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INTERIM MONITORING PLAN
(ANNEX B OF WORK PLAN)
FOR REMEDIAL DESIGN OF SHARKEY LANDFILL

PARSIPPANY AND TROY HILLS TOWNSHIPS
MORRIS COUNTY, NEW JERSEY

AUGUST 1989

Burns and Roe Industrial Services Company

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PARSIPPANY AND TROY HILLS TOWNSHIPS
MORRIS COUNTY, NEW JERSEY

PREPARED FOR:

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF HAZARDOUS SITE MITIGATION

BY:

BURNS AND ROE INDUSTRIAL SERVICES COMPANY
ORADELL, NEW JERSEY

THROUGH ITS SUBCONTRACTOR

CAMP, DRESSER & MCKEE, INC.
EDISON, NEW JERSEY

AUGUST 1989

SHARKEY LANDFILL REMEDIAL DESIGN
INTERIM ENVIRONMENTAL MONITORING PLAN

TABLE OF CONTENTS

TABLE OF CONTENTS
(continued)

(650)

1.0 PROJECT DESCRIPTION

The following sections present an overview of the rationale and implementation of the Interim Environmental Monitoring Plan (IMP) during the remedial design and construction activities at the Sharkey Landfill, Morris County, New Jersey (see figure 1-1). Detailed descriptions of the types and numbers of samples, chemical analyses, sampling protocols, sample preservation, handling, and shipment, and all other aspects of the field program are presented in subsequent sections of this Plan.

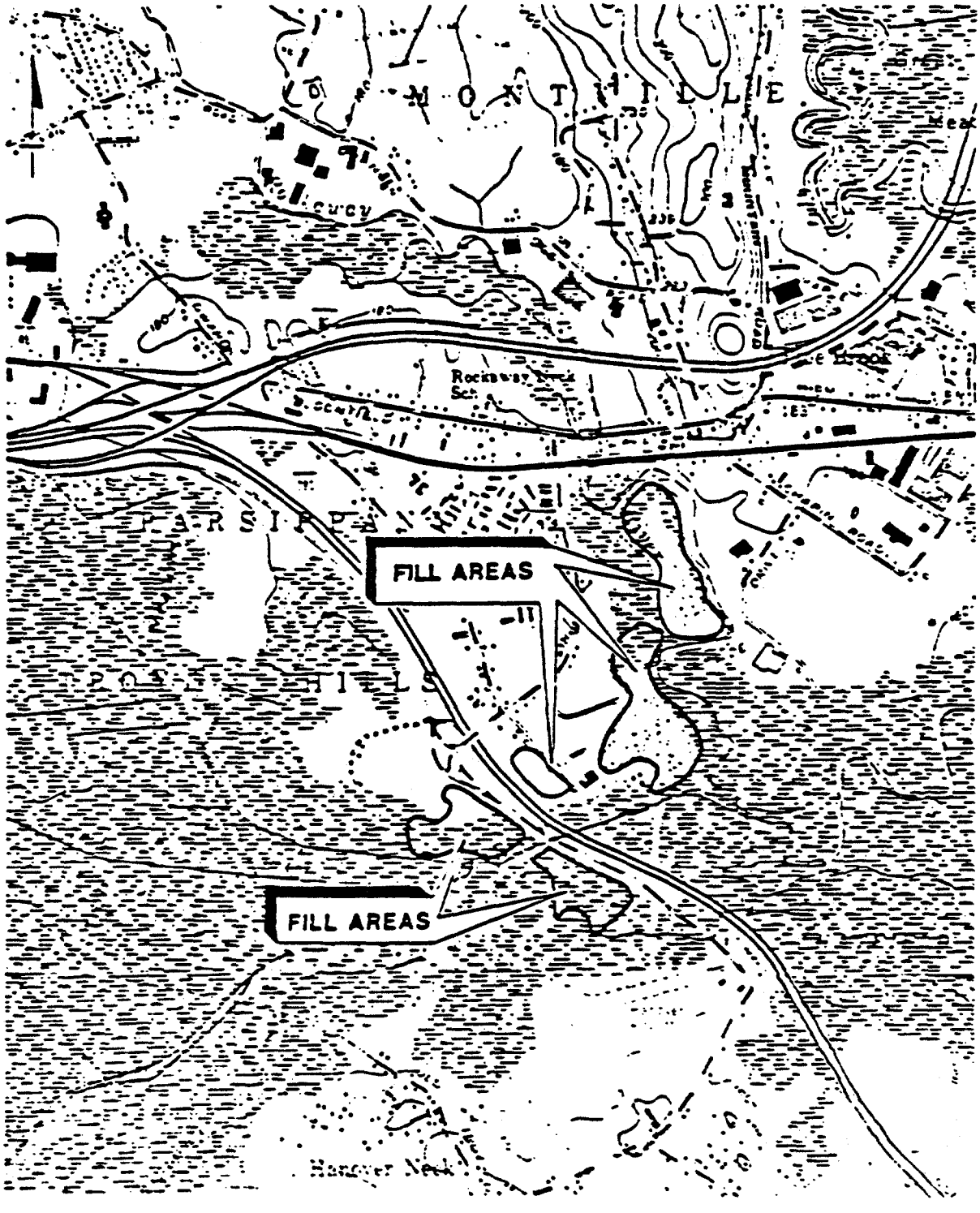
1.1 PURPOSE AND INTENT

The purpose of the interim monitoring program is to track water quality characteristics and emissions to the air from the Sharkey's Landfill. The program will consist of collection and analysis ground water, surface water and air samples every six months throughout the design and construction period. The time requirement for completion of the remedial design is 14 months. Thus it is expected that two rounds of interim sampling will be conducted during design.

As presented in section 1.2, the results of the Remedial Investigation indicate that the Sharkey Landfill has a limited degree of contamination. The number of hazardous contaminants detected was small. Contamination appears to be localized at this time primarily in the shallow aquifer below the site, and present at very low concentrations.

The objectives of the selected remedy were to minimize the potential for migration of ground water contamination to surface water, and to minimize the risk to the public from exposure to waste and contaminated soil from the site. Data from the interim and post-closure monitoring programs will be used to monitor the effectiveness of the selected remedy in achieving these objectives.

The IMP is intended as a guide from which the post-closure monitoring plan for the site will be developed. The data obtained from design- and



Reference: USGS Caldwell, N.J.
Copied from RI/FS report

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Figure 1-1

Site Location Map

Sharkey Landfill, Morris County, New Jersey

construction-phase monitoring will be used to verify the findings of the Remedial Investigation, and develop a historical database from which to compare future environmental monitoring results.

The first round of interim monitoring activities will be performed concurrently with the field investigations for development of design criteria. Data from that round will be used as part of the basis for design of the ground water/leachate recovery and treatment systems.

1.2 SUMMARY OF PREVIOUS INVESTIGATIONS

A Remedial Investigation was conducted at the Sharkey Landfill between July and December 1985 by Alfred Crew Consulting Engineers, Hazen and Sawyer Engineers and their subconsultants. These investigations focused on better defining the level and extent of the contamination at the site and to develop the needed information to evaluate appropriate remedial alternatives.

The major investigations included: air sampling; installation of twenty-six monitoring wells; sampling the shallow and lower aquifers; soil sampling; an electromagnetic survey; residential and commercial well sampling; and two water quality surveys, which included leachate and sediment sampling.

During the initial site visit for the Remedial Investigation Study in September 1984, a 24-hour air monitoring investigation was conducted.

These results indicated that the air quality measurements suggested a low probability of respiratory or dermal hazards from airborne volatile organics under ambient conditions.

In November 1985, the twenty-six monitoring wells were sampled. Two of the volatile organic compounds detected, benzene and trichloroethylene (TCE), were present at concentrations exceeding the EPA Proposed Maximum Contaminant Levels for drinking water supplies applicable at that time. Benzene was found in five shallow wells on the site and TCE was found in one

well. One intermediate well exceeded the drinking water standards for benzene.

Cadmium, chromium, cyanide, lead, and nickel were detected in several ground water samples. Iron and manganese was high throughout the area in the samples obtained.

Seven organic compounds were detected in the soil samples these include acetone, 2-butanone, naphthalene, phenanthrene, 2-methylnaphthalene, fluoranthene, and pyrene.

Two surface water and leachate sampling surveys were conducted on-site. The first, the dry weather survey was done on July 23 and 24, 1985 and the wet weather survey was done November 5, 1985. Twenty-three samples were collected during the dry weather survey and eleven during the wet weather survey.

The results indicated no significant concentrations of organic or inorganic priority pollutants detected in the surface water or leachate. Cadmium and mercury were the only priority pollutants detected downstream of the site that exceeded drinking water standards. Iron and manganese exceeded the drinking water standards at all the sampling locations.

The results of the remedial investigation indicated that the site has a limited degree of contamination. The number of chemicals found were limited and their concentrations were low. Those contaminants found, at that time, were primarily located in the shallow aquifer.

The primary remedial objective identified as a result of these investigations, was to minimize the potential for migration of the low level contamination detected in the shallow aquifer to the surrounding surface waters. The downstream surface waters are used as a source of potable water after treatment.

Additional remedial objectives established during the RI phase included proper closure of the Landfill, include installation of a suitable cover

over the North, South, and Northwest Fills, and implementation of site security measures, and implementation of erosion control measures to minimize loss of refuse by action of runoff and surface water bodies.

The NJDEP conducted an additional round of ground water sampling, based on the recommendations of the Remedial Investigations Report. During the summer of 1986 eleven monitoring wells were sampled. The NJDEP scope of sampling activities was limited to verify or re-examine specific monitoring wells for specific analytical parameters. The results from this sampling round show very low levels of contamination. Additional surface water and ground water monitoring was recommended.

A feasibility study was conducted on this site where remedial technologies and the development of remedial alternatives were evaluated and recommended. This study was conducted by Alfred Crew Consulting Engineers and Hazen and Sawyer Engineers under contract to the NJDEP.

The NJDEP and USEPA presented their remedial alternatives and recommendations in their Record of Decision (ROD) for Sharkey Landfill, dated September 24, 1986. The major remedial activities include capping the five fill areas, a ground water pumping and recovery system, a gas venting system for methane collection, additional fencing and gates for security, rehabilitation of the North Fill Bridge, stormwater controls to control erosion of the fill areas, and a long-term monitoring program including construction of four additional monitoring wells.

The Conceptual Design Analysis of the selected remedy was completed by Alfred Crew Engineers and Hazen and Sawyer Engineers in July 1987. The analysis included the engineering approach to complete the selected remedial alternatives; an engineering evaluation of the alternatives including implementation requirements, safety and cost analyses which included construction, operation and maintenance costs.

The Remedial Design activities or the Sharkey Landfill were initiated in November 1988. The design is being performed by Burns and Roe Industrial Services Corporation (BRISC), as prime contractor to NJDEP, and its sub-

contractors, Camp Dresser & McKee Inc. (CDM), Enseco-East (Enseco), and Empire Soils Investigations, Inc. (ESII). These design activities are described in detail in the project Work Plan, and this associated Field Sampling and Testing Plan and an Interim Monitoring Plan.

1.3 INTERIM MONITORING ACTIVITIES

The interim monitoring activities consist of:

- water quality sampling of 15 existing monitoring wells used in the RI, and one (1) new shallow well to be installed near the Whippany River at the South-Northwest fill
- water quality sampling of surface water
- air sampling

The primary goal of the ground water and surface water sampling is to identify any changes in the water quality that may have occurred in the selected wells since they were last sampled, with particular regard to indications of plume movement. The sampling points identified in table 1-1 and 1-2 are located appropriately to provide coverage at the edges of the plume. A summary of sampling and analytical requirements for the interim environmental monitoring program are summarized in section 5.0.

1.3.1 GROUND WATER MONITORING

Ground water will be sampled at 16 locations, composed of 15 of the monitoring well locations used in the RI, and one (1) new shallow well to be installed near the Whippany River at the Northwest Fill (South). Sample locations are presented in figure 1-2.

Interim monitoring for ground water will be performed at the locations identified in table 1-1, which are consistent with those identified in guidance provided by NJDEP.

TABLE 1-1

GROUND WATER SAMPLE LOCATIONS

Monitor well	Location/Depth	Purpose
WS-14	North of North Fill/shallow	Detect possible northward migration of contaminants offsite
WS-13	North Fill/shallow	Monitor migration of contaminants toward Rockaway River
WS-12	North Fill/shallow	Monitor migration of contaminants from North Fill toward Rockaway River
WS-17	South Fill/shallow	Monitor migration of contaminants from South Fill toward Rockaway River
WS-2	South Fill/shallow	Monitor migration of contaminants from South Fill toward Rockaway River
WS-3	Northwest Fill/shallow	Monitor migration of Contaminants from NW Fill toward Whippany River
WS-4	Southwest Fill/shallow	Monitor presence of contaminants in the SW Fill
New	NW Fill(s) near Whippany River/shallow	Monitor migration of contaminants from NW Fill toward Whippany River
WI-15	NW of site/intermediate	Detect migration of contaminants in the lower aquifer
WI-8	South Fill/intermediate	Detect migration of contaminants in the lower aquifer
WI-16	East of site/intermediate	Detect migration of contaminants in the lower aquifer

TABLE 1-1
(continued)

Monitor well	Location/Depth	Purpose
WI-7	West of site/intermediate	Detect westward migration of contaminants in the lower aquifer
WD-2	South Fill/deep	Detect migration of contaminants in the lower aquifer (upgradient)
WI-4	NW Fill/intermediate	Detect migration of contaminants in the lower aquifer
WI-6	South Fill/intermediate	Detect migration of contaminants in the lower aquifer
WI-17	South Fill/intermediate	Re-evaluate presence of organics in (over aquifer systems and detect migration of contaminants in the lower aquifer

(580)

TABLE 1-2

INTERIM MONITORING PROGRAM

SURFACE WATER SAMPLE LOCATIONS

Sample No.	Location	Purpose
SW-1	Northwest of North Fill in Rockaway River (formerly SD-4)	Background location to monitor water upstream from North Fill
SW-2	East of North Fill in Rockaway River (formerly SD-10	To monitor river passing east of North Fill
SW-3	East of North Fill in Rockaway River (formerly SD-11	To monitor river passing east of North Fill
SW-4	Northeast of South Fill (formerly SD-5)	Background location to monitor water upstream of South Fill
SW-5	West of South Fill (formerly SD-9)	Monitor contaminants migrating off West side of South Fill
SW-6	Southeast side of South Fill (formerly SD-6)	Monitor Rockaway River at confluence of Rockaway and Whippany Rivers
SW-7	Southeast side of South Fill (in Whippany River) (formerly SD-3)	Monitor Whippany River at confluence of Whippany and Rockaway Rivers
SW-8	Adjacent to East side of Northwest Fill (South) (formerly SD-2)	Monitor Whippany River adjacent to Northwest Fill (South)
SW-9	South of Northwest Fill (South) (formerly SD-1)	Monitor Whippany River upstream of Southwest and Northwest Fill (South)
SW-10	Grab sample of site runoff to be determined in field	To monitor quality of site runoff to surface waterways

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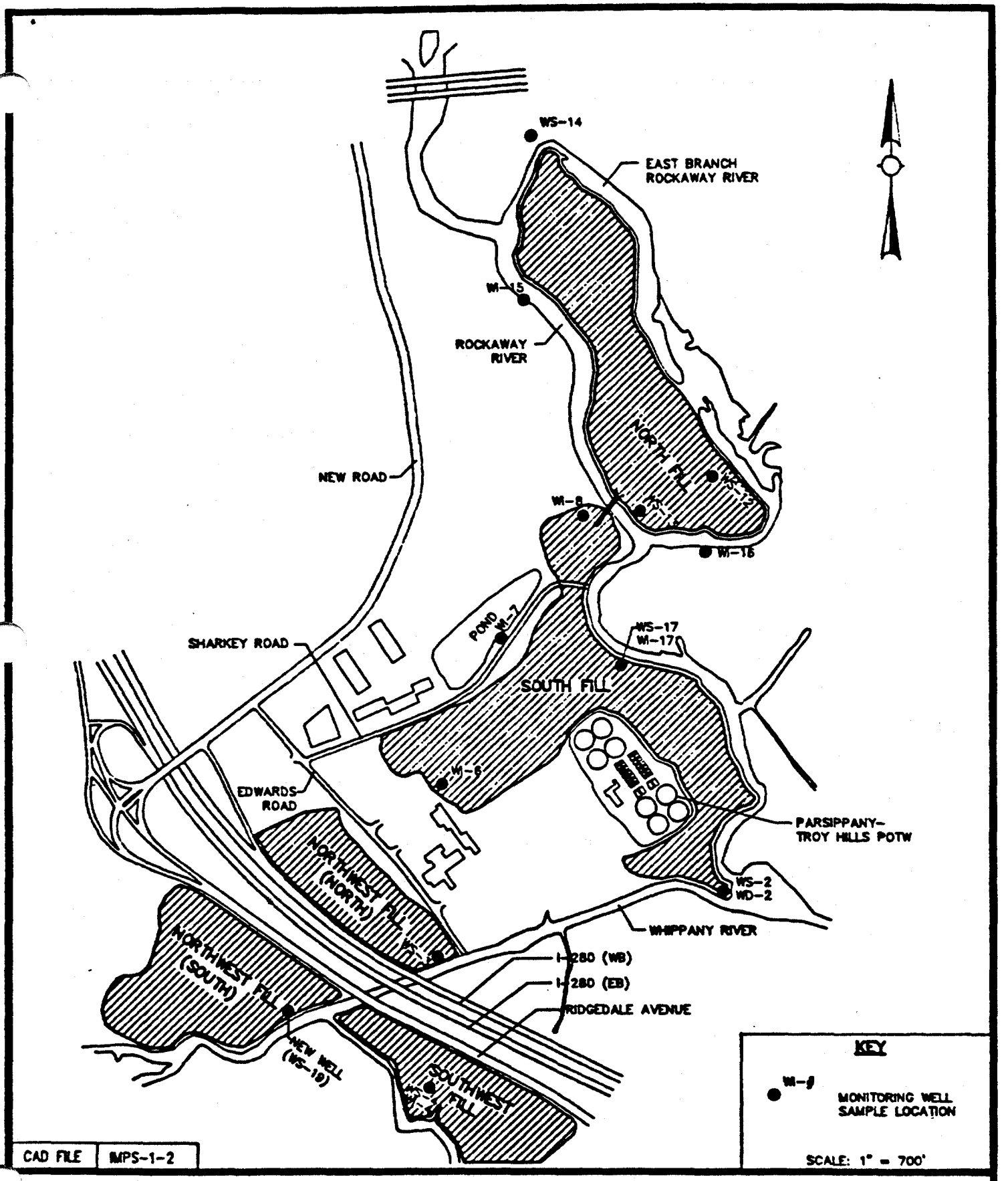

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Figure 1-2
Interim Groundwater Monitoring Location Map
Sharkey Landfill Remedial Design

Ground water samples will be analyzed for compounds on USEPA's Target Compound List (TCL), plus 30 non-target analytes. Samples will also be analyzed for conventional parameters that commonly serve as indicators of leachate contamination. The conventional parameters for analysis are listed in table 1-3.

1.3.2 SURFACE WATER MONITORING

Surface water will be sampled at nine fixed locations, and at one grab sample location (see figure 1-3). The fixed locations will be consistent with the surface water sampling locations used during the RI. The location of the grab sample will be determined in the field based on observed site runoff. Sampling locations for interim monitoring of surface water are listed in table 1-2.

Surface water samples will be analyzed for compounds on USEPA's Target Compound List (TCL), plus 30 non-target analytes. Samples will also be analyzed for conventional parameters that commonly serve as indicators of leachate contamination. The conventional parameters for analysis were listed in table 1-3.

1.3.3 AIR MONITORING

Locations for collection of air monitoring will be selected on-site, upwind, and downwind of the site, based on the prevailing wind direction at the time of sampling. Sampling will be performed under conditions for "worst-case" exposure, to the extent practical. Factors contributing to "worst-case" conditions include falling barometric pressure, low wind speed, temperature inversion, and high ambient temperature. Sampling must be conducted during periods of relatively constant wind direction, in order to maintain the upwind and downwind locations as representative of "no exposure" and "maximum exposure" conditions. Some meteorological conditions that contribute to worst-case exposures, notably falling barometric pressure and low wind speed, are associated with variable winds, and may present unsuitable conditions for air monitoring.

TABLE 1-3

CONVENTIONAL PARAMETERS FOR
GROUND WATER AND SURFACE WATER ANALYSIS

Total suspended solids (TSS)
Total dissolved solids (TDS)
Alkalinity
Hardness
pH
Total chlorides
Chemical Oxygen demand (COD)
Ammonia as N (NH_3-N)
Biological oxygen demand, total 5-day (BOD_5)
Nitrate as N (NO_3-N)
Total kjeldahl nitrogen (TKN)
Phosphorous, total as P
Total solids
Specific conductance
Total organic carbon (TOC)
Sulfate, total
Iron, total
Manganese, total

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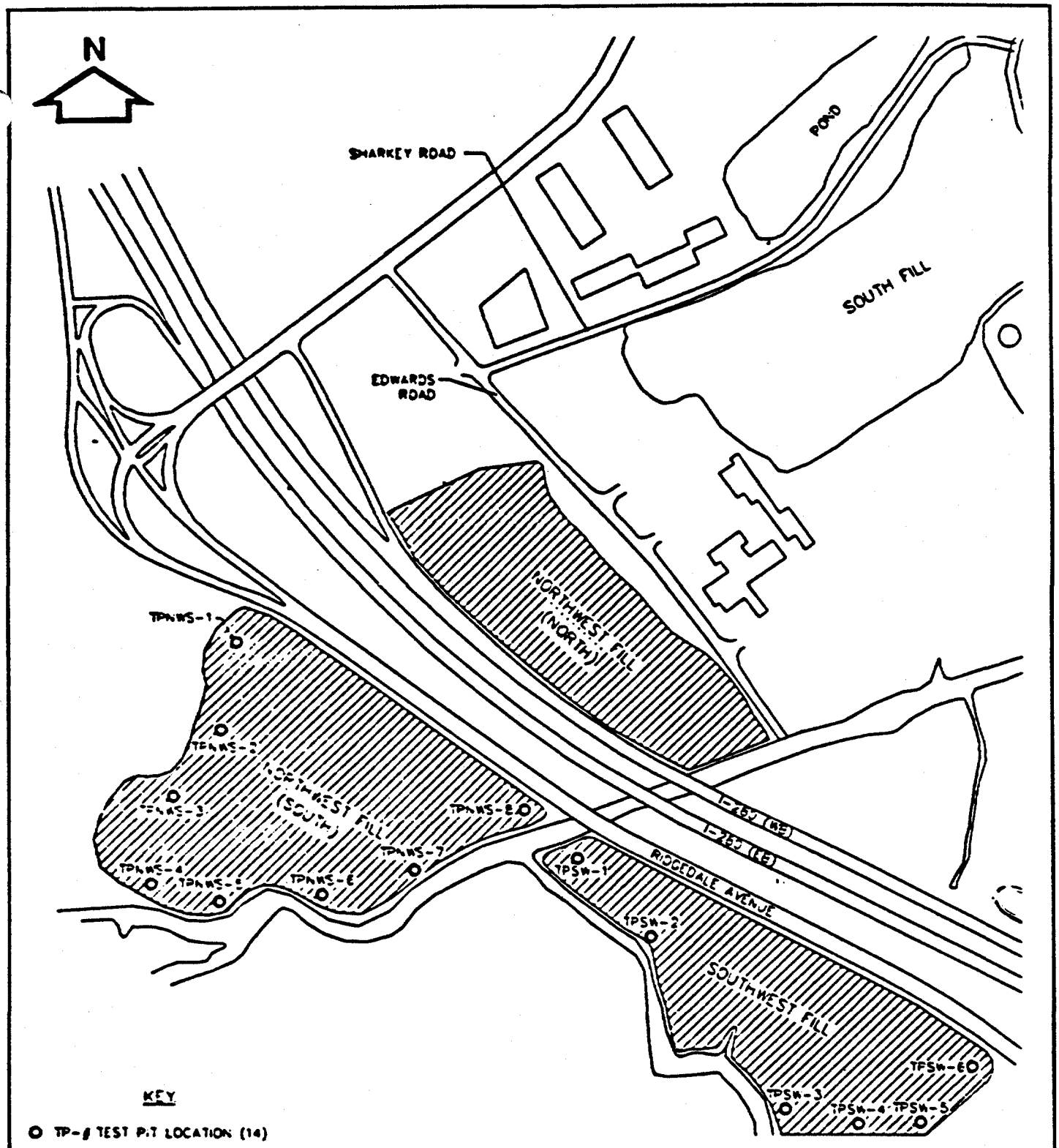

Figure 1-3

Soil Investigation for the Delineation of the Northwest and Southwest Fills

Sharkey Landfill, Morris County, New Jersey

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Selection of sample locations will consider contributions from locally important background sources, particularly the sewage treatment plant located between the South Fill and Northwest Fill. The effects of local topography on formation of eddies and stagnant areas will also be considered. Seven sets of samples are proposed for each sampling event. One sample each will be placed at anticipated upwind and downwind property line points for both the North and South Fills. An additional two sampling locations will be selected where high concentrations of airborne contaminants are expected. One such location would be in the area immediately downwind of the water treatment plant. A seventh sample will be collected at one of the six sampling locations to provide a duplicate sample for quality assurance purposes. Sample locations, based on the prevailing wind direction, are presented in figure 1-4.

No sampling is planned for the area of the Northwest Fill because no significant organic contamination was detected at that fill.

Air samples will be analyzed for TCL volatile organic contaminants, and 15 nontarget compounds, plus hydrogen sulfide, hydrogen cyanide, mercaptans, sulfur dioxide, and methane.

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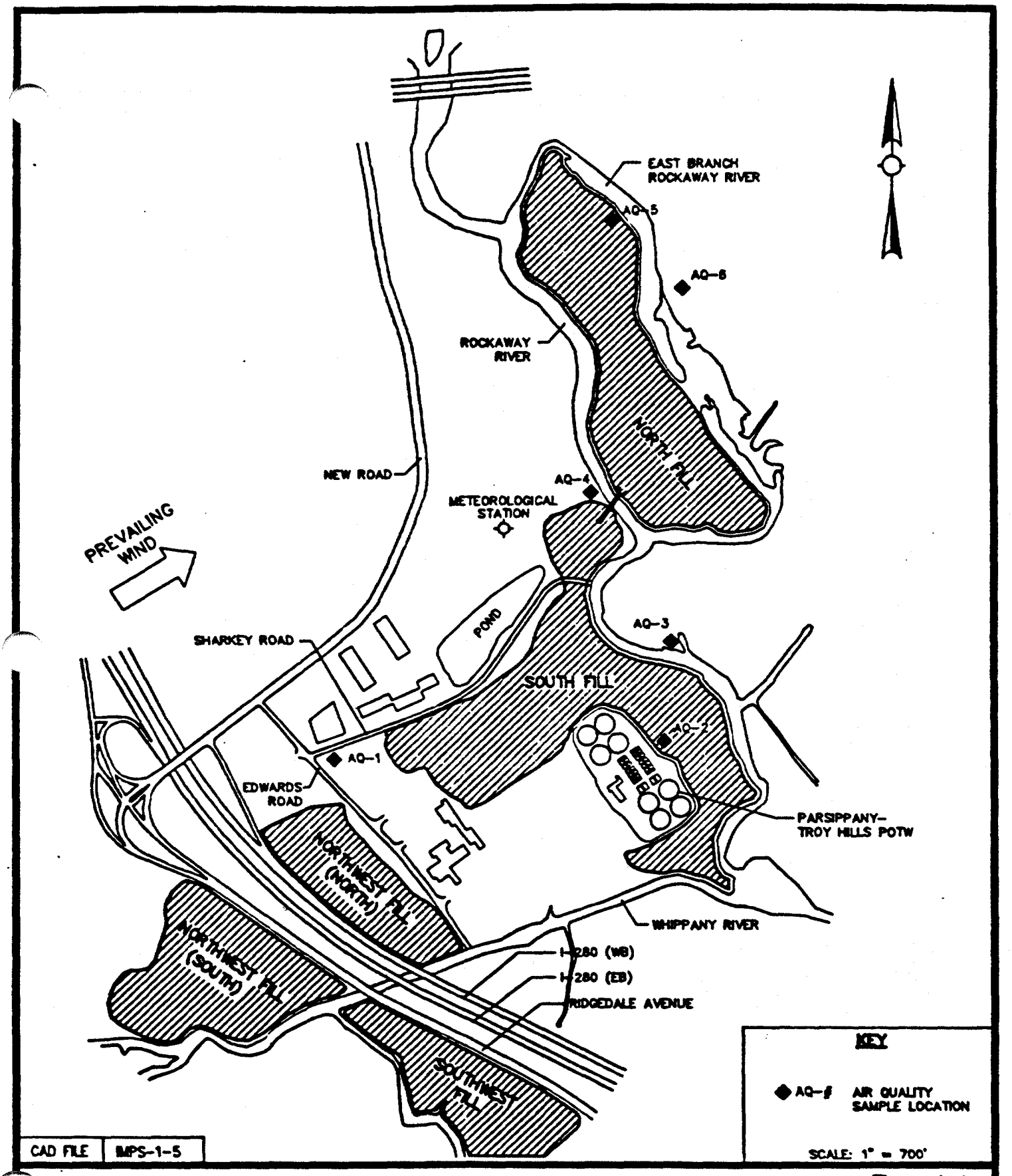

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Figure 1-4
Interim Air Quality Monitoring Location Map
Sharkey Landfill Remedial Design

2.0 PROJECT ORGANIZATION AND RESPONSIBILITY

2.1 PROJECT ORGANIZATION

The project management organization for the Sharkey Landfill Remedial Design project is designed to provide a clear line of functional and program authority supported by a management control structure (see figure 2-1). This control structure provides:

- o Clearly identified lines of communication and coordination
- o Monitoring of program budget, schedules and financial performance
- o Managing key technical resources
- o Providing monthly financial management and progress reports
- o Health and safety
- o Quality control

The following is a listing of management personnel assigned to this project and their area of responsibility. Resumes of key BRISC and CDM personnel are presented at the end of this section. Should any key personnel be changed during the course of the project, BRISC will notify NJDEP of the change and submit the necessary information regarding the official function responsibilities, authority and experience of the newly assigned staff.

