MW-1S while several other volatile organics were detected at levels below their respective guidance levels at both well MW-1S and well MW-3S. A trace amount of toluene was detected at well MW-1D. Analytical results for heavy metals showed several of the shallow wells to have concentrations of arsenic, cadmium and lead in excess of the New York State Class GA ground water standards. The cadmium, lead and copper concentrations tend to increase in the downgradient direction, while arsenic is highest in the upgradient direction.

Results of the hydrogeological investigation showed the general direction of flow in the shallow aquifer to be to the east-northeast. A clay layer was also found on the site which is thought to form a confining layer between the water table aquifer and the deeper outwash aquifer.

## 3.3 IDENTIFICATION OF CONTAMINANTS

Table 3-1 lists, by media, (i.e. ground water, soil, etc.) the contaminants found at the site based on the analytical test results of the two investigations and analytical test results obtained from the NYSDEC.

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TABLE 3-1

## CONTAMINANTS MATRIX

## (MAXIMUM CONCENTRATION FOUND)

| PARAMETER | SOIL (mg/kg) | SEDIMENT (mg/kg) | GROUNDWATER (ug/l) |
|---|---|---|---|
| 1,1-Dichloroethene | NA[3] | NA | 520 |
| t-1,2-Dichloroethene | NA | NA | 160 |
| 1,1,1-Trichloroethane | NA | NA | 10,000 |
| Trichloroethene | NA | NA | 7,400 |
| Toluene | NA | NA | 7 |
| PCBs (Total) | 120 | 72 | 4.1 |
| Arsenic | NA | LT 0.5 | 26 |
| Beryllium | NA | LT 0.5 | 7 |
| Cadmium | 2    7 | 14 | 22 |
| Chromium | 148 | 121 | 103 |
| Copper | 19,900 | 1530 | 413 |
| Mercury | NA | 0.7 | 0.9 |
| Nickel | 200 | 111 | 384 |
| Lead | 4.050 | 1620 | 400 |
| Antimony | NA | 1.4 | 600 |
| Selenium | LT 0.6 | LT 0.5 | LT 50 |
| Thallium | NA | 3.5 | LT 300 |
| Silver | NA | 3.5 | LT 300 |
| Zinc | 8830 | 2250 | 1,090 |

NA - Not analyzed for.

## 3.4 POTENTIAL CONTAMINANT MIGRATION ROUTES, EXPOSURE PATHWAYS AND RECEPTORS

Prior to identifying migration and exposure routes and potential receptors, it is necessary to identify the sources of contamination. The primary source of contamination appears to be spills of PCB oil and possibly other materials onto the surrounding land surface. This condition has in turn created secondary sources of contaminants in the underlying soil.

### 3.4.1 Possible Contaminant Migration Routes

Possible contaminant migration routes at the site include:

- Infiltration of precipation into underlying soil and ultimately into the shallow ground water.
- Surface water runoff (i.e. precipitation and sediment) entering the sewer and being carried off-site.
- Sewer line bedding material providing a porous conduit for routing contaminants off site.
- Fugitive dust emissions from truck traffic and related operations at the site in dry periods of the year.

### 3.4.2 Potential Exposure Routes

Possible exposure routes would include dermal contact with contaminated soils and surface waters, inhalation of fugitive dust emissions and ingestion of contaminated ground water.

### 3.4.3 Potential Receptors

Potential receptors would include Shulman employees, people making scrap deliveries and pickups at the facility, people using the ground water as a potable water supply, unauthorized personnel entering the property, and off-site people exposed to contaminated dust.

## 3.5 PRELIMINARY REMEDIAL RESPONSE OBJECTIVES

Based on previous site investigation activities, the following remedial response objectives have been identified:

- Further define the nature of contamination (i.e. principal contaminants, media, horizontal and vertical extent).
- Identify the possible populations at risk and potential exposure levels.
- Identify applicable or relevant and appropriate requirements (ARARs).
- Establish and screen response actions consistent with results of baseline risk assessment.
- Evaluate remedial action alternatives and select a recommended alternative to meet site clean-up criteria.

## 3.6 PRELIMINARY REMEDIAL ACTION ALTERNATIVES

### 3.6.1 Response Actions

Prior to the development of remedial action alternatives, general response actions must be identified for the site. Response actions are actions where the source of contamination is controlled to levels of acceptable risk. Source control response actions remove threats or detoxify the contaminants and are the preferred response actions. Site contaminant response actions consist of activities that will immobilize the contaminant source in a controlled situation. The type of response action needed is driven by site specific conditions. Once the response actions are identified, remedial action alternatives can be devised. The following is a list of response actions identified for the Shulman site:

- No action/institutional actions
- Continued monitoring only
- Source control-excavation/removal/treatment and/or disposal of contaminated soil
- Containment - collection/treatment and disposal of contaminated ground water.

### 3.6.2 Remedial Action Alternatives

The following is a list of preliminary remedial action alternatives that may be applicable for the Shulman site:

Alternatives to Remediate Soil

- Complete removal of PCB-contaminated soil (above 10 ppm), off-site treatment/disposal.
- Removal of PCB-contaminated soil (above 50 ppm), cap the remaining areas, treat or dispose of soil.
- Capping of all areas higher than 10 ppm with no removal.
- No action.

Alternatives to Remediate Shallow Ground Water

- Collect/treat as necessary for PCBs, VOCs and heavy metals and discharge to existing site sewers.
- Collect/treat to state drinking water quality standards and reinject to aquifer.
- No action.

Alternatives to Remediate Surface Water Sewer Line

- Regrade site to divert surface water from sewer to private treatment, remove sediment from inverts, treat or dispose of sediment off-site, decontaminate existing line and seal it to prevent infiltration of contaminated ground water.
- Install surface water runoff controls, remove old sewer line and sediment with off-site disposal, reroute line through non-contaminated area.
- No action.

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# 4.0 WORK PLAN RATIONALE

The work plan rationale is intended to identify the data needs, the quality of the data required and what steps will be taken to satisfy the data requirements for the risk assessment and evaluation of the alternatives.

## 4.1 DATA QUALITY OBJECTIVES

The following Data Quality Objectives (DQO) have been defined for the remedial response objectives.

### 4.1.1 Data Needs

#### 4.1.1.1 Nature of Contamination

The previous site investigation activities were aimed at trying to identify areas of PCB contamination, therefore, they were limited in scope and did not evaluate a full range of parameters that could potentially be present.

The data required to define the nature of contamination include the following areas:

- Identify the type of contaminants present in each media (soil, ground water, etc.).
- Define both the horizontal and vertical extent of contamination in both the soil and ground water.
- Identify contaminants in the storm water runoff and sediment in the sewer.
- Define the direction and rate of ground water flow in both the shallow ground water zone and outwash aquifer.
- Characterize the permeability, thickness and areal extent of the clays which underlie the site.
- Characterize any volatile and particulate air emissions from site.

#### 4.1.1.2 Populations at Risk and Allowable Exposure Levels

The data required to access this response action will require a population count of the area within a 1/2 mile radius of the site to determine the numbers of human receptors present. Allowable exposure levels need to be defined to help identify potential receptors.

#### 4.1.1.3 ARARs

The following regulations need to be reviewed to determine if they are applicable to the site: federal and state air and water quality standards, OSHA exposure levels and RCRA trigger levels.

#### 4.1.1.4 Screening of Alternatives

The following types of data are needed to screen the remedial action alternatives: proven technologies for treatment and/or disposal of PCBs, current cost data, estimated quantities of contaminants to be remediated, pilot or treatability study results.

### 4.1.2 Data Quality Requirements

The quality requirements for each type of data needed in the RI/FS is summarized in Table 4-1.

The remaining parts of this work plan will present the specific procedures defining how the data will be collected and how they will be used.

# TABLE 4-1

## DATA QUALITY REQUIREMENTS

| Data Needed | Data Quality Required |
|---|---|
| Contaminant identification/ concentration levels for sediment, soil, ground water, surface water and air | TCL-CLP for ground water, surface water and sediemnt |
| Water level | ±0.01 foot |
| Population information | Most recent census and field verification |
| ARAR's | Existing and proposed regulatory levels |
| Acceptable risk clean-up criteria | ARAR's when available if ARAR's are not available:<br>- non-carcinogens - no appreciable risk of significant adverse effect<br>- carcinogens - $10^{-4}$ to $10^{-7}$ lifetime excess cancer risk |
| Treatment technology evaluation | Actual remedial action data |
| Estimated quantities of contaminated media | ±20% of actual volume. |
| Unit costs | Vendor quotations and actual costs from similar projects preferred<br>Compendium costs adjusted to current dollars |
| Cost estimates | +50% - 30% all in current year dollars |

# 5.0 PROJECT MANAGEMENT

Proper management of the RI/FS project is important for several reasons. First, the interactive nature of the RI and the FS makes it necessary to have one project team performing the work to ensure continuity in the work products. Second, proper management is required to enable integration of regulatory input at critical times during both portions of the project.

## 5.1 PROJECT ORGANIZATION

The Table of Organization proposed for this project is shown on Figure 5-1. The following sections are brief descriptions of the duties and responsibilities, key positions, and personnel responsible for that position.

### 5.1.1 Project Manager - Richard Klippel, P.E.

Mr. Klippel will have overall project management responsibilities. His duties will include keeping the project on-schedule and on-budget and to serve as regulatory liaison.

### 5.1.2 Technical Review Team - Richard Brownell, P.E., V.P. Paul H. Werthman, P.E., V.P., Richard Califano and John Isbister, P.G.

The technical review team is responsible for providing quality assurance review for various parts of the project. Mr. Werthman, in his position of Project Officer, and Mr. Brownell will be responsible for the overall review of the RI/FS report. Mr. Califano will be responsible for final technical review of the baseline risk assessment. Mr. Isbister will review the hydrogeological data during the field investigation activities and also during the report preparation.

# I. SHULMAN & SON, INC. RI/FS

## TABLE OF ORGANIZATION

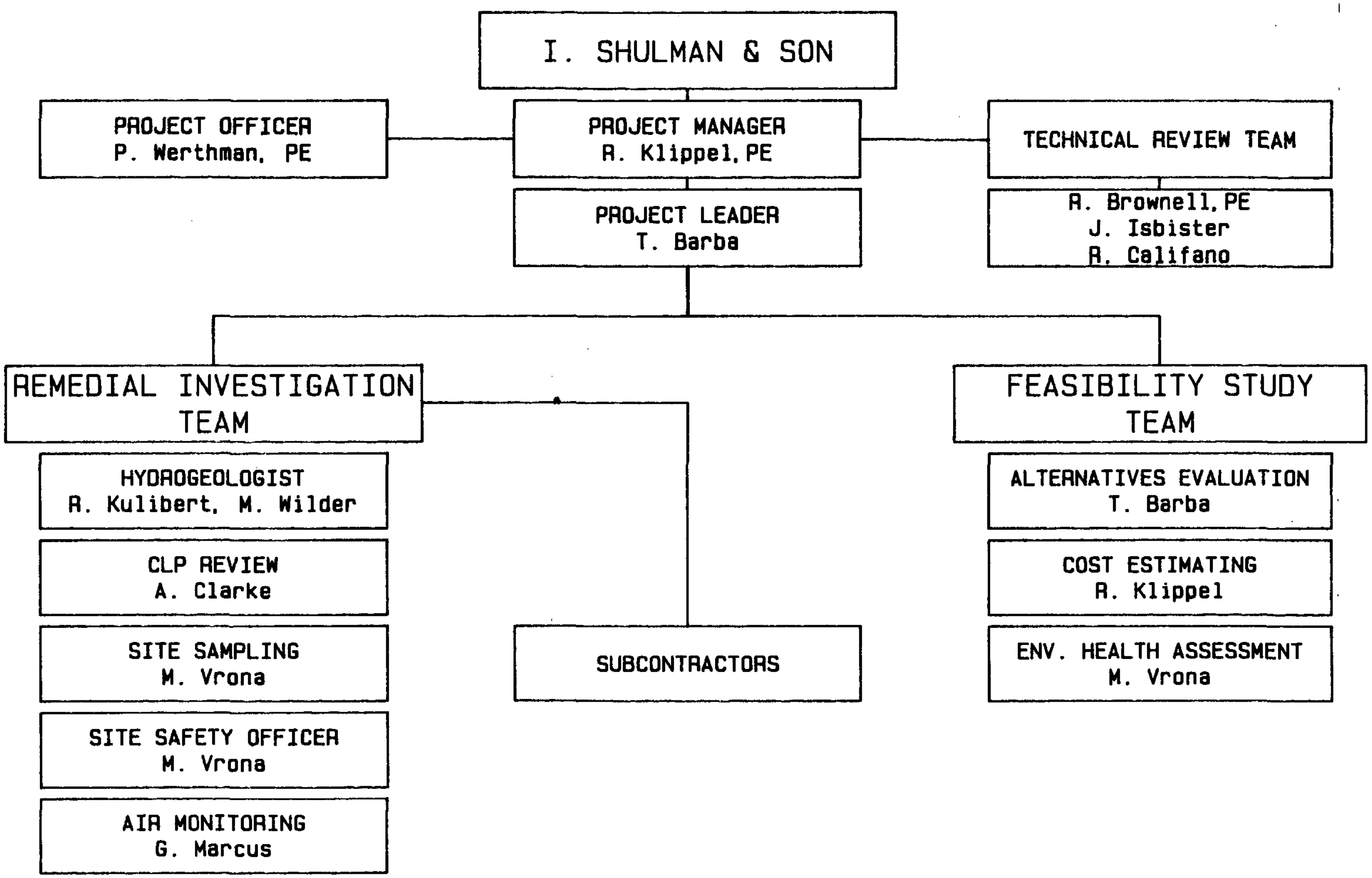

Figure 5-1

### 5.1.3 Project Leader - Thomas Barba

Mr. Barba will manage the day-to-day project activities of the two project teams. He will also manage the activities of the subcontractors.

### 5.1.4 Project Team Members

Two teams have been proposed: a remedial investigation team and a feasibility study team. The remedial investigation team will be responsible for the field investigation activities, analytical data validation and baseline risk assessments. The feasibility study team will consist of individuals specialized in developing remedial action alternatives, preparing cost estimates and conducting environmental/health assessments of the screened alternatives.

## 5.2 SUBCONTRACTOR MANAGEMENT

### 5.2.1 Drilling Subcontractor

We propose to utilize North Star Drilling, Cortland, New York for drilling test borings and installing monitoring wells at the site. Representatives from North Star Drilling have the required health and safety training for working at hazardous waste sites.

### 5.2.2 Analytical Subcontractor

The analytical subcontractor will be selected from a list of laboratories that are qualified for performing the required analyses and are on the NYSDEC list of technically acceptable laboratories.

### 5.2.3 Survey Subcontractor

A licensed surveyor will be subcontracted for performance of the required surveying on site.

## 5.3 COMMUNITY RELATIONS

I. Shulman & Son, Inc. acknowledges that the information contained in the RI/FS will become public information upon its submittal to the NYSDEC. If, in the course of complying with the consent agreement terms and conditions, it becomes necessary for public hearings <u>and meetings</u> to be held regarding the disposition of what remedial action will be taken to clean up the site, representatives of I. Shulman & Son, Inc., <u>including MPI,</u> will participate to the extent required.

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# 6.0 REMEDIAL INVESTIGATION PLAN

## 6.1 INTRODUCTION

The remedial investigation (RI) plan is designed to provide sufficient field data to enable a baseline risk assessment and feasibility study to be carried out that will meet the remedial response objectives.

The remedial investigation is broken down into the following tasks:

- Field investigation
- Sample analysis
- Data evaluation and validation
- Baseline risk assessment
- Refine remedial action goals

At the completion of the five tasks a draft remedial investigation report will be prepared and submitted to NYSDEC for review and comment. An interim investigation report will be submitted upon receipt and evaluation of analytical reports from the sampling programs.

## 6.2 FIELD INVESTIGATION

### 6.2.1 Preliminary Activities

Prior to any field activities being conducted, the following documents must be prepared and approved:

- Site specific health and safety plan
- Quality assurance project plan

Drafts of these documents are included as Appendix A and B, respectively.

### 6.2.2 Proposed Soil Boring and Monitoring Well Installation Program

Drilling of additional test borings and installation of additional monitoring wells are necessary in order to:

- Provide enough data to make an improved determination regarding the presence or absence of a continuous clay layer beneath the site.

- Provide data for mapping the configuration of the water table aquifer and the deeper glacial outwash aquifer in the vicinity of the site.
- Determine the magnitude of the effect of the sewer on shallow ground water flow.
- Provide shallow and deep ground water sampling points in locations downgradient of wells where contaminants have been detected at contravening levels.
- Provide sampling points to determine if downward vertical migration of contaminants has occurred from the shallow aquifer across the clay layer to the outwash aquifer.

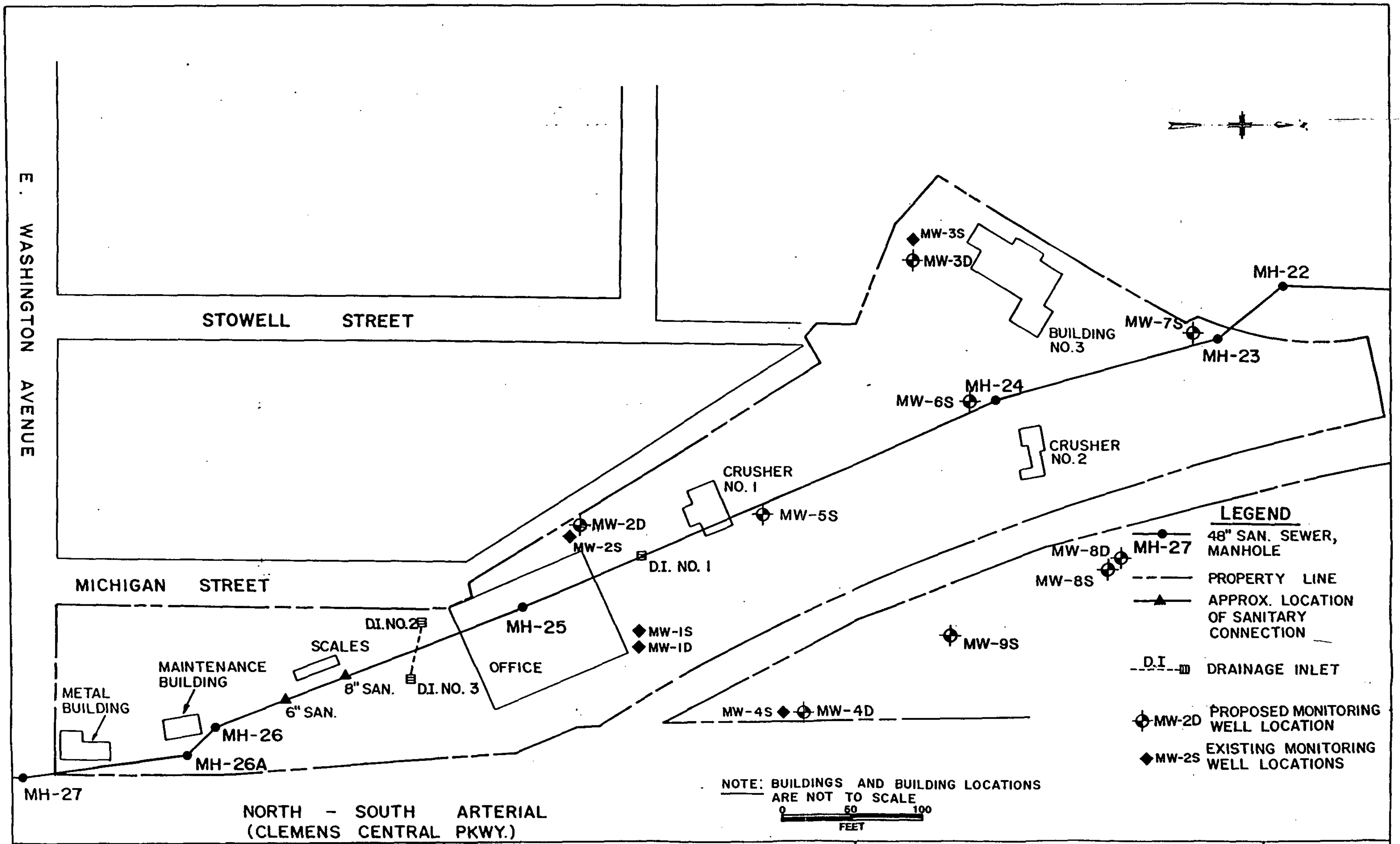
To facilitate collection of the required information, it is proposed that nine new monitoring wells be installed in the vicinity of the site. The proposed locations for the wells are shown on Figure 6-1.

#### 6.2.2.1 Rationale for New Monitoring Wells

Monitoring wells MW-2D and MW-3D are intended to provide sampling points in the upper outwash aquifer, thereby enabling an assessment of downward vertical contaminant migration in those locations.

Monitoring wells MW-4D, MW-8S, MW-8D and MW-9S provide downgradient ground water sampling points. Wells MW-4D and MW-8D will monitor the upper portion of the outwash aquifer, while MW-8S and MW-9S will be used to monitor the shallow ground water zone.

Monitoring wells MW-5S, MW-6S and MW-7S will be used to monitor the water table in the vicinity of the sewer to determine the sewer's impact on the shallow ground water regime. Analytical results of ground water samples collected from these wells will provide information on ground water quality in these areas. Additional boreholes and/or monitoring wells may be necessary in the vicinity of the MW-5S, MW-6S and MW-7S locations depending on the occurrence of the confining clay layer relative to the depth of the sewer and its associated backfill. For example, if the clay layer is present but appears to have been penetrated during the excavation of the trench for the sewer, it may be necessary to install additional deeper wells for an assessment of water quality with depth. If the clay layer is absent in any of these



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| REVISIONS | | | |
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| NO. | BY | DATE | REMARKS |

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I. SHULMAN & SON, INC.
ELMIRA, NEW YORK

**PROPOSED MONITORING WELL LOCATIONS**

MALCOLM PIRNIE, INC.
DATE FEBRUARY 1989
FIGURE 6-1

locations, additional deeper wells may be required for the water quality-with-depth determination. However, if the clay layer is encountered at a depth that is below the influence of any sewer trench excavation activity (based on sewer invert elevations and drilling information) then the boreholes will be discontinued at the top of the clay layer. The Malcolm Pirnie hydrogeologist, in conjunction with the on-site NYSDEC representative, will be responsible for making the decision on the need for additional monitoring wells in these areas.

Information collected during the drilling of the boreholes for all of the wells will be used to delineate subsurface geologic units. The presence or absence of a continuous clay layer beneath the site will thereby be determined.

Additional soil borings/monitoring wells may also be needed depending on the results of the ground water analyses. Identification of contaminants of concern at contravening levels in the deep or shallow downgradient monitoring wells would require the installation of additional monitoring points to determine the extent of ground water contamination. In the event that contravening levels of contaminants are suspected to have migrated off-site an addendum to this portion of the work plan will be submitted to the NYSDEC for review and approval.

One additional soil boring/monitoring well installation will be needed to replace well MW-1S which has been damaged and will not allow the passage of a bailer into the well for sampling purposes.

#### 6.2.2.2 Drilling Methods and Monitoring Well Installation Procedures

The drilling methods and monitoring well installation procedures utilized during the last phase of work at the site will essentially be followed for installation of the proposed shallow wells (MW-5S, MW-6S, MW-7S, MW-8S and MW-9S). However, modifications in the procedures utilized will be made to allow for the screening of split-spoon samples for volatile organics content by head space analysis.

Assuming that the clay layer is continuous beneath the site, the drilling methods and well construction techniques will require modification for installation of the deep wells. The modifications will ensure that there is no hydraulic communication from the upper to the lower aquifer across the clay layer via the borehole.

Only potable water will be utilized during drilling procedures, and will be obtained from the I. Shulman and Sons water supply.

A 6 5/8-inch I.D. flight of hollow stem augers will be used to drill and split-spoon sample to the top of the clay layer. Split-spoon samples will be collected continuously at standard two (2) foot intervals. The split-spoon samples will be collected, described and classified by the AFI Environmental hydrogeologist on-site according to the procedures described in Appendix B. Portions of each split-spoon sample will be tested for the presence of volatile organics utilizing the method in Appendix B. Representative samples from each different unit penetrated during the drilling process will be submitted to a soils laboratory for grain size distribution analysis and/or for a determination of the soil's Atterberg limits, depending on the physical make-up of the soil. Portions of the samples from each different unit penetrated will also be subjected to a dry combustion process to determine the amount of total organic matter present in the soil.

Predominantly granular, noncohesive soils will be subjected to mechanical sieving and a sedimentation method to determine the distribution of the soil particle size distribution. Predominantly fine-grained, cohesive soils will be subjected to 'plasticity tests' to determine their Atterberg limits. The predominantly fine-grained soils may also be subjected to mechanical tests to determine their grain size distribution.

The determination of the total organic matter content will be accomplished according to ASTM D-2974.

After the top of the clay layer has been confirmed via split-spoon, a socket will be augered to receive the six (6) inch casing. Non-shrink grout will be pumped into the socket and a six (6) inch steel casing will be installed prior to removal of the augers. The remaining annulus of the six (6) inch casing will then be grouted. This method will prevent the borehole from collapsing, and will insure that the grout forms a seal within the casing and in the annulus between the casing and the borehole to secure the pipe and effectively seal the clay layer.

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After the grout has hardened for a period of 24 hours, a 5-7/8" roller cone will be utilized to drill through the grout to the clay layer. A Shelby-tube sample will be obtained from the upper part of the clay layer in the deep borings. Permeability tests will be performed on the undisturbed samples to determine the saturated vertical hydraulic conductivity (<u>$K_v$</u>) of the clay layer. Additional samples of the clay layer may be obtained, depending on the thickness of the unit, for a laboratory determination of ion exchange capacity. <u>Continuous</u> split-spoon samples will be collected through the remainder of the clay layer, and into the underlying outwash aquifer. A four (4) inch diameter casing will be driven intermittently to the bottom of the borehole, utilizing a 140 pound hammer, as the hole is advanced by the split-spoon sampler. After the four (4) inch casing is cleaned out with a roller bit, the two (2) inch well will be installed inside the four (4) inch casing, and the casing will be retracted as the well materials are being emplaced.

If the clay layer is of insufficient thickness to permit sampling of the unit for determination of the $K_v$ via Shelby tube sampling and the ion exchange capacity, then the ion exchange capacity sample will not be collected. A determination of the $K_v$ for this layer is deemed to be more important than the determination of the ion exchange capacity for the unit.

### 6.2.2.3 <u>Drilling Equipment Decontamination Procedures</u>

To prevent the possibility of any cross-contamination between boreholes, the drilling rig and all drilling accessories will be thoroughly decontaminated before arriving on site and between drilling sites. A pressurized steam cleaner will be utilized for purposes of decontamination of the rig and accessories. All split-spoon samplers will be decontaminated with either the steam cleaner or by using a detergent, followed by a tap water rinse, followed by another rinse using a pesticide grade methanol or hexane, and finally three rinses of de-ionized water.

### 6.2.2.4 <u>Monitoring Well Construction</u>

Upon completion of the drilling at each location, each of the above referenced boreholes will be converted to a ground water monitoring well to enable sampling of ground water and to permit measurement of ground water elevations at that location.

It is anticipated that each monitoring well will have the following characteristics. Figures 6-2 and 6-3 illustrate the typical monitoring well construction for a shallow and deep well, respectively.

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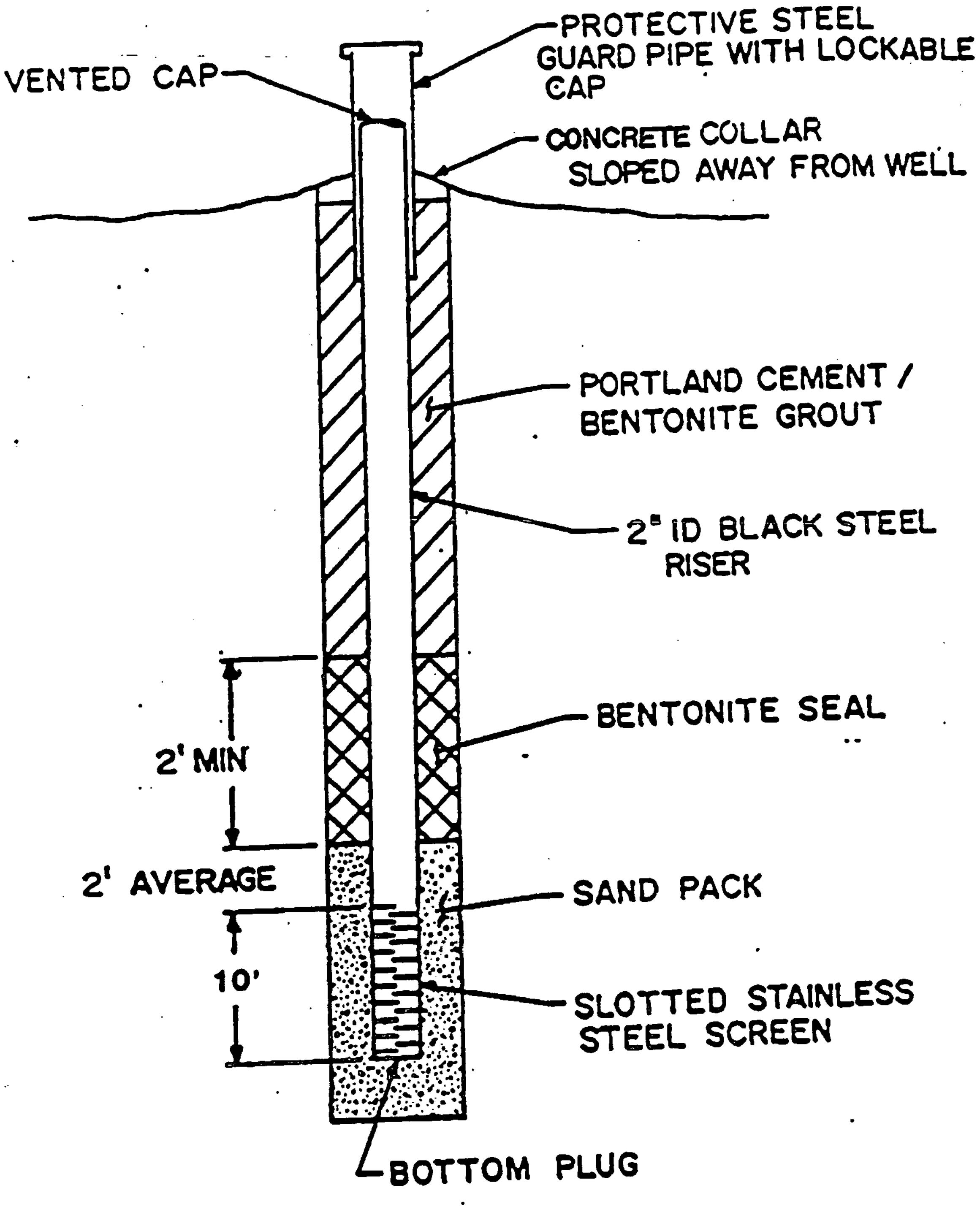

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A-F-I TYPICAL SHALLOW MONITORING WELL

FIGURE 6-2

# Appendices

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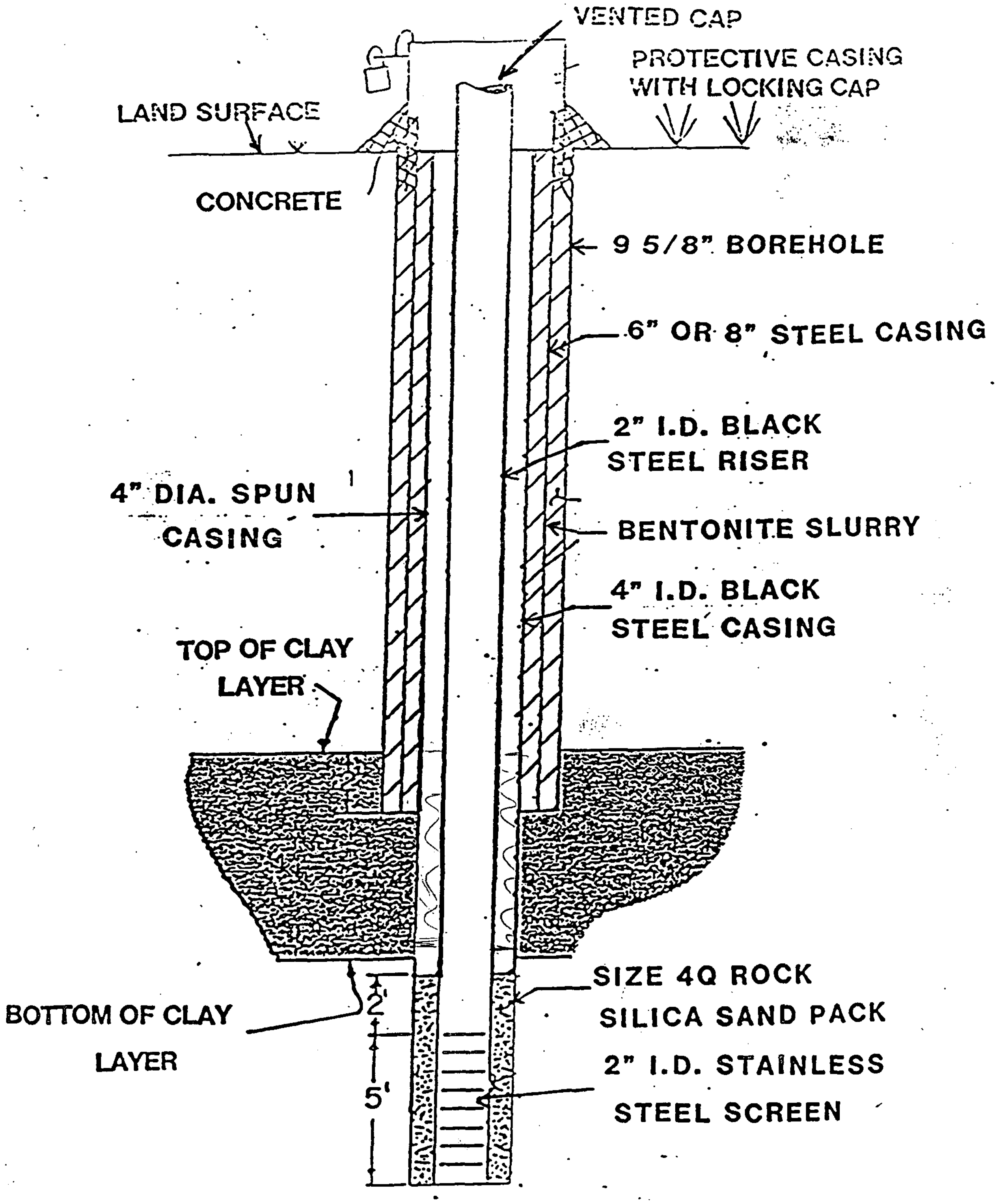

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TYPICAL DOUBLE-CASED MONITORING WELL

FIGURE 6-3

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- Ten foot well screens will be utilized in shallow wells to provide a sufficient volume for sampling. Based on grain size distrubution analysis performed on soil samples collected from the screened interval in shallow wells MW-1S, MW-3S and MW-4S, 0.006 inch slots will be used for the shallow wells. Screens with 0.01 inch slots will be used for the deep wells.
- Two-inch I.D. black steel riser pipe will extend rom the screened interval to the top of the well.
- Select sand (size 10 ROK for shallow wells and size 20 ROK for the deep wells) will be packed in the annular space between the well and the borehole to approximately two feet above the top of the screened interval.
- For the shallow wells, a bentonite seal at least two feet in thickness will be placed above each sand pack. In the deep borehole annulus, which penetrates the confining clay layer, the bentonite slurry seal will extend two (2) feet above the top of the sand pack.
- Portland cement/bentonite grout (3 to 5 pounds of bentonite per 94-pound bag of cement plus approximately 6.5 gallons of potable water, depending on field consistency) will be used to fill the remaining annulus to land surface. The onsite Geologist will record the quantities of water and bentonite entering the grout mixture in the field log.
- A four-inch I.D. protective steel guard pipe with a lockable cap will be lowered over the well casing and cemented into place. The concrete collar will be sloped away from the well toward the land surface.

As each well installation is completed, the well will be developed by bailing until: 1.) all drilling cuttings are removed; 2.) any drilling fluids that were added are removed; and, 3.) if possible, to a turbidity level of less than 50 NTU. However, development of wells to 50 NTU may not be possible if the wells are screened in a formation that is comprised of predominantly very fine-grained unconsolidated soils. The decision to terminate development will be by mutual agreement between AFI Environmental and the NYSDEC representative.

Turbidity measurements will be taken and recorded intermittently during development and purging. Provisions have been made for containerizing all purge water in DOT drums. However, due to the suspected groundwater contamination at the site, dedicated bailers will be utilized for development/purging to eliminate the possibility of cross-contamination.

Written procedures for the field calibration of the turbidity meter have been added to the QAPP.

The decision flow chart shown on Figure 6-4 will be used to determine what steps should be taken during well development. The NYSDEC on-site representative will have significant input into all well

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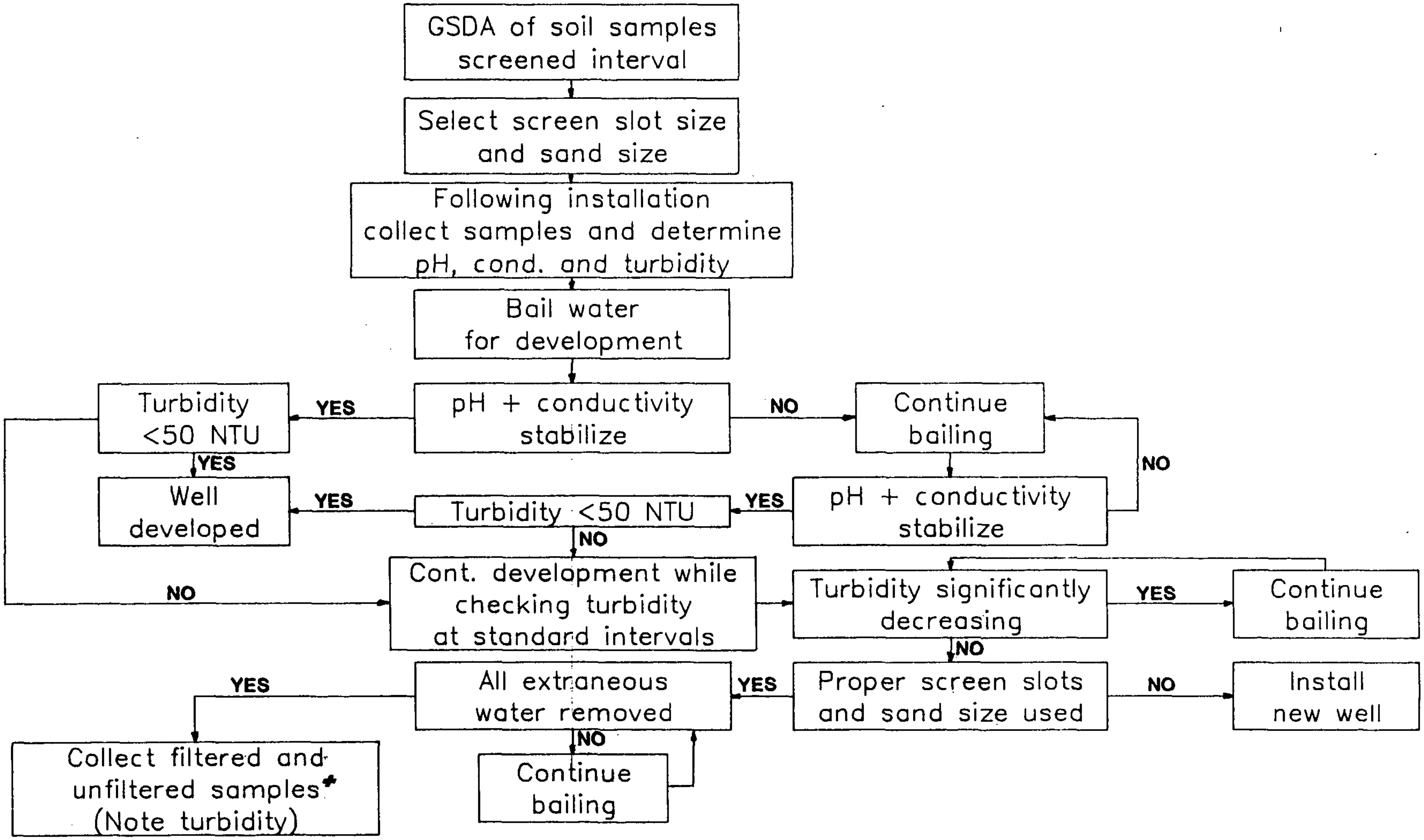
**FIGURE 6-4**

# DECISION FLOW CHART: WELL INSTALLATION AND DEVELOPMENT



* ANALYZE UNFILTERED SAMPLE FIRST : IF THE UNFILTERED SAMPLE EXCEEDS A R A R's ANALYZE THE FILTERED SAMPLE
IF THE UNFILTERED SAMPLE MEETS A R A R's DO NOT ANALYZE THE FILTERED SAMPLE.

development procedures. Should the newly installed wells fail to meet proper installation guidelines, the NYSDEC can request the installation of replacement wells. In addition, MPI will make every effort to redevelop the existing wells to the 50 NTU target level. However, based on available grain size distribution analyses, and knowledge of the slot sizes used for well construction (0.01 inch), the 50 NTU level may not be attainable. In this case, the development process will be thoroughly documented and forwarded to the NYSDEC.

