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REVISED PROJECT PLANS
TASK 3A, 3B & 3C
Cook Composites and Polymers Co.
Saukville, Wisconsin
(Formerly: Freeman Chemical Corporation)

Prepared for:

COOK COMPOSITES AND POLYMERS CO.
Saukville, Wisconsin
(Formerly: Freeman Chemical Corporation)

Prepared by:

HATCHER-SAYRE, INC.
Richmond, Virginia

Job No. 0001-003

April, 1991

REVISED PROJECT PLANS
Task 3A, 3B and 3C
for
Cook Composites and Polymers Co.
Saukville, Wisconsin
(Formerly: Freeman Chemical Corporation)

Submitted: ______________________
(Date)

Russell Cerk, Project Coordinator,
Cook Composites and Polymers Co.
(Formally: Freeman Chemical Corporation)
Signature ______________________________

Steve Werner, Project Coordinator,
Hatcher-Sayre, Inc.
Signature ______________________________

Robert D. Money, Quality Assurance Officer,
Hatcher-Sayre, Inc.
Signature ______________________________

Mary Ford, Program Administrator,
Enseco - Erco Laboratory
Signature ______________________________

Deborah A. Loring, Director, Quality Assurance,
Enseco - Erco Laboratory
Signature ______________________________

Robert Smith, Project Manager,
U.S. EPA Region V
Signature ______________________________

Valerie J. Jones, Quality Assurance Officer,
U.S. EPA Region V
Signature ______________________________

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1.0 INTRODUCTION

This document describes the Sampling, Data Management, and Community Relation Plans for the continuing corrective measure activities at the Cook Composites and Polymers Co. (formerly Freeman Chemical Corporation) plant in Saukville, Wisconsin. It fulfills Task 3, Parts A, B, and C outlined in Attachment I, Scope of Work of the RCRA 3008(h) Consent Order issued by USEPA October 14, 1987, to Freeman Chemical Corporation. It incorporates the following:

1. EPA/WDNR comments received on February 29, 1988, concerning the original Task 3A, B, C (submittal dated December 18, 1987).
2. Hatcher response dated April 4, 1988.
3. EPA/WDNR response received on May 6, 1988.
4. EPA/WDNR meeting on June 10, 1988, with Freeman Chemical Corporation and Hatcher Incorporated.
5. EPA/WDNR comments received on July 5, 1988, related to in June 10 meeting.
6. Hatcher comments dated dated July 1, 1988, related to the June 10 meeting.
7. EPA/WDNR response received on August 8, 1988.
8. EPA comments received on August 19, 1988.
9. Hatcher Revised Project Plans, Task 3A, 3B, & 3C dated August 26, 1988.
10. EPA comments received on October 19, 1988.
11. Hatcher Revised Project Plans, Task 3A, 3B, & 3C dated April 6, 1990.
12. EPA Comments received June 7, 1990.
13. Conference Call with EPA Region V, Hatcher-Sayre, Inc. and representative from Freeman Chemical Corporation on November 1, 1990.

The revised Operation and Maintenance Plan (Task 3, Part D) has been submitted under separate cover.

The Task 3 Project Plan (T3PP) in concert with the Laboratory

Quality Assurance Project Plan (LQAPP) address the 16 Quality Assurance Project Plan (QAPP) elements for the referenced project. Because the QAPP elements are closely related to the T3PP, they are incorporated into the work plan.

1.1 Background

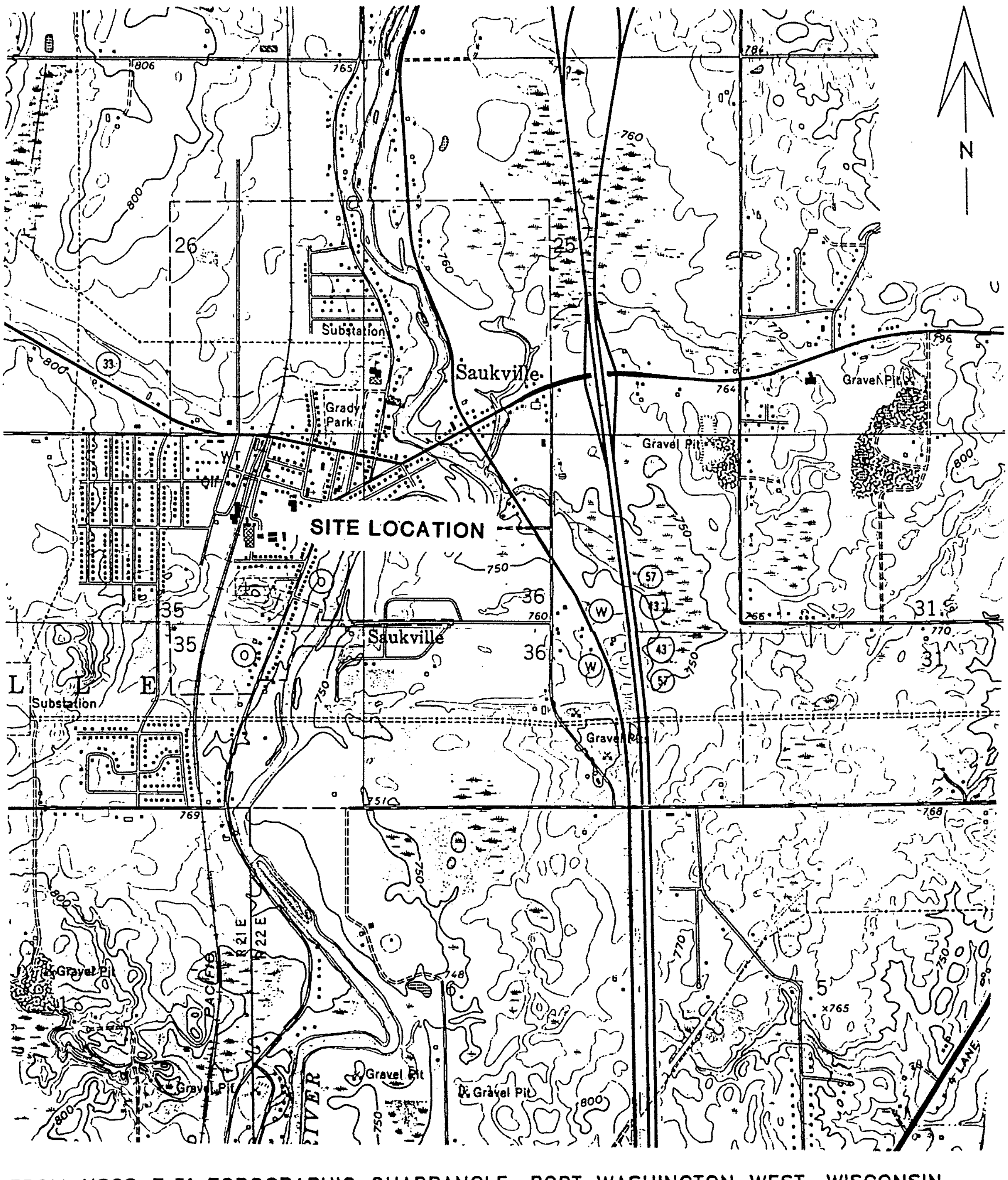
1.1.1 Site Background

Freeman Chemical Corporation's (FCC) Saukville Plant is centrally located in the Village of Saukville, Wisconsin. A portion of the U.S. Geological Survey (USGS) 7.5-minute topographic map surrounding the Village of Saukville is shown in Figure 1.

Within 1,000 feet of the Freeman property, residential properties exist in essentially all directions; commercial properties are located north of the site; industrial zoning occurs to the west, northwest and southeast; and some agricultural land is found east of the plant. Freeman's property is bounded by residential properties on all sides except the western border which is zoned industrial.

The Saukville Plant is an old plant that was originally operated as a cannery. Freeman Chemical installed its original plant equipment in 1949. Since that time, the plant site has grown geographically, by acquiring additional properties to the east and southeast of the original site, and the addition of equipment, by adding various kettles, tanks, and buildings for adjusting, blending, thinning, rinsing, and storage of its raw materials and finished products.

Since 1949 this plant has manufactured alkyd, polyester, and urethane synthetic resins. The alkyd and polyester resins are produced by a condensation reaction; the urethane resins are produced either by blending or by an isocyanate reaction. Alkyd resins are used in the coatings industry to make paints and varnishes. Polyester Resins are sold to the reinforced plastics industry for use in fiberglass boats and molded polyester parts. Urethane resins are widely used for insulation and seating applications.



FROM USGS 7.5' TOPOGRAPHIC QUADRANGLE: PORT WASHINGTON WEST, WISCONSIN

JOB #:0001-003	FIGURE 1 SITE LOCATION MAP	HATCHER-SAYRE, INC.
DATE: 4-03-91		
SCALE: 1:24000	FREEMAN CHEMICAL CORPORATION SAUKVILLE, WISCONSIN	
DRAWN BY: RDM		

Five hazardous wastes are presently generated at Freeman Chemical's Saukville Plant: waste rinse solvent, reaction water, waste resin, spill residues from "U"-listed chemicals, and ash from the present incinerator. By far, the greatest amount of wastes are the waste rinse solvent and reaction water.

For further information about the site, please see Hatcher Incorporated's Corrective Measures, Task I, Site Conditions and Construction Report 1986, Volumes 1 through 3.

1.1.2 Project Background

The hydrogeologic situation existing at the Freeman Chemical facility resulted in the formulation of a remediation scheme consisting primarily of: 1) dewatering of the glacial overburden to remove contaminated groundwater; 2) removal or repair of existing site sources of contamination; 3) repair of the casing of the nearby Laubenstein well; 4) reconditioning of one of the Village Wells; 5) reversing the direction of groundwater flow in the Dolomite Aquifer back to the site by installing and pumping a system of one deep and several shallow dolomite wells located on site; and 6) directing surface runoff drainage to a collecting basin. All of these remedial actions have been completed and the collection systems have been operating since July 1987. For a complete description of project background and details on monitoring well and piezometer construction materials and techniques, please see Hatcher Incorporated's Corrective Measures, Task I, Site Conditions and Construction Report 1986, Volumes 1 through 3.

1.2 Project Organization and Responsibilities

1.2.1 Organization

As Freeman Chemical Corporation's consultant, Hatcher-Sayre, Inc., Richmond, Virginia, is primarily responsible for all sampling program activities, data evaluation and presentation. Chem-Bio Corporation (CBC), Oak Creek, Wisconsin, has been contracted to conduct the quarterly and annual well sampling and Erco Laboratory, a division of Enseco Incorporated, Cambridge, Massachusetts has been contracted to perform the laboratory analyses. Hatcher-Sayre, Inc. is the common point of reference for all parties (see Figure 2). All field data, QA procedures (for both CBC and Erco), and laboratory analysis reports are sent to Hatcher-Sayre, Inc. for evaluation, presentation, and safe keeping. This is to ensure comparability and compatibility of all sampling activities and data presentation.

1.2.2 Contractor Responsibilities

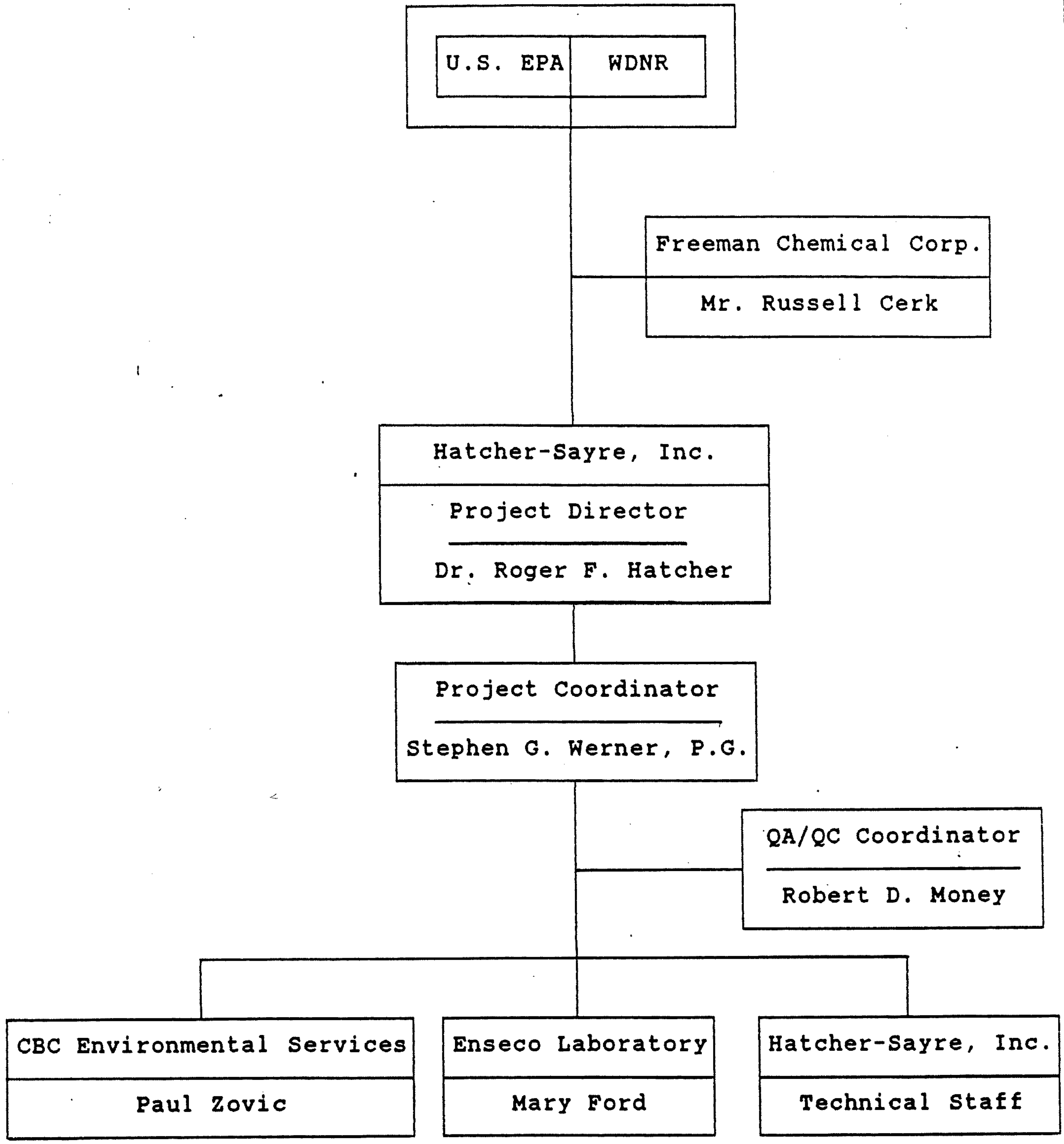
Hatcher-Sayre, Inc.

Project Director - Roger F. Hatcher, Ph.D., the Project Director, is the primary liaison between the contractors and Freeman Chemical Corporation, EPA and the WDNR. He directs the overall project activities and is responsible for the schedule, costs and technical performance of the project. He also provides support and input for the project coordinator.

Project Coordinator - The Project Coordinator, Stephen G. Werner, P.G., is responsible for the scheduling and coordination of the day-to-day project activities. He will direct the field activities, laboratory analyses, data analysis and report preparation.

QA/QC Coordinator - The QA/QC Coordinator, Robert D. Money, is responsible for ensuring that all QA/QC procedures are being followed. This includes establishing a QA/QC file, reviewing all QA/QC procedures and documentation, and reviewing data and project reports. He is also responsible for internal and external performance and system audits.

Hatcher-Sayre, Inc. is responsbile for oversight of the internal and external performance and system audits for the entire project. In addition to the internal auditing procedures of each contractor, Hatcher-Sayre, Inc. will conduct audits to ensure



JOB #:0001-003	FIGURE 2 PROJECT ORGANIZATION
DATE: 4-03-91	
SCALE: NO SCALE	FREEMAN CHEMICAL CORPORATION
DRAWN BY: RDM	SAUKVILLE, WISCONSIN

HATCHER-SAYRE, INC.

proper execution of the specific tasks in each phase of the project. The auditing procedures may include but are not limited to site visits during sampling activities or laboratory analyses.

Chem-Bio Corporation (CBC)

CBC Environmental Services, Wisconsin, has been contracted to obtain all groundwater samples. They are responsible for conducting and documenting the appropriate pre-field checks, field measurements, water sample collection and filling out the necessary QA/QC forms. All raw data and forms are submitted to Hatcher-Sayre, Inc., Richmond, Virginia, following each sampling period.

CBC's designated Field Manager is also the Health and Safety Officer. He must review conditions on-site and make sure any protective clothing or special equipment needed are on-site and used properly.

Erco Laboratory

Erco Laboratory, Cambridge, Massachusetts, will perform all laboratory analyses. They are responsible for providing pre-prepared sampling containers, shipping the containers to CBC in a timely fashion, logging samples back into the lab, chemical analyses, QA/QC analyses, and submitting the results to Hatcher-Sayre, Inc., Richmond, Virginia.

Erco's designated contact for this project is Ms. Mary Ford. Erco Laboratory is an EPA CLP laboratory and, as such, conducts and documents all of the necessary QA/QC procedures.

1.3 Quality Assurance Objectives (QAOs)

The QAOs for the laboratory and field measurement data are listed in Table 1. The QAOs for the laboratory measurement data are also listed in Table 12-1. of the LQAPP.

TABLE 1

QUALITY ASSURANCE OBJECTIVES[a]
LABORATORY MEASUREMENT

Analyses	Matrix	Precision (% RPD)	Accuracy (% Recovery)	Completeness (%)
Volatile organics	Aqueous	<15	61-145	95
Volatile organics	Solid	<25	59-172	95
Semivolatile organics	Aqueous	<45	9-103	95
Semivolatile organics	Solid	<50	11-142	95
Pesticides, PCBs, and herbicides	Aqueous	<27	38-131	95
Pesticides, PCBs, and herbicides	Solid	<50	23-139	95
Metals, cyanide, and sulfide	Aqueous	<20	75-125	95
Metals, cyanide, and sulfide	Solid	<20	75-125	95
Dioxins and furans	Aqueous	<50	60-140	95
Dioxins and furans	Solid	<50	60-140	95

[a] The sources of these criteria are the EPA's SOW887 and "Data quality Objectives for Remedial Response Activities Development Process," EPA/540/G-87/003.

TABLE 1 (Continued)

FIELD MEASUREMENT

Analyses	Matrix	Precision	Accuracy
pH	Aqueous	≤0.1 su*	0.01 su
Conductivity	Aqueous	+15% Std. Dev.	+5% of Standard
Temperature	Aqueous	-2° to 50°C	+1.0°C
PID Readings	Vapor	0.1 to 200 ppm	+1% of meter scale

su = Standard Unit of pH
* = Standard Deviation of Four (4) Replicate Measurements.

tab1.fcc

2.0 SAMPLING PLAN

2.1 Introduction

The sampling plan discussed in this section describes the procedures for the collection and analyses of samples obtained during the monitoring activities for the Freeman Chemical plant in Saukville, Wisconsin. It includes a description of the objectives of the plan, the rationale for the scope of the programs, and details of the pre-field, field and laboratory activities including quality assurance/quality control (QA/QC) procedures.

The major procedural descriptions are included under the Groundwater Monitoring Program. Specific and/or unique descriptions pertaining to the POTW Monitoring Program and the Hydrogeological Testing Program are discussed separately at the end of this section.

A summary table of sampling and analysis for the Freeman site has been included as Table 2. It is a summary of all samples to be taken at the site listed by category, i.e. groundwater, POTW influent and effluent, and stabilized sludge.

2.2 Objectives

The objective of the Sampling Plan is to provide specific guidance for all field work. The Sampling Plan will provide a specific procedure for planning and approving sampling activities, ensure that sampling activities are limited to those that are necessary and sufficient, provide a common point of reference for all parties and provide information on work limitations, safety precautions, decontamination procedures and emergency information. The sampling program as presented utilizes a trend analysis to document the effectiveness of the interim measures. It is also designed to evaluate the capture zone of the interim measures in the glacial till, shallow dolomite and deep dolomite, based on monitoring well water level elevations.

TABLE 2
SUMMARY OF SAMPLING AND ANALYSES TO BE CONDUCTED FOR FREEMAN CHEMICAL CORPORATION

SAMPLE CATAGORY	FIELD MEASUREMENTS	LABORATORY MEASUREMENTS	*NUMBER OF INVESTIGATIVE SAMPLES FOR EACH PARAMETER	*NUMBER OF FIELD BLANKS FOR EACH PARAMETER	*NUMBER OF FIELD DUPLICATES FOR EACH PARAMETER	TOTAL NUMBER OF SAMPLING ROUNDS	***TOTAL NUMBER OF SAMPLES TO BE SENT TO THE LABORATORY
Groundwater	pH, Specific Conductivity PID readings, Explosivity and % Oxygen for wells inside man-holes.	Aromatic Volatile Organics BTX-Method 602	15/15	1/1	1/1	4	17/17
		Volatile Organics Method 8240	14/32	1/3	1/3	4	16/38
		Appendix IX Organochlorine, Organophosphorus Pesticides Method 608 & 614	1	**1	**1	1	3
		Appendix IX Herbicides Method 615	1	**1	**1	1	3
		Appendix IX Dioxins, Furans Method 8280	1	**1	**1	1	3
		Appendix IX Volatile Organics Method 624	1	**1	**1	1	3
		Appendix IX Semi-volatile Organics Method 625	1	**1	**1	1	3

* QUARTERLY/ANNUALLY - Where there is only one number this is a one time sampling event
** MAY OR MAY NOT BE REQUIRED
*** IF BLANKS AND DUPLICATES ARE NOT REQUIRED, THIS NUMBER WILL CHANGE. TRIP BLANKS WILL BE SENT TO THE LABORATORY, ONE FOR EACH COOLER CONTAINING A VOC SAMPLE, THEREFORE THIS WILL ALSO CHANGE THE TOTAL NUMBER.

TABLE 2 (CONTINUED)
SUMMARY OF SAMPLING AND ANALYSES TO BE CONDUCTED FOR FREEMAN CHEMICAL CORPORATION

SAMPLE CATAGORY	FIELD MEASUREMENTS	LABORATORY MEASUREMENTS	*NUMBER OF INVESTIGATIVE SAMPLES FOR EACH PARAMETER	*NUMBER OF FIELD BLANKS FOR EACH PARAMETER	*NUMBER OF FIELD DUPLICATES FOR EACH PARAMETER	TOTAL NUMBER OF SAMPLING ROUNDS	***TOTAL NUMBER OF SAMPLES TO BE SENT TO THE LABORATORY
Groundwater		Appendix IX Total Metals ICP/Method 200.7	1	**1	**1	1	3
		Appendix IX Total Metals Furnace, Methods 206.2, 270.2, 279.2, 239.2	1	**1	**1	1	3
		Appendix IX Mercury, CVAA Method 245.1	1	**1	**1	1	3
		Appendix IX Total Sulfide Method 376.2	1	**1	**1	1	3
		Appendix IX Total Cyanide Method 335.1	1	**1	**1	1	3
POTW Influent and Effluent	pH and Specific Conductivity	Volatile Organics Method 8240	2/2	**1/1	**1/1	4	4/4
		Semi-Volatile Organics Method 8270	2	**2	**2	1	6

* QUARTERLY/ANNUALLY - Where there is only one number this is a one time sampling event
** MAY OR MAY NOT BE REQUIRED
*** IF BLANKS AND DUPLICATES ARE NOT REQUIRED, THIS NUMBER WILL CHANGE. TRIP BLANKS WILL BE SENT TO THE LABORATORY, ONE FOR EACH COOLER CONTAINING A VOC SAMPLE, THEREFORE THIS WILL ALSO CHANGE THE TOTAL NUMBER.