Name	Role	Affiliation	Telephone
Ashraf T. Dajani, P.E.	Officer-in-Charge	BRISC	201-265-2000
Thomas Klemm	Contract Manager	BRISC	201-265-2000
Paul D. Lanik	Project Manager	BRISC	201-265-2000
James Delaney, P.E.	Assistant Project Manager	BRISC	201-265-2000
Robert Baumbach, P.E.	Quality Assurance Manager	BRISC	201-225-2000
John J. Johnnidis	Health and Safety Supervisor	CDM	201-225-7000
James Zodak	Analytical Laboratory Manager	Enseco	201-469-5800
Edward Emery	Quality Assurance Officer	Enseco	201-469-5800
William Sherman	Laboratory Project Manager	Enseco	201-469-5800
W. Dean Anderson	Drilling and Geotechnical	ESII	201-846-5200

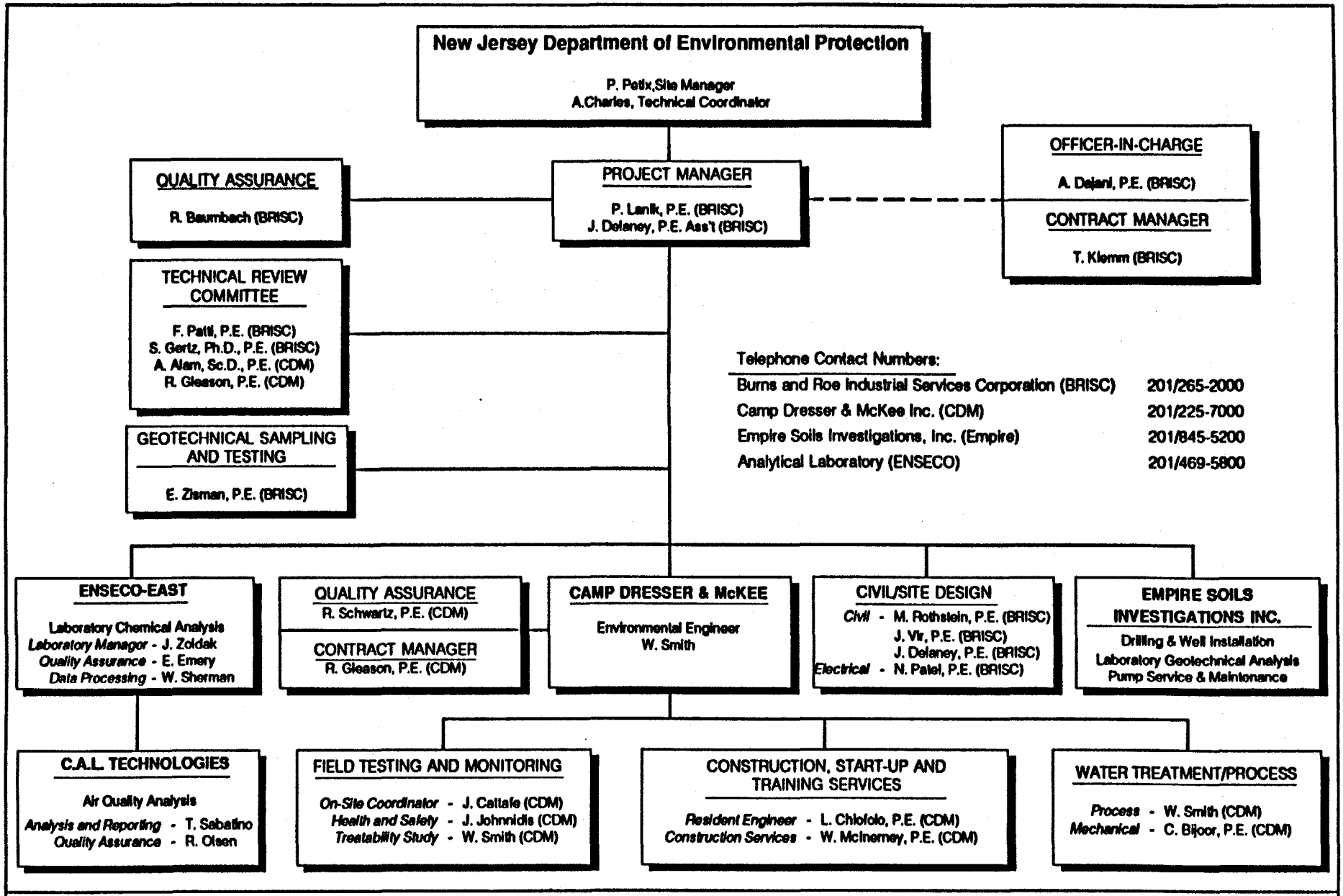

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Figure 2-1

Table of Organization

Sharkey Landfill Remedial Design

Burns and Roe Industrial Services Company (BRISC) is the prime contractor for the Sharkey Landfill Remedial Design project, and as such, will be responsible for the overall project management, coordination with the NJDEP, and QA/QC of the work performed as part of this project. In addition to responsibility for project performance, BRISC will provide general/civil, architectural, structural, mechanical, electrical and instrumental engineering of earthwork and facilities. Subcontractors to BRISC, and their project responsibilities are as follows:

- Camp Dresser & McKee, Inc. (CDM) - Hydrogeological evaluation, environmental monitoring, field sampling and testing, pretreatment process design, and mechanical design drawings.
- Enseco - East (Enseco) - Chemical analysis of aqueous, soil and air samples.
- Empire Soils Investigations, Inc. (Empire), - Drilling, collection of soil samples for geotechnical analysis, geotechnical soil analysis, monitoring well installation and pump maintenance during aquifer tests.

2.2 RESPONSIBILITY

The Project Manager, Paul Lanik, is ultimately responsible for the execution of all field sampling and testing, analytical, design, construction, startup, and training activities performed as part of the Sharkey Landfill Design project. This includes ensuring that all field activities are carried out in strict conformance with the Field Sampling and Testing Plan, the Interim Monitoring Plan, the Quality Assurance Project Plan, and the Health and Safety Plan. Mr. Lanik will coordinate all interactions with the NJDEP.

Robert Baumbach, the Quality Assurance Manager, will be responsible for overseeing all aspects of Quality Assurance and reporting this status to the project manager. Mr. Baumbach will be responsible for conducting procedural audits for the project. Ed Zisman will be responsible for geotechnical investigations and overseeing project field activities for BRISC. The Assistant Project Manager, James Delaney, is responsible for overseeing civil and site design activities. He will report directly to the project manager on these affairs.

William Smith is responsible for overseeing CDM's project activities. Mr. Smith will also coordinate the treatability studies and treatment design activities being conducted by CDM. Joseph Cattafe will coordinate all field sampling and testing activities, and interim monitoring activities for CDM. John J. Johnnidis will be responsible for the health and safety aspects of all field work performed as part of this project. Robert Schwartz is CDM's Quality Assurance Coordinator and will be responsible for CDM internal quality assurance and field audits.

Enseco-East maintains internal QA/QC procedures to assure that the analytical procedures are performed in accordance with the appropriate NJDEP-approved methods. Enseco's responsibilities include laboratory analyses, laboratory QC, and data processing activities and QC pertaining to the laboratory activities. The Enseco Project Manager, William Sherman, will be responsible for coordinating the activities of Enseco and their subcontractor, and will be the laboratory's contact for this project. The laboratory Quality Assurance Officer, Edward Emery, will be responsible for implementing Enseco's QA/QC procedures, and for ensuring that the air laboratory's QA/QC program is maintained. Data processing activities are the responsibility of William Sherman. The Analytical Laboratory Manager, James Zodak, has overall responsibility for the laboratory's technical and QA/QC functions, and will perform the final review of the laboratory reports. Further detail is presented as part of the laboratory Standard Operating Procedures, which are on file with NJDEP. Thomas Sabatino of C.A.L Technologies will have responsibility for analysis of air quality samples, and preparation of air sampling media.

The NJDEP Bureau of Environmental Measurements and Quality Assurance will perform all validation of the results of laboratory chemical analysis for this project.

Empire Soils Investigations, Inc. (ESII) will be responsible for obtaining all necessary NJDEP permits for drilling and monitoring well installation. Empire will also be responsible for assuring that geotechnical testing is performed in accordance with the appropriate NJDEP-approved standard test methods.

3.0 SAMPLING PROTOCOL

3.1 INTRODUCTION

The following section outlines the procedures which the sampling team will follow when conducting those field activities necessary to complete the work assignment for the Interim Monitoring Program. Prior to initiating any field work the following preparatory activities must be completed:

- Inform NJDEP of time and date of sampling event at least two weeks before the event.
- Ensure that all sample analyses are scheduled through the Enseco-East laboratory.
- Determine the type and size of sample containers required and the preservatives and maximum holding times for each sample.
- Determine what type of equipment is needed and make sure the equipment is available.
- Ensure all field measuring equipment has been calibrated and has received appropriate quality control checks.
- Obtain trip blanks and field blank water from the Enseco-East laboratory.

Personal protective equipment and health and safety guidelines are specified for each activity in the Health and Safety Plan.

3.2 MONITORING WELL INSTALLATION

OBJECTIVE

The objective of the monitoring well installation is to provide access to the ground water system for the purpose of collecting ground water samples and taking water level measurements. This information will be used to evaluate ground water quality, direction of ground water flow and characteristics of the aquifer in which the well is screened.

PREPARATORY ACTIVITIES

1. Interpret the existing logging data (lithologic and geophysical) from the remedial investigation to determine optimum setting of screen interval. Screen intervals will be selected based on the RI data and may be slightly modified based on the actual stratigraphy encountered in the initial test boring.

2. Provide the information needed to obtain a drilling permit to the driller. The driller will be responsible for obtaining a drilling permit, prior to mobilization.

3. Actual well locations will be selected in the field, based on access, and staked.

4. Steam clean stainless steel well casing and well screen thoroughly prior to installation if evidence of possible contamination is present.

5. Identify health and safety protection and requirements based on air monitoring measurements and visible contamination.

FIELD EQUIPMENT

All drilling equipment, supplies and materials will be supplied by the drilling contractor.

The supervising hydrogeologist (inspector) will supply a field logbook, boring log and well construction diagram forms, folding rule, and stainless steel knife, necessary to log document stratigraphic and well construction information.

DOT-approved 55-gallon steel drums for the storage of drill cuttings.

The driller and inspector will supply their own health and safety equipment. Modified level D equipment with provisions to upgrade to level C will be required for well installation. This equipment is described at the end of this section.

RESPONSIBILITIES

The on-site hydrogeologist will ensure that the monitoring well installation procedures outlined below are followed. The Health and

Safety Coordinator will ensure that all health and safety protocols are followed.

PROCEDURES

1. Well will be installed in an initial test boring or pilot hole.

2. The setting for the screen interval of each well shall be determined using data available from the lithologic and geophysical logs and information from the RI/FS.

3. The initial test boring/pilot hole will be drilled by the hollow-stem auger methods. If the mud rotary method is used, only pure Wyoming bentonite and potable water will be used as drilling fluid. Polymer enhanced muds will not be used.

4. Split-spoon samples will be collected at five-foot intervals at the monitoring well location. Split-spoon samples will also be collected from the screen interval at pumping well locations. Split-spoon samples will be collected in accordance with ASTM D-1586 (74). Unconsolidated material will be classified according to the Unified Soil Classification System so that this information can be compared to the logs of the geotechnical borings.

5. Place cuttings in DOT-approved 55-gallon steel drums.

6. The monitoring well and pumping wells will be constructed of four-inch-diameter, threaded well casing and screen. Individual lengths will be installed by screwing the individual pieces together and installing them as one unit. Schedule 5, type 304 stainless steel casing and type 304 stainless steel wire-wrapped (continuous) well screens will be used for these wells. It is anticipated that .020-inch slot well screen will be used. All casing and well screen will be of threaded, flush-joint construction. Vegetable shortening may be used to lubricate the threads.

7. The base of the well shall be secured a minimum of one foot above the bottom of the borehole. Graded, washed sand shall be added to the annulus from the top of the hole, until a continuous filter pack forms beneath and around the well screen.

8. The filter pack shall extend from one foot below the base of the well screen to no more than two feet above the top of the well screen.

9. Bentonite pellets shall be used to seal the annulus a minimum of one foot above the gravel pack material. The pellets will be installed by pouring from grade along the outside of the riser pipe.

10. The remaining annulus shall be filled with a cement/bentonite grout installed by the tremmie method above the bentonite pellet seal to the ground surface.

11. A protective steel casing with locking cap will be installed at each monitoring well. The bottom of the protective casing will be cemented two feet below grade. A concrete pad sloping away from the protective casing will be completed around each well. Inner casing caps will be provided for each well.

12. Each well will be provided with keyed-alike padlocks. A set of keys will be sent to NJDEP.

13. The monitoring well will be developed using a combination surge block, air surge or interrupted pumping. All equipment required for well development will be supplied by the drillers. The drillers will also be responsible for carrying out the well development. Development will be complete when a clear, sediment free discharge is maintained and can be repeated. The monitoring well and pumping wells will be pumped at a constant rate for approximately one hour in order to measure specific capacity.

14. Purge water will be discharged to the surface and returned to the saturated zone by natural percolation.

3.3 MONITORING WELL SAMPLING

OBJECTIVE

To obtain aqueous samples from monitoring wells for laboratory chemical analysis to evaluate ground water quality in specific areas for design purposes.

SAMPLE TYPE, SAMPLE METHOD, AND SAMPLE CODE

Sample type: Monitoring Well
Sample method: Grab
Sample code: MW

PREPARATORY ACTIVITIES

1. Allow a two week period between the conclusion of well development activities and the beginning of sampling activities.

2. All bailers will be laboratory decontaminated and wrapped in aluminum foil (shiny side out) that has been decontaminated in the same manner, packaged and dedicated. The following decontamination procedures will be used:

- Non-phosphate detergent plus tap water wash
- Tap water rinse
- Distilled/deionized water rinse
- 10% nitric acid rinse* (trace metal or higher grade HNO_3 diluted with distilled/deionized H_2O)
- Distilled/deionized water rinse*
- Acetone (pesticide grade) rinse**
- Total air dry or pure nitrogen blow out**
- Distilled/deionized water rinse**
  * Only if sample is to be analyzed for metals.
  ** Only if sample is to be analyzed for organics.
- wrap in aluminum foil

3. All other field equipment that will come in contact with the sample which cannot be laboratory cleaned, will be cleaned by the above procedure at the designated decon station prior to sample collection. Field measurement equipment that will enter the well (e.g., water level indicators) will be cleaned in the following manner:

   - wiped with paper towel to remove visible contamination
   - tap water and non-phosphate detergent wash
   - tap water rinse
   - distilled/deionized water rinse

FIELD EQUIPMENT

1. Stainless steel water-level measuring tape
2. Electric water-level indicator
3. Plastic buckets; 1-, 3-, and 5-gallon capacity
4. HNu with 11.7 eV lamp
5. Field log book
6. Key to well locks
7. Stainless steel submersible pump
8. Centrifugal pump
9. Hose clamps (3/4 inch)
10. 3/4-in. diameter PVC hose
11. 110/220 volt, 8 amp generator
12. 3/4-in. gate valves (two)
13. Bailers (teflon construction)
14. Cable
15. Electrical line clamps (stay ties)
16. OVA flame ionization detector
17. Paper towels
18. Laboratory surfactant cleanser (Alconox)
19. Commercial distilled water
20. Gasoline can
21. Teflon-coated stainless steel leader cable
22. Utility knife
23. Rope clamp and hex wrench
24. Scrub brush
25. Sample containers, paper work, and packaging as outlined in sections 4 and 6
26. Polyethylene
27. Nylon or polypropylene braided cord

RESPONSIBILITIES

The On-site Coordinator will ensure that the monitoring well sampling procedures outlined below are followed so that a representative sample is obtained. The Health and Safety Coordinator will ensure that all health and safety protocols are followed.

PROCEDURE

1. Prior to sampling, the casing radius (ft.), total casing and screen length (ft.), and depth-to-water (ft.) shall be measured such that the height of the water column (ft.) and thus well volume (gallons) can be calculated.

2. Using the electric water level indicator, measure and record the static water level to the nearest 0.01 foot from the top of the inner casing.

Preparation for Submersible Pump

3. Clean the submersible pump with a non-phosphate detergent and tap water wash, follow that with a water rinse. Then flush 20 gallons of potable water through the pump and follow that with a final distilled/deionized water rinse. Dedicated ASTM Drinking Water grade tubing will be used for each well and discarded after use. The decontaminated pump and hose will be placed on clean polyethylene sheeting to avoid contact with the ground surface before lowering it into the well.

4. Attach the polyethylene hose to the pump and tighten the hose clamp securely.

5. Attach the polypropylene security line securely to the pump. A dedicated security line will be used at each well.

6. At 10-foot intervals, attach the electrical cable to the hose with stay ties. Clean the stay ties according to the procedures listed above.

7. Lower the pump assembly to a depth which results in the pump intake being located no less than 5 feet above the top of the well screen. As the pump or hose is being lowered into the well, rinse the exterior of the hose and electrical cable with distilled water. This should be done away from the wellhead opening. Clean disposable gloves must be worn when handling cleaned sampling or purging apparatus.

8. Trim excess hose such that a gate valve can be attached in order to regulate the pump discharge if the rated pump capacity exceeds the well yield.

9. Attach a spare piece of hose to the gate valve discharge in order to minimize spraying.

10. Check fuel and oil levels in the generator, start the generator and turn on the pump.

Preparation for Centrifugal Pump

11. Cut a length of polyethylene hose and attach it to the intake of the centrifugal pump with a hose clamp. The hose should be long enough to reach the water level in the well plus several feet of anticipated drawdown.

12. Put on a clean pair of surgical gloves and lower the hose into the well wiping the outside of the hose with a paper towel, soaked with distilled water, as it is fed into the well.

Well Purging

13. Start the pump, remove the prime plug and prime the pump. Once discharge begins, replace plug.

14. Record the time pumping begins, fill a graduated container to get the flow rate (gallons per minute). Discharge evacuated water to the ground surface and allow for evaporation and/or percolation. Based on the results of prior sampling during the RI, and by the NJDEP, all evacuated water will be released to the ground surface.

15. Periodically check and record the pumping water level and yield and make necessary adjustments.

16. Purge three well volumes. Periodically (i.e., every five minutes) monitor temperature, pH, and specific conductance of the pump discharge for stabilization within 10% over three successive readings.

17. The pump assembly/evacuation hose will be slowly raised until the pump intake is above the pumping water level and "suction" is broken. Once suction is broken, the pump will be turned off and the pump assembly/evacuation hose will be removed from the well. New tubing will be used for each well and then discarded.

18. All wells with sufficient recovery potential will be sampled within two hours of evacuation. For slow recovery wells, the discharge rate will be reduced as much as possible to avoid purging to dryness. It is anticipated that all wells will be able to meet these criteria, based on the results of previous sampling events.

General Sampling Procedures

19. Wearing a clean pair of surgical gloves, remove the dedicated bailer and check-valve from the aluminum wrapping.

20. Attach line securely to the five-foot teflon-coated stainless-steel leader. Keep excess line coiled on plastic sheeting to prevent contact with the ground. When lowering the bailer into the well, allow only the bailer and a small length of leader to be submerged (i.e., preventing polypropylene rope from touching the water).

21. Commencing with the first bailer volume, pour the bailer contents into sample bottles. Fill volatile organic analysis (VOA) sample bottles first according to procedures below.

22. Repeat the procedure for extractable organics, PCB, metals and phenol sample bottles. These bottles should only be filled according to procedures below.

23. Record all appropriate data in the field log book.

24. Add preservatives to the sample containers for total metals and conventional parameter analysis until the pH has been adjusted. Do not immerse pH paper or pH stick in the bottle to check pH. Shake bottle so that inside of cap is wetted. Remove cap and check pH by touching pH paper to drops adhering to the inside of the cap.

25. Complete chain-of-custody records and other required documentation and include with the shipment.

Sampling for Volatile Organics

1. Remove cap from 40 ml septum vial. Avoid contact with the inner surface.

2. Pour water from bailer into vial and fill vial to the point where a miniscus forms at the top of the vial.

3. Place cap (containing a Teflon-faced silicone rubber septum) on the vial and screw on tightly.

4. When sealing the vial, be sure that the silicone rubber septum is positioned in the cap so that the Teflon side will lie face down on the water sample.

5. Inspect the vial for air bubbles and tap vial on palm of your hand. If air bubbles are present, remove the cap and add more water to the vial.

6. Place cap back on and inspect and tap for bubbles again.

7. Place vial in cooler with ice.

8. Fill a second bottle by repeating steps 1 through 7.

Sampling for Extractable Organics and Pesticides/PCBs

1. Remove Teflon-lined cap from the 1-liter bottle. Avoid contact with the inner surface.

2. Pour water from bailer directly into container or use dedicated bottom emptying device to fill container.

3. Fill bottle to approximately 7/8 full.

4. Replace cap on sample bottle and place sample in a cooler, on ice.

5. Collect other bottles by repeating steps 1 through 5.

Sampling for Metals

1. Remove polyethylene caps from a 1-liter polyethylene bottle.

2. Repeat steps 3 and 4 under "Sampling for Extractable Organics."

3. Add the appropriate amount of HNO_3 to the sample to reach a pH of less than 2. Check pH with pH paper.

4. Replace cap on sample bottle and place sample in cooler.

Sampling for Conventional Water Quality Parameters

1. Remove cap from a 1-liter glass bottle.

2. Repeat steps 2, 3 and 4 under "Sampling for Extractable Organics."

3. Add preservative as described in table 4-1, Sample Preservation and Holding Time Requirements and check pH with pH paper.

4. Replace cap on sample bottle and place sample in cooler.

3.4 WATER LEVEL MEASUREMENTS

OBJECTIVE

As part of the development of the data base for the site, water level measurements will be collected from all of the monitoring wells and surface water gauging stations (refer to figure 3-1). The results of this survey will be used to determine the hydraulic gradient between the landfill areas, and the adjacent rivers and wetlands, for use in designing the ground water containment system.

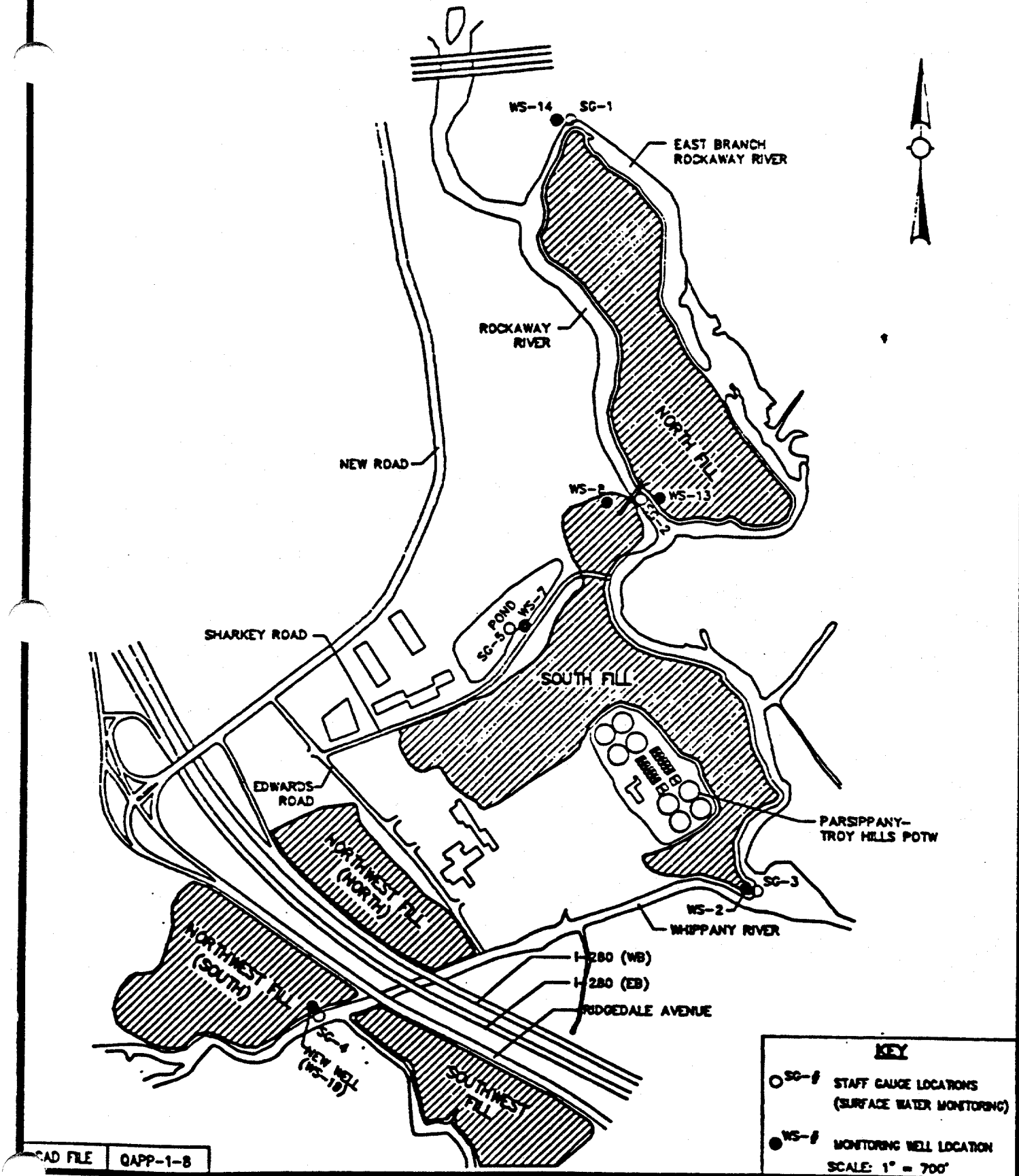

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Figure 3-1
Water Level Measurement Location Map
Sharkey Landfill Remedial Design

SAMPLE TYPE, SAMPLE METHOD, SAMPLE CODE

No samples will be collected during this activity.

PREPARATORY ACTIVITIES

1. Obtain all well keys and review records of prior air monitoring, and records of prior water level measurements.
2. Install staff gauges and determine elevation and location

FIELD EQUIPMENT

1. Electric water level recorder
2. Plastic 5-gallon bucket
3. Paper towels
4. 2 squeeze bottles with liquinox solution, and DI water

PROCEDURE

Refer to the Site Specific Health and Safety Plan for safety protocols. Prior to measuring water levels, refer to table 2-1 for the appropriate levels of protection based on previous sampling.

1. Confirm well/gauge identification. If well, open and allow to vent.
2. Using an electronic water level indicator, measure depth to water from tip of inner casing/top of staff gauge to nearest 0.01 inch and record.
3. Wash probe with liquinox solution, followed by a distilled water rinse. Secure well.
4. After measuring final well/staff gauge, remeasure the first well/gauge to determine if any systematic change in the ground water or surface water level has occurred.

3.5 SURFACE WATER SAMPLING

OBJECTIVE

To establish baseline surface water quality. Water quality measured during construction and operation of the remedial alternative will be compared to these baseline concentrations to evaluate the effects of these activities on local surface water bodies.

Surface water sampling will be conducted at nine locations and one grab sample will be taken at a location where on-site runoff occurs. The nine locations are consistent with the sample locations used for the RI/FS, the location of the grab sample will be determined in the field.

SAMPLE TYPE, SAMPLE METHOD AND SAMPLE CODE

Sample type: Surface water
Sample method: Grab
Sample code: SW

PREPARATORY ACTIVITIES

1. Decontaminate pond samplers in accordance with the NJDEP requirements outlined in subsection 3.3.3, Preparatory Activities.

FIELD EQUIPMENT

1. Pond sampler
2. Field log book
3. Organic vapor analyzer (flame ionization detector)
4. HNu photoionization detector
5. Sample containers, paperwork and packaging as described in section 6.0.
6. 100-foot tape measure

RESPONSIBILITIES

The On-site Coordinator will ensure that the surface water sampling procedures outlined below are followed so that a representative sample is obtained. The Health and Safety Coordinator will ensure that all health and safety protocols are followed.

PROCEDURE

1. Each sample location will be screened with an organic vapor analyzer (OVA) and/or HNu photoionization detector. Results of this screening will be entered into the field log book. This information will be used to ensure the proper levels of protection are being utilized.

2. All samples will be collected from the shore. The downstream sample will be collected first and remaining samples collected at progressively upstream locations.

3. If access allows, all samples will be collected directly into the sample containers. The containers for volatile organic analysis

will be filled first. The remaining containers will be filled in the following order:

- o extractable organics
- o pesticides/PCBs
- o inorganics
- o conventional parameters

Preservations will be added to the samples after the sample is collected.

4. If access will not allow the sampler to reach the sample location, the required volume of water will be collected by using the pond sampler. The volatile organic analysis vials will be filled first, followed by the containers extractable organics, pesticides/PCBs, metals, and conventional parameter analysis.

5. A concise description of the sample locations, identification number, name of sampler date and time will be entered into the field log book.

6. The sample location will be recorded by measuring the distance to the nearest landmark (i.e., monitoring well).

7. The duplicate sample will be collected. Field and trip blanks must accompany all samples on each day of sampling.

8. Following sample collection, the containers and sampler will be returned to the decontamination station. These will be washed with a solution of non-phosphate detergent and water and rinsed with clean tap water. The containers will not be submerged at any time during decontamination.

9. All samples will be retained in a cooler with ice to preserve the samples until they can be packaged for shipment.

10. All paperwork, chain-of-custody, sampling preservation and packaging will be completed. Procedures for these activities are described in Sections 6.0 and 7.0.

11. At the conclusion of the day's activities, samples will be picked up by the laboratory personnel and transported to the laboratory for analysis.