### 6.2.2.5 Disposition of Drill Cuttings and Development/Purge Water

In accordance with the proposed NYSDEC Technical and Administrative Guidance Memorandum on the disposal of drill cuttings (Appendix C), all drill cuttings will be disposed of within 20 feet of their respective boreholes. All development and purge water will also be disposed of near the wells.

Clear indelliable mark made on the well for correct measuring point

### 6.2.2.6 Water Level Measurements

Subsequent to well development, water levels in the shallow and deep wells will be measured and recorded on a monthly basis for a period of at least six months. These data will be used to map the configuration of the water table and the potentiometric surface of the deeper aquifer.

### 6.2.2.7 Well Surveying

The land surface and the top of the well casing elevations for each well will be surveyed by a licensed surveyor. All surveyed elevations will be tied to a USGS datum. The wells will be surveyed to enable correlation of water levels and subsurface units.

### 6.2.2.8 Permeability Tests

Falling- or rising-head permeability tests (slug tests) will be performed at each monitoring well to permit calculation of the saturated horizontal hydraulic conductivity of the soils in the vicinity of the screened interval. The procedure for this type of test is provided in the QAPP (Appendix B).

### 6.2.3 Sewer Line Investigation

In the 1984 site investigation, sediment taken from the grating above DI No. 1 contained high levels of PCBs and selected VOCs. For this reason, it was deemed necessary to conduct further investigation activities into the impact of the sewer line and off-site migration of contaminants.

#### 6.2.3.1 Manhole and Storm Drain Inlet Inspection

Starting with manhole 27 and working north, each of the six manholes (27-23) and the three surface water drainage inlets will be opened and inspected. The following physical information will be collected:

- Location of manhole.
- Size and description of sewer and any cross connections.
- Depth from the top of the manhole or surface drain to the bottom of the sewer.
- Estimated amount of sediment present in the bottom.
- Note the presence of oil or other unusual conditions.

#### 6.2.3.2 Dye Testing Surface Water Drainage Inlets

Beginning with DI No. 3, followed by DI No. 2 and DI No. 1, each drainage inlet will be dye tested and tracked downstream through each manhole until it reaches manhole 27.

The arrival time of the dye as it reaches each manhole will be recorded. This process will be repeated for the 6 and 8 inch sanitary sewer lines if the source can be located.

#### 6.2.3.3 Infiltration Survey (Optional)

A comparison of the sewer line bottom elevations with the elevation of the water table (during a seasonally wet and a seasonally dry period) will be made across the site. If it is found that the sewer line elevation is partially or completely below ground water, an infiltration survey will be conducted by running a sewer line television camera through the sewer line to identify if ground water is infiltrating the sewer line. If it is found that the sewer line elevation is not below the ground water elevations, no infiltration survey will be performed.

### 6.2.4 Environmental Sampling

Based on the response objectives defined in Section 1, the following media have been identified as requiring sampling and analysis in order to meet the data requirements.

- Ground water
- Soil
- Surface water runoff
- Sewer line sediments
- Air

The following sections describe in general the sampling programs that will be conducted. Specific sampling procedures can be found in the QAPP (Appendix B).

#### 6.2.4.1 Ground Water Sampling

A total of fourteen ground water samples will be collected, one from each newly installed and existing well. Each well will be purged of 4 to 10 well volumes (or to dryness) by hand bailing and the samples will be obtained, also by bailers. Dedicated PVC bailers will be used at each well. Quality control samples for the ground water samples will include 1 trip blank/day (VOCs only), 1 field duplicate, 1 matrix spike sample, and 1 matrix spike duplicate. The list of parameters will be the TCL list established by NYSDEC along with hexavalent chromium. Analysis of ground water samples will be in accordance with CLP protocols. Based on the results of the first round of sampling, a second round of ground water samples may be obtained at the wells.

Analytical parameters to be analyzed in the second sampling event will be based on the results of the initial sampling. An analytical parameter list will be submitted to the NYSDEC for approval prior to performing any second-round sampling, should this sampling event be necessary. Section 2 of the QAPP provides detailed information regarding sampling and analysis requirements.

#### 6.2.4.2 Phase 1 - Revised Soil Sampling

The site will be divided into five sections as presented in Figure 6-5. Section 1, located to the north of the Office Building, is about 4.43 acres in size and contains Crusher No. 1. Section 2, located north of Section 1, is about 4.92 acres in size and contains Crusher No. 2 and Building No. 3. Section 3, located to the east of Sections 1 and 2, is about 1.72 acres in size. Section 4 is located to the north of Section 3 and is about 1.60 acres in size. Section 5 is located to the north of Section 4 and is about 3.06 acres in size.

Sections 1, 2 and 4 have shown the presence of PCBs during previous sampling. No previous contamination has been documented in Sections 3 and 5. Therefore, different sampling methods have been selected for these section groups. A biased sampling plan will be utilized in Sections 1, 2 and 4 to take into account existing data, while the systematic random statistical sampling approach will be used in Sections 3 and 5.

#### Areas With Documented Soil Contamination

Previous sampling results have revealed the presence of PCB-contaminated soil in Sections 1, 2 and 4. The purpose of the proposed soil sampling strategy in these sections is to define the overall extent of contamination for purposes of remediation, based on previous test pit analytical results. The future analytical data that will be generated will be used in conjunction with the existing analytical data, if the data are deemed consistent, to determine the most suitable remedial action for the site.

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In the draft February 1989 work plan, 200-foot square grid areas in these sections were proposed to be sampled randomly. Five soil samples were to be collected from each grid area. It is now proposed that approximately 16 samples be collected from each 200 x 200 foot area. In order to accomplish this goal, the original grid areas have been subdivided into 50 x 50 foot areas. The new grid layout is shown on Figure 6-5 which is located in the back of this work plan. Soil samples will be obtained from a test pit excavated in the center of each grid area. The samples will be collected at depths of 0 to 12 inches, 12 to 24 inches, 24 to 36 inches and 36 to 48 inches below land surface. There will be approximately 664 individual soil samples collected from these three sections, as follows.

Section 1 - 280 soil samples
Section 2 - 260 soil samples
Section 4 - 124 soil samples

After the individual soil samples are collected, they will be composited 4 to 1 and submitted for analysis. Utilizing the 4 to 1 compositing scheme, there will be approximately 70, 65 and 31 composite samples from Sections 1, 2 and 4, respectively. The compositing procedure to be utilized is as follows.

> Equal volumes of the individual samples to be composited will be weighed in stainless steel containers on a digital scale and placed on a polyethylene "mixing cloth". The stainless steel containers will be decontaminated and a new piece of poly-cloth will be used between samples. The samples will then be mixed by pulling the corners of the mixing cloth toward the diagonally opposite corner and rolling the sample upon itself, or by manually mixing the sample on the sheet.
>
> After the soil is mixed, it is spread on the cloth into a relatively flat pile. The pile is quartered. A small spoon

is used to collect samples from each quarter and these are composited into a clean glass container with teflon-lined cap.

The submission of samples will be dependent on where the samples have originated. Based on the previous analytical data, sections 1, 2 and 4 have been categorized into two areas where separate analytical methodologies will be utilized in an effort to reduce analytical costs.

The shaded areas on Figure 6-5 depict the areas where the two methodologies will be utilized. Samples from the Method I area, where contamination has been detected at elevated levels, will be submitted for analysis according to the procedure shown on Figure 6-6. The soil samples from these areas will be analyzed essentially from the bottom up. If contamination above 10 ppm is found at the 2 to 3 foot level, then the soil overlying this zone will be considered to be contaminated also. The underlying samples (3 to 4 feet) would then require analysis. If sufficient contamination is found at that depth, additional sampling would be required. However, if significant contamination is not found from 2 to 3 feet, then the 3 to 4 foot samples will be considered clean also and analytical tests will be performed on the overlying samples.

The submission of samples according to Method II, will follow an alternate methodology as indicated on Figure 6-7. The Method II areas are shown on Figure 6-5. The approach described by this method results in the submission of samples essentially from the top down.

### Areas With No Documented Soil Contamination

Previous limited sampling has not demonstrated that there is contamination in Sections 3 and 5. The purpose of this soil sampling strategy is to statistically identify any areas of

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# SECTIONS 1, 2 AND 4 · METHOD I

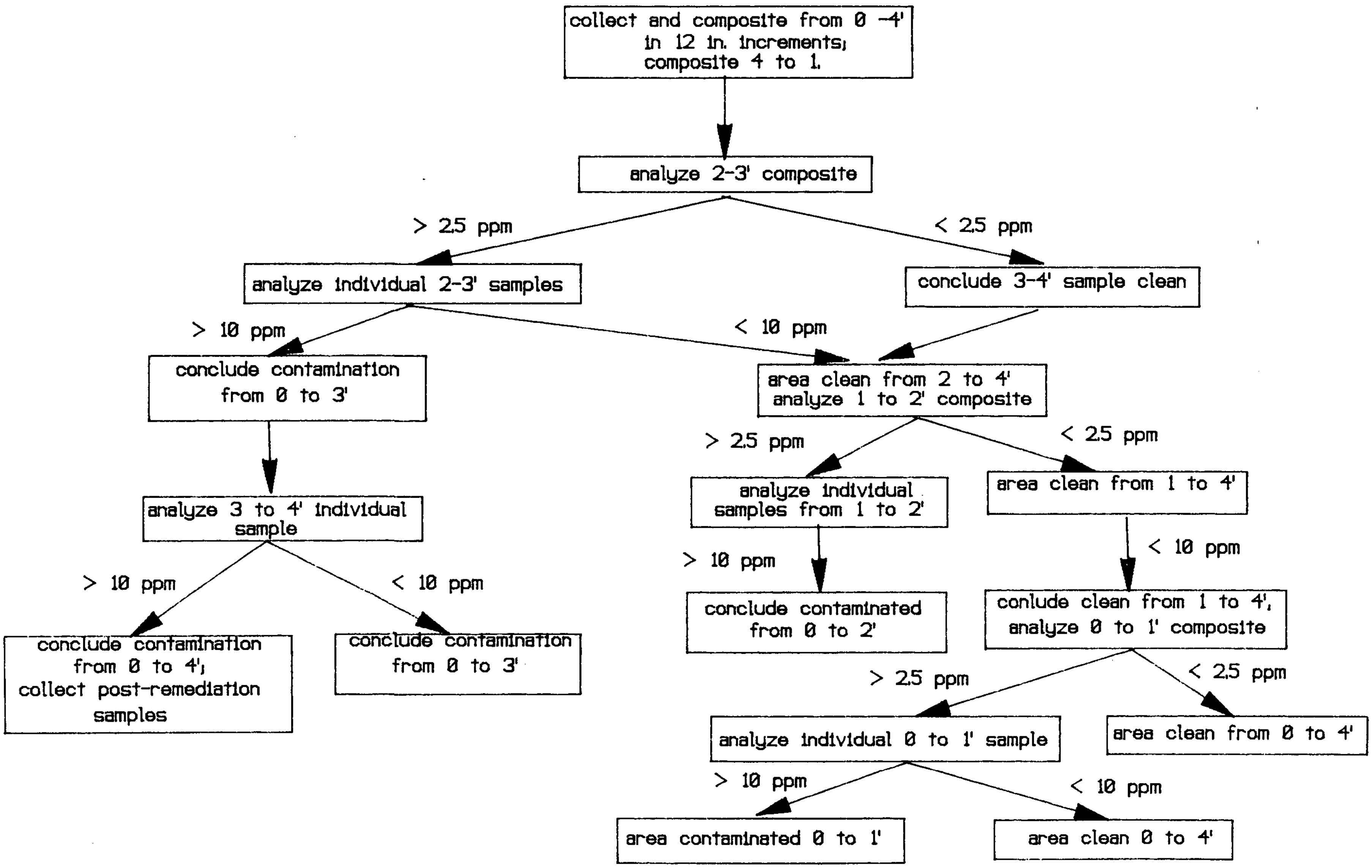

FIGURE 6-6

# SECTIONS 1, 2 AND 4 METHOD II

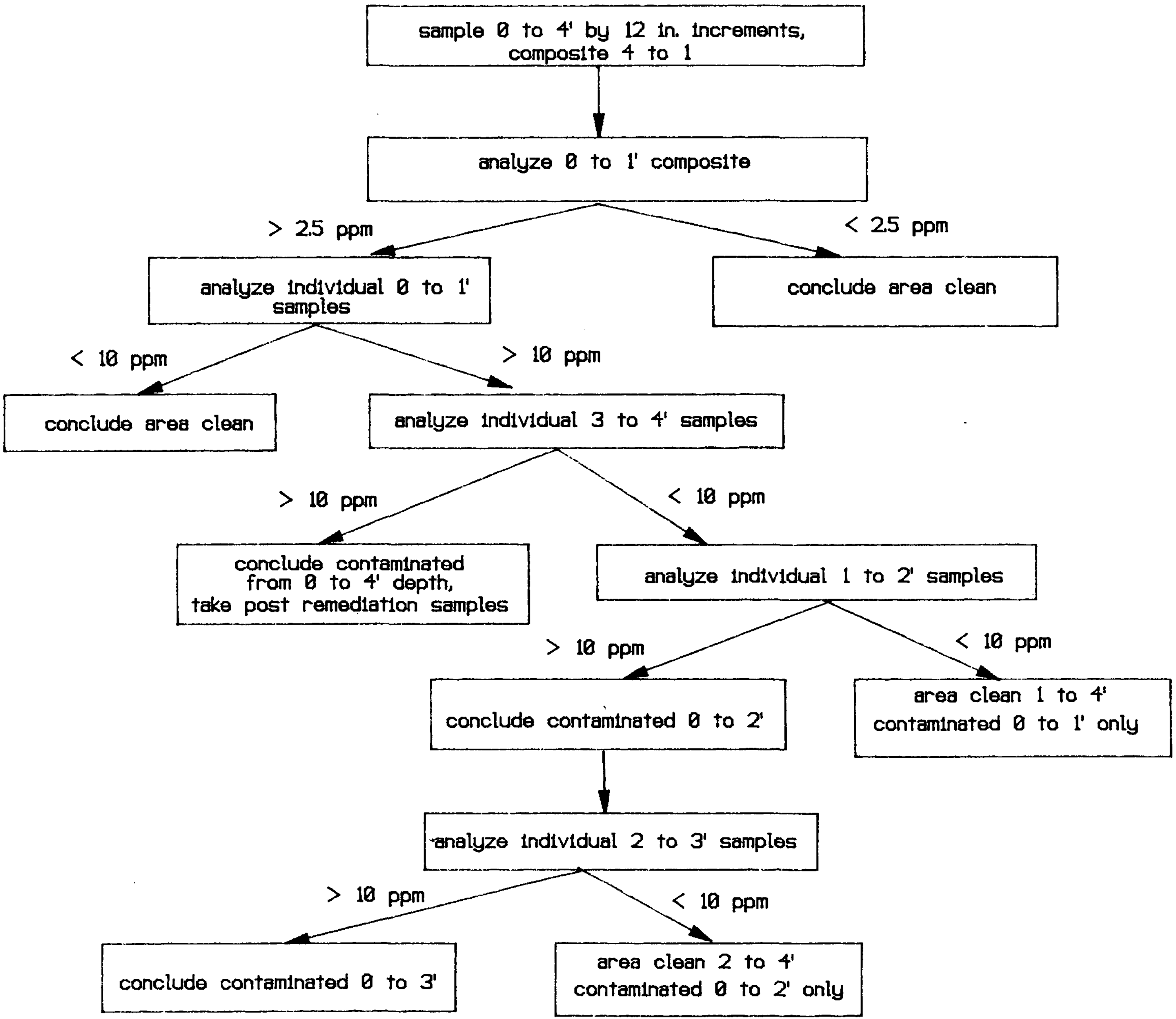

FIGURE 6-7

contamination and to statistically isolate areas that do not require any additional study. The sampling approach is designed to locate an area of concern, regardless of shape, equal to 22,185 square feet or 0.51 acres in size. If the area of concern were circular, it would have a radius of about 84 feet of if the area of concern were square, one side would be about 148.9 feet in length. The area of concern size was determined to be the minimum area of soil contamination for each depth that statistically can be detected and defined based on review of the historical sampling at the site. Historical sampling had the potential of detecting an area of contamination about 1.0 acre in size with a radius of about 117.6 feet. To statistically and geostatistically detect and define the extent of contamination having a radius of about 117.6 feet, an area of concern with a radius equal 84 feet or 71 percent of the radius for the historical contamination detected in other sections was selected. The size of this area of concern will ensure that the soil samples collected will be spatially representative. The areas will be divided into 300 foot by 300 foot grids as displayed in Figure 6-5. The origin for each grid will be the grid's area of 90,000 square feet, the percentage of concern area to grid area equals 24.65 percent. The number of random soil samples to be collected directly corresponds to the area of the grid. To statistically locate, with a 95 percent confidence, a 22,185 square foot area of concern within a 300 foot by 300 foot grid, 5 random soil sampling locations will be required.

In areas where a full 300 foot by 300 foot grid cannot be placed the grid size and corresponding sample size will be adjusted. The minimum grid size to locate a 22,185 square foot area of concern is 62,847 square feet which corresponds to 4 random soil sample locations. Less than 4 random soil sample locations per grid is not statistically valid. Any grids that have less area than 62,487 square feet will be added to an adjacent grid and the number of random soil sample locations required will be recalculated.

Within each of the grids, "X and "Y" random number coordinates will be generated through the use of a random number table or random number generating computer program. The "X" and "Y" random number coordinates generated will be converted to feet and then used to measure the surface sample location from the origin of the grid. At each random soil sample location, soil samples will be collected at depths of 0-12, 12-24, 24-36 and 36-48 inches.

If the random soil sample location falls on an area where the sample cannot be collected, a new random soil sample location will be generated. This process will continue until the required number of random soil sample locations, that contain sufficient sample material, can be established for each grid.

The following is a summary of the approximate number of sample locations that will be established per section for sections with no documented history of contamination:

Section 3 - 4
Section 5 - 8

Total 12

The approximate number of random soil samples to be collected for these sections is 48.

### Random Soil Sample Collection and Compositing (Sections 3 and 5)

As previously stated, soil samples will be collected at each grid's random sample locations. Samples will be collected by excavating

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a 4-foot deep test pit at the sample location with a backhoe. Malcolm Pirnie personnel will gather the soil samples at the required depths from the wall of the test pit using stainless steel samplers.

The random samples collected from a particular depth from each grid will be composited together to create one sample for analysis that has a composite of 4 to 1. Actual concentrations of individual samples which made up a composite sample could be four times greater than the composite values. This means the action level of 10 ppm of total PCBs needs to be reduced by three-fourths to 2.5 ppm (0.36 ppm for each of the seven Aroclors). In subsequent analyses, samples will be split and a minimum of 1 duplicate sample will be analyzed per 10 samples. Documentation of sample compositing will be maintained and included in the draft RI report.

### 6.2.4.3 Data Interpretation and Phase 2 Soil Sampling

#### A. Sections 1, 2 and 4

Once the soil analysis has been completed and the analytical data are available, the data will be compared with historical data for these areas of the site to determine consistency. If the historical data can be correlated with the newly obtained data, all available data will be used to generate isopleth maps of the results. The isopleth maps will provide a contoured representation of the levels of soil contamination at the site. The contours of the analytical results will provide a visual estimate of the areas of concern that will require remediation or additional sampling either during a second phase of soil sampling or during the remediation activities. Since relatively large volumes of soil will be represented by a single soil sample, it may be economically advantageous to conduct a second phase of soil sampling to further define contaminated areas thereby limiting the amount of contaminated soil for off-site disposal purposes. It seems likely that a second round of sampling will be necessary, given previous test pit results that indicate that areas of contamination are present at the site. Therefore, an analysis of the isopleth maps will be conducted and a map indicating proposed additional sampling locations will be forwarded to the NYSDEC for approval. Although it is not possible to actually generate the second phase sampling locations without the benefit of the first phase data, it is envisioned that samples will be collected based on a grid pattern that is smaller in diameter than the first phase grid pattern in order to isolate areas for remediation. Every effort will be made to expedite this process.

B. Sections 3 and 5

The analytical results of soil samples collected in Sections 3 and 5 will be analyzed and isopleth maps will be generated. Should soil contamination be documented in these sections, the contaminated areas will be divided into a grid pattern similar to that employed during Phase I sampling in Sections 1, 2 and 4. The sampling plan will be forwarded to the NYSDEC for approval.

### 6.2.4.4 Additional Soil Sampling During Test Pit Excavation

Soil samples will be collected during the test pit excavation process and submitted to a soils laboratory for a determination of the soil porosity. The soil samples will be collected by digging a few inches into the sides or bottom of the test pits to obtain as undisturbed a sample as possible. The soil samples will be collected in areas where PCB contamation has been documented in the past, e.g. near monitoring well MW-3S, near Crusher #1 and in the Section 1 area near former test pits. It is estimated that four soil samples will be collected for submission, however, additional samples may be submitted depending on the variability of the materials encountered in the test pits.

The results of the porosity tests will be used to estimate the effective porosity of the soil and, ultimately, will be used to estimate the potential for PCB migration through the unsaturated zone to the water table when coupled with additional data such as the estimated total organic carbon content, The Army Corps of Engineer test

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EM1110-2-1906, which is available in Appendix 2 of the Engineer Manual, will be followed to arrive at the porosity as well as other closely associated parameters.

### 6.2.4.5 Surface Water Sampling

Surface water runoff from the site is collected by three storm drains known as DI No. 1, DI No. 2 and DI No. 3 (Figure 6-1). The runoff water may be a potential source of contamination to the sanitary sewer because of coming in contact with metal scrap on site and by picking up soil as it travels to one of the drainage inlets. In order to determine if the surface water runoff from the site is contaminated, the following sampling program will be implemented.

A composite sample will be collected from each of the three drainage inlets during a major precipitation event while the field investigation activities are being conducted. A major precipitation event is defined as one that will result in the continual flow of water to the drainage inlets for a minimum of one hour. The composite sample for each drainage inlet will be collected by taking a series of four grab samples, one every 15 minutes for an hour. Sampling should begin as soon as the water reaches the drainage inlet, if possible. (See Appendix B for sampling procedures). Surface water runoff samples will be analyzed for the TCL list of parameters using CLP protocol. The following quality control samples will be collected: 1 trip blank (VOCs only), 1 duplicate and one field blank sample.

If the analytical test results indicate the presence of significant levels of contaminants, a second round of samples may be proposed.

### 6.2.4.6 Sewer Sediment Sampling

The sewer sediment sampling will be carried out in two phases. The first phase will be to contact the operators of the POTW and determine if they have had a history of PCBs in the plant's sewage sludge. The next step will be to acquire maps of the sewer line between the Shulman site and the POTW. The drawings will be reviewed to locate areas where sediment sludge may accumulate. Once these areas have been identified, Phase 2 will be performed. Phase 2 consists of going on-site and collecting sediment that may be present at each of the on-site drainage inlets. The next step is to go off-site and physically locate those areas suspected of having built up an accumulation of sediment sludge.

Off-site sediment sampling will only take place where it is physically possible to collect the samples from the surface. No AFI Environmental personnel will be allowed to enter the sewer system to collect samples.

Each drain inlet and sewer line location will be inspected for the presence or absence of sediment ant, if found, a grab sample will be collected with either an Eckman dredge, Ponar dredge or other sediment sampling device. The number of samples will vary from a minimum of 3 to possibly 10.

Each sample will be analyzed for the TCL list of parameters using CLP protocol. Based on the analytical test results, a second round of sampling and analysis may be proposed if significant levels of contaminants potentially originating at the Shulman site are found.

### 6.2.4.7 Air Monitoring and Sampling

Concern has been raised regarding the potential for PCB contaminated dusts being released from the site via wind-borne fugitive dust. There has also been concern regarding PCBs volatizing from the site. In response to these concerns an air monitoring program for PCBs will be conducted. In order to provide the necessary detection limit NYSDOH air sampling method 311-1 will be utilized. This method utilizes a modified high volume sampler with glas fiber filter and solid absorbent. PCBs are recovered from the samples by soxhlet extraction with hexane. Sampling would be conducted concurrently at 3 or 4 locations at the site perimeter during normal conditions and then during test pit excavations. Monitoring would be performed at both upwind and downwind locations. Air samples will be monitored for total PCB's. Individual PCB aroclors will be identified and quantified where found.

Fugitive dusts will be minimized during excavation and remediation activities by implementing dust suppression measures.

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6.2.4.8 Oil Pit Samples

Previous investigations have shown detectable levels of PCB's in oil samples from the oil pit behind building Number 3. Two sediment samples will be obtained from this pit and submitted to the laboratory for analysis for total PCB's and oil and grease. One sample of the oil will be analyzed for total PCB's. Individual PCB arochlors will be identified and quantified where found.

6.2.5 Sample Analysis And Validation

6.2.5.1 Sample Analysis

Chemical testing of samples taken from the Shulman site will be described below and in Section 2 of the QAPP. The laboratory, which will be on the NYSDEC's list of Technically Acceptable Laboratories, will analyze for the CLP organic and inorganic analyses found in the New York State Contract Laboratory Program protocol (NYSDEC CLP, November 1987, Volume I, Exhibit C, Sections I and II). The laboratory will follow the analytical methodologies found in the NYSDEC CLP, Volume I, Exhibit D, Parts I through V. This testing will include the contaminants on the TCL list and all GC/MS peaks greater than 10 percent of the nearest calibrating standard. The TCL parameter list and the required quantitation limits are shown in Section 2 of the QAPP for this project. Testing of any samples from second sampling events, if necessary, will be for selected parameters of concern identified as a result of the first sampling event. All soil samples will be analyzed for total PCBs. Individual PCB arochlors will be identified and quantified where found. Oil pit sediments will be analyzed for total PCBs and oil and grease. Analytical methodologies and detection limits are provided in Section 2 of the QAPP. The laboratory selected for non-CLP testing will be on the NYSDEC's list of Technically Acceptable Laboratories for the scans involved. The laboratory will be required to fill out the NYSDEC analytical summary forms.

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### 6.2.5.2 Data Validation of Analytical Data

Data validation is a process by which analytical data are compared against criteria that have been established as being technically and legally acceptable. There are two areas that must be evaluated in order for the analytical test results to be considered valid. The first is validation that the sampling protocols were properly adhered to and the second is a review of the laboratories data package for the sample results to confirm the results are within the acceptable limits of the DQOs. AFI Environmental will contract an individual who is independent of the analytical laboratory and consistent with the NYSDEC qualifications and guidelines for a data validator. The data validation review documentation, along with conclusions, will be included in the RI report.

#### Field Data Validation

The validation of field data will take into account the verification that the following areas have been carried out in accordance with the QAPP standard operating procedures:

- review of field notes to see that proper field information was collected (i.e. times of sample collection, field instrumentation calibration checks)
- conduct audits of sampling personnel
- review trip and field blank samples to see if sample contamination has occurred
- compare duplicate sample results

If, after a review of the data, the results are satisfactory the field sampling procedures will be considered acceptable for use.

#### Laboratory Validation

Validation of laboratory data is an exhaustive process when utilizing CLP methods. In this case the validation of laboratory data is a two-stage process. The laboratory is the first to validate its own data in accordance with its state approved quality assurance plan.

Once the laboratory certifies the results, AFI Environmental personnel will review the data packages in accordance with the following guidelines: "Functional Guidelines for Evaluating Organic Analyses", TDD No. HQ-8410-01, USEPA 1985 and "Evaluation of Metals Data for the Hazardous Waste Site Program", SOP No. HW-2, USEPA 1985. Data Validation will be performed for 100% of the samples analyzed for the complete TCL and consistent with the 1987 NYSDEC CLP requirements. For those sample results that are not performed under CLP protocols the following areas will be screened:

- Method of sample preparation
- Method for sample clean-up (if used)
- Calibration data (initial and continuing)
- Matrix spike/Matrix spike duplicate
- Definition of surrogates
- Recovery of surrogates
- Instrument blank
- Method blank
- Retention time windows
- Raw data(chromatograms and integration files)
- Corrective action taken

This level of evaluation will ensure the analytical data is correct and an accurate representation of the site conditions.

### 6.2.6 Data Evaluation

Once the data have been validated as to their accuracy and precision, the data must be reduced and tabulated into a manageable format. The next step will be to evaluate the data to determine if they are sufficient to allow the remedial response objectives to be met by incorporating the data into one of the following activities.

- Ground water quality assessment
- Modeling of the fate of contaminants or contaminant transport in soil and/or ground water.
- Identification of potential wastewater treatment technologies capable of successfully treating known contaminants.
- Identification of additional air monitoring.
- Incorporation of data into a geostatistical analysis to define the horizontal and vertical extent of contamination in soil.
- Determining what risks are associated with the site contaminant concentration levels in the baseline risk assessment.

Once these activities are completed the results will either identify data gaps which will require further investigative work to be performed or conclude that the data are sufficient to achieve the remedial response and data quality objectives.

## 6.3 BASELINE RISK ASSESSMENT

### 6.3.1 Purpose and Objectives of Risk Assessment

The purpose of the risk assessment is to provide an evaluation of the potential threat to human health and the environment in the absence of any remedial action and is intended to provide sufficient justification as to whether or not remedial actions need to be performed.

The objectives of the baseline risk assessment are to characterize the following:

- Toxicity and quantity of hazardous substances present in the respective media
- Identify environmental fate and transport mechanisms of contaminants
- Identify potential exposure pathways
- Identify potential human and or environmental receptors
- Determine likelihood of impact or threat occurring
- Define acceptable levels of risk

The following is a brief overview of each component:

Contaminant Characterization

This component is concerned with the development of the analytical data to define the nature and concentration of site contaminants in the various environmental media (soil, surface water, ground water). The development of these data (e.g., contaminant content of the soil and ground water, contaminant migration) will be completed as described above.

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### Hazard Identification

This component deals with the review of the known site contaminants and the adverse health and environmental affects that result from both chronic and/or acute exposure. During this step, a review is conducted of water quality criteria, human health and toxicology data and similar information from a variety of sources. Only published (peer-reviewed) data are utilized.

### Exposure Assessment

The third component of the risk assessment is an evaluation of what exposures are occurring or could be anticipated to occur under existing and realistic future conditions. Consideration is given to identification of physical and biological modes of contaminant migration, identification of exposure methods (e.g. direct contact, ingestion, inhalation), identification of target population and target receptors, and evaluation of target-receptor probability and frequency of exposure.

### Risk Evaluation

The final component involves an evaluation of the hazards identified when coupled with the exposure potentials Also factored in is other relevant information (e. g. seasonal effects on potential exposures).

## 6.4 REFINEMENT OF REMEDIAL ACTION OBJECTIVE

During the process of preparing the Remedial Investigation Report the limitations of the data collected will be assessed to see if additional work is required to adequately address the remedial action objectives. If the data are sufficient, than the remedial action objectives will be reviewed to see if changes are required based on the new data and their interpretation .

Examples of changes would be in the form of better defining the extent of contamination, elimination of particular preliminary remedial actions because site conditions are not conclusive to a particular technology, eliminating particular exposure pathways or identifying clean-up levels which would provide adequate protection to human health and the environment, but are higher than State or Federal standards. Once these refinements are made they can be incorporated into the feasibility study plan and report.

# 7.0 FEASIBILITY STUDY PLAN

## 7.1 TECHNICAL APPROACH

The primary objective of the feasibility study plan (FSP) is to present a methodology to develop alternatives that will achieve the remedial response objectives established for the site.

As part of this work plan, remedial action alternatives were developed based on the available data in order for the RI portion of the work plan to be interactive with the FS portion.

The feasibility study will be performed in three tasks:

- development of alternatives
- screening of alternatives
- conducting detailed analysis of the remaining alternatives.

## 7.2 DEVELOPMENT OF REMEDIAL ACTION ALTERNATIVES

Alternatives for remediation will be developed by assembling combinations of technologies for each identified contaminated media that singularly or in combination will address the extent of contamination on a site-wide basis.

The development of the alternatives will encompass the following process:

- Develop general response actions for each media by defining: containment, treatment, removal, collection and disposal actions that singularly or in combination will achieve the remedial response objectives.
- Identify volumes and/or areas of media to which general response actions might be applied.
- Identify and screen technologies applicable to each general response action and begin elimination of those technologies that cannot technically be implemented at the site.
- Identify and evaluate technology process options to select a representative process for each technology.
- Assemble the selected representative technologies into alternatives.

The results of this process will yield a group of alternatives that conceptually would be able to achieve the remedial action objectives.

Upon completion of the draft RI report, the remedial action objectives will be reevaluated and updated as required to reflect new data obtained in the field investigation activities and baseline risk assessment.

## 7.3 SCREENING OF REMEDIAL ALTERNATIVES

The screening of remedial alternatives will be conducted in three steps. Step one consists of refining the alternatives by quantifying areas and volumes of the media of interest, along with the size and capacities of process options that make up each of the alternatives. The second step is to evaluate each alternative on a general basis as to its effectiveness, implementability and cost. Step 3 is to decide, based on the general evaluation, which alternative(s) should be retained for detailed analysis. The objective of screening the alternatives is to eliminate those alternatives which:

- Cannot accomplish the remedial action objectives on the basis of effectiveness.
- Cannot be reasonably implemented.
- Are cost prohibitive (other technologies can achieve the same results at less cost).

At a minimum, five remedial action alternatives will be retained for detailed analysis. The remedial action alternatives fall into the following categories as specified in 40 CFR 300.68.

- No action.
- Alternatives for treatment or disposal at an off-site facility.
- Alternatives which achieve ARARs.
- Alternatives which exceed ARARs.

- Alternatives that do not attain ARARs, but will reduce the likelihood of present or future threat from hazardous substances and that provide significant protection to the public health and welfare and the environment.

## 7.4 DETAILED ANALYSIS OF REMEDIAL ALTERNATIVES

The detailed analysis of alternatives includes the analysis and presentation of relevant information needed to allow decision makers to select a site remedy. During the detailed analysis, each alternative will be assessed against nine criteria:

- Short-term effectiveness
- Long-term effectiveness
- Reduction of toxicity, mobility and volume
- Implementability
- Cost
- Compliance with ARARs
- Overall protection of human health and the environment
- State acceptance
- Community acceptance

The results of this nine-criteria assessment will allow for a comparative analysis to be made and key tradeoffs identified among the alternatives. Once the analysis is completed, the results (the selected remedial alternative) will be able to address the following CERCLA requirements:

- Be protective of human health and environment
- Attain ARARs
- Be cost-effective
- Use permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent possible.
- Satisfy the preference for treatment that reduces toxicity, mobility and volume as a principal element.

### 7.4.1 Alternative Definition

If any treatability study data and/or additional field investigation data are generated after the draft RI report is prepared, the alternative(s) left from the screening process will need to be more fully refined prior to performing the detailed analysis.

### 7.4.2 Nine Point Criteria Analysis

The following are specific items that will be evaluated in each of the criteria:

#### 7.4.2.1 Short-term Effectiveness

Under this criterion, the alternatives will be evaluated with respect to their effectiveness in protecting human health and the environment during the construction and implementation phase until the response objectives are met. Areas of concern that will be addressed for each alternative include protection of workers (both Shulman and clean-up contractors) and the surrounding community, potential adverse environmental impacts, and the time required to achieve response objectives.

#### 7.4.2.2 Long-Term Effectiveness and Permanence

The components of this criterion will evaluate the magnitude of risk remaining after the response objectives have been achieved, and the adequacy of controls to contain contaminants and ensure the system is sufficient to maintain designed protection levels. An example of this might be, "How effective would a site cap be if the scrapyard operations were continued on top of that cap?"

#### 7.4.2.3 Reduction of Toxicity, Mobility and Volume

CERCLA legislation provides a statutory preference to selecting remedial actions which employ treatment technologies that permanently reduce toxicity, mobility or volume of hazardous substances as their principal element. The evaluation will focus on the following factors:

- Treatment processes and the materials they treat.

- The amount of hazardous materials destroyed or treated and how principal threats will be addressed.
- Degree of expected reduction in toxicity mobility or volume.
- Irreversibility of the process.
- Type and quantity of residual material remaining after treatment.

#### 7.4.2.4 Implementability

This criterion will be assessed based on technical feasibility, administrative feasibility, and availability of services and materials required for implementation of each alternative. The technical feasibility analysis will consist of an evaluation of the difficulty and unknowns associated with construction and operation of each technology (the ability to meet specified process efficiencies or performance goals), the ease of undertaking additional remedial action and the ability of monitor the effectiveness of a remedy. Administrative feasibility will consist of an evaluation of the ability and time required to obtain approvals and permits for the remedial action. Availability of services and materials includes availability of materials of construction, necessary equipment and specialists, timing of availability and ability to procure the necessary materials and services.

#### 7.4.2.5 Cost

The cost criterion will be evaluated in four areas:

- Capital Costs - construction, equipment, land-development, disposal, indirect costs (i.e. engineering fees, permitting and contingency allowance).
- Annual Operation and Maintenance Costs - labor, disposal, power, administrative contingency.
- Present Worth Analysis - apply a discount rate of 5 percent for the anticipated length of the remediation not to exceed 30 years.

- Sensitivity Analysis - identify areas of uncertainty (i.e. effective life, duration of cleanup, sizing of treatment system, etc.) and evaluate how they would impact the total cost of the alternatives.

#### 7.4.2.6 Compliance with ARARs

This criterion will be used to determine how each alternative complies with applicable or relevant and appropriate State and Federal requirements as defined in CERCLA Section 121. The three categories of ARARs to be evaluated include chemical, location and action-specific. The detailed analysis will summarize which requirements are applicable or relevant to each alternative.

#### 7.4.2.7 Overall Protection of Human Health and the Environment

The overall assessment of the degree of protection provided will be based on a composite of factors assessed under the other criteria, especially, long-term effectiveness, short-term effectiveness and compliance with ARARs. The primary focus of this analysis will be the extent to which leachate generation and migration is controlled by the various alternatives.

#### 7.4.2.8 State Acceptance

This criterion is applicable to State-lead sites and evaluates how the alternatives address the formal technical and administrative comments and concerns NYSDEC may have raised during the review of the draft RI report or the interim report describing the alternatives screening.

#### 7.4.2.9 Community Acceptance

This analysis will address public comments received by the NYSDEC or other agencies during preparation of RI/FS documents.

### 7.4.3 Comparative Analyses of Alternatives

Once each of the alternatives have been individually assessed against the nine criteria, a comparative analysis will be conducted to evaluate the relative performance of each alternative in relation to each specific evaluation criterion. The purpose of the comparative analysis is to identify the advantages and disadvantages relative to one another and will be presented in a narrative format that describes the above analysis. Things which will be considered would include variations in the key uncertainties and how it impacts the alternative's performance. Whenever possible, quantative information that was used to assess the alternatives and will be included in these discussions.

# 8.0 PROJECT SCHEDULE AND DELIVERABLES

## 8.1 PROJECT SCHEDULE

Figure 8-1 depicts the proposed project schedule and selected project milestones. It is anticipated that it will take approximately 12 months to successfully complete the RI/FS report.

## 8.2 PROJECT DELIVERABLES

### 8.2.1 Interim Investigation Report *

Following the receipt and evaluation of all site sampling and analysis data, an interim report containing this data will be submitted to the NYSDEC.

### 8.2.2 Draft Remedial Investigation Report

A draft Remedial Investigation report will be prepared and submitted to the NYSDEC for review and comment. Included in this report will be the following:

- Discussion of field investigation activities
- Presentation of analytical tests for all media tested
- QA/QC evaluation of analytical data
- Description of the extent of contamination
- Baseline risk assessment results (i.e. identified receptors, risks associated with the site and ARARs)
- Identification of any further data requirements

### 8.2.3 Interim Remedial Action Alternatives Screening Report

At the end of the alternatives screening process, an interim report describing the screening process, evaluation of alternatives and the basis for selection of the alternatives will be prepared and submitted to the NYSDEC for review and comment.