TABLE 2 (CONTINUED)
SUMMARY OF SAMPLING AND ANALYSES TO BE CONDUCTED FOR FREEMAN CHEMICAL CORPORATION

SAMPLE CATAGORY	FIELD MEASUREMENTS	LABORATORY MEASUREMENTS	*NUMBER OF INVESTIGATIVE SAMPLES FOR EACH PARAMETER	*NUMBER OF FIELD BLANKS FOR EACH PARAMETER	*NUMBER OF FIELD DUPLICATES FOR EACH PARAMETER	TOTAL NUMBER OF SAMPLING ROUNDS	***TOTAL NUMBER OF SAMPLES TO BE SENT TO THE LABORATORY
POTW STABLIZED SLUDGE	N/A	Volatile Organics Method 8240	1/1	N/A	**1/1	4	2/2
		Semi-Volatile Organics Method 8270	1	N/A	**1	1	2

* QUARTERLY/ANNUALLY - Where there is only one number this is a one time sampling event
** MAY OR MAY NOT BE REQUIRED
*** IF BLANKS AND DUPLICATES ARE NOT REQUIRED, THIS NUMBER WILL CHANGE. TRIP BLANKS WILL BE SENT TO THE LABORATORY, ONE FOR EACH COOLER CONTAINING A VOC SAMPLE, THEREFORE THIS WILL ALSO CHANGE THE TOTAL NUMBER.

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2.3 Program Scope Rationale

2.3.1 Groundwater Monitoring Program Rationale

The current groundwater monitoring program consists of the collection of quarterly samples from 29 wells or collectors (16 glacial, 8 shallow dolomite and 5 deep dolomite) and annual samples from 11 wells (6 glacial, 4 shallow dolomite and 1 deep dolomite). Each of these samples were analyzed for the 35 Hazardous Substance List (HSL) Volatile Organic Compounds (VOCs) (see Table 3). Additionally, during previous monitoring programs, samples from select wells were analyzed for total priority pollutants which indicated that in addition to the VOC contaminants, low concentrations of phenols were also present.

This current program was established to define the type and extent of contamination so that remedial actions could be designed and constructed. Since these phases have already been completed, however, the emphasis of the new program now changes to monitoring the effectiveness of the remedial actions. This consists of monitoring the groundwater to ensure a reduction in concentrations and contaminated areas is actually occurring. These reductions will be monitored in the following ways:

- Areal reductions by utilizing total VOCs as presented in Figure 3.
- Trend analyses by utilizing total and/or specific VOCs as presented in Figure 4.

The proposed program consists of continuing to monitor the existing wells and collectors at the same frequency as is currently being conducted. Selected critical locations will be analyzed for the Hazardous Substance List (HSL) VOC's to enable specific compound trend analyses. The glacial water monitoring locations for these analyses were selected to represent the three major areas of concentration, i.e., 6A representing the most contaminated zone, 14B and 46 representing the medium and lowest contamination areas, respectively. For the shallow dolomite waters, wells 3A, 40 and

TABLE 3

VOLATILE ORGANIC CARBON HAZARDOUS SUBSTANCE LIST

Chloromethane
Bromomethane
Vinyl Chloride
Methylene chloride
Acetone
Carbon Disulfide
1,1-Dichloroethene
1,1-Dichloroethane
1,2-Dichloroethene (total)
Chloroform
1,2-Dichloroethane
2-Butanone
1,1,1-Trichloroethane
Carbon Tetrachloride
Vinyl Acetate
Bromodichloromethane
1,1,2,2-Tetrachloroethane
1,2-Dichloropropane
trans-1,2-Dichloropropene
Trichloroethene
Dibromochloromethane
1,1,2-Trichloroethane
Benzene
cis-1,3-Dichloropropene
Bromoform
2-Hexanone
4-Methyl-2-Pentanone
Tetrachloroethene
Toluene
Chlorobenzene
Ethylbenzene
Sytrene
total Xylenes

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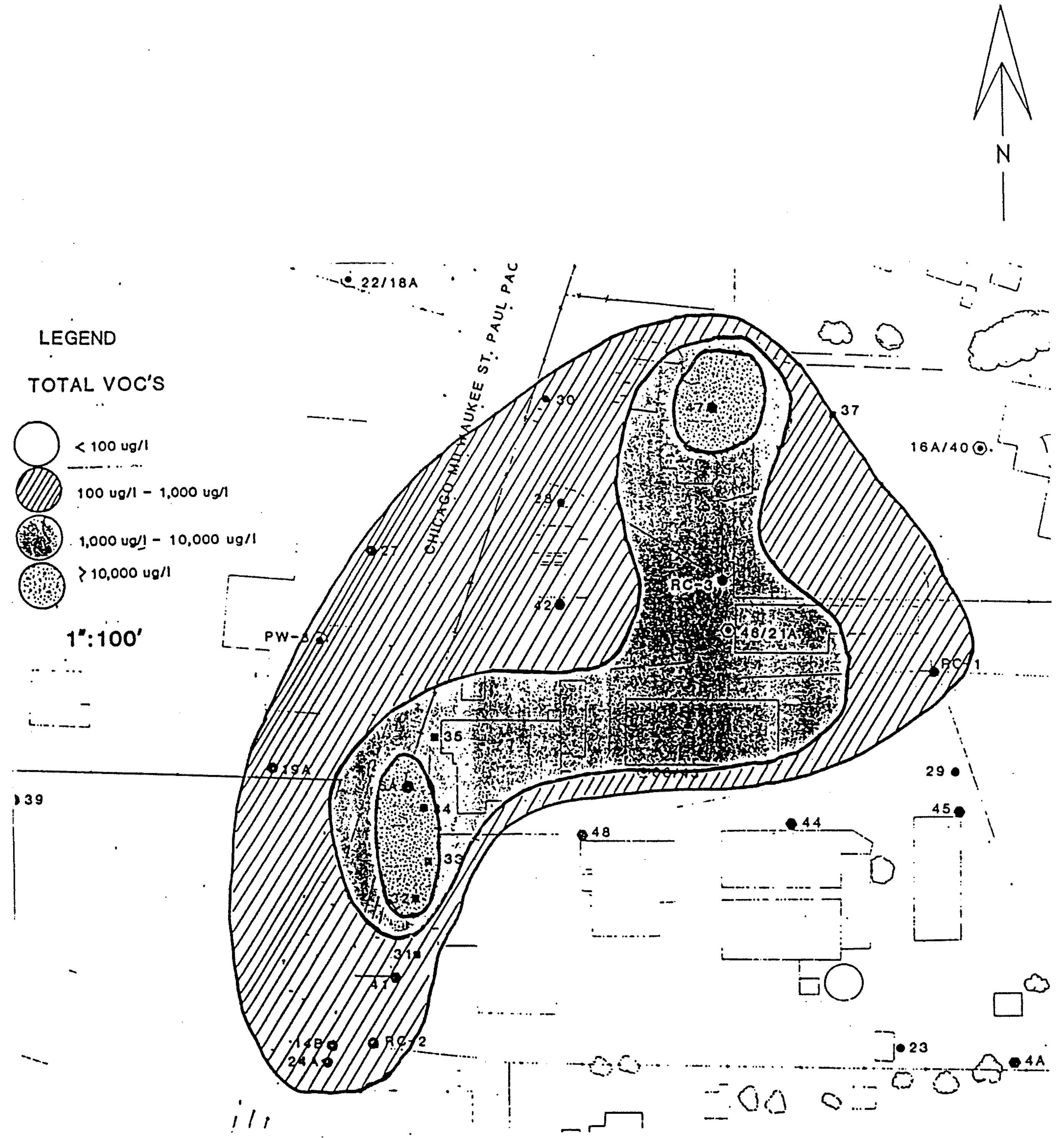
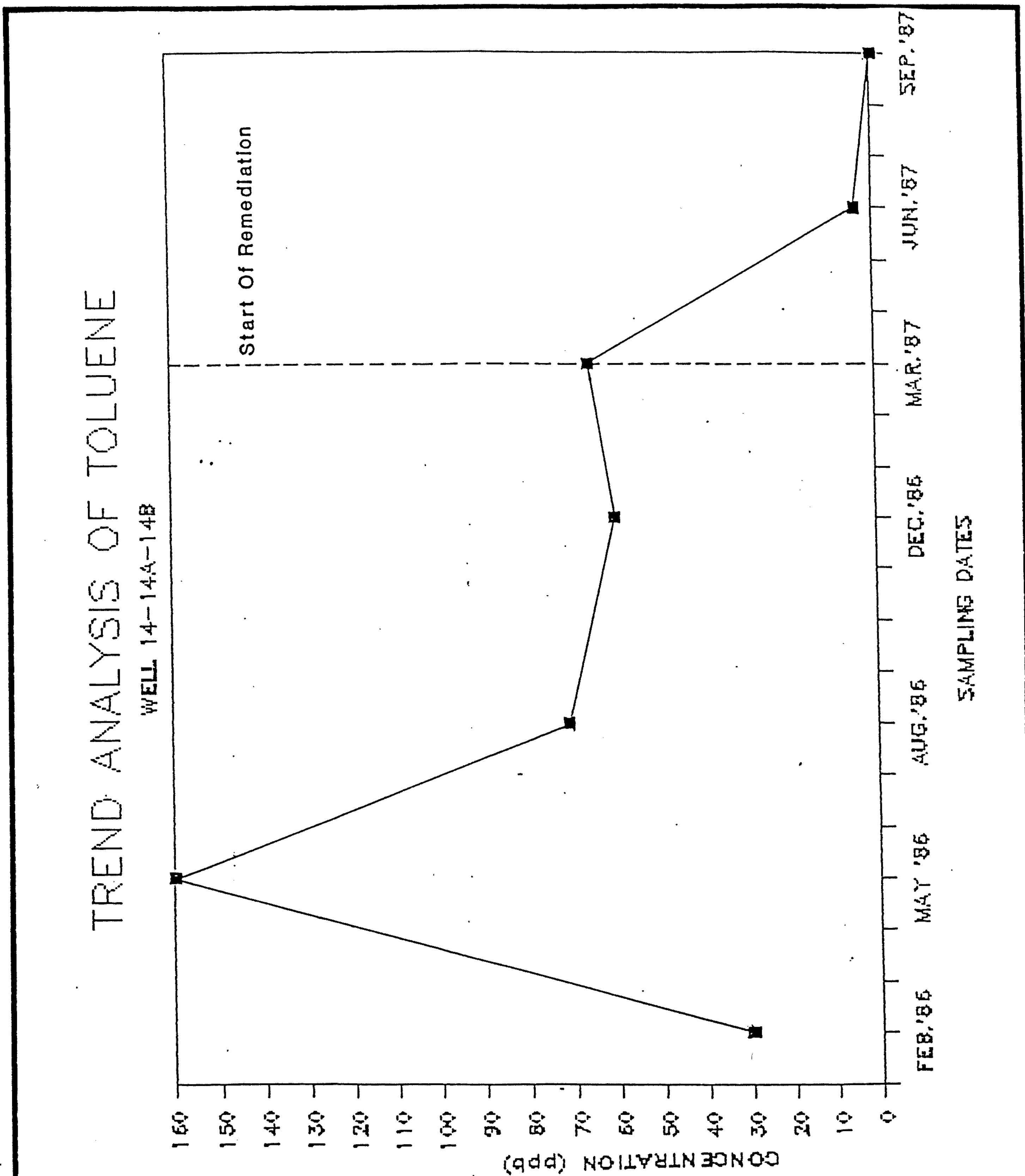


JOB #:0001-003	FIGURE 3 APPROXIMATE EXTENT GLACIAL AQUIFER CONTAMINATION SUMMER 1987 FREEMAN CHEMICAL CORPORATION SAUKVILLE, WISCONSIN
DATE: 4-03-91	
SCALE: AS SHOWN	
DRAWN BY: RDM	HATCHER-SAYRE, INC.



JOB #:0001-003	FIGURE 4	
DATE: 4-03-91	TREND ANALYSIS OF TOLUENE (1987)	
SCALE: AS SHOWN	FREEMAN CHEMICAL CORPORATION	HATCHER-SAYRE, INC.
DRAWN BY: RDM	SAUKVILLE, WISCONSIN	

replacement well 7A (not yet drilled) were selected for detailed analyses since they are on the fringe of the contaminated area and would detect any movements of contaminants in an unanticipated direction. Replacement Well 7A will be constructed of stainless steel in order to prevent VOC sample contamination. Deep glacial overburden well 20 and shallow dolomite well 23 are added to the program due to their proximity to residential areas. The remainder of the well samples contain fairly high concentrations of solvents and, therefore, they will be analyzed for benzenes, toluenes, and xylenes (BTX) by the EPA approved CLP GC Method 602 to monitor their progress. Quarterly water quality data developed for the past year have been reviewed to determine whether or not analysis for BTX by GC method would be appropriate for a number of the wells. This analysis detects the compounds listed in Table 4. Although the analysis does not include trans-1,2-dichloroethene; 1,1,1-trichloroethane or vinyl chloride, these parameters have been detected only intermittently, and therefore, are not considered as significant as indicators of gross contamination as the parameters listed in Table 4. A comparison of the current program to the proposed program is shown on Table 5.

There has been considerable discussion concerning whether or not existing well 7 is satisfactory for monitoring since it is apparently constructed in competent dolomite and thus effectively isolated from any eastward flowing groundwater. As requested by EPA/WDNR this well will be reconstructed. We propose the approximate location shown on Figure 5 with completion to a depth of 60 feet. If competent dolomite is again encountered, the well exhibiting the greater specific capacity will be used for monitoring. If this should be well 7A, we intend to construct a replacement glacial well (8A) adjacent to 7A and properly abandon the 7/8 well nest. Abandonment will consist of grouting each well with a lean cement/bentonite mix (6:1) to the ground surface and cutting the protective steel casing flush to the ground.

Additionally, as required, select samples will be collected once for analysis of the Appendix IX constituents. These samples will be collected in the last quarter of this sampling year

TABLE 4

AROMATIC VOLATILE ORGANICS
BENZENES, TOLUENES, AND XYLENES
(EPA Method 602)

Parameter	Reporting Limit μg/l
Benzene	1.0
Toluene	1.0
Ethylbenzene	1.0
Chlorobenzene	1.0
Xylenes (total)	1.0
1,4-Dichlorobenzene	1.0
1,3-Dichlorobenzene	1.0
1,2-Dichlorobenzene	1.0

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TABLE 5

COMPARISON OF THE CURRENT AND PROPOSED GROUNDWATER MONITORING PROGRAMS
Cook Composites and Polymers Co.
Saukville, Wisconsin

Well	Quarterly Samples	
	Analytical Method	
	Current	Proposed
Glacial Wells		
RC-1	624	BTX by GC
RC-2	624	BTX by GC
RC-3	624	BTX by GC
6A	624	624
14B	624	624
18A	624	*
19A	624	*
20	---	624
27	624	BTX by GC
41	624	BTX by GC
42	624	BTX by GC
43	624	BTX by GC
44	624	BTX by GC
45	624	BTX by GC
46	624	624
47	624	BTX by GC
48	624	BTX by GC
Shallow Dolomite Wells		
3A	624	624
7	624	624
21A	624	BTX by GC
23	624	624
24A	624	BTX by GC
28	624	BTX by GC
29	624	624
38	624	BTX by GC
40	624	624
Deep Dolomite Wells		
MW-1	624	624
MW-2	624	624
MW-3	624	624
MW-8	624	624
30	624	624

TABLE 5 (Continued)

COMPARISON OF THE CURRENT AND PROPOSED GROUNDWATER MONITORING PROGRAMS
Cook Composites and Polymers Co.
Saukville, Wisconsin

Well	Annual Samples Analytical Method Current	 Proposed
Glacial Wells		
1A	624	624
3B	624	624
4A	624	624
6A	---	624
8	624	624
16A	---	624
18A	okay	624
19A	624	624
20	624	**
47	---	624
Shallow Dolomite Wells		
21A	---	624
22	624	624
23	624	**
24A	---	624
25	624	624
28	---	624
29	---	624
39	624	624
Deep Dolomite Well		
MW-4	624	624
30	---	624

* Added to proposed annual program, eliminated from quarterly program.

** Added to proposed quarterly program, eliminated from annual program.

NOTE: Replacement Well 7A will be substituted for Well 7 in the sampling program if a more permeable interval is encountered in the replacement well.

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(October, 1991), to enable the information obtained to be utilized in the preparation of Task 4, Parts B and C, of Attachment I in the Freeman Chemical Corporation Consent Order. Samples for the Appendix IX analyses will be collected from the three contaminated subsurface waters occurring on-site: glacial; shallow dolomite; and deep dolomite. The glacial waters will be collected from glacial wells 6A, 44, and 47. If glacial well 44 is dry or cannot produce an adequate sample, shallow dolomite well 29 will be sampled and analyzed for the Appendix IX parameters. The shallow dolomite sample will be obtained by manually operating the pumps in Wells 21A, 24A, 28 and 29 simultaneously and sampling from the discharge point in the manhole. The deep dolomite water sample for the Appendix IX analyses will be obtained from deep Well 30.

For clarification purposes wells 21A, 24A, 28 and 29 can be sampled individually at the respective well heads by opening a valve in the well discharge line. Individual discharge lines connect to a common line, which allows the mixing of water from these four wells before they discharge into one of two places. First, the mixed well water can enter the plant process water line, which is also fed by water from W-30. Secondly, it can be discharged directly into the sanitary sewer. Flow into either point is controlled by a valve at each location.

The data obtained from this new monitoring plan will allow for the determination of the overall degree of contamination, trend analyses and graphical representations of the contaminated areas.

2.3.2 POTW Monitoring Program Rationale

No specifically designed POTW monitoring program currently exists. The Village of Saukville, however, in their agreement to accept the contaminated groundwaters from Freeman, has requested periodic sampling of VOCs in the POTW's influent, effluent and sludge.

Two studies were conducted by Hatcher-Sayre, Inc. during 1987: 1) Assimilative Study of Freeman Chemical Corporation's VOC Contaminated Groundwater at the Saukville Village POTW, May 20, 1987; and 2) Saukville POTW Study, Groundwater Remediation, Freeman

Chemical Corporation, Saukville, Wisconsin, November 13, 1987. Neither study indicated any problems under normal operating conditions.

Quarterly sampling is proposed, i.e. January, April, July and October. During each period, a sample will be collected from the POTW influent and effluent at a time when any of the three Ranney Collectors have operated during the last 24 hr. period. Additionally, one stabilized sludge sample will be collected quarterly. All samples will be analyzed for Method 624/HSL VOCs and total recoverable phenolics to ensure that no problems develop during the treatment of the contaminated groundwater from the Freeman facility. In addition to the above quarterly sampling, we will sample the influent, effluent and stabilized sludge for Method 625/HSL organics one time, Spring quarter 1989.

2.3.3 Hydrogeological Testing Program Rationale

The recommended remediation scheme for the Dolomite Aquifer at Saukville, Wisconsin, is withdrawal of contaminated groundwater, principally through a new deep well on the Freeman Chemical Corporation (Freeman) property. The rationale is that reversal of the groundwater gradient from toward the Village's well field to one sloping toward the original source of pollutants will in time flush this aquifer of contaminated groundwater.

Well MW-2 has yielded water having low levels of contaminants and an odor since about 1979. Well MW-1 apparently draws in slugs of contaminated water periodically. It is currently reported to be "clean." There is some circumstantial evidence that not pumping Well MW-2 causes contaminated water to be drawn into Well MW-1 when it is pumping.

An attempt has been made recently to place Well MW-3 back in service by reducing its "clay" or "silt" content to manageable levels. This has in part been successful, although the well reportedly still yields some "silt." This well reportedly sustained a one-time incident of "contaminated" water and odor problem. However, this well is on the opposite side of the Milwaukee River from the Freeman property, and there is extremely little or no demonstrated pumping gradient toward Well MW-3. No contamination has ever been detected at Well MW-4.

It is obvious from a groundwater hydrology standpoint that the greater the rate at which the new Freeman Remediation Well (W-30) is pumped, the larger its cone of influence, the higher the groundwater flow velocity, and the faster the dolomite aquifer will be flushed of contaminants. However, high pumpage rates reportedly substantially reduce the water levels in the Village's wells (except perhaps Well MW-3) and therefore, their potential useable potable water supply.

Various combinations of pumping schemes have been proposed and discussed as the one best to: 1) remediate the dolomite aquifer and 2) maintain a potable water supply for the Village. All have some merit.

Some of these schemes include:

1. Pumping Wells MW-3 and MW-4 for potable water, Well W-30 for remediation and cooling water, and placing Wells MW-2 and MW-1 our of service.
2. Pumping Wells MW-3, MW-4, and MW-1 for potable water; pumping Well W-30 (and perhaps the Laubenstein Well) for cooling water and remediation; and leaving only Well MW-2 off.
3. Pumping Wells MW-3 and MW-4 for potable water; pumping wells MW-2, W-30, MW-1, and perhaps even the Laubenstein Well for remediation and cooling.

Obviously, the rate of pumping, the combination of wells used for pumping potable water versus remediation, and the timing of any pump sequencing all potentially affect the amount of potable water available to the Village as well as the rate of Dolomite Aquifer remediation. Therefore, local Dolomite Aquifer pumpage needs to be managed and coordinated with great care. It is proposed that additional integrated aquifer tests be made to determine the efficacy of the several proposed long-term groundwater withdrawal schemes.

2.4 Sampling Planning and Approvals

As remedial activities progress and site conditions change, the sampling plan may need to be changed. Any proposed changes will be based on periodic reviews of the monitoring data to ensure that all sampling activities are limited to those that are necessary and sufficient. Any proposed changes, along with all data supporting the change, will be presented by Hatcher-Sayre, Inc. to the USEPA and the WDNR for approval. Approved changes would be implemented during the next scheduled sampling period.

2.5 Pre-Field Preparation

Pre-field preparations include sampling notifications, laboratory coordination, and equipment checks. These steps will help ensure that valid data are collected, the field and post-field activities go as smoothly as possible and unnecessary delays are prevented.