3.6 AIR SAMPLING

OBJECTIVE

The procedures described herein are for the representative sampling of volatile organic compounds and otherwise quality parameters present in the ambient air. The sampling protocol is to be implemented as outlined below

at several locations at and around the Sharkey Landfill in order to quantitatively establish baseline data for concentrations of the volatile organic compounds (VOCs) and other air quality parameters found in the ambient air.

The sampling sites will be selected in the field, based on weather and other conditions at the time of sampling, as discussed in section 1.3.3. Such sites, once established, will be marked on a baseline map of the Sharkey Landfill site. The sites will be maintained for both sampling rounds, and any changes made should be minor and will based on evaluation of changes in site conditions.

SAMPLE TYPE, SAMPLING METHOD, SAMPLE CODE

Sample type: Air
Sampling method: Solid absorbent, Tedlar bag
Sample code: AQ

PREPARATORY ACTIVITIES

1. Set up and calibrate meteorological station.
2. Calibrate the total air sampling system including the sampling pumps.
3. Select sample locations based on the prevailing wind direction and time of sampling.
4. Consider various environmental and meteorological factors before sampling.
5. Prepare sampling equipment and instrumentation.

FIELD EQUIPMENT

1. Sampling pumps
2. Organic vapor analyzer (flame ionization detector)
3. Air sampling system
4. Multimedia collection system (Tenax, carbon sieve, granular activated carbon)
5. Tedlar gas collection bags
6. Meteorological station:
   - Wind speed sensor
   - Wind direction sensor
   - Temperature sensor

- Relative humidity sensor
- Barometer
- Strip chart recorder
- Tripod stand (2 meter)

RESPONSIBILITIES

The Air Monitoring Coordinator will ensure that the air monitoring procedures outlined below are followed.

PROCEDURES

1. Air sampling locations will be located throughout the site. Three stations will be located at both the north and south fills. One sampling station will be located in a clean off-site area (control or background sample), the exclusion area, and downwind from the site. See figure 1-4 for the sampling location (based on the prevailing wind direction which is from the southwest) at the north and south fills.

2. A meteorological station will be set up onsite to collect meteorological information that is required for proper data interpretation. Wind speed, wind direction, air temperature, relative humidity, and barometric pressure will be recorded throughout the sampling episode.

3. The portable sampling assembly is used to collect the ambient air sample. Label and set aside a multimedia trap to be used for calibration purposes only. Only one calibration trap is necessary per sampling round. This calibration trap is to be used to set the desired flow rate of gas through the sampling assembly at every site.

4. Prior to sampling each site, determine the volume and number of each type of sample to be taken. Set aside the necessary number of traps, including traps for duplicate field samples.

5. Set aside a multimedia trap and label it "trip blank". Use a Ziplock plastic bag to store all traps as samples are collected. The purpose of the true blank is to ensure that no sample contamination occurs during the sample shipment and handling. The trip blanks are analyzed in the laboratory, but do not have ambient air passed through them.

6. Select the site at which the sample will be collected. Determine the type of plumbing required at the sampling gas port and add the necessary fittings to complete the sampling assembly. Prior to installation of calibration trap, ensure that all sampling connections are free of dirt and moisture.

7. Leak test the gas sampling assembly by following the steps below:

a. Install the calibration trap. Use stainless steel swage-lok fittings for all applicable connections.

b. Close the toggle valve on the rotameter's inlet side (nearest the sample inlet) and turn on the sampling pump.

c. Check to see if flow is detected by the bubble flowmeter when the needle control valve of the rotameter is fully opened.

d. If flow is detected, check the entire gas sampling system for leaks. Replace teflon tape of swage-lok fittings at suspected leaks.

e. As an additional check, test the second toggle valve (on the rotameter's outlet side) in the same manner.

f. If a no-flow condition is detected using the bubble flowmeter, then system is free of leaks. Leak test the gas sampling assembly at each monitoring well. Proceed to calibration of the gas flow rate through the sampling assembly.

8. The gas flow rate should be calibrated as follows:

a. Calibrate the gas flow rate at each sampling site.

b. Close only the second toggle valve (on the rotameter's outlet side). The first toggle valve remains open.

c. Install the calibration trap. Use stainless steel Swage-lok fittings for all applicable connections.

d. Turn the sampling pump on.

e. Open the second toggle valve to allow subsurface gas through the sampling assembly.

f. Adjust the flow using the needle control valve on the rotameters so that 15 ml/minute (recommended flow rate) is established from bubble flowmeter readings. Readings of the bubble flowmeter should be taken every minute to establish that the 15 ml/minute flow rate is maintained.

g. Close the second toggle valve (rotameter's outlet side).

h. Shut off the sampling pump and close first toggle valve.

i. Remove calibration trap.

j. Do not change setting of the needle control valve on the rotameter while the services of volatile organic samples is being collected.

9. The below procedures should be carefully followed during the actual sample collection:

a. Select a sample Tenax trap, note the identification number in the field notebook, and install the trap in the sampling assembly.

b. Determine and record the required sample volume.

c. With the first toggle valve open and the second toggle valve closed, turn on the sampling pump.

d. Open the second toggle valve and start the stopwatch or note the time of starting. Use this to determine the elapsed sampling time.

e. Calculate the time to obtain the required sample volume (if different from the previous calibration test).

f. Monitor the gas flow through the rotameter by visually inspecting the scale.

g. Close the second toggle valve and stop the stopwatch at the time needed to obtain the required sample by 4 liters (approximately 4 hours).

h. Shut off the pump.

i. Close the first toggle valve, and remove and securely cap the Tenax trap. Place trap in Ziplock bag.

j. Reset the elapsed time clock/stopwatch, and repeat the above sets for all duplicate field samples or other samples for adjacent gas probes.

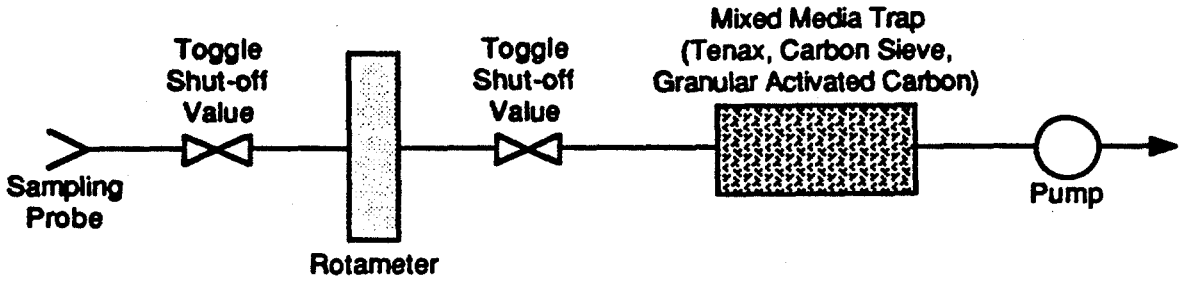
10. At the completion of VOC collection, connect a Tedlar sample collection bag to the outlet of the sample collection assembly.

11. Collect a 1-liter sample of air at the preset flow rate.

12. Close the second toggle valve, and seal and remove the Tedlar bag.

13. Recalibrate the sample collection pump according to steps 8a through 8j.

(653)



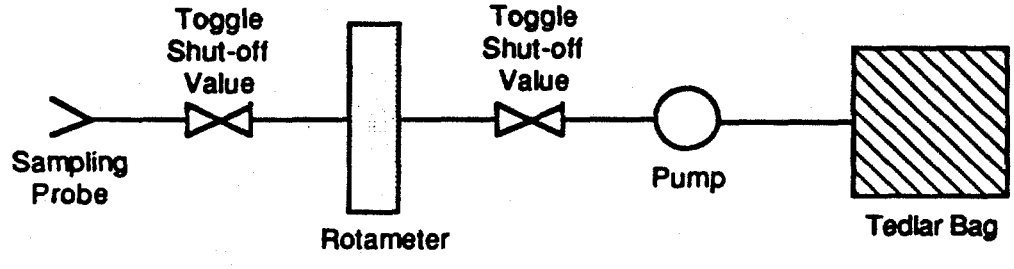


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Figure 3-1

Sampling Assemblies for Air Quality Samples

Sharkey Landfill Remedial Design

4.0 SAMPLE PRESERVATION AND HOLDING TIME REQUIREMENTS

The sample preservation and holding time requirements for the analytical parameters that will be analyzed for in the Interim Monitoring Program are presented in table 4-1. The tables also reference the analytical method that will be used by the laboratory.

(654)

TABLE 4-1
Interim Monitoring Program
Sharkey Landfill
Sample Preservation and Holding Time Requirements

Parameter	Matrix	Method[4]	Preservative	Holding Time
Volatile Organics (1)	Aqueous	EPA-CLP-IFB	Cool to 4°C	10 days
Semivolatile Organics (1)	Aqueous	EPA-CLP-IFB	Cool to 4°C	5 days[2]
Pesticides/PCBs (1)	Aqueous	EPA-CLP-IFB	Cool to 4°C	5 days
Metals/Cyanide (1)	Aqueous	EPA-CLP-IFB	Add HNO_3 to pH<2, Cool to 4°C	180 days[3]
Conventional Parameters	Aqueous	EPA-CLP-IFB	Add NaOH to pH>12, Cool to 4°C	14 days
• Total Suspended Solids		APHA 209C[5]	NA	NA
• Total Dissolved Solids		APHA 209B[5]	NA	NA
• Alkalinity		EPA 310.1	Cool to 4°C	14 days
• Hardness		EPA 130.1	Add H_2SO_4 or HNO_3 to pH<2	6 months
• pH		EPA 150.1	none required	Analyze immediately
• Total Chlorides		EPA 325.3	none required	28 days
• COD		EPA 410.1	Add H_2SO_4 to pH<2, Cool to 4°C	28 days
• Ammonia as N		EPA 350.2	Add H_2SO_4 to pH<2, Cool to 4°C	28 days
• BOD, Total 5 days		EPA 405.1	Cool to 4°C	48 days
• Nitrate as N		EPA 352.1	Cool to 4°C	48 days
• Total Kjeldahl-N		EPA 351.3	Add H_2SO_4 to pH<2, Cool to 4°C	28 days
• Phosphorus, Total as P		EPA 365.2	Add H_2SO_4 to pH<2, Cool to 4°C	28 days
• Total Solids		APHA 209A[5]	NA	NA
• Specific Conductance		EPA 120.1	Cool to 4°C	28 days
• Total Organic Carbon (TOC)		EPA 415.1	Add HCL or H_2SO_4 to pH<2 Cool to 4°C	28 days
• Sulfate, Total		EPA 375.1	Cool to 4°C	28 days
• Total Iron		EPA 236.1	Add HnO_3 to pH<2, Cool to 4°C	6 months
• Total Manganese		EPA 243.1	Add HnO_3 to pH<2, Cool to 4°C	6 months

TABLE 4-1
Interim Monitoring Program
Sharkey Landfill
Sample Preservation and Holding Time Requirements
(continued)

Parameter	Matrix	Method[6]	Preservative	Holding Time
Volatile Organics (1)	Air	USEPA TO-1, TO-2	NA	NA
Hydrogen Sulfide	Air	NIOSH, or equivalent [5]	NA	NA
Hydrogen Cyanide	Air	NIOSH, or equivalent [5]	NA	NA
Mercaptans	Air	NIOSH, or equivalent [5]	NA	NA
Sulfur Dioxide	Air	NIOSH, or equivalent [5]	NA	NA
Methane	Air	NIOSH, or equivalent [5]	NA	NA

Notes:

(1) Target Compound List

(2) Holding time until extraction. Extracts may be held 40 days

(3) Mercury is 26 days

(4) Blanks accompanying aqueous samples will be analyzed using aqueous methods. Blanks accompanying soil samples will be analyzed using the aqueous portion of the SW-846 method.

(5) Reference: Standard methods for reexamination of water and wastewater, 1985

(6) Analysis will be performed by an applicable method reference by NIOSH, OSHA or APHA

NA Not specified in analytical method

5.0 SAMPLE SUMMARY TABLE

The number of samples collected, analyses performed and QA/QC documentation to be provided during each round of criterion monitoring are summarized in tables 5-1 and 5-2. The tables identify the number of samples, the chemical analyses required, and the analytical report format deliverable (i.e., NJDEP Tier 1 or Tier 2) for each matrix identified. The number of field and trip blanks planned for each matrix is also identified. One duplicate sample is planned for each matrix during each round of sample collection for criterion monitoring.

There are several factors affecting the number of field blanks and trip blanks collected for analysis. Field blank samples are required at a frequency of one per matrix per sampling day. Trip blanks, which originate in the analytical laboratory and are sent to the site with each cooler shipment, must be returned to the laboratory for analysis at the frequency of one per matrix per sample shipment. A total of three trip blanks and three field blanks have been planned for the surface water plus ground water matrices, and one trip blank has been planned for the air matrix. These are the minimum number of blanks that would be required in each sampling round.

A total of three (3) duplicate samples have been planned based upon the total number of environmental samples to be collected during these investigations. One sample will be collected for duplicate analysis for every 20 samples collected of each matrix. If less than 20 samples are to be collected in a particular matrix, a minimum of one duplicate sample will be collected for each matrix.

The formats of the deliverables for TCL analyses will meet NJDEP Tier 1 or Tier 2 report formats. The difference between the two formats is the quantity of QA/QC documentation supplied with each report. The Tier 1 package includes all QA/QC documentation, while the Tier 2 package does not. The analytical must provide the additional QA/QC documentation for the Tier 2 report upon request. Their is no difference in laboratory methodology or QA/QC requirements between the Tiers.

TABLE 5-1
Interim Monitoring Program
Sharkey Landfill
Sample Summary Table

Matrix	No. of Samples	Analysis	No. of Blanks	No. of Duplicates	No. of Splits (splits not req'd)
Ground Water	17 (WS-14, WS-13, WS-12, WS-17, WS-2, WS-3, WS-4, WI-15, WI-8, WI-16, WI-7, WD-2, WI-4, WI-6, WI-17, WS-18, WS-19)	Target Compound List (plus 30 analytes)			
		• Volatile Organics	4	1	0
		• Semivolatile Organics	2	1	0
		• Pesticides/PCBs	2	1	0
		• Metals/Cyanide	2	1	0
		Conventional Parameters	2	1	0
		• Total Suspended Solids			
		• Total Dissolved Solids			
		• Alkalinity			
		• Hardness			
		• pH			
		• Total Chlorides			
		• COD			
		• Ammonia as N			
		• BOD, Total 5 days			
		• Nitrate as N			
		• Total Kjeldahl-N			
		• Phosphorus, Total as P			
		• Total Solids			
		• Specific Conductance			
		• Total Organic Carbon (TOC)			
		• Sulfate, Total			
		• Total Iron			
		• Total Manganese			

TABLE 5-1
Interim Monitoring Program
Sharkey Landfill
Sample Summary Table
(continued)

Matrix	No. of Samples	Analysis	No. of Blanks	No. of Duplicates	No. of Splits (splits not req'd)
Surface Water	10* (SW-1, SW-2, SW-3, SW-4, SW-5, SW-6, SW-7, SW-8, SW-9, SW-10)	**Target Compound List (plus 30 analytes)**			
		• Volatile Organics	2	1	0
		• Semivolatiles Organics	1	1	0
		• Pesticides/PCBs	1	1	0
		• Metals/Cyanide	1	1	0
		Conventional Parameters	1	1	0
		• Total Suspended Solids			
		• Total Dissolved Solids			
		• Alkalinity			
		• Hardness			
		• pH			
		• Total Chlorides			
		• COD			
		• Ammonia as N			
		• BOD, Total 5 days			
		• Nitrate as N			
		• Total Kjeldahl-N			
		• Phosphorus, Total as P			
		• Total Solids			
		• Specific Conductance			
		• Total Organic Carbon (TOC)			
		• Sulfate, Total			
		• Total Iron			
		• Total Manganese			

* Includes one grab sample (SW-10) to be determined in the field based on site runoff

TABLE 5-1
Interim Monitoring Program
Sharkey Landfill
Sample Summary Table
(continued)

Matrix	No. of Samples	Analysis	No. of Blanks	No. of Duplicates	No. of Splits (splits not req'd)
Air Quality Samples	**7**	**Target Compound List**			
		(plus 15 analytes)			
		• Volatile Organics	**1**	**1**	**0**
		Non-Target Compound List	**1**	**1**	**0**
		• Hydrogen Sulfide			
		• Hydrogen Cyanide			
		• Mercaptans			
		• Sulfur Dioxide			
		• Methane			

(1) Split samples were not requested

TABLE 5-2

INTERIM GROUND WATER AND SURFACE WATER MONITORING
QA/QC DOCUMENTATION

	TCL + 30[1] (Tier 1)	TCL + 30[1] (Tier 2)	TCL + 15[2] (Tier 1)
Ground Water Samples	7	9	
Ground Water Duplicate	1	-	
Ground Water Trip Blank	2	-	
Ground Water Field Blank	2	-	
Total Per Sampling Round	12	9	
Surface Water Samples	4	6	
Surface Water Duplicate	1	-	
Surface Water Trip Blank	1	-	
Surface Water Field Blank	1	-	
Total Per Sampling Round	7	6	13
Air Samples			6
Air Sample Trip Blank			1
Air Sample Duplicate			1
Total Per Sampling Round			8

(1) USEPA Target Compound List (TCL) plus 30 nontargeted compounds. Tier deliverable level as shown.

(2) USEPA Target Compound List (TCL) volatile organic compounds plus 15 non-targeted compounds. Tier deliverables as shown.

(672)

6.0 SAMPLE CUSTODY AND HANDLING

6.1 SAMPLE CONTAINERS

Enseco-East will provide all sample containers for the project. Each container will be decontaminated, by the laboratory, in accordance with the USEPA CLP "SOW for Maintenance of Quality Controlled Prepared Sample Container Repository", April, 1985. Enseco-East decontamination procedures are presented in their Laboratory Standard Operating Procedures; appendix A to the QAPP. All sample containers are purchased from I-Chem Research of Hayward, California.

Sample containers will be delivered to the site in custody-sealed steel coolers. Non-carcinogenic vermiculite will be used as packing material. The sampling team will accept the sample containers from the laboratory only if the custody seal is intact.

6.2 QA/QC BLANKS

Enseco-East will provide blank water for all sampling events. Blank water will be shipped to the site in the coolers with the sample containers. Enseco-East will prepare the blank trip/travel (for VOA only) at the laboratory. CDM will request that additional VOA vials be prepared, to assure that an acceptable trip/travel blank (no head space) is received from the laboratory with the sample container. Blank water for field blanks will be shipped in containers appropriate for the particular analysis to be performed. Bulk shipments will not be accepted.

6.3 SAMPLE LABELING

A coding system is to be used to identify each sample taken during the sampling program. This coding system will provide a tracking procedure to allow retrieval of information about a particular sample and assure that each sample is uniquely identified. Each sample identification number is composed of four components:

1. A three-digit designation is used to identify the site where the sample is being collected. The designation for the Sharkey Landfill Design project will be SKY.

2. A two-letter designation issued to identify the specific type of sample being taken.

   The sample types which will be collected during this project are:

   GW - Ground water sampled from monitoring wells

   SW - Surface water sample

   AQ - Air quality sample

   A number immediately following this code is used to identify the station at which the sample is being taken (Station Code).

3. A number or letter designation used to identify a specific interval (such as depth), if multiple samples are collected at a single interval location or station.

4. A three-number designation is used to number samples according to sample type. The samples are numbered consecutively within the type and are not related to the date of collection. As an example, a sample code follows: SKY-GW1-S

   Sharkey Landfill - ground water sample taken at well location WS-1 - from the shallow water bearing zone

   All samples will be identified with a self-adhesive label which will be attached directly to the container. Additional information to be included on the sample label is as follows:

   - Date - Month, day and year of sample collection
   - Sample number code as explained above
   - Preservative
   - Analysis

   If possible, sample label information is filled in the extent possible prior to field sampling, in order to expedite sample collection. The self-adhesive Chain-of-Custody label will be completely covered with clear mylar tape prior to sampling.

6.4 SAMPLE HANDLING, PACKAGING AND SHIPPING

One member of the field sampling crew will be designated sample manager. It will be this persons sole responsibility to perform all sample labeling,

packaging and shipping. The sample manager will also be responsible for ensuring that samples are handled and preserved in the proper manner.

6.4.1 SAMPLE HANDLING

Sample containers will be separated from any possible outside source of contamination (i.e., gasoline cans, decontamination solvents) between the time they are received from the laboratory, and the time samples are shipped for analysis. Care will be taken when handling containers and samples to guard against the introduction of outside contamination before and after sample collection. If the containers are not used immediately, they will be stored in a suitable area, preferably in a cool area. Following sample collection, the containers will quickly undergo a cursory decontamination (wipe down), if necessary, and will be preserved on ice until they are shipped to the laboratory. Sample containers should never be immersed in a decontamination solution. Samples for volatile organic analysis will be preserved on ice as soon as practical following sample collection. This may require that the sampling crew carry an additional cooler for this purpose.

Sample preservation will be performed quickly, in an area removed from any possible sources of outside contamination. The pH of the preserved sample will be checked with pH paper following preservation.

6.4.2 SAMPLE PACKAGING

All samples that will be collected as part of the Sharkey Landfill Design project are anticipated to be "low level" samples, based on a review of the analytical results for samples collected during the RI/FS. Therefore, no special packing requirements are anticipated to be necessary.

The samples will be packaged in 88-quart steel coolers, provided by Enseco-East. Vermiculite (non-carcinogenic) will be used as packing material to cushion and insulate the samples during shipment. Sample shipments will be cooled to approximately 4° centigrade, using cubed ice sealed in plastic zip-lock bags. The chain-of-custody record for each cooler will be sealed

in a plastic zip-lock bag, and taped to the inside cover of the cooler. Each cooler will be taped closed for shipment. Two custody seals will be placed on each cooler for shipment to the laboratory.

6.4.3 SAMPLE SHIPPING

Enseco-East which is located in Somerset, New Jersey, within traveling distance of the site, provides a sample pickup service. As such, sample shipment by Federal Express or another overnight carrier will not be necessary. CDM will arrange for the laboratory to pick up samples at the end of each day of sampling activities.

A record of the persons responsible for the integrity of the samples between the time they are collected, and the completion of laboratory analysis will be kept on a chain-of-custody record. Enseco-East forms will be used when shipping sample containers and blanks to the field sampling team. CDM forms will be used when shipping samples to the laboratory for analysis. Figure 6-1 provides a copy of the CDM chain-of-custody form.

The completed chain-of-custody form will display the following information as a minimum:

- Project name (Sharkey Landfill)
- The sample code indicating the station number, media, etc. as previously described
- Numbers and volumes of sample bottles in cooler
- A brief description of the sample location
- Signature of sample manager (responsible for packaging the samples)
- The data and time of collection
- Signatures of the individuals involved in the sample transfer, and the date and time of transfer

The forms include copies so that four forms are completed simultaneously. The sampler is responsible for the samples until custody is relinquiched to

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Chain of Custody Record

Figure 6-1

Sharkey Landfill Remedial Design

CHAIN OF CUSTODY RECORD

Camp Dresser & McKee Inc.

CDM

PROJECT NAME_____

PROJECT NUMBER_____

Field Log Book Reference No._____

LEGEND: Original: Return to Sample Traffic Control Center Copies: Ship with Samples

SAMPLE NUMBER	DATE	TIME	SAMPLE LOCATION	SAMPLE TYPE	ANALYSES: EXTR. ORG. / VOA / PEST. PCB / TRACE METALS	NUMBER OF CONTAINERS	LAB MARK FOR NO.	REMARKS

SAMPLED BY (SIGN)_____ / / /

RELINQUISHED BY (SIGN)	RELINQUISHED BY (SIGN)	RELINQUISHED BY (SIGN)	RELINQUISHED BY (SIGN)	RELINQUISHED BY (SIGN)
①_____ DATE/TIME (/)	②_____ DATE/TIME (/)	③_____ DATE/TIME (/)	④_____ DATE/TIME (/)	⑤_____ DATE/TIME (/)
RECEIVED BY (SIGN)	**RECEIVED BY (SIGN)**	**RECEIVED BY (SIGN)**	**RECEIVED BY (SIGN)**	**RECEIVED BY (SIGN)**
①_____ DATE/TIME (/)	②_____ DATE/TIME (/)	③_____ DATE/TIME (/)	④_____ DATE/TIME (/)	⑤_____ DATE/TIME (/)

METHOD OF SHIPMENT	SHIPPED BY (SIGN)	RECEIVED FOR LABORATORY BY (SIGN)	DATE/TIME
			(/)

the laboratory. When the samples are relinquished, the sampler will retain the last copy of the form. The original and the remaining copies will remain with the samples. The original will be returned to CDM with the sampling results, maintaining a complete record of the chain-of-custody. Care will be taken that all four copies are legible. If additional duplicate sheets are required, the person relinquishing the samples is responsible for making reproductions.

Enseco-East will maintain internal chain-of-custody to clearly trace the movement of each sample through the laboratory. Laboratory chain-of-custody procedures are provided in Enseco-East Standard Operating Procedures, see Quality Assurance Project Plan.

(656)

7.0 DOCUMENTATION

All project documentation will be maintained by BRISC and CDM. The main project file will be kept at the BRISC office in Oradell, New Jersey, in a documentation of the environmental sampling and treatability testing will be maintained by CDM at their Edison, New Jersey, office. This documentation will be transferred to BRISC at the conclusion of the project.

7.1 FIELD NOTEBOOKS

Field notebooks will be used to document all data collection activities performed at a site. As such, entries will be descriptive and detailed so that a particular situation can be reconstructed without reliance on the collector's memory.

Field notebooks will be bound books with consecutively numbered pages. Notebooks will be permanently assigned to personnel during field activities, but will be stored in the project file when not in use.

The cover of each notebook contains the following information:

- Person and organization to whom the book is assigned
- Book number
- Project name
- Start date
- End date.

A general description of all activities will be entered into the logbook each day of field work. At the beginning of each day's activities the data, start time, weather, all field personnel present, level of personal protection being used on site, and the signature of the person making the entry are recorded.

All measurements and information on the collected samples are recorded. All entries should be made in black pen only. Incorrect entries will be crossed out with a single strike mark and initialed. Entries should be organized into easily understandable tables wherever possible.

At each station where a sample is collected or a measurement made, a detailed description of the location of the station, along with the time of sampling, depth interval (if appropriate), sample description and volume sample designation number and number of containers is recorded. In addition, the container lot number, type of analysis, preservative (if appropriate) and date of shipment are recorded. Sample numbers are assigned prior to going on-site.

Duplicates, which receive an entirely separate sample number, are noted under the sample description. All field equipment used during the days activities is identified, along with the date of calibration. Significant field notebook entries (samples collected, significant observations) must be countersigned by the On-site Coordinator.

7.2 DOCUMENTATION FORMS

Typed forms may be used to document certain types of field activities, such as the collection of drawdown measurement during pump tests, monitoring well construction and stratigraphic and lithologic information. These forms will be signed and dated by the person collecting the data. All forms will be kept in a temporary project file on-site while the field work proceeds. At the conclusion of field work, all forms will be transferred to the main project file until such time as the entire file is transferred to the NJDEP.

7.3 PROJECT GUIDANCE DOCUMENTS

Signed copies of the Interim Monitoring Plan, Quality Assurance Project Plan, and Health and Safety Plan for the Sharkey Landfill design project will be maintained in a temporary onsite project file. The file will be

located in the field trailer, so that these documents may be referenced at any time by members of the field crew, or reviewed by an NJDEP auditor.

(657)

8.0 PERFORMANCE OF SYSTEM AUDITS AND FREQUENCY

8.1 FIELD ACTIVITIES

Internal audits of field sampling, preservation, shipping and equipment cleaning procedures may be conducted during the course of the project under the supervision of the Quality Assurance Officer. Actual field audits may be performed by the CDM QA Manager and reported to the project QA officer. Audits, if conducted, will be during actual field operations and may or may not be scheduled. The standardized form for the field audit is contained in the Field Related Quality Assurance Audit Checklist shown in figure 8-1.

A written report of the results of this audit along with (as necessary) a notice of nonconformance is submitted to the:

- Quality Assurance Officer
- Site Project Manager
- On-site Coordinator
- Contract Manager

Corrective action, if any, which may be taken as a result of the audit will be documented in the project files. To complete an audit, the auditor must submit a summary of the findings. The vehicle for submitting this summary is the Quality Assurance Notice (figure 8-2).

A completed Quality Assurance Notice shall be submitted to the Quality Assurance Officer. This notice shall indicate the completion of the audit; any identified nonconformance or deficiencies; corrective action taken; follow-up review of corrective action; and final recommendations concerning continued operation.

8.2 LABORATORY ACTIVITIES

Laboratory audits are the responsibility of the respective support laboratory Enseco-East.

8.2.1 INTERNAL QC AUDITS

Internal audits are periodically conducted by the QA department to evaluate compliance with the laboratories SOP. The audits involve an independent check of the performance of the laboratory analysis to determine if the appropriate analytical procedures are being closely followed.

All internal audits are kept on file by QA personnel and are used to check for systematic problems. Precision, accuracy and control charts are kept on all internal QC checks.

8.2.2 PERFORMANCE AUDITS

Several QA audit programs are performed on Enseco-East on a regular basis. These audits currently include a yearly New Jersey Department of Environmental Protection (NJDEP) certification for drinking water and water pollution parameters; and certification for non-potable water and solid waste in the State of New York. These audits include the analysis of proficiency samples as well as onsite lab inspections on a frequent basis.

(658)

FIELD AUDIT CHECKLIST

Site No./Name _____

Site Manager _____

NJDEP Manager _____

Auditor/Date _____

Field Activities to be Audited _____

_____

_____

_____

Audit Location _____

Facility Contract _____

Personnel Contacted During Audit and Affiliation _____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

E-1

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Figure 8-1

Field Audit Checklist Form

Sharkey Landfill Remedial Design

Y or N

PLANNING AND PREPARATION

1) What document(s) is (are) relevant to this audit?