# I. SHULMAN & SON

## PROPOSED PROJECT SCHEDULE

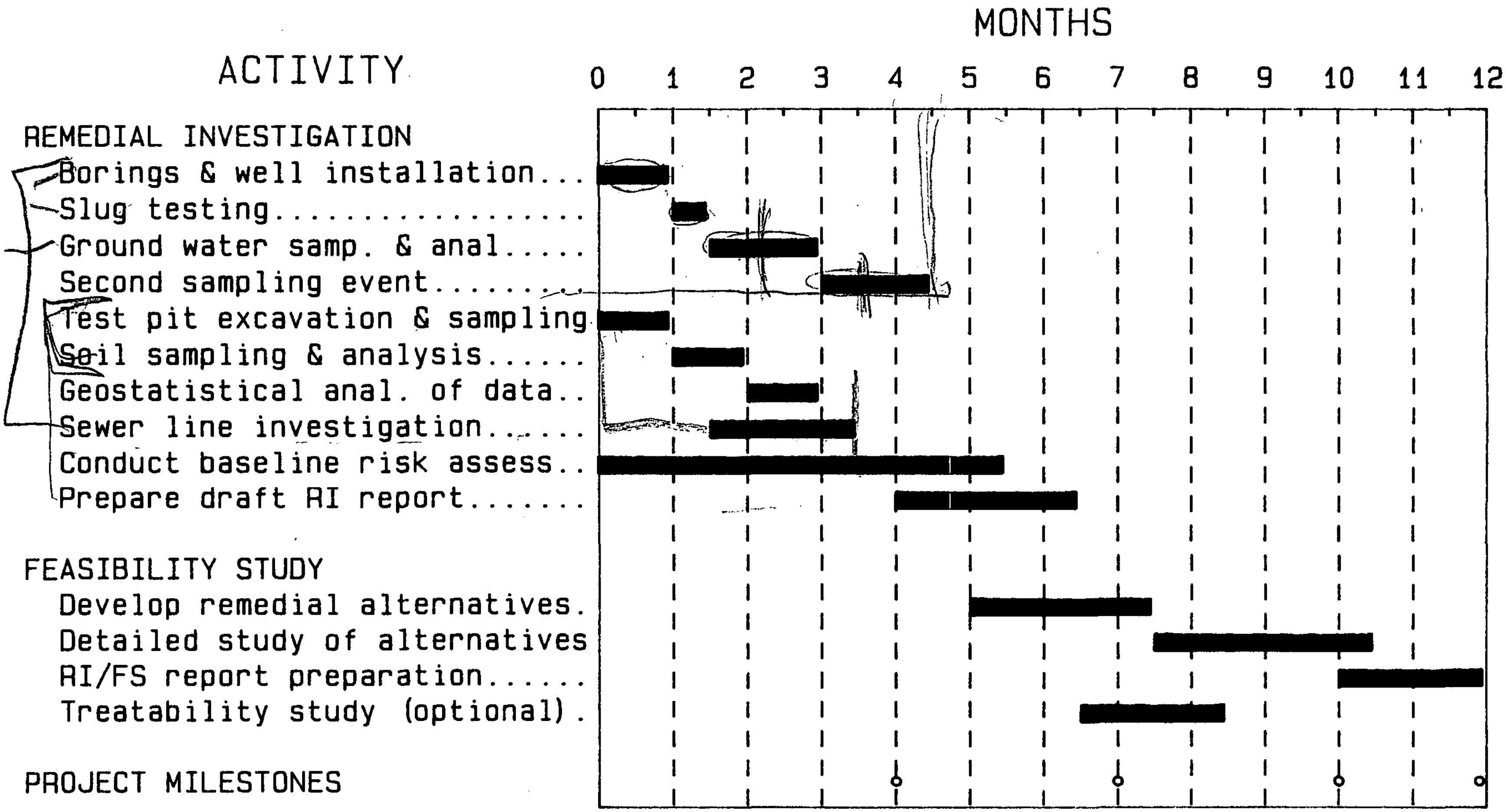

Figure 8.1

### 8.2.4 Final RI/FS Report

Upon completion of the detailed analysis of the remaining remedial action alternatives and selection of a preferred remedial alternative, a final report will be prepared which will address any comments and concerns the NYSDEC had in both the draft remedial investigation report and the interim remedial action alternative screening report. The final report will be submitted to the NYSDEC for review and comment.

### 8.2.5 Monthly Reports

Monthly status reports of the progress of the project will be sent to the client with copies to the NYSDEC. The status report will be in a one page memo format with the following headings:

- Report Month
- Work Accomplished During the Report Period
- Problems Encountered and Corrective Actions Taken
- Items Which Need Regulatory Attention
- Percentage of Project Complete

### 8.2.6 Certification

Upon completion of the final RI/FS report, the consultant will certify that all work on this project was completed in substantial accordance with the work plan and written revisions thereof.

## 9.0 DECONTAMINATION PROCEDURES

All decontamination will take place within the decontamination zones. Decontamination of personnel will consist of washing the outer rubber boots and outer gloves with a brush using detergent and water, and disposing of protective clothing (i.e., Tyvek) if used. If personnel do not contact contaminated materials, decontamination will not be required. Non-disposable sampling equipment (e.g. trowel) will be decontaminated using a detergent, followed by a tap water rinse, followed by another rinse using a pesticide grade methanol or hexane, and finally three rinses of deionized water. The backhoe, drilling rig and all drilling accessories will be decontaminated using a pressurized steam cleaner between excavation pits or wells and prior to exiting the site. Contaminated disposable materials, along with all decontamination solutions, will be collected and drummed in preparation for appropriate disposal.

## 10.0 STANDARD OPERATING AND CONFINED SPACE ENTRY PROCEDURES

Work at Shulman site will not require any spcific standard operating procedures based on health and safety considerations other than those presented in AFI Environmental's Health and Safety Program for Hazardous Waste Operations (Attachment 1). No confined space entry will be conducted during this project.

## 11.0 EMERGENCY RESPONSE PLAN

The only type of emergency anticipated at the Shulman site would be personal injury due to minor accidents (e.g., slips, falls) or injury from heavy machinery (e.g., drilling rig). Emergency medical treatment can be obtained at St. Joseph's Hospital in Elmira.

Hospital Phone Number -(607) 737-7806

Directions to Hospital - Exit Shulman turning left onto Washington Street. Turn right onto Clemans Central Parkway. Turn left onto Water Street. Turn left again onto Madison. Turn right onto Church Street.

Other Emergency Numbers

- Ambulance - (607) 734-9141 (Erway Ambulance Service).
- Fire Department - (607) 734-0911.
- Police Department - (607) 734-5121.

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AFI Revision #2 4/24/90

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# APPENDIX A

# SITE SAFETY PLAN

# SITE SAFETY PLAN

FOR

I. SHULMAN & SONS
Elmira, New York

## REMEDIAL INVESTIGATION/FEASIBILITY STUDY

APPROVED BY:

| | |
|---|---|
| PROJECT DIRECTOR | DATE |
| CERTIFIED HYGIENIST | DATE |
| PROJECT LEADER | DATE |
| HEALTH AND SAFETY COORDINATOR | DATE |

PROJECT NUMBER: 0801-03-1
REVISED JULY 1989

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# I. SHULMAN & SON
# SITE SAFETY PLAN

## 1.0 SITE LOCATION AND BACKGROUND

I. Shulman and Son Company, Inc. (Shulman) owns and operates a ferrous and non-ferrous metal salvaging facility comprising 24 acres located at One Shulman Plaza in the City of Elmira, Chemung County, New York. The location of the facility is shown on Figure 1, the Site Location Map.

Metal salvaging operations have been performed on the site for approximately twenty years. In 1982, a shipment of drained transformers was received by Shulman for processing. The transformers were dismantled on-site and sold as scrap. It is suspected by the New York State Department of Environmental Conservation (NYSDEC) that these transformers were contaminated with "PCB" oil which was spilled onto the surface of the site during the dismantling operations. Consequently, the NYSDEC and Shulman entered into a Consent Agreement which resulted in the performance of a series of site investigations.

The investigations conducted at the Shulman site have identified the presence of PCBs and metals in the soil. Testing also showed the presence of low levels of PCBs, volatile organics and metals in ground water samples.

## 2.0 PROJECT SCOPE-OF-WORK

Malcolm Pirnie, Inc. (MPI) was retained by Shulman to conduct an RI/FS. The scope-of-work for the project consists of the following tasks:

A. Field Work
  - Test borings and monitoring well installations
  - Excavate test pits
  - Sampling and analysis of soils, ground water, surface water and sediment
  - Air monitoring

B. Office Work
  - Evaluation of data and report preparation

## 3.0 PROJECT ORGANIZATION AND KEY PERSONNEL

### 3.1 Malcolm Pirnie Personnel

Project Director - Richard W. Klippel
Health & Safety Officer - Richard J. Califano (White Plains)
Health & Safety Coordinator - Thomas A. Barba
Project Leader - Thomas A. Barba
Site Safety Officers - Mark D. Wilder, Marcia Vrona
Others on Site - Richard J. Kulibert, Michael E. Florczykowski, Wesley L. Jones, Gary W. Mullen and Keith A. White

### 3.2 Other Contractors

Contractors whose work will be performed on-site, or who otherwise could be exposed to health and safety hazards, will be advised of known hazards through the distribution of this Site Safety Plan (SSP). All contractors are responsible for: (1) providing their own personal protection equipment; (2) training their employees; (3) providing medical surveillance for their employees; (4) insuring their employees are advised of and meet the minimum requirements of this SSP; and (5) designating their own site safety officer.

## 4.0 HAZARD AND RISK ANALYSIS

### 4.1 Hazard Analysis For Each Project Task

Based on the results of the previous site investigations, potential hazards have been identified for each task listed in the project scope of work. These hazards are listed in Table 1.

### 4.2 Potential Exposure to Contaminants

#### 4.2.1 Contaminants of Concern

Table 2 lists the contaminants found in soil, ground water and sediment samples taken from the Shulman site. The concentration levels shown represent the maximum values found for those contaminants detected.

#### 4.2.2 Contaminant Hazard and Risk Assessment

##### 4.2.2.1 Inhalation Hazard

Inhalation of contaminants from this site fall into two categories. First inhalation of volatile organic vapors could occur. Table 3 provides the threshold limit values for PCBs and the organics detected. The second category would be from inhalation of contaminated particles generated during excavation of test pits. The hazard associated with the second hazard is difficult to assess, but the nature of the soils and the work being performed indicates that inhalation of particulates is not of concern.

#### 4.2.2.2 Dermal and Oral Hazards

The dermal and oral hazard ranking for the contaminants found in the samples at the Shulman site show high oral toxicity for five contaminants and potential skin and or eye irritation for six contaminants. These compounds along with their associated hazard are listed on Table 4.

#### 4.2.2.3 Carcinogens

Several of the compounds detected in samples taken from the site are known or suspected carcinogens. These compounds are listed on Table 5.

### 4.3 Physical Hazards

Physical hazards at the Shulman site include potential injury or hearing loss from the use of heavy machinery for excavation and drilling activities, potential accidents caused by unstable surfaces near excavation and potential injury from debris located on-site. These hazards will be minimized by wearing the proper protective equipment and by keeping all unnecessary personnel away from excavation areas.

## 5.0 PERSONAL PROTECTION EQUIPMENT

Personal protection equipment (PPE) has been designated for each project task where potential hazards exist. The designated PPE is listed on Table 6. An attitude of safety-consciousness will be maintained during all on-site work.

## 6.0 TRAINING ASSIGNMENTS AND MEDICAL SURVEILLANCE REQUIREMENTS

There will be no special training assignments or medical surveillance requirements for work at the Shulman site. Malcolm Pirnie's standards for training and medical surveillance for hazardous waste operations (including 29 CFR 1910) as described in the firm's Health and Safety Program are deemed adequate. A site health and safety meeting will be conducted prior to project start-up.

## 7.0 AIR MONITORING

Air monitoring for volatile organics will be conducted on site during well construction and sampling, as well as test pit excavation. Background concentrations prior to sampling will also be monitored. The monitoring will be conducted using a HNU photoionization analyzer. Data will be recorded on the form shown in Appendix A. The HNU will be calibrated according to the manufacturers instruction manual prior to going on-site.

Site data indicates the presence of low levels of chlorinated organic compounds in ground water. None have been detected in on-site soils or sediment. Because this is a site where spills/disposal occurred, and the scope of work includes installation of new wells and excavation of test pits, standard USEPA guidance for respiratory protection will be used. This guidance specifies that persistent readings in the breathing zone of workers, as recorded on the HNU, will result in use of the following respiratory protection.

| Reading | Respiratory Protection |
|---|---|
| background | None required |
| 0 - 5 units above background | Chemical cartridge respirator with a full facepiece and organic vapor cartridges |
| 5 - 500 units above background | Supplied air respirator such as a self-contained breathing apparatus with a full facepiece |

At this site, if persistent readings are recorded above 5 units on the HNU continuously in the breathing zone, work will be halted until air samples can be collected and analyzed by GC to identify the specific substance or substances causing the elevated reading. Respiratory protection will be provided in order to protect the workers against the identified substance(s).

A particulate monitoring program (see Appendix B of this HSP) will be implemented whenever dust-creating operations are being conducted.

Revised Text

Table 6 of this Health and Safety Plan provided PPE requirements for Malcolm Pirnie employees for each level of activity during the RI/FS work.

Air monitoring for PCBs will be conducted during test pit excavation and remediation (if interim remediation is determined to be necessary). Samples will be taken at the property line and will be analyzed as soon as possible.

PCB concentrations above 1 ug/m$^3$ will dictate the need for corrective measures. Corrective measures will be discussed with the NYSDEC and NYSDOH prior to implementation. All excavation activities will cease until corrective measures are implemented. Monitoring will continue at the property line.

## 8.0 SITE CONTROL

The majority of the contaminated portions of the Shulman site are enclosed by fencing. However, since the scrap yard is operating, it is possible for the public to gain access to the site by entering through the unmanned main gate or by walking along the railroad tracks. The spread of contamination to off-site locations by project workers will be controlled by the use of decontamination zones.

The buddy system will be used for the work tasks designated on Table 1. The buddies may be a combination of Malcolm Pirnie and other contractor's personnel; however, in no case shall less than two people be on-site during the designated project tasks.

The following safe work practices will apply during all on-site activity:

1. Smoking, eating or drinking is forbidden.
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.
5. Any injury or unusual health effect must immediately be reported to the Project Manager who will notify the Corporate Health & Safety Officer. The location of medical assistance and other emergency procedures are described in Section 11 of this Plan.

## 9.0 DECONTAMINATION PROCEDURES

All decontamination will take place within the decontamination zones. Decontamination of personnel will consist of wahing the outer rubber boots and outer gloves with a brush using detergent and water, and disposing of protective clothing (i.e., Tyvek) if used. If personnel do not contact contaminated materials, decontamination will not be required. Non-disposable sampling equipment (e.g. trowel) will be decontaminated with a detergent-water-hexane wash between uses. The backhoe, drilling rig and all drilling accessories will be decontaminated using a pressurized steam cleaner between excavation pits or wells and prior to exiting the site. Contaminated disposable materials, along with all decontamination solutions, will be collected and drummed in preparation for appropriate disposal.

## 10.0 STANDARD OPERATING AND CONFINED SPACE ENTRY PROCEDURES

Work at the Shulman site will not require any specific standard operating procedures based on health and safety considerations other than those presented in Malcolm Pirnie's Health & Safety Program for Hazardous Waste Operations (Attachment 1). No confined space entry will be conducted during this project.

## 11.0 EMERGENCY RESPONSE PLAN

The only type of emergency anticipated at the Shulman site would be personal injury due to minor accidents (e.g., slips, falls) or injury from heavy machinery (e.g., drilling rig). Emergency medical treatment can be obtained at St. Joseph's Hospital in Elmira.

Hospital Phone Number - (607) 737-7806.

Directions to Hospital - Exit Shulman turning left onto Washington Street. Turn right onto Clemans Central Parkway. Turn left onto Water Street. Turn left again onto Madison. Turn right onto Church Street.

Other Emergency Numbers

- Ambulance - (607) 734-9141 (Erway Ambulance Service).
- Fire Department - (607) 734-0911.
- Police Department - (607) 734-5121.

Revised Text

## 12.0 PROTECTION OF THE COMMUNITY

All precautions will be taken to protect the health of the surrounding community. In the unlikely event that an emergency situation arises, the emergency coordinator for Chemung County will be notified.

Alfred O. Kerbein
Director
Chemung Emergency Management Office
203-209 Williams Street
Elmira, New York 14901
Phone: (607) 737-2096

As discussed in Section 7.0, to ensure the protection of the community air monitoring for PCB's will be conducted along the Shulman property line during test pit excavation and remediation (if interim remediation is determined to be necessary). If the action level of 1 $ug/m^3$ is reached corrective action will be conducted.

## 13.0 RECORDS

Personal and site safety logs will be maintained by Malcolm Pirnie personnel working on tasks designated on Table 1. These forms are included in Appendix A.

# Tables

MALCOLM PIRNIE

## TABLE 1

## PROJECT TASKS WITH POTENTIAL HAZARDS

| PROJECT TASK | POTENTIAL HAZARDS |
|---|---|
| 1. Install borings and monitoring wells | Exposure to Contaminants: dermal, oral and inhalation. Physical hazards. |
| 2. Develop wells | Exposure to Contaminants: dermal, oral and inhalation. |
| 3. Sample ground water | Exposure to Contaminants: dermal, oral and inhalation. |
| 4. Excavate test pits | Exposure to Contaminants: dermal, oral and inhalation. Physical hazards. |
| 5. Sample soil | Exposure to Contaminants: dermal and oral. |
| 6. Sample surface water and sediment | Exposure to Contaminants: dermal and oral. |
| 7. Air monitoring | None. |

# TABLE 2

## MAXIMUM CONTAMINANT LEVELS
## MEASURED ON-SITE

| CONTAMINANT | SOIL (mg/kg) | GROUND WATER (mg/l) | SEDIMENT* (mg/kg) |
|---|---|---|---|
| PESTICIDES/PCBs | | | |
| Aroclor 1242 | 36 | 0.07 | NA |
| Aroclor 1248 | 34 | ND | NA |
| Aroclor 1254 | 120 | 0.78 | NA |
| Aroclor 1260 | 69 | ND | 72 |
| METALS (TOTAL) | | | |
| Antimony | NA | 0.6 | 1.4 |
| Arsenic | NA | 0.026 | LT 0.5 |
| Beryllium | NA | 0.007 | LT 0.5 |
| Cadmium | 27 | 0.022 | 14 |
| Chromium | 173 | 0.15 | 121 |
| Copper | 19,900 | 0.39 | 1,530 |
| Iron | 124,000 | NA | NA |
| Lead | 4,050 | 0.4 | 1,620 |
| Mercury | NA | 0.0009 | 0.7 |
| Nickel | 200 | 0.09 | 3.5 |
| Silver | NA | LT 0.03 | 2,250 |
| Zinc | 8,830 | 0.8 | NA |
| ORGANICS, VOLATILE and SEMIVOLATILE | | | |
| 1,1-Dichloroethene | NA | 520 ug/l | NA |
| t-1,2-Dichloroethene | NA | 160 ug/l | NA |
| 1,1,1-Trichloroethane | NA | 10,000 ug/l | NA |
| Trichloroethene | NA | 7,400 ug/l | NA |
| Toluene | NA | 7 ug/l | NA |
| Chrysene | NA | 1.9 ug/l | NA |
| Phenanthene | NA | 3.4 ug/l | NA |
| Pyrene | NA | 2.1 ug/l | NA |

* Sediment sample taken from a site surface drainage inlet. Not representative of site soils.

LT = Less Than
ND = Not Dectected
TR = Trace
NA = Not Analyzed

## TABLE 3

## THRESHOLD LIMITS FOR SITE INHALATION HAZARDS

| PARAMETER | ACGIH TLV TWA ppm | ACGIH TLV STEL ppm | OSHA TWA ppm | OSHA STEL ppm |
|---|---|---|---|---|
| 1,1-Dichloroethene | 5 | 20 | 1 | - |
| t-1,2-Dichloroethene | 200 | - | 200 | - |
| 1,1,1-Trichloroethane | 350 | 450 | 350 | 450 |
| Trichloroethene | 50 | - | 50 | 200 |
| Toluene | 100 | 150 | 100 | 150 |
| PCB's | 0.5 $mg/m^3$(skin) | 1 $mg/m^3$(skin) | 0.5 $mg/m^3$(skin)<br>(54% Cl)<br>1.0 $mg/m^3$(skin)<br>(42% Cl) | - |

ACGIH - American Conference of Governmental Industrial Hygenists, a professional association establishing nonenforceable guidance levels for use in occupational environemnts.

TLV = Threshold Limit Value

TWA = Time weighted average concentration for a normal 8 hour day and 40 hour week, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect.

STEL = A 15 minute time-weighted average exposure which should not be exceeded at any time during a work day, even if the eight-hour TWA is met.

OSHA = Occupational Safety and Health Administration

Short term exposures should exceed three times the TLV-TWA for no more than a total of 30 minutes during a work day and under no circumstances should they exceed five times the TLV-TWA, provided that the TLV-STEL is not exceeded.

References: ACGIH Threshold Limit Values for Chemical Substances in the Work Environment, 1988-89.
Federal Register, 54 FR 2329-2984, January 19, 1989.

## TABLE 4

## DERMAL AND ORAL HAZARDS

| DERMAL and/or EYE IRRITANT | ORAL THR-HIGH |
|---|---|
| Arsenic | 1,1-Dichloroethene |
| Silver | Cadmium |
| Zinc | Copper |
| Trichloroethene | Lead |
| Toluene | Nickel |
| Pyrene | |

Note: THR - Toxic Hazard Review
HIGH ORAL THR - $LD_{50}$: Dose per kilogram of body weight = 50-500 mg (Probable lethal dose for a 70 kg man - one ounce or 28.350 g).

Reference: Based on Dangerous Properties of Industrial Materials, 6th Edition, N. Irving Sax Editor, Van Nostrand Reinhold Company, New York 1984.

## TABLE 5

## KNOWN OR SUSPECTED CARCINOGENS DETECTED ON SITE

| COMPOUND | CARCINOGENCITY |
|---|---|
| Polychlorinated biphenyls (PCBs) | Suspected |
| Arsenic | Known |
| Beryllium | Suspected |
| Cadmium | Suspected |
| Chromium | Known |
| Nickel | Suspected |
| 1,1-Dichloroethene | Suspected |
| Trichloroethene | Suspected |
| Chrysene | Suspected |

Reference: Based on United States Department of Health and Human Services "Fourth Annual Report on Carcinogens" 1985, and ACGIH "Threshold Limit Values for Chemical Substances in the Work Environment", 1988-89.

## TABLE 6

## PPE FOR EACH PROJECT TASK WITH IDENTIFIED HAZARDS

| PROJECT TASK | PPE LEVEL |
|---|---|
| Install borings and monitoring wells | C-1 |
| Develop wells | C-1 |
| Sample wells | C-1 |
| Excavate test pits | C-1 |
| Sample soil | C-1 |
| Sample surface water and sediment | D-1 |
| Air monitoring | D-2 |

### PPE DESCRIPTIONS

### Level C-1

- Tyvek suit
- Chemical protective gloves (nitrile)
- Rubber boots (pull on) and safety shoes
- Safety glasses/goggles/face shield
- Hard hat
- Coveralls
- Full face air purifying respirator with organic vapor cartridges and dust filters, on hand
- If necessary, SCBA with a full face piece

### Level D-1

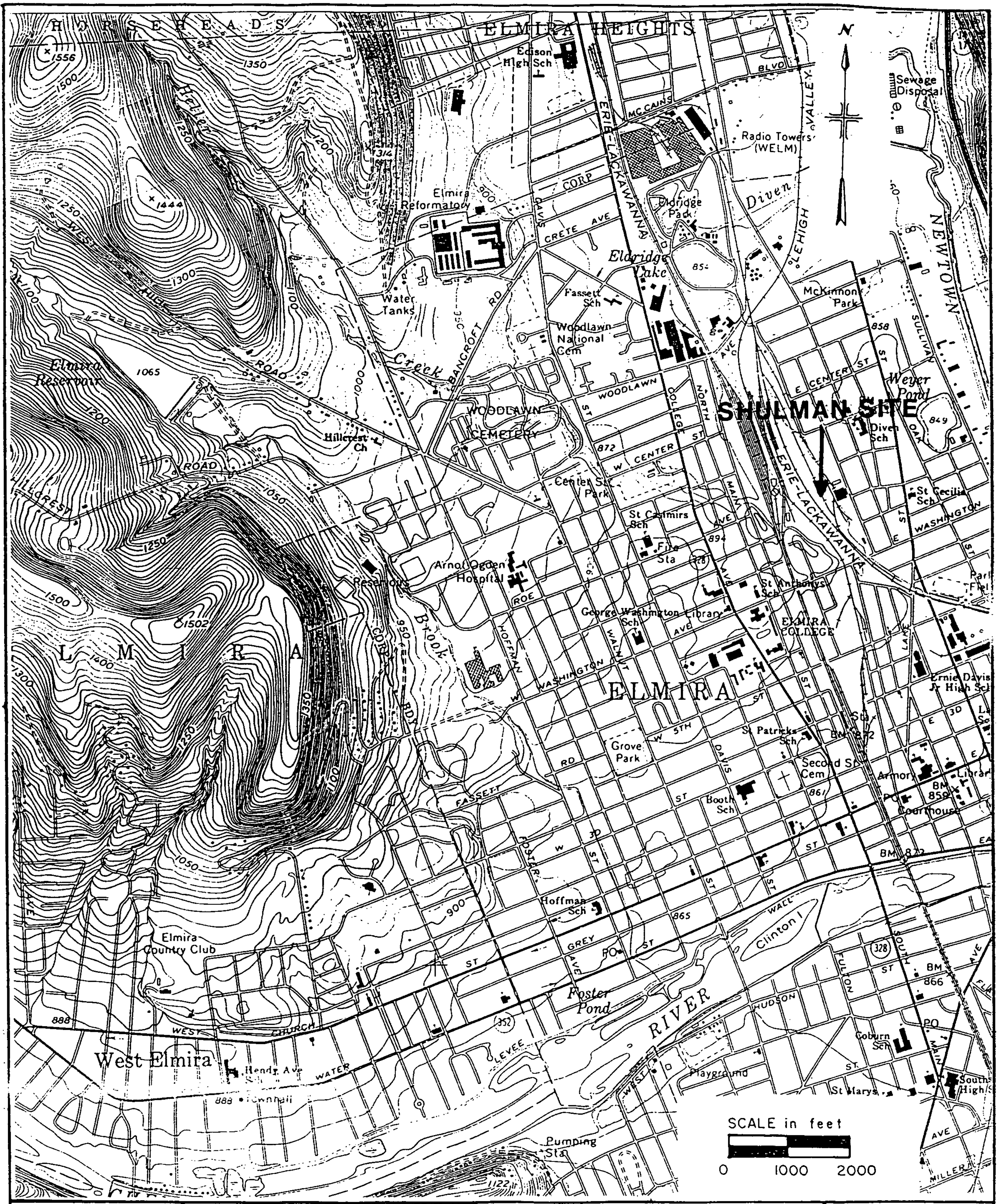
- Chemical protective gloves (nitrile)
- Rubber boots (pull-on) and safety shoes
- Safety glasses
- Coveralls

### Level D-2

- Same as D-1 except gloves not needed

# Figures

MALCOLM
PIRNIE



MALCOLM PIRNIE

## SITE LOCATION MAP

MALCOLM PIRNIE, INC.

MARCH 1987

FIGURE 1

# Appendices

MALCOLM
PIRNIE

# APPENDIX A - HSP

# PERSONAL AND SITE SAFETY LOGS

MALCOLM PIRNIE

# HNU Air Monitoring Data

Site Sketch

Site Name ____________________

Client Name ____________________

Project No. ____________________

Sampler's Name ____________________

Weather & Notes ____________________

| Date | Time | Wind Direction | Wind Speed | Location | Span Setting | Concen-tration |
|---|---|---|---|---|---|---|
| | | | | | | |
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MALCOLM
PIRNIE

# PERSONAL SAFETY LOG

Employee Name: ______________________ Site Name: ______________________

Client Name: ______________________ Project Number: ______________________

Work Performed: ______________________________________________

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date | | | | | | | |
| Work Area | | | | | | | |
| Hours on Site | | | | | | | |
| Coveralls | | | | | | | |
| Tyvek | | | | | | | |
| Gloves, Inner | | | | | | | |
| Gloves, Outer | | | | | | | |
| Boots | | | | | | | |
| Hard Hat | | | | | | | |
| Face Shield | | | | | | | |
| Resp., Dust | | | | | | | |
| Resp., Half | | | | | | | |
| Resp., Full | | | | | | | |
| SCBA | | | | | | | |
| Resp., ESC | | | | | | | |
| Dosimeter | | | | | | | |
| Air Monitor | | | | | | | |
| Others | | | | | | | |
| Decontamination | | | | | | | |
| Complete | | | | | | | |
| Incomplete | | | | | | | |

Comments: ______________________________________________

MALCOLM PIRNIE

# SITE SAFETY LOG

Site Name:________________________________Date:__________________

Client Name:_______________________Project No.:__________________

Employees on Site:____________________________________________

Others on Site:_______________________________________________

Work Area:___________________________________________________

Weather Conditions:___________________________________________

Summary of Site Conditions (include air monitoring data):________

State Any First Aid Administered:________________________________

Filled Out By:__________________________

MALCOLM PIRNIE

# PERSONAL HAZARDOUS WASTE EXPOSURE RECORD

Name: ______________________ Date: ______________

Site Location: ______________________________________

Operation being Performed at Time of Exposure: ______________

______________________________________________________

Hazardous Materials Present: __________________________

______________________________________________________

Type of Exposure: _____________________________________

______________________________________________________

Decontamination Measures Taken: ______________________

______________________________________________________

______________________________________________________

Observed Reactions or Health Effects: _________________

______________________________________________________

______________________________________________________

Comments: ____________________________________________

______________________________________________________

______________________________________________________

Employee's Signature: ______________

# APPENDIX B - HSP

# PARTICULATE MONITORING PROGRAM

# PARTICULATE MONITORING PROGRAM

## 1. BACKGROUND

In 1971, the United States Environmental Protection Agency (USEPA) promulgated air quality standards for "total suspended particulate matter" (TSP). The primary standard for TSP was set at 260 $ug/m^3$, 24-hour average and the secondary standard at 150 $ug/m^3$, 24-hour average. On July 1, 1987, the USEPA announced their final decision on standards for particulate matter less than 10 microns ($PM_{10}$). The 24-hour primary $PM_{10}$ standard, has been set at 150 $ug/m^3$ and the secondary standard at 50 $ug/m^3$, expected annual arithmetic mean.

The real-time monitoring equipment available measures particulate matter less than 10 microns and can integrate over a period of six seconds to 10 hours. The equipment utilized by Malcolm Pirnie, Inc. is supplied by MDA and is called the P-5 Digital Dust Indicator. There is no equipment available for monitoring TSP on a real-time basis.

## 2. GUIDANCE

A program for monitoring particulate matter at hazardous waste sites during construction can be developed without placing an undue burden on construction activities and still be protective of health and the environment. The following particulate monitoring and dust suppression program shall be employed during construction activities at hazardous waste sites.

a. Particulate monitoring will be employed during the handling of waste or contaminated soil or when activities on site may generate fugitive dust from exposed waste or contaminated soil. Monitoring will not be necessary during the excavation, grading or placement of clean fill and after all waste or contaminated soil has been covered.

b. During the handling of waste or contaminated soil, or when activities on site may generate fugitive dust from exposed waste or contaminated soil, reasonable dust suppression techniques must be employed (see paragraph f).

c. It must be recognized that the generation of dust from waste or contaminated soil, that migrates off-site, has the potential for transporting contaminants. There may be situations when dust is being generated and leaving the site and the monitoring equipment does not measure $PM_{10}$ at or above the action level. Since this situation has the potential for off-site contaminant migration, this situation is unacceptable. It is not practical to quantify, on a real-time basis, total suspended particulates, therefore, it is appropriate to rely on visual observation. If visual dust is generated and observed leaving the working site additional dust suppression techniques must be employed (see paragraph f).

d. Particulate monitoring will be performed using the real-time particulate monitor and shall monitor particulate matter less than 10 microns. Particulate levels will be monitored immediately downwind <u>at</u> the working site and integrated over a period not to exceed 15 minutes.

e. The action level will be established at 150 $ug/m^3$ over the integrated period not to exceed 15 minutes. If particulate levels are detected in excess of 150 $ug/m^3$ the upwind background level must be measured immediately using the same portable monitor. If the working site particulate measurement is greater than 100 $ug/m^3$ above the background level additional dust suppression techniques must be implemented to reduce the generation of fugitive dust and corrective action taken to protect site personnel and reduce the potential for contaminant migration. Corrective measures may include increasing the level of protection and implementing additional dust suppression techniques (see paragraph f).

f. The following techniques have been shown to be effective for the controlling of the generation and migration of dust during construction activities.

1) Applying calcium on haul roads.
2) Wetting equipment and excavation faces.
3) Water spraying buckets during excavation and dumping.
4) Using watertight containers to haul materials.
5) Restricting vehicle speeds to 10 mph.
6) Covering excavated areas after excavation activity ceases.

Experience has shown that utilizing the above-mentioned dust suppression techniques, within reason as not to create excess water which would result in unacceptable wet conditions, the chance of exceeding the 150 $ug/m^3$ action level at hazardous waste site remediations is remote.

g. If the dust suppression techniques being utilized at the site do not lower particulate to an acceptable level (either below 150 ug/$m^3$ and no visible dust), work will be suspended until appropriate corrective measures are approved to remedy the situation.

# APPENDIX B

# QUALITY ASSURANCE PROJECT PLAN

# QUALITY ASSURANCE PROJECT PLAN

## I. Shulman & Son

## Remedial Investigation/ Feasibility Study

RICHARD W. KLIPPEL, P.E.
PROJECT MANAGER

THOMAS A. BARBA
QUALITY ASSURANCE MANAGER

PROJECT NUMBER: 0801-03-1
VERSION: 1.00
FEBRUARY 1989
REVISED JULY 1989

PREPARED BY:

MALCOLM PIRNIE, INC.
ENVIRONMENTAL ENGINEERS,
SCIENTISTS & PLANNERS
890 Seventh North Street
Liverpool, New York 13088

Revised Text

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# 1.0 INTRODUCTION

## 1.1 GENERAL

This Quality Assurance Project Plan (QAPP) has been developed for the Remedial Investigation (RI) and Feasibility Study (FS) to be conducted at the I. Shulman & Son (Shulman) site in Elmira, New York. The RI/FS is being conducted to further evaluate contamination found on the site during a Phase II Investigation.

Specific information regarding the site location and history is provided in the RI/FS workplan.

## 1.2 PROJECT ORGANIZATION AND MANAGEMENT

The sections below identify the key personnel on this project that have quality assurance responsibilities. Additional information regarding these personnel is provided below.

### 1.2.1 Project Director

Richard W. Klippel, P.E. will serve as the Project Director for the Shulman RI/FS. Mr. Klippel has considerable experience overseeing large scale projects and has been responsible for the conduct of numerous investigative studies at inactive hazardous waste sites.

### 1.2.2 Quality Assurance Manager

Thomas A. Barba will serve as the Quality Assurance Manager on this project. The Quality Assurance Manager's responsibilities will be to insure that all of the appropriate procedures in this QAPP are followed and that the proper documentation is maintained. The Quality Assurance Manager is also responsible for overseeing the review and analysis of analytical data and insuring that all chemical testing is performed in accordance with previously agreed upon procedures.

### 1.2.3 Sampling and Equipment Coordinator

Marcia Vrona will serve as the Malcolm Pirnie coordinator for all sampling services needed as part of the RI/FS. Ms. Vrona will be responsible for insuring that the proper procedures, containers, and preservatives are utilized. In addition, she will be responsible for insuring that all field equipment is in operable condition and calibrated and that all chain-of-custody and other recordkeeping requirements are completed.

### 1.2.4 Boring Program Coordinator

Mark Wilder will be the in-field coordinator for the boring program and test pit excavations. Mr. Wilder will coordinate all activities with the drilling subcontractor and will arrange for all geotechnical soil testing.

### 1.2.5 Analytical Report Review

Art Clark will be responsible for reviewing the quality control data presented with laboratory analytical reports.

## 1.3 QAPP ORGANIZATION

Section 2 of this QAPP discusses the data quality objectives and analytical requirements for the Shulman RI/FS. Section 3 describes standardized sampling procedures for various environmental media. Section 4 describes field monitoring procedures. Section 5 contains the requirements for maintaining sample integrity. Field instrument calibration and maintenance is covered in Section 6.

# 2.0 QUALITY ASSURANCE OBJECTIVES

## 2.1 INTRODUCTION

This section discusses the quality assurance objectives (QAO) that have been established for the I. Shulman & Son RI/FS. Quality assurance objectives are the requirements specifying the quality of the environmental data needed to support the decision-making process. Establishment of QAO's identifies the target levels of measurement for various laboratory and field activities and also serves to identify the uncertainty that will be inherent in these measurements. One of the goals of the site investigation is to keep the uncertainty to levels that will allow the resultant data to be utilized.

Various procedures will be utilized to monitor the precision, accuracy and representativeness. Section 2.2 discusses the data quality requirements for the Shulman project. Section 2.3 discusses the sampling and analysis planned for the RI/FS. Section 2.4 discusses the quality assurance samples.

## 2.2 DATA QUALITY REQUIREMENTS

Table 2-1 identifies the data quality requirements (DQR) for the Shulman RI/FS. Several of these items are discussed further below:

- Sample analysis - Analytical testing of samples will be conducted for ground water, soil, surface water, sediment and air samples obtained at the Shulman site. The quality of the data needed is determined by the intended end use in the feasibility study portion of this project. Ground water quality will be monitored in both existing and new wells (to be installed during the RI/FS). Since this information is being utilized to further refine the determination of the impact of the Shulman site on the ground water in the area,

TABLE 2-1

## DATA QUALITY REQUIREMENTS

| Data Needed | Data Quality Required |
|---|---|
| Contaminant identification/ concentration levels for sediment, soil, ground water, surface water and air | TCL-CLP for ground water, surface water and sediment |
| Water level | ±0.01 foot |
| Population information | Most recent census and field verification |
| ARARs | Existing and proposed regulatory levels |
| Acceptable risk clean-up criteria | ARAR's when available. If ARAR's are not available:<br>- non-carcinogens - no appreciable risk of significant adverse effect<br>- carcinogens - $10^{-4}$ to $10^{-7}$ lifetime excess cancer risk |
| Treatment technology evaluation | Actual remedial action data |
| Estimated quantities of contaminated media | ±20% of actual volume. |
| Unit costs | Vendor quotations and actual costs from similar projects preferred<br>Compendium costs adjusted to current dollars |
| Cost estimates | +50% - 30% all in current year dollars |

testing will be to determine what contaminants may be present. Testing of soil is being conducted to determine what areas of the site need to be remediated to a target level of 10 ppm PCB's. The sewer investigation will involve a study of what contaminants are contained in surface water runoff to the sewer and what contaminants may be in the sewer sediment. Air sampling is being conducted to monitor any off-site migration of PCB- contaminated particulates. Further information regarding parameters, analytical methodologies, and detection limits is provided in section 2.3 of this QAPP.

- Water levels - Water level readings will be conducted on a monthly basis (for six months) in all monitoring wells. This data will be needed to develop the rate and direction of ground water flow at the Shulman site. Water levels will be measured to the nearest 0.01 foot. Surveying of measuring points (i.e., top of the well casing) will be conducted by a New York State licensed surveyor.
- Population information - Data regarding the number of residents and workers in the area surrounding the site is needed to develop exposure potentials during the baseline risk assessment. The data will be from the most recent census data available, and will be verified to within a two block radius of the site. The verification will involve a door-to-door canvass to determine names and numbers of occupants per address.
- ARAR's - Development of applicable or relevant and appropriate requirements (ARAR's) is needed to evaluate the impact of the site on the environmental media in the area. Standards used will include the USEPA and New York State drinking water and ambient water quality standards, and NYSDEC class GA ground water standards. Since there are no ambient air standards for PCB's, the OSHA exposure requirements will serve as guidance for the air evaluation. Soil levels of PCB's will be compared

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to the current PCB spill cleanup standards as given in 40 CFR 761, Subpart G (PCB Spill Cleanup Policy). There are currently no other Federal or State standards for contaminant levels in soil.