The equipment checks are part of the preventative maintenance plan for the project to ensure that the field measurements necessary are obtained. If, during these routine checks, a problem is encountered, corrective actions are taken immediately whether it is changing batteries or sending equipment to be repaired.

2.5.1 Sampling Notifications

The appropriate plant personnel (and Village of Saukville personnel in the case of the POTW sampling) will be notified at least two weeks before any field investigations are to take place. Early notification will allow for any unanticipated schedule changes and also notify plant personnel when Hatcher-Sayre, Inc. or CBC personnel will be on-site so any necessary preparations (i.e., remove obstacles, have keys ready, etc.) can be made before the field team arrives.

For the groundwater monitoring program, CBC Environmental Services will be notified approximately two weeks prior to the scheduled sampling date when samples are to be collected. They will be notified as to the preferred sampling date, wells to be sampled and parameters to be analyzed. Confirmation will be obtained on the sampling schedule.

Following confirmation of the schedule with the plant personnel, and approximately one week prior to the field investigations, when possible, the appropriate agencies will be notified so they can make arrangements to visit the site during the site investigations, if they desire.

The laboratory, Erco (Enseco), Cambridge Massachusetts, will be notified at least two weeks before the field sampling, when possible. The lab will be notified by telephone and/or sample analysis request form (see Figure 6). Information to be transmitted will consist of a list of parameters to be sampled, number and type of samples to be collected (including replicates and blanks), and the required detection limits.

All sampling containers will be prepared for field sampling by the laboratory. This includes properly washing/rinsing and labeling the containers. The sampling containers are pre-prepared according to the analytes to be sampled. Based upon the preliminary investigations, the analytes of interest, to be used as indicators of contamination, are volatile organics.

When the pre-prepped sample containers arrive from the lab, they will be checked to make sure the number delivered matches the number ordered, checked to ensure that each container is labeled properly, and checked for their general overall condition (none have cracked caps or are broken). Sample container labels will reference the well identification number or sample location in the case of the POTW. Duplicate samples will also follow the above scheme. Both field and trip blank samples are labelled as such and referenced by date of collection. Additionally, the field log book will note at what locations field blanks and duplicates were collected. The current program requires field blanks and duplicate samples to be collected (at a minimum) at every tenth well sample location.

2.5.2 Equipment Check

For each field trip, an equipment list will be generated and all equipment needed for the field effort will be inspected before

HATCHER-SAYRE, INC.

Distribution List

___
___
___

SAMPLE ANALYSIS REQUEST

To: ____________ *Reference Number: ____________
Job Name: ____________
Attn: ____________ Job Number: ____________

Please send results to:
Name & Company: Hatcher-Sayre, Inc.
Address: 905 Southlake Blvd., Richmond, Virginia 23236
Number Street City State Zip

Telephone: (804) 794-0216 Company Contact: ____________
Approximate Sample Date: ____________ Sample Type: ____________

Analysis Requested	For Sample Number(s)	Detection Limits

Comments: ____________

*PLEASE INCLUDE THIS NUMBER ON THE LABORATORY REPORT AND INVOICE

By: ____________ Date: ____________
Checked By: ____________ Date: ____________ SHEET ____ OF ____
sampanal.hat

JOB #:0001-003	FIGURE 6 SAMPLE OF ANALYSIS REQUEST FREEMAN CHEMICAL CORPORATION SAUKVILLE, WISCONSIN	HATCHER-SAYRE, INC.
DATE: 4-03-91		
SCALE: NO SCALE		
DRAWN BY: RDM		

it is transported to the site. Before any instruments are packed, they will be thoroughly checked out and/or calibrated to ensure they are in proper working order. For instruments needing calibration, all values will be recorded on a calibration sheet (see example Figure 7) and kept on file. Instrument calibration procedures are presented in Appendix A. As each item is put into the vehicle, or properly packed for transport, it will be checked off the list and, after completion, the list will be signed by the person responsible and submitted to the QA/QC Coordinator.

2.6 Field Activities

Field studies for Freeman Chemical, Saukville, Wisconsin include quarterly and annual groundwater monitoring sampling, quarterly POTW sampling and hydrogeological testing. The latter two programs are described in Sections 2.8 and 2.12, respectively.

For the groundwater monitoring program, quarterly sampling will be conducted at the locations exhibiting the greatest contamination, in addition, some low contamination perimeter wells will be sampled to detect any off-site migration. Wells which lie outside of the indicated contamination plumes and have shown no or very low levels of contamination will be sampled annually (see Table 6 and Figure 5).

2.6.1 Frequency

The quarterly and annual monitoring well samples are collected by CBC Environmental Services and are to be taken within fifteen days of the following dates: January 15, April 15, July 15 and October 15. The annual samples are to be taken within fifteen days of October 15. The above dates are subject to change based upon final approval of the QAPP.

2.6.2 Health and Safety

Hatcher-Sayre, Inc. and CBC have been provided with a copy of Freeman's document on facility safety procedures and emergency information (see Appendix B). It is the responsibility of the field team leader to see that the field team is briefed and fully

MULTI-PARAMETER CALIBRATION LOG

PAGE ____ OF ____

PROJECT TITLE: ______________________________ PROJECT NO.: ________________

DATE CALIBRATION PERFORMED: ____________

INSTRUMENT	S/N	PARAMETER	STD(Y)	RDG(X)	UNITS	COMMENTS

CALIB. BY: __________ DATE: ________ FTL: __________ DATE: __________ QA/QC: ________ DATE: ________

JOB #:0001-003

DATE: 4-03-91

SCALE: NO SCALE

DRAWN BY: RDM

FIGURE 7
SAMPLE OF CALIBRATION LOG
FREEMAN CHEMICAL CORPORATION
SAUKVILLE, WISCONSIN

HATCHER-SAYRE, INC.

TABLE 6

MONITORING WELLS AND SCHEDULE
Cook Composites and Polymers Co.
Saukville, Wisconsin

QUARTERLY MONITORING

Glacial Wells

RC-1	41
RC-2	42
RC-3	43
6A	44
14B	45
20	46
27	47
	48

Shallow Dolomite Wells

3A	23	29
7	24A	38
21A	28	40

Deep Dolomite Wells

MW-1	MW-3	PW-8 (Laubenstein)
MW-2	30	

ANNUAL MONITORING

Glacial Wells

1A	8
3B	16A
4A	18A
	19A

Shallow Dolomite Wells

22	39
25	

Deep Dolomite Wells

MW-4

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understands the facility's safety procedures and emergency information.

An explosimeter is used continuously by the field team while sampling. If the meter readings indicate that 20% of the Lower Explosion Level has been reached, this area is abandoned, at least temporarily, until proper precautions or remedial actions can be taken to lower the risk of explosion.

Based on past Photoionization Detection (PID) Meter readings, there is normally no need for respirators during above ground activities. However, respirators will be brought on-site and available for use by the field team, if needed. HNU readings are taken at each well to determine whether or not a respirator is required. The level at which a respirator is required is 125 ppm. This level is based on the lowest short term exposure level of all contaminants found on-site. Respirator use is <u>required</u> for anyone entering a manhole to conduct sampling. Gloves are used during sampling and are changed and properly disposed after sampling each well. Depending upon the working conditions, disposable suits and booties may be required (see CBC Sampling Protocol, Appendix C).

2.6.3 Sample Integrity

A Field Notebook will be maintained during the entire sampling period and a Chain of Custody Record will be completed for and shipped with each sample batch. <u>NOTE</u>: All of these records will be filled out in permanent, indelible ink.

The field team leader is responsible for the care and custody of the samples collected until those samples are properly dispatched to the receiving laboratory or are transferred to an assigned custodian. Either of these actions must be properly documented on the Chain of Custody Record (Figure 8). The field team leader must assure that each sample container is in his physical possession, in view at all times, or stored in a secure, locked, tamper-proof container for safekeeping.

CBC ENVIRONMENTAL SERVICES
140 E. RYAN RD.
OAK CREEK, WI 53154
(414) 764-7005

CLIENT

PROJECT LOCATION

QUOTE NUMBER

CHAIN OF CUSTODY

No.10980

PLEASE PRESS FIRMLY WHEN WRITING

SAMPLER *(Signature)*	AFFILIATION	DATE	TIME
PURPOSE OF ANALYSIS			

ITEM NUMBER	NUMBER AND SIZE OF CONTAINERS	DESCRIPTION	TRANSFER NUMBER 1	2	3	4	5

TRANSFER NUMBER	ITEM NUMBER	RELINQUISHED BY *(Signature)*	ACCEPTED BY *(Signature)*	DATE	TIME
1					
2					
3					
4					
5					

JOB #:0001-003 DATE: 4-03-91 SCALE: NO SCALE DRAWN BY: RDM	FIGURE 8 SAMPLE OF CBC CHAIN OF CUSTODY FREEMAN CHEMICAL CORPORATION SAUKVILLE, WISCONSIN	HATCHER-SAYRE, INC.

2.6.4 Sampling

The following sampling information has been separated by the various types of wells encountered at the Freeman site:

Water Level and Depth Measurements

Water levels for Wells 21A, 24A, 28, 29, 30, MW-1, MW-2, MW-3, and MW-4 will be taken by connecting a tire pump or other air supply to the schrader valve located beneath the pressure gauge at the top of each well head and pumping air into the line until the pressure gauge reaches a maximum reading. This reading is the point at which further supply of air will not increase the reading to any higher value. Record the gauge reading.

Let X = Depth to water (in feet) unknown
Y = Known length of air line (in feet)
Z = Water pressure on air line, obtained from pressure gauge reading. Altitude type gauge reads directly in feet of water. If gauge reads in pounds, convert to feet by multiplying by 2.31.
X = Y - Z

Distance to water = length of air line minus gauge reading (feet).

All other water levels and depths will be obtained using a water level meter except for Ranney Collectors 1, 2 and 3 which do not require these measurements. All water levels and depths for each well will be recorded in the field notebook. Table 7 contains purging information for each well.

Well Evacuation and Sampling

All wells will have three volumes evacuated before sample collection. After determining the height of the water column, calculate well volume (in gallons) using the following calculation:

Volume in gallons = [ht. of water column (ft) x 12in/ft x $D^2/4$] - 231 in^3/gal

This number represents one well volume. It is required that three well volumes be evacuated from each well before sample collection takes place. If the well is low yielding, it will be evacuated to dryness once and then sampled.

TABLE 7

EXAMPLE OF WELL PURGING INFORMATION
USING APRIL AND JULY, 1988 DATA

Well	Bottom of Well Elevation (ft. above m.s.l.*)	Typical Water Level Elevations (ft. above m.s.l)	Typical Purge Vols. (gallons)	Volume Per Linear Ft. (gals)
Glacial Wells				
RC-1	N/A	N/A	N/A	N/A
RC-2	N/A	N/A	N/A	N/A
RC-3	N/A	N/A	N/A	N/A
6A	753.59	762.89	4.5	0.16
14B	756.42	762.07	2.7	0.16
18A	757.29	763.94	3.2	0.16
19A	749.39	761.93	6.0	0.16
20	650.07	727.32	37.1	0.16
27	751.51	764.55	6.3	0.16
41	754.38	DRY	--	--
42	752.58	756.25	1.8	0.16
43	753.25	DRY	--	--
44	753.65	DRY	--	--
45	753.10	DRY	--	--
46	750.60	762.27	5.6	0.16
47	755.33	756.46	1.5	0.16
48	753.84	DRY	--	--
Shallow Dolomite Wells				
3A	535.30	731.22	864.0	1.47
7	735.35	741.23	2.8	0.16
21A	685.14	729.81	197.0	1.47
23	701.72	736.05	69.0	0.67
24A	680.79	750.21	306.1	1.47
28	676.01	736.85	268.3	1.47
29	678.44	729.69	226.0	1.47
38	721.19	745.40	106.7	1.47
40	720.59	735.84	67.2	1.47
Deep Dolomite Wells				
MW-1	≈500*	212.00**	--	--
MW-2	≈500	172.00	--	--
MW-3	≈500	95.00	--	--
PW-8	455	43.46	1,813.28	1.47
30	556	82.00	Pump runs continuously	

TABLE 7

EXAMPLE OF WELL PURGING INFORMATION
USING APRIL AND JULY, 1988 DATA

Well	Bottom of Well Elevation (ft. above m.s.l.*)	Typical Water Level Elevations (ft. above m.s.l)	Typical Purge Vols. (gallons)	Volume Per Linear Ft. (gals)
<u>Glacial Wells</u>				
1A	750.43	754.27	1.8	0.16
3B	700.48	731.82	15.3	1.47
4A	749.69	751.69	1.0	0.16
8	746.18	747.55	0.7	0.16
16A	--	DRY	--	0.16
20	650.07	727.32	37.8	0.16
<u>Shallow Dolomite Wells</u>				
22	708.74	754.93	90.4	0.65
23	701.74	736.05	67.2	0.65
25	81.50**	21.29	117.9	0.65
39	707.19	753.27	203.0	1.47
<u>Deep Dolomite Well</u>				
MW-4	≈500*	91.00	—	—

* Mean Sea Level
**Elevation of Well Measuring Point not surveyed. Depths listed are feet below measuring point.

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Ranney Collectors

The Ranney Collector System does not require evacuation, but does need to be flushed for 10 - 15 minutes between each sampling so that a representative sample may be collected. This is due to the use of a common pipe for discharge to the village sewer system. The discharge pipe is inside of the "Discharge Manhole" which is located approximately 7 feet northeast of the northeast corner of the groundwater pump house. The pipe without a valve attached is the Ranney System discharge pipe.

Ranney Collectors 1 and 3 need to be turned to the "off" position 24 hours prior to sampling so that a sufficient quantity of water is available for the flushing procedure. RC-2 will be sampled first and turned to the "off" position after samples are taken. Ranney Collectors 1 and 3 will be turned to the "auto" position, one at a time, and allowed to flush for 10 - 15 minutes and the samples collected. It is advised that the entire flushing and sampling times for Ranney Collectors 1 and 3 not exceed 20 minutes each so that the collectors do not run dry before sampling has been completed.

The VOA vials will be filled directly from the end of the discharge pipe, capped, checked for bubbles, and stored in an ice chest.

Shallow Dolomite Wells

Wells 21A, 24A, 28, and 29 are equipped with dedicated submersible pumps (A discussion of the plumbing system associated with these four wells is presented in 2.3.1, p. 17.). Well evacuation is accomplished by opening the valve on the system discharge pipe in the discharge manhole at each well and evacuating each well separately by turning their respective pump controls to their "auto" position. Quarterly samples are taken from a sampling tap which will be flushed for 2 - 3 minutes prior to sampling. The sampling taps are located on each well head. The VOA vials will be filled directly from the sampling taps using the same procedure as for the Ranney Collector System samples.

Wells 3A, 7, 23, 38, and 40 will be equipped with dedicated bladder pumps for well evacuation and sampling. The pumps are operated by connecting a pressurized gas supply to a controller which is connected a pressurization tube, located inside the top of each well head. Water is delivered by the process of inflating and deflating the bladder inside of the pump. This inflation and deflation process is controlled by the controller. The samples are collected in VOA vials from the sample tube which is connected to the pump as part of the dedicated equipment.

Deep Dolomite Wells

Well 30 does not require purging since it is constantly pumping. The samples will be collected from the sampling tap located on the well head and collected directly in VOA vials. The sampling tap will be flushed for 2-3 minutes prior to sampling.

Municipal Wells 1, 2, 3, and 4 will be sampled from sampling taps inside of their respective well houses. The taps will be flushed with the same procedure as for Well 30. Gerry Dickman of the Saukville Water Department must be notified at least 3 days in advance so that he may provide access to each facility.

A submersible pump will be installed at least 30 feet below the bottom of the casing in Well PW-8 for sampling purposes. This is the only practical way to sample this high yielding dolomite well, which is 455 feet deep. Neither a bailer, peristalic pump or bladder pump can evacuate the volume of water required prior to sampling. A minimum of 3 sampling hose volumes will be removed prior to sampling directly in VOA vials. Water generated during well purging will be discharged to the nearest sewer.

Glacial Wells

Wells 6A, 14B, 18A, 19A, 20, 27, 41, 42, 43, 44, 45, 46, 47, and 48 will be equipped with dedicated bladder pumps for well evacuation and sampling. The procedure evacuation and sampling is the same as described for shallow dolomite wells 3A, 7 (or 7A), 23, 38, and 40.

Yearly Sampling Location

For Wells 1A, 3B, 4A, 8, 16A, 22, 25, and 39 either a bladder pump, peristalic pump, or dedicated bailer will be used for well evacuation. When the bladder pump or peristalic pump is used, it will be washed and triple rinsed with deionized water before evacuation of another well. A plastic sheet will be placed around each well to protect the pump from contact with any potentially contaminated soil.

These 8 wells are all sampled with dedicated bailers. The procedure is as follows:

1. Gently lower the bottom discharging bailer into the monitoring well.
2. Allow the bailer to fill slowly, to minimize agitation of the VOC's.
3. Collect the samples in triplicate.
4. After sample collection, triple rinse the bailer with deionized water.
5. After collecting and preserving all samples, remove the protective plastic sheets from around the well.

Sampling Equipment Decontamination

All of the wells that are sampled for Freeman Chemical have dedicated sampling equipment in them. The sampling equipment is either a dedicated pump or dedicated bailer and therefore does not require decontamination. However, for wells without dedicated sampling pumps, a nondedicated pump is used for evacuating the well. This pump is decontaminated by thoroughly washing it with Alconox (or a comparable product), and rinsing it with deionized water. In order to minimize the possibility of any cross contamination, the wells that require the use of this pump are evacuated beginning with the least contaminated ending with the more contaminated.

Purged Water Disposal

Purged water from all wells will be discharged only into the Ranney Collector discharge manhole. This will require the filling of carboys, drums or water tanks and transportation of those drums and tanks to the discharge manhole (which flows into the sewer system.)

Field Measurements

Field measurements at each well are taken in the following sequence: Explosimeter and HNU readings, water level, well depth, purge volume, pH, temperature, and conductivity before a sample is obtained, and pH, temperature and conductivity after a sample is obtained. All measurements are recorded in the field notebook.

Before any physical measurements are made on the well, an explosimeter and HNU meter are used to ensure that it is safe to work near the well and to see if respirators are needed. A Model MX241 (or equal) Combination Combustible Gas/Oxygen Meter is used to measure the LEL (lower explosive limit) and a HNU Systems Model Pl-101 (or equal) used to obtain HNU readings. After worker safety has been ensured, well depth and water level measurements are taken and purge volume calculated. Three well volumes are then evacuated from the well, prior to sampling, if possible.

As outlined in the Technical Enforcement Guidance Document (TEGD, September, 1986), pH (Standard units), temperature (°C), and conductivity (μmhos/cm) measurements are recorded in the field notebook, before and after collecting samples at a well. An Orion Model 201 (or equal) pH meter is used to obtain pH values and a YSI Model 3000 (or equal) T-L-C meter is used to obtain temperature and conductivity. A sample container is rinsed three times and then filled with sample water to take the necessary measurements.

All instruments are calibrated according to the manufacturers recommendations and specifications. A discussion of each instrument's calibration procedures is presented in Appendix D. CBC personnel calibrate all instruments before leaving for the field to ensure it is in working order, and in the field, as required. All field calibration procedures are recorded in the field notebook. Backup equipment shall be readily available in case of instrument failure and calibration measures shall be followed as noted above.

Field Blanks, Field Duplicates, and Trip Blanks

Field blanks and field duplicates are to be collected at a frequency of one for every ten samples. Both these types of blanks are of the same volume and containers as the regular investigative samples. Field blanks are to be filled with deionized water at the location of the tenth sampling point. These blanks are routed through a decontaminated sample collection device before filling the sample vials. Field duplicates are to be taken along with the tenth sample and are to be labeled identical to the regular sample.

Trip blanks are provided by the lab and accompany each cooler containing VOC Samples to the site and back to the lab. They are documented and analyzed in the same manner as the regular samples.

The field blank for the Appendix IX testing, if required, will be prepared during the sampling of glacial well 6A. The trip blank for the VOC's will be supplied by Enseco as described earlier. Documentation for the field and trip blanks will be in the manner described above.

Field Records

A bound Field Notebook will be kept during the entire sampling trip. Basic field measurements and conditions, the sequence of observations, field instrument calibration procedures, the names of the sampling team, sampling progress, problems encountered, any deviations from the sampling plan and why, etc., will be recorded for later reference and/or documentation. Basic field measurements include all measurements and calculations needed to determine the volume of water to be evacuated from each well, explosimeter, HNU, pH, specific conductivity and temperature readings and sample collection times. The pages in the field notebook will be numbered consecutively and each sampler will sign the Field Notebook, for verification of the entries. The Field Notebooks will be kept in secured storage to maintain their integrity for future reference.

A Chain of Custody Record will be completed for each sample batch and secured to the sealed sample cooler after the samples or blanks are collected/prepared. Each sample, field blank or trip blank custody change (e.g., from the field sampler to the laboratory) must be documented on the Chain of Custody Record.

Sample Transportation

Transportation of samples will be in sealed containers with ice to keep the samples and blanks cool (4°C). The ice must be separately packaged in the container to preserve the integrity of the samples. CBC will ship these collected samples, field blanks, and trip blanks to Enseco Incorporated every other day, by overnight air express. Holding times for each group of tests are presented in Table 8. The reported holding times commence on the day the sample is collected. This procedure assures that Enseco has the samples no later than 3 days after sampling. This allows adequate time to analyze the samples within the prescribed holding time.

2.7 Laboratory

2.7.1 VOC Analyses

Enseco/Erco Laboratory, Cambridge, Massachusetts, is an EPA approved contract laboratory (CLP) for RCRA and Superfund sites. When samples arrive at the laboratory, they are logged in, the chain of custody form signed, and the condition of the samples noted and recorded (i.e., any visible signs of tampering or damage).