Title/Date/Section

SAMPLING

General Procedures

1) a. Does field crew have operating procedures for field work onsite? _____

b. Is health and safety documentation on site?
Health and Safety Assurance Manual _____
Site - Specific Health and Safety Plan _____

2) Were sampling locations selected as planned? _____

If No, explain _____

3) Were samples collected starting with the least likely contaminated and proceeding to the most likely contaminated? _____
Remarks _____

4) Was sampling equipment protected from possible contamination prior to sample collection?

If No, explain _____ _____

5) If equipment was cleaned in the field, were described procedures used? _____

If No, explain _____ _____

CD4-15 E-2

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Figure 8-1
(Continued)
Field Audit Checklist Form
Sharkey Landfill Remedial Design

Y or N

6) What field instruments were used during this investigation?

7) Were field instruments calibrated as described? _____

If No, explain

8) Were calibration procedures documented in the field notes? _____

Remarks

9) Were the samples chemically field preserved? _____

If No, explain

10) Were the samples iced? _____

11) Were samples for selected parameters field filtered? _____

If Yes, list parameters and describe procedures.

Well Sampling N/A

1) Was depth of well determined? _____

2) Was depth to water determined? _____

3) Were the above depths to water converted to water level elevations common to all wells? _____

Describe how the depths were determined

4) How was the volume of water originally present in each well determined?

CD4-15 E-3

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Figure 8-1
(Continued)
Field Audit Checklist Form
Sharkey Landfill Remedial Design

Y or N

5) Was the volume determined as described? _____

6) How was completeness of purging determined? _____

Volume Measure _____
Time/Flow Rate _____
Cond./pH/Temp _____ _____

7) Was well purged to completeness point? _____

Remarks _____ _____

8) Was a dedicated (in-place) pump utilized? _____

If no, describe the method of purging (bailer - include type and construction material, pump - include type)_____
_____
_____

9) How were the samples collected?
Bailer_____
Pump_____
Combination_____
Construction material of bailer:_____
_____

Design of bailer
Open Top_____
Closed Top_____
Other_____

10) If a pump was used, describe how it was cleaned before and/or between wells._____
_____
_____

11) Was the sample properly transferred from bailer to sample bottle (i.e., was the purgeable sample agitated, etc.)? _____

12) Was the rope or line allowed to touch the ground? _____

13) Was any wetted rope or line discarded after use at each well? _____

14) How many wells were sampled? _____

15) Who collected samples: _____

_____

CD4-15 E-4

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Figure 8-1
(Continued)
Field Audit Checklist Form
Sharkey Landfill Remedial Design

Y or N

16) Note any deficiencies observed during the collection of well samples. _____ _____

Surface Water Sampling N/A

1) What procedures and equipment were used to collect surface water samples? _____

Who collected samples? _____

2) Did the samplers wade in the stream during sample collection? _____

If Yes:

Did the sampler face upstream while collecting sample? _____

Did the sampler insure that sediments were not collected along with water sample? _____

3) Note any deficiencies observed during the collection of the surface water samples _____

Waste, Sludge, Soil/Sediment Sampling N/A

1) What procedures including equipment were used to collect soil/sediment samples? _____

2) Were the soil/sediment samples well mixed prior to placing the sample in the sample container? _____

3) Note any deficiencies observed during the collection of the soil/sediment samples _____

4) Total number of samples collected _____

5) Sample collector _____

CD4-15 E-5

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Figure 8-1 (Continued)
Field Audit Checklist Form
Sharkey Landfill Remedial Design

Y or N

Other Sampling

1) What other types of samples were collected during this investigation?

_____
_____
_____

2) What procedures were used for the collection of these samples?

_____
_____
_____

Who collected samples?_____

CD4-15 E-6

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Figure 8-1
(Continued)
Field Audit Checklist Form
Sharkey Landfill Remedial Design

Y or N

QUALITY ASSURANCE/QUALITY CONTROL

(While all of these QC procedures are not necessarily used, please check on the specific techniques which were described in the field protocols.)

1) Did the sampling personnel utilize any field trip blanks? _____

2) Did the sampling personnel utilize preservative blanks? _____

If Yes, to either of the above questions, list the type and handling of the blanks _____

3) Were any equipment blanks collected? _____

If Yes, list: _____

4) Were any duplicate samples collected? _____

If Yes, list the types (parameter coverage, etc.) and describe their handling. _____

5) Were any spiked samples utilized? _____

If Yes, list the types (parameter coverage, etc.) and describe their handling. _____

FIELD DOCUMENTATION AND CHAIN-OF-CUSTODY

1) Were split samples offered to the site owner or facility representative? _____

2) Was a receipt for samples given to the site owner or facility representative prior to leaving the site? _____

3) Were chain-of-custody records completed for all samples? _____

CD4-15 E-7

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Figure 8-1
(Continued)
Field Audit Checklist Form
Sharkey Landfill Remedial Design

	Y or N
4) Were sample tag numbers and laboratory traffic report form numbers cross referenced to chain-of-custody forms?	_____
5) Were chain-of-custody form numbers recorded in the field log book?	_____
6) Were all samples properly sealed at the time of collection?	_____
7) Were samples kept in a secure place after collection?	_____
8) Were all sample tags and chain-of-custody forms signed by sample collector(s)?	_____
9) Were sampling locations adequately documented?	_____
If No, explain_____	
10) Was sampling required to be documented with photographs?	_____
If Yes, was a photolog maintained?	
11) Were the samples shipped to a contract laboratory?	_____
If Yes:	
Were the traffic report forms filled out properly?	_____
Were the samples properly packed for shipment?	_____

CD4-15 E-8

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Figure 8-1
(Continued)
Field Audit Checklist Form

Sharkey Landfill Remedial Design

AUDIT COMPLETION NOTICE

SITE NO./NAME: _____

TYPE / DATE OF AUDIT: _____

AUDITOR(S): _____

SITE MANAGER: _____

AUDIT SUMMARY:

DEFICIENCIES FOUND:

CORRECTIVE ACTION TAKEN/COMMENTS:

AUDIT COMPLETED:

_____ DATE: _____
AUDITOR

_____ DATE: _____
QA DIRECTOR

QA FORM 3.0 12/87

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Figure 8-2

Audit Completion Notice Form

Sharkey Landfill Remedial Design

9.0 CALIBRATION PROCEDURES AND PREVENTIVE MAINTENANCE

9.1 FIELD EQUIPMENT

Each piece of field equipment used for measuring, monitoring and analytical purposes is calibrated and maintained periodically to assure accuracy within specified limits. Calibration and maintenance procedures and the frequency at which these procedures should be applied for field equipment are detailed in CDM's Uncontrolled Hazardous Waste Site Investigation Procedure Manual.

Where applicable, the instrumentation is calibrated using standard solutions or standardized techniques. All calibration of field instruments is performed by qualified personnel. The general procedures for equipment and instrument calibration and maintenance as well as the specific procedures that will apply to the Interim Monitoring Program are presented as appendix B to this document.

The air sampling system will be calibrated before and after each sampling event using either a wet test meter or bubble tube. The specific procedures for the calibration of low volume air sampling systems are described in appendix B to this plan.

CDM field equipment undergoes calibration and maintenance before and after every field activity. If an instrument is to be in the field for longer than two or three weeks, it shall be returned to the CDM equipment room to undergo full calibration and maintenance.

A Field Equipment Status Report sheet is kept for each piece of field equipment and kept in the Equipment Log Book. These sheets contain the following information:

- Date of calibration and date of last maintenance.
- Data pertaining to above.
- Initials of agent performing calibration and/or maintenance.

- o Accuracy prior to and following calibration.
- o Notations on equipment failures.

If the calibration schedule is not adequately maintained or accuracy as reported in the instrument's specifications cannot be attained, the instrument is placed on "hold" and is unavailable for use until the specifications are attained. It is the responsibility of the CDM Home Office Equipment Manager to assure that all equipment is properly calibrated and maintained and that proper documentation is kept.

9.2 LABORATORY EQUIPMENT

Calibration procedures and frequency for specific analytical equipment are provided in Enseco-East's Standard Operating Procedures Manual (see the Quality Assurance Project Plan). The procedures meet the requirements set forth in the Regulations Governing Laboratory Certification and Standards of Performance, NJAC 7:18-1.1 et seq., and in the most recent USEPA-CLP - Statement of Work (SOW).

(659)

10.0 SPLITTING OF SAMPLES

A discussion of the collection of split samples have not been included. The need for split samples has not been identified at the time this Interim Monitoring Plan was prepared.

(660)

11.0 TRIP/TRAVEL AND FIELD BLANK REQUIREMENTS

11.1 TRIP/TRAVEL BLANKS

Trip/travel blanks will accompany the ground water, surface water samples and air quality samples that will be analyzed for TCL parameters. Trip/travel blanks will be analyzed for volatile organic compounds only. Blanks will not be prepared for conventional water quality parameter analysis. The blanks for both aqueous samples will be prepared from analyte-free water. The analyte-free water will originate from one common source and the physical location within the laboratory. The analyte-free water will be the same as the method blank water used by the laboratory. Containers for aqueous samples will be used for all blanks.

Trip/travel blanks will accompany the environmental sample containers at all times, from delivery from the laboratory through sample collection, shipment to the laboratory, and sample analysis. The blanks will be handled in the same manner as the environmental samples at all times. Blank water will be maintained at 4°C while onsite and during shipment.

At this time it is anticipated that two trip/travel blanks will be needed for ground water sampling, one trip/travel blank will be needed for surface water sampling, and one trip/travel blank will be needed for air quality samples. This is based on an anticipated duration of one day for the collection ground water samples and one day each for the collection of surface water and air quality samples.

Trip/travel blanks will be prepared at the laboratory and delivered to the site on the following day, by laboratory personnel. If the blanks and sample containers arrive in an acceptable condition, the environmental samples will be collected the same day that the containers are delivered to the site. Samples and blanks will be picked up and transported to the laboratory, by laboratory personnel, at the end of each day of sampling. In the case of ground water sampling, the containers and blanks for the second day of sampling will be delivered when samples collected during the

first day are picked up for transportation to the laboratory. This schedule will result in a holding time of one day in the field, for sample containers and blanks.

11.2 FIELD BLANKS

Field blanks will accompany ground water and surface water samples that will be analyzed for TCL parameters. Field blanks will be analyzed for the same parameters as samples collected that day. Blanks will be prepared for analysis from from analyte-free water.

Field blanks will consist of two sets of identical sample containers. Bulk shipments of blank water will not be accepted. One set will be filled with analyte-free water by the laboratory, and one set will be empty. The sampler will prepare the field blank by pouring water from one container over a decontaminated sampling instrument (i.e., bailer, trowel), into a matching container. The laboratory will fill additional 40 ml VOA vials so that the field blank for volatile organic analysis will be filled with water transported to the site in this type of container. The field blanks will accompany the environmental samples through shipment to the laboratory and sample analysis. The blanks will be handled in the same manner as the environmental samples once they have been prepared in the field.

At this time it is anticipated that two field blanks will be needed for ground water sampling and one field blank will be needed for surface water sampling. This is based on an anticipated duration of two days for the collection of ground water samples and one day for the collection of surface water samples.

Field blank containers and water will be supplied by the laboratory and delivered to the site with the trip/travel blanks, and containers for the environmental samples. If the shipment arrives in an acceptable condition, the field blank will be prepared during the day of sample collection and transported to the laboratory at the end of one field day with the environmental samples and the trip/travel blank. Field blank containers and blank water for the second day of ground water sampling will be delivered at the end of the first day of sample collection.

12.0 HANDLING TIME IN THE FIELD

As discussed in section 11.0, Trip/Travel Blank and Field Blank Requirements, it is anticipated that one day, plus one night for the second day of ground water sampling of holding time in the field will be necessary. This will be accomplished as follows:

Day 1

- o Trip/travel blanks prepared by laboratory
- o Field blanks set up by laboratory
- o Environmental sample containers and blanks packaged for transport to the site by laboratory

Day 2

- o Laboratory transports environmental sample containers and blanks to site
- o Sample manager inspects shipment for acceptability
- o Environmental samples are collected (day 1), field blanks are prepared, environmental samples and blanks are packaged for shipment to the laboratory
- o Custody of samples is transferred to laboratory personnel and samples are transported to the laboratory for analysis at the end of the day
- o Sample manager receives blanks and containers for the second day of ground water sampling, inspects shipment, supplements ice, and stored in a safe location overnight (see section 14.0)

Day 3

- o Environmental samples are collected (day 2), field blanks are prepared, environmental samples and blanks are packaged for shipment to the laboratory
- o Custody of samples is transferred to laboratory personnel and samples are transported to the laboratory for analysis at the end of the day

(662)

13.0 DUPLICATE SAMPLES

Duplicate samples will be collected for ground water and surface water samples that will undergo TCL analysis. Duplicate samples will not be collected for samples conventional water quality parameter analysis. Duplicate samples will be collected for all air quality parameters. The duplicate samples will be given a unique sample number in order to provide the laboratory with true "blind" duplicates.

At this time it is anticipated that fewer than 20 environmental samples of each sample type (ground water, surface water, air quality) will be collected. Therefore, one duplicate sample for each sample type will be collected as part of this program.

The duplicate samples of ground water will be collected by dividing each bailer of well water between duplicate sample containers. The four 40 ml vials for volatile organic analysis will be filled from the first bailer, if sufficient volume is present. If sufficient volume for this purpose is not collected in the first bailer, two duplicate vials will be filled, and the remaining two vials will be filled from the top of the second bailer. The remaining duplicate sample containers will be filled by splitting each bailer volume between the duplicate containers.

Duplicate sampling of surface water will depend on the sample collection method. Duplicate sample containers will be filled, simultaneously, or by alternating between duplicate containers for individual analyses when samples are collected directly into the sample containers. Duplicate samples collection with a pond sampler will be similar to the method for ground water sampling. The four 40-ml vials for volatile organic analysis will be filled from the first sampler of water if sufficient volume to present. If sufficient volume is not collected in the first grab sample, two duplicate vials will be filled, and the remaining two vials will be filled from the second grab sample. The remaining duplicate sample containers will be filled by splitting each grab sample between duplicate containers.

At a minimum, duplicate air quality samples will be taken at each sampling site to ensure that a sample will be available for analysis. The purpose of these duplicate field samples is twofold: (1) if a sample is lost, either during shipping or laboratory analysis, then the field duplicate serves as a back-up sample, and (2) for quality assurance purpose duplicate pairs should be periodically analyzed by GC/MS to establish the precision of the sampling technique. Duplicates will be collected at different air flow rates to identify potential interferences arising from the sampling equipment or absorbent media.

(663)

14.0 SAMPLE STORAGE REQUIREMENTS

QA/QC blanks, sample containers, and all environmental samples, once collected, will be preserved at a temperature of approximately 4° centigrade while they are in the field or being transported between the site and the laboratory.

The QA/QC blanks and environmental sample containers will be logged in by the sample manager when they arrive onsite. The condition of the ice will be checked, and supplemented if necessary. All containers will be removed from the coolers for a period so that labels bearing the appropriate information can be affixed. Trip/travel blanks will be returned to the cooler so that they can be transported to the environmental sample locations. Field blanks will be removed, labeled, prepared and returned to a cooler. Containers for the environmental samples will be held in a central location once until the sample is collected. The sample containers will be transported to the sample location in a cooler with ice, removed to collect the sample and returned to the cooler as soon as the sample is collected.

If the sample location cannot be easily accessed by a four-wheel vehicle, or if the sample container requires more than a cursory whipe down the sample containers may be held outside of a cooler for a period of time. In this case, the samples will be placed on ice as soon as possible. Neither access or contamination of the outside of the sample container is anticipated to be a concern at this site. However, in the event that such problems do arise, sample collection is currently scheduled for late winter or early spring and the ambient temperature is anticipated to be close to 4° centigrade.

The samples and blanks will be repackaged before shipment to the laboratory. The ice packages will be inspected and supplemented at this time to provide for the required temperature during shipment.

The blanks and sample container shipment for the second day of ground water sampling will be inspected when receiving and the ice will be supplemented

if necessary. The coolers will be stored in a locked field vehicle or at the field trailer, if security is sufficient, until the second day of sampling. The ice will be inspected and supplemented the next morning. The coolers will not be stored in a vehicle or area that may introduce a possible source of outside contamination such as gasoline, or decontamination solvents.

(664)

15.0 FIELD AUDIT SCHEDULING

Under the present project schedule, it is anticipated that BRISC will be able to provide the NJDEP with the required fourteen days notice following approval of the Interim Monitoring Plan, and the Quality Assurance Project Plan, and prior to mobilization for the first round of interim monitoring.

(665)

APPENDIX A

STANDARD OPERATING PROCEDURES
FOR
CALIBRATION AND MAINTENANCE OF FIELD INSTRUMENTS

EQUIPMENT AND INSTRUMENT CALIBRATION AND MAINTENANCE, GENERAL REQUIREMENTS

1.0 INTRODUCTION

The general guidelines for calibrating and maintaining instruments and monitoring equipment are presented in this document.

2.0 CALIBRATION AND MAINTENANCE PROCEDURES

Calibration and maintenance procedures are documented for each piece of equipment affecting quality. Calibration and maintenance procedures are developed based on manufacturer's specifications and are retained in the Site Investigation Procedures Manual. These procedures include, but are not limited to:

1. Equipment identification (name) and description.
2. Equipment specifications.
3. Calibration and/or maintenance schedule.
4. Equipment necessary to accomplish calibration (where applicable).
5. Procedure for calibration and/or maintenance.

3.0 CALIBRATION LABEL

Instruments requiring calibration and/or maintenance have a prominently displayed sticker containing the following information:

1. Date of calibration and/or maintenance.
2. Next due date for calibration and/or maintenance.
3. Initials of person performing calibration and/or maintenance.
4. Span gas and concentration(s) (if applicable).
5. Span or sensitivity setting (if applicable).

4.0 EQUIPMENT LOG BOOK

An equipment log book is issued to record the life history of each measuring and testing device used in activities affecting quality. This book is a three ring binder in which individual records for each piece of equipment are maintained. A form such as F6101 or a reasonable facsimile should be used to maintain the calibration and maintenance record. The record should include:

1. Equipment identification (name) and control number.
2. Date of calibration and/or maintenance.
3. Condition of equipment.
4. Activity performed on instrument (calibration and/or maintenance).
5. Adjustments made and accuracy of equipment prior to and following calibration (where applicable).
6. Record of equipment failure or inability to meet specifications (where applicable).
7. Initials of person performing calibration/maintenance.
8. Next due date for calibration and/or maintenance.

5.0 CALIBRATION/MAINTENANCE FORM

An instrument specific calibration/maintenance form will be developed to record data relating to each individual calibration/maintenance event. A single form will be used for each calibration/maintenance event. In addition to the data recorded in the calibration/maintenance log, the following items should also be included in the instrument specific form (where applicable).

1. Calibration calculations and curves.
2. Span gas type and concentrations.
3. Span or sensitivity range settings.
4. Specifics on repairs and parts replaced, added, or removed.

5. Instrument's overall condition.

6.0 FIELD CALIBRATION

As part of normal field operations, some instruments require calibration prior to, during, and/or after field use. This field operation calibration should remain separate from pre-field calibrations and should not be used as a substitute for standard calibration activities. Field calibration should be recorded in field log books or on field forms as part of the normal field data collection process. Field calibration records should not be included in the history log.

7.0 INSTRUMENTS NOT IN COMPLIANCE

If the calibration schedule is not adequately maintained, or if accuracy as reported in specifications cannot be attained for a specific instrument, that instrument is labelled "HOLD" and is unavailable for use until it is repaired and specifications are attained.

CALIBRATION PROCEDURE FOR THE HNu PI 101

1.0 INTRODUCTION

1.1 Content

This procedure presents the steps required to calibrate the HNu Model PI 101 photoionization analyzer. This instrument should be calibrated after each field use or prior to each field use if the instrument has not been calibrated during the previous 14 calendar days. The principle of detection and operating procedures are described in Procedure 5607001. This procedure presents calibration steps only.

1.2 Equipment

- Calibration Gas (2 ranges)

  Low range 0-20 ppm and mid range 20-200 ppm Isobutylene gas for standard field operation when contaminants are unknown or a mixture of gases is present. Isobutylene is the gas used for general calibration because of the instrument's relatively high sensitivity to it and the non-toxic nature of the gas.

  Note: A specialty gas may be required if a single atmospheric contaminant is present and the contaminant has a sensitivity different from that of the calibration gas. See procedure for 5607001 for a discussion on specialty calibration.

- Tubing and fittings (See Figure 1).
- Rotomoter or bubble flow meter.
- Calibration Form F6264.
- Table 1 for ionization potentials for compounds of interest.

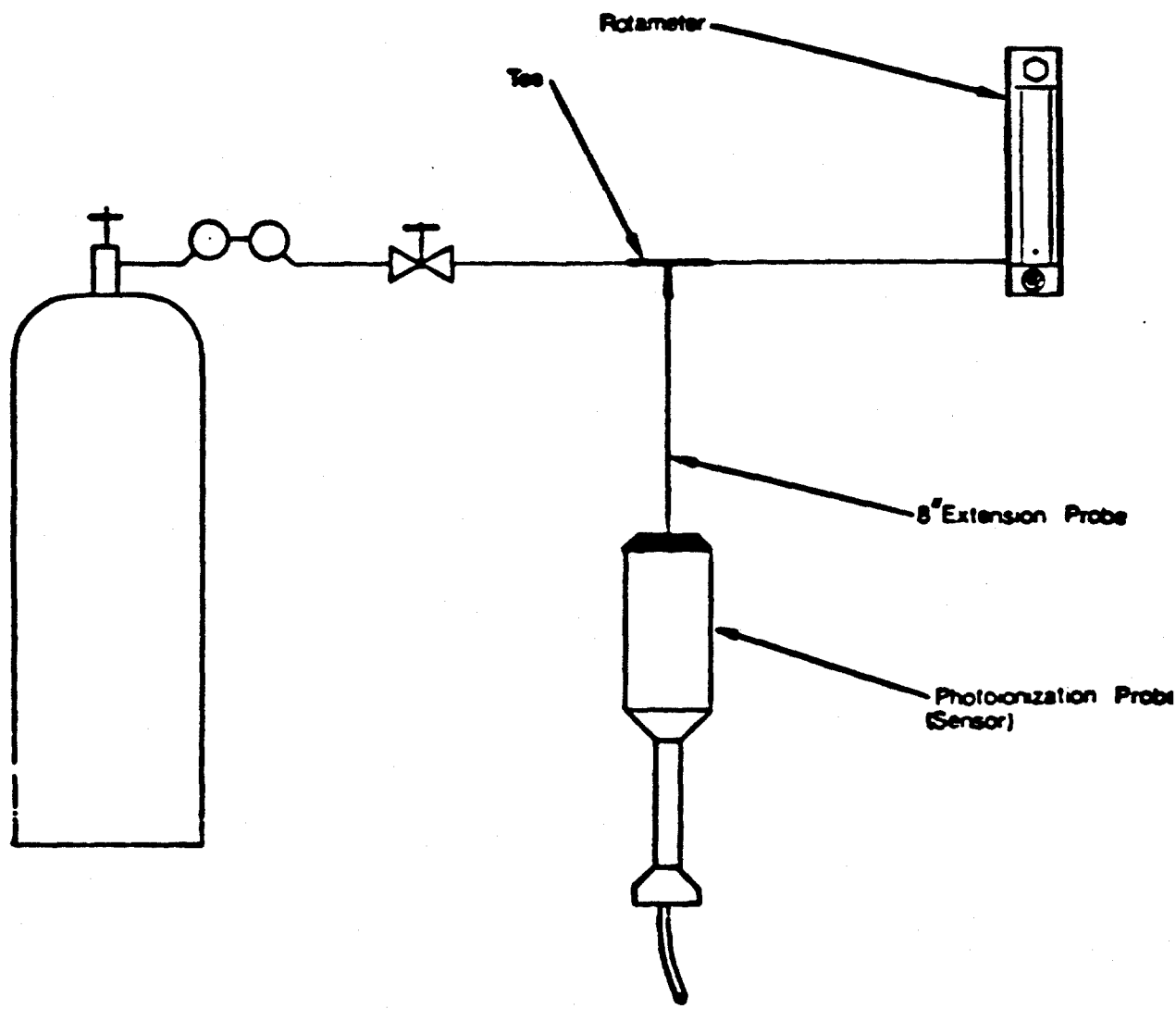


FIGURE 1 RECOMMENDED CALIBRATION PROCEDURE FOR PHOTOIONIZATION ANALYZER

TABLE 1 RELATIVE SENSITIVITIES FOR VARIOUS GASES
(10.2 eV Lamp)

Species	Photoionization Sensitivity*
p-xylene	11.4
m-xylene	11.2
benzene	10.0 (reference standard)
toluene	10.0
diethyl sulfide	10.0
diethyl amine	9.9
styrene	9.7
trichloroethylene	8.9
carbon disulfide	7.1
isobutylene	7.0
acetone	6.3
tetrahydrofuran	6.0
methyl ethyl ketone	5.7
methyl isobutyl ketone	5.7
cyclohexanone	5.1
naptha (85% aromatics)	5.0
vinyl chloride	5.0
methyl isocyanate	4.5
iodine	4.5
methyl mercaptan	4.3
dimethyl sulfide	4.3
allyl alcohol	4.2
propylene	4.0
mineral spirits	4.0
2,3-dichloropropene	4.0
cyclohexene	3.4
crotonaldehyde	3.1
acrolein	3.1
pyridine	3.0
hydrogen sulfide	2.8
ethylene dibromide	2.7
n-octane	2.5
acetaldehyde oxime	2.3
hexane	2.2
phosphine	2.0
heptane	1.7
allyl chloride (3-chloropropene)	1.5
ethylene	1.0
ethylene oxide	1.0
acetic anhydride	1.0
a-pinene	0.7
dibromochloropropane	0.7
epichlorohydrin	0.7
nitric oxide	0.6

TABLE 1 RELATIVE SENSITIVITIES FOR VARIOUS GASES
(10.2 eV Lamp) (Continued)

Species	Photoionization Sensitivity*
b-pinene	0.5
citral	0.5
ammonia	0.3
acetic acid	0.1
nitrogen dioxide	0.02
methane	0.0
acetylene	0.0

*Expressed in ppm (v/v).

2.0 CALIBRATION PROCEDURE

2.1 CDM employs a two-point standardization procedure to facilitate proper instrument calibration over the 0-20 ppm and 20-200 ppm operating ranges. Two distinct mixtures of the calibration gas (isobutylene) in air are used. Each mixture should give a 3/4 scale deflection in its respective operating range.

2.2 Instrument Setup.

2.2.1 Remove Instrument cover by pulling up on the side straps.

2.2.2 Prior to calibration, check the function switch (Figure 2) on the control panel to make sure it is in the OFF-positon. The probe nozzle, is stored inside the instrument cover. Remove cover plate by pulling up on the pins that fasten the cover plate.

2.2.3 Remove the nozzle from the cover. Assemble probe by screwing nozzle into casing.

2.2.4 Attach probe cable to instrument box by inserting 12 pin interface connector of the probe cable into the connector on the instrument panel. Match the alignment keys and insert connector. Turn connector in clockwise direction until a distinct snap and lock is felt.

2.2.5 Turn the function switch to the Battery Check position. When the battery is charged, the needle should read within or above the green battery arc on the scale plate. If the needle is below the green arc or the red LED light

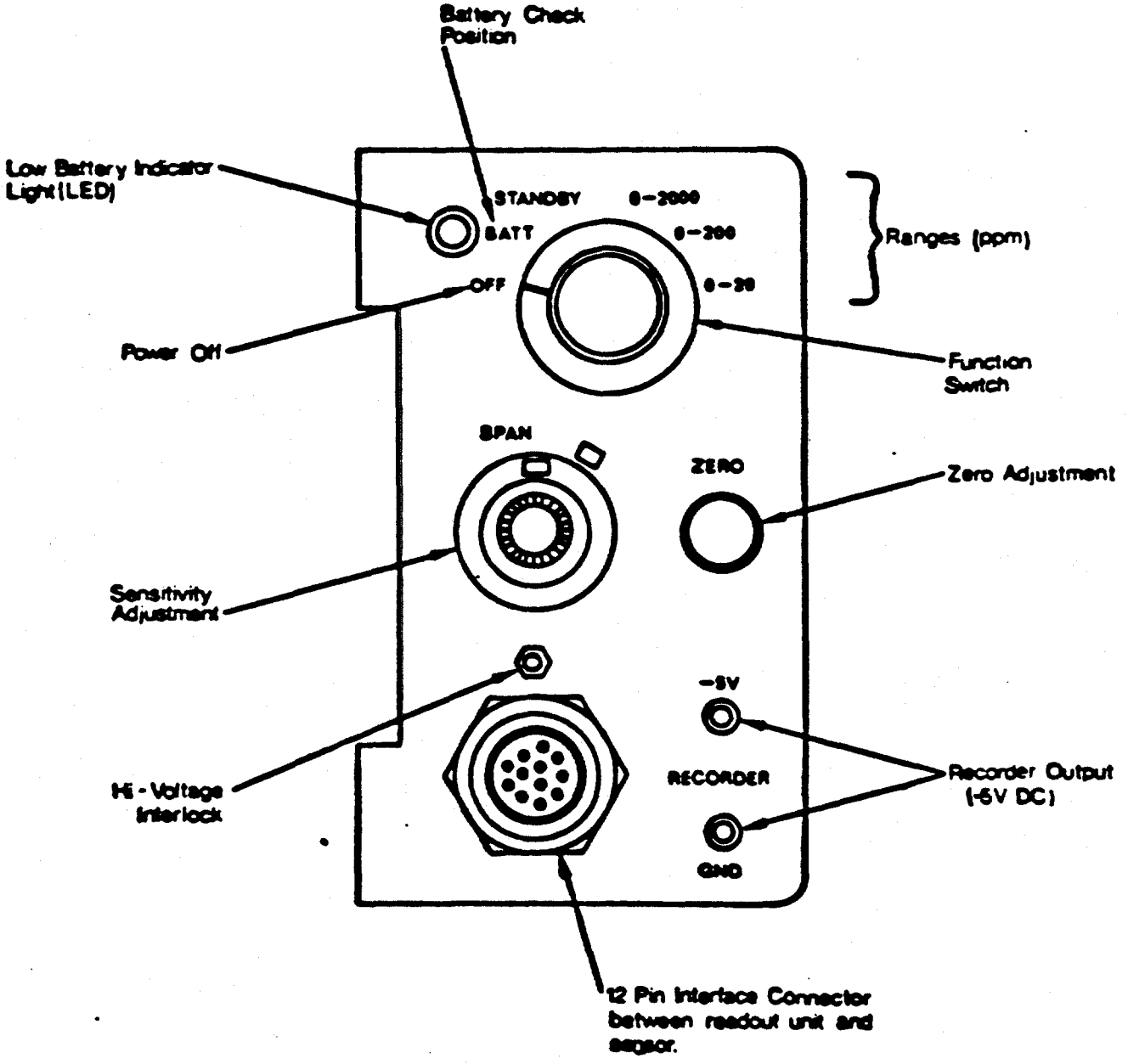


FIGURE 2 CONTROL PANEL FEATURES

comes on, the instrument should be recharged prior to making any measurements. Implement step 3.0 to recharge battery.