- Acceptable Risk Clean-up Criteria - During the development and analysis of alternatives, the risks associated with potential alternatives will be evaluated based on a reasonable maximum exposure scenario. Evaluation of acceptable risks will be based on the current USEPA guidelines as follows. ARAR's will be used if available. For noncarcinogenic chemicals for which an ARAR is not available, acceptable risk is when exposures are such that no appreciable risk of significant adverse effects to individuals over a lifetime of exposure exist. For carcinogens, health-based ARAR's will be used when available. When an ARAR is not available, remedies will be selected that result in cumulative risks that fall within a range of $10^{-4}$ to $10^{-7}$ individual lifetime excess cancer risk (ref.: 53 FR 51394-51520, 12/21/88).
- Estimated quantities of contaminated media - The estimates of contaminated media that will need to be cleaned up will be used in determining remedial activities and for cost estimates for those activities. The estimates used will be ± 20 percent of actual quantity.
- Cost estimates - Estimates of the total cost for various alternative actions will be needed during the FS process to properly evaluate and select the appropriate remedy. Cost estimates in the range of +50 percent to -30 percent of actual cost (in current year dollars) will be utilized.

## 2.3 ANALYTICAL REQUIREMENTS

The following sections discuss the analytical requirements for samples being taken during the RI/FS at the Shulman site. Table 2-2

# TABLE 2-2
# SAMPLING AND ANALYSIS MATRIX
# I. SHULMAN & SON RI/FS

| MEDIA | NO. OF SAMPLES | DUPLICATES | TRIP BLANKS | OTHER QA/QC | PARAMETER LIST | DATA VALIDATION REQUIRED |
|---|---|---|---|---|---|---|
| GROUND WATER | | | | | | **100%** |
| Event 1 | 14 | 1 | 1 | 1 MS, 1 MSD | TCL; CLP protocol + Cr(hex) | |
| Event 2 | 14 | 1 | 1* | | To be determined | |
| SOIL | | | | | | **10%** |
| Composite | 178 | 20 | | | PCB's | |
| Individual sampling | 140 est. | 8 | | | PCB's | |
| SURFACE WATER | | | | | | **100%** |
| Event 1 | 5 | 1 | | 1 Field blank | TCL; CLP protocol | |
| SEWER SEDIMENT | | | | | | **100%** |
| Event 1 | 3-10 | 1 | Still not in text → | **1MS, 1MSD**<br>Field Blank | TCL; CLP protocol | |
| AIR | | | | | | **10%** |
| Event 1 | 6-8 | | | | PCB's | |
| OIL PIT SAMPLES | | | | | | **NONE** |
| Sediment | 2 | | | | PCB's, oil & grease | |
| Oil | 1 | | | | PCB's | |

* = VOC's only MS = Matrix spike MSD = Matrix spike duplicate

identifies the type and number of samples along with the required analytical requirements.

### 2.3.1 Ground Water

Two sampling events are planned for the Shulman RI. During the first event, all new and existing wells will be sampled. Samples will be submitted for analysis of the organic and inorganic analytes found in the New York State Department of Environmental Conservation Contract Laboratory Program protocol (NYSDEC CLP, November 1987, Volume I, Exhibit C, Sections I and II). The parameter list will include the contaminants on the Target Compound List (TCL) and up to 30 additional tentatively identified compounds from GC/MS peaks greater than 10 percent of the nearest calibrating standard. Table 2-3 identifies the parameters on the TCL list along with the target detection limits. Samples of all wells will also be analyzed for hexavalent chromium in accordance with USEPA Method 218.4.

The second sampling event, if necessary, will be for selected parameters found in the first sampling. Analytical methodologies will be determined based on the testing required.

### 2.3.2 Soil

Soil testing will be for PCB's. Testing will be in accordance with USEPA method 8080. The required detection limit will be 0.72 ppm total PCB's. Analysis is being done for total PCB's. Individual aroclors will be identified and quantified where found.

### 2.3.3 Surface Water

Samples of surface water will be obtained during precipitation events that result in significant runoff. Samples will be submitted for analysis of the organic and inorganic analytes found in the New York State Department of Environmental Consrvation Contract Laboratory Program protocol (NYSDEC CLP, November 1987, Volume I, Exhibit C, Section I and II). The parameter list will include the contaminants on the Target Compound List (TCL) and all GC/MS peaks greater than 10 percent of the nearest calibrating standard. Table 2-3 identifies the parameters on the TCL list along with the target detection limits.

After discussions with the analytical laboratory, General Testing, AFI Environmental has determined that the proposed method for compositing of surface water samples could be a problem for volatiles and semi-volatiles. Therefore, samples of surface water will be obtained during a precipitation event that results in significant runoff. <u>Sample sets consisting of 3</u>

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grab samples will be collected such that one sample is collected from each drainage inlet at various times during the precipitation event. The most representative sample set will be selected and submitted for analysis for volatiles and semi-volatiles and all other constituants for organic and inorganic analytes found in the New York State Department of Environmental Conservation Contract Laboratory Program Protocol (NYSDEC CIP, November 1987, Volume I, Exhibit C, Sections I and II). The parameter list will include the contaminants in the Target Compound List (TCL), and all GC/MS peak greater than 10 percent of the nearest calibration standard. Table 2-3 identifies the parameter on the TCL list along with the target detection limits.

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TABLE 2-3

Superfund Target Compound List (TCL) and
Contract Required Quantitation Limits (CRQL)*
Page 1 of 6

| | Volatiles | CAS Number | Quantitation Limits**<br>Low Water<br>µg/L | <br>Low Soil/Sediment<br>µg/Kg |
|---|---|---|---|---|
| 1. | Chloromethane | 74-87-3 | 10 | 10 |
| 2. | Bromomethane | 74-83-9 | 10 | 10 |
| 3. | Vinyl chloride | 75-01-4 | 10 | 10 |
| 4. | Chloroethane | 75-00-3 | 10 | 10 |
| 5. | Methylene chloride | 75-09-2 | 5 | 5 |
| 6. | Acetone | 67-64-1 | 10 | 10 |
| 7. | Carbon Disulfide | 75-15-0 | 5 | 5 |
| 8. | 1,1-Dichloroethylene | 75-35-4 | 5 | 5 |
| 9. | 1,1-Dichloroethane | 75-35-3 | 5 | 5 |
| 10. | 1,2-Dichloroethylene (total) | 540-59-0 | 5 | 5 |
| 11. | Chloroform | 67-66-3 | 5 | 5 |
| 12. | 1,2-Dichloroethane | 107-06-2 | 5 | 5 |
| 13. | 2-Butanone | 78-93-3 | 10 | 10 |
| 14. | 1,1,1-Trichloroethane | 71-55-6 | 5 | 5 |
| 15. | Carbon tetrachloride | 56-23-5 | 5 | 5 |
| 16. | Vinyl acetate | 108-05-4 | 10 | 10 |
| 17. | Bromodichloromethane | 75-27-4 | 5 | 5 |
| 18. | 1,1,2,2-Tetrachloroethane | 79-34-5 | 5 | 5 |
| 19. | 1,2-Dichloropropane | 78-87-5 | 5 | 5 |
| 20. | cis-1,3-Dichloropropene | 10061-01-5 | 5 | 5 |
| 21. | Trichloroethene | 79-01-6 | 5 | 5 |
| 22. | Dibromochloromethane | 124-48-1 | 5 | 5 |
| 23. | 1,1,2-Trichloroethane | 79-00-5 | 5 | 5 |
| 24. | Benzene | 71-43-2 | 5 | 5 |
| 25. | trans-1,3-Dichloropropene | 10061-02-6 | 5 | 5 |
| 26. | Bromoform | 75-25-2 | 5 | 5 |
| 27. | 2-Hexanone | 591-78-6 | 10 | 10 |
| 28. | 4-Methyl-2-pentanone | 108-10-1 | 10 | 10 |
| 29. | Tetrachloroethylene | 127-18-4 | 5 | 5 |
| 30. | Toluene | 108-88-3 | 5 | 5 |
| 31. | Chlorobenzene | 108-90-7 | 5 | 5 |
| 32. | Ethyl Benzene | 100-41-4 | 5 | 5 |
| 33. | Styrene | 100-42-5 | 5 | 5 |
| 34. | Total Xylenes | 1330-20-7 | 5 | 5 |

*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation Limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis, as required by the protocol, will be higher.

TABLE 2-3
Superfund Target Compound List (TCL) and
Contract Required Quantitation Limits (CRQL)*
Page 2 of 6

| | Semivolatiles | CAS Number | Quantitation Limits** Low Water µg/L | Quantitation Limits** Low Soil/Sediment µg/Kg |
|---|---|---|---|---|
| 35. | Phenol | 108-95-2 | 10 | 330 |
| 36. | bis(2-Chloroethyl) ether | 111-44-4 | 10 | 330 |
| 37. | 2-Chlorophenol | 95-57-8 | 10 | 330 |
| 38. | 1,3-Dichlorobenzene | 541-73-1 | 10 | 330 |
| 39. | 1,4-Dichlorobenzene | 106-46-7 | 10 | 330 |
| 40. | Benzyl alcohol | 100-51-6 | 10 | 330 |
| 41. | 1,2-Dichlorobenzene | 95-50-1 | 10 | 330 |
| 42. | 2-Methylphenol | 95-48-7 | 10 | 330 |
| 43. | bis(2-Chloroisopropyl) ether | 108-60-1 | 10 | 330 |
| 44. | 4-Methylphenol | 106-44-5 | 10 | 330 |
| 45. | N-Nitroso-dipropylamine | 621-64-7 | 10 | 330 |
| 46. | Hexachloroethane | 67-72-1 | 10 | 330 |
| 47. | Nitrobenzene | 98-95-3 | 10 | 330 |
| 48. | Isophorone | 78-59-1 | 10 | 330 |
| 49. | 2-Nitrophenol | 88-75-5 | 10 | 330 |
| 50. | 2,4-Dimethylphenol | 105-67-9 | 10 | 330 |
| 51. | Benzoic acid | 65-85-0 | 50 | 1600 |
| 52. | bis(2-Chloroethoxy) methane | 111-91-1 | 10 | 330 |
| 53. | 2,4-Dichlorophenol | 120-83-2 | 10 | 330 |
| 54. | 1,2,4-Trichlorobenzene | 120-82-1 | 10 | 330 |
| 55. | Naphthalene | 91-20-3 | 10 | 330 |
| 56. | 4-Chloroaniline | 106-47-8 | 10 | 330 |
| 57. | Hexachlorobutadiene | 87-68-3 | 10 | 330 |
| 58. | 4-Chloro-3-methylphenol (p-chloro-m-cresol) | 59-50-7 | 10 | 330 |
| 59. | 2-Methylnaphthalene | 91-57-6 | 10 | 330 |
| 60. | Hexachlorocyclopentadiene | 77-47-4 | 10 | 330 |
| 61. | 2,4,6-Trichlorophenol | 88-06-2 | 10 | 330 |
| 62. | 2,4,5-Trichlorophenol | 95-95-4 | 50 | 1600 |
| 63. | 2-Chloronaphthalene | 91-58-7 | 10 | 330 |
| 64. | 2-Nitroaniline | 88-74-4 | 50 | 1600 |
| 65. | Dimethyl phthalate | 131-11-3 | 10 | 330 |
| 66. | Acenaphthylene | 208-96-8 | 10 | 330 |
| 67. | 2,6-Dinitrotoluene | 606-20-2 | 10 | 330 |
| 68. | 3-Nitroaniline | 99-09-2 | 50 | 1600 |
| 69. | Acenaphthene | 83-32-9 | 10 | 330 |
| 70. | 2,4-Dinitrophenol | 51-28-5 | 50 | 1600 |
| 71. | 4-Nitrophenol | 100-02-7 | 50 | 1600 |
| 72. | Dibenzofuran | 132-64-9 | 10 | 330 |

## TABLE 2-3
## Superfund Target Compound List (TCL) and Contract Required Quantitation Limits (CRQL)*

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| | Semivolatiles (cont.) | CAS Number | Quantitation Limits** | |
|---|---|---|---|---|
| | | | Low Water µg/L | Low Soil/Sediment$^b$ µg/Kg |
| 73. | 2,4-Dinitrotoluene | 121-14-2 | 10 | 330 |
| 74. | Diethylphthalate | 84-66-2 | 10 | 330 |
| 75. | 4-Chlorophenyl phenyl ether | 7005-72-3 | 10 | 330 |
| 76. | Fluorene | 86-73-7 | 10 | 330 |
| 77. | 4-Nitroaniline | 100-01-6 | 50 | 1600 |
| 78. | 4,6-Dinitro-2-methylphenol | 534-52-1 | 50 | 1600 |
| 79. | N-nitrosodiphenylamine | 86-30-6 | 10 | 330 |
| 80. | 4-Bromophenyl phenyl ether | 101-55-3 | 10 | 330 |
| 81. | Hexachlorobenzene | 118-74-1 | 10 | 330 |
| 82. | Pentachlorophenol | 87-86-5 | 50 | 1600 |
| 83. | Phenanthrene | 85-01-8 | 10 | 330 |
| 84. | Anthracene | 120-12-7 | 10 | 330 |
| 85. | Di-n-butyl phthalate | 84-74-2 | 10 | 330 |
| 86. | Fluoranthene | 206-44-0 | 10 | 330 |
| 87. | Pyrene | 129-00-0 | 10 | 330 |
| 88. | Butyl benzyl phthalate | 85-68-7 | 10 | 330 |
| 89. | 3,3'-Dichlorobenzidine | 91-94-1 | 20 | 660 |
| 90. | Benz(a)anthracene | 56-55-3 | 10 | 330 |
| 91. | Chrysene | 218-01-9 | 10 | 330 |
| 92. | bis(2-ethylhexyl)phthalate | 117-81-7 | 10 | 330 |
| 93. | Di-n-octyl phthalate | 117-84-0 | 10 | 330 |
| 94. | Benzo(b)fluoranthene | 205-99-2 | 10 | 330 |
| 95. | Benzo(k)fluoranthene | 207-08-9 | 10 | 330 |
| 96. | Benzo(a)pyrene | 50-32-8 | 10 | 330 |
| 97. | Indeno(1,2,3-cd)pyrene | 193-39-5 | 10 | 330 |
| 98. | Dibenz(a,h)anthracene | 53-70-3 | 10 | 330 |
| 99. | Benzo(g,h,i)perylene | 191-24-2 | 10 | 330 |

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*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the contract, will be higher.

TABLE 2-3

Superfund Target Compound List (TCL) and
Contract Required Quantitation Limits (CRQL)*

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| | | | Quantitation Limits** | |
|---|---|---|---|---|
| | Pesticides/PCBs | CAS Number | Low Water µg/L | Low Soil/Sediment µg/Kg |
| 100. | alpha-BHC | 319-84-6 | 0.05 | 8.0 |
| 101. | beta-BHC | 319-85-7 | 0.05 | 8.0 |
| 102. | delta-BHC | 319-86-8 | 0.05 | 8.0 |
| 103. | gamma-BHC (Lindane) | 58-89-9 | 0.05 | 8.0 |
| 104. | Heptachlor | 76-44-8 | 0.05 | 8.0 |
| 105. | Aldrin | 309-00-2 | 0.05 | 8.0 |
| 106. | Heptachlor epoxide | 1024-57-3 | 0.05 | 8.0 |
| 107. | Endosulfan I | 959-98-8 | 0.05 | 8.0 |
| 108. | Dieldrin | 60-57-1 | 0.10 | 16. |
| 109. | 4,4'-DDE | 72-55-9 | 0.10 | 16. |
| 110. | Endrin | 72-20-8 | 0.10 | 16. |
| 111. | Endosulfan II | 33213-65-9 | 0.10 | 16. |
| 112. | 4,4'-DDD | 72-54-8 | 0.10 | 16. |
| 113. | Endosulfan sulfate | 1031-07-8 | 0.10 | 16. |
| 114. | 4,4'-DDT | 50-29-3 | 0.10 | 16. |
| 115. | Endrin ketone | 53494-70-5 | 0.10 | 16. |
| 116. | Methoxychlor | 72-43-5 | 0.5 | 80. |
| 117. | alpha-Chlordane | 5103-71-9 | 0.5 | 80. |
| 118. | gamma-Chlordane | 5103-74-2 | 0.5 | 80. |
| 119. | Toxaphene | 8001-35-2 | 1.0 | 160. |
| 120. | AROCLOR-1016 | 12674-11-2 | 0.5 | 80. |
| 121. | AROCLOR-1221 | 11104-28-2 | 0.5 | 80. |
| 122. | AROCLOR-1232 | 11141-16-5 | 0.5 | 80. |
| 123. | AROCLOR-1242 | 53469-21-9 | 0.5 | 80. |
| 124. | AROCLOR-1248 | 12672-29-6 | 0.5 | 80. |
| 125. | AROCLOR-1254 | 11097-69-1 | 1.0 | 160. |
| 126. | AROCLOR-1260 | 11096-82-5 | 1.0 | 160. |

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*Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

**Quantitation Limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis, as required by the protocol, will be higher.

## TABLE 2-3

## Superfund Target Compound List (TCL) and Contract Required Quantitation Limit

Page 5 of 6

| Parameter | Quantitation Level[1 2] Low water (ug/L) | Quantitation Level[1 2] Low soil/sediment (mg/kg) |
|---|---|---|
| 1. Aluminum | 200 | 40 |
| 2. Antimony | 60 | 12 |
| 3. Arsenic | 10 | 2 |
| 4. Barium | 200 | 40 |
| 5. Beryllium | 5 | 1 |
| 6. Cadmium | 5 | 1 |
| 7. Calcium | 5000 | 1000 |
| 8. Chromium | 10 | 2 |
| 9. Cobalt | 50 | 10 |
| 10. Copper | 25 | 5 |
| 11. Iron | 100 | 20 |
| 12. Lead | 5 | 1 |
| 13. Magnesium | 5000 | 1000 |
| 14. Manganese | 15 | 3 |
| 15. Mercury | 0.2 | 0.2 |
| 16. Nickel | 40 | 8 |
| 17. Potassium | 5000 | 1000 |
| 18. Selenium | 5 | 1 |
| 19. Silver | 10 | 2 |
| 20. Sodium | 5000 | 1000 |
| 21. Thallium | 10 | 2 |
| 22. Vanadium | 50 | 10 |
| 23. Zinc | 20 | 4 |
| 24. Cyanide | 10 | 2 |
| 25. Hexavalent Chromium | 20 | 4 |

TABLE 2-3

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1: Any analytical method specified in Exhibit D, CLP-Inorganics may be utilized as long as the documented instrument or method detection limits meet the Contract Required Quantitation Level (CRQL) requirements. Higher quantitation levels may only be used in the following circumstance:

If the sample concentration exceeds two times the quantitation limit of the instrument or method in use, the value may be reported even though the instrument or method detection limit may not equal the contract required quantitation level. This is illustrated in the example below:

For lead:
Method in use = ICP
Instrument Detection Limit (IDL) = 40
Sample concentration = 85
Contract Required Quantitation Level (CRQL) = 5

The value of 85 may be reported even though instrument detection limit is greater than Contract Required Quantitation Limit. The instrument or method detection limit must be documented as described in Exhibit E.

2: These CRQL are the instrument detection limits obtained in pure water that must be met using the procedure in Exhibit E. The quantitation limits for samples may be considerably higher depending on the sample matrix.

The second sampling event, if necessary, will be for selected parameters found in the first sampling. Analytical methodologies will be determined based on the testing required.

### 2.3.4 Sewer Sediment

Sediment samples obtained during the sewere investigation will be submitted for analysis of the organic and inorganic analytes found in the New York State Department of Environmental Conservation Contract Laboratory Program protocol (NYSDEC CLP, November 1987, Volume I, Exhibit C, Sections I and II). The parameter list will include the contaminants on the Target Compound List (TCL) and all GC/MS peaks greater than 10 percent of the nearest calibrating standard. Table 2-3 identifies the parameters on the TCL list along with the target detection limits.

The second sampling event, if necessary, will be for selected parameters found in the first sampling. Analytical methodologies will be determined based on the testing required.

### 2.3.5 Air Samples

Analysis of high-volume filter samples obtained during the air monitoring program will be in accordance with DOH method 311-1. The detection limit, which is a function of the analytical detection limit and the volume of air drawn through the filter. Analysis is being done for total PCB's. Individual aroclors will be identifed and quanified where found.

### 2.3.6 Oil Pit Samples

Samples of sediment from the oil pit area will be analyzed for PCBs and oil and grease. PCB analysis will be in accordance with USEPA Method 8080 with a detection limit of 0.72 ppm total PCBs. Oil and grease analysis will be in accordance with USEPA Method 9071. Analysis is being done for total PCBs. Individual aroclors will be identified and quantified where found.

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### 2.3.7 Detection Limits

Detection limits given in the preceding subsections are based on conducting the testing in accordance with the stated analytical methodology in the absence of matrix interferences and high levels of target and non-target analytes. Analytical clean-ups will be performed for matrix interference where required according to the methods and protocols designated in the 2/12/90 letter from General Testing to AFI. If the laboratory is unable to meet the stated detection limits (after appropriate cleanup) due to matrix interferences, they will contact AFI Environmental prior to proceeding further with the analytical work. AFI Environmental will discuss the situation with the laboratory to determine what, if anything, can be done for improvement. AFI Environmental will then dicuss this with the NYSDEC prior to deciding on a course of action.

### 2.3.8 Analytical Report Deliverables

The NYSDEC will be provided with the CLP reporting and deliverables, and data validation for samples, according to the following categories as summarized in revised table 2-2.

Category 1 – Soil and water samples analyzed for the complete TCL and consistent with the reporting and deliverables in the 1987 NYSDEC CLP for VOAs, SVAs, Pesticides/PCBs and inorganics. Data validation will be performed for 100% of these samples.

Category 2 – Groundwater samples analyzed for the complete TCL plus hexavalent chromium and consistent with the reproting and deliverables in the 1987 NYSDEC CLP for VOAs, SVAs, Pesticides/PCBs and inorganics. Data validation will be performed for 100% of these samples.

Category 3 – Samples analyzed for PCBs only by method 8080. The laboratory will supply the following documentation for 10% of these samples.

- Method of sample preparation
- Method for sample clean-up(if used)
- Calibration data(initial/continuing)
- Matrix spike/matrix spike duplicate
- Definition of surrogates
- Recovery of surrogates
- Instrument Blank
- Method Blank
- Retention time windows

- Raw data(chromatograms and integration files)
- Corrective action taken

Selection of the samples which will be included in this 10% will remain a field decision based on consultation with the on-site NYSDEC representative.

The remaining 90% of these samples will be presented in summary form only. The NYSDEC will be provided with full validation on the 10% of the samples requiring full reporting and deliverables , and shall retain the option to require full reporting of samples.

Category 4 - Analysis of oil pit samples of sediment, oil and grease will not be validated. The data will be presented to the NYSDEC in a summary form.

## 2.4 QUALITY ASSURANCE SAMPLES

Table 2-2 identifies the quality assurance samples that will be obtained for each type of sampling being conducted during this RI/FS. Duplicate samples will be taken for approximately 10 percent of each type of sample taken. Trip blanks will be utilized for water analyses for volatile organics. Since dedicated bailers will be utilized, field blanks for ground water samples will not be taken. Field blanks will be taken for the surface water and sewer sediment sampling. One matrix spike (MS) and the matrix spike duplicate (MSD) will be taken for the sewer sediment samples, along with the first event samples of ground water, as required by the CLP. Location of the duplicates, MS, and MSD will be determined in the field upon consideration of such factors as sample size, well recovery rates, etc.

## TABLE 2-4

## DOCUMENTATION FOR NON-CLP ANALYTICAL REPORT

1. Metals Analysis

- analytical method (graphite furnace, flame, ICP cold vapor, hydride generation)
- digestion method (3005, 3010, 3020, 3040, 3050)
- blank results
- duplicate results
- results of spiked samples
- results of method of standard addition
- hardcopies of instrument printouts
- initial calibration of instrument
- dilution's and calculations
- IDL's
- corrective actions taken
- data shall be presented on a dry weight basis

2. Gas Chromatographic Methods

- Method 8010 Halogenated Volatile Organics
- Method 8015 Nonhalogenated Volatile Organics
- Method 8020 Aromatic Volatile Organics
- Method 8030 Acrolein, Acrylonitrile, Acetonitrile
- Method 8040 Phenols
- Method 8060 Phthalate Esters
- Method 8080 Organochlorine Pesticides and PCB's
- Method 8090 Nitroaromatics and Cyclic ketones
- Method 8100 Polynuclear Aromatic Hydrocarbons
- Method 8120 Chlorinated Hydrocarbons
- Method 8140 Organophosphorus Pesticides
- Method 8150 Chlorinated Herbicides

The following information is to be provided:

- Method for sample preparation
- Method for sample cleanup (if used)
- Calibration data (initial and continuing)
- Matrix spike/Matrix spike duplicates
- Definition of surrogates
- Recovery of surrogates
- Instrument blank
- Method blank
- Retention time windows
- Raw data (chromatograms and integration files)
- Corrective actions taken

3. Gas Chromatographic/Mass Spectroscopic Methods

| | | |
|---|---|---|
| - | Method 8240 | GC/MS for Volatile Organics |
| - | Method 8250 | GC/MS for Semivolatile Organics: Packed Column Technique |
| - | Method 8270 | GC/MS for Semivolatile Organics: Capillary Column Technique |
| - | Method 8280 | The Analysis of Polychlorinated Dibenzo-p-Dioxins and Polychlorinated Dibenzofurans |

The following information is to be provided:

- initial calibration
- continuing calibration
- daily tune (BFB or DFTPP)
- instrument blanks
- method blanks
- method of sample preparation
- method of cleanup (if used)
- surrogate recovery
- matrix spike/matrix spike duplicate
- mass spectral matches
- corrective actions taken

4. High Performance Liquid Chromatographic Methods (HPLC)

- Method 8310 Polynuclear Aromatic Hydrocarbons

The following information is to be provided:

- calibration standards
- surrogate standards
- internal standard
- surrogate recoveries
- corrective actions
- sample preparation
- sample cleanup

# 3.0 SAMPLING PROCEDURES

## 3.1 GROUND WATER

### 3.1.1 Introduction

In order to assess the impact of the site waste materials on ground water quality, the behavior of pollutants in the subsurface environment and the processes governing this behavior must be evaluated. The fundamental objective of monitoring land disposal sites is to serve as a check on potential ground water contamination by leachate. The subsurface environment, however, is an extremely complex system, subject to extensive physical, chemical and biological changes within small vertical and horizontal distances. Samples from a monitoring well represent a small part of an aquifer horizontally and in many cases, vertically. Special precautions must be taken to ensure that the sample taken from a given well is representative of the ground water at that location and that the sample is neither altered nor contaminated by the sampling and handling procedure.

The following subsections detail the basic procedures followed by Malcolm Pirnie field crews in monitoring ground water at disposal facilities. These procedures are based on USEPA manuals and other ground water monitoring manuals.

### 3.1.2 Representative Sample Collection

During any ground water sampling program, it must be understood that the composition of the water within the well casing and in close proximity to the well is probably not representative of the overall ground water quality at that sampling site. This is due to the possible presence of drilling contaminants near the well and because important environmental conditions such as pH and oxidation-reduction potential may differ drastically near the well from the conditions in the surrounding water-bearing materials. In addition, stagnation as well as stratification of water can take place within the well.

To safeguard against collecting non-representative water in a sample, it is highly desirable that a well be pumped or bailed until the well is thoroughly flushed of standing water and contains fresh water from the aquifer. The recommended length of time required to pump or bail prior to sampling is dependent on many factors including the characteristics of the well, the hydrogeological nature of the aquifer, the type of sampling equipment being used, and the parameters of interest.

The generally accepted procedure is to bail between three and ten well volumes prior to sampling. In those situations where the well is bailed to dryness, the amount bailed prior to sampling will be less. Note also that non-representative samples can result from excessive pre-pumping of the monitoring well. Stratification of the leachate concentrations in the ground water formation may occur, and excessive bailing can dilute or increase the contaminant concentrations from what is representative of the sampling point of interest.

Determination of the quantity of water in one well volume is calculated from the following formula:

$$V = 5.875\ I^2\ (D-W)$$

WHERE V = one well volume (gallons)
I = inside diameter of well casing (feet)
D = well depth (feet)
W = Depth to water from top of casing (feet)

For a 2-inch ID well, 6 feet of water is approximately one gallon. In most cases, monitoring of temperature, pH <u>and conductivity</u> during bailing will indicate when the well is adequately purged. When these parameters stabilize, it is probable that little or no water from casing storage is left in the well.

### 3.1.3 Water Level Elevations

Valuable hydrogeological data can be obtained from the periodic monitoring of water level elevations in the ground water monitoring system at a facility. This information is necessary for the determination of the flow and direction of ground water and to monitor

Revised Text

seasonal changes in the ground water elevation in the area. Frequency of these measurements should be determined by the Project Engineer and Hydrogeologist, but at a minimum, they should be taken at each sampling occurrence.

Water level measurements are made using an electronic water level indicator. Depths are measured from the top of the well casing to the water surface. These measurements are converted to elevations (above mean sea level) using a survey elevation of the well. Measurements should be accurate to ±0.01 foot.

### 3.1.4 Soil Pore Water Sampling

Since few soils or sediments are chemically inert, movement of leachate through the unsaturated zone frequently will result in chemical changes to the leachate. Samples of soil pore water in the unsaturated zone are collected using vacuum/pressure lysimeters. The lysimeters work by creating a vacuum within the sampling vessel; pore water moves toward the sampler and enters the lysimeter through a porous cup. Pressure is then placed on the lysimeter and the sample is forced to the surface.

It should be noted that there are a number of inherent limitations involved with the use of vacuum/pressure lysimeters. These include the uncertainty of the degree to which the collected sample represents the surrounding pore water, the disruption of normal drainage patterns caused by suction induced sampling, clogging of the lysimeter itself, and the potential sample contamination from materials used in lysimeter construction. In addition, their use may be limited by the nature of the site soils.

### 3.1.5 Collection of Ground Water Samples - Equipment

Malcolm Pirnie utilizes a variety of sampling equipment to bail wells and obtain samples. Selection of the type of equipment used is based on depth of well, recovery rate, accessibility, parameters of interest and cost. The following sections describe the equipment and techniques normally used:

- Bailers

Use of bailers is one of the oldest and simplest methods of sampling ground water wells. Malcolm Pirnie normally utilizes PVC bailers with a PVC check valve on the bottom, but Teflon or stainless steel bailers are also used for certain projects. The PVC bailers are 1.66" OD and will fit in a 2 inch well. The low cost of the PVC bailers allows them to be dedicated to individual wells as a means of minimizing cross contamination. In addition, there is no need for external power.

Bailing and sampling techniques are dictated by the recovery rate of the well. However, for most situations, the bailer is lowered to the bottom of the well and retrieved. In the case of wells that have historically had high recovery rates, the first well volume is retrieved from the top of the water column. Fresh water entering from the bottom insures that the water within the well is fresh and representative of the aquifer of concern.

- Air Lift Sampler

The air lift system uses air under pressure that is fed down the well and forces water up and out of the well. This system is comprised of threaded PVC pipe sections that are connected together as the screened section is lowered into the well. When the sampler is in place, it is capped off with a top section of PVC which allows for the introduction of pressurized air or gas. This forces a check valve closed and the well water up out of the sampler.

The air lift sampler, which can be used as either a portable or permanently installed system, is not suitable for pH sensitive parameters such as metals. Gas stripping of volatile organics may occur, and if air or oxygen is used, oxidation may be a problem. For this reason, the airlift system is normally used only for bailing of the well and samples are collected by other methods.

- Bladder Pumps (Gas Pressure Displacement Pumps)

  Bladder pumps (also referred to as gas squeeze pumps) consist of a flexible tube enclosed in a rigid plastic or stainless steel housing. Water enters the housing through a screen and check valve at the bottom of the pump. Air pressure inflates the bladder and forces the water to the surface (Note: In a similar design, the water enters the bladder and the air pressure introduced into the housing compresses the bladder and forces water to the surface). Upon release of the pressure, an upper check valve prevents water from flowing back into the pump. An automated control system regulates gas flow rates and pressurization cycles to produce a nearly continuous flow.

  The bladder pump has several advantages including a wide range of pumping rates, no contact between air and well water and the unit is fairly portable. In addition, once the unit is set up and in operation, constant operator attendance is not needed during bailing operations.

  Because of the time involved in disassembly, cleaning and reassembly between uses, Malcolm Pirnie recommends that, where used, bladder pumps should be permanently installed.

- Handpump

  A hand operated pump that pumps over 2.5 gallons per minute and fits inside a 2-inch well can sample down to 50 feet or further with extensions. The high flow volume provides for rapid bailing of wells with a high well volume.

- Suction Lift Pumps

  While not normally used for monitoring well sampling, both automatic and manual suction lift pumps can be used in special situations. These pumps (both peristaltic and vacuum) are relatively portable, but sampling is limited to ground water that is within 20 feet of the surface. Use of these pumps may result in degassing and loss of volatile compounds.

Use of these pumps is generally restricted to monitoring installations such as shallow wells and seepage galleries that are not feasibly sampled by the above described techniques.

### 3.1.6 Collection of Ground Water Samples - Procedures

The following subsections describe procedures used for sampling ground water monitoring wells. The procedures are adapted from various USEPA guidance manuals (see references in Appendix A).

Prior to the use of any of these procedures, the following steps should be completed.

a. Put on the necessary personal protective equipment and a new pair of disposable gloves.
b. Insure that all sampling and monitoring equipment has been properly decontaminated prior to use.
c. Place a square sheet of plastic, with a slit in the middle, over the well to cover the working area around the well.
d. Unlock the well and remove the inner protective cap. Place this in a location that will not contribute contamination to the well when it is replaced.
e. Using the pre-cleaned electric well depth probe, measure the depth to the water surface in the well (to 0.01 foot) from the top of the internal well casing. Record this information on the log sheet.

It should be noted that all down-hole and potentially wetted surfaces must also be non-contaminating/non-contributing. This includes power cables, suspension cables or rope, compressed gas lines, and sample tubing.

#### 3.1.6.1 Purging With a Peristaltic Pump

- Discussion

The peristaltic pump as described in subsection 2.5 can be implemented for the presample purging of ground water monitoring wells.

- Uses

The use of a peristaltic pump for well purging is particularly advantageous since in many instances, the same system can later be used for sample collection. The application, however, is limited to wells with a depth of less than approximately 8 meters, due to the limited lift capabilities of peristaltic action. In addition, certain parameters particularly volatile organics, can be affected by this sampling process.

- Procedures For Use

1. Based on well depth and water elevation, determine well volume of water in well.
2. Lower intake into the well to a short distance below the water surface and begin water removal. Collect or dispose of purged water in an acceptable manner. Lower suction intake, as required, to maintain submergence.
3. Measure rate of discharge frequently. A bucket and stopwatch are most commonly used.
4. Purge a minimum of three casing volumes or until the well is dry or until discharge pH, temperature, or conductivity stabilize.

### 3.1.6.2 Purging With a Gas Pressure Displacement System

- Discussion

A pressure displacement system consists of a chamber equipped with a gas inlet line, a water discharge line and two check valves. When the chamber is lowered into the casing, water floods in from the bottom through the check valve. Once full, a gas (i.e., nitrogen or air) is forced into the top of the chamber at a pressure sufficient to result in the upward displacement of the water out of the discharge tube. The check valve in the bottom prevents water from being forced back into the casing, and the upper check valve prevents water from flowing back into the chamber when the gas pressure is released. This cycle can be repeated as necessary until purging is complete.

- Uses

The pressure lift system is particularly useful when the well depth is beyond the capability of a peristaltic pump. The water is displaced up the discharge tube by the increased gas pressure. The potential for increased gas diffusion into the water makes this system unsuitable when sampling for volatile organic and most pH critical parameters.

- Procedures For Use

1. Based on well depth and water level elevation, determine the well volume of water in the well.
2. Lower displacement chamber until top is just below water level.
3. Attach gas supply line to pressure adjustment valve on cap.
4. Gradually increase gas pressure to maintain discharge flow rate.
5. Measure rate of discharge, pH and temperature frequently. A bucket and stopwatch are usually sufficient for flow measurement.
6. Purge a minimum of three casing volumes or until discharge characteristics stabilize unless the well becomes dry first.

### 3.1.6.3 Purging With a Bailer

- Discussion

Bailers are long narrow tubes equipped with a check valve on the bottom. This valve allows water to enter from the bottom as the bailer is lowered, then prevents its release as the bailer is raised. Top filling bailers are also available and are useful for bailing wells, but they should not be used for sampling unless the purpose is to sample the water surface for floating materials.

- Uses

Bailers are not generally practical for bailing wells since the procedure is labor intensive. In particular, deep or large diameter wells with large well volumes require long bailing times. The primary advantage of bailers are low cost and easy decontamination.

- Procedures For Use

1. Based on the well depth and water level elevation, determine the volume of water in the well.
2. Attach a new piece of rope to the pre-cleaned bailer and lower it to just fill the bailer. Withdraw the bailer and note the pH and appearance of the water on the log sheet, along with the time.
3. Continue to bail until at least three complete well volumes have been removed, or the pH or other characteristics stabilize or the well becomes dry.

### 3.1.6.4 Sampling Monitoring Wells With a Bailer

- Discussion

As mentioned above, bailers are tall narrow tubes equipped with a check valve on the bottom. This valve allows water to enter from the bottom as the bailer is lowered, then prevents its release as the bailer is raised. Top filling bailers are not recommended for sample acquisition except for specific applications.

- Uses

This device is particularly useful when samples must be recovered from depths greater than the range (or capability) of suction lift pumps, when volatile stripping is of concern, or when well casing diameters are too narrow to accept submersible pumps. It is the method of choice for the collection of samples which are susceptible to volatile component stripping or degradation due to the aeration associated with most other recovery systems. Samples can be recovered with a minimum of aeration if care is taken to gradually lower the bailer until it contacts the water surface and is then allowed to sink as it fills. Teflon is generally the most acceptable construction material but other materials (PVC, stainless steel, etc.) are acceptable if compatible with designated sample analysis. The primary disadvantages of bailers are their limited sample volume and inability to collect discrete samples from a depth below the water surface. In some cases, especially where analyses for trace contaminants are desired, it may be prudent to use a separate bailer for each well, thus avoiding cross-contamination between wells.

- <u>Procedures For Use</u>

1. Attach precleaned bailer to a new line for lowering.
2. Lower bailer slowly until it contacts water surface.
3. Allow bailer to sink and fill with a minimum of surface disturbance.
4. Slowly raise bailer to surface. Do not allow bailer line to contact ground.
5. Tip bailer to allow slow discharge from top to flow gently down the side of the sample bottle with minimum entry turbulence.
6. Repeat steps 2-5 as needed to acquire sufficient sample volume.
7. Select sample bottles and preserve the sample, if necessary, according to the guidelines in Section 5.
8. Check that a Teflon-liner is present in cap if required. Secure the cap tightly. In the case of vials for volatile organic analyses, insure that no air bubbles are present.
9. Label the sample bottle with an appropriate label and complete all chain-of-custody documents.
10. If non-dedicated bailers are being used, thoroughly decontaminate the bailer and add clean rope after each use according to the guidelines in Section 5.

### 3.1.6.5 Sampling Monitoring Wells With a Peristaltic Pump

- Discussion

A pump system is considered advantageous when analytical requirements demand sample volumes in excess of several liters. The major drawback of a pump system is the potential for increased volatile component stripping as a result of the required lift vacuum. Samples for volatile organic analysis should be collected with a bailer as described in Section 3.1.6.4 and should precede any sample collection which may further disturb the well by contact.

- Uses

The peristaltic pump system can be used for monitoring well sampling whenever the lift requirements do not exceed 8 meters. It becomes particularly important to use a heavy wall tubing in this application in order to prevent tubing collapse under the high vacuums needed for lifting from depth.

- Procedures For Use

1. Install clean medical grade silicon tubing in the peristaltic pump head.
2. Attach the pump to the required length of precleaned suction line and lower the end of the line to the midpoint of the well screen.
3. Consider the first liter of liquid collected as a system purge/rinse. NOTE: If well yield is insufficient for required analysis, this purge volume may be suitable for some less critical analysis.
4. Fill necessary sample bottles by allowing pump discharge to flow gently down the side of bottle with minimal entry turbulence. Cap each bottle as filled.
5. Select sample bottles and preserve the sample, if necessary, as per guidelines in Section 5.
6. Check that a Teflon-liner is present in cap if required. Secure the cap tightly.