The methods to be used by the lab are EPA's Method 624 for the HSL VOC analyses and EPA's Method 602 for the Aromatic Volatile Organics (BTX) from the EPA Contract Lab Program (CLP) procedures. As part of their QA/QC Program, the lab has initiated sampling in triplicate and has included in the field sampling kits, water and containers for field blanks and trip blanks to be analyzed along with the other samples. Laboratory QA/QC procedures include using an extracted standard or spike as a quantitative check of the

TABLE 8
ENSECO RECOMMENDED MAXIMUM HOLDING TIMES AND
SAMPLE COLLECTION/PRESERVATION INFORMATION

Appendix IX Constituents*

Sample Container	Preservation	Minimum Sample Size (mL)	Parameters/Methods	Recommended Holding Times**
2 x 11-litter glass	4°C	1,000	Organochlorine, Organophosphorus, Pesticides/ Method (3510), (3520) 8080, Method (3510), (3520) 8140	7 days until extraction; 40 days after extraction
2 x 1-liter glass	4°C	1,000	Herbicides Method 8150	7 days until extraction; 40 days after extraction
2 x 1-liter glass	4°C	1,000	Dioxins, Furans/ Method 8280	7 days until extraction; 40 days after extraction
3 x 40-mL glass (VOA)	4°C HCl to pH <2	40	Volatile Organics/ Method (5030) 8240	14 days
2 x 1-liter glass	4°C	1,000	Semivolatile Organics/ Method (3510), (3520) 8270	7 days until extraction; 40 days after extraction
1 x 0.5-liter polyethylene	HNO_3 to pH 2***	100	Total Metals, ICP/ Method (3010) 6010	6 months
1 x 0.5-liter polyethylene	HNO_3 to pH 2***	100	Total Metals, Furance (As, Se, Tl, Pb)/ Methods (3020) 7060 7740, 7841, 7421	6 months

TABLE 8 (continued)

Appendix IX Constituents*

Sample Container	Preservation	Minimum Sample Size (mL)	Parameters/Methods	Recommended Holding Times**
		Aqueous Samples		
3 x 40-ml glass (VOA)	4°C, HCl to pH <2	40 ml	Volatile Organics/ Method (5030) 8240	14 days
3 x 40-ml glass (VOA)	4°C, HCl to pH <2	40 ml	Aromatic Volatile Organics/ Method (3510) 8270	14 days
2 x 1-liter glass	4°C	1,000 ml	Semivolatile Organics/ Method (3510) 8270	7 days until extraction; 40 days after extraction
		Solid Samples		
3 x 40-ml glass (VOA)	4°C, HCl to pH <2	20 g	Volatile Organics/ Method (5030) 8240	14 days
3 x 40-ml glass (VOA)	4°C,	20 g	Aromatic Volatile Organics/ Method (3510) 8270	14 days
2 x 8-oz jar, glass	40°C	100 g	Base-neutral Acid Extractables/ Method (3540), (3550) 8270	7 days until extraction; 40 days after extraction

Please note that no filtration is required for VOCs or SVCs.

* Preparation methods are in parentheses, followed by analytical procedure (where applicable).

** Holding time is calculated from the date of sample collection.

tab8.fcc

TABLE 8 (continued)

Please note that no other Appendix IX constituents require filtration.

* Preparation methods are in parentheses, followed by analytical procedure (where applicable).

** Holding time is calculated from the date of sample collection.

*** This preservation is for total metals. Dissolved metals require filtration prior to the pH adjustment.

samples. A detailed description of Enseco's Quality Assurance Program is contained in Appendix C.

2.8 POTW Sampling Program

2.8.1 Introduction

Freeman Chemical has constructed three Ranney Collectors within the contaminated areas on-site to collect the groundwater for subsequent treatment. Waters collected from the Ranney System are discharged to the Saukville POTW sewerage system to be treated by the Village's activated sludge treatment facility. The Village agreed to accept the contaminated groundwater from Freeman on the condition that periodic laboratory analyses to be conducted to ensure effective treatment of the VOC's and that no accumulation was occurring in the sludge.

As indicated in Section 2.3.2, two studies were conducted on the POTW treatment of the contaminated groundwater during 1987. Neither of these studies indicated any treatment problems under "normal" operating conditions.

2.8.2 Objective

The objective of this sampling program is to continue to check the Saukville POTW's capability to effectively handle the contaminated groundwater collected from the Freeman Chemical facility.

2.8.3 Sampling Methodology

Since the three Ranney Collectors all operate independently and their discharges are automatically controlled, obtaining representative samples from the POTW's influent and effluent during "normal" Ranney Collector operations would be extremely difficult. However, based upon the metered discharges from the three systems, RC-2 contributes about 94% of the total flow to the POTW and discharges about 50% of the time. RC-1 and RC-3 were estimated only to discharge for about 3 minutes every 5 to 6 hours. When RC-2 is run continuously over some unit time, instead of over 50% of the time, the total chemical loading to the POTW would be greater than when all three systems are operating normally, Therefore, the most representative sampling conditions would be with RC-2 running continuously while RC-1 and RC-3 are manually turned off. Since sludge age at the POTW plant averages about 2.5 days, samples from it should be representative of normal operations.

The following sampling protocol will be followed:

1. Manually turn off RC-2 12 hours prior to initiating the sampling program.
2. Collect POTW sludge sample.
3. After 12 hours, manually turn off RC-1 and RC-3 and turn on RC-2.
4. Four (4) hours later, collect POTW influent sample at "wet well".
5. Fifteen (15) hours after collecting influent sample, collect effluent sample.

Influent samples will be collected in the POTW's "wet well" utilizing a teflon-lined bottom discharge bailer. The bailer will be gently lowered into the well allowing it to fill slowly to minimize agitation of water containing VOCs. Gently fill the VOA vials, in triplicate, and cap. Check vials to ensure no air bubbles have formed and immediately place samples in ice cooler. Record collection data in the Field Notebook.

The effluent samples will be taken below the discharge of the final settling and aeration basin from the chlorine contact trough, just prior to decent down the aeration stairs on its way to the Milwaukee River. The effluent samples will be taken prior to the point of chlorination to avoid any possibility of the chlorination forming chlorinated organic compounds. The triplicate VOA vials will be submerged at an angle and allowed to fill slowly. When the vials are full, they will be capped and checked to ensure no air bubbles exist. Immediately place the vials in the ice cooler and record sampling information.

The sludge samples will be collected from the aerobic digester, which is the last process before the sludge is pumped to the spreader for land application. The sampling method will be the same procedure used to collect the effluent samples.

The samples and Chain-of-Custody will be air expressed to Erco Laboratory, Cambridge, Massachusetts. All of the samples (collected quarterly) will be analyzed for the HSL VOC using EPA's Method 624, including the CLP QA/QC procedures. A one-time Method 625/HSL organics analysis will be performed on the Spring quarter 1989 samples.

2.9 <u>Investigation of Logeman Property</u>

Two areas on the Logeman property require additional investigation as indicated by the EPA/WDNR. These areas consist of the incinerator and the wastepile.

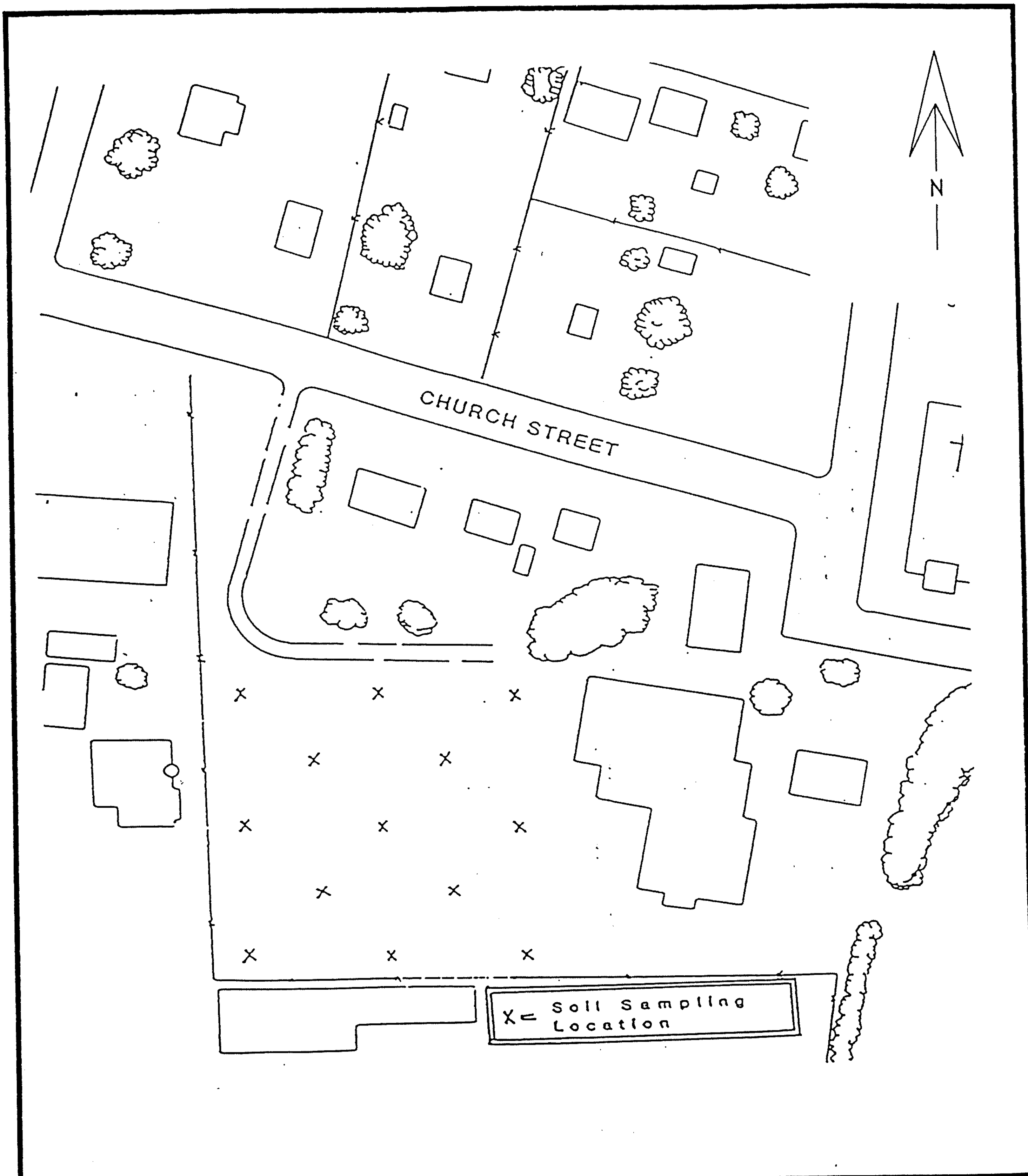
To complete the investigation of the incinerator, it is required that at least two borings be placed near the incinerator. One boring will be installed within 10 feet of the east side of the incinerator, the other will be installed approximately 50 feet east of the incinerator. The borings will continue to the water table. Soil samples will be HNU screened at 5-foot intervals. The soil samples will be placed in glass jars, covered with aluminum foil and sealed with a "mason"jar type lid. After allowing to equilibrate for approximately 2 hours at approximately 70-80° F., the samples will be analyzed with a HNU Model P1-101 Photoionization detector by inserting the probe through the aluminum foil. The soil sample with the highest HNU reading from each boring will be analyzed for Method 8240/HSL parameters. Separate soil samples will be taken for laboratory analysis so as to eliminate head space losses and losses due to bacterial activity. These samples will be taken simultaneously with the HNU field screen samples and immediately prepared and iced for laboratory analysis. These samples will be properly sealed with a secure teflon/stainless steel-lined cap and not re-opened until received by the laboratory. Soil samples for 8240/HSL analysis will be stored at approximately 4° C (in cooler with ice) and shipped to the laboratory for analysis. At the water table, a temporary screen will be installed in each boring. The temporary well will be purged and sampled for Method 624/HSL parameters. An additional soil sample will be collected in the area where the ash was removed from the incinerator. This sample will be collected at a depth of 0 to 6 inches and analyzed for Method 625/HSL, HSL metals and EP metals.

To complete the investigation of the wastepile on the Logeman property, it is required that three shallow borings be taken in the wastepile to characterize the waste. Each of the borings will bore through any existing cover material, and continuously sample the boring through the waste until native soils are encountered. Soil samples will be obtained by continuous split-spoon sampling. A composite sample of the waste will be prepared from each boring and analyzed for Method 624/HSL, Method 625/HSL, HSL metals and EP metals.

In order to prevent cross contamination of soil samples during sampling, split-spoon samples will either be washed with a soap solution and triple rinsed with deionized water or steam cleaned. The method of decontamination will be selected based upon the ability to establish a convenient steam cleaning point. All hollow stem augers will be steam cleaned prior to drilling each location.

2.10 Church Yard Sampling/Testing Program

The USEPA and WDNR have expressed concern about the presence of volatile organic compounds at shallow depths directly beneath the church property. In order to address this concern, we propose to drill 13 hand auger borings to depths of 3 feet at the locations shown in Figure 9. Each location will be sampled at 12" - 14" and 36" - 38" depths unless we meet auger refusal at a lesser depth. If we are unable to hand auger to 36", we will move the sampling location. If this is unsuccessful, we will sample from the depth closest to 36". The sampling will be accomplished by first drilling with a hand auger to the specific sampling depth. Then, a hand driven soil core sampler will be used to obtain two 1" long and one 2" long and 1.9" O.D. soil samples. The sample ring assembly will consist of an upper and lower 1" cylinder and



JOB #:0001-003	FIGURE 9	HATCHER-SAYRE, INC.
DATE: 4-03-91	SOIL SAMPLING LOCATION PLAN	
SCALE: 1" = 100'	FREEMAN CHEMICAL CORPORATION	
DRAWN BY: RDM	SAUKVILLE, WISCONSIN	

a middle 2" cylinder. A description of the sampling equipment is included as Figure 10. The sample will be contained in two 1" long and one 2" long, thin wall stainless steel retaining cylinders. Upon completion of the sampling, the 2" cylinder will be removed from the sampler, immediately covered on both ends with a stainless steel cover and capped with plastic cover, taped longitudinally, put into a ziplock bag and then placed in an ice chest for laboratory analysis. The two 1" cylinders will be immediately placed in a ziplock bag and will be analyzed with an HNU Model caP1-101 photoionization detector after a time interval (from sampling to analyzing) of approximately 2 hours at approximately 70-80° F. The hole will then be extended to the next sampling depth, and sampling performed at the next interval. A total of 26 samples will be taken and sent to ERCO in Cambridge, Massachusetts for 8240/HSL volatile organic compound analysis. The holding time for refrigerated soil samples is 14 days from the date of sampling.

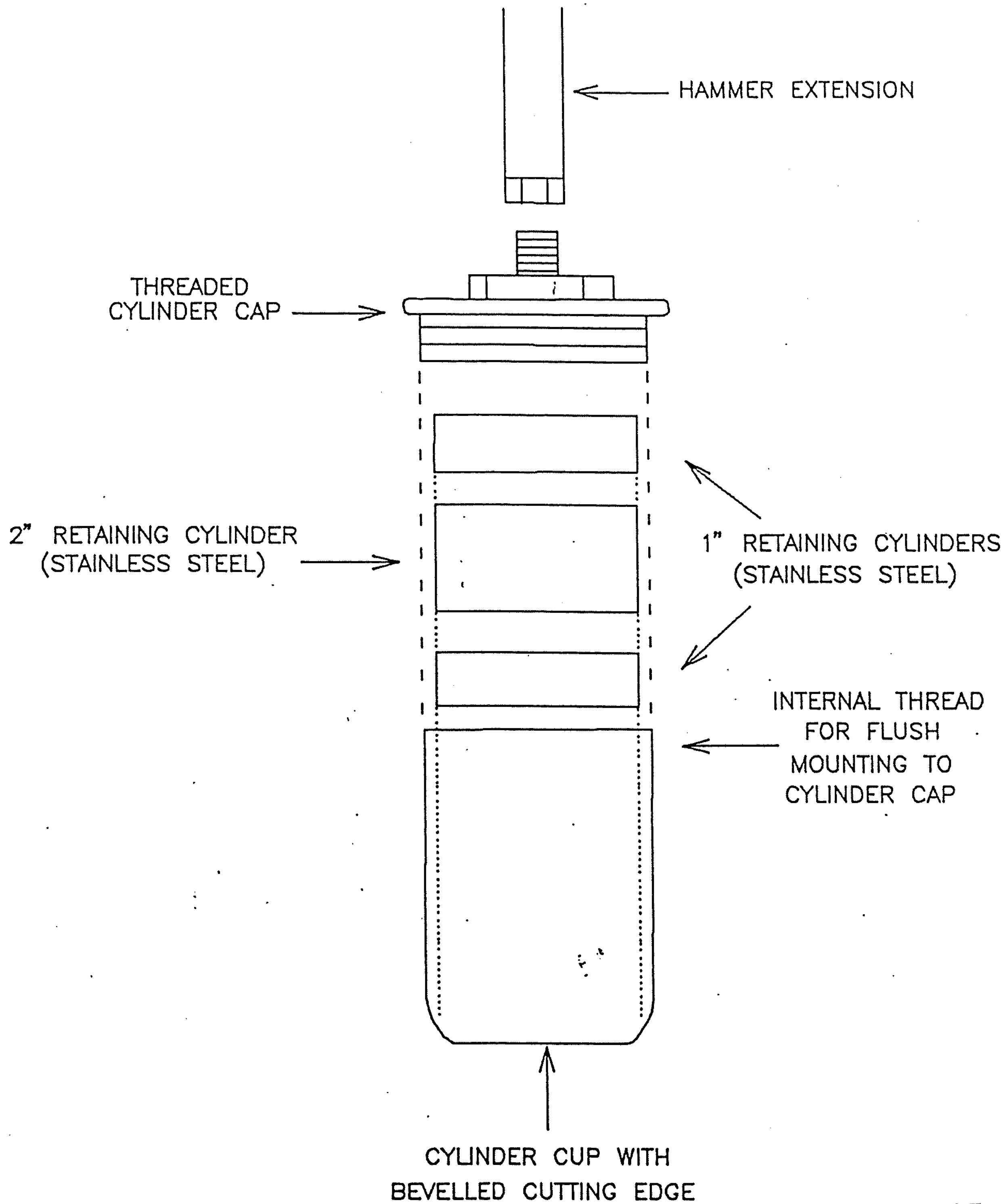
The following decontamination procedures will be used at each sampling location:

a. A clean hand auger and clean sampling spoon with clean stainless steel cylinder insert will be used at each location.

b. The hand auger will be decontaminated between each sampling location and the sampling spoon cleaned between each sampling interval.

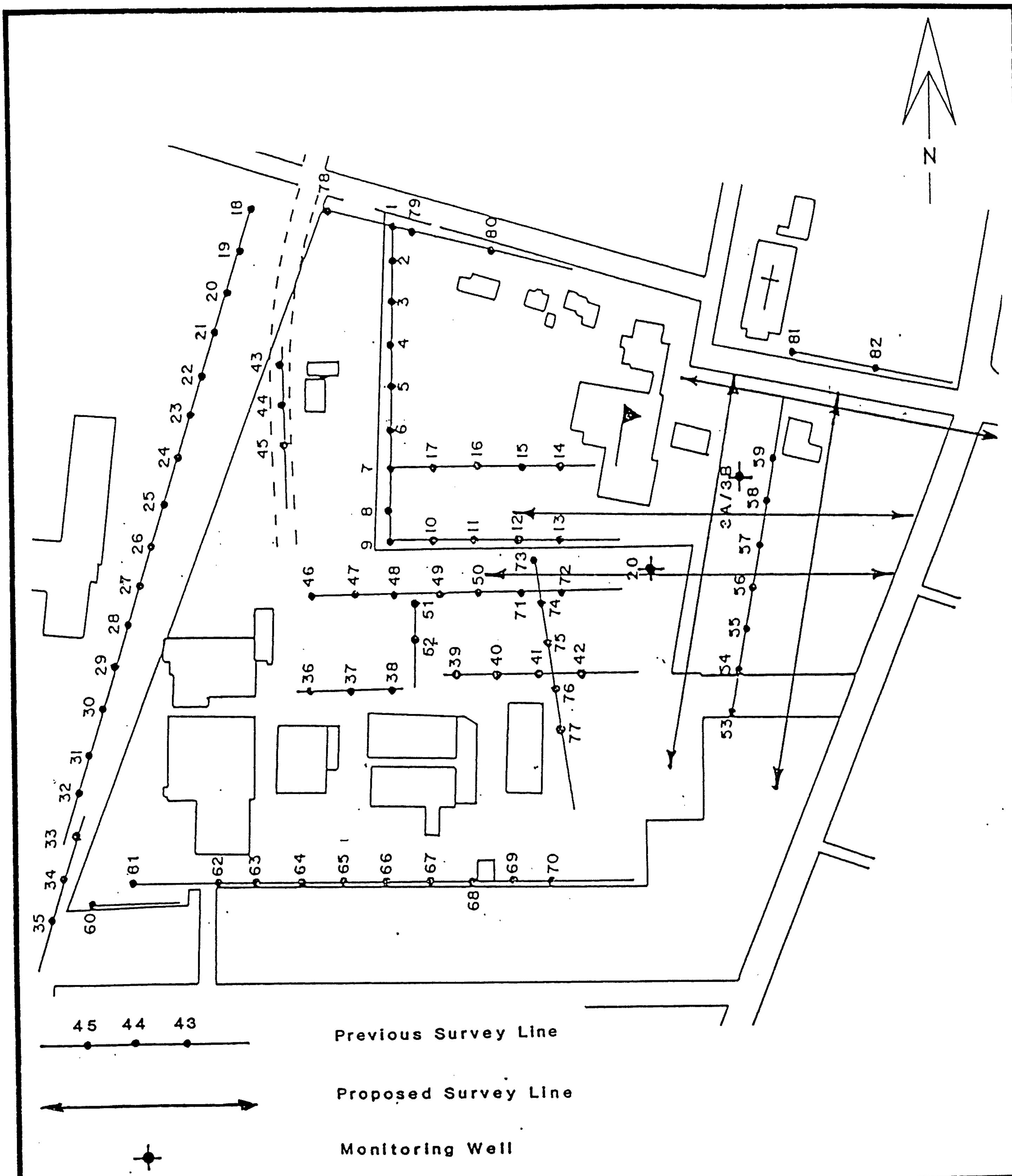
c. Clean stainless steel cylinders will be used at each sampling depth. The stainless steel cylinders will not be reused. The hand auger bucket and the sampling instrument will be cleaned with a soapy water solution, rinsed with tap water and finally rinsed in distilled water and dried before next use.

d. Once properly sealed and capped, the 2" stainless steel cylinder will be placed on ice until all sampling is complete and then shipped to ERCO in Cambridge, Massachusetts for analysis.



NOT TO SCALE

JOB #:0001-003	FIGURE 10 DIAGRAM OF HAND DRIVEN SOIL CORE SAMPLER FREEMAN CHEMICAL CORPORATION SAUKVILLE, WISCONSIN	HATCHER-SAYRE, INC.
DATE: 4-03-91		
SCALE: AS SHOWN		
DRAWN BY: RDM		



JOB #:0001-003	FIGURE 11
DATE: 4-03-91	SIESMIC SURVEY LINE LOCATION PLAN
SCALE: 1"= 200'	FREEMAN CHEMICAL CORPORATION
DRAWN BY: RDM	SAUKVILLE, WISCONSIN

HATCHER-SAYRE, INC.

ft. in length.