2.2.6 Turn the function switch to the ON position. In this position, the UV light source should be on. To verify, gaze at the end of the probe for a purple glow. Do not look directly at the lamp itself. If the lamp does not come on refer to maintenance step 4.1.2.

2.2.7 To zero the instrument, turn the function switch to the standby position and rotate the zero potentiometer until the meter reads zero. Clockwise rotation of the zero potentiometer produces an upscale deflection while counter clockwise rotation yields a downscale deflection. (Note: no zero gas is needed since this is an electronic zero adjustment.) If the span adjustment is changed during instrument calibration, the zero should be rechecked and adjusted. If necessary wait 15 to 20 seconds to ensure that the zero reading is stable. Readjust as necessary.

2.3 Calibration Steps

2.3.1 Insert one end of T tube (Figure 1) into probe. Insert second end of probe into calibration gas in the 20-200 ppm range. The third end of probe should have the rotometer (bubblemeter) attached.

2.3.2 Set the function switch in the 0-200 ppm range.

2.3.3 Crack the valve on the pressured calibration gas container until a slight flow is indicated on the rotometer. The instrument will draw in the volume required for detection with the rotometer indicating excess flow.

2.3.4 Adjust the span potentiometer so that the instrument is reading the exact value of the calibration gas. (Calibration gas value is labeled on the cylinder).

2.3.5 Turn instrument switch to the standby position and check the electronic zero. Reset zero potentiometer as necessary following step 2.3.7.

2.3.6 Record on form F6264 all original and readjusted settings as specified in the form.

2.3.7 Next, set the function switch to the 0-20 ppm. Remove the mid range (20-200 ppm) calibration gas cylinder and attach the low range (0-20 ppm) calibration gas cylinder as described above.

2.3.8 Do not adjust the span potentiometer. The observed reading should be $\pm$ 3ppm of the concentration specified for the low range calibration gas. If this is not the case, recalibrate the mid range scale repeating procedures 3.3.1 to 3.2.7 above. If the low range reading consistently falls outside the recommended tolerance range, the probe light source window likely needs cleaning. Clean window following step 4.1.3. When the observed reading is within the required tolerances, the instrument is fully calibrated.

2.3.9 Complete forms F6264 and F6265 for the respective instrument being calibrated.

3.0 BATTERY RECHARGING

3.1 Place plug on end of charger cable into jack on left side of instrument case

3.2 Plug charger into 120V AC supply.

3.3 To ensure that charger is functioning, turn the function switch to the battery check position. The meter should go upscale if the charger is working correctly and correctly inserted.

3.4 The battery is completely charged overnight (ca, 14 hours).

3.5 When disconnecting charger, remove from 120 V AC before removing mini phone plug.

4.0 TROUBLE SHOOTING AND MAINTENANCE

4.1 General Fault Determination and Correction

4.1.1 Battery level is low. Recharge if necessary implementing step 3.0. If the battery will not recharge it will have to be replaced.

4.1.2 UV lamp function. Gaze at sample inlet when mode switch is on an instrument function position and observe for purple glow of lamp. If the lamp does not glow in any of the three instrument function positions, it may be burned out and will have to be replaced. To replace the lamp:

1. Turn the function switch to the off position and disconnect the probe connector from the readout unit.

2. Remove the exhaust screw found near the base of the probe (Figure 3).

3. Grasp the end cap in one hand and the probe shell in the other and gently pull to separate the end cap and lamp housing from the shell.

4. Loosen the screws on the top of the end cap and separate the end cap and ion chamber from the lamp and lamp housing. Care must be taken so that the ion chamber does not fall out of the end cap and the lamp does not slide out of the lamp housing.

5. Turn the end cap over in your hand and tap on the top of it; the ion chamber should fall out of it.

6. Place one hand over the top of the lamp housing and tilt slightly. The light source will slide out of the housing.

7. Replace lamp with one of same energy source as the one removed by sliding it into the housing. Note: the amplifier board and instrument circuitry are calibrated for one light energy source. Insertion of a lamp of a different energy level will produce false instrument readings.

8. Place the ion chamber on top of the lamp housing, checking to ensure that the contacts are aligned.

9. Place the end cap on top of the ion chamber and replace the two screws. The screws should be tightened only enough to seal the "O" ring. Do not overtighten.

10. Line up the pins on the base of the lamp housing with the pins inside the probe shell. Gently slide the housing assembly into the probe shell. Do not force the assembly as it only fits one way.

11. Replace and tighten the exhaust screw.

12. Reconnect the 12 pin connector and turn instrument mode switch to a function position. Check for glow of lamp. If lamp still does not function the instrument has an electrical short or other problem that will have to be corrected at the factory.

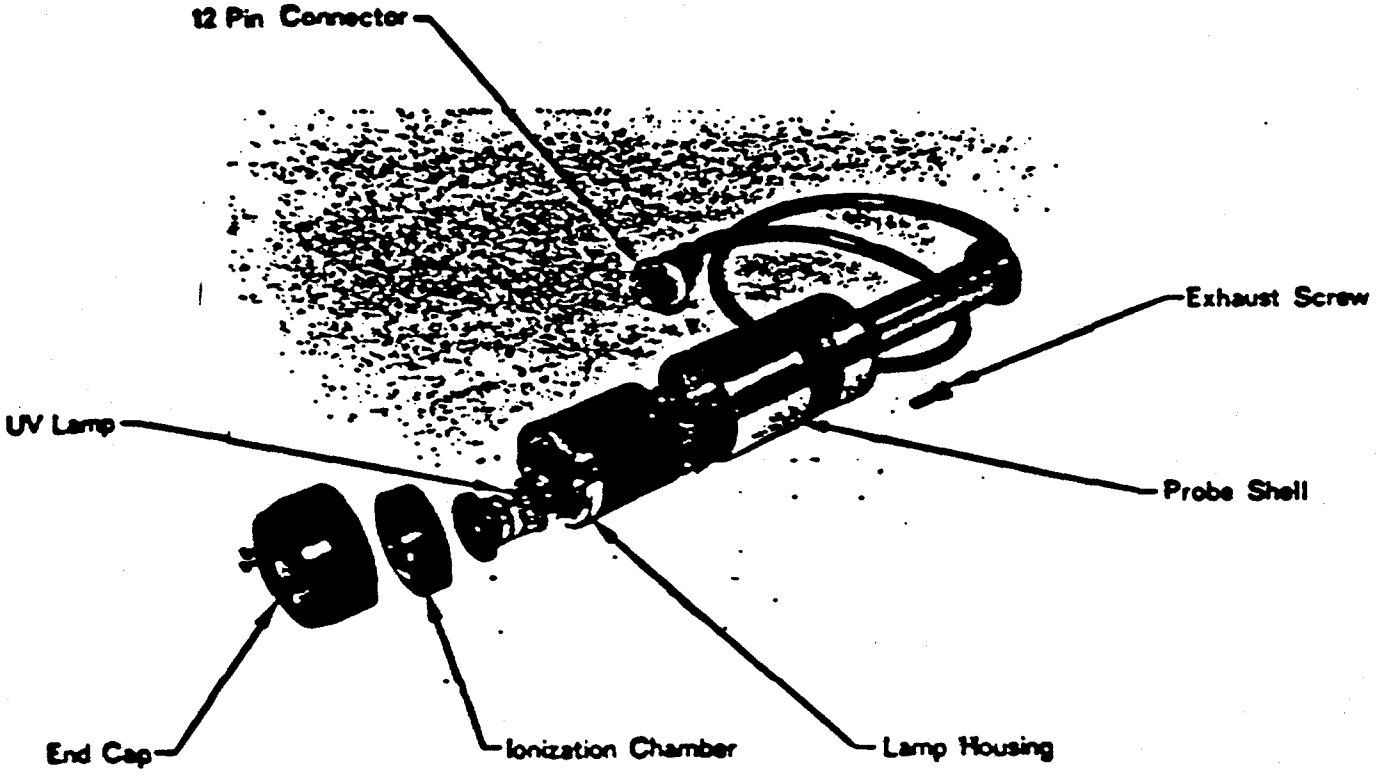


FIGURE 3 COMPONENT PARTS OF PROBE

4.1.3 Instrument appears to be functional, but responses are lower than expected or erratic. The window of the light source may be dirty and need to be cleaned. To clean the light source window:

1. Disassemble the probe assembly by repeating steps 1 through 6 under 4.1.2 above.
2. Clean the window of the light source using compound provided with instrument and soft clean cloth. Important: use cleaning compound on the window of the 10.2 eV lamp only. The cleaning compound may damage the windows of the 9.5 and 11.7 eV lamps.
3. Reassemble the probe assembly repeating step 7 through 12 above.

4.2 Specific Faults

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

1. Broken meter movement: Tip instrument rapidly from side to side. Meter needle should move freely, and return to zero.
2. Electrical connection to meter is broken: Check all wires leading to meter and clean the contacts of quick-disconnects.
3. Battery is completely dead: Disconnect battery and check voltage with a volt-ohm meter.
4. Check 2 amp fuse.
5. If none of the above solves the problem, consult the factory.

4.2.2 Meter responds in BATT CHK position, but reads zero or near zero for all others.

1. Power supply defective: Check power supply voltages per Figure 4. If any voltage is out of specification, consult the factory.

2. Input transistor or amplifier has failed: Rotate zero control; meter should deflect up/down as control is turned. Open probe; both transistors should be fully seated in sockets.

3. Input signal connection broken in probe or readout: Check input connector on printed circuit board. Should be firmly pressed down. Check components on back side of printed circuit board. All connections should be solid, and no wires should touch any other object. Check all wires in readout for solid connections.

4.2.3 Instrument responds correctly in BATT CHK, and STBY, but not in measuring mode.

1. Check to see the light source is on (See Section 4.1.2).

2. Check high voltage power supply (see Figure 4).

3. Open end of probe, remove lamp and check high voltage on lamp contact ring.

4. If high voltage is present at all above points, light source has most likely failed. Consult the factory.

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

1. Check span setting for correct value.

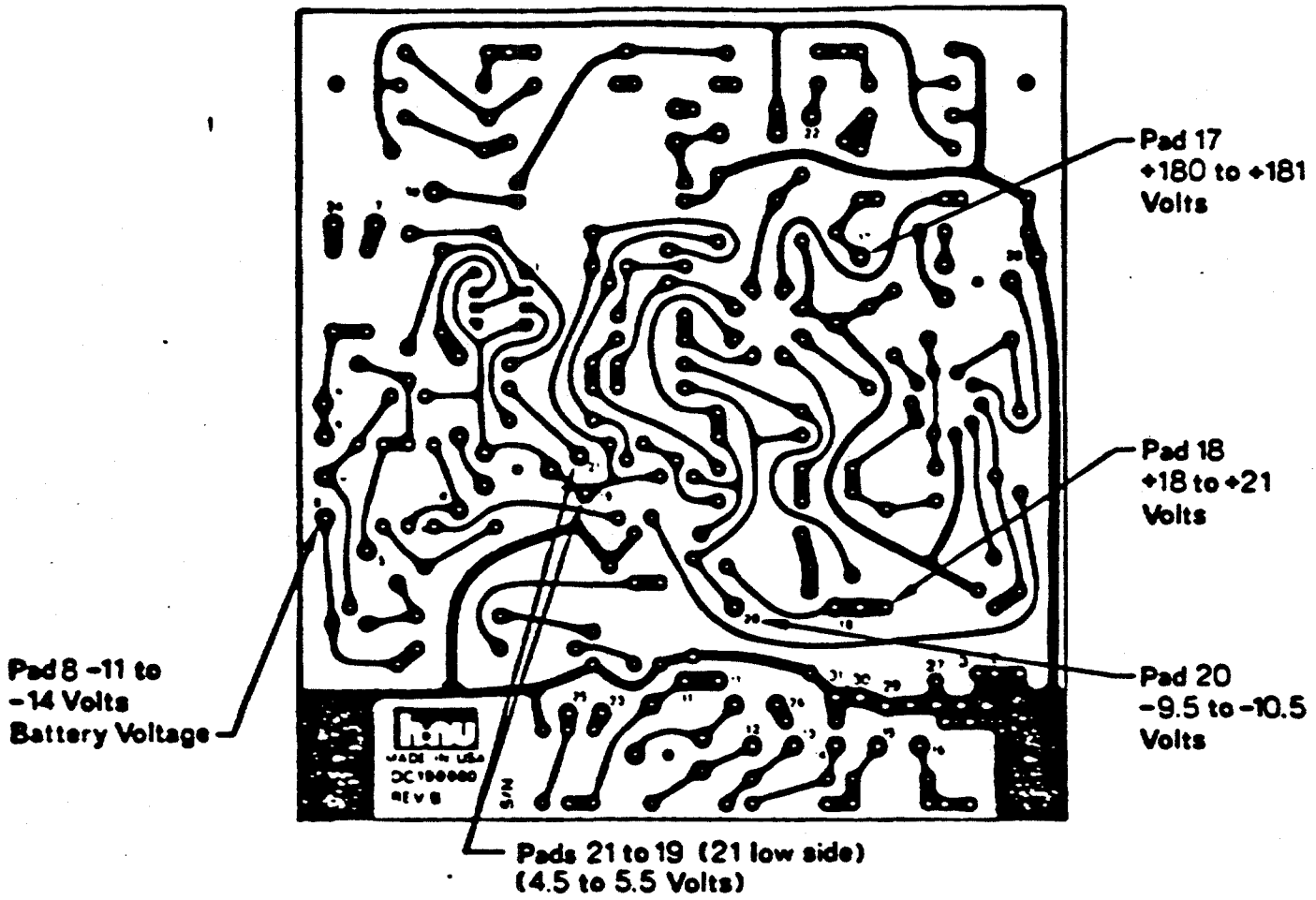
2. Clean window of light source (See 4.1.3).

3. Double check preparation of standards.

4. Check power supply 180 V output. See Figure 4.

5. Check for proper fan operation. Check fan voltage. See Figure 4.

6. Rotate span setting. Response should change if span pot is working properly.



All Voltages Respect to Ground							
pads	voltage	pads	voltage	pads	voltage	pads	voltage
1	− 5.7V	9	− 12.2V	17	180V	25	0
2	GRD	10	− 12.1V	18	+ 19.4V	26	0
3	GRD	11	0	19	− 10.6V	27	GRD
4	−10.7V	12	0	20	− 9.7V	28	0
5	− 11.3V	13	0	21	− 14.5V	29	GRD
6	− 12.1V	14	0	22	− 400V	30	GRD
7	0	15	0	23	0	31	GRD
8	− 12.2V	16	0	24	0		

Figure 4 Power Supply PC Board

4.2.5 Instrument responds in all switch positions, but is noisy (erratic meter movement).

1. Open circuit in feedback circuit. Consult the factory.
2. Open circuit in cable shield or probe shield. Consult the factory.

4.2.6 Instrument response is slow and/or irreproducible.

1. Fan operating improperly. Check fan voltage. See Figure 4.
2. Check calibration and operation.

4.2.7 Low battery indicator.

1. Indicator comes on if battery charge is low.
2. Indicator also comes on if ionization voltage is too high.

CALIBRATION AND MAINTENANCE PROCEDURES
CENTURY SYSTEMS PORTABLE ORGANIC VAPOR ANALYZER MODEL OVA-128

1.0 INTRODUCTION

This procedure presents steps required to calibrate and maintain the model OVA-128 organic vapor analyzer. Specifications and operating principles and procedures are presented in Procedure 5607003.

2.0 CALIBRATION

2.1 General

The OVA is capable of responding to nearly all organic compounds. However, the response will vary from compound to compound. The responses of some compounds relative to methane, are presented in Table 1. For precise analyses it is necessary to calibrate the instrument to a specific compound of interest, particularly if that compound contains elements other than carbon and hydrogen. For general use, the instrument is calibrated to methane.

Internal electronic adjustments are provided to calibrate and align the electronic circuits. There are four such adjustments, all located on the electronics board. One adjustment potentiometer, R-38, is factory set and is used to set the power supply voltage. Potentiometer R-38 thus should never be adjusted. The remaining three adjustments, R-31 (X1), R-32 (X10), and R-33 (X100) are used for setting the electronic amplifier gain for each of the three calibration ranges. Access to the adjustments is accomplished by removing the instrument from its case.

TABLE 1 - RESPONSE OF OVA TO HYDROCARBONS RELATIVE TO METHANE

Compound	Relative Response (%)
Methane	100 (Reference)
Propane	64
N-butane	61
N-pentane	100
Ethylene	85
Acetylene	200
Benzene	150
Tolvene	120
Ethane	90
Acetone	60
Methyl Ethyl Ketone	80
Methyl Isobutyl Ketone	100
Methyl Alcohol	15
Ethyl Alcohol	25
Isopropyl Alcohol	65
Carbon Tetrachloride	10
Chloroform	65
Trichloroethylene	70
Vinyl chloride	35

2.2 Methane Calibration

2.2.1 Equipment

- o Calibration gas (75-90 ppm methane)
- o T-tube assembly

2.2.2 Instrument Startup

Start instrument by:

1. Move PUMP switch to ON and check battery condition by moving the INSTR switch to the BATT position.

Recharge battery (section 3.0) if battery level is low.

2. Move INSTR switch to ON and allow 5 minutes for warmup.

3. Place instrument in vertical position and check flow rate.

4. Open the H_2 TANK VALVE and H_2 SUPPLY VALVE.

5. Depress Ignitor button for 6 seconds or until hydrogen ignites, whichever is shorter. If hydrogen fails to ignite, wait 2 minutes and attempt to ignite hydrogen.

6. Once lit, wait 5 minutes for instrument to stabilize before starting calibration procedure.

7. Open instrument cover to expose circuit board.

2.2.3 Calibration

Calibration should be performed in a well ventilated area.

1. Set CALIBRATE switch to X10.

2. For methane calibration the GAS SELECT control should be set to 300. Check to ensure that this control is set at 300.

3. Adjust meter reading to zero by rotating the Calibrate ADJUST (zero) knob.

4. Attach one end of T assembly to methane gas cylinder and the other to the probe.

5. Crack open methane gas cylinder until a slight flow of gas can be detected exiting the open end of the T assembly.

6. Adjust trimpot R-32 on circuit board so that meter reads the equivalent of the calibration gas concentration. This sets the instrument gain for methane with the panel mounted gain adjustment set at 300.

7. Close methane gas cylinder. Turn off H_2 SUPPLY VALVE to put out flame. Wait for flameout alarm to sound to ensure the flame is out.

8. Leave CALIBRATE switch on the X10 position and use CALIBRATE ADJUST (zero) knob to adjust meter reading to 4 ppm.

9. Place CALIBRATE switch in X1 position and, using trimpot R-31 on circuit board, adjust meter reading to 4 ppm. This is the Bias Adjustment for the X1 range.

10. Move CALIBRATE switch to X10 position again. Use CALIBRATE ADJUST (zero) knob to adjust meter to a reading of 40 ppm.

11. Move CALIBRATE switch to X100 position and use trimpot R-33 on circuit board to adjust meter reading to 40 ppm.

12. Move CALIBRATE switch to X10 position and use CALIBRATE ADJUST (zero) knob to adjust meter reading to zero.

13. Unit is now balanced from range to range, calibrated to methane, and ready to be placed in normal service.

14. Shut instrument down by ensuring that the H_2 SUPPLY VALVE and H_2 TANK VALVE are closed and the INSTR and PUMP switches are in the OFF position.

15. Record on instrument calibration label, calibration date, gas, and initials of person performing calibration. Remove old tag and replace it with updated label. Fill out instrument history log form.

2.3 Calibration to Specialty Gas/Vapor

Primary calibration of the instrument is accomplished using a known mixture of a specific gas or vapor.

2.3.1 Equipment

- Calibration (span) gas (75-90ppm of known gas or vapor)
- T-tube assembly

2.3.2 Instrument Startup

Follow steps in 2.2.2 above.

2.3.3 Calibration

Calibration should be performed in a well ventillated area.

1. Set CALIBRATE switch to 10.
2. Adjust meter reading to zero by rotating the CALIBRATE ADJUST (zero) knob.
3. Attach one end of T assembly to calibration gas cylinder and the other to the probe.
4. Crack open calibration gas cylinder until a slight flow of gas can be detected exiting the open end of the T assembly. (Caution: if the calibration gas is toxic or highly flammable, calibration should occur underneath a hood.)
5. Adjust GAS SELECT knob on instrument until the meter reads the same level as that of the calibration gas.
6. Turn off calibration cylinder and remove T assembly.
7. The instrument is now calibrated for the specialty gas/vapor. All responses of the instrument should be recorded relative to the specialty gas.
8. Calibration in the X10 range by adjusting the GAS Select knob automatically calibrates the instrument for the X1 and X100 ranges. No further adjustments are necesary.
9. Shut instrument down by closing the H_2 SUPPLY VALVE and H_2 TANK VALVE, and putting the INSTR and PUMP switches in the OFF position.
10. Record in instrument calibration label calibration date, span gas and concentration, span setting, and initials of person performing calibration. Remove old

tag and replace it with updated label. Fill out instrument history log.

3.0 FILLING OF HYDROGEN SUPPLY

The instrument should be completely shut down for hydrogen tank refilling. The refilling should be done in a ventillated area. There should be no potential ignitors or flame in the area.

1. Attach filling hose to external source of hydrogen. Pure hydrogen of 1,600 to 2,300 psi will be required.
2. Crack open valve on hydrogen supply, place FILL/BLEED valve on hose in FILL position and purge hose for 2-3 seconds.
3. Close FILL/BLEED Valve (OFF position) and immediately attach other end of fill hose to instrument fill connection and tighten the connection.
4. Open supply valve external on hydrogen tank 1/2 to 1 turn. Set regulator to 1,600 to 2,300 psi.
5. Open the REFILL Valve and the H_2 Tank VALVE on the instrument.
6. Place FILL/BLEED Valve in FILL position. The instrument hydrogen tank should now be filling.
7. The instrument H_2 Pressure Indicator should now indicate instrument tank pressure. This pressure should approximate that of the external supply tank regulator gauge.
8. After the instrument tank is filled, shut off:
   a. The REFILL VALVE on the instrument panel.
   b. The FILL/BLEED Valve on the filling hose assembly.
   c. The valve on the external hydrogen supply bottle.
9. The supply hose and internal lines on the instrument now contain hydrogen under pressure. To reduce this pressure to atmospheric pressure:
   a. Turn FILL/BLEED Valve to BLEED position until gas can no longer be heard escaping.

b. Turn FILL/BLEED Valve to FILL position to allow gas trapped in the connective fittings to go into the hose assembly.

c. Turn FILL/BLEED Valve to BLEED position to bleed off this pressure.

d. Turn FILL/BLEED Valve to OFF position. Keep valve in OFF position.

10. Close H_2 Tank Valve.

11. Remove fill hose from instrument. Any gas still under pressure will escape as the connector is removed. Release of gas should only be momentary.

12. As a check of the integrity of the instrument's hydrogen supply system, observe the H_2 TANK PRESSURE Indicator with the system shut down. Release of internal pressure should not go down rapidly. If there is a rapid decrease (greater than 350 PSIG/hour) with the instrument in shut down mode, there is a significant leak in the H_2 supply system. If so, the instrument should be returned to the manufacturer for repairs.

4.0 BATTERY RECHARGING

The battery should be recharged following each use of 4 hours or more, or when the battery check indicator indicates need of a charge. Never charge instrument in hazardous environment or when refilling hydrogen tank.

1. Remove cover from battery charge part on instrument.

2. Plug charger BNC connector into mating connector on battery cover and insert AC plug into 115 VAC wall outlet.

3. Move battery charger switch to the ON position. The light above the switch should illuminate.

4. Battery charge condition is indicated by the meter on the front panel of the charger; meter will deflect to the right while charging. When fully charged, the pointer will be in line with the charged mark above the scale.

5. Approximately 1 hour of charging time is required for each hour of operation; 12 hours for complete charge. Do not charge for more than 24 hours.

5.0 MAINTENANCE

5.1 General

Section 6.0 of the Model OVA-128 Instruction and Service Manual contains detailed maintenance and repair procedures for servicing the OVA. These procedures are not repeated here. Equipment managers are referred to the manual for repair of the OVA.

Equipment managers should be thoroughly familiar with instrument operation before performing maintenance. It is essential that all safety considerations regarding use and maintenance of this instrument be understood. There should be no potential igniters or flame in the area when filling, emptying, or purging the hydrogen system and the instrument should be in shut-down mode.

5.2 Trouble Shooting

Table 2 presents common problems and corrective actions for repairing the instrument.

6.0 REFERENCE

Foxboro Analytical. No date. Instruction and Service Manual, Century Systems Portable Organic Vapor Analyzer Model OVA-128 (M1 2R900AC).

TABLE 2

TROUBLE	TROUBLE SHOOTING PROCEDURE	REMEDY
1) Low sample flow rate on flow indicator	a) Check teflon tubing on valve assembly for kinks, etc. b) Check flow rate with valve in down position.	Straighten or replace teflon tubing Check for over restriction of charcoal filter
2) H2 flame will not light	a) Check column connections on top of unit to make sure they are tight. b) Check column for sharp bends or kinks. (Hydrogen flows through this column at all times and a sharp bend will compact packing too tightly for proper hydrogen flow.) c) Check charcoal filter fittings to make sure they are tight. d) Check H2 flow rate from the column. e) Check that the Inject and Backflush Valves are both completely in or out. A partially activated valve will block the H2 and air flow paths. f) If a new column was installed prior to problem identification, check for proper hydrogen flow rate through the column (should be approximately 12 cc/minute). Reference paragraph 7.1.4.2 d.	Tighten fittings Replace column Tighten fittings Adjust hydrogen pressure to obtain 12 cc/min. flow rate. Ensure both valves are either completely in or out. Increase hydrogen pressure to obtain proper hydrogen flow rate or if column is excessively restrictive, replace or repack the column.
3) Ambient background reading in clean environment is too high	a) Check for contamination in charcoal filter assembly. This can be detected if ambient reading increases when going in to the chromatographic mode. Reference paragraph 7.1.5.2 b. b) Check for contamination in column. Reference paragraph 7.1.5.2 a c) Check for contamination in column valve assembly.	Replace activated charcoal in charcoal filter assembly. Replace or clean column. Remove valve stems and wipe with clean lint-free cloth. Heat valve assembly during operation to vaporize and remove contaminants.
4) Flame-out when operating either valve	a) Ensure valves are being operated with a quick, positive motion. b) Either H2 or air may be leaking around one or more of the valve quad rings. Assess by taste and "O" ring inspection. c) Damaged or worn quad rings causing leak.	Operate valve with a positive motion. Remove stems and lightly coat with silicone grease, only on contact surface of the "O" ring. Wipe off excess (do not remove quad rings). Replace quad rings and grease as above.
5) Excessive peak tailing	a) Change or clean GC column and see if problem disappears. b) Inspect GC valves for excessive silicone grease or contamination.	Ensure columns are clean prior to use. Refer to paragraph 7.1.5.2 a for cleaning instructions. If one of a same type of column tails worse than others, repack the column or discard. Excessive lubricant or foreign matter in the valve assembly can cause excessive tailing. Clean valve assemblies and lightly relubricate as required. Lubricant should be put only on the outside contact surface of the "O" ring. Do not get grease into "O" ring

CALIBRATION AND MAINTENANCE PROCEDURE
YSI MODEL 33 S-C-T METER

1.0 INTRODUCTION

This procedure presents steps to calibrate and maintain the YSI Model 33 S-C-T meter. Operation principles, procedures, and equipment specifications are presented in Procedure 5617002 and are not repeated here.

2.0 CALIBRATION

2.1 Temperature

2.1.1 Temperature Knob Setting

It is possible for the temperature knob to become loose or slip from its normal position. In an emergency, the dial can be repositioned. It must be emphasized that this is an emergency procedure only and that the instrument should be returned to the factory for proper recalibration - at the earliest opportunity.

To recalibrate the temperature setting:

1. Red line instrument and then place probe in sample of known conductivity.
2. Read and record the temperature and conductivity of the solution using appropriate settings. Leave probe in solution.
3. Determine the salinity of the solution by running a line vertically on Figure 1 until it intersects the appropriate °C line. From this intersection, extend a line horizontally to the left edge of the graph (Figure 1). This determines the salinity of the sample.