7. Label the sample bottle with the appropriate label. Complete the chain-of-custody documents.
8. Allow system to drain then disassemble. Return tubing to lab for decontamination.

### 3.1.6.6 Sampling Monitoring Wells With a Submersible Pump

- Discussion

Several types of submersible pumps are available for ground water monitoring and offer considerable advantages over other systems. They are able to operate from depths beyond the capabilities of peristaltic pumps and save significant time and effort relative to hand bailing. Further, if constructed of suitable materials and properly used, they can both purge and adequately sample the well.

- Uses

Submersible pumps generally use one of two types of power supplies, either electric or compressed gas. Electric powered pumps generally run off a 12 VDC rechargeable battery from an automotive electrical system. Those units powered by compressed gas normally use a small electric compressor which also needs 12 VDC power. They may also utilize compressed gas from bottles or even high performance hand pumps.

These pumps are generally constructed of "more or less" noncontaminating materials "suitable for Priority Pollutant Sampling". They often contain plastics, rubber or metal parts which may contribute or otherwise effect the analysis of samples for certain trace components. Such pumps may not be suitable when samples are collected for analyses of a wide range of trace contaminants. They may, however, be useful for initial purging of such wells. In any case, when doubt remains, bailers are the best choice for actual sample acquisition.

- Procedures For Use
  1. Lower the precleaned pump to just below the water level and begin pumping. Consider the first liter of water as a system purge/rinse. Lower the pump as required to maintain submergence.
  2. Fill necessary sample bottles by allowing pump discharge to flow gently down the side of bottle with minimal entry turbulence. Cap each bottle as filled.
  3. Select appropriate sample bottles and preserve the sample if necessary as per guidelines in Section 5.
  4. Check that a Teflon-liner is present in cap if required. Secure the cap tightly.
  5. Label the sample bottle with an appropriate label. Complete chain-of-custody documents.
  6. Allow system to drain then disassemble. Return tubing to lab for decontamination.

## 3.2 SURFACE WATER

### 3.2.1 Considerations in Determining Representative Sample Locations

The collection of surface water samples is performed for the purpose of assessing the general water quality of a particular body of water and/or to measure the impact of point or non-point source discharges on that body. To properly meet the objective of the sampling, consideration must be given to mixing zones, stratification areas, stream hydraulics, flow status (high flow vs. low flow), and any other conditions which influence the character of the water being sampled.

When monitoring the general water quality of a body of surface water, a determination must be made as to the homogeneity of the water both vertically and horizontally. This can be accomplished by either researching historical data on the water body and surrounding land use patterns, by preliminary random sampling, or by in-situ measurement (usually by probe) of certain water quality parameters (such as pH, temperature, dissolved oxygen or specific conductance) prior to sampling.

If the water is known to be homogeneous, a representative sample can be collected at any reasonable location. If the homogeneity of the water cannot be determined, or if it is known to be heterogeneous, the monitoring program must be structured to take into account all sources of variability. At Malcolm Pirnie, this is usually accomplished by theoretically dividing the water body into approximately equal sized sections and taking a representative sample from each section. These samples can be analyzed separately, or composited into one or more representative samples. Stratification of the water column is accounted for by taking samples at more than one depth. These samples can be also be composited if desired.

In addition to the above considerations, samples collected to assess the impact of a particular discharge on a body of water must be defined in terms of the discharge conditions which they represent. Initially, the discharge location(s) must be pin-pointed so that representative samples can be collected both upstream and downstream of the site. The extent of the mixing zone should be defined so that well-mixed or unmixed samples can be collected, depending on the objectives of the study. Turbulence or aeration at the discharge point is an important consideration when sampling for volatile compounds because these mechanisms may cause the compounds to dissipate. For a worst case analysis of the impact of a particular discharge, samples should be collected when the receiving water is at low flow; this is usually during the summer months.

### 3.2.2 Sampling Methods

A variety of surface water sampling procedures can be utilized depending on the water body to be sampled and parameters of concern. The following subsections describe the four basic methods utilized by Malcolm Pirnie.

### 3.2.2.1 Sampling Surface Waters Using a Dipper or Other Transfer Device

- Discussion

A dipper or other container constructed of inert material, such as glass, stainless steel or Teflon, can be used to transfer liquid wastes from their source to a sample bottle. This prevents unnecessary contamination of the outer surface of the sample bottle that would otherwise result from direct immersion in the liquid. Use of this device also prevents the technician from having to physically contact the water stream. Depending upon the sampling application, the transfer vessel can be either disposed of or reused. If reused, the vessel should be thoroughly rinsed and/or decontaminated prior to sampling a different source.

- Uses

A transfer device can be utilized in most sampling situations except where aeration must be eliminated (samples for volatile organic analysis) or where significant material may be lost due to adhesion to the transfer container.

- Procedures For Use

1. Submerge a precleaned stainless steel dipper or other suitable device with minimal surface disturbances.
2. Allow the device to fill slowly and continuously.
3. Retrieve the dipper/device from the surface water with minimal disturbance.
4. Remove the cap from the sample bottle and slightly tilt the mouth of the bottle below the dipper/device edge.
5. Empty the dipper/device slowly, allowing the sample stream to flow gently down the side of the bottle with minimal entry turbulence.
6. Continue delivery of the sample until the bottle is almost completely filled.
7. Select appropriate bottles and preserve the sample if necessary as per guidelines in Section 5.

8. Check that a Teflon liner is present in the cap if required. Secure the cap tightly.
9. Label the sample bottle with an appropriate label and complete the chain-of-custody form.
10. Properly clean and decontaminate the equipment prior to reuse or storage (Section 5).

#### 3.2.2.2 Use of Pond Sampler For the Collection of Surface Water Samples

- Discussion

The pond sampler consists of bottle or similar container attached to the end of a two- or three-piece telescoping tube that serves as the handle.

- Uses

The pond sampler is used to collect surface water samples from near shore and liquid waste samples from disposal ponds, pits, lagoons, and similar reservoirs. The handle may bow when sampling very viscous liquids if sampling is not done slowly.

- Procedures For Use

1. Assemble the pond sampler. Make sure that the sampling container and the bolts and nuts that secure the clamp to the pole are tightened properly.
2. Take grab samples by slowly submerging the precleaned container with minimal surface disturbance.
3. Retrieve the pond sampler from the surface water with minimal disturbance
4. Remove the cap from the sample bottle and slightly tilt the mouth of the bottle below the dipper/device edge.
5. Empty the sampler slowly, allowing the sample stream to flow gently down the side of the bottle with minimal entry turbulence.
6. Continue delivery of the sample until the bottle is almost completely filled.
7. Select appropriate sample bottles and preserve the sample if necessary as per guidelines in Section 5.

8. Check that a Teflon liner is present in the cap if required. Secure the cap tightly.
9. Properly label the sample bottle and complete the chain-of-custody documents.
10. Properly clean and decontaminate the equipment prior to reuse or storage using recommended guidelines of Section 5.

### 3.2.2.3 Peristaltic Pump For Sampling Surface Water Bodies

- Discussion

This collection system consists of a peristaltic pump capable of achieving a pump rate of 1 to 3 liters per minute, and an assortment of tubing for extending the suction intake. A battery operated pump is preferable as it eliminates the need for DC generators or AC inverters.

- Uses

The system is highly versatile since it is portable and the sample collection is conducted through essentially chemically nonreactive material. It is practical for a wide range of applications including streams, ponds, and containers. This procedure can both extend the lateral reach of the sampler and allow sampling from depth. Likewise, it can function both as a well purge and a surface water sample collection system. The chief disadvantage of this method is the limited lift capacity of the pump, approximately 8 meters.

- Procedures For Use

1. Install clean, medical-grade silicone tubing in the pump head, as per the manufacturer's instructions. Allow sufficient tubing on the discharge side to facilitate convenient dispensation of liquid into sample bottles and only enough on the suction end for attachment to the intake line. This practice will minimize sample contact with the silicone pump tubing.
2. Select the length of suction intake tubing necessary to reach the required sample depth and attach to intake side of pump tubing. Heavy-wall Teflon, of a diameter equal

to the required pump tubing, suits most applications. (Heavier wall will allow for a slightly greater lateral reach.) Tygon or equivalent tubing may be applicable depending on the parameters of concern.

3. If possible, allow several liters of sample to pass through the system, before actual sample collection. Collect this purge volume and then return to source after the sample aliquot has been withdrawn.
4. Fill necessary sample bottles by allowing pump discharge to flow gently down the side of bottle with minimal entry turbulence. Cap each bottle as filled.
5. Select appropriate bottles and preserve the sample, if necessary, as per guidelines in Section 5.
6. Check that a Teflon liner is present in the cap if required. Secure the cap tightly.
7. Label the sample bottle with an appropriate label and complete the chain-of-custody documents.
8. Allow the system to drain, then disassemble. Return tubing to lab for decontamination (if feasible). See Section 5 for general decontamination procedures.

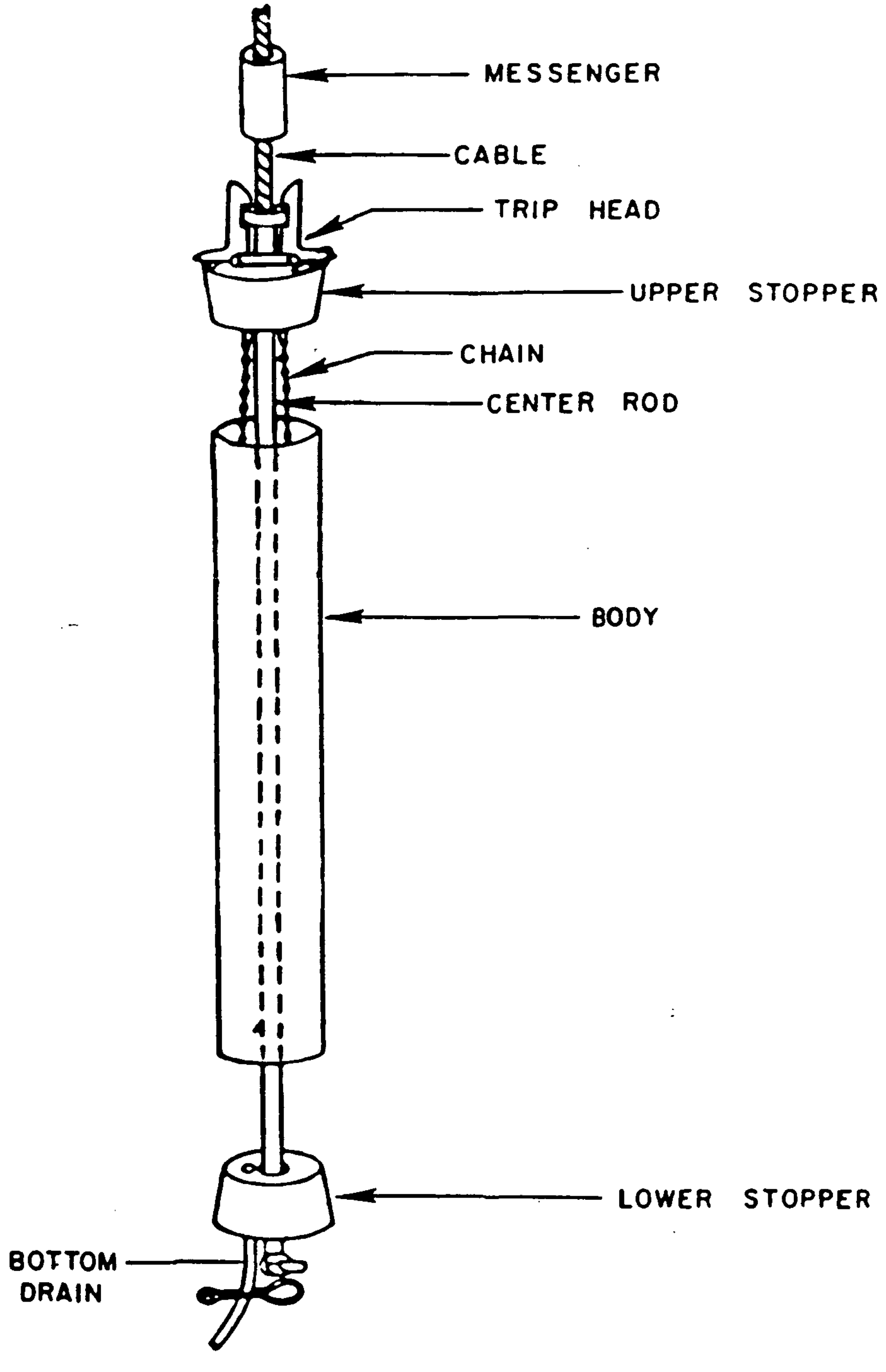
### 3.2.2.4 Collection of Water Samples From Depth With a Kemmerer Bottle

- Discussion

The kemmerer bottle is a messenger-activated water sampling device (see Figure 3-1). In the open position, water flows easily through the device. Once lowered to the desired depth, a messenger is dropped down the sample line tripping the release mechanism and closing the bottle. In the closed position, the bottle is sealed, both on top and bottom, from any additional contact with the water column and can be retrieved.

- Uses

The kemmerer bottle is currently the most practical method of collecting discrete, at-depth samples from surface waters or vessels where the collection depth exceeds the lift



MALCOLM PIRNIE

**MODIFIED KEMMERER SAMPLER**

MALCOLM PIRNIE, INC.

FEBRUARY 1989

FIGURE 3-1

capacity of pumps. The application is limited however by the incompatability of various construction materials with some analytical techniques. Proper selection, i.e., all metal assemblies for organic analysis or all plastic assemblies for trace element analysis, will overcome this deficiency.

- Procedures For Use

1. Inspect kemmerer bottle for thorough cleaning and insure that sample drain valve is closed (if bottle is so equipped).
2. Measure and then mark sample line at desired sampling depth.
3. Open bottle by lifting top stopper-trip head assembly.
4. Gradually lower bottle until desired level is reached (predesignated mark from Step 2).
5. Place messenger on sample line and release.
6. Retrieve sampler; hold sampler by center stem to prevent accidental opening of bottom stopper.
7. Rinse or wipe off exterior of sampler body (wear proper gloves and protective clothing, if required).
8. Recover sample by grasping lower stopper and sampler body with one hand (gloved), and transfer sample by either (a) lifting top stopper with other hand and carefully pouring contents into sample bottles, or (b) holding drain valve (if present) over sample bottle and opening valve.
9. Allow sample to flow slowly down side of sample bottle with minimal disturbance.
10. Select sample bottles and preserve the sample if necessary as per guidelines in Section 5.
11. Check that a Teflon liner is present in the cap if required. Secure the cap tightly.
12. Label the sample bottle with an appropriate label and complete all chain-of-custody records.
13. Decontaminate sampler and messenger or place in plastic bag for return to lab. See Section 5 for general decontamination procedures.

## 3.3. SOIL, SLUDGE, & SEDIMENT

### 3.3.1 Introduction

The sampling of solid or semi-solid materials such as soils, sludges and sediments is complicated by the structural properties of the materials and the fact that the material to be sampled can be below the soil or water surface. In addition, solids may not have uniform characteristics with respect to depth and areal distance.

Soil sampling is an important factor in site investigations, especially in conjunction with ground water investigation. Acquisition of samples can be limited by such factors as grain size, cohesiveness, associated moisture, depth to bedrock and depth to water table. Shallow sampling of soils is accomplished by Malcolm Pirnie through the use of trowels, hand auger-type tools, and thin wall tube samplers. Sampling at greater depth is usually accomplished in conjunction with a boring/monitoring well installation program. Soil samples at depth are collected in accordance with ASTM D-1586, "Standard Method for Penetration Test and Split-Barrel Sampling of Soils" (See Appendix B). The actual sampling is conducted by a drilling subcontractor with supervision by Malcolm Pirnie personnel.

Sludges (semi-dry materials ranging from dewatered solids to high viscosity liquids) and sediments (deposited material underlying a body of waste) require somewhat different procedures and equipment due to their physical nature. Sludge sampling methods can vary from the use of a peristaltic pump, to the use of thin-tube samplers. Sediment sampling is similar except that factors such as inflows and discharges may cause significant variations in sediment composition. In addition, the presence of moving and/or deep waste complicates sampling.

### 3.3.2 Soil Sampling Methods

The following subsections describe several soil sampling procedures utilized by Malcolm Pirnie personnel. They have been adapted from the USEPA (Reference 1).

### 3.3.2.1 Soil Sampling With a Spade and Scoop

- Discussion

The simplest, most direct method of collecting soil samples for subsequent analysis is with the use of a spade and scoop. A normal lawn or garden spade can be utilized to remove the top cover of soil to the required depth and then a smaller stainless steel scoop can be used to collect the sample.

Uses

This method can be used in most soil types but is limited to sampling the near surface. Gathering of samples from depths greater than 20 feet becomes extremely labor intensive in most soil types. Very accurate, representative samples can be collected with this procedure depending on the care and precision demonstrated by the technician. The use of a flat, pointed mason trowel to cut a block of the desired soil will be of aid when undisturbed profiles are required. A stainless steel scoop or lab spoon will suffice in most other applications. Care should be exercised to avoid the use of devices plated with chrome or other materials. Plating is particularly common with garden implements such as potting trowels.

- Procedures For Use

1. Carefully remove the top layer of soil to the desired sample depth with a precleaned spade.
2. Using a precleaned stainless steel scoop or trowel, remove and discard a thin layer of soil from the area which comes in contact with the shovel.
3. Transfer sample into an appropriate sample bottle with a stainless steel lab spoon or equivalent.
4. Check that a Teflon liner is present in the cap if required. Secure the cap tightly. The chemical preservation of solids is generally not recommended. Refrigeration is usually the best approach supplemented by a minimal holding time.

5. Label the sample bottle. Complete all chain-of-custody documents.
6. Decontaminate equipment after use and between sample locations. For specific decontamination guidelines, consult Section 5.

#### 3.3.2.2 Subsurface Soil Sampling With Auger and Thin-Wall Tube Sampler

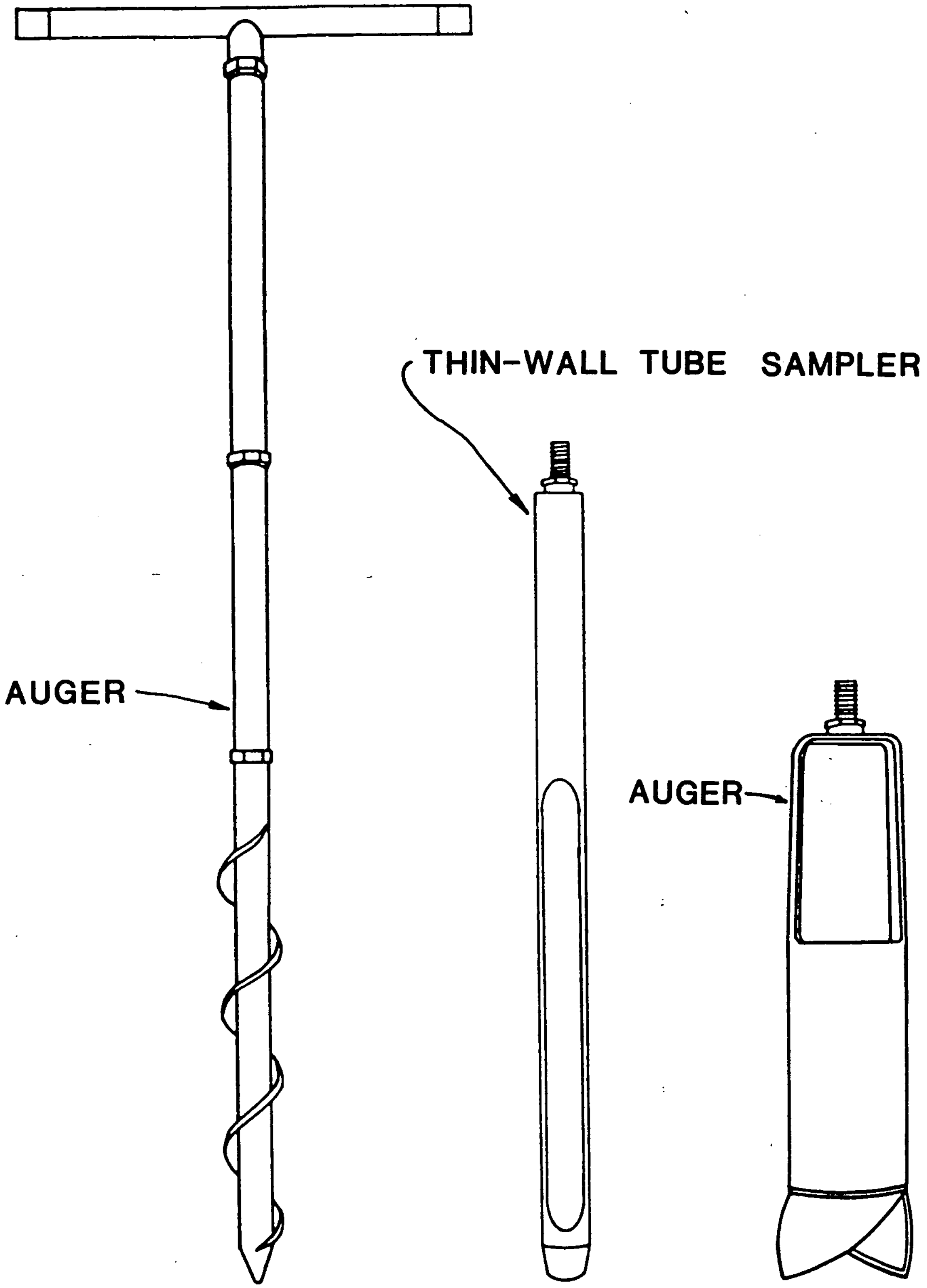
- Discussion

This system consists of an auger bit, a series of drill rods, a "T" handle, and a thin-wall tube corer (see Figure 3-2). The auger bit is used to bore a hole to the desired sampling depth and then withdrawn. The auger tip is them replaced with the tube corer, lowered down the borehole, and forced into the soil at the completion depth. The corer is then withdrawn and the sample collected.

Alternately, the sample can be recovered directly from the auger. This technique however, does not provide an "undisturbed" sample as would be collected with a thin tube sampler. In situations where the soil is rocky, it may not be possible to force a thin tube sampler through the soil or sample recovery may be poor. Sampling directly from the auger may be the only viable method. In soils where the borehole will not remain open when the tool is removed, a temporary casing can be used until the desired sampling depth is reached.

- Uses

This system can be used in a wide variety of soil conditions. It can be used to sample both from the surface, by simply driving the corer without preliminary boring, or to depths in excess of 6 meters. The presence of rock layers and the collapse of the borehole, however, usually prohibit sampling at depths in excess of 6-7 feet. Interchangeable cutting tips on the corer reduce the disturbance to the soil during sampling and aid in maintaining the core in the device during removal from the borehole.



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AUGERS and THIN-WALL TUBE SAMPLER

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FIGURE 3-2

- Procedures For Use

1. Attach the auger bit to a drill rod extension and further attach the "T" handle to the drill rod.
2. Clear the area to be sampled of any surface debris (twigs, rocks, litter). It may be advisable to remove the first 3 to 6 inches of surface soil for an area approximately 6 inches in radius around the drilling location.
3. Begin drilling, periodically removing accumulated soils. This prevents accidentally brushing loose material back down the borehole when removing the auger or adding drill rods.
4. After reaching desired depth, slowly and carefully remove auger from boring. (Note: When sampling directly from auger, collect sample after auger is removed from boring and proceed to Step 10).
5. Remove auger tip from drill rods and replace with a precleaned thin-wall tube sampler. Install proper cutting tip.
6. Carefully lower corer down borehole. Gradually force corer into soil. Care should be taken to avoid scraping the borehole sides. Hammering of the drill rods to facilitate coring should be avoided as the vibrations may cause the boring walls to collapse.
7. Remove corer and unscrew drill rods.
8. Remove cutting tip and remove core from device.
9. Discard top of core (approximately 1 inch), which represents any material collected by the corer before penetration of the layer in question. Place remaining core into sample container.
10. Check that a Teflon liner is present in the cap if required. Secure the cap tightly. The chemical preservation of solids is generally not recommended. Refrigeration is usually the best approach supplemented by a minimal holding time.

11. Label the sample bottle. Complete all chain-of-custody documents.
12. Decontaminate sampling equipment after use and between sampling locations. Refer to Section 5 for decontamination requirements.

### 3.3.3 Sludge and Sediment Sampling

The following subsections describe several methods for obtaining representative sludge and sediment samples. These have been adapted from USEPA methods (Reference 1).

#### 3.3.3.1 Collection of Sludge or Sediment Samples With a Scoop

- Discussion

Sludge and sediment samples are collected using the simple laboratory scoop or garden type trowel specified in Subsection 3.3.2.1. This method is more applicable to sludges but it can be used for sediments provided the water depth is very shallow (a few inches). It should be noted, however, that this method can be disruptive to the water/sediment interface and might cause substantial alterations in sample integrity if extreme care is not exercised. The stainless steel laboratory scoop is generally recommended due to its noncorrosive nature. Single grab samples may be collected or, if the area in question is large, it can be divided into grids and multiple samples can be collected and composited.

- Uses

This method provides for a simple, quick, and easy means of collecting a disturbed sample of a sludge or sediment.

- Procedures For Use

1. Sketch the sample area or note recognizable features for future reference. If practical, place a numbered stake at the sample site.
2. Insert scoop or trowel into material and remove sample. In the case of sludges exposed to air, it may be

desirable to remove the first ½ to 1 inch of material prior to collecting sample.

3. If compositing a series of grab samples, use a stainless steel mixing bowl, Teflon tray, or a hard surface covered with aluminum foil for mixing.
4. Transfer sample into an appropriate sample bottle with a stainless steel lab spoon or equivalent.
5. Check that a Teflon liner is present in cap if required. Secure the cap tightly. The chemical preservation of solids is generally not recommended. Refrigeration is usually the best approach supplemented by a minimal holding time.
6. Label the sample bottle and complete all chain-of-custody documents.
7. Decontaminate sampling equipment after use and between sample locations according to the guidelines presented in Section 5.

#### 3.3.3.2 Sampling Sludge or Sediments With a Hand Corer

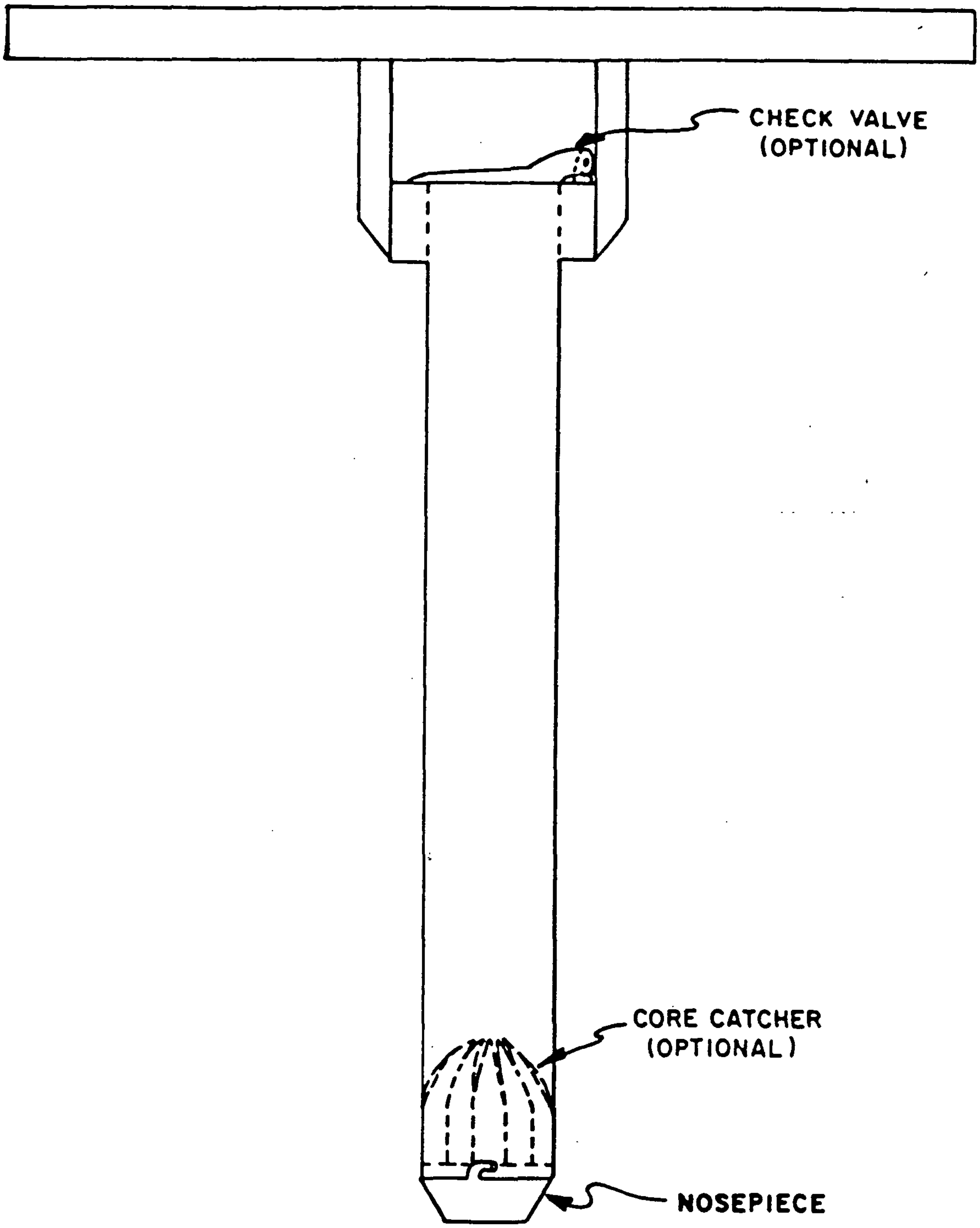
- Discussion

This device is essentially the same type of thin-wall corer described for collecting soil samples (Subsection 3.3.2.2). It is modified by the addition of a handle to facilitate driving the corer (see Figure 3-3) and a check valve on top to prevent washout during retrieval through an overlying water layer.

- Uses

Hand corers are applicable to the same situations and materials as the scoop described in Subsection 3.3.3.1. It has the advantage of collecting an undisturbed sample which can profile any stratification in the sample as a result of changes in the deposition.

Some hand corers can be fitted with extension handles which will allow the collection of samples underlying a shallow layer of liquid. Most corers can also be adapted to



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HAND CORER

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FIGURE 3-3

hold liners generally available in brass, polycarbonate plastic or Teflon. Care should be taken to choose a material which will not compromise the intended analytical procedures.

- Procedures For Use

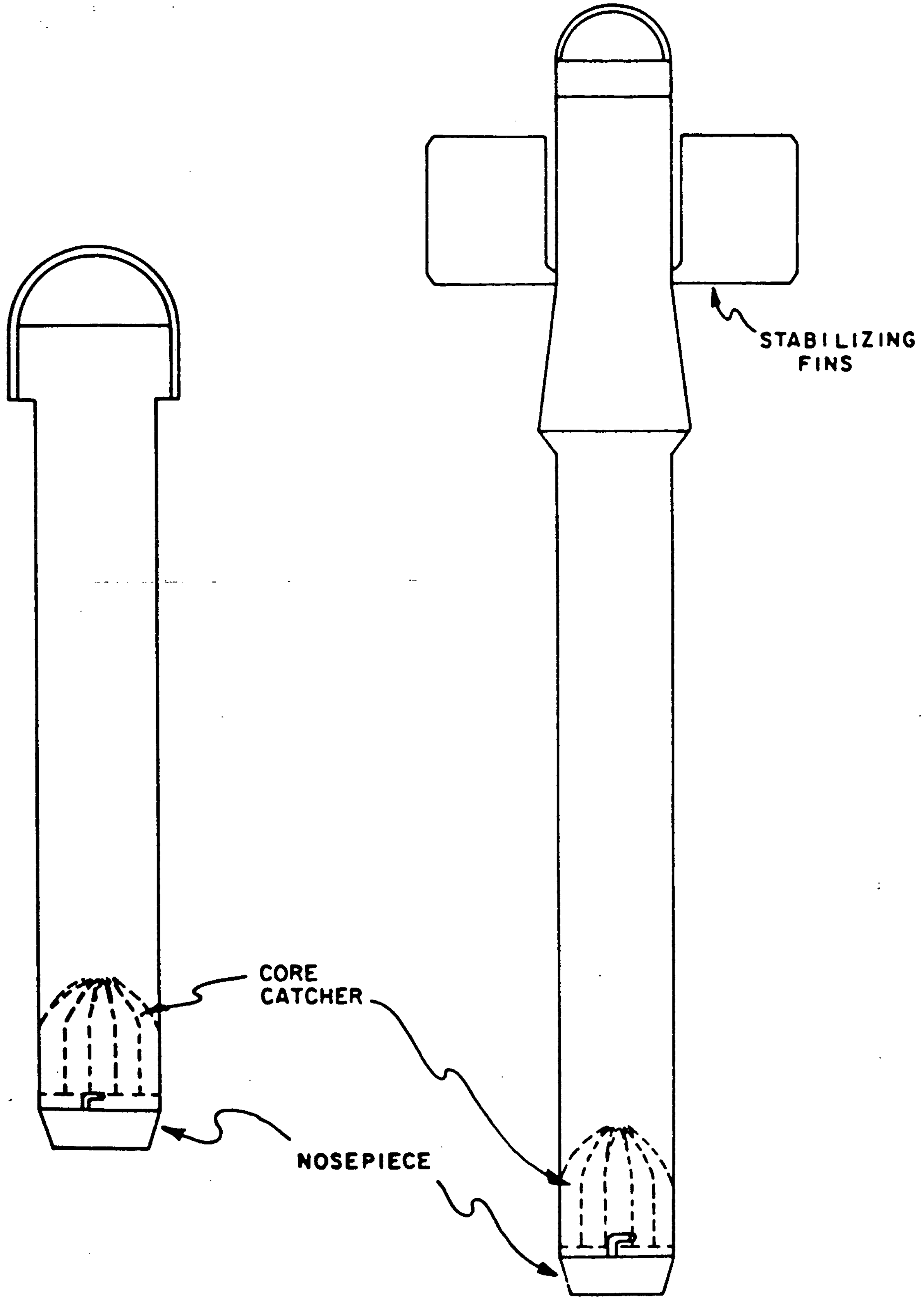
1. Inspect the corer for proper precleaning, and select sample location.
2. Force corer in with smooth continuous motion.
3. Twist corer then withdraw in a single smooth motion.
4. Remove nosepiece and withdraw sample into a stainless steel or Teflon tray, or a tray covered with aluminum foil.
5. Transfer sample into an appropriate sample bottle with a stainless steel lab spoon or equivalent.
6. Check that a Teflon liner is present in cap if required. Secure the cap tightly. The chemical preservation of solids is generally not recommended. Refrigeration is usually the best approach supplemented by a minimal holding time.
7. Label the sample bottle and complete all chain-of-custody documents.
8. Decontaminate sampling equipment after use and between sample locations as required by procedures in Section 5.

#### 3.3.3.3 Sampling Bottom Sludges or Sediments With a Gravity Corer

- Discussion

A gravity corer is a metal tube with a replacement tapered nosepiece on the bottom and an optional ball or other type of check valve on the top. The check valve allows water to pass through the corer on descent but prevents a washout during recovery. The tapered nosepiece facilitates cutting and reduces core disturbance during penetration.

Most corers are constructed of brass or steel and many can accept plastic liners and additional weights (see Figure 3-4).



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GRAVITY CORERS

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FIGURE 3-4

- Uses

Corers are capable of collecting samples of most sludges and sediments. They collect essentially undisturbed samples which represent the profile of strata which may develop in sediments and sludges during variations in the deposition process. Depending on the density of the substrate and the weight of the corer, penetration to depths of 30 inches can be attained.

Care should be exercised when using gravity corers in vessels or lagoons that have liners because penetration depths could exceed that of the subsurface and result in damage to the liner material.

- Procedures For Use

1. Attach a precleaned corer to the required length of sample line. Solid braided 5 mm (3/16 inch) nylon line is sufficient; 20 mm (3/4 inch) nylon, however, is easier to grasp during hand hoisting.
2. Secure the free end of the line to a fixed support to prevent accidental loss of the corer.
3. Allow corer to free fall through liquid to bottom.
4. Retrieve corer with a smooth, continuous lifting motion. Do not bump corer as this may result in some sample loss.
5. Remove nosepiece from corer and slide sample out of corer into stainless steel or Teflon pan, or a hard surface lined with aluminum foil.
6. Transfer sample into appropriate sample bottle with a stainless steel lab spoon or equivalent.
7. Check that a Teflon liner is present in cap if required. Secure the cap tightly. The chemical preservation of solids is generally not recommended. Refrigeration is usually the best approach supplemented by a minimal holding time.
8. Label the sample bottle. Complete all chain-of-custody documents.

9. Consult Section 5 for decontamination requirements and decontaminate sampling equipment after use and between sampling locations.

### 3.3.3.4 Sampling Bottom Sludges or Sediments With a Ponar Grab

- Discussion

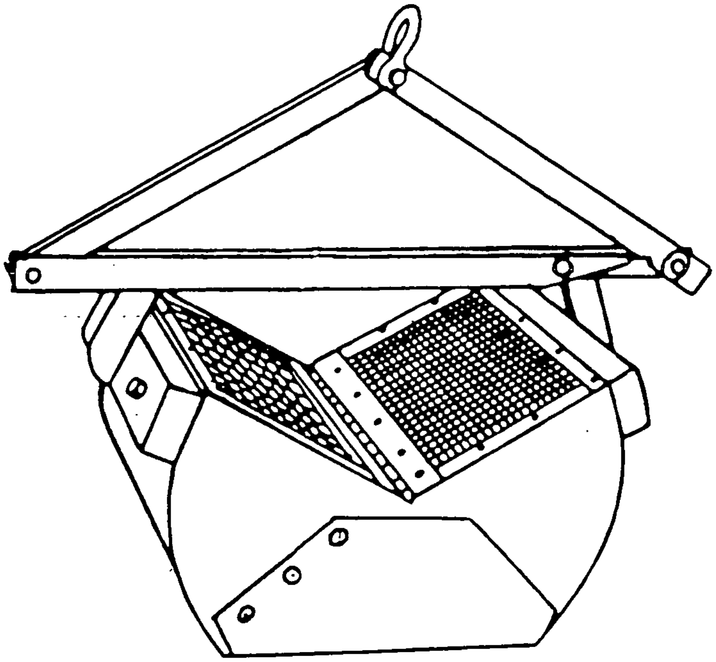
The Ponar grab is a clamshell type scoop activated by a counter lever system. The shell is opened and latched in place and slowly lowered to the bottom. When tension is released on the lowering cable the latch releases and the lifting action of the cable on the lever system closes the clamshell (see Figure 3-5).

- Uses

Ponars are capable of sampling most types of sludges and sediments from silts to granular materials. They are available in a "Petite" version with a 36 square inch sample area that is light enough to be operated without a winch or crane. Penetration depths will usually not exceed 2-3 inches. Grab samplers, unlike the corers described in Subsection 3.3.3.3 are not capable of collecting undisturbed samples. As a result, material in the first inch of sludge cannot be separated from that a lower depths. The sampling action of these devices causes agitation currents which may temporarily resuspend some settled solids. This disturbance can be minimized by slowly lowering the sampler the last one to two feet and allowing a very slow contact with the bottom. It is advisable, however, to only collect sludge or sediment samples after all overlying water samples have been obtained.

- Procedures For Use

1. Attach a precleaned Ponar to the necessary length of sample line. Solid braided 3/16 inch nylon line is usually of sufficient strength; however, 3/4 inch or greater nylon line allows for easier hand hoisting.