Reflection seismic surveying measures the travel time of compressional waves reflected from subsurface layers. These compression waves are generated by a surface impact source or from a shot. In this method of investigation, selected reflector horizons are mapped, and the depths to various subsurface strata can be established. The intent of this study is to describe the configuration and bottom of the river channel/sinkhole. It is estimated that the investigation must extend to depths of at least 300 ft., which are readily attainable using the reflection system. Performance of geophysical surveys are in part affected by frozen ground conditions, however, such conditions have less impact on a reflection survey than on a refraction survey. Assuming that the investigation is performed during periods of frozen ground, accuracy of the survey is not significantly impacted. By generating information on 20 ft. centers, it will be possible to prepare a detailed traverse through the area. Based upon the depths of reading, ground conditions, type of impact source and the steepness of the side slopes of the subsurface feature, there may be a margin of error of approximately 5 to 10 ft. and not more than 20 ft. This is not considered significant,when attempting to define the limits of what appears to be rather sizeable subsurface feature. The intent of the study is to determine the general depth and overall configuration of the structure, and this can be obtained with the above described accuracy.

The locations presented on Figure 11 have been field checked. Lines along S. Main St. and Church St. will be made along the public grassed median areas between the sidewalk and the road. We have received permission to perform a traverse through the church property and finally, two other traverses will be performed on the Freeman property.

It is estimated that approximately three (3) days will be required to complete this survey. Once the results of the survey are provided to us, we will review the data and then make an assessment as to whether the feature is a sinkhole or a buried river channel. We understand that it will probably be necessary to drill a confirmatory boring in the area. A recommended location for this boring will be submitted to EPA and WDNR for confirmation before the location is drilled. We understand additional traverse lines may ultimately be required, however access to numerous residential properties will be necessary if any further investigation is required.

2.12 Hydrogeologic Testing Program

2.12.1 Introduction

One of the major tasks to be completed at the Freeman facility is the performance of aquifer test program. Information developed from such a program will provide more accurate characterization of the Dolomite Aquifer in the plant area and also better define the hydraulic relationship between Village wells and Freeman wells. Information developed from this will allow the definition of the capture zone within the Dolomite Aquifer, the hydraulic relationship between the Milwaukee River and the aquifer, and also the sinkhole/river channel and the aquifer. To help identify the extent of the capture zone for the dolomite extraction system, glacial and shallow dolomite water elevation maps will be prepared at the beginning and end of each step of the pump test program. Water level data will be developed for all of the monitoring wells installed by Freeman.

The aquifer test, which requires the pumping of several different wells at different intervals, will not be performed before mid-May and probably not until June, 1989, because of current and proposed modifications to the Saukville Village wells. We have spoken with representatives of the Village of Saukville, and it was stated that it would not be possible to perform the aquifer test prior to this time and receive their cooperation.

Since the aquifer test program represents a major remaining task to be performed, a discussion of both previously developed data and the proposed program are presented below.

Background

The recommended remediation scheme for the Dolomite Aquifer at Saukville, Wisconsin, is withdrawal of contaminated groundwater, principally through a new deep well on the Freeman Chemical Corporation (Freeman) property. The rationale is that the localized reversal of the groundwater gradient from toward the Village's well field to one sloping toward the original source of pollutants will in time flush this aquifer of contaminated groundwater.

Well MW-2 has yielded water having low levels of contaminants and an odor since about 1979. Well MW-1 apparently draws in slugs of contaminated water periodically. It is currently reported to be "clean." There is some circumstantial evidence that not pumping well MW-2 causes contaminated water to be drawn into well MW-1 when it is pumping.

An attempt has been made to place well MW-3 back in service by reducing its "clay" or "silt" content to manageable levels. This has in part been successful, although the well reportedly still yields some "silt." This well reportedly sustained a one-time incident of "contaminated" water and odor problem. However this well is on the opposite side of the Milwaukee River from the Freeman property, and there is extremely little or no demonstrated pumping gradient toward well MW-3. No contamination has ever been detected at well MW-4.

It is obvious from a groundwater hydrology standpoint that the greater the rate at which the new Freeman Remediation Well (W-30) is pumped, the larger its cone of influence, the higher the groundwater flow velocity, and the faster the Dolomite Aquifer will be flushed of contaminants. However, high pumpage rates reportedly substantially reduce the water levels in the Village's wells (except perhaps well MW-3), and therefore, their potential usable potable water supply.

Various combinations of pumping schemes have been proposed and discussed as the one best to: a) remediate the Dolomite Aquifer and b) maintain a potable water supply for the Village. All have some merit.

Some of these schemes include:

a. Pumping wells MW-3 and MW-4 for potable water, well W-30 for remediation and cooling water, and placing wells MW-2 and MW-1 out of service.

b. Pumping wells MW-3, MW-4, and MW-1 for potable water; pumping well W-30 (and perhaps the Laubenstein Well, PW-8) for cooling water and remediation; and leaving only well MW-2 off.

c. Pumping wells MW-3 and MW-4 for potable water; pumping wells MW-2, W-30, MW-1, and perhaps even the Laubenstein Well for remediation and cooling.

Obviously, the rate of pumping, the combination of wells used for pumping potable water versus remediation, and the timing of any pump sequencing all potentially affect the amount of potable water available to the Village as well as the rate of Dolomite Aquifer remediation. Therefore, local Dolomite Aquifer pumpage needs to be managed and coordinated carefully. It will be necessary to meet with appropriate Village representatives several months in advance of the testing program to develop a satisfactory aquifer test protocol.

Pump Test History

All of the wells now being used by the Village have undergone some form of performance testing. A major aquifer test using wells MW-1, MW-2, MW-3, MW-4, and the Laubenstein well was conducted in the Summer of 1984.

Much was learned from this test about the local aquifer system, the affect of one well's pumpage on the others, and the probable range of T & S (Transmissivity and Coefficient of Storage) of the Dolomite Aquifer. However, the test was conducted under a severe constraint -- the need to provide a continuous source of water to the Village and to Freeman. Also, during this test, pumps cut off and on automatically in response to water needs, and new pump tests were started before the Dolomite Aquifer had totally recovered from a prior test.

Since then, well MW-3 has undergone rehabilitative cleaning and testing and a larger capacity pump is planned, the Laubenstein Well casing has been extended to 100 feet, and a new deep dolomite well has been constructed on the Freeman property.

The new Freeman Well (W-30) underwent a short (24-hour) acceptance test in August 1986 and a longer, step-drawdown test in the Spring of 1987. During the latter test, the water levels and pumpage rates in the Village wells, the Laubenstein well, and the Freeman observation wells were monitored.

No test has been conducted long enough to adequately establish leakage from the thin, low-permeability, glaciofluvial sediments overlying the Dolomite Aquifer. Although the longer pump tests conducted thus far indicate the interception of recharge in the late stages of the test data, the source of that recharge whether from the Milwaukee River, local swamps, leakage from the overlying glaciofluvial cover, or some combination of all three is currently unknown.

2.12.2 Objectives

It is proposed that additional integrated aquifer tests be made to establish:

a. The efficacy of the several proposed long-term groundwater withdrawal schemes at Saukville.

b. To further check the accuracy of past pumping test results.

c. The capture zone for the Ranney Collectors.

d. The hydraulic relationship between the on-site river channel/sinkhole and the Dolomite Aquifer.

e. The hydraulic relationship between the Dolomite Aquifer and the Milwaukee River.

Data developed from the proposed aquifer test program will be used to establish the "capture zone," in the area in which contamination would be intercepted as a result of on-site pumping activities.

This test would differ from past tests in several respects, the most important of which being that no test would be conducted until the Dolomite Aquifer had reached a "steady state" pumping condition in response to pumping enough water to keep the Village of Saukville and Freeman supplied with water. Most aquifer tests are conducted under what are termed "static" conditions wherein no water other than that discharged by the well under test is withdrawn from the aquifer. Because it is not possible to attain this non-pumping or "static" condition without closing down Freeman and the Village for a lengthy period of time, it is proposed to conduct new tests after the well or wells necessary to supply only Freeman's and the Village's needs have pumped at a steady, continuous rate long enough for the aquifer to adjust to a "static" or "steady state" pumping condition. For example, this can be accomplished by pumping two wells continuously at their design or pump capacities, until drawdown in the aquifer has stabilized; starting the test of some other well; and following completion of the test of that other well, allowing the aquifer to recover to its "steady state" condition once more before starting another test on the next well.

2.12.3 Specific Test Protocols

General

Background aquifer storage conditions in the dolomite and overlying glacial sediments must be monitored in order to adjust test results for diurnal changes, barometric effects, rainfall, and other normal seasonal changes. This requires, as a minimum, the monitoring of one unpumped dolomite well and one glacial sediment observation well located outside the potential test pumping zone of influence beginning at least one week prior to the test pumping and continuing throughout the entire testing period.

All such background "monitoring" wells should be equipped with continuous recorders.

Because the test cannot be conducted under truly static conditions but rather under "steady state" pumping conditions, water for the Village and Freeman must be withdrawn from the Dolomite Aquifer at a constant and continuous rate. Effectively, this means that whatever well(s) is(are) chosen to supply the 24-hour needs of the Village and Freeman must not ever cut off or change its(their) rate of discharge during the entire test period. To meet this condition slightly more water than is needed must be pumped with the excess going to storage. When storage is full or reaches a preset level, all automatic controls used by the Village to shut off pumps at that point must be in a "manual" or "off" mode so that excess water is wasted to the Milwaukee River. Also, all air lines on all pumps will have to be checked for operational accuracy with an electric tape prior to the test period.

<u>"Steady State" Aquifer Condition</u>

It is proposed that "steady state" aquifer conditions be achieved by pumping wells MW-3 (600 gpm ± with new pump) and MW-4 (780 gpm ±) at a combined yield of 1380 gpm for a minimum of one week prior to the inception of the test period or until it is judged from water level measurements in other local dolomite wells that drawdowns in the aquifer resulting from the combined pumpage of wells MW-3 and MW-4 have truly stabilized. Adjustment of the combined output of well MW-3 and MW-4 to slightly more than is necessary for the long-term constant needs of the Village and Freeman will require throttling of well MW-4 output. Discussions with the Village Water Department Manager will be required in order to determine what maximum combined pumping rate is feasible and can be tolerated.

Wells MW-2 and MW-1, the Laubenstein Well, and Freeman well W-30 will not be pumped during creation of the "steady state" pumping condition. Furthermore, the on-site Ranney collector wells (R-1, R-2 and R-3) will not be pumped.

Step I Test

In discussions and correspondence with EPA/WDNR, there is some question as to whether or not the dolomite well extraction system is causing most of the dewatering in the glacial deposits. Consequently, the effectiveness of the Ranney Collectors is not known. Since previously developed water table surface maps are not believed by the agencies to be of sufficient detail to establish the capture zones of the Ranney Collectors, additional monitoring points will be required near the collectors to establish their effectiveness.

To estimate the capture zone of the Ranney Collectors, monitoring of the eight driven well points is proposed at the locations shown on Figure 5. These areas are assumed to be representative of other areas served by the Ranney Collectors. The objective of the monitoring is to establish the area of influence by the collectors and to find the approximate locations of the groundwater divide downgradient of the Ranney Collector. The divide is considered the capture zone of the collector because only contaminants upgradient of the divide can be intercepted by the collector.

Since only water elevation measurements are needed in establishing the capture zone, stainless steel well points driven into the glacial overburden are proposed. The well points will be installed to the depth of the respective Ranney Collector sump, which is the lowest point of each system. They are intended for obtaining only water level readings and will not be suitable for sampling. Although the exact number of well points will be determined in the field, a minimum of 8 wells are planned. A 25-foot spacing will be used to locate the groundwater divide to within 25 feet.

It is intended to establish the hydraulic parameters desired by utilizing recovery tests rather than pumping tests. The following program is planned:

1. At the time of the W-30 pump test (described below as Step II Test) we will turn off the Ranney Collector

System 2 weeks prior to turning off W-30. We will monitor all glacial wells including the 8 driven well points during recovery from pumping the Ranney Collector.

2. Once it is decided to terminate the pumping of W-30, we will monitor further recovery in the same glacial wells and driven well points. The recovery period will be monitored until sufficient data can be obtained for hydraulic analysis.
3. The glacial wells and well points will be monitored during other on-site aquifer tests in an attempt to more thoroughly understand the interrelationship between the Dolomite Aquifer and the Glacial Aquifer.

Step II Test

The first part of the test period will be pumpage of well W-30 at a minimum 400 gpm and observation of its effect on aquifer storage. A higher pumping rate (600 gpm) may be utilized if the electrical system can be modified and if the higher rate of pumping does not detrimentally impact Village water supply requirements. The Step II Test will be continued until it is determined that sufficient test data have been collected to document all long-term effects on aquifer storage and areal distribution of its drawdown cone of influence. This is expected to take from 3 days to 1 week. Wells MW-3 and MW-4 will continue to pump at a constant rate. This rate will be based upon the existing pump settings and maximum allowable pumping rates, which will not detrimentally impact the Village Water System. Discharge from well W-30 can be either used for cooling or wasted. If used for cooling, then provision for an equivalent wasting of water at the Village storage reservoir must be assured. In conjunction with monitoring the deep dolomite wells, we also plan to monitor water levels in select glaciofluvial wells in order to determine the hydraulic interconnection between the Dolomite Aquifer and the overlying unconsolidated materials.

After all data have been collected in the Step I test, the pump test results will be analyzed before proceeding to Steps III, IV, and V, which will be completed at a later date.

Step III Test

Following total recovery of well W-30, judged from a return of pre-pumping water levels at that well, well MW-2 will be pumped at approximately 190 gpm until the same confidence in the data set as needed for Step I is established. This is anticipated to take from 2 to 4 days. Wells W-30 and MW-1 will remain off, and wells MW-3 and MW-4 will continue to be pumped at a constant rate during this period.

Step IV Test

Following complete recovery of well MW-2 (1 to 3 days), well MW-1 will be pumped at approximately 300 gpm until the same set of data conditions as above are met (2 to 4 days). Wells MW-2 and W-30 will be off, and wells MW-3 and MW-4 will be on and pumping at the same rate as before during this step.

Step V Test

Optionally, some combination of wells W-30 and MW-2 or wells W-30, MW-1, and MW-2 will be run while pumping MW-3 and MW-4 at a constant rate.

Monitoring Program

The monitoring program will utilize those wells which are expected to provide data essential to evaluating the Dolomite Aquifer. The following dolomite wells will be utilized: MW-1, MW-2, MW-3, MW-4, PW-8, W-30, a residential well on the east side of the river, and a new well on the west bank of the river. The following six groups or nests of glacial overburden and shallow dolomite wells will also be monitored: 14B/24A, 18A/22, 43/38, 46/21A, 16A/40 and 3B/3A (or a new well drilled in the middle river channel area). A summary of the monitoring wells to be used in each pumping test are presented in Table 9 and their locations are presented on Figure 12. Water level readings will be taken with electronic water level indicators, airline pressure gauges, chart recorders and possibly with pressure transducers.

TABLE 9

Summary of Dolomite Aquifer Test Program

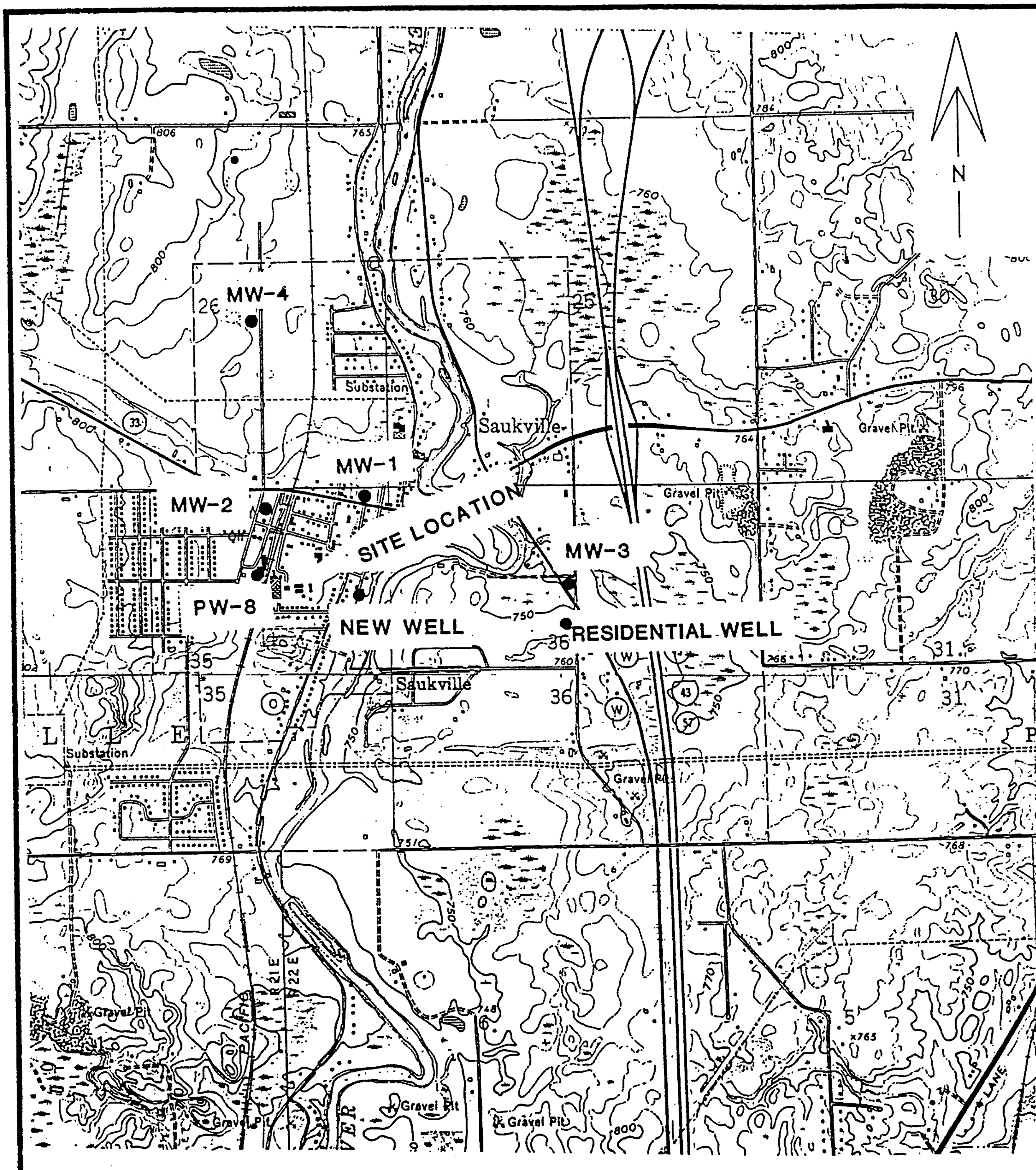
		Monitoring	
Test	Logarithmic[a]	Continuous[b]	Hourly/Daily[c]
Step II, W-30 (600 gpm for 3-7 days)	MW-1, MW-2 PW-8, W-30	Residential Well/east bank, New Well/ west bank	24A/14B,38/43 46/21A, 22/18A, 16A/40, 3A/3B (or new well) MW-3, MW-4
Step III, MW-2 (250 gpm for 2-4 days)	"	"	"
Step IV, MW-1 (300 gpm for 2-4 days)	"	"	"
Step V, (Optional) Combination of W-30, MW-1, MW-2	"	"	"

a. Every minute 0-30 min; every 5 min. 30-60 min; every 10 min. 60-120 min; every 15 min., 120-180 min; every 30 min., 180-240 min; hourly, 240 min - 1080 (12 hrs.) every 4 hrs., 12 hrs - 24 hrs., twice daily until termination of pump. Use same frequency for recovery.

b. Chart recorder.

c. Hourly for first 12 hrs, then follow sequence for wells MW-1, MW-2, PW-8, W-30.

Note: Background water level readings will be obtained for all monitoring wells installed by Freeman at least 3 days prior to performance of the tests. During the tests readings will be taken at least every other day for all wells installed by Freeman not listed above.



FROM USGS 7.5' TOPOGRAPHIC QUADRANGLE: PORT WASHINGTON WEST, WISCONSIN

JOB #:0001-003	FIGURE 12	HATCHER-SAYRE, INC.
DATE: 4-03-91	LOCATION OF MUNICIPAL WELLS AND OUTLYING MONITORING WELLS	
SCALE: 1:24000	FREEMAN CHEMICAL CORPORATION	
DRAWN BY: RDM	SAUKVILLE, WISCONSIN	

The program will include monitoring of the Milwaukee River during the aquifer tests. A permanent measuring point consisting of a "pk nail" will be established in the bridge (Main Street) nearest the site. Elevations will be determined for these points by a certified land surveyor. River water levels will be recorded before the pump tests and daily during the monitoring period using an electric tape. Measurements will be taken to the nearest 0.01 feet.

Pumping Test Schedule

Because it is necessary for the Dolomite Aquifer to stabilize at a "steady state" pumping condition before pump tests can begin and completely recover between tests of individual well tests, the proposed long term aquifer management test is expected to last from 25 to 50 days. This schedule provides two days for the installation of water level recorders on wells outside the local aquifer use area to obtain background water storage data.

Also, 1 to 2 weeks has been allowed for the stabilization of the aquifer and any adjustments to yields or Village and Freeman water handling procedures that may be necessary. It is imperative that this section of the schedule be as short as possible to prevent undo migration of contaminants toward well MW-4, and long enough to ensure stabilization of the aquifer.

Following achievement of the desired steady state condition a 1 day period is provided to ascertain that everyone who will be participating in test monitoring understand their task and water level measuring schedule and that all equipment is in working order. The subsequent tests will be run sequentially, 24 hours per day, allowing only breaks for total recovery of the well being currently tested. At the conclusion of each pump test period (during the recovery period) the pump test results will be evaluated as to the need for any adjustment of pump test scheduling of the remaining wells.

Water Quality Testing

It is proposed that Municipal Wells 1 & 2 and Freeman Well W-

30 be monitored for chemical oxygen demand and conductivity to ensure that changes in water quality which could occur as a result of the continuous pumping be quickly recognized. These tests would be performed every eight hours throughout the duration of the pump test.

Personnel Complement

This Aquifer Management test will need different levels of staffing depending on what activity is being done. Installation of the recorders, background monitoring, and monitoring the progress of aquifer stabilization requires one senior technician or junior hydrologist. He should arrive 1 to two weeks prior to everyone else.

The first few hours of each pumping and recovery period will require a minimum of 4 people. Following the first 8 hours, a minimum of three people on a 10 hour (2 hour overlap) shift cycle can handle a long term pump test. Each well measuring cycle will take at least an hour to allow sufficient time to visit each observation well and take an accurate measurement.

The proposed staffing is as follows:

a. A Senior Geohydrologist who is responsible for the planning and test decision making, interfacing with the Village, Hatcher-Sayre, Inc., and Freeman, and collation and interpretation of test results. This person would actively participate in monitoring activities and shift work.

b. A staff or junior level geohydrologist who would assist the Senior Geohydrologist in his responsibilities and data interpretations as well as work a routing water level monitoring shift.

c. A Senior Technician who would be responsible for installation and maintenance of recorders in addition to a water level monitoring shift.

d. One or two trained Technicians (or trained on the job) who could be a local hire to help the staff during the first few hours of a pumping or recovery period and to sub for the Senior Geohydrologist when he is needed elsewhere.