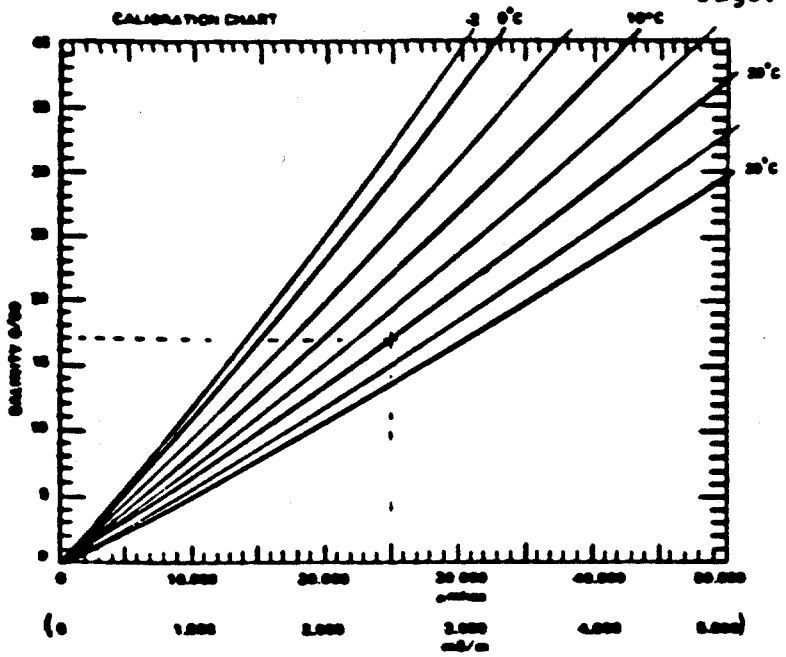


Figure 1. Calibration Chart for Resetting Temperature Knob

4. Remove the °C knob switch to SALINITY, and turn the control shaft until the meter needle indicates the salinity value determined in step 3.

5. Switch to TEMPERATURE. If this temperature is the same as step 2, continue. If not, repeat steps 1 through 5.

6. Place the knob on the control shaft - without turning the control shaft - with the pointer at the same temperature as the meter reading. Tighten both sets of screws securely. Care must be taken at this step so that the shaft setting is not moved.

7. Return the instrument to the factory at the earliest opportunity.

2.1.2 Tempertaure Probe/Instrument

To check the accuracy of the Probe/Instrument temperature readings:

1. Place NBS traceable thermometer in solution with thermometer and probe.

2. Place instrument in temperature mode after zeroing and red lining the instrument.

3. After five minutes, compare temperature of thermometer and instrument. If the instrument varies by +'1C, the instrument should be returned to the factory for calibration and maintenance.

2.2 Probe Cell Calibration

The YSI #3300 Series Cells are calibrated to absolute accuracy of ± 1.5 percent based on a standard solution of 0.01 demol KCl. To prepare this solution:

1. In a one liter flask, dissolve 0.745 grams of pure dry KCl until the solution is one kilogram in weight.

2. Use Table 1 and the temperature of the water to determine the conductivity of the solution just prepared. Note: Table 1 shows conductivity as if the distilled water was nonconductive. Since even high purity distilled water is slightly conductive, the measured conductivity will be higher by an amount equal to the water's conductivity.

3. Place probe in solution and measure conductivity. The conductivity of the solution plus the conductivity of the distilled water should not vary from the meter reading by ± 1.5%. If the reading is greater than 1.5%, clean the probe and then recheck the conductivity. If after cleaning it is not possible to measure the conductivity of the calibration solution within ± 1.5%, the probe and instrument should be returned to the manufacturer for calibration and maintenance.

3.0 MAINTENANCE

3.1 Batteries

The batteries should be replaced either (1) when it is not possible to red line the instrument, (2) after 200 hours of operation, or (3) every 6 months to reduce the danger of corrosion due to leaky batteries.

To replace batteries, remove the six screws from the rear plate. The battery holders are color coded. The positive (+ button) end must go on red.

Use two "D" size alkaline flashlight cells (Eveready E95 or equivalent).

3.2 Probe

3.2.1 Cleaning

When the cell test indicates low readings, the probable cause is dirty electrodes. Hard water deposits, oils, and organic matter are the most likely contaminants.

TABLE 1 - CELL CALIBRATION DATA

Temperature (°C)	Conductivity (umhos/cm)
15	1141.5
16	1167.5
17	1193.6
18	1219.9
19	1246.4
20	1273.0
21	1299.7
22	1326.6
23	1353.6
24	1380.8
25	1408.1
26	1436.5
27	1463.2
28	1490.9
29	1518.7
30	1546.7

For convenient normal cleaning, soak the electrodes for 5 minutes with a locally available bathroom tile cleaner such as: "Rally, Tile, Porcelain, and Chrome Cleaner"; Johnson Wax "Envy, Instant Cleaner"; or Lysol Brand "Basin, Tub, Tile Cleaner".

For storage cleaning, a 5 minute soak in a solution made of 10 parts distilled water, 10 parts isopropyl alcohol, and 1 part HCl can be used.

Always rinse the probe in distilled water after cleaning and before storage.

CAUTION: Do not touch the electrodes inside the probe. Platinum black is very soft and can be scraped off.

If cleaning does not restore the probe performance, re-platinizing is required.

3.2.2 Probe Replatinizing

1. Equipment required:
   a. YSI #3140 Platinizing Solution, 2 fluid ounce (3% platinum chloride dissolved in 0.025% lead acetate solution)
   b. YSI Model 33 meter
   c. 50 ml glass beaker or equivalent
   d. Distilled water
2. Procedure
   a. Clean probe as in section 3.2.1 - either method

b. Place the cell in the beaker and add sufficient YSI #3140 solution to cover the electrodes. Do not cover the top of the probe

c. Plug the probe into the Model 33 and switch to the X100 scale to platinize the electrode

d. Move the probe slightly to obtain the highest meter reading and continue platinizing for the appropriate time shown below:

Meter Reading (umhos/cm)	Time (minutes)
30,000	5
25,000	6
20,000	8
15,000	11
10,000	16

e. After the elapsed time, remove the probe and rinse in distilled water.

f. Return the solution to its container. Two ounces of solution should be sufficient for 50 treatments.

3.2.3 Storage

It is best to store conductivity cells in deionized water. Cells stored in water require less frequent platinization. Any cell that has been stored dry should be soaked in deionized water for 24 hours before use.

CALIBRATION AND MAINTENANCE PROCEDURES HAAKEBUCHLER pH STICK

1.0 INTRODUCTION

This procedure presents the steps for calibrating and maintaining the HaakeBuchler pH Stick. Instrument operation principles and procedures and specifications are presented in Procedure 5617003.

2.0 CALIBRATION

2.1 Calibration Solutions

The instrument requires distilled water, a pH 7 buffer solution, and a pH 4 buffer solution for calibration. To prepare the buffer solutions, dissolve the buffer powders provided with the instrument into the volume of distilled water specified on the buffer powder packets. (Note: the manufacturer does not specify whether buffer and pH 4 solutions, other than that provided, may be used as substitute solutions).

The pH of the buffer and pH 4 solutions will vary with the temperature of the solution. Use the table below to determine solution pH based on temperature.

Temp	0°C	10°C	20°C	25°C	30°C	40°C	50°C
pH 4	4.00	4.00	4.00	4.01	4.02	4.04	4.06
pH 7	7.11	7.06	7.01	7.00	6.98	6.97	6.97

2.2 Calibration Procedure

The instrument requires calibration in the field prior to each use. However, as a check of proper instrument function, the instrument should be periodically calibrated in the laboratory,

particularly if the instrument has been stored for an extended period without use.

To calibrate the instrument:

1. Remove the protective sheath and rinse the electrode in distilled water.
2. Place the electrode in the pH 7 buffer solution, depress the white operation button below the LCD display and allow the reading to stabilize.
3. Adjust pH 7 control using the tool on the end of the protective sheath. The pH 7 control is the upper most white control on the right side of the instrument. Adjust the pH control until the meter reads pH 7.
4. Rinse the electrode in distilled water.
5. Place the electrode in pH 4 solution, depress the white operation button, and allow the reading to stabilize.
6. Adjust the slope control (white control below pH 7 control on the right side of the instrument) until the meter reads the correct value of the pH 4 solution.
7. Rinse the probe in distilled water.
8. Repeat steps 2 through 7.
9. Record calibration on the instrument log form.
10. Store instrument properly.

3.0 MAINTENANCE

3.1 Storage

To maintain high accuracy and to obtain a long electrode life, the pH stick must be stored correctly when not in use. Always rinse the electrode in distilled water before replacing it in its protective sheath. The electrode must not be let to dry out.

The absorbent pad at the bottom of the sheath must be kept saturated with a pH 7 buffer solution. If this is not available, distilled water can be used as a temporary measure. Replace distilled water with buffer solution at the earliest possible opportunity. Always place buffer (or distilled water) into sheath following each use.

To retain accuracy and speed of response, the insulation of the connectors on the electrode and the body must be kept clean and dry. This is best assured by not unnecessarily removing the electrode from the body.

When not in use, place the pH stick in the wallet provided and store in a dry place.

3.2 Electrode Cleaning

If rinsing the electrode in distilled water is not deemed sufficient to clean the electrode, it can be cleaned in a N/10 HCl acid solution. Following cleaning in the acid, the electrode should be soaked in a pH 7 buffer solution for 24 hours before rinsing. Record cleaning on instrument's log form.

3.3 Battery

Normal battery life is in excess of 200 hours of continuous use. Cells should be replaced at 2 year intervals or earlier if exhausted (voltage per cell of less than 1.35V). Replacement cells must be mercury type V312H or direct equivalent. When refitting cells, make sure they are refitted in the manner illustrated on the battery housing.

INSPECTION, CLEANING, MAINTENANCE AND STORAGE OF RESPIRATORS

1.0 INSPECTION

1.1 INSPECTION FOR DEFECTS

The most important part of a respirator maintenance program is continual inspection of the devices. If properly performed, inspections will identify damaged or malfunctioning respirators before they can be used. The OSHA standard outlines two types of inspections.

- While the respirator is in use.
- While it is being cleaned.

In plants where the workers maintain their own respirators, the two types of inspections become essentially one.

1.2 FREQUENCY OF INSPECTION

OSHA requires that "All respirators be inspected before and after each use" and that those not used routinely, i.e., emergency escape and rescue devices, "shall be inspected after each use and at least monthly . . ." Obviously, emergency escape and rescue devices do not require inspection before use. Records of inspections should be kept.

1.3 INSPECTION PROCEDURES

1.3.1 General

The OSHA standard states that the respirator inspection shall include checking of:

- Tightness of the connections
- Facepiece
- Valves
- Connecting tubes
- Canisters, filters or cartridges

In addition, the standard also states that the regulator and warning devices on a SCBA shall be checked for proper function.

1.32 Field Inspection of Air-Purifying Respirators

Routinely used air purifying respirators should be checked as follows before and after each use:

1. Examine the facepiece for:
   a. Excessive dirt.
   b. Cracks, tears, holes or physical distortion of shape from improper storage.
   c. Inflexibility of rubber facepiece (stretch and knead to restore flexibility).
   d. Cracked or badly scratched lenses in full facepieces.
   e. Incorrectly mounted full facepiece lenses, or broken or missing mounting clips.
   f. Cracked or broken air-purifying element holder(s), badly worn threads of missing gasket(s), if required.

2. Examine the head straps or head harness for:
   a. Breaks.
   b. Loss of elasticity.
   c. Broken or malfunctioning buckles and attachments.
   d. Excessively worn serrations on head harness, which might permit slippage (full facepieces only).

3. Examine the exhalation valve for the following after removing its cover:
   a. Foreign material, such as detergent residue, dust particles or human hair under the valve seat.
   b. Cracks, tears or distortion in the valve material.
   c. Improper insertion of the valve body in the facepiece.
   d. Cracks, breaks or chips in the valve body, particularly in the sealing surface.
   e. Missing or defective valve cover.
   f. Improper installation of the valve in the valve body.

4. Examine the air-purifying element for:
   a. Incorrect cartridge, canister or filter for the hazard.
   b. Incorrect installation, loose connections, missing or worn gasket or cross threading in the holder.
   c. Expired shelf-life date on the cartridge or canister.
   d. Cracks or dents in the outside case of the filter, cartridge or canister, indicated by the absence of sealing materials, tape, foil, etc., over the inlet.

5. If the device has a corrugated breathing tube, examine it for:
   a. Broken or missing end connectors.
   b. Missing or loose hose clamps.
   c. Deterioration, determined by stretching the tube and looking for cracks.

6. Examine the harness of a front- or back-mounted gas mask for:
   a. Damage or wear to the canister holder, which may prevent its being held in place.
   b. Broken harness straps for fastening.

1.3.3 Atmosphere-Supplying Respirators

For a routinely used atmosphere-supplying device, use the following procedures:

1. If the device is a tight-fitting facepiece, use the procedures outlined under air-purifying respirators, except those pertaining to the air-purifying elements.

2. If the device is hood, helmet, blouse or full suit, use the following procedures:
   - Examine the hood, blouse or full suit for rips and tears, seam integrity, etc.
   - Examine the protective headgear, if required, for general condition with emphasis on the suspension inside the headgear.
   - Examine the protective face shield, if any, for cracks or breaks or impaired vision.
   - Make sure the protective screen is intact and secured correctly over the face shield of abrasive blasting hoods and blouses.

3. Examine the air supply systems for:
   - Integrity and good condition of air supply lines and hoses, including attachment and end fittings.
   - Correct operation and condition of all regulators, or other air flow regulators.

1.3.4 Self-Contained Breathing Apparatus (SCBA)

In addition to the above, for SCBA units also determine that:

1. The high pressure cylinder of compressed air or oxygen is sufficiently charged for the intended use, preferably fully charged.
2. On closed circuit SCBA, a fresh canister of CO_2 (carbon dioxide) sorbent is installed.
3. On open circuit SCBA, the cylinder has been recharged if less than 25% of the useful service time remains.

All SCBAs are required to have a warning device that indicates when the 25% level is reached. However, it is recommended that an open-circuit SCBA be fully charged before use.

1.3.5 Non-Routine Use of Air-Purifying or Atmosphere Supplying Devices

When air-purifying or atmosphere supplying devices are used non-routinely, all the above procedures should be followed after each use. OSHA requires that devices for emergency use be inspected once a

month and that "a record shall be kept of inspection dates and findings for respirators maintained for emergency use."

1.3.6 Defects Found in Field Inspection

If defects are found during any field inspection, two remedies are possible. If the defect is minor, repair and/or adjustment may be made on the spot. If it is major, the device should be removed from service until it can be repaired. (A spare unit should replace the unit removed from service). Under no circumstances should a device that is known to be defective remain in the field.

1.3.7 Inspection During Cleaning

Because respirator cleaning usually involves some disassembly, it presents a good opportunity to examine each respirator thoroughly. The procedures outlined above for a field inspection should be used. Respirators should be inspected after cleaning operations and reassembly have been accomplished.

OSHA requires, as part of an inspection program, that all respirators be leak checked, a determination that the complete assembly is gas tight. Follow field inspection procedures to examine the freshly cleaned reassembled respirator.

2.0 CLEANING AND DISINFECTING

2.1 GENERAL

OSHA 1910.134 states "routinely used respirators shall be collected, cleaned and disinfected as frequently as necessary to ensure that proper protection is provided . . ." and that emergency use respirators "shall be cleaned and disinfected after each use."

When used routinely, respirators should be exchanged daily for cleaning and inspection. Where respirators are used only occasionally, the exchange period could be weekly or monthly. Workers maintaining their own respirators should be thoroughly briefed on cleaning and disinfecting them. Although workers may not be required to maintain their own respirators, briefing on the cleaning procedure will encourage their acceptance of a respirator by providing knowledge of what is a clean, disinfected properly maintained device. This is particularly important where respirators are not individually assigned.

Where respirators are individually assigned (a practice to be encouraged), they should be durably identified to ensure that the worker always receives the same device. Identification markers must not penetrate the facepiece, block the filter, cartridge parts or exhaust valves.

In plants where a relatively small number of respirators are used, or where workers clean their own respirators, the generally accepted procedure is washing with detergent and warm water using a brush, thoroughly rinsing in clean water, and drying in a clean place. Precautions should be taken to prevent damage from rough handling during this procedure.

In plants where large numbers of respirators are used, it is recommended that a centralized cleaning and maintenance facility with specialized equipment and personnel trained in respirator maintenance be established.

2.2 RESPIRATOR DISASSEMBLY

The used respirators are collected and deposited in a central location. They are taken to an area where the filters, cartridges or canisters are removed and discarded. Canisters should be damaged to prevent accidental reuse. If facepieces are equipped with reusable dust filters, they may be cleaned with compressed air in a hood. This prevents dust from getting into the room and affecting the respirator personnel. If SCBA are used, tanks are removed and connected to a charging station; the rest of the unit is sent to an area where the SCBA regulator and low-air warning devices are tested. SCBA facepieces are cleaned like air-purifying respirator facepieces.

2.3 CLEANING AND SANITIZING

The actual cleaning may be done in a variety of ways. It is recommended that a commercial dishwasher be used. A standard domestic clothes washer may also be used if a rack is installed around the agitator to hold the facepieces in fixed positions. If the facepieces are placed loose in the washer, the agitator may damage them. A standard domestic dishwasher may be used, but it is not preferred because it does not immerse the facepieces. Any good detergent may be used followed by a disinfecting rinse or a combination disinfectant-detergent for a one stop operation. Disinfection is not absolutely necessary if the respirator is reused by the same person. However, where individual issue is not practical, disinfection is strongly recommended. Reliable, effective disinfectants may be made from readily available household solutions, including:

a. Hypochlorite solution (50 ppm of chlorine) made by adding approximately two milliliters of bleach (such as Chlorox) to one liter of water, or two tablespoons of bleach per gallon of water. A two-minute immersion disinfects the respirators.

b. Aqueous solution of iodine (50 ppm of iodine) made by adding approximately 0.8 milliliters of tincture of iodine per liter of

water, or one teaspoon of tincture of iodine per gallon of water. Again, a two-minute immersion is sufficient.

If the respirators are washed by hand, a separate disinfecting rinse may be provided. If a washing machine or dishwasher is used, the disinfectant must be added to the rinse cycle; the amount of water in the machine at that time will have to be measured to determine the correct amount of disinfectant.

To prevent damaging the rubber and plastic in the respirator facepieces, the cleaning water should not exceed 140°F, but it should not be less than 120°F to ensure adequate cleaning. In addition, if commercial or domestic dishwashers are used, the drying cycle should be eliminated, since the temperatures reached in these cycles may damage the respirators.

2.4 RINSING

The clean and disinfected respirators should be rinsed thoroughly in water (140°F maximum) to remove all traces of detergent and disinfectant. This is very important for preventing dermatitis.

2.5 DRYING

The respirators may be allowed to dry in room air on a clean surface. They may also be hung from a horizontal wire, like drying clothes, but care must be taken not to damage or distort the facepieces. Another method is to equip a standard steel storage cabinet with an electric heater that has a built-in circulating fan, and to replace the solid steel shelves with steel mesh.

2.6 REASSEMBLY AND INSPECTION

The clean, dry respirator facepieces should be reassembled and inspected in an area separate from the disassembly area to avoid contamination. The inspection procedures have been discussed; special emphasis should be given to inspecting the respirators for detergent or soap residue left by inadequate rinsing. This appears most often under the seat of the exhalation valve, and can cause valve leakage or sticking.

The respirator should be thoroughly inspected and all defects corrected. New or retested cartridges and canisters should be installed, and the completely reassembled respirator should be tested for leaks.

For SCBA devices, the facepiece should be combined with the tested regulator and the fully charged cylinder, and an operational check performed.

3.0 MAINTENANCE AND REPAIR

The OSHA standard states that "replacement or repair shall be done by experienced persons with parts designed for the respirator." Besides being contrary to OSHA requirements, substitution of parts from a different brand or type of respirator invalidates approval of the device.

Maintenance personnel must be thoroughly trained. They must be aware of the limitations and never try to replace components or make repairs and adjustments beyond the manufacturer's recommendations, unless they have been specially trained by the manufacturer.

These restrictions apply primarily to maintenance of the more complicated devices, especially closed- and open-circuit SCBA, and more specifically, regulator valves and low pressure warning devices. These devices should be returned to the manufacturer or to a trained technician for adjustment or repair.

There should be no problems in repairing and maintaining most respirators, particularly the commonly used air-purifying type.

An important aspect of any maintenance program is having enough spare parts on hand. Only continual surveillance of replacement rates will determine what parts and quantities must be kept in stock. It is desirable to have a recording system to indicate spare parts usage and the inventory on hand.

4.0 RESPIRATORS STORAGE

OSHA requires that respirators be stored to protect against:

- Dust
- Sunlight
- Heat
- Extreme cold
- Excessive moisture
- Damaging chemicals
- Mechanical damage

Damage and contamination of respirators may take place if they are stored on a workbench, or in a tool cabinet or toolbox, among heavy tools, greases and dirt.

Freshly cleaned respirators should be placed in heat-sealed or reusable plastic bags until reissue. They should be stored in a clean, dry location away from direct sunlight. They should be placed in a single layer with the facepiece and exhalation valve in an undistorted position to prevent rubber or plastic from taking a permanent distorted "set."

Air-purifying respirators kept ready for non-routine or emergency use should be stored in a cabinet with individual compartments.

The storage cabinet should be readily accessible, and all workers should be made aware of its location, as is done for fire extinguishers. Preventing serious injury from the inhalation of a toxic substance depends entirely on how quickly workers can get to the emergency respirators.

A chest or wall-mounted case may be purchased from the respirator manufacturer for storing SCBA for use in emergencies. Again, the location of SCBA should be well-known and clearly marked. Unlike fire extinguishers, however, they should be located in an area that will predictably remain uncontaminated. Putting on a SCBA in a highly contaminated atmosphere such as might be created by massive release of a toxic material may take too long a time to perform safely in that area. Therefore, the first reaction should be to escape to an uncontaminated area, then put on the SCBA, which should be located there, and re-entered the hazardous area for whatever task must be done. Exceptions to this rule may be encountered, and only a thorough evaluation of the process and escape routes will permit a final decision about the correct storage location for SCBA.

Respirators thus should be stored in a plastic bag inside a rigid container. The OSHA standard suggests that respirators be in their original cartons, but this would provide only minimal protection from mechanical damage.

If the worker is trained adequately, he/she should develop a respect for respirators which will be an automatic incentive to protect them from damage. Besides providing better assurance of adequate protection, this training will lower maintenance costs by decreasing damage.

5.0 REFERENCES

*Source: Birkner, L.R. 1980. Respiratory Protection: A Manual and Guideline. American Industrial Hygiene Association

INSTRUCTIONS FOR USE OF MSA PORTABLE REGULATOR TESTER

1.0 INTRODUCTION

The MSA Portable Regulator Tester is a field operable testing device which is used to check the performance of various regulators used on breathing apparatus manufactured by MSA. The tester is used to verify that important characteristics of the regulator remain within the requirements that were specified at the time of manufacture. These procedures can only be implemented by personnel certified by MSA to test regulators.

Equipment: 1. Apparatus Air Supply for Regulator
2. Electrical Source of 110 Volts AC 60 Cycle for Tester

1.1 WARNINGS:

1. DO NOT use oxygen or test oxygen regulators or equipment on this tester. Oxygen could ignite motor on regulator tester.

2. Air supply source connected to test regulator shall meet Compressed Gas Association Commodity Specification for G-7.1 (Grade D or Higher Quality).

3. Use grounded 110 Volt AC 60 cycle electrical source only.

4. Do not remove back panel of tester with electric cord plugged in or operate tester with back panel or covers removed. Resistor (Item 17) gets hot enough to burn skin and terminals on electrical components are not insulated to prevent shock.

5. Do not use fuse larger than 4 amp. slow blow.

6. Always attach the regulator to its appropriate air supply source. NEVER attach low pressure airline regulators (maximum 125 psig) to high pressure air supplies (maximum 2250 psig) without an MSA Pressure Regulator.

7. Do not operate tester unless a test regulator is attached. Operating the tester with an open connector will contaminate the flow orifice and the flow gauge will eventually produce inaccurate readings. Cleaning and maintenance can be minimized by this procedure. The only time tester should be operated with an open connector is when calibration check requires it. (Minimize this time).

1.2 NOTES:

1. Set tester on level table. Zero both gauges before each use by turning screw at bottom front of gauges with screwdriver (pump must be off).

2. Calibrate and leak test. (See Regulator Tester Maintenance section for procedures and frequency). The initial accuracy of this tester, when shipped, is expected to be approximately plus or minus 5%.

2.0 TEST PROCEDURE:

1. Identify the regulator to be tested by using Table 1, Table 2, and Illustrated Parts Lists suplied with the apparatus.

2. Establish from Table 1 and 2 the flow characteristics expected for the particular regulator being tested.

   NOTE: Regulator part numbers do not specifically dictate what the performance of that regulator might be. The type admission valve, type lever assembly, demand type, or pressure demand type must be determined as well as part number, since the regulator may have been modified or updated. After establishing the flow characteristics, determine the number on the tester flow gauge which corresponds to the liter per minute flow. Obtain this from the flow calibration chart on the cover of the tester.

3. Attach the regulator to its appropriate air supply source. WARNING: DO NOT attach low pressure airline regulators to high pressure air supplies.

4. Attach regulator to tester with the breathing hose used with the breathing apparatus. Do not use extra lengths of hose. Mask mounted regulators are connected directly to the tester.

5. Turn on air supply to regulator. Make sure pressure of supply is within range specified in table. Make sure cylinder and main-line valves are fully open and by-pass valve closed.

   CAUTION:
   If disassembly of high pressure side of regulator is required for any reason, turn air supply off and release pressure in regulator disassembly.

6. Close valve on tester by turning clockwise.

7. Activate vacuum pump on tester with switch.

Table 1

PERFORMANCE
HIGH PRESSURE REGULATORS (Maximum 2250 PSIG)

Apparatus	Group	Admission Valve Pt. No.	Lever Assembly Pt. No.	Supply Pressure Range (psig)	Max. Crack Pressure ("H_2O)	Static Pressure Range ("H_2O)	Min. Flow (LPM)	Acceptable Pressure Range ?. ("H_2O)	Regulator Part Number Included in Group	Notes
Air Mask and Air Cob Demand-Type	1A	46840	45214	1000 - 2250	−8.75	———	175	−2.0 - +1.0	46151, 46309, 75414 75586, 83819, 83820, 87826, 87827	1,2,5
	1B	85187	85207	1000 - 2250	−8.5	———	350	−2.0 - +1.0	85180, 85182, 85183, 456100, 85218	3,4,5
Air Mask and Air Cob Pressure-Demand	2A	46840	45214	1000 - 2250		+0.0 - +1.5	115	0.0 - +1.5	87823, 87826, 87827	1,2
	2B	85187	85207	1000 - 2250		+0.0 - +1.5	200	0.0 - +1.5	85184, 85185, 85186, 85220, 456101	3,4,5
Work Mask and Dual Purpose Demand-Type	3A	46840	45214	1000 - 2250	−8.75	———	125	−1.5 - +1.0	45849, 85348, 85350	1,2,5
				Connected to 50 - 80 psig airline	−8.75	———	125	−1.5 - +1.0		
	3B	85187	85207	1000 - 2250	−8.75	———	200	−2.0 - +1.0	85349	3,4,5
				Connected to 50 - 80 psig airline	−8.75	———	200	−2.0 - +1.0		
Work Mask & Dual Purpose Pressure Demand	4	85187	85207	1000 - 2250		+0.0 - +1.5	200	0.0 - +1.5	480712	4,5
				75 - 85 psig Air-Line		+0.0 - +1.5	200	0.0 - +1.5		
Work Mask Pressure-Demand w/Warning Light (Bert Stasik)	5	85187	85207	1000 - 2250		+0.0 - +1.5	200	0.0 - +1.5	485844	3,4,5
				75 - 85 psig Air-Line		+0.0 - +1.5	200	0.0 - +1.5		
Air Escape Apparatus	6A	46840	45214	1000 - 2250	−8.75	———	125	−1.5 - +1.0	76780	1,5,2.
	6B	85187	85207	1000 - 2250	−8.75	———	200	−2.0 - +1.0	76780	3,4,5
Sling Mask	7A	46840	45214	1000 - 2250	−8.50	———	175	−2.0 - +1.0	458041	1,2,5
	7B	85187	85207	1000 - 2250	−8.50	———	200	−2.0 - +1.0	458041	3,4,5

NOTES: 1. Lever Assembly, Pt. No. 45214, can be identified by a small roller that rides against diaphragm.
2. Admission Valve, Pt. No. 46840, can be identified by the appearance of 4 holes on periphery.
3. Lever Assembly, Pt. No. 85207, can be identified by the lack of a roller on the short arm.
4. Admission Valve, Pt. No. 85187, can be identified by the appearance of 8 holes on periphery.
5. The proper admission valve and lever arm must be in the regulator before it will meet the specified flow characteristics.
6. The crack pressure is that reading on the tester PRESSURE gage at the exact time the regulator flow starts. Normally, the flow can be heard before the tester FLOW gage needle indicates any movement. However, watch for slight movement of flow gage.
7. If pressure is positive, regulator could separate. Test for excess aspiration as per page 2.

Table 2

PERFORMANCE
LOW PRESSURE AIR-LINE REGULATORS (Maximum 125 PSIG)

Apparatus	Group	Admission Valve Pt. No.	Lever Assembly Pt. No.	Supply Pressure Range (psig)	Max. Crack Pressure ("H_2O)	Static Pressure Range ("H_2O)	Min. Flow (LPM)	Acceptable Pressure Range ?. ("H_2O)	Regulator Part Number Included in Group	Notes
Mask Mounted	8A	—	—	50 - 80	—	———	115	−2.0 - +1.0	93208	1
	8B	—	—	50 - 80	−.5	———	200	−2.0 - +1.0	461898	2
Air-Line Demand	9A	46840	46214	50 - 80	−.5	———	115	−2.0 - +1.0	81070, 92856	3,4
	9B	95197	462281	50 - 80	−.5	———	115	−2.0 - +1.0	81070, 92856	5
Air-Line Pressure-Demand	10A	46840	46214	50 - 80	—	——— +.5 - +1.5	115	0.0 - +1.5	88108 —	
	10B	95197	462281	80 - 80	—	——— +1.0 - +1.5	115	0.0 - +1.5	462284 —	5

NOTES: 1. Air-Line supply of 50 psig can be attached to regulator.
2. Regulator, Pt. No 451958, has metal cap on valve lever arm. Pt. No 93208 has plastic disk on valve arm.
3. Short length of hose can be used to attach regulator to air supply.
4. See table 1 for descriptions of admission valves and lever assemblies.
5. Lever Assembly, Pt. No. 462281, appears to be the same as Pt. No 95207 but is ¼ inch shorter in total length (2 1/8 inches vs. 2⅜ inches). 462281 and 95207 have no roller on the short arm as is on 46214.
6. Admission Valve, 46840 can be identified by the appearance of 4 holes on periphery.
Admission Valve, 95197, has 8 holes on periphery.
7. If pressure is positive, regulator could aspirate. Test for excess aspiration as per page 2.