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**PONAR GRAB**

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FIGURE 3-5

2. Measure and mark the distance to bottom on the sample line. A secondary mark, 1½ foot shallower, will indicate proximity so that lowering rate can be reduced, thus preventing unnecessary bottom disturbance.
3. Open sampler jaws until latched. From this point on, support sampler by its lift line or the sampler will be tripped and the jaws will close.
4. Tie free end of sample line to fixed support to prevent accidental loss of sampler.
5. Begin lowering the sampler until the proximity mark is reached.
6. Slow rate of descent through last 1½ foot until contact is felt.
7. Allow sample line to slack several inches. In strong currents more slack may be necessary to release mechanism.
8. Slowly raise dredge clear of water surface.
9. Place Ponar into a stainless steel, Teflon or aluminum foil lined tray and open. Lift Ponar clear of the tray.
10. Collect a suitable aliquot with a stainless steel lab spoon or equivalent and place sample into appropriate sample bottle.
11. Check for a Teflon liner in cap if required and secure cap tightly. The chemical preservation of solids is generally not recommended. Refrigeration is usually the best approach supplemented by a minimal holding time.
12. Label the sample bottle with the appropriate label. Complete all chain-of-custody documents.
13. Consult Section 5 Decontamination, for appropriate decontamination procedures to be used on sampling equipment after use and between sampling locations.

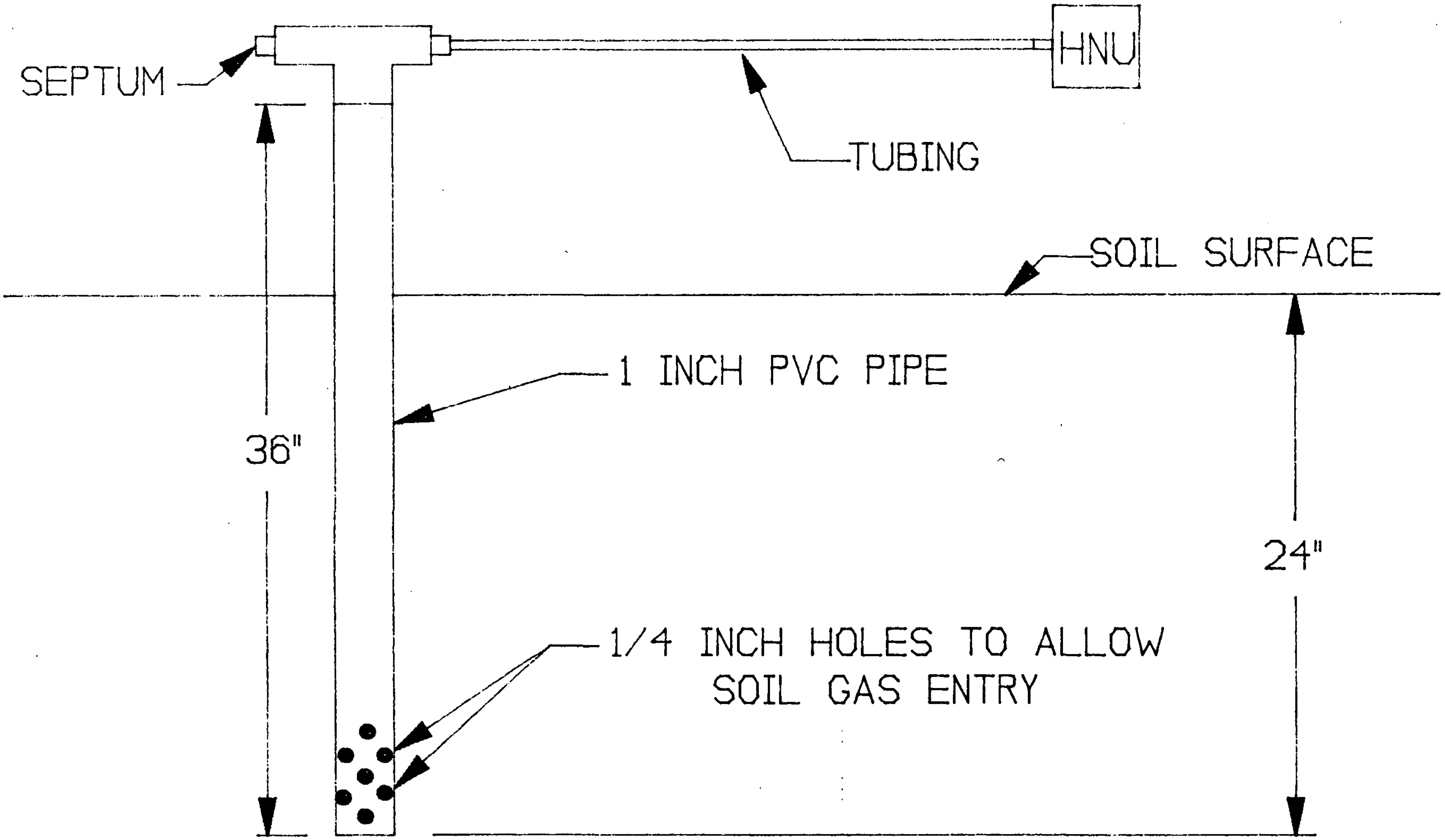
## 3.4 SOIL GAS

Since soil gas survey results can be affected by weather conditions, surveys will be conducted when both soil temperature and ambient temperature exceed 40 degrees F. Other factors which can affect the outcome of the survey are: the chemical and physical properties of the organic compounds being monitored, properties of the unsaturated zone, hydrogeologic properties, and size and concentration of the contaminant plume. All of these factors will have been considered when planning the soil gas survey described in the work plan.

The following procedure will be used at the site to conduct the soil gas survey described in the work plan. Two inch diameter borings will be drilled to a depth of 24 inches below the land surface (or 24 inches below the bottom of any cap material). The boring will be drilled with a hand or power auger, depending on soil conditions. The soil gas probe (see Figure 3-6) will be inserted into the boring and the probe will be sealed off at the soil surface by compressing the natural soil around the PVC pipe. The probe will be left in place at least 24 hours to allow the area to come to equilibrium.

An HNU PI101 organic vapor analyzer will be connected to the probe as shown in Figure 3-6 and soil gas will be drawn into the unit and two readings will be taken and recorded. The first is the maximum reading noted during the screening of soil gas. The second reading is the level at which the HNU stabilizes after the peak reading.

Depending upon the requirements of the work plan, further on-site characterization of the soil gas may be performed utilizing a portable gas chromatograph (GC). Soil gas for GC analysis will be collected using a gas-tight syringe. The syringe will be inserted through the septum on the probe filled with the proper volume, and then injected into the GC. Minimum detection limits will be as required for the particular parameters being analyzed; these detection limits are spelled out in the work plan.



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SOIL GAS PROBE SCHEMATIC

FIGURE 3-6
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## 3.5 AIR SAMPLING

### 3.5.1 General

Air monitoring for the purpose of conducting site investigations can be useful for indicating potential health and safety concerns for both on-site workers and off-site residents. The data is necessary in some cases for evaluating the extent of contamination, the need for remediation and also for conducting the risk assessment. This subsection describes various methodologies that can be used during site investigations to develop the needed information. Since air monitoring procedures are generally determined by the parameters to be monitored, this section provides general information regarding the types of monitoring commonly conducted. Specifics regarding the sampling and analysis of air samples are provided in the workplan and in section 2 of this QAPP. Procedures for conducting soil gas surveys are described in subsection 3.4 of the QAPP. Air monitoring requirements for protection of workers and the community are provided in the site Health & Safety Plan. Procedures for screening soil samples for volatile organics are provided in subsection 4.1.

### 3.5.2 Volatile Organics in Ambient Air

Monitoring of volatile organics in air is conducted utilizing an HNU PI 101 photoionization instrument. The HNU is capable of detecting a wide variety of organic chemicals. Detection levels are as low as 0.2 ppm depending on the specific parameter being monitored. One drawback with the HNU is the inability to quantitate specific parameters when one or more organics are present.

When lower detection limits are needed or specific parameters need to be identified and quantified, gas chromatography (GC) is needed. The GC can be either a portable model that is brought to the site or it can be in the laboratory and samples are then collected at the site and transported to the laboratory for analysis. For the on-site GC, samples can be introduced into the GC by direct injection (gas-tight syringe) or through a gas sampling loop

### 3.5.3 Combustible Gases in Air

Combustible gases in air are monitored with a Neotronix Ecotox Model 40. This instrument reports the level of combustible gases in air as a percentage of the Lower Explosive Limit (LEL). The combustible gas meter provides a general indication of the presence of high levels of volatile organics. The instrument does not provide information for trace levels of volatiles in air.

### 3.5.4 Detector Tubes

A variety of detector tubes are available for monitoring a specific compound or classes of compounds in air. Malcolm Pirnie utilizes a Drager hand pump for site monitoring. Selection of tubes is based on the parameters of concern and the detection level needed. A major advantage of detector tubes is the ability to obtain compound-specific, real-time information. The tubes are easily used by personnel with a minimum amount of training. The tubes are generally adequate for verifying the presence or absence of non-trace levels of numerous organic and inorganic compounds. They may not be adequate for off-site or non-work zone ambient air monitoring due to the low sample volume analyzed.

### 3.5.5 Particulates in Ambient Air

Particulate sampling of ambient air, mainly off-site or at the property line, is conducted with a high-volume (hi-vol) sampler. Basically this involves the use of a high-volume blower to draw air through one of more filters. The mass concentration in air of particulate samples of a given size is determined from the weight of particles collected and the volume of air pulled through the filter. Specific filters can be utilized depending on the nature of the particulates being monitored and whether chemical analyis of the particulates is needed.

# 4.0 FIELD MONITORING PROCEDURES

## 4.1 SOIL SCREENING FOR HYDROCARBON VAPOR DETECTION

### 4.1.1 General

During drilling activities, a total hydrocarbon vapor analyzer (HNU PI101) can be used to monitor the borehole and split-spoon samples upon opening of each sampler. The monitoring results will provide a vertical profile of possible soil contamination by volatile organic substances.

Generally, the hydrocarbon vapor analyzer is a portable trace gas analyzer that can be used to measure the concentration of a wide variety of organic vapors. The instrument relies upon the fact that an ultraviolet (UV) light source at a given intensity will emit photons with an energy level high enough to ionize many trace species, particularly organics, but not high enough to ionize the major components of air, ($O_2$, $N_2$, CO, $CO_2$) or $H_2O$.

Although the analyzer can be used to detect the presence of a single, pre-specified species, results should be taken as indicative rather than absolute. For precise results, a detailed lab analysis should be performed.

### 4.1.2 Procedure For Soil Screening

The following procedures shall be incorporated when testing for volatile organic vapors.

- Upon opening each split-spoon sampler, a subsample of the soil will be place into a precleaned glass VOA vial, sealed with a teflon-lined septum cap, labeled, and placed immediately on ice in an ice chest. The remainder of the sample will be placed in a comparable labeled wide-mouth glass jar and sealed with aluminum foil and a screw top cap. All samples of the latter type will be staged at a single location and maintained at a temperature that will be as near as possible to $70^0$ F. (Note that a VOA vial sample is not needed if screening will not be followed by laboratory analysis for volatile organics).

After a minimum of 15 minutes, and before the end of the work day, a head-space analysis of any organic vapor present in each sample bottle will be performed by inserting the sample probe of the total organic vapor analyzer through the aluminum foil seal.

### 4.1.3 Field Recording Procedure

Field records will be maintained during all field activities. Data and information which will be recorded during soil screening for hydrocarbon vapor detection will include:

- Date
- Time
- Location
- Sampler Name
- Weather
- General Observations/Remarks
- Sample Description and Identification
- Sample Handling Method
- Equipment Used
- Instrument Reading

## 4.2 SOIL BORING LOG DESCRIPTION PROCEDURES

### 4.2.1 General

This procedure is presented as a means for insuring proper field identification and description of soils collected from a split barrel sampler according to American Standard Testing Method (ASTM) D 1586, "Penetration Test and Split Barrel Sampling of Soils". The lithology and moisture content of each soil sample can be visually and physically characterized according to either the Burmister Soil Classification System or the Unified Soil Classification System. Both of these methods of soil classification describe soil types on the basis of grain size and liquid and plastic limits and include moisture content.

#### 4.2.2 Data Recording Forms

Enter all data pertaining to the soil descriptions on the Field Borehole Log. Write the dominant particle size in capital letters. Record additional notes such as water loss or gain, drill chatter, odor, etc.

Maintain a daily drilling report indicating the day's drilling activities. This latter report will include all drilling starting and ending times, footage drilled, consumables, and any other important notes about the day's drilling process.

#### 4.2.3 Soil Boring Sampling and Borehole Log Descriptions

1. Maintain a daily drilling report describing the day's activities in addition to the field borehole log.
2. With the split-spoon sample barrel resting on the bottom of the borehole, the entire length of the sampler (24 inches) is driven into the sub-soil by a 140 lb. weight free falling from a height of 30 inches.
3. Record the number of blows necessary to drive the sampler 6 inches on the borehole log sheet as blow counts. If the sampler is not driven the 6 inch interval after 100 blows are delivered, measure the penetration distance for that interval.
4. After the split-spoon is pried open with a screwdriver, measure and record the length of the sample, the upper 2 to 3 inches of the sample should be neglected since this material will consist of cuttings and sludge.
5. Shave a thin layer off the entire length of the sample to prevent descriptive errors that may result from smearing of the outer sample surface while the sample barrel is being driven.
6. After the sample has been described, place a representative portion of the sample in the pre-cleaned jars and tightly seal with a screw-on cap. Label the jar with the number of blow counts, sample interval, borehole number, and date and store at a safe location.

### 4.2.4 Descriptive Terms For Soil Characteristics

Use the following terms to identify major characteristics of the soils:

1. Color: Describe soil color utilizing a single color descriptor preceded by a modifier to denote variations in shade or color mixtures. Soil color should be described while the sample is still moist.
2. Density: Classify the relative density of a soil according to the number of blow counts from the standard penetration test while sampling:

| Designation | Blows per Foot |
|---|---|
| Very loose | 0 to 4 |
| Loose | 5 to 10 |
| Med. dense | 11 to 30 |
| Dense | 31 to 50 |
| Very dense | Over 50 |

3. Particle Size: Base particle size classification upon the grain sizes in the Burmister and Unifies Soil Classification Systems (See Tables 4-1 and 4-2).
4. Soil Descriptors: Describe the relative weight proportions of each soil sample using terms as: and, some, little or trace. Each term represents a range of percentage by weight. See the Burmister Classification System for further details (Table 4-1).
5. Moisture Content: Estimate moisture content according to four categories: dry, moist, wet and saturated. In dry soil, there appears to be little or no water. Saturated samples contain more water than can hold. Moist and wet are used to describe samples that contain more or less water than these two extremes. The application of these terms is subjective, but if consistency is used throughout the drilling project, they will prove to be adequate.

## TABLE 4-1

## KEY TO SOILS IDENTIFICATION
### Burmister Classification

### Granular Soils - Particle Size Classification

| Material | | Fractions | Passing | Retaines On |
|---|---|---|---|---|
| BOULDERS | Material retained on the 9 in. sieve | | | 9 in. |
| COBBLES | Material passing the 9 in. sieve and retained on the 3 in. sieve | | 9 in. | 3 in. |
| GRAVEL | Material passing the 3 in. sieve and retained on the No. 10 sieve | coarse (c) | 3 in. | 1 in. |
| | | medium (m) | 1 in. | 3/8 in. |
| | | fine (f) | 3/8 in. | No. 10 |
| SAND | Material passing the No. 10 sieve and retained on the No. 200 sieve | coarse (c) | No. 10 | No. 30 |
| | | medium (m) | No. 30 | No. 60 |
| | | fine (f) | No. 60 | No. 200 |
| SILT | Material passing the No. 200 sieve that is nonplastic in character and exhibits little or no strength when air-dried | | No. 200 | |

### Penetration Resistance and Soil Properties on Basis of the Standard Penetration Test (After Peck, Hanson and Thornburg, 1974)

| Sands (Fairly Reliable) | | Clays (Rather Unreliable) | |
|---|---|---|---|
| Number of Blows per ft. N | Relative Density | Number of Blows per ft. N | Consistency |
| | | Below 2 | Very Soft |
| 0-4 | Very Loose | 2-4 | Soft |
| 4-10 | Loose | 4-8 | Medium |
| 10-30 | Medium | 8-15 | Stiff |
| 30-50 | Dense | 15-30 | Very Stiff |
| Over 50 | Very Dense | Over 30 | Hard |

### Clay Soils - Plasticity Classification

| Material* | Degree of Overall Plasticity | Overall Plasticity Index Sand - Silt - Clay Components |
|---|---|---|
| Clayey SILT | Slight | 1 to 5 |
| SILT & CLAY | Low | 5 to 10 |
| CLAY & SILT | Medium | 10 to 20 |
| Silty CLAY | High | 20 to 40 |
| CLAY | Very High | 40 and greater |

*Soils passing the No. 200 sieve which can be made to exhibit plasticity and clay qualities within a certain range of moisture content, and which exhibits considerable strength when air-dried.

### Terms Identifying Composition of Soil

| Written* | Defining Range of Percentage by Weight |
|---|---|
| and | 35 to 50 |
| some | 20 to 35 |
| little | 10 to 20 |
| trace | 0 to 10 |

*Plus (+) or minus (-) sign used after identifying term denotes extremes of range, e.g., "some (-) Gravel" indicates 20 to 24 percent Gravel; "some (+) Gravel" indicates 31 to 35 percent Grave.

# TABLE 4-2

# SOIL TERMS

## UNIFIED SOIL CLASSIFICATION ( USCS )

### COARSE GRAINED SOILS

More than half of material is LARGER than No. 200 sieve size

| FIELD IDENTIFICATION PROCEDURES (Excluding particles larger than 3" & basing fractions on estimated weights) | | | GROUP SYMBOLS | TYPICAL NAMES |
|---|---|---|---|---|
| GRAVELS 50%(±) > 1/4" ø | CLEAN GRAVELS Low % fines | Wide range in grain size and substantial amounts of all intermediate particle sizes | GW | Well graded gravels, gravel-sand mixtures, little or no fines |
| | | Predominantly one size or a range of sizes with some intermediate sizes missing | GP | Poorly graded gravels, gravel-sand mixtures, little or no fines |
| | GRAVELS W/FINES High % fines | Non-plastic fines (for identification procedures see ML) | GM | Silty gravels, poorly graded gravel-sand-silt mixtures |
| | | Plastic fines (for identification procedures see CL) | GC | Clayey gravels, poorly graded gravel-sand-clay mixtures |
| SANDS 50% (±) < 1/4" ø | CLEAN SANDS Low % fines | Wide range in grain size and substantial amounts of all intermediate particle sizes | SW | Well graded sand, gravelly sands, little or no fines |
| | | Predominantly one size or a range of sizes with some intermediate sizes missing | SP | Poorly graded sands, gravelly sands, little or no fines |
| | SANDS W/FINES High % fines | Non-plastic fines (for identification procedures see ML) | SM | Silty sands, poorly graded sand-silt mixtures |
| | | Plastic fines (for identification procedures see CL) | SC | Clayey sands, poorly graded sand-clay mixtures |

### FINE GRAINED SOILS

More than half of material is SMALLER than No. 200 sieve size

| FIELD IDENTIFICATION PROCEDURES (Excluding particles larger than 3" & basing fractions on estimated weights) | | | | GROUP SYMBOLS | TYPICAL NAMES |
|---|---|---|---|---|---|
| Identification procedures on fraction smaller than No. 40 sieve size | | | | | |
| | DRY STRENGHTH (Crushing Characteristics) | DILATANCY (Reaction to Shaking) | TOUGHNESS (Consistency Near Plastic Limit) | | |
| SILTS & CLAYS Liquid limit < 50 | None to slight | Quick to slow | None | ML | Inorganic silts and very fine sands, rock flour, silty or clayey fine sands with slight plasticity |
| | Medium to high | None to very slow | Medium | CL | Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays |
| | Slight to medium | Slow | Slight | OL | Organic silts and organic silt-clays of low plasticity |
| SILTS & CLAYS Liquid limit > 50 | Slight to medium | Slow to none | Slight to medium | MH | Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts |
| | High to very high | None | High | CH | Inorganic clays of high plasticity, fat clays |
| | Medium to high | None to very slow | Slight to medium | OH | Organic clays of medium to high plasticity |
| HIGHLY ORGANIC SOILS | Readily identified by color, odor, spongy feel and frequently by fibrous texture | | | Pt | Peat and other organic soils |

Boundary classifications-Soils possessing characteristics of two groups are designated by combining group symbols. For example GW-GC, well graded gravel-sand mixture with clay binder.
All sieve sizes on this chart are U.S. standard.

### DENSITY OF GRANULAR SOILS

| DESIGNATION | STANDARD PENETRATION RESISTANCE - BLOWS/FOOT |
|---|---|
| Very loose | 0 - 4 |
| Loose | 5 - 10 |
| Medium dense | 11 - 30 |
| Dense | 31 - 50 |
| Very dense | Over 50 |

### CONSISTENCY OF COHESIVE SOILS

| CONSISTENCY | UNC. COMPRESSIVE STR. TONS /SQ. FT. | STANDARD PENETRATION RESISTANCE — BLOWS/FOOT | FIELD IDENTIFICATION METHODS |
|---|---|---|---|
| Very soft | Less than 0.25 | 0 to 2 | Easily penetrated several inches by fist |
| Soft | 0.25 to 0.50 | 2 to 4 | Easily penetrated several inches by thumb |
| Medium stiff | 0.50 to 1.0 | 4 to 8 | Can be penetrated several inches by thumb |
| Stiff | 1.0 to 2.0 | 8 to 15 | Readily indented by thumb |
| Very stiff | 2.0 to 4.0 | 15 to 30 | Readily indented by thumbnail |
| Hard | More than 4.0 | Over 30 | Indented with difficulty by thumbnail |

## ROCK TERMS

### ROCK HARDNESS ( FROM CORE SAMPLES )

| DESCRIPTIVE TERMS | SCREWDRIVER OR KNIFE EFFECTS | HAMMER EFFECTS |
|---|---|---|
| Soft | Easily gouged | Crushes when pressed with hammer |
| Medium soft | Can be gouged | Breaks (one blow) Crumbly edges |
| Medium hard | Can be scratched | Breaks (one blow) Sharp edges |
| Hard | Cannot be scratched | Breaks conchoidally (several blows) Sharp edges |

### ROCK BROKENNESS

| DESCRIPTIVE TERMS | ABBREVIATION | SPACING |
|---|---|---|
| Very broken | (V. Br.) | 0 - 2" |
| Broken | (Br.) | 2" - 1' |
| Blocky | (Bl.) | 1' - 3' |
| Massive | (M.) | 3' - 10' |

## LEGEND

**SOIL SAMPLES - TYPES**

S - 2" O.D. Split Barrel Sample
ST - 3" O.D. Undisturbed Sample
O - Other Samples, Specify in Remarks

**ROCK SAMPLES - TYPES**

X - NX ( Conventional ) Core (~ 2-1/8" O.D. )
Q - NQ ( Wireline ) Core ~1-7/8" O.D. )
Z - Other Core Sizes, Specify in Remarks

**WATER LEVELS**

12/18
▽ 12.6' Initial Level w/Date & Depth
12/18
▼ 12.6' Stabilized Level w/Date & Depth

## 4.3 HYDRAULIC CONDUCTIVITY DATA COLLECTION

### 4.3.1 General

This procedure is presented for calculating the hydraulic conductivity of an aquifer from the rate of rise or fall of the water level in a monitoring well after a certain volume of water is removed or added.

### 4.3.2 Data Collection Procedures

1. Obtain the static ground water surface elevation by measuring the distance from the ground water surface to a stable reference point (viz., top of well riser) with an electronic water level indicator. The top of the protective steel casing should not be used as a reference point since th elevation may be altered by physical disturbance (i.e., heaving due to freeze-thaw cycles, disturbance resulting from vehicle or other heavy equipment bumping into protective casings, etc.)
2. Remove or add a known volume of water (slug).
3. Quickly measure the water level with the electronic water level indicator and note the time corresponding to that reading. Simultaneously read and record the water level and time every 15 seconds for the first 2 to 3 minutes. The frequency of subsequent water level and time recording are based upon the rate of well recovery and are generally taken every few minutes. Record all readings in the field notebook.

### 4.3.3 Calculation of Hydraulic Conductivity

A slug-test procedure applicable to fully or partially penetrating wells in unconfined aquifers was developed by Bouwer and Rice (1976). The procedure is based on the Thiem equation (1) and assumes negligible drawdown of the water table around the well and no flow above the water table.

$$Q = \frac{2\,(3.1416)KD(h_2-h_1)}{\ln\,(r_2/r_1)} \qquad (1)$$

The term $h_2-h_1$ in Eq. 1 then represents the distance y of the water level in the well below the water table (Figure 4-1).

The rate of rise dy/dt of the water level after removal of water is expressed as

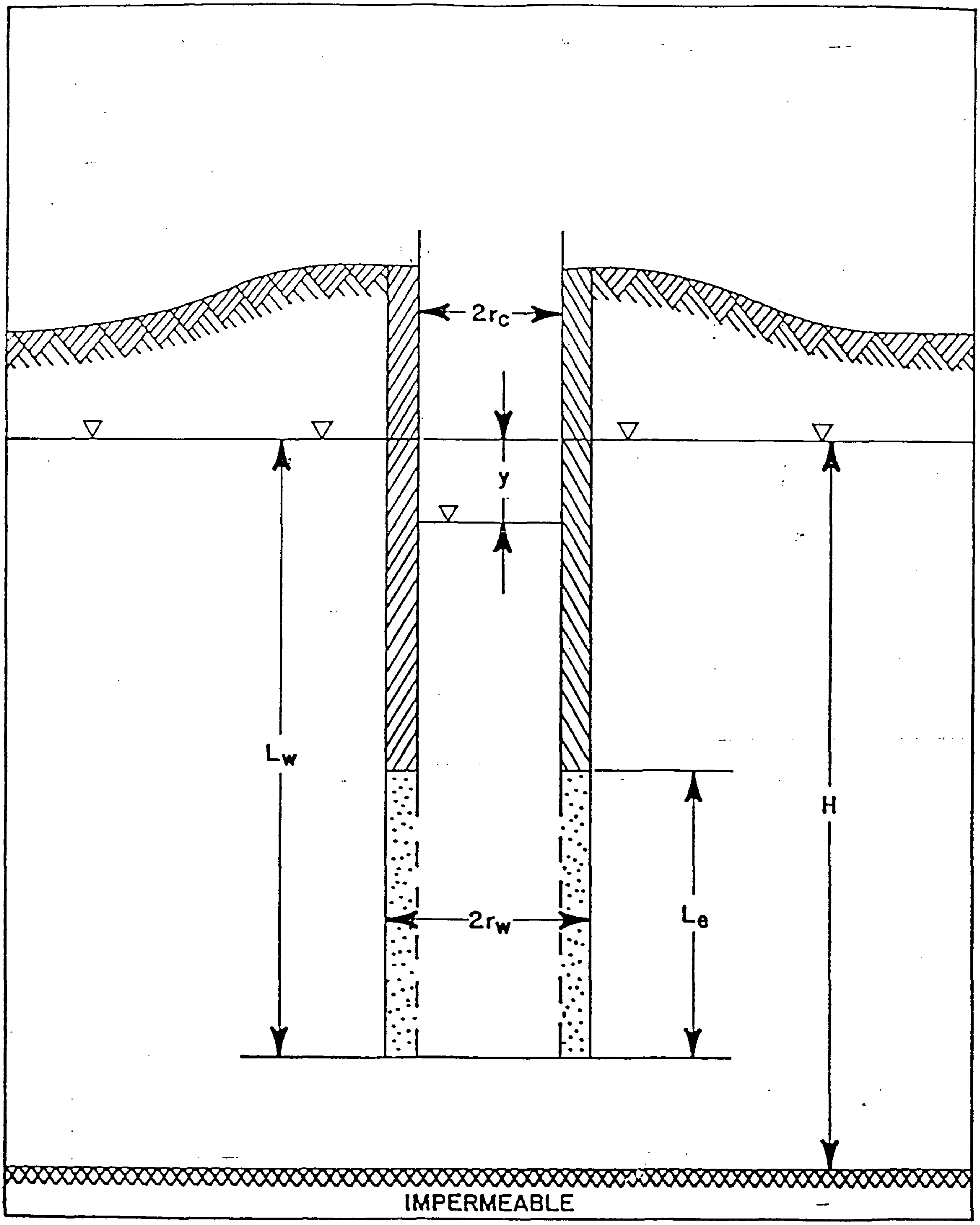
$$\frac{dy}{dt} = -\frac{Q}{(3.1416)r_c^2} \qquad (2)$$

where $r_c$ is the radius of the well section where the water level is rising and Q is the flow of ground water into the well. The minus sign in Eq. (2) is introduced because y decreases with increasing t, so that dy/dt is negative. Substituting the Thiem equation (1) for Q in Eq (2), integrating, and solving for K yields

$$K = \frac{r_c^2 \ln\,(R_e/r_w)}{2L_e}\,\frac{1}{t}\,\ln\frac{y_o}{y_t} \qquad (3)$$

where $R_e$ = effective radial distance over which the head difference y is dissipated

$r_w$ = radial distance between well center and undisturbed aquifer ($r_c$ plus thickness of gravel envelope or developed zone outside casing)



MALCOLM PIRNIE

GEOMETRY & SYMBOLS OF MONITORING WELL

MALCOLM PIRNIE, INC.

FEBRUARY 1989

FIGURE 4-1

$L_e$ = height of perforated, screened, uncased, or otherwise open section of well through which ground water enters

$y_o$ = y at time zero

$y_t$ = y at time t

t = time since $y_o$

The effective radius $R_e$ is essentially the effective value of $r_2$ to be used in Eq. (1) so that it gives the correct value of Q (the Thiem equation was developed for horizontal flow only and as such cannot be used to calculate Q for the system of Figure 4-1). Values of $R_e$ were experimentally determined with a resistance network analog for different values of $r_w$, $L_e$, $L_w$ and H (see Figure 4-1 for meaning of symbols). The following empirical equation was then developed to relate $R_e$ to the geometry and boundary conditions of the system

$$\ln \frac{Re}{r_w} = \frac{1}{\dfrac{1.1}{\ln(L_w/r_w)} + \dfrac{A + B \ln [(H - L_w)/r_w]}{(L_e/r_w)}} \qquad (4)$$

where A and B are dimensionless parameters shown in Figure 2 in relation to $L_e/r_w$. If H is much larger than $L_w$, a further increase in H has little effect on the flow system and, hence, on $R_e$. The analog analyses indicated that the effective upper limit of $\ln[(H - L_w)/r_w]$ is 6. Thus, if $H - L_w$ is so large that $\ln[(H - L_w)/r_w]$ is greater than 6, a value of 6 should still be used for this term in Eq (4) including the theoretical case of H = . If $H = L_w$ (well penetrating to bottom of aquifer), the term $\ln [(H - L_w)/r_w]$ in Eq. (4) cannot be used. For this situation, the equation for $\ln (R_e/r_w)$ is:

$$\ln \frac{R_e}{r_w} = \frac{1}{\dfrac{1.1}{\ln(L_w/r_w)} + \dfrac{C}{(L_e/r_w)}} \qquad (5)$$

where C is a dimensionless coefficient shown in Figure 4-2 as a function of $L_e/r_w$. The value of $\ln(R_e/r_w)$ calculated with Eqs. (4) and (5) is within 10 percent of the analog value if $L_e$ is greater than $0.4L_w$ and within 25 percent if $L_e$ is less than $0.2L_w$.

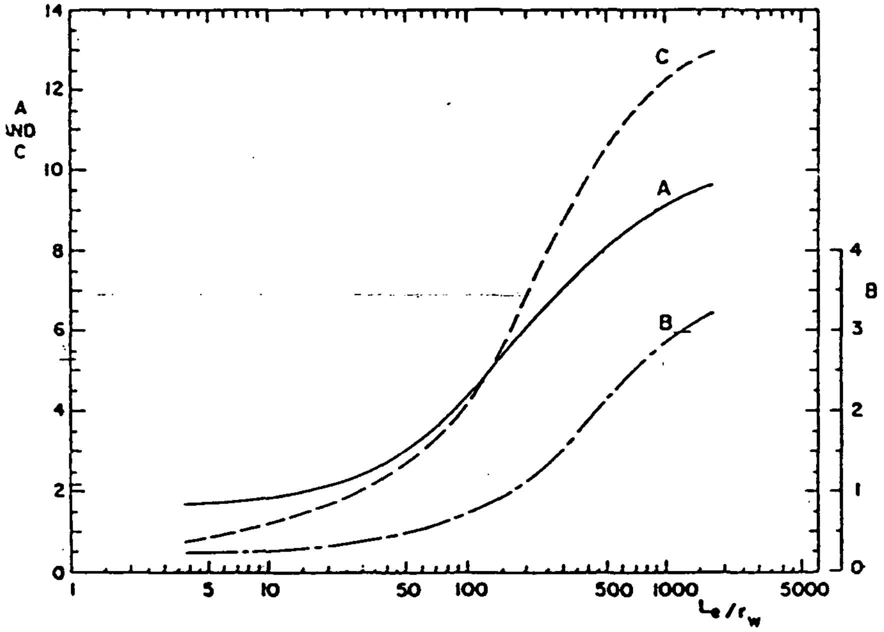


Figure 4-2. Curves relating to coefficients A, B, and C to $L_e/r_w$

Since K, $r_c$, $R_e$, $r_w$, and $L_e$ are constant for a given well, $1/t \ln(y_0/y_t)$ must also be constant, as indicated by Eq. (3). Thus, when the observed values of y are plotted against t on semilogarithmic paper (y on the log scale), the data points should form a straight line.

# 5.0 SAMPLE INTEGRITY

## 5.1 EQUIPMENT CLEANING

Contamination of samples is precluded by proper cleaning of sampling equipment and containers prior to their use in the field, or by the utilization of dedicated equipment. The actual cleaning process is dictated by the analytical procedures designated for the sample, but usually includes the following steps:

1. detergent washing
2. rinse with tap water
3. rinse with a dilute hydrochloric acid solution (inorganics only)
4. one or more rinses with distilled water
5. rinse with hexane
6. rinse with organic-free water

Steps 5 and 6 are generally performed only when samples are to be analyzed for organic compounds.

The cleaning is performed prior to going out in the field. When discrete samples are to be collected at multiple locations, additional cleaning between samples is performed on-site to prevent carry-over of contaminants. Also, in the case of surface water sampling, the sample jars are usually rinsed in the field with sample water prior to filling. During sampling, equipment is not allowed to come in contact with the ground, other equipment, or potential sources of contamination.

The use of dedicated equipment is optimal for projects where a long-term monitoring program is in place, or where protection from contamination is not adequate through the use of normal cleaning procedures. Malcolm Pirnie frequently uses dedicated equipment for extended ground water monitoring programs. In this application, well bailers and pumps are used in only one well and are stored in the well between samplings.

## 5.2 CONTAINERS, PRESERVATIVES AND HOLDING TIMES

Sample integrity is preserved through the use of proper sample containers, addition of the correct preservatives to the samples and meeting designated holding times (the time from sample collection to sample analysis). Containers, preservatives and holding times used by Malcolm Pirnie are taken from 40 CFR Part 136 and are shown in Table 5-1. Note that preservation techniques, other than cooling to 4°C, and holding times have not been promulgated for soil samples. Holding time for samples submitted for volatile organic analysis will be seven days from the day the sample is taken. This requirement applies to all sample matrices.

## 5.3 QUALITY CONTROL SAMPLES

### 5.3.1 Trip Blanks

Trip blanks are prepared prior to going on-site. Clean sample bottles are filled with distilled or organic-free water, depending on the analyses to be performed. These blanks are taken to the site, kept with the samples collected there, and submitted to the laboratory for the same analyses that the samples will receive. Results of the analysis will be indicative of quality control on container cleanliness, external contamination and the analytical method. Trip blanks are only utilized for water samples.

### 5.3.2 Field Blanks

Field blanks are prepared in the field. Distilled or organic-free water is placed in or through the sampling equipment in the same manner that a sample would be collected, placed in a clean sample container, and preserved like other samples. Analysis of the field blank will indicate potential contamination from sampling equipment, sample preservation and external site conditions. Field blanks are not used for dedicated well bailers if no preservative is utilized. Field blanks are only used for water samples.

### 5.3.3 Duplicate and Split Samples

Duplicate samples are multiple samples collected at the same time, from the same location, and using the same procedure and containers.

Revised Text

# TABLE 5-1
# REQUIRED CONTAINERS, PRESERVATION TECHNIQUES, AND HOLDING TIMES
Page 1 of 2

| Parameter No./name | Container [1] | Preservation [2,3] | Maximum holding time [4] |
|---|---|---|---|
| Table IA—Bacterial Tests: | | | |
| 1–4. Coliform, fecal and total | P, G | Cool, 4°C, 0.008% $Na_2S_2O_3$ [5] | 6 hours. |
| 5. Fecal streptococci | P, G | do | Do. |
| Table IB—Inorganic Tests: | | | |
| 1. Acidity | P, G | Cool, 4°C | 14 days. |
| 2. Alkalinity | P, G | do | Do. |
| 4. Ammonia | P, G | Cool, 4°C, $H_2SO_4$ to $pH<2$ | 28 days. |
| 9. Biochemical oxygen demand | P, G | Cool, 4°C | 48 hours. |
| 11. Bromide | P, G | None required | 28 days. |
| 14. Biochemical oxygen demand, carbonaceous. | P, G | Cool, 4°C | 48 hours. |
| 15. Chemical oxygen demand | P, G | Cool, 4°C, $H_2SO_4$ to $pH<2$ | 28 days. |
| 16. Chloride | P, G | None required | Do. |
| 17. Chlorine, total residual | P, G | do | Analyze immediately. |
| 21. Color | P, G | Cool, 4°C | 48 hours. |
| 23–24. Cyanide, total and amenable to chlorination. | P, G | Cool, 4°C, NaOH to $pH>12$, 0.6g ascorbic acid [5]. | 14 days.[6] |
| 25. Fluoride | P | None required | 28 days. |
| 27. Hardness | P, G | $HNO_3$ to $pH<2$, $H_2SO_4$ to $pH<2$. | 6 months. |
| 28. Hydrogen ion (pH) | P, G | None required | Analyze immediately. |
| 31, 43. Kjeldahl and organic nitrogen | P, G | Cool, 4°C, $H_2SO_4$ to $pH<2$ | 28 days. |
| Metals:[7] | | | |
| 18. Chromium VI | P, G | Cool, 4°C | 24 hours. |
| 35. Mercury | P, G | $HNO_3$ to $pH<2$ | 28 days. |
| 3, 5–8, 10, 12, 13, 19, 20, 22, 26, 29, 30, 32–34, 36, 37, 45, 47, 51, 52, 58–60, 62, 63, 70–72, 74, 75. Metals, except chromium VI and mercury. | P, G | do | 6 months. |
| 38. Nitrate | P, G | Cool, 4°C | 48 hours. |
| 39. Nitrate-nitrite | P, G | Cool, 4°C, $H_2SO_4$ to $pH<2$ | 28 days. |
| 40. Nitrite | P, G | Cool, 4°C | 48 hours. |
| 41. Oil and grease | G | Cool, 4°C, $H_2SO_4$ to $pH<2$ | 28 days. |
| 42. Organic carbon | P, G | Cool, 4°C, HCl or $H_2SO_4$ to $pH<2$. | Do. |
| 44. Orthophosphate | P, G | Filter immediately, Cool, 4°C | 48 hours. |
| 46. Oxygen, Dissolved Probe | G Bottle and top. | None required | Analyze immediately. |
| 47. Winkler | do | Fix on site and store in dark | 8 hours. |
| 48. Phenols | G only | Cool, 4°C, $H_2SO_4$ to $pH<2$ | 28 days. |
| 49. Phosphorus (elemental) | G | Cool, 4°C | 48 hours. |
| 50. Phosphorus, total | P, G | Cool, 4°C, $H_2SO_4$ to $pH<2$ | 28 days. |
| 53. Residue, total | P, G | Cool, 4°C | 7 days. |
| 54. Residue, Filterable | P, G | do | 7 days. |
| 55. Residue, Nonfilterable (TSS) | P, G | do | 7 days. |
| 56. Residue, Settleable | P, G | do | 48 hours. |
| 57. Residue, volatile | P, G | do | 7 days. |
| 61. Silica | P | do | 28 days. |
| 64. Specific conductance | P, G | do | Do. |
| 65. Sulfate | P, G | do | Do. |
| 66. Sulfide | P, G | Cool, 4°C add zinc acetate plus sodium hydroxide to $pH>9$. | 7 days. |
| 67. Sulfite | P, G | None required | Analyze immediately. |
| 68. Surfactants | P ,G | Cool, 4°C | 48 hours. |
| 69. Temperature | P, G | None required | Analyze. |
| 73. Turbidity | P, G | Cool, 4°C | 48 hours. |
| Table IC—Organic Tests.[8] | | | |
| 13, 18–20, 22, 24–28, 34–37, 39–43, 45–47, 56, 66, 88, 89, 92–95, 97. Purgeable Halocarbons. | G, Teflon-lined septum. | Cool, 4°C, 0.008% $Na_2S_2O_3$.[5] | 7 days. |
| 6, 57, 90. Purgeable aromatic hydrocarbons | do | Cool, 4°C, 0.008% $Na_2S_2O_3$[5], HC1 to pH2[9]. | Do. |
| 3, 4, Acrolein and acrylonitrile | do | Cool, 4°C, 0.008% $Na_2S_2O_3$[5]; Adjust pH to 4–5 [10]. | Do. |
| 23, 30, 44, 49, 53, 67, 70, 71, 83, 85, 96. Phenols [11]. | G, Teflon-lined cap. | Cool, 4°C, 0.008% $Na_2S_2O_3$[5] | 7 days until extraction, 40 days after extraction. |
| 7, 38. Benzidines[11] | do | do | 7 days until extraction.[13] |
| 14, 17, 48, 50–52. Phthalate esters[11] | do | Cool, 4°C | 7 days until extraction; 40 days after extraction. |
| 72–74. Nitrosamines[11,14] | do | Cool, 4°C, store in dark, 0.008% $Na_2S_2O_3$[5]. | Do. |
| 76–82. PCBs[11] acrylonitrile | do | Cool, 4°C | Do. |
| 54, 55, 65, 69. Nitroaromatics and isophorone[11] | do | Cool, 4°C, 0.008% $Na_2S_2O_3$[5] store in dark. | Do. |
| 1, 2, 5, 8–12, 32, 33, 58, 59, 64, 68, 84, 86. Polynuclear aromatic hydrocarbons.[11]. | do | do | Do. |
| 15, 16, 21, 31, 75. Haloethers[11]. | do | Cool, 4°C, 0.008% $Na_2S_2O_3$[5] | Do. |
| 29, 35–37, 60–63, 91. Chlorinated hydrocarbons [11]. | do | Cool, 4°C | Do. |
| 87. TCDD [11] | do | Cool, 4°C, 0.008% $Na_2S_2O_3$[5] | Do. |
| Table ID—Pesticides Tests: | | | |
| 1-70. Pesticides [11] | do | Cool, 4°C, pH 5-9 [15] | Do. |
| Table IE—Radiological Tests: | | | |
| 1-5. Alpha, beta and radium | P, G | $HNO_3$ to $pH<2$ | 6 months. |

# TABLE 5-1
# REQUIRED CONTAINERS, PRESERVATION TECHNIQUES, AND HOLDING TIMES
Page 2 of 2

[1] Polyethylene (P) or Glass (G).