2.12.4 Aquifer Test Analysis

The pumping test data will be used to construct both semi-logarithmic and logarithmic plots, depending upon the analytical method selected to interpret the data. It is intended to use Jacob-Lohman method for evaluating drawdown data from the pumping wells and the Hantush-Jacob method and Hantush Modified method for drawdown data from the observation wells and/or other published methods as appropriate. The methods which are used for the leaky artestian case, utilize a curve matching technique to determine the hydraulic properties of aquifer and the confining bed. Interpretations of the aquifer test data will be based on both time-drawdown and distance-drawdown curves.

3.0 DATA MANAGEMENT PLAN

3.1 Introduction

Data collection on the groundwater investigations/ remediations at the Freeman Chemical Corporation's Saukville Facility has been on-going since 1983. Data obtained by or pertaining to these investigations have been, for the most part, either provided as data summary reports or as raw data to the U.S. EPA and the WDNR. This section defines the data management procedures to be followed during the remedial action assessment phase of the project.

3.2 Objective

The primary objective of the data management plan is to document and track investigation data and results in an orderly and manageable fashion. The plan is to establish data documentation materials and procedures and also provide the formats to be used to present raw data and conclusions of the investigations.

3.3 Data Records

All outgoing correspondence regarding the Freeman Chemical groundwater remedial investigations are maintained in a specific project file No. 0001-003. This file, which is in chronological order, also receives all of the project in-coming correspondence after it has been stamped with the receiving date and the project number. Large attachments, reports, etc. are maintained in a separate file identified by the project number 0001-003 and filed by category, i.e., Final Consent Order, Soil Boring Logs, etc.

A separate data management file has been established by the QA/QC Coordinator to track the project sampling activities and document the quality control procedures established for the project (discussed in the Sampling Plan). Major file headings include:

- Project Plans
- QA/QC Forms

- Sampling Notifications
- Pre-Field Documentation (Equipment Lists, Calibration Logs, etc.)
- Raw Field Data (By Sampling Period)
- Chain-of-Custody Records
- Laboratory Data (By Sampling Period)
- POTW Sampling Data
- Hydrogeological Testing
- Audits/Actions

Raw data initially received by the office are checked for inconsistencies by an appropriate technical staff member. If any inconsistencies are found, they are documented along with the approach for checking their source and the final determination. If the data appear correct or inconsistencies resolved, the technical person signs off on the data and it can then be entered into the computer.

The computer database storage system will be constructed using dBase III Plus Version I.0, by Ashton-Tate. This program will provide storage, sequencing, selection and report generation for any or all items in the database. This will make it possible to recall any file or files by date, geologic formation, sample I.D., or any other parameter or combination of parameters, which are included in the database. For instance, by using this software, a report may easily be compiled showing wells between 100 and 110 feet deep with stainless steel screens that were sampled on a certain date or dates with a concentration of total xylenes over 10 ppb, but less than 50 ppb.

The database will be divided into sub-directories so that access to data is simplified. The sub-directories will include:

1. Well Construction Data
   - Construction Material
   - Well Depths
   - Diameters
   - Screen Lengths
   - Location

2. Field Data

- Field Measurements
- Water Levels
- Purge Volumes

3. Lab Data

- Sampling Data Parameters
- Concentrations

Lotus 1-2-3 Release 2.01 by the Lotus Development Corporation will be used in conjunction with dBase III to reproduce database files graphically and to accomplish statistical analyses of the groundwater chemical constituents. With Lotus 1-2-3 and its integrated graphics section the following can be accomplished:

1. Various types of graphs and tables will be constructed to show such items as concentration levels.
2. Changes in concentration levels over time.
3. Changes in concentrations over distance.
4. A variety of other comparative graphs.

The graphical format will be mostly line and X,Y graphs. Other formats such as bar graphs, stacked bar graphs, and pie charts may be incorporated if they permit a better understanding, graphically, of the data. Since piezometric surfaces will be used to evaluate the remedial measures, this data will also be provided with the graphics. Other graphics will include geographical extent of contamination, and changes in concentration with depth.

Pump test data will be collected and professional judgement used to evaluate the data to establish the probable interaction among the various pumping wells in the Village and also in determining the capture zone of the remediation system. The pumping test data will be used to construct both semi-logarithmic and logarithmic plots, depending upon the analytical method selected to interpret the data. It is intended to use Jacob-Lohman method for evaluating drawdown data from the pumping wells and the Hantush-Jacob method and Hantush Modified method for drawdown data from the observation wells. The methods which are used for the leaky artestian case, utilize a curve matching technique to determine the hydraulic properties of aquifer and the confining bed. Interpretations of the aquifer test data will be based on both time-drawdown and distance-drawdown curves.

3.4 Data Reports

Essentially two types of data reports will be prepared and submitted to EPA and the WDNR; quarterly reports and an annual report. The quarterly report will consist of a transmittal letter which summarizes the results obtained during that period, any pertinent observations, changes to the anticipated program and why they occurred, and any other appropriate comments. Water level data will be included to hydraulically evaluate the effectiveness of the remediation system. Database printouts, tabular displays and graphics described in Section 3.3 will also be included. Appended to the letter will be the raw field and laboratory data including the QA/QC documentation.

The results of both field and laboratory measurements and analyses are compared with previous (quarterly) results for changes in the general concentration trend of a parameter at each particular geographic (well) location. Water level data are reduced, contoured and compared with previous quarterly levels and the remaining field measurements are compared with ranges of values found throughout the sampling program. The analytical results are compared with previous quarterly results using trend graphs as shown in Figure 4, and changes in total VOC concentrations from the preceding sampling quarter are recorded and submitted with the quarterly reports described above. The analytical results for each sample location are also scrutinized for parameters not previously detected and any inconsistencies are compared with field and/or trip blanks associated with the sample location. Additionally, detection of analytical parameters in the field and/or trip blanks are discussed in the quarterly reports.

The annual report, which is to evaluate the effectiveness of the groundwater remediation systems, will provide a thorough analysis of the data collected during the year. It will at a minimum include trend analyses for selected wells (e.g. wells 16A, 20, 23, 29, 40 and any new wells in the "buried stream channel" and glacial wells that still have water on the eastern side of the contaminant plume. Three basic presentation forms are envisioned at this time: contamination contour maps; trend analysis graphs; and tabular summaries by well. Examples of these three presentation forms are shown in Figures 3, 4 and 13, respectively. Database printouts, tabular displays and graphics described in Section 3.3 will also be included. This will include submittal of groundwater contour maps of both the glacial and dolomite well systems.

Isoconcentration contours and trend analyses will be done separately for each of the following individual parameters, as well as for total VOCs in the annual report.

- methylene chloride
- acetone
- 1,2-dichloroethene (total)
- 2-butanone
- benzene
- 4-methyl-2-pentanone
- toluene
- ethyl benzene
- total xylenes

These parameters will be plotted on the same trend analysis graphs, depending on the scale necessary. also, any other parameter found in concentrations over the reportable limit will be noted in the trend analysis. In drawing the contours for VOC data, results from the annual wells will be included in each quarterly contour, provided the concentrations in these annual wells remain relatively constant. This is intended to make it easier to compare the quarterly contours.

As part of data management, sampling results will be submitted for the WDNR's Turn Around Document (TAD) system. This will be accomplished by transcribing test results onto a blank TAD form. The laboratory ID number will also be included on the form. Well numbers have already been established by WDNR and data for the Summer Quarter 1988 are being submitted under this new system.

YEARLY SUMMARY OF QUARTERLY SAMPLING

WELL I.D. PZ - 6A

Sampling Date	2/86	5/86	8/86	12/86
Compound	ug/L	ug/L	ug/L	ug/L
Chloromethane	<500	<500	<400	<500
Bromomethane	<500	<500	<400	<500
Vinyl Chloride	<500	<500	<400	<500
Chloroethane	<500	<500	<400	<500
Methylene Chloride	4,000	11,000	<4,000	<5,000
Acetone	12,500	8,000	<16,000	<15,000
Carbon Disulfide	<500	<500	<400	<500
1,1-Dichloroethene	950	<500	<400	<500
1,1-Dichloroethane	<500	<500	<400	<500
trans-1,2-Dichloroethene	1,500	1,400	1,400	2,400
Chloroform	3,900	<500	<400	<500
1,2-Dichloroethane	<500	<500	<400	<500
2-Butanone	<500	3,000	<8,000	<500
1,1,1-Trichlorethane	<500	<500	<400	<1,000
Carbon Tetrachloride	<500	<500	<400	<500
Vinyl Acetate	<500	<500	<400	<500
Bromodichloromethane	<500	<500	<400	<500
1,1,2,2-Tetrachloroethane	<500	<500	<400	<500
1,2-Dichloropropane	<500	<500	<400	<500
trans-1,3-Dichloropropene	<500	<500	<400	<500
Trichloroethene	600	<500	<2,000	<500
Dibromochloromethane	<500	<500	<400	<500
1,1,2-Trichloroethane	<500	<500	<400	<500
Benzene	2,500	1,700	2,500	2,000
cis-1,3-Dichloropropene	<500	<500	<400	<500
2-Chloroethylvinylether	<500	<500	<400	<500
Bromoform	<500	<500	<400	<500
2-Hexanone	<500	<500	<2,000	<2,500
4-Methy-2-Pentanone	<500	<500	<2,000	<2,500
Tetrachlorethene	<500	<500	<400	<500
Toluene	42,500	60,000	77,000	63,000
Chlorobenzene	<500	<500	<400	<500
Ethylbenzene	14,500	16,000	19,000	18,000
Styrene	<500	<500	<400	<500
Total Xylenes	62,000	72,000	82,000	86,000

JOB #:0001-003

DATE: 4-03-91

SCALE: NO SCALE

DRAWN BY: RDM

FIGURE 13

YEARLY SUMMARY OF QUARTERLY SAMPLING

FREEMAN CHEMICAL CORPORATION

SAUKVILLE, WISCONSIN

HATCHER-SAYRE, INC.

4.0 COMMUNITY RELATIONS PLAN

4.1 Introduction

Freeman Chemical Corporation has, for many years, taken a formalized approach to community relations regarding general and specific dissemination of information to the public. This approach has included specific information relating to the data and requirements of this Consent Order. Prior to the formal signing of the document, the Company and its representatives have actively satisfied the stipulations of the Consent Order. Listed below are activities that have been completed.

1. Open Houses

   Three Open Houses were conducted at the Saukville facility. The initial Open House was open to the general public and was directed toward educating those in attendance to the overall business of the Company and acquainting them to general processing procedures. In excess of 600 people attended. A second Open House was conducted for the Saukville Village Board on August 18, 1986. A walking tour of the Plant and detailed explanation of the groundwater cleanup programs were discussed. A third Open House for the Saukville Village Board was given on August 18, 1987, to review and update our progress on the groundwater cleanup program.

2. Media

   During the course of the past three year time period, the Company has actively incorporated a policy of dissemination of information to the local and regional press. Several articles have appeared in the Ozaukee Press, News Graphic, Milwaukee Journal and Milwaukee Sentinel. These articles have specifically addressed the groundwater cleanup program, including specific testing results and data.

3. <u>Village of Saukville</u>

The Company has developed a close working relationship with Village officials including its Administrator, President and Trustees. Weekly and, oftentimes, daily communication between these officials and the Company has been routine. These discussions included the sharing of specific test data and planning timetables to meet the requirements of the Consent Order.

4. <u>Community Groups/Citizens</u>

Each citizen and community group request was honored and documented. Company representatives have met to discuss the provisions of the Consent Agreement, both formally and informally. Those groups requesting information which the Company has given, both verbally and in writing, are as follows:

- The Immaculate Conception School and Church Board
- The Linden Street Neighborhood Group
- Specific Linden Street Neighbors
- Various Saukville Village Citizens
- Saukville Chamber of Commerce
- Saukville Village Board
- Ozaukee County Board Members
- The General Public, as requested

5. <u>Public Meetings</u>

The Company, on March, 26, 1986, held an informational meeting open to the public to discuss the provisions of the Consent Agreement as well as the Company, in general. This meeting was held at the Village of Saukville Municipal Building. Over 100 persons attended this meeting which was open to public comment.

For each of the above listed activities, the Company endeavored to disseminate factual information and receive comments and input from the respective groups.

4.2 Continuation of the Community Relations Plan

Freeman Chemical Corporation has, in the past, addressed areas for community relations activity as outlined previously. The Company will continue to maintain and increase its past and current activities. The Company will continue to respond promptly to inquiries or complaints from the media, the Village and its citizens through Mr. James G. Gumm, Vice President of Personnel and Public Affairs. Plant tours will continue to be provided to small groups upon request and Mr. Gumm will continue to speak to civic groups and also Village officials upon request as he has done in the past. Good relations will continue to be maintained with the media, Village officials and civic groups. The following Community Relations Plan is intended to assure this:

OPEN HOUSES

Freeman Chemical Corporation will schedule an open house for the Saukville facility during 1990, once the incineration unit is formally in use and operating. This open house will be open to all community groups in the Village and the general public. The open house will occur sometime between June and September. A specific date during this time period will be coordinated through operational feasibility and Village officials.

MEDIA (PRESS RELEASES)

Specific press releases on improvements to the Saukville facility will occur as improvements are completed. It is not possible to present a formal schedule until specific requirements have been identified. The media will be informed of activities at the Saukville facility through attendance at the quarterly Village Board meetings described below and also the Industrial Development Committee meetings. Since the Committee meetings are called on an "as need basis" by the Village Administrator, it is not possible to establish a formal schedule. In the past year, Committee meetings have been approximatly every 6 weeks.

WRITTEN REPORTS TO THE VILLAGE

A formal schedule of presentations to Village officials has been scheduled quarterly with the Village Administrator in conjunction with Saukville Village Board meetings. The following dates have been established for the next year: May 2, 1989, August 1, 1989, November 7, 1989, February 6, 1990. Updates on activities at the Saukville production facility will be given at these meetings. The media will be in attendance since these are public meetings. Minutes of these meetings will be made available to interested parties by the Village upon request.

COMMUNICATIONS WITH CITIZENS GROUPS

The Company will continue to make information available through the Village of Saukville to any citizen groups. Specific requests by a citizen group will be handled by the Vice President of Personnel and Public Affairs at the time they are requested.

samplan2.fre/sp

HNU METER (P1-101 or equivalent)

1. Battery Check - Turn the function switch to BATT. The needle should be in the green region. If not, recharge the battery.

2. Zero set - Turn the function switch to STANDBY. In this general position the lamp is OFF and no signal is generated. Set the zero point with the ZERO set control. The zero can also be set with the function switch on the XI position and using a "Hydrocarbon-free" air. In this case "negative" readings are possible if the analyzer measures a cleaner sample when in service.

3. 0-20 or 0-200 range - For calibrating on the 0-20 or 0-200 range only one gas standard is required. Turn the function switch to the range position and note the meter reading. Adjust the SPAN control setting as required to read the ppm concentration of the standard. Recheck the zero setting (step 2). If readjustment is needed, repeat step 3. This gives a two-point calibration; zero and the gas standard point.

4. 0-2000 range - For calibrating on the 0-2000 range, use of two standards is recommended. First calibrate with the higher standard using the SPAN control for setting. Then calibrate with the lower standard using the ZERO adjustment. Repeat these several times to ensure that a good calibration is obtained. If the analyzer is subsequently to be used on the 0-20 or 0-200 range, it must be recalibrated as described in steps 2 and 3 above.

5. Lamp cleaning - If the span setting resulting from calibration is 0.0 or if calibration cannot be achieved, then the lamp must be cleaned (see instruction manual).

6. Lamp replacement - If the lamp output is too low or if the lamp has failed, it must be replaced (see instruction manual).

CALIBRATION CHECKING

Rapid calibration checking in the field can be accomplished by use of a small disposable cylinder containing calibration gas. Immediately after a calibration has been completed, a reading is taken on a special standard. This provides a reference concentration measurement for later checking in the field. This can be done at any time with a portable cylinder containing this same special standard, using this reference reading as a check, and making adjustments to the analyzer if necessary. In effect, this is an indirect method of calibration, one maintaining the calibration to give direct readings for the original gas mixture, but using the portable cylinder.

pH METER (Orion Model 201 or equivalent)

1. Connect electrode to meter.

2. Turn power switch to "ON".

3. Slide "BATT-CHK" switch to right-should read in green.

4. Remove plastic boot from electrode.

5. Immerse electrode in the 7.00 pH buffer, turn "CALIBRATE" knob so the meter reads 7.00.

6. Rinse electrode in water.

7. Immerse electrode in either the 4.00 pH buffer or the 10.00 pH buffer. The choice is made based on the expected pH of the solution to be measured. Turn the "TEMP" knob (span adjust) so that the meter reads the proper pH.

8. Meter should be calibrated at least daily and more often if drastic temperature changes occur.

CONDUCTIVITY/TEMPERATURE METER (YSI Model 3000 T-L-C Meter or equivalent)

1. Check batteries.

2. Zero set - with meter in off position, adjust meter reading to zero using the set screw on the face of the meter.

3. Red line set - Turn meter switch to "RED LINE" position and using the red line adjust knob, match up the needle and the red line on the meter face.

4. Immerse the probe into the lowest conductivity standard.

5. Record the temperature and conductivity values.

6. Rinse the probe in de-ionized water.

7. Immerse the probe in the next highest conductivity standard. Repeat steps 5 and 6.

8. At least three conductivity standards should be read and recorded.

COMBINATION COMBUSTIBLE GAS/OXYGEN MONITORING METER (Model MX241 or equivalent)

Oxygen Detector

Loosen the knurled collar on the strap mounting post and swing aside the potentiometer access cover. Allow 15 minutes for the oxygen detector to reach equilibrium before calibration. If the sensor has never been used, the equilibration time may be slightly longer, but after the instrument is used a few times, the time is reduced dramatically. The delays are due to the circuitry which disconnects the oxygen cell when it is not being used to extend the working life of the sensor.

In clean air, adjust the oxygen calibration potentiometer (through the hole labeled "o") slowly clockwise so that the oxygen readout goes downward. The alarm should sound clearly at 19.5% oxygen or at the percentage set by the user. Final calibration of the oxygen readout should only be done in free air if the user is sure that the air contains the normal 20.9% oxygen. The readout should then be adjusted to 20.9. If there is any doubt of the oxygen content of the air, calibration gas of a known percentage of oxygen in nitrogen should be used. Introduce the test gas at 0.5 (± .05) liters per minute through the calibration cup (NMS P/N 1700-6933). Allow one minute for the oxygen sensor to respond to the gas. Adjust the readout to show the known percentage of oxygen.

Combustibles Detector

Before calibrating the combustibles detector, switch on the instrument and allow the sensor to warm up for 15 minutes. In clean air, switch the instrument display to combustibles. Adjust the zero potentiometer, (through the hole labeled "z") to obtain a readout 000.

Use the calibration cup (NMS P/N 1700-6933) to apply combustible gas of a known concentration to the instrument. The rate of gas flow should be 0.5 (± .05) liters per minute. Switch the instrument display to combustibles. Use the span potentiometer (through the hole labeled "s") to set the readout to the percent LEL corresponding to the known gas concentration. Variations in the flow rate will cause inaccurate calibration of the instrument.

Remove the test gas and wait for approximately one minute for the gas to completely disperse. Check that the instrument readout returns to 000. Place the potentiometer access cover in its operation position and tighten the knurled collar.

APPENDIX B

FREEMAN CHEMICAL CORPORATION
CONTRACTOR HAZARD COMMUNICATION

Freeman
A SUBSIDIARY OF H. H. ROBERTSON COMPANY
Specialty Products and Services Today For Tomorrow's Needs

Freeman Chemical Corporation
222 E. Main Street
P. O. Box 247
Port Washington, WI 53074
(414) 284-5541 — Telex 2-6737

To All Contractors:

Welcome to Freeman Chemical. You have been retained by the Company to perform a specific service related to our Plant facility in Saukville, Wisconsin. These services have been arranged so that we may improve our facilities, systems or equipment.

In order that you may complete your contracted work assignments in a timely and safe atmosphere, there are certain guidelines that must be followed. Attached you will find a listing of these guidelines. Please review them personally, as well as with any employees or representatives you assign to any Freeman worksites. If you should have questions about any of these, please contact me for clarification.

We at Freeman have been very proud of our safety record and appreciate your helping us to maintain it. Remember, any violations to these guidelines would not only jeopardize future contracts, but could cause an unsafe situation for you or one of your employees.

Palmer J. Langteau

Palmer J. Langteau
Plant Engineer

PJL:jmm

The following Plant Guidelines have been given to you to review prior to doing any contracted work for Freeman Chemical. It will be your responsibility to follow these guidelines and adhere to any instructions given to you by our engineering staff or plant managers.

These guidelines are intended to help you do your job in a safe and timely manner. In turn, any situations that could pose any problem to Freeman, its facilities, or its employees, must be communicated to an appropriate suvervisor immediately.

GENERAL

Freeman is a major supplier of synthetic resins. The materials we produce at our plant facilities are used in a variety of plastic, foam, and coating products that you come into contact with everyday. Many of the products and raw materials used in our facilities can cause hazardous situations if not handled properly. This includes situations where you may not be handling these materials directly, but working around them. All materials in the plant should be considered flammable. Therefore, any potential fire situations must absolutely be avoided.

INSURANCE

At the time you are requested to provide services to Freeman, you will be asked to provide a Certificate of Insurance. This certificate must be presented to the appropriate plant supervisor prior to any work being done. This certificate will be reviewed for appropriate coverages and kept on file for future contracts. The Company may request, from time to time, to produce evidence that this coverage is still in effect. The Company may also request the contractor to acquire additional insurance coverages, dependent upon the type of work being performed.

REPORTABILITY

Each contractor or their representatives, must report in to an appropriate plant supervisor, prior to starting any work. At this time, specific worksite instructions will be given to each contractor. These specific instructions will include the following:

1) Appropriate parking areas for contractors' vehicles and equipment.
2) Restricted areas of the Plant.
3) Review of potentially hazardous materials and/or situations at the worksite.
4) Fire procedures.
5) Equipment and housekeeping procedures.
6) Excavation and removal of waste.

Each contractor will be appraised of any special requirements while they are in the plant, dependent upon the service they are providing.

HAZARDOUS MATERIALS

Freeman Chemical, due to the nature of our business, is obligated to comply with several State and Federal regulations regarding the handling of materials. We have always met or exceeded any standards set by these regulatory agencies. Recently, the Occupational Safety and Health Agency of the Federal government has implemented a standard for hazard communications. This has required chemical producers, such as Freeman, to set up labeling systems, determination practices, training programs and make available written procedures for Hazard Communications. Our written Hazard Communications manuals are located in the foreman's office and are available to you upon request. This manual will detail any information you might need to know regarding hazardous materials at the Saukville Plant. In turn, it will also outline your responsibilities as a contractor to Freeman on bringing any hazardous materials into our facilities. (See Attached).