8. A. Demand Regulators

Cracking Pressure Test: Open VALVE on tester slowly and listen for flow to start through regulator or watch for slight movement of flow gauge indicator. The reading on the tester PRESSURE GAUGE when flow starts, is the crack pressure.

Example No. 1: Locate data for regulator 95160 in Table 1 and carry out procedures 3 through 7 above. Open valve on tester slowly. When flow starts, pressure gauge on tester reads -0.2 inches of H2O. Therefore, crack pressure is -.2. This is acceptable since -0.5 max. is allowable.

Example No. 2: Using a 95160 regulator, flow starts when pressure gauge reads 0. This is acceptable since the requirement is -0.5 maximum.

Airflow Performance Test: Open VALVE on tester and adjust until the minimum required flow is registered on the FLOW GAUGE. The pressure on the PRESSURE GAUGE should fall within the specified range in column titled "Acceptable Pressure Range".

Example No. 1: Locate data for regulator 95160 in tables and carry out procedures 3 through 7 above, if you have not already done so. Open the flow valve on the tester. When flow gauge reads 350 liters per minute, the pressure gauge reads -1. Since requirements are 350 liters per minute minimum with maximum of 02 inches, the regulator is acceptable.

Example No. 2: Using a 95160 regulator with breathing tube, open the valve on the tester until flow gauge indicates 350 liters per minute. The pressure gauge reads +1.0. Since the minimum flow requirement is 350 liters per minute and the pressure is between -2.0 and +1.0 inches of water, the regulator is acceptable. Because this regulator has positive pressure, it should be tested for excess aspiration (see procedure 9).

8. B. Pressure Demand Regulator

Static Pressure Test: make sure tester VALVE is closed. Air supply to regulator must be on (cylinder valve completely open). Turn REGULATOR MAIN-LINE VALVE completely open. Take static pressure readings from PRESSURE GAUGE.

While measuring the static pressure, ensure the flexible breathing hose is not bumped or moved. Open briefly and close the tester valve a number of times until a repeatable static pressure setting is read on the tester PRESSURE GAUGE.

Example No. 1: Locate data for regulator 95166 in tables. With diaphragm spring in place and cover installed, the static pressure is obtained by opening and closing valve on the regulator tester several times until a repeatable setting is read on tester pressure gauge. A reading of +.8 occurs. This is acceptable because of -0.8 to +1.5 is the requirement.

Airflow Performance Test: Open the Valve on tester until the flow specified is registered on the FLOW GAUGE. The PRESSURE GAUGE on the tester must read zero or positive. A NEGATIVE READING IS NOT ACCEPTABLE. The positive reading can go no higher than +1.5 inches of H2O, for any flow from zero to the maximum performance of the regulator.

Example No. 1: Locate data for regulator, Pt. No. 95166, in Table 1. Open VALVE on tester until flow gauge reads 200 liters per minute. The pressure GAUGE on tester reads +0.5. For this regulator, the pressure gauge does not go to zero when flowing. This regulator is good since it does not go negative and does not exceed +1.5 inches for any flow.

9. Test for Excess Aspiration of Demand and Pressure Demand Regulators: Disconnect breathing tube from tester and connect it to the facepiece. Put on facepiece and test for proper fit. Fully open the cylinder valve and main-line valve and inhale deeply. Hold breath without exhaling so as to not create back pressure. Flow from regulator should stop. If it does not, the regulator must be adjusted to correct this condition.

10. If any adjustments or repairs are required, the adjustments and repairs must be made only by certified personnel who have been trained in maintenance and repair of MSA apparatus by an authorized MSA representative. ATTEMPTED REPAIRS BY NONCERTIFIED PERSONNEL VOID ALL WARRANTIES. Certified personnel must follow procedures set forth in MSA manual "How to Maintain and Repair MSA Air Masks" and/or "Testing and Repair Procedures".

Note: Screw VALVE on tester to fully "off" position, before closing cover. Close cover when tester is not in use to protect gauges.

3.0 REGULATOR TESTER MAINTENANCE

Check regulator tester for leaks and calibration about once each month or every 50 regulators tested whichever comes first or whenever inaccurate performance is suspected. Check tester when first received for possible shipping damage.

1. Testing Instrument for Leaks:
   A. Plug connection hole with stopper #3 (Item #52 in parts list).

B. Make sure valve is closed (turn clockwise for closing).
C. Turn vacuum pump on.
D. Open valve very slowly until pressure gauge reads negative 5 inches H20, turn valve off, then turn switch off.
E. Pressure gauge should take more than 15 seconds to change one inch between -5.0 and -3.0 inches H20, to have an acceptable leakage rate.

2. Check Calibration of Instrument
A. Connect calibration orifice (Item #53) to connector port.
B. Make sure valve is closed.
C. Turn vacuum pump on.
D. Open valve slowly comparing the following readings on pressure gauge and the flow gauge. Set the pressure gauge needle to the numbers on the following table and observe the flow gauge readings.

Note: The pressure gauge numbers will vary with each individual regulator tester. The user should check valves supplied by MSA with instrument and substitute accordingly.

0	1.1	2.3	3.3	4.3
0	1	2	3	4

FLOW GAUGE

E. If the flow gauge readings are more than 10% higher than indicated above, the plumbing should be taken apart and the orifice screen cleaned. The procedure should be as follows:

1. Unplug electric cord.
2. Remove back perforated cover (18 screws).
3. Remove hinged cover by removing 12 screws.
4. Remove top cover by removing 3 screws from each side.
5. Refer to attached sketch and proceed as follows: Remove Item 11 (3 places), where it attaches to Items 8 and 16. The elastic tubing is stretched over the connectors.
6. Unscrew Item 8 from Item 10.
7. Remove two screws (Item 41), and clamp (Item 14).
8. Remove clamp (Item 51) and separate manifold (Item 16) from hose (Item 36).
9. Remove the elbow (Item 12) from manifold (Item 16)
10. Flush this section of pipe (Item 16) with water from the end that attaches to the valve. By sighting through the tube you can see when the screen orifice is clean.
11. Dry with clean air and reassemble system in reverse order of disassembly.

12. Check for leaks and calibration as instructed in Section 1 and 2 of this Regulator Tester Maintenance segment.
13. If cleaning regulator tester does not make the instrument operate normally, it must be returned to factory for repair and recalibration. Send it to:

    Mine Safety Appliances Company
    7522 Meade Street
    Pittsburgh, Pennsylvania 15208

    Wappatt Building #102
    ATTN: Return Material Department

4.0 REFERENCES

MSA (no date) Portable Regulator Tester. Part No. 462845. Mine Safety Appliances Company, Pittsburg, Pennsylvania.

From: "Radiological Environmental Monitoring Procedures," Radiation Services Inc., May 1979.

AIR SAMPLER CALIBRATION PROCEDURE

Low Volume

Introduction

Air samples are collected in order to determine the concentrations of one or more airborne contaminants. To define a concentration, the quantity of the contaminant of interest per unit volume of air must be determined. Accordingly, the sampling flowrate over time must be known. This data is derived by calibration.

Each element of the sampling system should be calibrated accurately prior to initial field use. Protocols should be established for periodic recalibration, since the performance of many flowmeters will change with the accumulation of dirt, corrosion, leaks and misalignment due to vibration or shocks in handling, etc. The frequency of such recalibration checks should initially be high, until experience is accumulated to show that less frequent calibration is adequate. [1]

Apparatus

1) Wet test meter or bubble tube (usually a one liter buret).
2) Accurate stopwatch.
3) 25 mm Gelman in-line filter holder.[1]
4) Filters.
5) 3/8" tygon tubing.
6) Pumps to be calibrated.

Procedure - Wet Test Meter

A wet-test meter (see figure 1) consists of a partitioned drum half submerged in a liquid (usually water) with openings at the center and periphery of each radial chamber. Air or gas enters at the center and flows into an individual compartment causing it to rise, thereby producing rotation. This rotation is indicated by a dial on the face of the instrument. The volume measured will be dependent on the fluid level in the meter since the liquid is displaced by air. A sight gauge for determining fluid height is provided and the meter may be leveled by screws and a sight bubble which are provided for this purpose.

There are several potential errors associated with the use of a wet-test meter. The drum and moving parts are subject to corrosion and damage from misuse, there is friction in the bearings and the mechanical counter, inertia must be overcome at low flows (~1 RPM), while at high flows (~3 RPM), the liquid might surge and break the water seal at the inlet or outlet. In spite of these factors, the accuracy of the meter usually is within one percent when used as directed by the manufacturer.

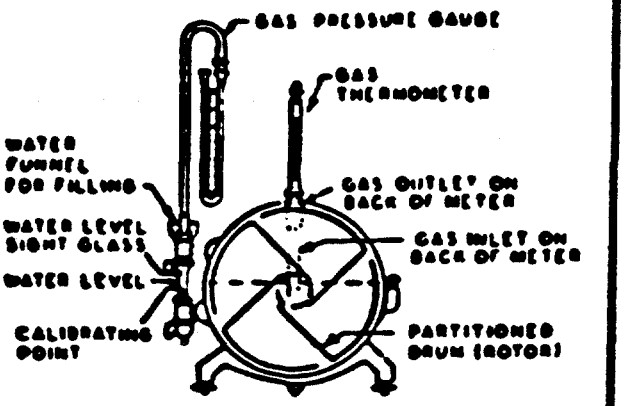


Fig. 1 Wet Test Meter (from PHS Publ. #614, 1965)

1) Place the meter on a firm platform and level by adjusting the two front legs until the spirit level bubble on the case top is centered in the bullseye. THIS LEVEL IS CRITICAL.

2) Fill the meter with distilled water through the thermometer port. For proper water level, the sight glass indicator just indents the meniscus.[2]

   Note: To do precisely, the meter must be level, and the inlet and outlet disconnected from any other fixture.

   Use the valve at the bottom of the sight glass for final adjustment of water level.

3) Fill the manometer U-tube with distilled water to "0" at midscale. Move the scale up or down for the final "0" adjustment.

4) Connect the in-line filter holder containing a filter[1, 3] between the meter outlet (back top of case) and the inlet of the pump as shown in Figure 2.

   Note: Minimize tubing length whenever possible.

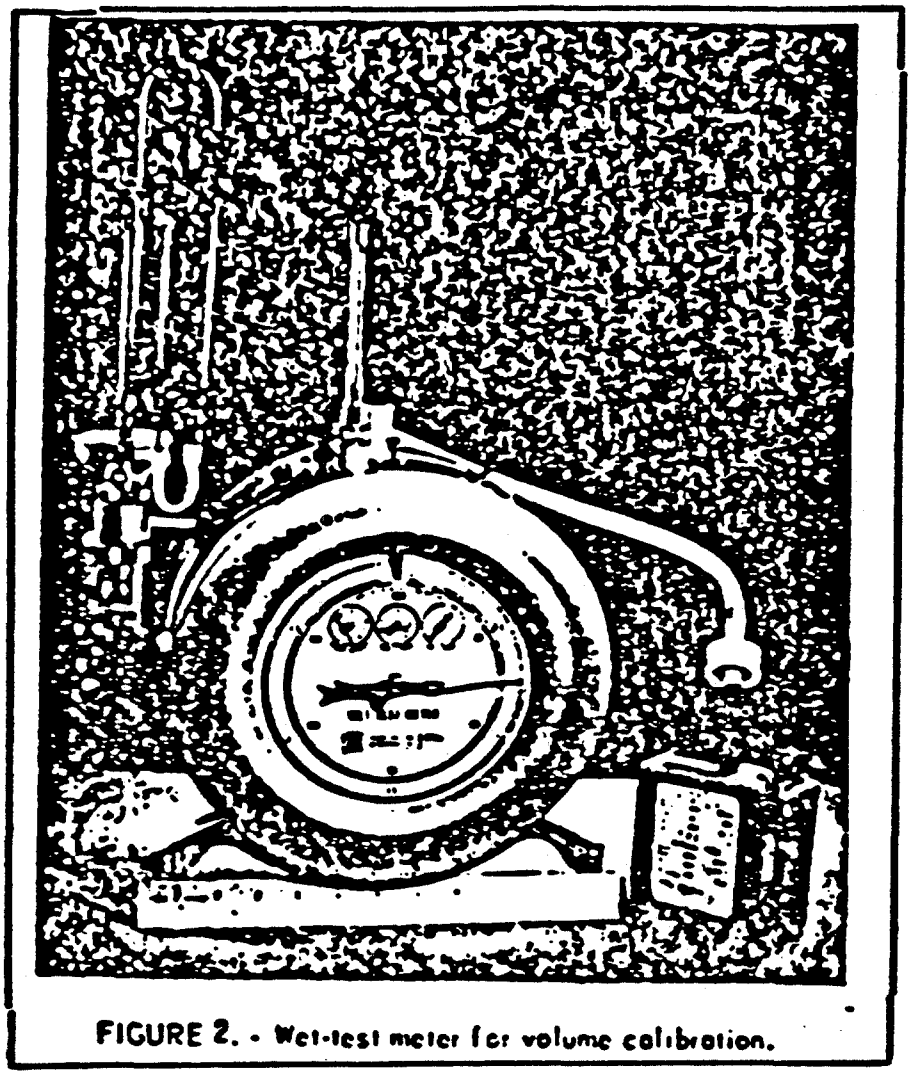


FIGURE 2. - Wet-test meter for volume calibration.

5) Enter appropriate data at the top of the "Air Sampler Calibration Data Sheet", i.e. date, ID No. if necessary, pump no., rotameter setting, type filter, and run time (usually 5 minutes).

6) Start the pump and pass air through the meter for several minutes to assure saturation of the water in the meter. While pumping, check all connections for leaks. Adjust the rotameter, placing the TOP of the float to the desired setting.

7) Stop the pump and manually turn all meter pointers to zero. Check all meter fluid levels. Adjust if necessary.

8) Start the pump and stopwatch simultaneously and flow for the desired time (usually 5 minutes). Check the rotameter and adjust as necessary.

9) Stop the pump and stopwatch simultaneously.

10) Enter the run number in column A, the barometric pressure and ambient temperature (from the barometer) in columns B and C respectively, and the volume pumped (from the meter) in column F.

11) Repeat steps 7, 8, 9 and 10 twice more at this rotameter setting.

12) Calculate average pressure, average ambient temperature, and average flowrate by the equations given on the data sheet.

13) Make remarks as appropriate.

14) Additional calibrations should be made at lower rotameter graduations to allow compensation for battery drain, filter blinding, etc. Accordingly, repeat steps 5 through 13 at lower rotameter settings.

15) Repeat steps 4 through 14 for all additional combinations of filters and filter holders.

16) Attach an adhesive label to the pump, listing the date of calibration.

The pump is now ready for field use.[8]

Procedure - Bubble Tube

Cylindrical air displacement meters with nearly frictionless pistons are frequently used for primary flow calibrations. The simplest version is the soap-bubble meter illustrated in Figure 3. It utilizes a volumetric laboratory buret whose interior surfaces are wetted with a detergent solution. If a soap-film bubble is placed at the left side, and suction is applied at the right, the bubble will be drawn from left to right. The volume displacement per unit time (i.e., flowrate) can be determined by measuring the time required for the bubble to pass between two scale markings which enclose a known volume.

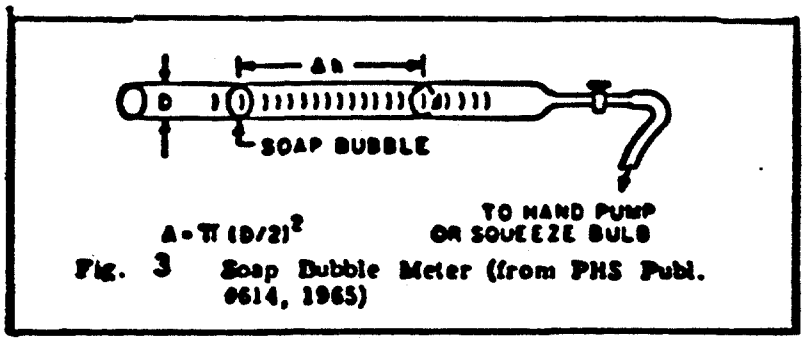


Fig. 3 Soap Bubble Meter (from PHS Publ. #614, 1965)

1) Connect the in-line filter holder containing a filter[1, 3] between the bubble tube (buret) tip and the pump inlet as shown in Figure 4.

Note: Minimize tubing length wherever possible.

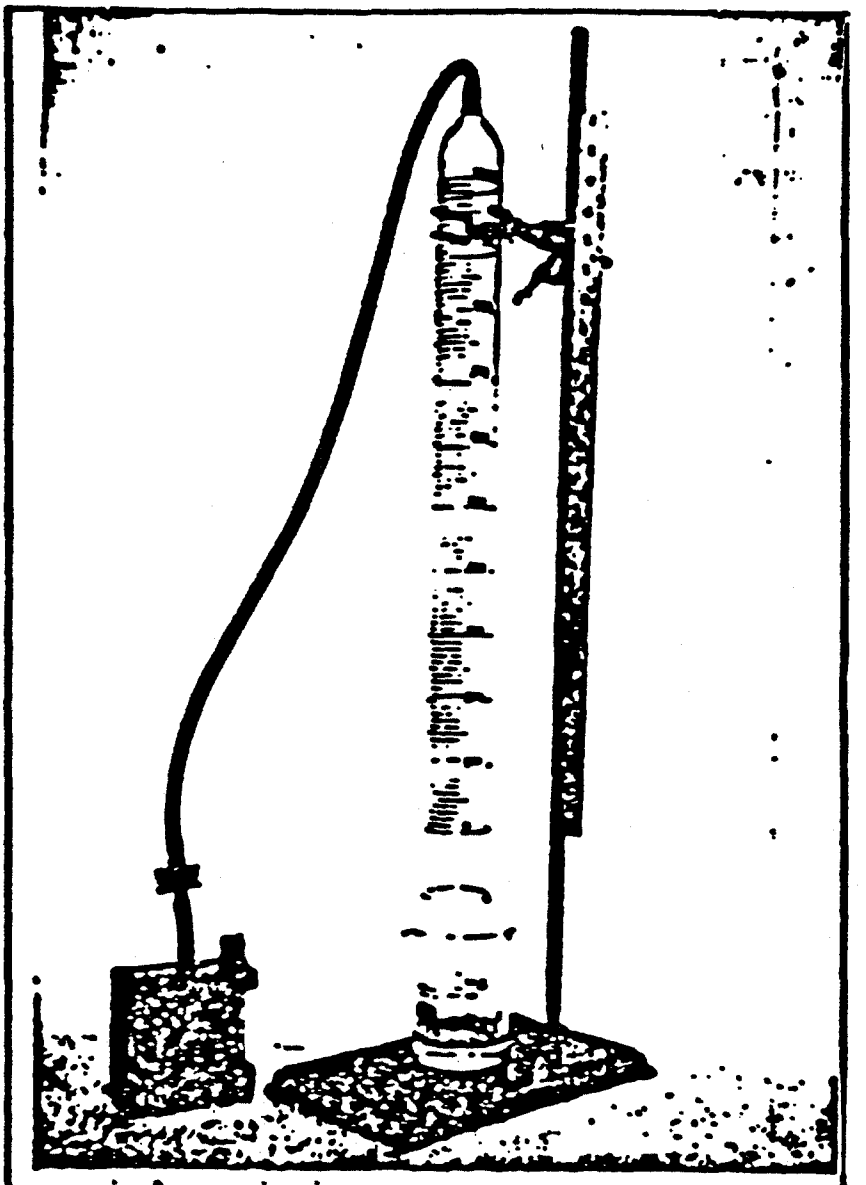


FIGURE 4 - Bubble tube for volume calibration.

2) To a small amount of water in a 400 ml beaker, add a little liquid detergent.

3) Start the pump and immerse the large end of the buret in the detergent water solution. Raise and lower the beaker several times to generate bubbles in the buret. Continue this operation until several bubbles have traversed the entire length of the buret.

4) Enter appropriate data at the top of the "Air Sampler Calibration Data Sheet", i.e., date, ID no. if necessary, pump no., rotameter setting, and type filter.[4]

5) Adjust the rotameter, placing the TOP of the float to the desired setting.[5]

6) With the stopwatch in one hand, immerse the buret end to generate a bubble as in step 4. Quickly sight across the lower buret graduation, i.e. "0". When the bubble traverses this mark, start the stopwatch.

7) When the bubble[10] traverses the upper buret graduation, i.e. "1000", stop the stopwatch.

8) Enter the run number, the barometric pressure[6], the ambient temperature, the run time, and the volume under columns A through E respectively.

9) Repeat steps 6 through 8 twice more at this rotameter setting.

10) Calculate the average pressure, average ambient temperature and average flowrate by the equations given on the data sheet.

11) Make remarks as appropriate.

12) Additional calibrations should be made at lower rotameter graduations to allow compensation for battery drain, etc. Accordingly, repeat steps 4 through 11 at several lower rotameter settings.

13) Repeat steps 1 through 12 for all combinations of filters and filter holders.

14) Attach an adhesive label to the pump, listing the date of calibration.

The pump is now ready for field use.[8]

NOTES

1) The filters and in-line filter holders used for pump calibration must be the same type as those used in the field. If more than one filter or filter holder type is used for field sampling, the pump must be calibrated for each combination.

2) Low water level gives low meter readings and high water level gives high meter readings.

3) Assemble the filter/filter holder components as described in "Air Sampling Procedures, Low Volume". Substitute an in-line holder for the open face holder.

4) Completed examples of the "Air Sampler Calibration Data Sheets" are attached for reference.

5) For radon daughter and uranium sampling, the highest flowrates possible are usually desirable. In some cases, the flowrate is dictated by the contaminant of concern, e.g. respirable silica sampling flowrate must be 1.7 l/min.

6) Adjust and read the barometer as per the instructions accompanying same.

7) A small refinement can be made in a given final flowrate determination by compensating for the meter/ambient pressure differential induced by the filter holderorifice. As this correction generally amounts to less than 2% of the flowrate, it is not addressed in this procedure. If one desires to make this correction, enter the meter fluid temperature and the manometer reading for each run. Then, refer to Appendix B of the "Handbook of Radiological and Environmental Sampling and Evaluation Procedures."

   Further, if one desires to convert flowrates to standard conditions, i.e. pressure = 760 mm Hg and temperature = 273.16°K, collect data as above and refer to Appendix B of the same handbook.

8) Calibrations should be performed at the approximate elevations of areas to be sampled. Where factors affecting air density are known to be different from those during pump calibration, the following corrections can be applied:

   1) For each 10°F drop in air temperature, subtract 1 percent from the indicated sample volume,

   2) For each 0.5 inch (Hg) increase in barometric pressure, subtract 1 percent from the indicated sample volume, and

   3) For each 500-foot decrease in elevation, subtract 1 percent from the indicated sample volume.

   These correction factors are approximate, but are within the accuracy necessary for the small corrections usually required.

9) Generally the bubbles will break near the buret tip and the soapy water will run back down the inside of the buret. However, water can be drawn into the tubing and, thus, into the filter. This must be avoided. If it occurs,

replace or dry the tubing and replace the filter.

10) Because of this volume limitation (usually one liter) the time measurement accuracy must be quite high.

11) Experience has demonstrated that most low volume air samplers powered on internal batteries require recalibration after every battery change, after every 150 hours of use, or every 3 months, whichever occurs first.

Date 1/12/79

AIR SAMPLER CALIBRATION DATA SHEET
(Wet Test Meter Method)

ID # 3 Pump # A-1 ROTA 25 Type Filter MilliporeAA Run Time 1 Min

Column	A	B	C	D	E	F
Run No.	Pressure mm Hg	Ambient Temperature °C	Meter Fluid Temperature °C	Manometer Inches H_2O	Volume Liters
1	614.8	24.5	21.7	0.6	17.25
2	614.8	24.5	21.5	0.6	17.43
3	614.8	25	21.5	0.6	17.45

Average Pressure = $\frac{\sum \text{Column B}}{\sum \text{Column A}}$ = 614.8 mm Hg

Average Ambient Temperature = $\frac{\sum \text{Column C}}{\sum \text{Column A}}$ = 24.7 °C

Average Meter Fluid Temperature $\frac{\sum \text{Column D}}{\sum \text{Column A}}$ = 21.6 °C

Average Manometer Reading = $\frac{\sum \text{Column E}}{\sum \text{Column A}}$ = 0.6 in. H_2O

Average Rate = $\frac{\sum \text{Column F}}{(\sum \text{Column A})(\text{Run Time})}$ = 17.38 Liters/Min.

Remarks: Maximum rate possible with this filter.
Correction per note 7 yields 17.11 l/min.
Filter is a 25 mm.

APPENDIX B

REMEDIAL INVESTIGATION SAMPLE SUMMARY TABLES

000710

TABLE 3-2

SHARKEY LANDFILL
November, 1985 Chemical Analyses
Identified Organic Compounds - Shallow Monitoring Wells

Monitoring Well/Concentration (ug/l)

Volatile Organic Compound	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8	MW-9	MW-11	MW-12	MW-13	MW-16	MW-17
Chlorobenzene (PP)					21	75			17		18			
Chloroform (PP)												34		
Methylene Chloride (PP)					3 JB			2 JB	3 JB	32 B	4 JB	2 JB		
Trichloromethane (PP)						13								
Benzene (PP)		:			28	6					5	22		4 J
Tetrachloromethane (PP)						3 J	3 J	3 J	3 J		1 J			
Toluene (PP)									16	11				
Ethylbenzene (PP)						1 J			27	42				
Carbon Disulfide	15													
Total Xylenes											22	21		
Acetone		9 J												
Total Volatiles	15	9			54	98	3	5	64	107	58	79		4
Semi-Volatile Organic Compounds														
2,6-Dimethylphenol (PP)									70					
1,4-Dichlorobenzene (PP)						6 J						6 J		
4-Methylphenol										74	20 J			
3-Methylphenol											27 J			
Bis(2 ethylhexyl)phthalate(PP)	2 JB	9 J	2 J	2 JB	6 JB	16 J			14 JB	120 B	11 JB	36 B	16 JB	6 J
Naphthalene (PP)				2 J	70 J	2 J			42	80	27 J	6 J		2 J
Benzo(a)Pyrene (PP)	8 JB			8	8	10 JB					27 JB			
4-Chloro-3-Methylphenol					22									
2-Methylnaphthalene					80						87			
Total Semi-Volatiles	10	9	2	12	186	34			126	274	201	48	16	8
Combined Totals	25	18	2	12	240	132	3	5	190	421	251	127	16	18

Notes: Data Reporting Qualifiers

B - The analyte was found in the blank as well as the sample. It indicates possible/probable contamination and warns the data user to take appropriate action.

J - Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1 : 1 response is assumed or when the mass spectral data indicated the presence of a compound that meets identification criteria but the result less than the specified detection limit but greater than zero (e.g. if limit of detection is 10 ug/l and a concentration of 3 ug/l is calculated report as 3J).

(PP) - Priority Pollutant

TABLE 3-3

[illegible]
December, 1985 Chemical Analyses
Adjusted Summary of Identified Organic Compounds - Shallow Monitoring Wells

Monitoring Well/Concentration (ug/l)

Volatile Organic Compound	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8	MW-9	MW-11	MW-12	MW-13	MW-14
Chlorobenzene (PP)				21	74			17		18		
Tetrachloroethene (PP)					11							
Benzene (PP)				28	6					5	22	0.3
Toluene (PP)								14	71			
Ethylbenzene (PP)					1.3			27	42			
Total Xylenes										22	21	
Acetone	9.3											
Total Volatiles	9			51	95			58	113	45	43	0
Semi-Volatile Organic Compounds												
2,4-Dimethylphenol (PP)								78				
1,4-Dichlorobenzene (PP)	2				6.3						6.3	
4-Methylphenol									76	30 J		
2-Methylphenol										27 J		
Naphthalene (PP)			3 J	78	2 J			62	88	27 J	6 J	2 J
4-Chloro-3-Methylphenol				11								
2-Methylnaphthalene				88						87		
Total Semi-Volatiles			3	178	8			112	156	141	12	2
Combined Totals	9		3	229	103			170	269	186	55	2

Notes: Data Reporting Qualifiers

B - The analyte was found in the blank as well as the sample. It indicates possible/probable contamination and warns the data user to take appropriate action.

J - Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1 : 1 response is assumed or when the mass spectral data indicated the presence of a compound that meets identification criteria but the result is less than the specified detection limit but greater than zero (e.g. if limit of detection is 10 ug/l and a concentration of 1 ug/l is calculated report as 1J).

(PP) - Priority Pollutant

*Compounds identified in laboratory analyses of field and trip blanks have been omitted.