[2] Sample preservation should be performed immediately upon sample collection. For composite chemical samples each aliquot should be preserved at the time of collection. When use of an automated sampler makes it impossible to preserve each aliquot, then chemical samples may be preserved by maintaining at 4°C until compositing and sample splitting is completed.

[3] When any sample is to be shipped by common carrier or sent through the United States Mails, it must comply with the Department of Transportation Hazardous Materials Regulations (49 CFR Part 172). The person offering such material for transportation is responsible for ensuring such compliance. For the preservation requirements of Table II, the Office of Hazardous Materials, Materials Transportation Bureau, Department of Transportation has determined that the Hazardous Materials Regulations do not apply to the following materials: Hydrochloric acid (HCl) in water solutions at concentrations of 0.04% by weight or less (pH about 1.96 or greater); Nitric acid ($HNO_3$) in water solutions at concentrations of 0.15% by weight or less (pH about 1.62 or greater); Sulfuric acid ($H_2SO_4$) in water solutions at concentrations of 0.35% by weight or less (pH about 1.15 or greater); and Sodium hydroxide (NaOH) in water solutions at concentrations of 0.080% by weight or less (pH about 12.30 or less).

[4] Samples should be analyzed as soon as possible after collection. The times listed are the maximum times that samples may be held before analysis and still be considered valid. Samples may be held for longer periods only if the permittee, or monitoring laboratory, has data on file to show that the specific types of samples under study are stable for the longer time, and has received a variance from the Regional Administrator under § 136.3(e). Some samples may not be stable for the maximum time period given in the table. A permittee, or monitoring laboratory, is obligated to hold the sample for a shorter time if knowledge exists to show that this is necessary to maintain sample stability. See § 136.3(e) for details.

[5] Should only be used in the presence of residual chlorine.

[6] Maximum holding time is 24 hours when sulfide is present. Optionally all samples may be tested with lead acetate paper before pH adjustments in order to determine if sulfide is present. If sulfide is present, it can be removed by the addition of cadmium nitrate powder until a negative spot test is obtained. The sample is filtered and then NaOH is added to pH 12.

[7] Samples should be filtered immediately on-site before adding preservative for dissolved metals.

[8] Guidance applies to samples to be analyzed by GC, LC, or GC/MS for specific compounds.

[9] Sample receiving no pH adjustment must be analyzed within seven days of sampling.

[10] The pH adjustment is not required if acrolein will not be measured. Samples for acrolein receiving no pH adjustment must be analyzed within 3 days of sampling.

[11] When the extractable analytes of concern fall within a single chemical category, the specified preservative and maximum holding times should be observed for optimum safeguard of sample integrity. When the analytes of concern fall within two or more chemical categories, the sample may be preserved by cooling to 4°C, reducing residual chlorine with 0.008% sodium thiosulfate, storing in the dark, and adjusting the pH to 6-9; samples preserved in this manner may be held for seven days before extraction and for forty days after extraction. Exceptions to this optional preservation and holding time procedure are noted in footnote 5 (re the requirement for thiosulfate reduction of residual chlorine), and footnotes 12, 13 (re the analysis of benzidine).

[12] 1,2-diphenylhydrazine is likely to be present, adjust the pH of the sample to 4.0 ± 0.2 to prevent rearrangement to benzidine.

[13] Extracts may be stored up to 7 days before analysis if storage is conducted under an inert (oxidant-free) atmosphere.

[14] For the analysis of diphenylnitrosamine, add 0.008% $Na_2S_2O_3$ and adjust pH to 7-10 with NaOH within 24 hours of sampling.

[15] The pH adjustment may be performed upon receipt at the laboratory and may be omitted if the samples are extracted within 72 hours of collection. For the analysis of aldrin, add 0.008% $Na_2S_2O_3$.

These samples provide a check on any variability introduced during the sampling process. Split samples are one sample that is divided into two or more aliquots. The aliquots may then be sent to separate laboratories as a check on analytical results or one of the aliquots may be assigned a fictitious number and submitted to the same laboratory as a "blind split". This "blind split" is a check on the analytical variability within the laboratory.

Unless otherwise specified, a field blank and trip blank are used by Malcolm Pirnie for each day of sampling. Duplicate or split samples are collected at a rate of approximately 5% (1 in 20) for each type of sample.

### 5.3.4 Matrix Spike Samples

Matrix spikes and matrix spike duplicates are collected, when required by the work plan, in the same manner as duplicate samples (see Section 5.3.3). The extra sample volume is used by the analytical laboratory to prepare sample aliquots to which they add known concentrations of sample constituents. Recovery rates of the spike compounds provide quality control data on the sample extraction/digestion procedures and also indicate sample matrix effects.

## 5.4 CHAIN-OF-CUSTODY

An important part of quality control is proper documentation of all aspects of the sampling program. This includes careful labeling of the sample containers, the use of field logs to record pertinent data on-site during sampling events, and the use of chain-of-custody sheets which accompany the sample from collection through analysis. Malcolm Pirnie uses pre-gummed labels with spaces to record client name, sample location, date and time of sampling, sampler's name, filtered or not, preservatives added, and sample ID number. The chain-of-custody sheets used by Malcolm Pirnie includes all the information on the label, and in addition: sample type, sampling method, number and type of containers, name, date and time of delivering and receiving the sample at the laboratory, and the date, method and person performing each sampling. Custody sheets used specifically for well-monitoring include information on the type of well, size of well, well depth, depth to water, number of volumes pumped, total volume and pH, temperature, color and appearance of the sample. Standard documents used by Malcolm Pirnie are included in Appendix C of this report. Care should be taken to avoid the use of inks that run when wetted.

# 6.0 FIELD INSTRUMENT CALIBRATION AND MAINTENANCE

## 6.1 INTRODUCTION

Calibration and maintenance procedures for the field instruments identified below are presented in the following sections.

## 6.2 PORTABLE FIELD pH METER

### 6.2.1 Accuracy

The calibrated accuracy of the pH meter will be 0.1 pH unit, over the temperature range of -2°C to 40°C.

### 6.2.2 Calibration

The pH meter will be calibrated by immersing the sensing probe in a container of certified pH buffer solution traceable to the National Bureau of Standards. The meter reading will be compared to the known value of the buffer solution, which is stirred. The meter will be two-point calibrated in the field at the beginning and end of each group of measurements. Precalibration at the office will be performed for local jobs.

### 6.2.3 Maintenance

1. When not in use or between measurements, the pH probe will be kept immersed in or moist with buffer solution.
2. The meter batteries will be checked at the end of each day and replaced when needed.
3. The pH probe will be replaced any time that the meter response time becomes greater than two minutes or the metering system consistently fails to retain its calibrated accuracy for a minimum of ten sample measurements.
4. If replacement of the pH probe fails to resolve instrument response time and stability problems, the instrument will be sent to the manufacturer for maintenance and repair.

5. A maintenance log will be kept for each pH monitoring instrument. All maintenance performed on the instrument will be recorded on this log with date and name of the organization performing the maintenance.

### 6.2.4 Data Validation

All instrument calibrations will be documented, indicating the meter readings before and after the meter has been adjusted. The pH buffers used to calibrate the meter will also be documented. This is important, not only for data validation, but also to establish maintenance schedules and component replacement.

## 6.3 PORTABLE FIELD CONDUCTIVITY METER

### 6.3.1 Accuracy

The calibrated accuracy of the specific-conductance meter will be within three percent of full-scale over the temperature range of -2°C to 40°C.

### 6.3.2 Calibration

The specific-conductance meter will be calibrated by immersing the sensor in a container of potassium-chloride standard solution and comparing the meter reading with the known value of the standard solution. The potassium-chloride solution will be prepared in accordance with Standard Methods for the Examination of Water and Wastewater, sixteenth edition, 1985, Part 205, or a purchased standard solution will be used.

### 6.3.3 Maintenance

1. The meter batteries will be checked at the end of each day and replaced when needed.
2. The meter response time and stability will be tracked to determine the need for instrument maintenance. When response time becomes greater than two minutes and the meter must be recalibrated more than once per day, the instrument will be sent to the manufacturer for maintenance and repair.

3. A maintenance log will be kept for each specific-conductance meter. All maintenance performed on the instrument will be recorded on this log with date and name of the organization performing the maintenance.

### 6.3.4 Data Validation

All instrument calibrations will be documented, indicating the meter readings before and after the meter has been adjusted. The standard solution used to calibrate the meter will also be documented.

## 6.4 HNU PHOTOIONIZATION ANALYZER

### 6.4.1 Accuracy

The HNU PI101 is temperature compensated so that a 20°C change in temperature corresponds to a change in reading of less than two percent full-scale at maximum sensitivity. The useful range of the instrument is from 0.2 to 2000 ppm. Response time is less than three seconds to 90 percent of full-scale.

### 6.4.2 Calibration

The meter will be calibrated using a cylinder of pressurized gas certified by a reputable supplier. The calibration gas will be in the same matrix in which the measurements will be taken. The span pot will be adjusted so the instrument will read the exact value of the calibration gas. For a HNU factory-calibrated by benzene, the calibration will be made using bottled "span gas" supplied by HNU.

### 6.4.3 Maintenance

1. If any of the following conditions occur, consult the troubleshooting guide provided in the Instruction Manual:

   a. No meter response in any switch position (including BATT CHK).

b. Meter response in BATT CHK, but reads zero or near zero for all others.

c. Instrument reads correctly in BATT CHK and STBY, but not in measuring mode.

d. Instrument responds in all positions, but signal is lower than expected.

e. Erratic meter movement occurs.

f. Instrument response slow or irreproducible.

g. Low battery indicator.

Should the troubleshooting techniques fail to resolve the problem, send the instrument to the manufacturer for repair and maintenance.

2. The light source window will be cleaned every four weeks during periods of continued use.

3. The meter battery will be checked at the beginning and end of each day. If the needle is not within or above the green battery arc on the scale-plate, the battery will be recharged prior to making any measurements.

### 6.4.4 Data Validation

All instrument calibrations will be documented, indicating meter readings and the standard gas mixture utilized.

# QAPP

# APPENDIX A

# REFERENCES

# REFERENCES

1. USEPA, Characterization of Hazardous Waste Sites - A Methods Manual: Volume II, Available Sampling Methods, Second Edition, EPA-600/4-84-076, December 1984.

2. USEPA, RCRA Ground-Water Monitoring Technical Enforcement Guidance Document, OSWER-9950.1, September 1986.

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

4. USEPA, Procedures Manual For Ground Water Monitoring At Solid Waste Disposal Facilities, SW-611, December 1980.

5. USEPA, Practical Guide For Ground-Water Sampling, EPA/600/2-85/104, September 1985.

6. USEPA, Sediment Sampling Quality Assurance User's Guide, EPA/600/4-85/048, July 1985.

7. USEPA, Test Methods For Evaluating Solid Waste, Physical/Chemical Methods, SW846, third edition, September 1986.

8. 40 CFR 136.3, Table II - Required Containers, Preservation Techniques, and Holding Times.

9. USEPA, Soil Sensing For Detection and Mapping of Volatile Organics, EPA/600/8-87/036, August 1987.

# QAPP

# APPENDIX B

# ASTM METHOD D-1586

Designation: D 1586 - 67 (Reapproved 1974)

## Standard Method for

# PENETRATION TEST AND SPLIT-BARREL SAMPLING OF SOILS[1]

This standard is issued under the fixed designation D 1586; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

*This method has been approved for use by agencies of the Department of Defense and for listing in the DoD Index of Specifications and Standards.*

## 1. Scope

1.1 This method describes a procedure for using a split-barrel sampler to obtain representative samples of soil for identification purposes and other laboratory tests, and to obtain a measure of the resistance of the soil to penetration of the sampler.

## 2. Apparatus

2.1 *Drilling Equipment*—Any drilling equipment shall be acceptable that provides a reasonably clean hold before insertion of the sampler to ensure that the penetration test is performed on undisturbed soil, and that will permit the driving of the sampler to obtain the sample and penetration record in accordance with the procedure described in Section 3. To avoid "whips" under the blows of the hammer, it is recommended that the drill rod have a stiffness equal to or greater than the A-rod. An "A" rod is a hollow drill rod or "steel" having an outside diameter of 1⅝ in. (41.2 mm) and an inside diameter of 1⅛ in. (28.5 mm), through which the rotary motion of drilling is transferred from the drilling motor to the cutting bit. A stiffer drill rod is suggested for holes deeper than 50 ft (15 m). The hole shall be limited in diameter to between 2¼ and 6 in. (57.2 and 152 mm).[2]

2.2 *Split-Barrel Sampler*—The sampler shall be constructed with the dimensions indicated in Fig. 1. The drive shoe shall be of hardened steel and shall be replaced or repaired when it becomes dented or distorted.

mm) (minimum diameter) vent ports and shall contain a ball check valve. If sizes other than the 2-in. (50.8-mm) sampler are permitted, the size shall be conspicuously noted on all penetration records.

2.3 *Drive Weight Assembly*—The assembly shall consist of a 140-lb (63.5-kg) weight, a driving head, and a guide permitting a free fall of 30 in. (0.76 m). Special precautions shall be taken to ensure that the energy of the falling weight is not reduced by friction between the drive weight and the guides.

2.4 *Accessory Equipment*—Labels, data sheets, sample jars, paraffin, and other necessary supplies should accompany the sampling equipment.

## 3. Procedure

3.1 Clear out the hole to sampling elevation using equipment that will ensure that the material to be sampled is not disturbed by the operation. In saturated sands and silts withdraw the drill bit slowly to prevent loosening of the soil around the hole. Maintain the water level in the hole at or above ground water level.

3.2 In no case shall a bottom-discharge bit be permitted. (Side-discharge bits are permissible.) The process of jetting through an open-tube sampler and then sampling when the

---

[1] This method is under the jurisdiction of ASTM Committee D-18 on Soil and Rock.

Current edition approved Oct. 20, 1967. Originally issued 1958. Replaces D 1586 - 64 T.

[2] Hvorslev, M. J., *Surface Exploration and Sampling of Soils for Civil Engineering Purposes*, The Engineering

desired depth is reached shall not be permitted. Where casing is used, it may not be driven below sampling elevation. Record any loss of circulation or excess pressure in drilling fluid during advancing of holes.

3.3 With the sampler resting on the bottom of the hole, drive the sampler with blows from the 140-lb (63.5-kg) hammer falling 30 in. (0.76 m) until either 18 in. (0.45 m) have been penetrated or 100 blows have been applied.

3.4 Repeat this operation at intervals not longer than 5 ft (1.5 m) in homogeneous strata and at every change of strata.

3.5 Record the number of blows required to effect each 6 in. (0.15 m) of penetration or fractions thereof. The first 6 in. (0.15 m) is considered to be a seating drive. The number of blows required for the second and third 6 in. (0.15 m) of penetration added is termed the penetration resistance, *N*. If the sampler is driven less than 18 in. (0.45 m), the penetration resistance is that for the last 1 ft (0.30 m) of penetration (if less than 1 ft (0.30 m) is penetrated, the logs shall state the number of blows and the fraction of 1 ft (0.30 m) penetrated).

3.6 Bring the sampler to the surface and open. Describe carefully typical samples of soils recovered as to composition, structure, consistency, color, and condition; then put into jars without ramming. Seal them with wax or hermetically seal to prevent evaporation of the soil moisture. Affix labels to the jar or make notations on the covers (or both) bearing job designation, boring number, sample number, depth penetration record, and length of recovery. Protect samples against extreme temperature changes.

## 4. Report

4.1 Data obtained in borings shall be recorded in the field and shall include the following:

4.1.1 Name and location of job,

4.1.2 Date of boring—start, finish,

4.1.3 Boring number and coordinate, if available,

4.1.4 Surface elevation, if available,

4.1.5 Sample number and depth,

4.1.6 Method of advancing sampler, penetration and recovery lengths,

4.1.7 Type and size of sampler,

4.1.8 Description of soil,

4.1.9 Thickness of layer,

4.1.10 Depth to water surface; to loss of water; to artesian head; time at which reading was made,

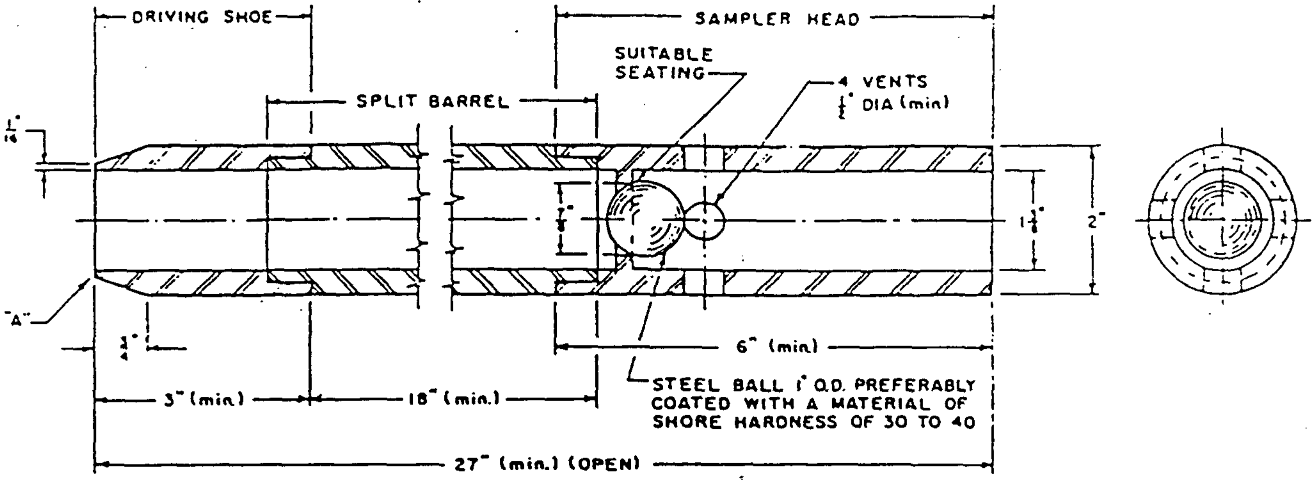
4.1.11 Type and make of machine,

4.1.12 Size of casing, depth of cased hole,

4.1.13 Number of blows per 6 in. (0.15 m),

4.1.14 Names of crewmen, and

4.1.15 Weather; remarks.



NOTE 1—Split barrel may be 1½ in. inside diameter provided it contains a liner of 16-gage wall thickness.

NOTE 2—Core retainers in the driving shoe to prevent loss of sample are permitted.

NOTE 3—The corners at *A* may be slightly rounded.

Metric Equivalents

| in. | mm | in. | mm |
|---|---|---|---|
| 1/16 (16 gage) | 1.5 | 2 | 50.8 |
| ½ | 12.7 | 3 | 76.2 |
| ¾ | 19.0 | 6 | 152.4 |
| ⅞ | 22.2 | 18 | 457.2 |
| 1⅜ | 34.9 | 27 | 685.8 |
| 1½ | 38.1 | | |

FIG. 1 Standard Split Barrel Sampler Assembly.

*The American Society for Testing and Materials takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.*

*This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 1916 Race St., Philadelphia, Pa. 19103.*

# QAPP

# APPENDIX C

# CHAIN OF CUSTODY FORMS

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SYRACUSE OFFICE

# CHAIN of CUSTODY
## SUMMARY FORM

890 SEVENTH NORTH STREET
LIVERPOOL, NEW YORK 13088
(315)457-4105

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLIENT/LOCATION | | | | | PROJECT NO. | ANALYSIS | | | | | | | | | | PRESERVATION |
| SAMPLE I.D. | DATE SAMPLED | TIME SAMPLED | CONTAINERS | | DATE ANALYSIS NEEDED | | | | | | | | | | | |
| | | | NO. | SIZE/TYPE | | | | | | | | | | | | |
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|---|---|---|---|---|
| RELINQUISHED BY: | DATE/TIME | RECEIVED BY: | DATE/TIME | NOTES: |
| RELINQUISHED BY: | DATE/TIME | RECEIVED FOR LAB. BY: | DATE/TIME | |

MALCOLM
PIRNIE
SYRACUSE
OFFICE

# MONITORING WELL SAMPLE CHARACTERIZATION & FIELD DATA SHEET

JOB NO. ____________________

## SOURCE

CLIENT ______________________________ WELL NO. ____________________

LOCATION ______________________________ WELL TYPE/SIZE ____________________

## EVACUATION

DATE ____________________

WELL DEPTH ____________________

DEPTH TO WATER ____________________

WELL VOLUME ____________________

METHOD ____________________

NO. OF VOLUMES ____________________

TOTAL VOLUME ____________________

| ITEM | START | FINISH |
|---|---|---|
| TIME | | |
| pH | | |
| TEMP. | | |
| DEPTH | | |
| COLOR | | |
| APPEAR. | | |

GAL./FT. 1-1/4": 0.077 1-1/2": 0.10 2" : 0.16 2-1/2" 0.24 3" 0.37 3-1/2" 0.50 4" 0.64 6" 1.46

## SAMPLING

DATE ____________________ pH ____________________

TIME ____________________ TEMP. ____________________

METHOD ____________________ COLOR ____________________

CONTAINER ____________________ APPEAR. ____________________

SAMPLED BY ____________________ Eh ____________________

## PRESERVATION

DATE ____________________

FILTERED: YES ______ NO ______ TIME ____________ BY ____________________

PRESERVED: YES ______ NO ______ TIME ____________ BY ____________________

PRESERVATIVE: ☐ $H_2SO_4$ ☐ $HNO_3$ ☐ NaOH ☐ $H_3PO_4+CuSO_4$ ☐ $Zn(C_2H_3O_2)_2$

☐ COOLED TO 4°C ☐ OTHER ____________________

## FIELD NOTES

______________________________________________

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MALCOLM
PIRNIE

# SAMPLE CHARACTERIZATION & CHAIN OF CUSTODY SHEET

LAB SAMPLE LOG No. ______________________

## SOURCE

CLIENT ______________________ JOB No. ______________

SAMPLE I.D. ______________ LOCATION DESCRIPTION ______________________

______________________________________________

## SAMPLING

SAMPLE TYPE ______________________ SAMPLING METHOD ______________

CONTAINERS: No. ______ TYPE ______________________

COMPOSITE: DATE SET ____________ TIME ____________ BY ______________

DATE PICKED-UP ____________ TIME ____________ BY ______________

GRAB: DATE ____________ TIME ____________ BY ______________

NOTES: ______________________________________________

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## PRESERVATION

DATE ______________

FILTERED: YES ______ NO ______ TIME ____________ BY ______________

PRESERVED: YES ______ NO ______ TIME ____________ BY ______________

PRESERVATIVE: ☐ $H_2SO_4$ ☐ $HNO_3$ ☐ NaOH ☐ $H_3PO_4 + CuSO_4$ ☐ $Zn(C_2H_3O_2)_2$

☐ COOLED TO 4°C ☐ OTHER ______________________

NOTES: ______________________________________________

______________________________________________

______________________________________________

## CUSTODY

DELIVERED BY ______________________

DATE ______________ TIME ______________

RECEIVED BY ______________________

DATE ______________ TIME ______________

## CUSTODY

LABORATORY SUBCONTRACTOR

NAME OF LAB ______________________

ADDRESS ______________________

DELIVERED BY ______________________

DATE ______________ TIME ______________

RECEIVED BY ______________________

DATE ______________ TIME ______________

## FIELD NOTES

______________________________________________

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MALCOLM PIRNIE

# OBSERVATION WELL READINGS

PROJECT________________ LOCATION________________

METHOD OF READING________________

REFERENCE POINT________________

DATE________ TIME (START)________ TIME (END)________ INITIALS________

WEATHER CONDITIONS________________

| WELL NO. | DEPTH TO WATER | REF. ELEV. | ELEV. |
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MALCOLM PIRNIE

# HNU Air Monitoring Data

Site Sketch

Site Name ____________

Client Name ____________

Project No. ____________

Sampler's Name ____________

Weather & Notes ____________

| Date | Time | Wind Direction | Wind Speed | Location | Span Setting | Concen-tration |
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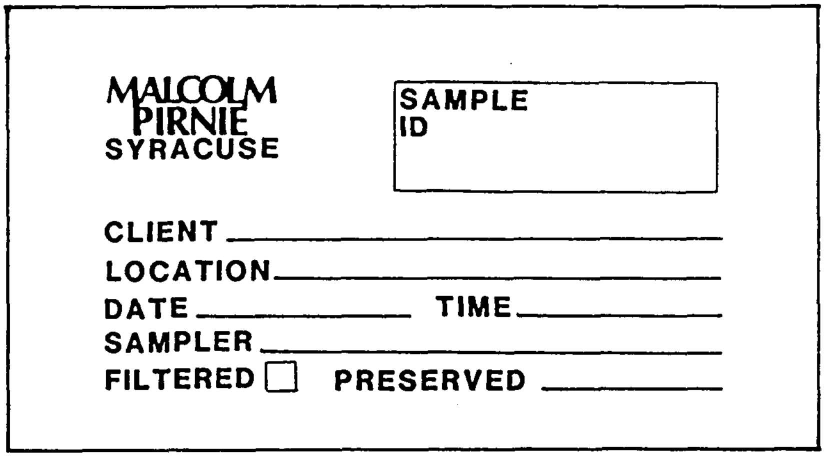

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SYRACUSE

SAMPLE
ID

CLIENT ____________________
LOCATION ____________________
DATE __________ TIME __________
SAMPLER ____________________
FILTERED ☐ PRESERVED __________

SAMPLE LABEL

# QAPP

# APPENDIX D

# RESUMES OF QA/QC OFFICER, DATA VALIDATOR AND OTHER KEY PROJECT PERSONNEL

THOMAS A. BARBA
Senior Project Scientist

## EDUCATION

BS (Chemistry) 1973; Syracuse University
BS (Biochemistry) 1973; SUNY College of Environmental Science and Forestry
Health and Safety Training for Hazardous Materials Spills and Emergency Response Operations
Risk Analysis in Environmental Health - Harvard University School of Public Health
Groundwater Pollution and Hydrology - Princeton University

## SOCIETIES

American Chemical Society

## SUMMARY OF EXPERIENCE

Mr. Barba has sixteen years of experience in solid and hazardous waste management, toxic substances management, and federal regulation compliance. He has been responsible for site investigations, surveys and remediations, health and safety programs, sampling and analysis programs, permit applications, training programs and contingency, waste analysis and closure plans.

1986 to Date Malcolm Pirnie, Inc.

As Senior Project Scientist: responsible for supervision of environmental projects in the hazardous waste and contaminant migration areas and for QA/QC and Health and Safety considerations on all projects in the Syracuse office. Responsible for projects involving environmental permitting, environmental auditing, and site investigations.

- Developed work plans for several Phase II and RI/FS projects involving hazardous waste sites. Supervised implementation and conduct of various aspects of these projects.
- Conducted investigation at an industrial plant to monitor extent of contamination from a solvent spill.
- Directed investigations at four coal ash disposal sites for a major New York State utility. Conducted risk assessments for these facilities.
- Conducted site investigations at scrap processing facilities to monitor extent of PCB contamination.
- Conducted data validation and review for several major investigations at inactive hazardous waste sites.

- Conducted environmental audits at several industrial facilities.
- Developed SPCC plans for a major industrial facility with numerous oil storage tanks.

1982 - 1986 Calocerinos & Spina, Consulting Engineers

As Senior Project Scientist and Project Scientist: Responsible for environmental projects involving solid and hazardous wastes, water and wastewater, and related activities for a variety of industrial and municipal clients.

- Conducted investigations at active and inactive disposal sites to monitor extent of organic and heavy metal contamination for numerous clients including Niagara Mohawk, Crucible Steel, Columbia Mills and Tonawanda Coke.
- Conducted risk assessments and developed conceptual remedial action alternatives for inactive hazardous waste site at Harbor Point in Utica, NY.
- Developed solid waste and hazardous waste permit applications with accompanying technical support and report for industrial landfill and storage facilities at Crucible Steel, Syracuse, NY.
- Directed cleanups at a PCB spill site in Syracuse, NY and a 1600 drum inactive storage facility in Utica, NY.
- Prepared air, wastewater discharge and solid waste permits, and closure plans for several industrial facilities including Ashland Chemical Co., Roth Bros. Smelting Corp., and Bernhards Bay Veneer Co.
- Developed industrial wastewater pretreatment programs for two major New York State municipalities (Town of Tonawanda, NY and City of Binghamton, NY).
- Directed field operations and health and safety aspects on sampling and analysis programs for all major environmental investigations at inactive and active hazardous waste sites conducted by C&S.
- Conducted environmental audits at industrial facilities handling wastes and wastewaters for Anaren Microwave, Syracuse, NY and Copperweld Flexowire, Oswego, NY.

1973-1982 Allied Chemical

As Supervisor and Environmental Chemist

- Responsible for all solid waste and toxic substance activities for three large chemical plants and two research and development laboratories in Upstate New York State.
- Responsible for administration of product safety and quality control programs including raw material standards and hazardous materials handling procedures for Solvay, NY chemical plant.
- Served as technical liaison between chemical plant and divisional sales, marketing and distribution staffs.
- Performed routine process and quality control functions including Food and Drug Administration and Department of Transportation compliance.

RICHARD W. KLIPPEL
Senior Associate

## EDUCATION

BSCE (Sanitary Engineering) 1963; University of Kansas

## REGISTRATION

Professional Engineer

## SOCIETIES

Diplomate, American Academy of Environmental Engineers
Water Pollution Control Federation
National and NYS Societies of Professional Engineers
New York Water Pollution Control Association

## SUMMARY OF EXPERIENCE

Mr. Klippel has over 25 years of experience in industrial waste disposal and treatment including extensive work with hazardous wastes. He has supervised Superfund RI/FS investigations, industrial wastewater treatment projects, wastewater treatment/reuse studies, municipal treatment plant designs and laboratory operations.

1986 to Date Malcolm Pirnie, Inc.

As Manager of the Syracuse office, responsible for marketing, production supervision and client relations for the Firm's activities in Central and Northern New York State.

Served as Project Director for a wide variety of projects including:

- Design and construction inspection for replacement fuel oil tanks for New York Telephone Co.
- A hydrogeologic study and groundwater remediation project for Miller Brewing Company, Container Division in Fulton, New York.
- A Phase II site investigation and RI/FS at an abandoned factory in Minetto, New York.
- Hydrogeologic studies, risk assessment and conceptual remedial design for four ash landfills for New York State Electric & Gas Corporation.
- Conceptual study for upgrading a coal pile runoff treatment facility at NYSEG's Milliken Station.
- Conceptual study for combined treatment of contaminated groundwater and coal pile runoff for New York State Electric & Gas Corporation.
- An updated SPCC plan for IBM Corporation, Owego, New York.

- A conceptual study for evaluating plating waste treatment facilities at Xerox Corporation, Webster, New York.

- Hydrogeologic study for a Niagara Mohawk Ashfill in Dunkirk, New York.

- Phase II Site Investigation at Goulds Pumps, Seneca Falls, New York.

- A conceptual study for soils treatment at Kodak Park in Rochester, New York.

- An environmental audit of 11 rubber products manufacturing facilities being transferred to new owners.

- An evaluation of aeration efficiencies and costs at Finch Pruyn Paper Mill, Glens Falls, New York.

- A Hydrogeologic Study and Engineering Report to accompany a Part 360 landfill application for Newton Falls Paper Mill.

1977-1986 Calocerinos & Spina, Consulting Engineers

As Industrial Waste Manager

- Responsible for the marketing and production management of the Firm's industrial wastewater treatment and solid/hazardous waste management and disposal projects.

- Supervised the development and documentation of comprehensive industrial waste pretreatment programs for Monroe County, New York, Onondaga County, New York Town of Tonawanda, New York and the City of Cortland, New York.

- Conducted wastewater treatment plant optimization studies and supervised treatment plant upgrading projects for Crucible Specialty Metals, Syracuse, NY and Trent Tube Division, East Troy, Wisconsin.

- Supervised preparation of NYS Part 360 landfill permits and RCRA Part B permit applications for numerous industrial facilities in Central and Northern New York, including Crouse Hinds Co., Oberdorfer Foundries, Newton Falls Paper Mill and Crucible Steel.

- Supervised citizen participation activities for BFI on project to locate new landfill in Columbia County, New York.

- Directed NYS Superfund Phase II Site Investigations for Niagara Mohawk Power Company, Utica, NY and Saratoga Springs, NY, Tonawanda Coke, Tonawanda, NY, Columbia Mills Minetto, NY and an RI/FS for Niagara Mohawk's Harbor Point site in Utica, NY.

1969-1976 O'Brien & Gere Engineers

As Managing Engineer

- Supervised the Research Division staff who were involved with industrial water and wastewater management and wastewater treatment and reuse studies.
- Performed a plant-wide water and wastewater management study for the General Electric Company, Lynn, Mass. and Niskaywna, NY, IBM Corporation, Endicott, NY and Research Triangle, NC and Xerox University Microfilms, Ann Arbor, Michigan.
- Coordinated pilot plant work and design of wastewater treatment facilities for Newton Falls Paper Mill, Newton Falls, NY and IBM Corporation, Endicott, NY.
- Directed a pilot plant study of nitrification for Eastman Kodak Co., Rochester, NY.
- Supervised development of Comprehensive Solid Waste Management Study of Franklin, Lewis and St. Lawrence Counties, NY.
- Responsible for an extensive facilities planning project for the Madison Metropolitan Sewerage District, Madison, Wisconsin.
- Established and supervised a branch office and laboratory operation in Madison, Wisconsin with a staff of six. Coordinated the work of 10-12 company staff plus the work of some 23 subcontractors including University grantees, plus biologists, geologists, chemists, water quality modelers and outside laboratories.

As Senior Project Engineer

- Performed pilot plant studies and provided technical coordination of preliminary and final design of the 80 mgd Metropolitan Syracuse Wastewater Treatment Plant. Supervised a staff of 8-10 engineers and designers. Coordinated entire effort including mechanical, structural, architectural and trade portions as well as subcontractor efforts.

1963-1968 Phillips Petroleum Company

As Corporate Sanitary Engineer

- Responsible for the process design, design coordination, start-up and regulatory approval of water and wastewater treatment systems serving a wide variety of facilities including refineries, petro-chemical plants, paper mills, offshore platforms, truck and marine terminals, truckstops and service stations.

## PUBLICATIONS AND PRESENTATIONS

R.W. Klippel, A.F. Diefendorf, T.A. Barba and F.L. Sciortino, "Coal Tar Contamination Investigations, Utica, NY", Presented at 79th Annual Meeting of Air Pollution Control Association, Minneapolis, Minnesota, June, 1986.

R.W. Klippel, J.A. Hagarman and R.H. Wills, Jr., "Landfilling Air Pollution Dusts from Specialty Steel Production on a Solvay Process Wastebed", Presented at the 15th Mid-Atlantic Industrial Waste Conference, June, 1982.

R.W. Klippel, "The Pretreatment Problem - Fact or Fiction", Presented at the 55th Annual Meeting of the Water Pollution Control Federation, St. Louis, Missouri, October, 1982.

R.W. Klippel and Robert H. Wills, Jr., "Optimization of Wastewater Treatment and Reuse at a Specialty Steel Mill", Presented at 52nd Annual Meeting of the Water Pollution Control Federation, Houston, Texas, October, 1979.

R.W. Klippel, "Opportunities for Savings in Financing Industrial Wastewater Treatment Facilities in New York State", Presented at the Winter Meeting of the New York Water Pollution Control Association, New York City, January, 1977.

S.R. Garver, R.W. Klippel, "Multiple Reuse of Photo Processing Wastewater Using Reverse Osmosis, Brine Reclamation and Cooling Tower Application", Presented at the Seventh Mid-Atlantic Industrial Waste Conference, Drexel University, November, 1974.

R.W. Klippel, A.J. Oliver, "Pilot Plant Experiences with Rotating Biological Discs at the Newton Falls Paper Mill", Presented at NCASI Northeast Regional Meeting, Boston, Massachusetts, November 1, 1973.

R.W. Klippel, A.F. Hassett, "Food Processing Wastewater - Municipal Discharge or Separate Treatment", Presented at Fifth Cornell University Agricultural Waste Management Conference, Syracuse, New York, March, 1973.

R.W. Klippel, "The New Federal Water Pollution Control Act: Its Effect on Industrial Wastewater Treatment Costs", Presented at the 28th Purdue University, Industrial Waste Conference, Lafayette, Indiana, May, 1973.

M.D. LaGrega, R.W. Klippel and N.L. Nemerow, "An Industrial Waste Case History, The Animal Glue Industry", Presented at Fifth Mid-Atlantic Industrial Waste Conference, Drexel University, November, 1971.

R.W. Klippel, "Pollution Control Built into Guayama Petrochemical Complex", Water and Sewage Works, March, 1969.

R.W. Klippel, "Pollution Control Planning for the Guayama Petrochemical Complex", Presented at reconvened session of Annual Conference, Water Pollution Control Federation, San Juan, Puerto Rico, October, 1967.

J.C. Word and R.W. Klippel, "Multiplant Wastes Taken in Stride by Automated System", Chemical Processing, October, 1965.

J.C. Word, M.V. Wright and R.W. Klippel, "Treating Complex Petroleum Wastes at Borger, Texas", Presented at the Annual Conference Water Pollution Control Federation, Atlantic City, N.J., October, 1964.

PAUL H. WERTHMAN
Vice President

## EDUCATION

BS (Environmental Engineering) 1975; Rensselaer Polytechnic Institute
ME (Environmental Engineering) 1977; Rensselaer Polytechnic Institute
Groundwater Well Hydraulics, Short Course, University of Wisconsin, 1977
Hazardous Waste Safety Training Course, Corporate Short Course, 1981
EPA Hazardous Waste Research Symposia, 1981, 1982
Hazardous Waste Compliance Management Course, 1985

## REGISTRATION

Professional Engineer: New York

## SOCIETIES

Water Pollution Control Federation
American Water Works Association
American Institute of Chemical Engineers

## RECOGNITION

Author: Articles and technical presentations on industrial wastewater treatment and solid/hazardous waste management.