FIRE PROCEDURES

The following fire related guidelines will be adhered to by all contractors:

1) No smoking is allowed at any time in the Plant with the exception of the Building 31A lunchroom. (See map).

FIRE PROCEDURES
(Cont.)

2) For all acetylene cutting, welding or grinding, a fire watch person must be present with an extinguisher/waterhose and be properly trained in its use.

3) All cutting, welding, grinding, drilling or pipe threading will be done in non-hazardous areas such as the truck garage. If you are unsure whether your worksite is a hazardous area, consult with your site foreman or appropriate plant personnel.

4) All contractors' employees will be shown the nearest fire alarm switch to the worksite, as well as the next two switches closest to the site.

5) In the event of a fire alarm, all contractors' employees must immediately shut down their equipment and report to the foreman's office for instructions.

EQUIPMENT AND HOUSEKEEPING

As with any facility, our safety and well-being hinge on our work habits. To insure that our facility is kept clean and safe, we ask that you adhere to the following:

1) No cutting, welding, grinding, drilling or plugging in of electrical equipment should be done without securing a daily welding/cutting permit for each specific area you are working in.

2) All contractors' employees must wear hard hats, safety glasses and safety shoes at all times.

3) All contractors doing arc welding in the plant must attach the ground (work) cable to the piece being welded. It is absolutely forbidden to attach the ground (work) cable to conveniences such as water pipes, building structurals, platforms, electrical conduit, etc.

EQUIPMENT AND HOUSEKEEPING (Cont.)

4) Prior to entering any tank or kettle, a tank entry permit is required. No tank shall be entered until it has been properly analyzed for its contents. At the time of entry, all required safety and rescue equipment must be worn as stipulated by the supervisor approving the entry. A safety person must always be present and properly trained on rescue duties.

5) No tools, equipment, facilities, or vehicles of Freeman should be used by any contractor without prior approval by an appropriate supervisor.

6) It will be the obligation of each contractor to maintain a clean work site. Any waste, debris, or materials determined to be non-hazardous must be cleaned up and removed by the contractor.

EXCAVATION

No excavation should be performed at the plant without prior approval from an appropriate plant supervisor. Once approval has been given, it will be the responsibility of the contractor to contact the Digger's Hotline prior to starting work, to determine any potential hazards.

Any excavated soils should be stored on sight at the direction of the plant engineer so that it may be properly analyzed and disposed of.

SUMMARY

The guidelines you have just reviewed will never cover every situation you may encounter while working in our Plant. It is extremely important that you keep in close contact with the plant engineer or his designated representative during the course of your work. If you are unsure about a situation, ask! Do not take for granted that each situation will be the same! By doing this, we can both enjoy a safe work atmosphere.

OUTSIDE CONTRACTORS

ALL PLANT FACILITIES

It will be the responsibility of the Plant Manager at each production facility to arrange, coordinate and contract for any outside services. In doing so, each contractor will be informed individually by the Plant Manager or his designated representative on any potentially hazardous chemicals or situations they may encounter or be exposed to during the course of the contractor's activities.

In addition to this, each contractor will have access to each facilities' Hazardous Communications manual. They may refer to this manual on an on-going basis to determine, in conjunction with the appropriate plant personnel, any materials they deem to pose a hazard.

Each contractor, upon entering the plant facility, will be given specific instructions that will include the following:

1) General Safety Guidelines
2) Fire Safety and Training
3) Hazardous Material Exposure
4) Hazard Communications Manual
5) Excavation and Removal of Waste
6) Housekeeping

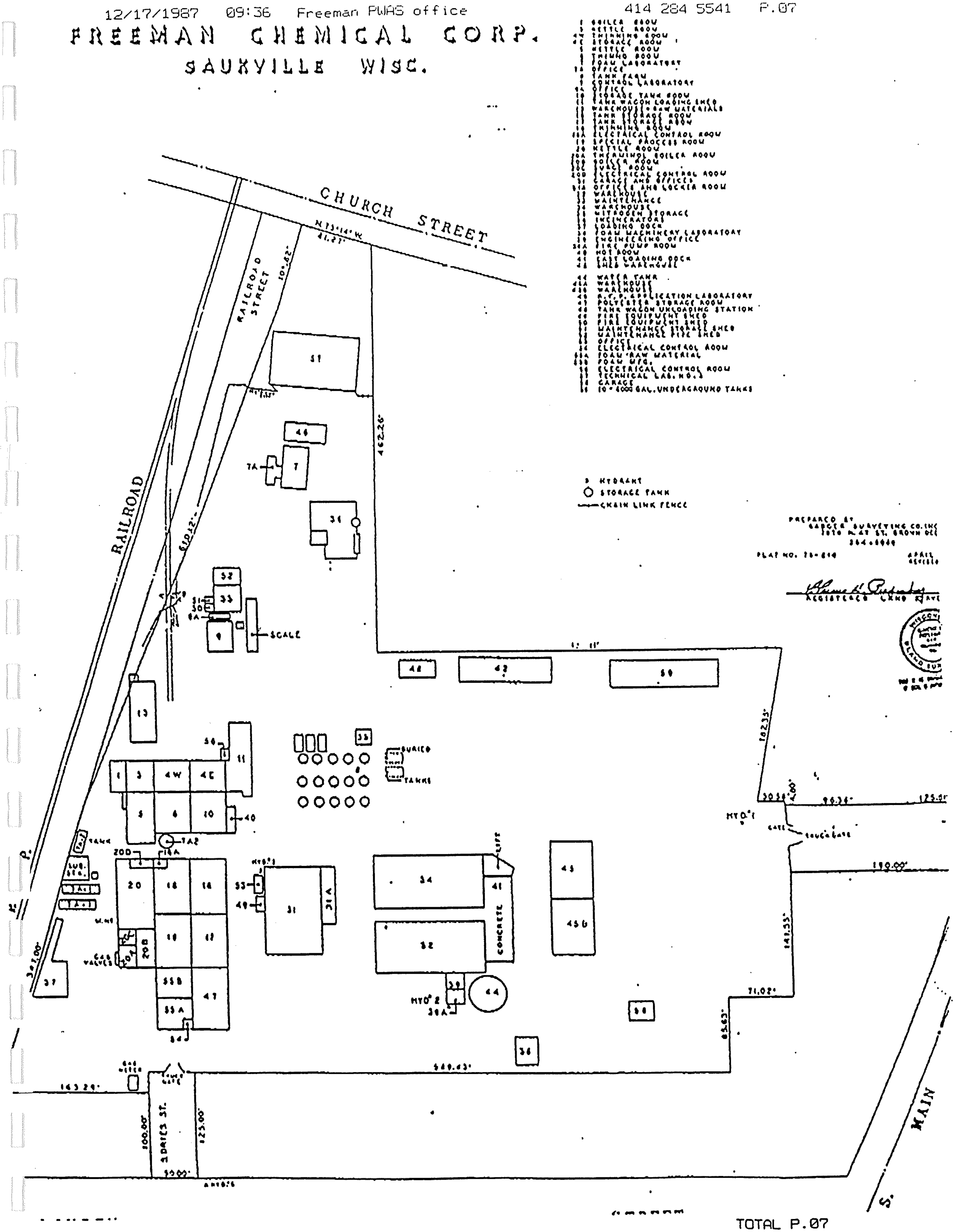
These insturctions are reviewed verbally with each contractor by the appropriate Plant Supervisor.

In addition, each contractor is requested at the time of agreement for service, to provide the Plant Manager with specific information, either in written or verbal form, regarding any hazardous materials he or his representative will be bringing into the plant in conjunction with his activities.

This information is reviewed with each Plant Manager prior to any services being provided to determine the hazard and inform Freeman employees of appropriate ways to protect themselves from this hazard.

FREEMAN CHEMICAL CORP.

SAUKVILLE WISC.



I. GENERAL

A. Personal Precautions

In dealing with both hazardous substances and water, field personnel use assorted tools, equipment, and machinery as well as come in contact with various unknown toxic, and flammable substances. It is because of this that Environmental Services field personnel must adhere to the following rules:

1) Hard hats, eye protection and safety shoes must be worn during all field operations.

2) Eating, drinking, smoking, or any other practice that increases hand-to-mouth contact is prohibited in any area designated as contaminated.

3) Hands and face must be thoroughly washed upon leaving the work site and before eating, drinking, or any other activities.

4) Excessive facial hair, which interferes with a satisfactory fit of the face-to-mask seal is not allowed on any personnel required to wear respiratory protection.

5) Since medicine can potentiate the effects of chemical exposure, prescribed drugs should be used with caution when the potential for absorption, inhalation or ingestion of toxic substances exists. Such activity should be approved by a qualified physician.

6) The use of alcohol and illicit drugs must be avoided while engaged in any field work.

B. In House Procedures

Before leaving for any assignment, field personnel will be responsible for the following:

1) Service Request Sheet must contain:

   (a) Proper address, (map or direction if needed) contact name, and phone number.

   (b) Hazard Class specification (hazardous work only).

   (c) Special equipment/tools needed.

   (d) Understandable instructions.

2) Equipment Check must be completed.

   (a) All necessary supplies and equipment must be on the vehicle.

(i) As per standard equipment checklist (see Appendix A).

(ii) As per service request.

(b) All equipment must be usable and in good working condition.

(c) Vehicle must be stocked with appropriate spare parts, (batteries, suits, gloves, etc.).

3) Site Leader must be assigned.

In order to facilitate a more efficient work effort a site leader will be assigned for each day/job.

(a) The site leader will be assigned by the field crew supervisor or by Client Services. The site leader may be assigned on a per job or per day basis.

(b) The site leader will have the following duties and responsibilities:

(1) Designate member of field team as clerk or -

(2) Assume responsibilities of clerk.

(3) Assume the role of field contact for clients, media, and general public.

(4) Conduct preliminary site evaluation and maintain site control.

(5) Determine appropriate level of protective equipment needed.

(6) Assemble and distribute appropriate emergency procedures.

(7) Coordinate all decontamination and maintenance of safety equipment.

(8) Accept full responsibility for all phases of field operations.

4) Designated Clerk must be assigned.

When performing any hazardous field work, one (1) member of the field crew shall be assigned the role of designated clerk.

(a) The designated clerk shall be assigned by the site leader on a per job or per day basis.

(b) The designated clerk shall have the following duties and responsibilities:

(1) Completing all required sections of the proper manifests, including signatures.

(2) Completing all required sections of the appropriate profiles, including signatures.

(3) Completing and affixing all necessary labels and placards.

(4) Satisfactorily entering all necessary data into the log books.

5) <u>Time Sheets</u>

Each field technician will be responsible for recording the amount of time spent on each project each day. Time sheets must include the date, project number, time spent performing assorted duties. Time sheets will be turned in daily to the field crew supervisor.

6) <u>Radio Contact</u>

The following rules shall govern the use of the two-way radios:

(a) Whenever using a radio equipped vehicle the radio must be turned on, and left on for the duration of the operation.

(b) Field crews will contact the office via radio when they reach a project site. Upon completion of the project the field crew will again contact the office and notify them of their next destination.

(c) If any problems are encountered in the field, the field crew must immediately contact the office and confer with either the field crew supervisor or Client Services on what should be done.

(d) In the event that the radio is inoperative all field office communication will be conducted via telephone.

7) <u>Public Relations</u>

(a) In the course of the activities undertaken by field personnel, contact with clients is inevitable. It is important to remember that it is not within the slope of the field team's responsibilities to discuss "Client Services" related matters, unless specifically directed to do so by Client Services. If any questions/problems are directed to field personnel by a client, the client should be directed to contact a client service representative.

(b) In dealing with members of the media and/or general public the aforementioned rule also applies.

II. WATER WORK

A. On The Job Site

1) Safeguarding the Entry
Before performing any work in or at a manhole, field personnel must take the proper precautions to safequard the entry and the work team.

(a) Whenever possible, the field truck should be placed in such a position as to allow direct access to the truck's storage compartment and crane. Care must be taken with regard to the exhaust fumes entering the hole.

(b) Whenever work is done in an area that must be shared with other vehicles the field truck's beacon and flashers shall be turned on.

(c) Cones shall be placed around the work area as to safely divert the flow of pedestrians and other vehicles.

2) Testing Air Quality
Before working in or at any manhole opening, field personnel shall test the air in the hole for O_2, H_2S, and Methane. Unacceptable readings must be noted in the field book.

(a) Acceptable Air Quality
If unaided by SCBA, entry can be made only if:

(i) O_2 content is at least 19.5%
(ii) H_2S content is less than 10 ppm
(iii) Methane content is less than 20% of LEL

(b) Unacceptable Air Quality

(i) If O_2 content is less than 19.5% entry can only be made if aided by SCBA.

(ii) If H_2S content is greater than 10 ppm, entry can only be made if aided by SCBA.

(iii) If the combustable gas content is higher than 20% of the LEL, no work is to be done.

3) Entering Opening

(a) Under no circumstances shall any field personnel enter any manhole without another person at the opening.

(b) Under no circumstances shall any field personnel enter any manhole without wearing a harness attached to a safety line.

(c) Personnel entering a manhole shall not carry anything in their hands. Any necessary tools or equipment shall be lowered (not dropped) when needed.

(d) Personnel at the opening shall continuously monitor air quality while work is being done.

(e) Personnel at the top shall be equipped with SCBA or air line respirator.

4) Installing Devices

When installing any device, field personnel should follow appropriate installation procedures. (See Appendix E)

5) Retrieving Devices

When retrieving any device from any location, field personnel shall first check to make sure that the desired operation was performed. If so, field personnel shall remove the device and affix the proper label. In the event that the device failed or any problems exist, field personnel must call in to the field supervisor or client services immediately. Before placing the device into the field vehicle, personnel must check the general condition of the device as well as the battery level and decicant state. If any of these conditions are substandard the device shall be taken in and repaired. It is also important to remember to bring the device(s) in for thorough cleaning as needed.

6) Labeling Samples

Before loading any samples into the field truck, field personnel shall complete and affix a label to each sample. The label must contain:

(a) Company name and account number.
(b) Sample descriptor (well #, flow #, etc.)
(c) Date(s) and time of sampling.
(d) Temperature and flow (when needed).
(e) Sampler's initials.

7) Documentation

Before leaving the job site the appropriate team member shall make the proper entry into the log book. This entry must include:

(a) Date and time
(b) Location
(c) Personnel present
(d) Work performed (be specific)
(e) Meter readings (air monitoring and device)
(f) Results (where applicable)
(g) Supplies used and/or exhausted

B. Job Completion

After job's completion and upon returning to lab, field personnel shall:

1) Bring in all samples and transfer them (per lab procedure) to lab custody.

2) Relay any and all pertinant results/information to proper laboratory/supervisory personnel.

3) Initial, date, and file service request sheet.

4) Complete postjob check including:

   (a) Vehicle clean-up
   (b) Tool/equipment inventory clean-up
   (c) Personal equipment check/clean-up

5) Bring in any broken or expended equipment for repair/ replacement, as per standard policy.

6) Restock vehicle with replacement supplies and equipment.

III. HAZARDOUS WORK

A. On the Job Site

1) Site Evaluation

Before the field team enters any area to perform "Hazardous" work, a preliminary site evaluation shall be conducted by the designated site leader. The objectives of this evaluation are to:

(a) Characterize the existing and potential hazards present. This includes taking the contaminant, its condition, concentration and properties into consideration. In addition, the physical condition of the site (O_2 content, combustable gas presence, ambient air temperature, geography, etc.) must be examined.

(b) Verify existing information about the job including the type and amount of work to be done. If any problems/conflicts arise it is the responsbility of the site leader to call the office immediately.

(c) Determine the necessity and practicality of establishing work zones.

(d) Determine the appropriate level of personal equipment needed to safely complete assignment.

NOTE: Before conducting the evaluation, the site leader should don the equipment designated in the C level Hazard Class.

2) Safety Gear

(a) All personnel on any site shall be required to wear the appropriate personal protective equipment as designated by both the service request sheet and the preliminary site evaluation. If any conflicts arise the higher level of protection shall be used. Environmental Services shall conform to the following standard hazard classifications.

(i) Level A should be used when the highest level of respiratory, skin, and eye protection is needed. This includes totally encapsulating suits worn over SCBA.

(ii) Level B should be used when the highest level of respiratory protection is needed, buth with a lesser level of skin protection. SCBA or combination SCBA must be used, but can be worn with rain-wear or disposable clothing.

(iii) Level C should be used when the concentration of substances is known and the criteria for using air-purifying respirators are met. Appropriate respirators must be worn with disposable suits (or rain-wear) and gloves.

(iv) Level D should not be used on any site with respiratory or skin hazards. It is primarily a work uniform providing minimal protection.

(b) Personal Control

When any type of work is done involving hazardous substances all personnel are required to wear the appropriate protection. As well, all visitors shall be informed of the potential hazards and advised to stay clear.

(c) Standard Practices

Whenever personal protective equipment is used the following must be adhered to:

(i) Inner gloves must always be taped to suits.

(ii) Coveralls must be worn over street clothes, regardless of whether or not disposable coveralls are worn.

(iii) Disposable suits must be taped to boot tops.

(iv) Disposable suits must be disposed of and replaced immediately upon being ripped or punctured.

3) Site Controls - Work Zones

(a) Working with hazardous substances necessitates the controlling of the site so that the possibility of exposure of translocation of the substances can be reduced or eliminated. To maintain this control the field team will delineate work zones on the site where designated operations take place. These zones will be:

(i) Exclusion Zone is the area where contamination could or does take place. All people who enter the exclusion zone must wear the prescribed level of protection. An entry and exit point shall be established and used as the only point of entry and exit. Whenever the possibility for foreign personnel entering the exclusion zone exists, the exclusion zone shall be physically roped off and appropriate warning signs must be displayed.

(ii) Contamination Reduction Zone provides the transition between the contaminated and clean zones. This zone acts as a buffer to reduce the probability of contaminating the clean area. Since this buffer is not "clean" personal protective equipment is required. The boundary between the exclusion zone and the contamination reduction zone is known as the hotline and contains the decontamination station.

(iii) Support Zone is considered a non-contaminated area. Equipment trucks, etc. are located in this zone. Potentially contaminated equipment must be decontaminated before being allowed to enter support zone.

(b) As well, the number of personnel on site should be minimized in order to reduce contamination.

4) Work Practices

(a) Sampling
When collecting samples for waste identification, the following procedure must be followed.

(i) Two (2) one liter samples must be collected from each wastestream. (See Appendix C)

(ii) Sample labels must be completed, including:

- Generator
- Waste name (or barrel #)
- Sample date and time
- Sampler signature

(iii) A certificate of representative sample must be completed for each sample taken.

(iv) The client must complete the witness portion of the certificate.

(v) Any container that is sampled must be marked accordingly.

(vi) The type, volume, and condition of container must be recorded in log book.

(vii) Care must be taken to satisfactorily decontaminate sampling instrument between samples.

(b) Drum Handling

When any drum handling is required, field personnel must exercise caution so that leaks, spills, personal injury or property damages can be avoided. If the transferring of contents from drum to drum is required, a plastic drop cloth must be used.

(c) Spills

If in the course of field operations any material is spilled, field personnel must adequately pick up the spilled material as well as clean up the area.

(i) 'Oil Zorb' shall be applied to any liquid spill and, after allowing time for it to absorb the liquid, picked up.

(ii) Any solid material spilled must be immediately shoveled or vacuumed.

In the case of large spills, proper emergency procedure should be followed.

5) Decontamination

Because of the variety of substances and situations encountered by field personnel, it is impossible to establish a definitive decontamination plan. However, the following guides must be observed.

- No contaminated equipment may be brought into the driving compartment of any vehicle.
- Personal protective equipment and tools must be field washed before they can leave Contamination Reduction Zone.
- Wash and rinse water as well as disposable clothing must be disposed of as a hazardous waste.
- Field washed equipment must be individually packed in plastic bags until complete decon at lab.

Respirator cartridges must be disposed of after each use.

6) Paperwork

Before leaving job site the designated clerk shall:

(a) Make certain that sections 1-17 of the Wisconsin Hazardous Waste Manifest are complete.

(b) Complete and affix proper labels to all drums being transported. (See Appendix D)

(c) Affix proper placards to truck(s).

(d) Make entry into log book including:

(i) Date and time
(ii) Client's name and location of service
(iii) Personnel present
(iv) Work performed (specifies)
(v) How performed
(vi) Gas meter readings

(vii) Protective equipment used
(viii) Supplies exhausted or broken
(ix) Any problems encountered.

7) Accidents

In the event of any accident involving fire, spill, explosion, property damage or personal injury field personnel must immediately administer/peform any emergency care then notify the proper authorities and Chem-Bio Corporation.

B. Job Completion

At job's completion and upon returning to lab, field personnel shall:

1) Bring in all samples and appropriate data.

2) Relay any pertinant information to proper laboratory/ supervisory personnel.

3) Initial, date and file service request sheet.