Table 3-4
Sharkey Landfill November 1985
Identified Inorganic Compounds
Shallow Monitoring Wells

Sample Location			MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7
Sample Code			4000-L	4000-EE	4000-II	4000-F	4000-G	4000-W	4000-L
INORGANICS	**I.P.S.ee**	**NJS**							
Aluminum			21200 E	2070 E	20800 E	59400 E	5560 E	27900 E	9960 E
Antimony		146							
Arsenic	50		15			15 N		8.3 []	9.9 []
Barium	1000		159 []	285 R	227 R	597	275	172 []R	161 []
Beryllium		0.0037	1.8 []		2.7 []	2.4 []		3.1 []	
Cadmium	10	10		11 e	8.4 e	6.2 ER		13 e	
Calcium		-	58300	118000	93500	63900	73200	200000	55300
Chromium	50	50	77		54	341	6.8 []	4920	24
Cobalt			16 []		41 []	45 []		19 []	16 []
Copper	1000		101		322	181	10 []	300	67
Iron	300		75600	6350 ER	68500 ER	185000	26800	47000 ER	35100
Lead	50	50			2.5 R	51 R	9	6.3 R	29
Cyanide	50	200			248			15	
Magnesium			27900	42400 E	35300 E	51000	49700	32800 E	22200
Manganese	50		1380 E	1490 E	1550 E	2400 E	244 E	1430 E	2570 E
Mercury	2	0.144	0.1 []	0.1 []	1	1	0.1 []	0.1 []	0.1 []
Nickel		13.4	52		172 R	246		87 R	63
Potassium			9500	31600	28500	7930	59900	19500	7080 E
Selenium	10	50							
Silver	50								
Sodium			14000	112000 E	37400 E	20000	58000	170000 E	48500
Thallium									
Tin									
Vanadium			119 E	122 E	170 E	230 E	85 E	57 E	68
Zinc			184 Ee	189	1110	684 Ee	184 Ee	477	93
Percent Solids			NA	NA	NA	NA	NA	NA	NA
Phenol				69	22	41	33	22	
Pesticides		(none)							

Notes:

ee -- EPA Interim Primary and Secondary Drinking Water Standards (1981-1982) in UG/L.
[] = if the result is a value greater than or equal to the instrument detection limit but less than the contract required detection limit, report the value in brackets.
. = Compounds underlined exceed I.P.S.ee or N.J.S.
E = Indicates a value estimated or not reported due to the presence of interference.
R = Indicates spike sample recovery is not within control limits.
e = Indicates duplicate analysis is not within control limits.
. = All results are in UG/L
NJS = New Jersey Pollutant Discharge elimination System (NJPDES) Regulations, October 1984.

Identified Inorganic Contaminants
Shallow Monitoring Wells

Sample Location Sample Code			MW-8 4MW-P	MW-9 4MW-MW	MW-11 4MW-MW	MW-12 4MW-MW	MW-13 4MW-CC	MW-14 4MW-M	MW-17 4MW-MW
INORGANICS	E.P.Sec	NJS							
Aluminum			<9300 L	31500 L	<9300 L	3670 L	36500 L	14000 L	11300 L
Antimony		146							
Arsenic	50				<4				
Barium	1000		<95	547	680	<17	1900	140 ()	240 H
Beryllium		0.0037		<2.0 (1)	1.7 (1)		<2.0 (1)		
Cadmium	10	10		1.9	2.3		0.1 (1)		0.1 *
Calcium			63100	33000	35000	54600	19300	71000	68400
Chromium	50	50	48	134	213	12	186	81	39
Cobalt			<9 (1)	44	126	<3 (1)	84	14 (1)	10 (1)
Copper	1000		80	134	183	32	191	46	95
Iron	300		83400	74300	67000	45300	101000	33700	69300 LR
Lead	50	50	4.8 (1)	4.3		11	14	<5	102 LR
Cyanide	50	200							
Magnesium			42100	67900	81200	64200	134000	39100	35400 E
Manganese	50		1240 E	1240 E	842 E	2010 E	3860 E	1160 (1) E	637 E
Mercury	2	0.144	0.1 (1)	1.6	0.1 (1)	0.1 (1)	0.1 (1)	0.1 (1)	0.1 (1)
Nickel		13.4	60	120	1200	210	480	60	91 H
Potassium			35200 L	48300 L	116000 L	19700 L	19200 L	3780 (1) E	29700
Selenium	10	20							
Silver	50								
Sodium			55300	1820000	3560000	617000	6910000	37300	46000 E
Thallium									
Tin									
Vanadium			114	196	439	12 (1)	286	62	103 L
Zinc			157	<249	1140	<29	288	94	178
Percent Solids			NA	NA	NA	NA	NA	NA	NA
Phenol				23	275	<4	<8	16	76
Pesticides	(none)								

Notes:

EPA -- EPA Interim Primary and Secondary Drinking Water Standards (1977-1986) in UG/L.
(1) = If the result is a value greater than or equal to the instrument detection limit but less than the contract required detection limit, report the value in brackets.
. = Compounds underlined exceed E.P.A. or N.J.S.
E = Indicates a value estimated or not reported due to the presence of interference.
N = Indicates matrix spike sample recovery is not within control limits.
* = Indicates duplicate analysis is not within control limits.
. = All results are in UG/L
NJS = New Jersey Pollutant Discharge Elimination System (NJPDES) Regulations, October 1984.

TABLE 3-7

SHARKEY LANDFILL
November, 1985 Chemical Analyses
Identified Organic Compounds - Intermediate and Deep Monitoring Wells
Lower Glacial Outwash Aquifer
Monitoring Well/Concentration (ug/l)

Volatile Organic Compound	WD-2	WI-3	WD-3	WI-4	WI-5	WI-6	WI-7	WI-8	WI-10	WI-15	WI-16	WI-17
Chloroform												2
Methylene Chloride							3 J					
Benzene										3 J		13
Tetrachloroethene	:											3
Acetone												8
Semi-Volatile Organic Compounds												
bis(2 ethylhexyl)phthalate				2 JB	4 JB	2 J	2 J	6 JB	2 JB	2 JB	7 JB	
Benzo(a)Pyrene		8 JB			8 JB		8 JB	8 JB	8 JB	27 JB		
Pesticides												
None												

Notes: Data Reporting Qualifiers

B - The analyte was found in the blank as well as the sample. It indicates possible/probable contamination and warns the data user to take appropriate action.

J - Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1 : 1 response is assumed or when the mass spectral data indicated the presence of a compound that meets identification criteria but the result less than the specified detection limit but greater than zero (e.g. if limit of detection is 10 ug/l and a concentration of 3 ug/l is calculated report as 3J).

- All results in ug/l.

Table 3-6
Brookhaven Landfill November 1985
Identified Inorganic Compounds
Intermediate and Deep Monitoring Wells

Sample Location			MI-7	MI-8	MI-9	MI-15	MI-16	MI-17
Sample Code			4806-T	4806-I	4806-E	4806-D	4806-A	4806-C
INORGANICS	I.P.S.ee	NJS						
Aluminum			4740 L	4840 L	281000 L	4730 L	2070 L	8630 L
Antimony		146						66
Arsenic	50				43 N		9.5 []	
Barium	1000		39 []	70 []	1200	206	51 []	
Beryllium	-	0.0037						
Cadmium	10	10	3 []e	6.4 EA	7.6 EA		19 EA	
Calcium			125000	48000	705000	181000	59000	83000
Chromium	50	50	16	18	422	7.6 []	5.8 []	20
Cobalt				8 []	307			12 []
Copper	1000		12 []	40	894		41	59
Iron	300		6100 EA	7600	98000	6690 N	2560	12700
Lead	50	50		24 A	31 A	5.3	15 A	
Cyanide	50	200						
Magnesium			5480 L	12400	336500	19200	12300	24200
Manganese	50		150 E	164 E	1900 E	367 E	20 E	429 E
Mercury	2	0.144	0.1 []	0.1 []	0.1 []	0.1 []	0.1 []	0.1 []
Nickel		13.4	16 []A	31 []	599			181
Potassium			16900	44000 []	28600	3420 []	5810	87000 L
Selenium	10	50						
Silver	50							
Sodium			76900 L	37000	96500	82200	67200	79700
Thallium								
Tin								
Vanadium			110 L	49 []E	867 L	56 L	30 []E	135
Zinc			60	206 Ee	1480 EA	69 Ee	70 Ee	91
Percent Solids			NA	NA	NA	NA	NA	NA
Phenol			17	20	15		22	21
Pesticides	(none)							

Notes:

ee -- EPA Interim Primary and Secondary Drinking Water Standards (1981-1982) in UG/L.
[] = If the result is a value greater than or equal to the instrument detection limit but less than the contract required detection limit, report the value in brackets.
. = Compounds underlined exceed I.P.S.ee or N.J.S.
E = Indicates a value estimated or not reported due to the presence of interference.
A = Indicates spike sample recovery is not within control limits.
* = Indicates duplicate analysis is not within control limits.

Table 3-8
Sharkey Landfill November 1985
Identified Inorganic Compounds
Intermediate and Deep Monitoring Wells

Sample Location			MW-2	MW-3	MW-4	MW-4	MW-5	MW-6
Sample Code			4886-FF	4886-U	4886-JJ	4886-O	4886-N	4886-S
INORGANICS	**I.P.Sec**	**NJS**						
Aluminum			11400 E	6010 E	150000 E	6660 E	2070 E	32400 E
Antimony		146			45	8 (3)R	7.9 (3)R	
Arsenic	50		82 (3)R	44 (3)R	337 R	44 (3)	35 (3)	190 (3)R
Barium	1000				7			3.1
Beryllium		0.0037	25 e	3.9 (3)e	5.5 e	5.4 ER	8.3 ER	
Cadmium	40	10	92400	22000	720000	11500	40200	25500
Calcium			17	68	143	21	24	97
Chromium	50	50	11 (3)	4 (3)	173		4.1 (3)	16 (3)
Cobalt			44	43	734	46		70
Copper	1000		164000 ER	8000 ER	260000 ER	893e	2160	42000 ER
Iron	300		35 R	26 R	80 R			7.5 R
Lead	50	50						
Cyanide	50	200	28800 E	5010 E	297000 E	4290 (3)	11500	16700 E
Magnesium			441 E	195 E	14700 E	225 E	23 E	916 E
Manganese	50		0.1 (3)	0.1 (3)	0.1 (3)	0.1 (3)	0.1 (3)	0.1 (3)
Mercury	2	0.144	33 (3)R	72 R	307 R	17 (3)		49 R
Nickel		13.4	8230	16300	23500	4710 (3)	4150 (3)	13500
Potassium								
Selenium	10	50						
Silver	50							
Sodium			79600 E	100000 E	91400 E	46600	40200	93000 E
Thallium								
Tin				110 (3)E				
Vanadium			83 E	130 E	442 E	83 E	68 E	132 E
Zinc			175	150	899	106 Ee	47 Ee	166
Percent Solids			NA	NA	NA	NA	NA	NA
Phenol			18	18	29	6		7
Pesticides	(none)							

Notes:

ee -- EPA Interim Primary and Secondary Drinking Water Standards (1981-1982) in UG/L.
() = If the result is a value greater than or equal to the instrument detection limit but less than the contract required detection limit, report the value in brackets.
. = Compounds underlined exceed I.P.S.ee or N.J.S.
E = Indicates a value estimated or not reported due to the presence of interference.
R = Indicates spike sample recovery is not within control limits.
e = Indicates duplicate analysis is not within control limits.
* = All results are in UG/L

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TABLE 3-13

SHARKEY LANDFILL
Summary of Identifiable Organic and Pesticide Compounds - Soil Sampling Program

Sample Location Sample Code	S1 4887-A-S1	S3 4887-B-S3	S4 4887-C-S4	S5 4887-D	S6 4887-E	Field Blank/Soils 4886-AA	Field Blank/Soils 4886-M	Field Blank/Soils 4886-V
Volatile Organic Compounds								
methylene chloride				8	8	2 JB	4 J	
acetone		97		16				
tetrachloroethene				2 J		3 J		3 J
2-butanone		20						
Carbon Disulfide				10	20			
Semivolatile Organic Compounds								
Bis(2-Ethylhexyl)Phthalate	210 JB		520 B	20000 B		4 JB		12 J
naphthalene			400	760 J				
Phenanthrene			200					
Benzo(a)Pyrene		1500			180 JB			6 JB
2-Methylnapthalene			5000					
Fluoranthene			240 J					
Pyrene			80 J					
Pesticide								
Dieldrin				330				
4,4'-DDD				370				
Aroclor-1254		130	380					
Endrin Ketone				410				
Methoxychlor								0.41

B - The analyte was found in the blank as well as the sample. It indicates possible/probable contamination and warns the data user to take appropriate action.

J - Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1 : 1 response is assumed or when the mass spectral data indicated the presence of a compound that meets identification criteria but the result less than the specified detection limit but greater than zero (e.g. if limit of detection is 10 ug/l and a concentration of 3 ug/l is calculated report as 3J).

U - All results in microgrems per kilogram (ug/kg) except for field blanks which are reported in microgram per liter (ug/l).

3-13

TABLE 3-16

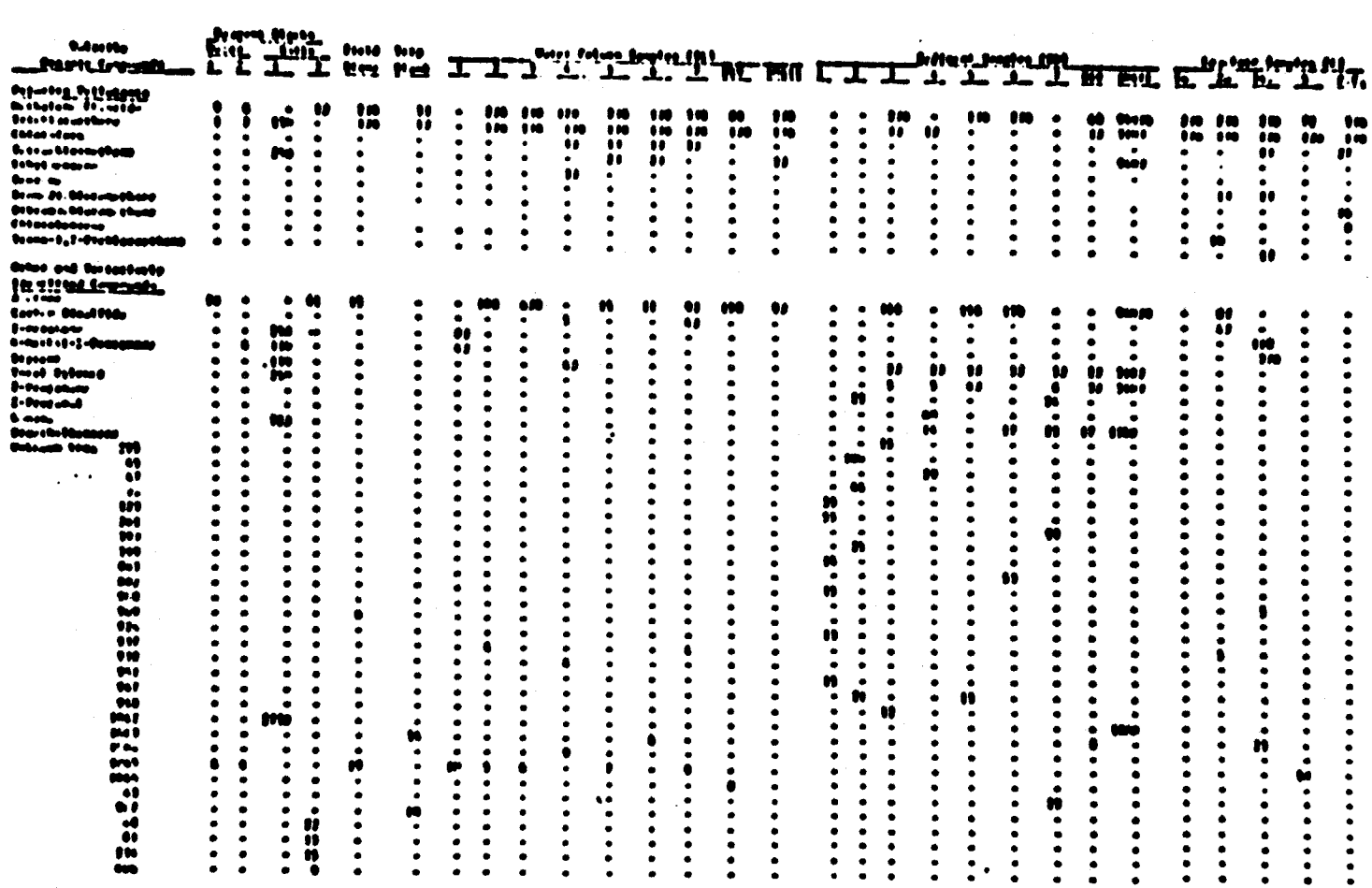
SHARKEY LANDFILL
Summary of Inorganic Compounds - Soil Sampling Program

Sample Location Sample Code	S1 0007-A-S1	S3 0007-B-S3	S4 0007-C-S4	S5 0007-D	S6 0007-E	Field Blank/Bottle 0006-AA	Field Blank/Bottle 0006-M	Field Blank/Bottle 0006-V
Inorganics								
Aluminum	36100	7910	7660 E	9390	6100	333 E	1060 E	1130 E
Antimony	32 B *							51 [1]
Arsenic	5.7 B							
Barium	191	80 [1E]	60 [1E]	64 [1]	37 [1]	2.8 [1]		0.6 [1]
Beryllium	1.0 [1]	0.6 [1]						
Cadmium	0.6		1.6 [1]	2 [1]	2 [1]		2.4 [1]	2.0 [1]
Calcium	14	1620 [1E]	182 [1E]			193 [1]	341 [1]	377 [1]
Chromium	69	18	46	19	21			
Cobalt	17 [1]	11 [1]	5.4 [1]	9 [1]	3.8 [1]			6.4 [1]
Copper	30	40 E	71	61	18 [1]	12 [1]		
Iron	66100	19700	18600	21000 E	11700 E	64 [1]	201 E	98 [1E]
Lead	42 ER	159 E	118 E	776		0.7		
Cyanide	1.9							
Magnesium	2850 [1]	5150 E	1990 E	3310 E	2330 [1E]	202 [1]	675 [1E]	769 [1E]
Manganese	1980	319	323	316 E	148 E		7.1 [1E]	7.1 [1E]
Mercury	0.1 [1]	0.1	0.1 [1]	0.6	0.1 [1]	0.1 [1]	0.1 [1]	0.1 [1]
Nickel	39	27	48	49				
Potassium	797 [1E]	2920	2300 [1]	4270	357 [1]	929 [1E]	3720 [1]	4190 [1]
Selenium	36 B							
Silver	2.2 B							
Sodium	343 [1E]	671 [1E]	821 [1E]	1410 [1E]	475 [1E]	496 [1]	1260 [1E]	1170 [1E]
Thallium	5.0 B							
Tin	8.2 B	121				130		
Vanadium	157 B	60 E	56 E	111 E	6.8 [1]	26 [1]	87 E	100 E
Zinc	198	117 E	216 E	192	49	29	36	26
Percent Solids	67	87	88	81	68	NA	NA	NA

Notes:

[1] - If the result is a value greater than or equal to the instrument detection limit but less than the contract required detection limit, report the value in brackets. Indicate the analytical method used with P (for ICP/Plasma AA) or F (for furnace).
B - Indicates spike sample recovery is not within control limits.
* - Indicates duplicate analysis is not within control limits.
E - All results are in mg/kg, except field blanks, reported in mg/l.
E - Indicates a value estimated or not reported due to the presence of interference.

3-149



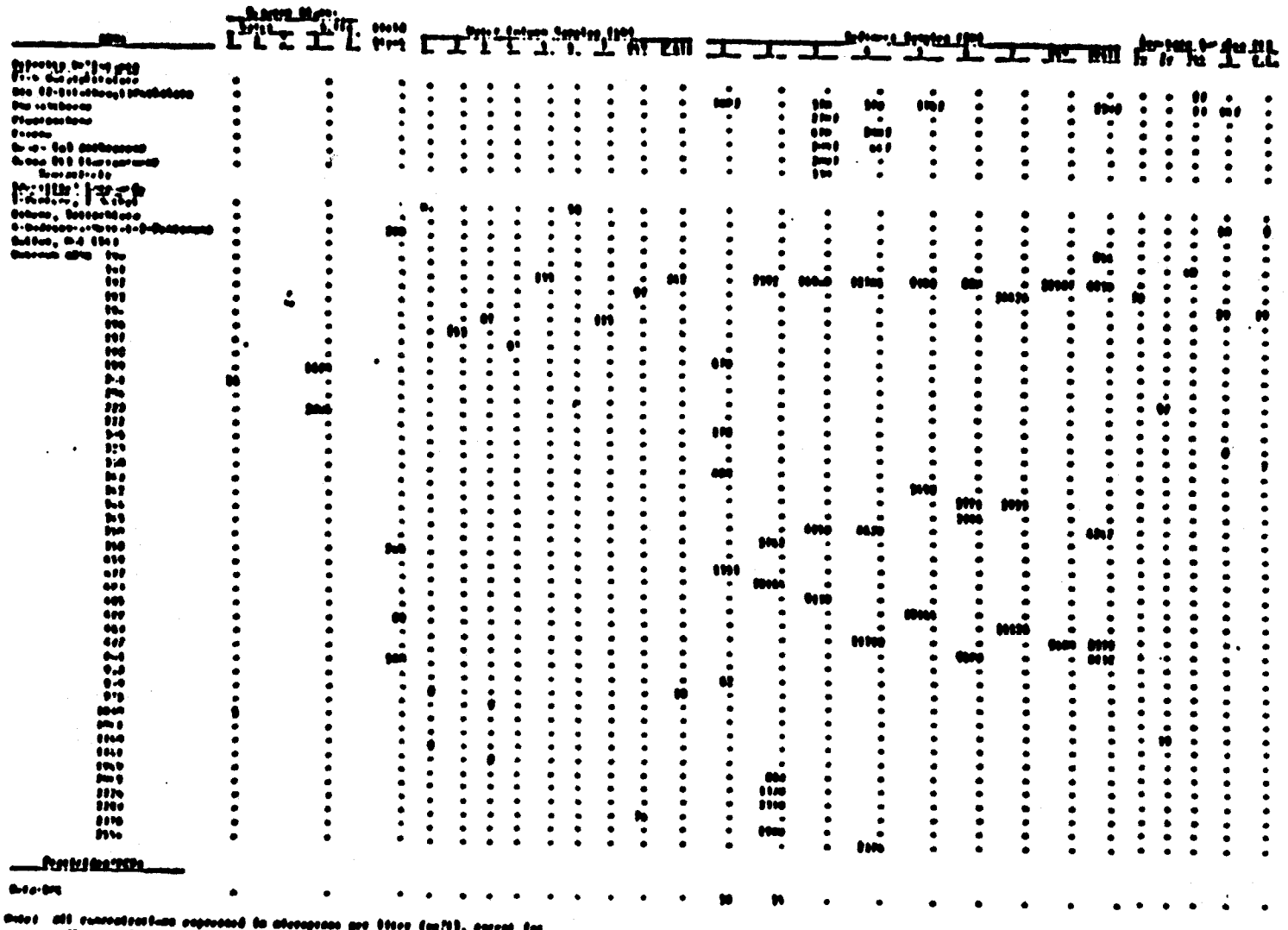
Notes: All concentrations expressed in micrograms per liter (µg/l), except for sediments which are expressed in micrograms per kilogram dry weight (µg/kg)

Tentatively identified compound based on mass number (non-polarity performance) confirmed concentrations.

J = An estimated value.

B = Analyte was found in blank as well as sample. Indicates possible/probable blank contamination

N.D. = Undetected given estimate



Note: All concentrations expressed in micrograms per liter (ug/l), except for additives which are expressed in milligrams per liter (mg/l).

Quantitatively identified compound based on mean number from-peroxide purchased contracted concentrations.

J = an estimated value

TABLE 4-10. ORGANIC CONCENTRATIONS IN SURFACE WATERS AND LEACHATES FOR WET WEATHER SURVEY OF NOVEMBER 5, 1985

Pollutant	Method Blank 1	Method Blank 2	Trip Blank	Field Blank	Surface Water SD1[b]	SD3	SD4	SD6	SD7	Leachates L2a	L4	L5	L6	L2	Plant Effluent
Volatile Organic Compounds															
Priority Pollutants															
Methylene Chloride	-	-	6J	-	1J	2J	1J	2J	2J	2J	2J	2J	-	2J	3J
Trichloroethene	-	-	-	-	-	3J			2J						
Tetrachloromethene			2J			3J					3J	2J		3J	3
Chloroform															21
Bromodichloromethane															12
Tentatively Identified Compounds															
Unknown VOAs 1130								10							
1131									10						
1139					10										
1149			6												
1150															6
1145														6	
1137							11			10					
1141				12											
1144												7			
1142						11									
1143													13		
1153											9				
Acid/Base/Neutral Organic Compounds															
Priority Pollutants															
Bis(2-ethylhexyl)phthalate	14	2			2JB	2JB	2JB		2JB	2JB	2JB		2JB	4JB	12JB
Benzo Pyrene	8		-		8JB	8JB	8JB		8JB		8JB		9JB		
Tentatively Identified Compounds															
[illegible]ethylcyclopentasiloxane					50				16						
Unknown ABNs 191					42	17				10	12				
192				185											24
302										85					
315				8											
409						24									
410				15											
304												19			
926						12									
290													29		
1224													12		
1535													31		
312										8					
407										24					
213														160	
408					10										
198							45								
211									79						

Note: All water and leachate concentrations are expressed in micrograms per liter

a) See Table4
b) Denotes sampling location number
c) Denotes sample number in 4888-A series

- J indicates an estimated value that is less than the specified detection limit, but greater than zero (e.g.if limit of detection is 10 ug/l and a concentration of 3 ug/l is calculated it is reported as 3J)

- B indicates that the analyte was found in the blank as well as sample.

TABLE 4-11. INORGANIC CONCENTRATIONS IN SURFACE WATERS AND LEACHATES FOR WET WEATHER SURVEY OF NOVEMBER 5, 1980

Pollutant	Matrix Blank 1	Matrix Blank 2	Field Blank	Surface Water SW1	SW2	SW6	SW4	SW7	Leachates L2e	L4	L5	L6	L8	Plant Effluent P.E.
Priority Pollutants														
Antimony	<60	<60	<63R	<63R	<63R	<63R	<63R	<63R	<63R	<63R	<63R	<63R	<63R	<63R
Arsenic	<10	<10	<7.6	<7.6	<7.6	<7.6	<7.6	<7.6	<7.6	<7.6	<7.6	<7.6	<7.6	<7.6
Beryllium	<5	<5	<0.9	<0.9	<0.9	[3.2]	<0.9	<0.9	<1.3	<0.9	<0.9	<1.0	<0.9	<0.9
Cadmium	<5	<5	<2.1	<2.1	13	[3.1]	<2.1	<2.1	<2.1	<2.1	<2.1	8.1	<2.1	<2.1
Chromium	<10	<10	<5.3	<5.3	<5.3	<5.3	<5.3	<5.3	<5.3	<5.3	<5.3	<5.3	<5.3	22
Copper	<25	<25	<6.2	34	[11]	<6.2	[17]	<6.2	<6.2	<6.2	<6.2	35	<6.2	<6.2
Lead	<5	<5	<4.7R	89ER	<4.7R	<4.7R	<24ER	<25ER	<4.7R	<4.7R	<4.7R	32ER	<4.7R	<4.7R
Mercury	<0.2	<0.2	<0.1R	<0.1R	2.1R	<0.2R	<0.1R	<0.1R	<0.1R	<0.1R	<0.1R	<0.1R	<0.1R	<0.1R
Nickel	<40	<40	<15	<15	<15	<15	<15	<15	<15	<15	<15	46	<15	<15
Selenium	<5	<5	<4.8	<4.8	<4.8	<24	<4.8	<4.8	<4.8	<24	<4.8	<4.8	<25E	<25E
Silver	<10	<10	<3.0R	<3.0R	<3.0R	<3.0R	<3.0R	<3.0R	<3.0R	<3.0R	<3.0R	<3.0R	<3.0R	<3.0R
Thallium	<10	<10	<6.7R	<6.7R	<6.7R	<6.7R	<6.7R	<6.7R	<6.7R	<6.7R	<6.7R	<6.7R	<6.7R	<6.7R
Zinc	<20	<20	20R	105R	68R	70R	61R	43R	60R	62R	60R	73R	30R	54R
Other Parameters Measured														
Aluminum	<200	<200	209E	3820E	1830E	2630E	1870E	1530E	593E	374E	450E	1130E	200E	1200E
Barium	<200	<200	<2.0	[86]	[32]	[46]	[44]	[27]	[37]	336	[33]	[162]	[21]	[14]
Calcium	<5000	<5000	[140]	23400	19400	22600	19600	20900	14100	89900	8360	130000	18400	59600
Cobalt	<50	<50	<3.9	<3.9	<3.9	<3.9	<3.9	<3.9	<3.9	<3.9	<3.9	<3.9	<3.9	<3.9
Iron	<100	<100	[88]	6810	2810	3540	2620	2430	984	7520	1040	1310	2690	698
Magnesium	<5000	<5000	[320]	9190	7140	8650	7350	7680	[4630]	29800	[2560]	64300	7110	20000
Manganese	<15	<15	0.1	446	178	216	159	173	66	735	20	20	132	[9.9]
Potassium	<5000	<5000	[335]E	[4910]E	[3980]E	5570E	4790E	[4630]E	[4400]E	14700E	[2950]E	70500E	[4970]E	22200E
Sodium	<5000	<5000	[340]	23300	18100	21400	18800	19700	33600	60300	5280	329000	16500	79800
Tin	<40	<40	<11R	<55ER	[35]ER	<55ER	55ER	<55ER	<55ER	<55R	<55ER	<55ER	<55ER	<55ER
Vanadium	<50	<50	[5.3]E	[24]E	[20]E	[25]E	[18]E	[20]E	[19]E	[21]E	[23]R	[22]E	[25]E	[24]E
Cyanide	<10	<10	<10	<10	<10	15	10	33	<10	32	<10	332	<10	<10
Phenol	<5	<5	<5	13	5.5	<5	17	29	<5	16	13	50	63	<5

All water and leachate concentrations are expressed in micrograms per liter (ug/l)

E = indicates a value estimated or not reported due to the presence of interference.
R = indicates spike sample recovery is not within control limits
[ ] = indicates that concentration is less than contract detection limit, but greater than instrument detection limit.