## SUMMARY OF EXPERIENCE

Mr. Werthman has over 13 years of responsible experience in hazardous waste management, wastewater/ground water treatment process evaluation, hazardous and solid waste facility and site remedial designs, and construction administration. He has been involved in nearly every aspect of hazardous waste management and site remediation including planning, performance and supervision of: environmental/property transfer audits; Consent Order negotiations; expert witness testimony; treatment/storage/disposal facility siting and permitting remedial investigation/feasibility studies (RI/FS); value engineering; treatability and predesign studies; exposure, risk, and endangerment assessments; health and safety plans; and construction quality assurance. Through Mr. Werthman's experience at 38 inactive hazardous waste sites (33 on the New York State list and 7 on the National Priority List) and 5 RCRA (NYS Part 373) sites, he has investigated a broad organic and inorganic contamination of all environmental media (i.e., soil, ground water, surface water, sediments, biota, and air) and has evaluated and/or applied both conventional and innovative technologies to their remediation.

(over)

## DETAILED EXPERIENCE

1979 to Date Malcolm Pirnie, Inc.

Summaries of several significant representative project experiences follows:

As Project Officer:

- Assisted in negotiation of an Order-on-Consent and preparation of a Work Plan/Quality Assurance Plan for an RI/FS at the City of Rochester Fire Academy, an 18-acre facility which formerly utilized flammable industrial wastes for training exercises. A NYS Title 3 Environmental Quality Bond Act (EQBA) grant is currently being pursued for this project.
- Provided technical and administrative oversight on supplemental remedial investigations and pre-design engineering studies at the Millcreek Superfund Site, Erie County, PA. Important elements of the project scope include: wetland sediment sampling; soil boring program to delineate contaminant distribution; feasibility evaluation of alternative ground water collection systems; bench- and pilot-scale treatability studies for removal of heavy metals, volatiles and semi-organics from ground water; evaluation and preliminary design of capping systems for the 85-acre site, and; soil pollutant fate and transport modeling to derive soil cleanup criteria.
- Provided technical oversight and quality assurance during treatability and pre-design studies, design, and construction administration phases of Alternative Treatment System at Lucidol Division of Pennwalt Corporation. The Alternate Treatment System consists of a 150,000 gpd pump station and treatment unit processes including pH adjustment, clarification, gravity organics separation, filtration and equilization. The $4.0 million system fast-track project renders the sometimes ignitible, corrosive and/or reactive organic chemical process wastewaters non-hazardous, thereby eliminating and replacing three hazardous waste surface impoundments.

As Project Manager:

- Directed 23-man team in field investigation of sewers and creeks in Love Canal area of Niagara Falls, NY. Over 1,000 liquid, sediment and soil core samples were collected and analyzed for a variety of organic and inorganic contaminants including TCDD. Prepared health and safety plan, performed remedial investigation, feasibility studies, and risk assessment for approximately 12 miles of contaminated sewers and creeks. Conceptual designs were prepared for a 5,000 cubic yard encapsulation facility with clay and synthetic liner, leachate collection, leak detection and liquid waste treatment systems.
- Developed remedial site plan and assisted in negotiation of a Consent Order for the clean-up of PCB-contaminated soils at non-ferrous secondary metals yard previously used for electrical transformer reclamation. Remedial action completed included excavation and secure burial of contaminated soils, leachate/groundwater collection and treatment, spill containment and surface runoff control. Prepared construction documents and supervised construction of recommended facilities. Currently working in conjunction with EPA MERL on field demonstration of in-situ PCB destruction processes.

(continued)

## DETAILED EXPERIENCE (Continued)

1979 to Date — Malcolm Pirnie, Inc. (Continued)

- Provided technical assistance in the negotiation of Consent Order for the investigation and clean-up of PCB-contaminated soils at three ferrous and non-ferrous metals reclamation yards previously used for the dismantling of electrical transformers.

- Evaluated immediate remedial measures and prepared a feasibility study of remedial alternatives volatile organics-contaminated well-field in the Town of Vestal, New York (National Superfund site) for the NYSDEC.

- Preparation of RCRA Part B applications for two chemical manufacturing facilities, one Dept. of Defense facility, one steel manufacturer and one tannery, encompassing surface impoundment, tank storage, waste pile, drummed storage and a burning pit for confidential clients. This work included conducting complete RCRA groundwater evaluations for three industrial sites: one with surface impoundments, and the other two with land disposal facilities including design and siting of nested monitoring wells, and collection and interpretation of groundwater monitoring results. Prepared contract documents for construction of an 800-drum covered RCRA storage facility.

- Preparation of closure plans for three hazardous waste landfills, four hazardous waste surface impoundments, numerous above-ground and below-ground storage tanks, and a drum container storage area under RCRA (NYS Part 373).

- Performed contaminated stormwater drainage evaluation at large integrated commercial waste disposal site. Samples were collected from the surface water drainage system to identify contaminant sources. Alternative ground and surface water collection/drainage modifications and treatment alternatives were evaluated to attain compliance with SPDES discharge permit.

- Granular activated carbon pilot-plant evaluation to simulate performance of the City of Niagara Falls 48 MGD wastewater treatment plant. Breakthrough curves were developed for more than 65 organic and inorganic parameters regulated by the SPDES permit. Alternative odor-control methods were also evaluated.

- Conducted an evaluation of stack test on boiler used for burning hazardous waste for confidential NY client.

1979 — Frontier Technical Associates

As Project Engineer:

- Hydrogeologic assessment of abandoned industrial solid waste disposal site for confidential NY client.

DETAILED EXPERIENCE (Continued)

1976-1979 Calspan Corporation

As Project Engineer: Designed, supervised construction and operation of a mobile pilot-scale wastewater treatment plant to evaluate the treatability of a variety of wastewaters from the ore mining and milling industry, including acid mine drainage and wastewater from uranium, lead, zinc and copper mills.

As Engineer: Developed pretreatment standards and effluent limitation guidelines for inorganic chemical manufacturing and ore mining and milling industries; designed groundwater monitoring systems; and conducted hydrogeologic investigations at abandoned industrial and hazardous solid waste disposal sites. Established and supervised soils laboratory for physical soils tests (i.e. permeability, particle size, Atterberg limits, etc.)

MALCOLM PIRNIE

RICHARD P. BROWNELL
Vice President

## EDUCATION

BS (Civil Engineering) 1966; Rensselaer Polytechnic Institute
MS (Civil Engineering) 1967; Stanford University
MBA 1976; New York University

## REGISTRATION

Professional Engineer
Diplomate, American Academy of Environmental Engineers

## SOCIETIES

American Society of Civil Engineers
Water Pollution Control Federation

## SUMMARY OF EXPERIENCE

As Vice President in charge of Malcolm Pirnie's industrial waste group, Mr. Brownell's involvement bridges problem identification and problem solving. He has directed projects on site evaluation, groundwater pollution, remedial measures for hazardous waste problems, leachate, wastewater process design, and detailed design for hazardous and industrial wastewaters and landfill closure. All significant hazardous waste work performed by the firm is reviewed by Mr. Brownell.

## DETAILED EXPERIENCE

| | |
|---|---|
| 1969 to Date | Malcolm Pirnie, Inc. |

As Vice President:

- Developed remedial measures for Superfund and hazardous waste sites from New England (gas emissions from waste piles, groundwater contamination) to the southern U.S. (extensive pesticide contamination of river sediments) to the Far West (VOC removal). Responsible for the design of stripping towers and granular activated carbon systems for VOC removal; also directed contaminated soils removal, landfill closures and leachate treatment system improvements at various sites. Project Officer on environmental evaluations for portions of the Upper Hudson River PCB project and bench scale and pilot treatability studies on PCB wastes for the New York State Department of Environmental Conservation.
- Directed hazardous waste management activities for Carpenter Technology Corp., Koppers, Texaco, Estee Lauder Inc., Scott Paper Company and The Upjohn Company. Directed multiplant, regional industrial/hazardous waste disposal evaluations for two major industrial corporation.

(over)

DETAILED EXPERIENCE (Continued)

1969 to Date Malcolm Pirnie, Inc. (continued)

- Directed studies of new processes for treating various types of industrial wastes for numerous companies such as Olin Chemical Group, The Upjohn Company, Pfizer, Inc., Textron, Inc., Colgate-Palmolive, Scott Paper, and Gulf + Western. Evaluated ethylene glycol/urea collection and treatment systems for a major air freight carrier.

- Responsible for the design of various physical-chemical and biological treatment systems, including a 5-mgd granular activated carbon plant in the Midwest to remove TCE from groundwater, activated sludge treatment of 0.25 mgd of pharmaceutical wastewaters for Warner Lambert Co. in New Jersey and treatment of 0.05 mgd of plating wastewater for North and Judd in Connecticut.

- Directed a property transfer audit, performed two multiplant environmental audits, both in two countries, prior to property transfer; focused on PBB contamination at an industrial site for Ameribrom, Inc.; directed many groundwater and/or site investigations for industrial clients where remedial measures considered included: relining lagoons, groundwater, soil and sludge recovery, air stripping, activated carbon treatment, landfill closure, slurry walls, surface water diversions.

As Project Manager: Managed a testing and feasibility study for disposal of alum sludges from Scott Paper Company and treatability, feasibility and engineering design reports for approximately 20 corporations in the chemical processing, private utility, computer, and metal finishing industries.

As Project Engineer: Responsible for major pilot/prototype studies at Akron and Cleveland OH, and studies of high purity oxygen activated sludge for several corporations including American Cyanamid Company (Lederle Laboratories Division).

1967-1969 U.S. Army Corps of Engineers
California and Republic of Korea

As Lieutenant: Deputy Post Engineer for 1,500-man organization; responsible for all facility planning; small project design and planning.

1966 J. Kenneth Fraser and Associates

As Engineer: Comprehensive report for wastewater treatment facilities.

PUBLICATIONS AND PRESENTATIONS

Brownell, R.P., 1986. "A Consultant's Viewpoint of Underground Storage Tanks," presented at New Jersey Chapter, WPCA Seminar, January 9.

(continued)

PUBLICATIONS AND PRESENTATIONS (Continued)

Brownell, R.P., 1984. "A Report Card on the Waste of the 1970's - PCB's in the Environment," presented at the 14th American Chemical Society New England Regional Meeting, Fairfield CT, June.

Brownell, R.P., Stubbins, H.D., and Kuniholm, P.F., 1982. "Comprehensive Approach to Landfill Leachate Treatment," New York Water Pollution Control Association, New York NY, January.

Brownell, R.P., 1980. "Real World Solutions to Hazardous Waste Problems," Columbus Industrial Association, Plant Engineers Council, Columbus OH, December.

Brownell, R.P. and Brunner, C.R., 1980. "Hazardous Waste Management," Seminar with D'Appolonia Consultants, Dallas TX, January.

JOHN ISBISTER
Principal Hydrogeologist

## EDUCATION

BS (Geology) 1956; Columbia University

## REGISTRATION

Professional Geologist

## SOCIETIES

American Institute of Professional Geologists
Association of Professional Geological Scientists
National Water Well Association

## SUMMARY OF EXPERIENCE

Mr. Isbister is an expert ground water geologist and hydrologist. He is responsible for the organization, direction, and evaluation of complex ground water quality investigations and ground water development projects carried out for the firm's major industrial clients and large ground water developers. Mr. Isbister also specializes in the investigation of contamination incidents and the development of cost-effective measures to control, contain, and abate ground water contamination. He has prepared documents for litigation relating to the actions of the firm's industrial clients, and he has delivered expert testimony on their behalf.

## DETAILED EXPERIENCE

1987 to Date | Malcolm Pirnie, Inc.

As Principal Hydrogeologist: Responsible for administration and technical direction of all corporate services in hydrogeology. Provides technical review and quality control of hydrogeological work performed in regional offices.

1984-1987 | Lawler, Matusky & Skelly Engineers

As Director, Groundwater Section, Hazardous Waste and Groundwater Group and Chief Hydrogeologist:

- Responsible for the organization and management of ground water development projects and hazardous waste studies. Duties included management of projects involving hazardous waste contamination, ground water development, resources evaluation, and other types of hydrogeologic investigations.

- Manager of a project for a Superfund site located in the State of Delaware. Evaluation of field studies, basic data, and reports prepared by EPA consultants; expert testimony services to an industrial client and attorneys representing the generators; attendance at technical meetings chaired by EPA; and successful negotiation of an alternative remediation scheme. Preparation of

(over)

DETAILED EXPERIENCE (Continued)

1984-1987 Lawler, Matusky & Skelly Engineers (continued)

work plan for design testing phase will be followed by review of design testing data, specifications for construction, construction and preparation of Remedial Phase Monitoring Plan and long-term operation and maintenance monitoring.

- Manager of a project to assess and clean up a large gasoline spill in Dutchess County NY. A test drilling program was designed and directed to define the limits of the spill and the conceptual design for cleanup was prepared.
- Represented a group of several generators in connection with the assessment and remediation of a Superfund site in Indiana. Reports and data provided by EPA were evaluated and alternative plans for additional investigation prepared.
- Provided expert services to a legal firm representing a group of generators in connection with remediation of an industrial landfill in Pennsylvania. Field inspection of the cleanup work was provided, and all testimony, data, and reports relating to site assessment reviewed; expert testimony will be provided as needed.
- Directed several projects involving the collection and interpretation of hydrogeologic data and design, and the installation of monitoring well programs at industrial sites where ground water and soil contamination was suspected or known, including a Superfund site in southern New Jersey.

1966-1984 Geraghty & Miller, Inc.

As Vice President and Senior Scientist:

- Responsible for the organization, direction, and evaluation of over 500 complex ground water quality investigations and ground water development projects in 20 states carried out for the firm's several major industrial clients and ground water developers. Specialized in the development of ground water supplies for municipalities and large industries, and in the investigation of incidents involving contamination and the development of cost-effective measures to control, contain, and abate ground water contamination. Prepared reports and presented expert testimony before state agencies in support of diversion applications. Prepared documents for litigation and appear purposes relating to the actions of the firm's industrial clients and delivered expert testimony on their behalf.
- Managed the development of "Procedures Manual for Ground-Water Monitoring at Solid Waste Disposal Facilities." The manual was designed to assist supervisory personnel of solid waste regulatory agencies complying with the management practices established by the Resource Conservation and Recovery Act.

(continued)

DETAILED EXPERIENCE (Continued)

1966-1984 Geraghty & Miller, Inc. (continued)

- Manager of a project for a major chemical company involving an assessment of the plant property to determine whether contamination of the ground water had taken place. The investigation revealed the presence of carbon tetrachloride at the bottom of the water table aquifer. The contaminant body was bounded and a well abatement system was designed and tested.
- Manager for a ground water assessment study at a site near Toms River NJ, involving clandestine dumping of hazardous wastes by a trucking firm contracted by a major chemical company for delivery to an acceptable landfill. Based on the results of the investigation, the chemical company was able to clean up the dump site and negotiate an agreement on plume management with the regulatory agency.
- Investigated ground water contamination for a major chemical and pharmaceutical firm. Extensive ground water contamination was found on the plant site as well as the revelation that movement of the contaminants was controlled by the operation of the plant supply wells and that the contamination had not spread beyond the plant boundaries. Also provided advice and recommendations on a major lagoon cleanup program and a monitoring well system designed to answer the requirements of the regulatory agency.
- Manager of a project financed by several industrial firms to evaluate studies of EPA contractors on the Price Landfill near Atlantic City NJ. The studies assessed ground water contamination and the need to relocate the nearby Atlantic City MUA wellfield.
- Manager of a continuing project for a hazardous waste treatment facility in southern New Jersey. The investigation involved assessing ground water contamination and designing an abatement well system to contain and remove contamination from the ground water. Also provided advice and recommendations on ground water considerations of a major lagoon cleanup program.
- Manager of a large-scale investigation for a major chemical company in southern New Jersey which assessed the ground water impact of several waste disposal areas and made recommendations on cleanup/abatement measures.

1956-1966 U.S. Geological Survey
Water Resources Division

As Project Manager: Ground water investigations related to availability of ground water supplies, saltwater intrusion, artificial recharge, long-term changes in water levels, aquifer properties, and contamination. Studies were carried out on Long Island and the Catskill region NY and in parts of Rhode Island.

(over)

PUBLICATIONS AND PRESENTATIONS

Isbister, J., 1959. Ground water levels and related hydrologic data from selected observation wells in Nassau County, New York. New York State Water Power and Control Commission, Bulletin 41.

Isbister, J., 1962. Relation of fresh water to salt water at Centre Island, Nassau County, New York. U.S. Geological Survey Professional Paper 450, Chapter E.

Isbister, J., 1963. Records of wells and related hydrologic data in northeast Nassau County, Long Island, New York. U.S. Geological Survey Open-File Report.

Isbister, J., 1965. Geology and hydrology of northeastern Nassau County, Long Island, New York. U.S. Geological Survey Water Supply Paper 1825.

Isbister, J., 1968. The status of ground water resources, 1967, Nansemond County and Isle Wight County (co-author).

Isbister, J., 1970. Ground water resources in Cape May County (co-author).

Isbister, J., 1975. Study of ground water conditions on the Long Island Lighting Company tract, Jamesport, New York (principal author).

Isbister, J., 1976. Procedures manual for monitoring solid waste disposal sites, U.S. EPA Publications (principal author).

Isbister, J., 1977. Westchester County 208. U.S. Environmental Protection Agency Publication.

RICHARD J. CALIFANO
Principal Toxicologist

## EDUCATION

BS (Biology) 1973; Manhattan College
MS (Biology) 1979; New York University
PhD (Biology/Environmental Health Science) 1981; New York University

## AWARDS

National Institute of Environmental Health Science Fellowship, 1975-1978
Sigma Xi R.E.S.A. Grant-in-Aid, 1977

## SOCIETIES

Society of Environmental Toxicology and Chemistry
Society for Risk Analysis

## SUMMARY OF EXPERIENCE

Dr. Califano specializes in environmental health science, where his work has included health risk assessments for remedial investigation/feasibility studies and resource recovery projects, environmental impact studies, and the management of health, safety and training programs.

## DETAILED EXPERIENCE

| | |
|---|---|
| 1986 to Date | Malcolm Pirnie, Inc. |

As Principal Toxicologist:

- Manages the Environmental Toxicology and Public Health Group which conducts public health and environmental risk assessments and toxicological evaluations for resource recovery, hazardous waste management and industrial waste projects. Directed or authored health risk assessments for the Town of North Hempstead NY, Union County NJ and York County PA resource recovery facilities, and endangerment assessments/public health evaluations for the Laurel Park Landfill CT, Long Prairie MN and Tucson Airport AZ groundwater contamination studies.

- Directs the corporate health, safety and training program for employees engaged in hazardous waste management projects.

- Manager of the aquatic toxicology laboratory which conducts multispecies chemical and effluent toxicity bioassays.

(over)

DETAILED EXPERIENCE (Continued)

1984-1986 NUS Corporation

As Assistant Regional Project Manager: Managed a multidisciplinary, 60-member Field Investigation Team investigating uncontrolled hazardous waste sites under the U.S. EPA Superfund Program. Directed public health assessments for remedial investigation/feasibility studies as well as the review, interpretation and reporting of analytical data. Managed or assisted numerous remedial investigation/feasibility studies and multimedia field investigations.

1981-1984 New Jersey Department of Environmental Protection
Division of Water Resources

As Environmental Scientist II: Provided consultation in aquatic toxicology/environmental health to an engineering/professional staff issuing indirect discharge, surface water, and groundwater NJPDES permits. Developed and reviewed impact assessment studies, biomonitoring studies, treatability studies, and mitigation alternatives. Provided technical expertise to multimedia enforcement cases including hazardous waste sites.

1975-1981 New York University Medical Center
Institute of Environmental Medicine
Laboratory of Environmental Studies

As Research Assistant: Examined organic chemical transfer in estuarine and marine environments. Conducted research on the accumulation dynamics and distribution of PCBs in estuarine fish with implications to toxicology, ecosystem cycling, and human exposure. Studied the environmental behavior of trace contaminants in dredged spoils and spoils disposal options. Examined metabolic transformation of PCBs by estuarine anaerobic bacteria.

1973-1975 Lawler, Matusky and Skelly Engineers

As Biologist: Supervised professional/technical staff studying estuarine and marine ichthyoplankton in relation to life history and impact studies. Conducted fish life history analyses and macrozooplankton analyses. Supervised field personnel in multiphased plant and river sampling program.

PUBLICATIONS AND PRESENTATIONS

Lee, C.C., R.J. Califano and R.M. Sansur, "The Degradation of Polychlorinated Biphenyls (Aroclor 1254) by Anaerobic Bacteria and Fungi from the Hudson River," Atlantic Estuarine Research Society, Rehoboth Beach, DE, 1979.

Califano, R.J., J.M. O'Connor and L.S. Peters, "Uptake, Retention, and Elimination of PCB (Aroclor 1254) by Larval Striped Bass (MORONE SAXATILIS), Bulletin of Environmental Contamination and Toxicology, 24(3):467-472, 1980.

Califano, R.J., J.M. O'Connor and J.A. Hernandez, "PCB Dynamics in Hudson River Striped Bass: I. Accumulation in Early Life History Stages," Aquatic Toxicology, 2:187-204, 1982.

# APPENDIX C

# TECHNICAL ADMINISTRATIVE GUIDANCE MEMORANDUM ON THE DISPOSAL OF DRILLING CUTTINGS

**DRAFT**

Regional Solid and Hazardous Waste Engineers, Bureau Directors and Section Chiefs
Michael J. O'Toole, Jr., Directors, Div. of Hazardous Waste Remediation

## PROPOSED DIVISION TECHNICAL AND ADMINISTRATIVE GUIDANCE MEMORANDUM TAGM - DISPOSAL OF DRILL CUTTINGS

### Purpose

This document presents disposal alternatives for drilling cuttings and spoils from the installation of monitoring wells or soil borings at Class 2 sites.

### Introduction

This document specifically addresses the handling of drill cuttings derived from Class 2 sites. These cuttings generally come under the derivative rule [Part 371.1 (d)(3) and (4)] which defines any constituent derived from a Class 2 hazardous waste site as a hazardous substance and requires handling of these materials as hazardous wastes.

### Disposal Alternatives

Disposal of monitoring well drill cuttings can be accomplished by one of two methods: on-site disposal or off site disposal.

1. On-site disposal to ground surface

   Drill cuttings may be disposed of on the ground surface provided the following conditions are met:

   a. The drill cuttings are disposed of within 20 feet of the well or bore hole.

   b. The drill cuttings are disposed of in such a manner that surface runoff does not move the cuttings or cause contaminants from the cuttings to migrate to a surface water body or a receiving stream.

   c. The drill cuttings are disposed of in such a manner so that infiltrate which comes in contact with the cuttings will migrate to the aquifer in contact with the area the cuttings came from. This is consistent with returning the contaminants to the aquifer of withdrawal.

   d. Drill cuttings do not pose an imminent threat to health and environment during disposal. Drill cuttings will be tested by field analytical techniques such as pH, conductivity, organic vapor levels, physical appearance or other Department approved field analytical methods to ascertain the threat to health and environment. This testing will be consistent with the Health and Safety Plan for the site. Drill cuttings which pose an imminent health threat will be handled on a case-by-case basis according to the determined risk.

e. Drill cuttings may be collected and disposed of at a specific central on-site location which provides the same protection as paragraphs (b) and (d) above.

2. Off site disposal

Drill cuttings may be disposed of off site provided the following conditions are met:

a. The drill cuttings are accompanied by a 6 NYCRR Part 372 manifest and a 6 NYCRR Part 364 Transporter Permit.

b. The drill cuttings are disposed of at facilities that are permitted to operate a hazardous waste disposal facility under 6 NYCRR Part 373 or a waiver of this regulation has been obtained.

c. In the case where drill cuttings have been determined not to be hazardous wastes, they can be disposed of at a permitted Part 360 disposal site.

c:newtagm

# APPENDIX D

# STATISTICAL METHOD FOR ARRIVING AT THE NUMBERS OF SAMPLES TO BE COLLECTED IN SECTIONS 3 AND 5

# SAMPLING METHODOLOGY

The sampling approach is an application of a standard statistical technique for estimating populations or contaminated areas. The proportion of the population is defined as a contaminated circular hot spot and the population is all the soil within the boundaries of the grid to be sampled. It is not necessary to define the contamination area as circular to use this approach. The design requires the selection of a confidence level for detecting the constituents of concern within the hot spot and the selection of the hot spot size.

Historically, The Agency for Toxic Substances and Disease Registry (ATSDR) has required in prior USEPA and New York State Department of Environmental Conservation (NYSDEC) studies a 95 percent confidence level for detection of contaminated hot spots. To achieve the ATSDR requirements, the hot spot size should be the minimum area of soil contamination for each interval that statistically can be detected based on review of the historical sampling at the site. The size of this hot spot was determined to be the minimum area of soil contamination for each depth that statistically can be detected and defined based on review of the historical sampling. The hot spot size will ensure that the soil samples collected will be spatially representative. With a confidence level and hot spot size selected, the following formula is used to calculate the required sample size:

$$n = \frac{z^2 pq}{d^2}$$

Notes:

d = antilog of -0.9626 long n + 0.250
n = number of samples
z = constant obtained from a normal distribution table for a 95 percent confidence
p = estimated population proportion or percentage of hot spot to grid area
q = 1 - p
d = antilog of -0.9626 log n + 0.250

Because "d", which is equivalent to (reliability coefficient) times (standard error), is a function of the sample number "n" the formula is iterative. Several iterations are required to arrive at the percent spot size to grid area.

# CALIBRATION PROCEDURES, PORTABLE TURBIDIMETER.

## CALIBRATION PROCEDURES

### A. STANDARD FORMAZIN SOLUTIONS

Calibration of this instrument is based on Formazin, a material which can be made by synthesis and reproduced repeatedly within one percent. When properly mixed, it is uniform in the number, size and shape of its particles, thus making it an ideal turbidity standard. The unit of measure, and thus the calibration of this instrument is in Nephelometric Turbidity Units (NTU) based on Formazin.

Calibration samples may be obtained by diluting Formazin stock suspension using "Turbidity-Free" water. Formazin stock suspension may be prepared by the user (Reference A.W.W.A. "Standard Methods", 14th Edition) or it may be purchased in kit form, HF scientific part number 50040.

Each kit contains:

-- 1 liter of 4000 NTU Stock Suspension
-- 1 Gallon (3.79 liters) turbidity-free water
-- 7 Sample cuvettes (28mm), with screw caps
-- Instructions for dilution
-- 1 200 µl Pipette

The following table gives the recommended dilutions of the stock suspension. <u>Be sure to adequately mix</u> the stock suspension prior to removing a portion for dilution.

| Pipettes Required | Formazin Standard in NTU's | Pipette amount below in ml into 200 ml flask and dilute to mark with "Turbidity-free water" |
|---|---|---|
| 9ml & 1ml in 1/100 | 198 | 9.9ml of 4000 NTU stock suspension |
| ml & 1ml in 1/100 | 19.8 | 9.9ml of 400 NTU formazin dilution |
| 1ml in 1/100 | 20 | 0.95ml of 400 NTU formazin dilution |

The equipment recommended for the above are:
1-1ml in 1/100 TD pipette, 1-9ml TD pipette, 3-200ml volumetric flask. The 400 NTU formazin dilution can be made from 1 10:1 dilution of the 4000 NTU stock suspension and should be made prior to making standards.

**NOTE:** 1. When the prepared samples start to flocculate, they are unreliable and fresh ones must be made. This will occur more rapidly for the lower value diluted suspensions.

2. The value of "Turbidity-Free" water is approximately 0.1 NTU. This value has been added to low value dilution, i.e., 2.0 NTU includes 0.1 NTU for water.

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to help protect the environment.

## B. ELECTRONIC CALIBRATION USING FRESHLY PREPARED FORMAZIN SOLUTIONS

The DRT Turbidimeters have been carefully calibrated by the factory. However, should the Electronic P.C. Board, the Photo Detectors, or the Light Source be replaced or if very carefully prepared Formazin suspensions indicate a need for recalibration, this may be easily accomplished in your facility.

To carry out a complete calibration the following Formazin suspension values are required:

198 NTU ,
19.8 NTU
& 2.0 NTU

- Fill, cap and label a separate cuvette with a sample of each.
- Always mix the contents of each cuvette by inverting several times before placing in the Optical Well for a reading.
- Keep the outside surface of cuvettes clean.
- When placing any standards in the well, always use the Light Shield to cover the well in order to keep out ambient light.

To gain access to the trimpots, remove the accessories from the foam holder. Refer to figure 2 for trimpot identification during the next few steps.

1) Center the reference adjust control on top of the instrument.
2) Insert the reference standard and turn the range control on the DRT-15C to the 20 range. Adjust the "Course Zero" trimpot (R2) until a reading of 0.10 NTU is obtained.
3) Replace the reference standard with the 19.8 formazin standard and adjust the "20 Range Adjust" trimpot (R7) to obtain a reading of 19.8 NTU ± 0.1 NTU.
4) Replace the 19.8 NTU formazin standard with the reference standard and adjust the reference adjust control to obtain a reading of 0.10 NTU.
5) Repeat steps 3 and 4 until no further adjustments are required.
6) Turn the range control on the DRT-15C to the 200 range. Insert the 198 NTU formazin standard and adjust the "200 Range Adjust" trimpot to obtain a reading of 198 ± 1 NTU.

This completes the calibration of the DRT-15C.

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General Testing Corporation

A Full Service Environmental Laboratory

February 12, 1990

Mr. Bill Heitzenrater
AFI Environmental
6103 Robinson Road
Lockport, NY 14094

RE: Schulman Project

Dear Bill:

As per our conversation on Friday, February 9, 1990, this letter contains GTC's response to several of the questions raised from the September 22, 1989 letter from E. Joseph Sciascia at the DEC.

Number 5

There is not a currently approved protocol from EPA or DEC for lab compositing of either VOA's or semi-VOA's. Field compositing of semi-VOA's utilizing teflon tubing in an autosampler and glass fishbowl for sample collection is indicated for effluents. This involves an absolute minimum amount of agitation with no introduction of air into sample.

The above protocol for semi-VOA's to our knowledge, has been utilized for VOA samples with prior approval of the DEC or EPA per individual project consideration.

The usual procedure is to analyze discreet grab samples.

Number 6

The detection limit of 40 ng/m$^3$ for PCB's in air should not pose an analytical problem considering quantities of air sampled, in accordance with NIOSH Method 5503.

Number 7

The normal laboratory reporting procedure as well as CLP protocol require internal data validation from our QA Department and laboratory director prior to submitting a report. The NYS DEC has, on occasion, required third party data validation on particular projects. This may be from the NYS DEC approved list for validation or other third party.

Number 12

GTC is confident it can work within the 10-day response time as 10 working days.

Number 13

GTC is expecting a copy of the work plan.

Number 14

GTC is prepared to perform the necessary clean-ups where indicated. These include:

EPA SW-846 Method 3620: Florisil column clean-up
EPA SW-846 Method 3660: Sulfur clean-up
NYS DEC CLP Protocol 89-10: Sulfur acid hydrolysis for PCB only

Number 15

GTC is prepared to analyze for total PCB's and identify and quantify individual aroclors where found.

Number 17

An MS/MSD can be provided for the sewer sediment in addition to groundwater.

In addition to the above, we would like to address Number 10. Note that the analytical run and set-up for standard reporting and CLP differ for pesticides and 8080.

If you have any further questions, please contact me. Thank you for the opportunity to serve you.

Sincerely,

GENERAL TESTING CORPORATION

Lawrence P. Tarnacki
Manager, Buffalo Office

msw

February 20, 1990

Bill Heitzenrater
AFI ENVIRONMENTAL
Lockport, New York

Dear Mr. Heitzenrater:

I have reviewed the Health and Safety Plan for the Shulman Site and have made the attached modifications. With these modifications, this plan will provide the necessary protocols to perform the work at this site in a safe and healthful manner.

If you have any questions concerning this matter, please contact me.

Sincerely,

Paul Hitcho

Paul Hitcho, Ph.D, CIH

PH:bh

cc: File

AFI
ENVIRONMENTAL
6103 Robinson Road
Lockport, New York 14094
Office: (716) 625-8434 Mobile: (716) 622-5783
FAX: (716) 625-8471

February 11, 1990

Mr. Lawrence Tarnacki
General Testing Corporation
710 Exchange Street
Rochester, NY 14608

RE: I. Shulman & Sons, Elmira, New York. Project C-1089.

Dear Larry:

As per our phone conversation of February 9, 1990 please find enclosed the original scope of work and NYSDEC correspondance regarding the RI/FS for the Shulman Site in Elmira, New York. As previously indicated this document is for your reference only and should be treated as confidential.

The attached work plan copy is an internal work plan only. However, it is representative of AFI's final work plan.

If after review of this document you have any questions or concerns please contact me as soon as possible. I look forward to doing future business with General Testing Corporation.

Sincerely,

William L. Heitzenrater

William L. Heitzenrater
Project Manager

genltest.elm
enclosure

cc: Peter Burke
Irv Rinde
Jack Krajewski

Printed on recycled paper
to help protect the environment.

# PAUL J. HITCHO, Ph.D., C.I.H.

## GENERAL

Dr. Hitcho is Director of Occupational Health and Safety for Sevenson Environmental Services, Inc. He develops and implements site safety plans, provides consultative services on occupational health matters, coordinates and supervises a comprehensive employee medical surveillance program, and supervises a staff of site safety officers.

## EXPERIENCE SUMMARY

Dr. Hitcho's career in the field of occupational health and safety has been very active and diverse. He has conducted extensive research as a National Institute of Health Postdoctoral Fellow, taught on the university level, conducted numerous health assessments as a regional field industrial hygienist prior to entering management. While the industrial hygiene department head for the United Steelworkers of America, Dr. Hitcho served as the liaison between the union and the coal carbonization (coking) and related chemical industries. He is recognized as a world expert in this field by the International Agency for the Research on Cancer (IARC). The IARC monographs developed while he was an active participant are used by OSHA in their hazardous communications standard 1910.1200 as a cited reference to determine whether a substance is a carcinogen. Also, Dr. Hitcho interfaced with pesticide and herbicide manufacturers to conduct occupational health studies and develop hazard analyses for some of the processes in this industry.

## CREDENTIALS

Ph.D., Biology, Notre Dame University, Notre Dame, Indiana (1971)
A.B. Biology, St. Vincent College, Latrobe, Pennsylvania (1966)

## EMPLOYMENT HISTORY

| | |
|---|---|
| 1986-Present | SEVENSON ENVIRONMENTAL SERVICES, INC.<br>Niagara Falls, New York |
| 1979-1986 | UNITED STEELWORKERS OF AMERICA, Pittsburgh, Pennsylvania |
| 1974-1979 | OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)<br>Pittsburgh, Pennsylvania |
| 1971-1974 | NATIONAL INSTITUTES OF HEALTH POSTDOCTURAL RESEARCH FELLOW<br>University of Massachusetts<br>Amherst, Massachusetts |

## KEY PROJECTS

1989 - Sealand Restoration, Lisbon, NY
1988 - New Lyme Landfill Site, Ashtabula, Ohio
1988 - Lang Property Site, Pemberton, New Jersey
1988 - Metaltec/Aerosystems Site, Franklin, New Jersey
1988 - Love Canal Site, Niagara Falls, New York
1988 - Union Carbide Corporation, Ponce, Puerto Rico
1987 - Maxus Energy, Painesville, Ohio
1987 - IBM, Poughkeepsie, New York
1987 - New York State DEC (Love Canal), Niagara Falls, New York
1987 - Universal Manufacturing, Bridgeport, Connecticut
1987 - FMC Corporation, Middleport, New York
1986 - Confidential Client, Crawfordsville, Indiana
1986 - Allied Corporation, Ironton, Ohio
1986 - Confidential Client, Staten Island, New York
1986 - Regional Municipality of Ottawa-Carlton, Ottawa, Ontario
1986 - U.S. Army Corps of Engineers, Council Bluffs, Iowa
1986 - New York State DEC (Love Canal), Niagara Falls, New York

## CERTIFICATIONS & HONORS

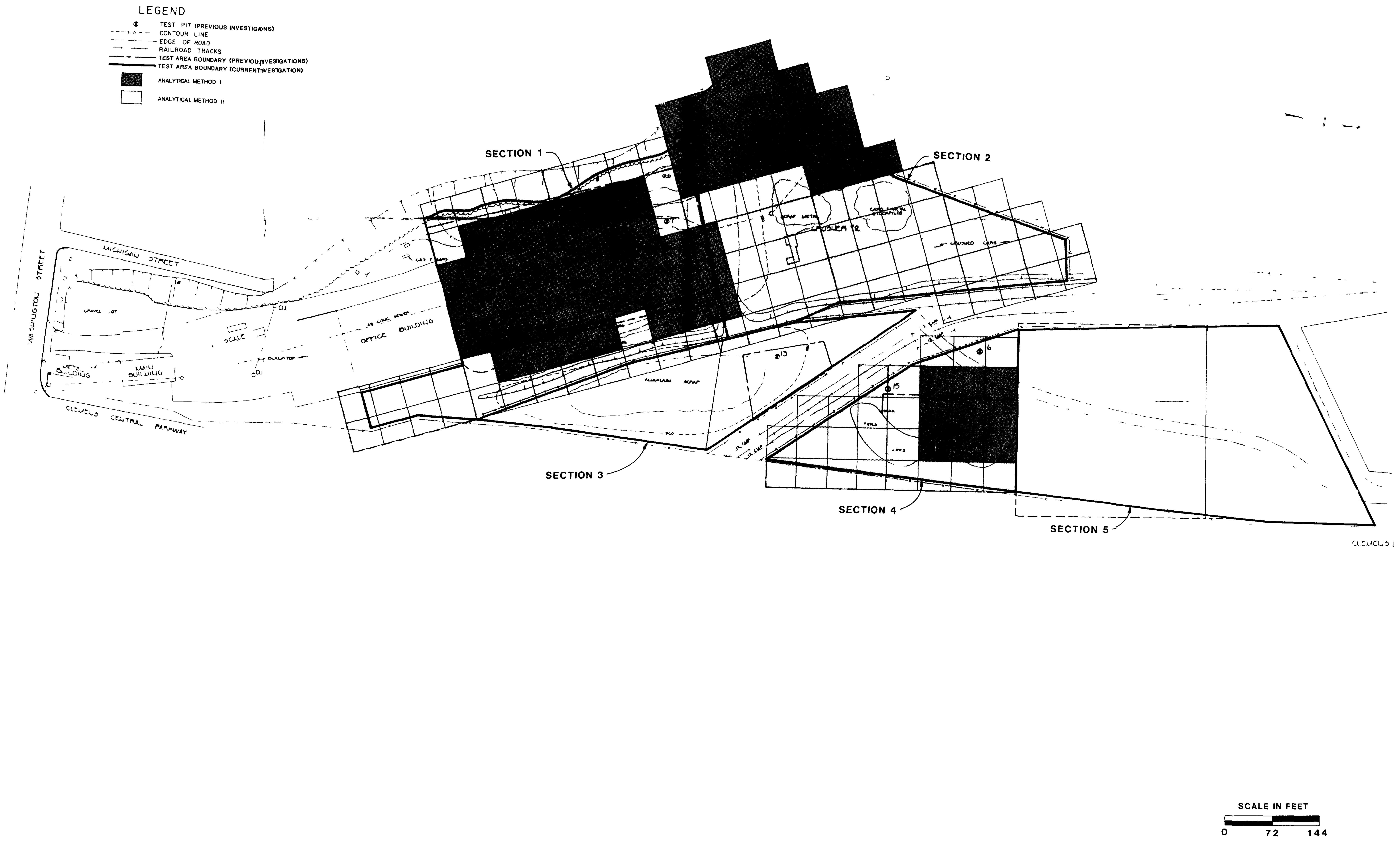
- BOARD CERTIFIED INDUSTRIAL HYGIENIST
  AMERICAN BOARD OF INDUSTRIAL HYGIENE

- NATIONAL INSTITUTES OF HEALTH POSTDOCTORAL FELLOW
  UNIVERSITY OF MASSACHUSETTS

- NATIONAL SCIENCE FOUNDATION FELLOW
  UNIVERSITY OF NOTRE DAME

- DIPLOMATE: AMERICAN ACADEMY OF INDUSTRIAL HYGIENE.

- CERTIFICATE OF APPRECIATION
  U.S. DEPARTMENT OF LABOR



MALCOLM PIRNIE

REVISIONS

DES

DWN

CKD

I SHULMAN & SON, INC
ELMIRA, NEW YORK

SITE INVESTIGATION

PROPOSED TEST PIT SAMPLE LOCATIONS

MALCOLM PIRNIE INC

DATE JULY 1989

FIGURE 6-5

35840