4) Complete equipment clean-up/decon, including:

(a) Vehicle
(b) Tools and equipment
(c) Personal equipment

5) Turn in any equipment for repair/replacement

6) Restock vehicle with replacement supplies/equipment

APPENDIX A

EQUIPMENT FOR WATER WORK

Six (6) samplers
Six (6) flow meters
Hoses for sampler
Flow proportional cords
Extra sampler bottoms with bottles
Transducers for sonic flow meter
Battery cables for dippers
Batteries for samplers
Batteries for flow meters
Extra parts for sampler & flow meter for field repairs
  A. Pump hose
  B. Fuses
  C. Electrical connections
  D. Extra keys & pens for flow meters
Six (6) sampler harnesses - (one for each sampler)
Six (6) harness ropes
Tripods for flow meter
Grab pole & extension
Bottles
  1 case glass quarts
  1 case plastic
Two (2) V.O. bottles
Two (2) full body harness
Cascade air system
Hard hats
Coveralls
Rain Suits
Gloves
Boots
Trouble light
Flashlight
Tool box - specific for water step van
Pick ax
Sledge hammer
Shovel
Safety cones
Traffic vests
One (1) sabre saw & extra blades
Triangle
Straight edge
Concrete & mixing buckets
Plywood
Extension cord
Flow rate charts
Calculator
Sample preservatives
pH meter
Thermometer
First Aide kit
Field notebook
Truck log book (mileage log)
Gas detector
"Z" hanger

EQUIPMENT FOR HAZARDOUS WASTE WORK

Coveralls
Hazardous waste suits PVC & tyvek
Boots
Gloves - yellow
Hard hats
SCBA respirators (30 min. & cascade)
Full face respirators - each man should have his own
Tools
Sledge hammer
Shovel
Oil dry
Bottles
Two (2) cases plastic quarts
Paper towel
Paint - various colors
Rope & stands
Signs - KEEP OUT, DANGER
Two (2) bung wrenches
Two (2) drum carts
Crow bar
Surgical gloves - several boxes - large
Duct tape
Hazardous waste labels
  Flammable Liquid
  Corrosive
  Flammable Solid
  Non-Hazardous
  Poison
Extension cords
Flashlights - Trouble light
Barrel slings
Barrel clamps

First Aide equipment
Oxygen
Acid-Base neutralization kit

Decontamination equipment
  A. Tubs
  B. Sprayers

Manifests - Hazardous and Non-Hazardous
  Chemical Waste Division forms
Gas detector
Bolt cutters

CBC ENVIRONMENTAL SERVICES
140 E. RYAN RD.
OAK CREEK, WI 53154
(414) 764-7005

CLIENT
PROJECT LOCATION
QUOTE NUMBER

CHAIN OF CUSTODY

J 10980

PLEASE PRESS FIRMLY WHEN WRITING

SAMPLER (Signature)	AFFILIATION	DATE	TIME

PURPOSE OF ANALYSIS

ITEM NUMBER	NUMBER AND SIZE OF CONTAINERS	DESCRIPTION	TRANSFER NUMBER 1	2	3	4	5

TRANSFER NUMBER	ITEM NUMBER	RELINQUISHED BY (Signature)	ACCEPTED BY (Signature)	DATE	TIME
1					
2					
3					
4					
5					

APPENDIX D

ENSECO (ERCO) QUALITY ASSURANCE PROGRAM

Enseco

QUALITY ASSURANCE PROGRAM

2240 Dabney Road
Richmond, Virginia 23230
804/359-1900

Facsimile: 804/353-1860

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1. INTRODUCTION

Enseco, Inc. consists of the combined resources of ERCO in Cambridge, Massachusetts and Houston, Texas; Gollob Analytical Service in Berkeley Heights, New Jersey; CAL Lab East (CLE) in Richmond, Virginia; Rocky Mountain Analytical Laboratory (RMAL) in Arvada, Colorado; and California Analytical Laboratory (CAL) in Sacramento, California. The merger of these organizations in June 1986 created the largest and most experienced independent environmental laboratory system in the United States. The union also strengthened the existing laboratory structures by providing a national level of officers to oversee quality control and laboratory operations.

Enseco provides analytical chemistry services to industry and government in a wide variety of technical areas. To ensure the production of reliable, accurate data, an extensive quality assurance and quality control (QA/QC) program monitors every aspect of analytical services.

The following Quality Assurance Plan describes, in general terms, the principal components and elements of Enseco's QA/QC program, and supports Enseco's commitment to produce analytical data of the highest quality. The QA Plan has been developed according to criteria described in "The Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans," published by the EPA. A more specific and detailed preparatory QA/QC manual is on file at Enseco laboratories.

2. ENSECO'S QUALITY ASSURANCE PHILOSOPHY

Parallel to quality laboratory work is a quality assurance and quality control program which effectively monitors and regulates the production of analytical data. Essential to the success of such a program are clearly defined objectives, documented standard operating procedures, management commitment and support, staff cooperation, and a comprehensive and thorough auditing system.

Enseco's rigorous QA/QC program is closely supervised at both the corporate and laboratory levels. The principal components of this program are prevention, assessment, and correction, which, supported by the program elements (many of which are described in this QA Plan), encompass the entire activities of laboratory operations.

Enseco's prevention program ensures that analytical systems are functioning properly through a coherent series of steps, which include quality control planning, training programs, instrument calibration and maintenance, and frequent validation of standards. Because prevention and assessment are often intervolved, the program provides an elaborate system of checks and balances by which data production can be further controlled. Additionally, Enseco studies the different principles involved in performing analytical methods and incorporates the most stringent criteria as standards.

Precision and accuracy are controlled by the assessment of data through quality control checks. Under the direction and guidance of the Corporate Vice President of Quality Assurance, QA officers at each laboratory perform regular systems and performance audits to evaluate the data produced by the laboratory's analytical systems. Audits include laboratory site visits, the analysis of QC samples (such as method blanks, sample spikes, sample duplicates, and laboratory control samples (LCS), which are duplicate spikes performed on laboratory prepared matrices of known backgrounds), the review of calculations, and validation of methodology. Enseco has developed extensive interlaboratory and intralaboratory performance evaluation studies and also participates in auditing programs conducted by regulatory agencies.

The ability to diagnose problems and implement corrective actions is critical to the generation of quality data. Enseco's QA/QC program places particular emphasis on the identification of quality defects and the implementation of appropriate methods to restore proper functioning of the analytical system. This is accomplished through reevaluation of methodology, reexamination of check samples, instrument recalibration or repair, as well as the utilization of QC reports, historical QC databases, and instrument maintenance logs. Corrective actions are fully documented and reported to the Corporate Vice President of Quality Assurance.

In addition to receiving documented sample test results, clients also receive QA/QC data specifying the blank, LCS, sample spikes and duplicates, holding times, and control limits. Qualifying the reporting data is a bold and progressive step in the industry, and demonstrates Enseco's leadership and confidence in the organization's analytical procedures and laboratory performance.

It is the steadfast goal of the Quality Assurance Group to uphold the integrity of Enseco's analytical chemistry services through dedicated commitment to good laboratory practices and the production of the highest quality data.

3. THE QUALITY ASSURANCE GROUP

Executing an effective QA program in a large and complex laboratory system demands the skills of a highly trained and qualified staff. The organizational structure of Enseco's Quality Assurance Group (Fig. 1) provides a disciplined national network of management which oversees and regulates all laboratory QA/QC functions.

Enseco's Quality Assurance Group is headed by Dr. Anthony Wong, Corporate Vice President of Quality Assurance, who reports directly to the Enseco Executive Committee and to the Chairman of the Board. As principal architect of Enseco's QA program, Dr. Wong has charted a rigid course to monitor and control laboratory operations. This involves the intricate process of developing QA manuals, QC protocols, training programs, Standard Operating Procedures (SOP's), uniform statistical data, interlaboratory and intralaboratory performance evaluation studies, and internal auditing programs. Dr. Wong is responsible for the administration and implementation of the QA program at all Enseco laboratories.

Laboratory QA/QC activities are specifically designed to fulfill the requirements of both the individual laboratory and Enseco. Directing these activities is the responsibility of each laboratory President, who works closely with the laboratory Quality Assurance Officer to enforce and monitor the program.

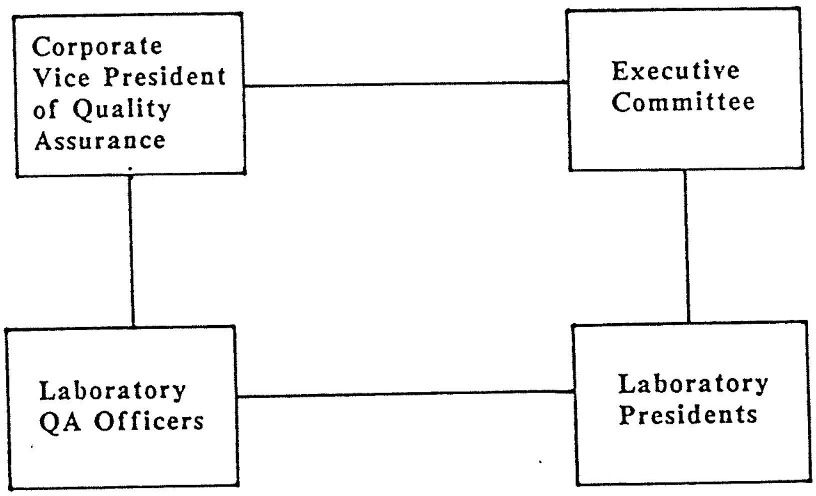
Because a QA program undergoes its most stringent test at the laboratory level, QA Officers hold a cornerstone position in the organizational structure. Enseco QA Officers are highly skilled analytical scientists, knowledgeable in all aspects of laboratory operations. Their responsibilities include diagnosing quality defects and resolving problems with the analytical system; conducting performance evaluation studies, in-house audits, and walk-throughs; performing statistical analyses of data; auditing spike results; enforcing chain-of-custody procedures; assisting in the development of QA manuals, SOP's and QC protocols; conducting QA training programs; and maintaining extensive records and archives of all QA/QC data.

QA Officers report to both the laboratory president and to Dr. Wong. They also interface with one another in a peer evaluation and auditing system that encourages assistance and feedback, problem analysis, and collaboration on ways to improve laboratory performance.

In conjunction with the QA Department, laboratory vice presidents, directors, and managers are responsible for a subset of QA activities, and work closely with supervisors to evaluate daily laboratory functions.

Ultimately, no plan can succeed without the cooperation and support of the entire working force. Enseco takes great pride in its most valuable resource---the men and women whose unwavering dedication to excellence forms the building blocks of our success.

Figure 1. Enseco Quality Assurance Group Organization Chart



4. QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT OF DATA IN TERMS OF PRECISION, ACCURACY, REPRESENTATIVENESS, COMPLETENESS AND RELIABILITY

The effectiveness of a QA program is measured by the quality of the data generated by the laboratory. Data quality is judged in terms of its precision, accuracy, representativeness, completeness and comparability. These terms are defined and described as follows:

* Precision is the degree to which the measurement is reproducible. Actual control limits for precision will depend upon the specific method; in general, the relative percent difference (RPD) must be within 20%, the limit set by the EPA for the Contract Laboratory Program (CLP).

* Accuracy is a determination of how close the measurement is to the true value. Unless specified otherwise in special contracts and particular methods, ENSECO's parameter for accuracy is ± three standard deviations from the mean, with two standard deviations established as a warning for system check.

* Representativeness is the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. Analytical data should represent the sample analyzed regardless of the heterogeneity of the original sample matrix. For example, with samples consisting of several phases, it may be advisable to analyze each phase separately and to determine each phase proportionately in terms of the whole sample.

* Completeness is a measure of the amount of valid data obtained from a measurement system compared with the amount that was expected to be obtained under correct normal conditions. The completeness of QC samples must be 100%.

* Comparability expresses the confidence with which one data set can be compared to another data set of the same property. Comparability is assured through the use of established and approved analytical methods, consistency in the basis of analysis (wet weight, volume, etc.), and consistency in reporting units (ppm, ppb, etc.).

5. STANDARD OPERATING PROCEDURES

Details of the analytical and QC protocols are contained in a set of standard operating procedures, commonly known as SOP's. SOP's incorporate the requirements of the analytical methods, the QA program, and good laboratory practices. Examples of some typical SOP's are given below.

1. **Method SOP**

   (Method 613 is used)

   a. Project and method requirements (detection limits, precision and accuracy, blanks, spikes, duplicates, acceptance criteria)
   b. Reagent and standard preparation
   c. Equipment and glassware requirements
   d. Sample preparation
   e. Sample analysis (instrument calibration, standard, samples)
   f. Data and report generation
   g. Data and report approval
   h. Sample and extract disposal
   i. Special remarks (safety measures, special considerations, errors)

2. **Instrument SOP**

   (Example is for GC/MS laboratory)

   a. Operational protocols (start-up, settings, shut-down, calibration, tuning)
   b. Maintenance and service
   c. Sample log and service log

3. **Sample Control SOP**

   a. Receiving information (shipping documents, condition of samples)
   b. Log-in
   c. Storage
   d. Chain of custody
   e. Sample transfer
   f. Disposal

4. **Reagents SOP**

   a. Suppliers
   b. Records and labels
   c. Purity and interference checks
   d. Shelf life and storage requirements
   e. Precautions
   f. Disposal of excess reagents and containers

5. Glassware and Shipping Containers Preparation SOP

   a. Suppliers
   b. Cleaning procedures
   c. Preservatives
   d. Labeling of sample containers
   e. Records
   f. Shipping

6. Auditing SOP

   a. Purpose
   b. Checklist
   c. Summary
   d. Recommendations
   e. Corrective actions
   f. Follow-up

Specific methods are referenced and retained in the laboratory SOP's.

6. AUDITS AND PERFORMANCE EVALUATIONS

Enseco laboratories participate in a wide variety of certifications, programs and contracts, and are therefore subjected to rigorous external performance evaluations and audits by the EPA, numerous other government agencies, and industrial clients. The purpose of these audits is to ensure that laboratory sample control, analysis, data, and documentation meet stringent regulatory requirements and comply with good laboratory practices.

In addition to external audits and site visits, Enseco conducts the following internal audits:

(1) Weekly walk-throughs by the laboratory QA Officer and Safety Officer;

(2) Monthly systems audits conducted by the laboratory QA Officer;

(3) Quarterly audits conducted by the Corporate Vice President of Quality Assurance;

(4) Special audits by the laboratory QA Officer or Corporate Vice President of Quality Assurance when a problem exists.

Another form of evaluation is the analysis of blind samples, a procedure important to assessing the true quality of the analytical system. As participants in the EPA Contract Laboratory Program (CLP) and other contracts and certifications, Enseco laboratories are required to analyze blind samples for organics, inorganics and chlorinated dioxins on a quarterly basis.

In addition to mandatory blind samples from regulatory agencies, all Enseco laboratories routinely analyze internal check samples as described below.

(1) The frequency of QC checks (duplicates, spikes and blanks) are equal to at least 10% of the total number of samples analyzed. In other words, a pair of LCS are performed for every twenty samples, and a method blank is performed for either every twenty samples or for each batch of samples analyzed, whichever is more frequent. Duplicates and spikes performed on sample matrix are also routinely performed at frequencies based on the client's specific requirements. Surrogates and internal standards are added to each individual sample when applicable. Additionally, quality control data is assessed before data results are approved for client use.

(2) Samples originally submitted to one laboratory are resubmitted as blind samples to either the same laboratory or to other Enseco laboratories for comparison. The results are evaluated by the Corporate Vice President of Quality Assurance, the in-house QA Officer, and senior staff scientists.

(3) An independent commercial firm is contracted to provide all laboratories with blind check samples. Results of such samples are evaluated by both the outside firm and by Enseco's Corporate Vice President of Quality Assurance.

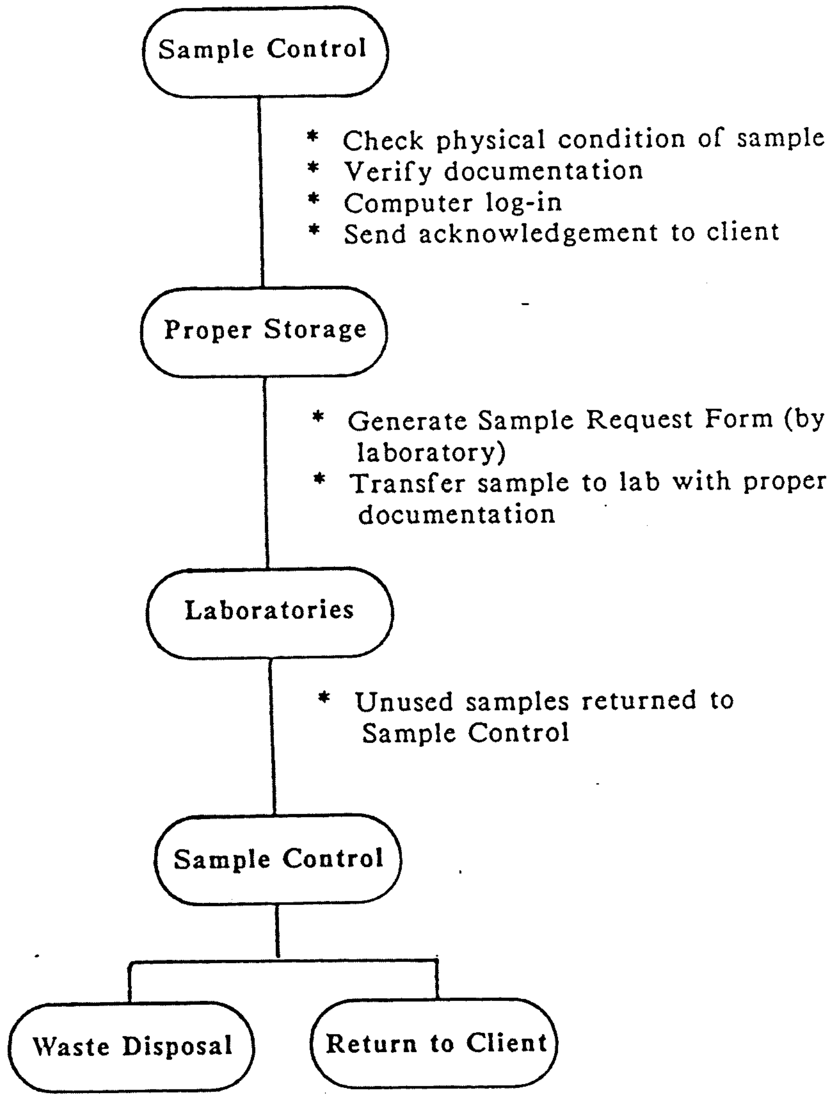
7. SAMPLE CHAIN OF CUSTODY

A sample enters the laboratory system upon its receipt and proceeds through an orderly chain-of-custody sequence specifically designed to ensure continual integrity of both the sample and documentation from, in the industry vernacular, "cradle-to-grave."

All samples are received by the laboratory Sample Control Group and are carefully checked for label identification, chain-of-custody, and any discrepancies. Each sample is assigned a unique laboratory identification number through the computerized Laboratory Information Management System (LIMS), which generates a job file and stores all identifications and essential information; a duplicate of the job file is forwarded to the client. Internal chain-of-custody procedures track the sample from storage through the laboratory system until the analytical process is complete and the sample is back in the custody of Sample Control for disposal or return to the client.

The flow chart in Figure 2 illustrates Enseco's chain-of-custody procedures.

Figure 2. Chain-of-Custody Flow Chart



8. METHOD VERIFICATION AND VALIDATION

Source of Methods

Since most of the analyses performed by Enseco laboratories are regulatory-oriented, the methods selected are predominately ones sanctioned by government agencies. Generally, the methods used are those specified by the U.S. Environmental Protection Agency (USEPA) and other federal or state agencies, as provided in the following references:

(1) Contract Laboratory Program Causus Protocol, U.S. EPA (revised July 1985).

(2) "Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act," 40 CFR, Part 136. Published in *Federal Register*, Vol. 49, No. 209 (October 26, 1984).

(3) Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020 (revised March 1983).

(4) Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater, EPA-600/4-82-057 (July 1982).

(5) Test Methods for Evaluating Solid Waste (SW-846), 2nd Edition (revised), Update I (1984), Update II (1985), Office of Solid Waste and Emergency Response, U.S. EPA (April 1984).

(6) Standard Methods for the Examination of Water and Wastewater, 16th Edition, APHA, AWWA, WPCF, Washington, DC (1985).

(7) Official Methods of Analysis, 14th Edition, AOAC, Arlington, VA (1984).

(8) Current EPA Contract Laboratory Program (CLP) methods for the analysis of Organic Priority Pollutants, Inorganic Priority Pollutants and Chlorinated Dioxins and Dibenzofurans.

Method Verification and Validation

Before any methods are used to generate analytical data, the following method verification and validation criteria must be observed:

(1) The selection of a method must be performed by a senior staff member.

(2) The method must be a written one, accompanied by an SOP, and contain objectives, equipment and reagents, analytical procedures, calculations, reporting formats and special remarks.

(3) The method must be tested to achieve the claimed detection limits, precision and accuracy.

(4) Data acceptance criteria must be established and approved by a senior staff member and the QA Officer.

9. REAGENTS AND STANDARDS

A critical element in the generation of quality data is the purity and grades of the reagents and standard solutions that are used in analytical operations. Contaminated or improperly prepared reagents or standard solutions can cause errors in analytical results. Enseco laboratories continually monitor the quality of reagents and standard solutions through a computer database and detailed log books which identify the supplier, lot number, purity, preparation date, solution and method of preparation, initial strength, quality checks, etc. These procedures are firmly established in SOP's for reagents and standards.

To insure the highest purity possible, all primary reference standards and standard solutions used by Enseco laboratories are those recommended and obtained through the National Bureau of Standards (NBS), the EPA repository (Research Triangle Park, NC), and other reliable commerical sources. All secondary reference standards are validated prior to use. The validation may involve comparison to previous standards, a check for chromatographic purity, etc., as appropriate. Stock and working standards are checked regularly for signs of deterioration, such as discoloration, formation of precipitates, and change of concentration. Care is exercised in the proper storage and handling of standard solutions, and all containers are labeled as to compound, concentration, solvent, expiration date and preparer.

Reagents are examined for purity by subjecting an aliquot or subsample to the analytical method correspondent to their intended use; for example, every lot of dichloromethane (for organic extractables) is analyzed prior to acceptance or shipment by commercial carriers.

A computerized database is used to store essential information on specific standards or reagents. The system is designed to serve various functions; for instance, the computer will issue warnings on expiration dates, or allow the chemist to obtain a list of all working standard solutions prepared from the same stock solution. The program also facilitates the management and auditing of reagents and standards.

10. INSTRUMENT CALIBRATION

Calibration of instruments is required to ensure that the analytical system is operating correctly and functioning at the proper sensitivity to meet established detection limits. The complexity of modern instrumentation has created the demand for tighter quality control so that malfunctions may be quickly detected and the quality of analytical results continually maintained. Each instrument is calibrated with standard solutions appropriate to the type of instrument and the linear range established for the analytical method. Frequency of calibration and concentration of standards is determined by the manufacturer's guidelines, the analytical method, and the requirements of special contracts.

Following are examples of calibration requirements for GC/MS, GC, AA and ICP instrumentation.

GC/MS Calibration - All GC/MS instruments must undergo calibration to ensure the quality of the data acquired during any shift. Daily (or every 12 hours) the mass calibration standard is analyzed to demonstrate that the instrument meets the standard mass spectral abundance criteria. Whenever any action is taken which may affect the tuning parameters of the instrument (e.g., source cleaning or other maintenance) the mass calibration must be verified regardless of the 12-hour time period. Mass calibration criteria must be met before any analysis (standards, blanks or samples) using EPA protocols may be performed.

GC Calibration - The GC used for quantitation is calibrated according to the protocol that is used for a particular analysis. For the analysis of chlorinated pesticides and PCB's, the procedure outlined in the EPA-CLP "Organics Analysis Statement of Work" is followed. For the analysis of drinking water samples submitted for the determination of insecticides and herbicides, the procedure outlined in the corresponding method is followed.

AA and ICP Calibration - Other instruments, such as atomic absorption spectrometers (AA) and Inductively Coupled Argon Plasma Emission Spectrometers (ICP), must be calibrated every 24 hours, or sooner if a check standard falls more than ten percent off a calibration curve. Check standards are run every 10 samples or every 2 hours, while interference checks must be performed every 8 hours.

The systematic criteria established for instrument calibration and certification by regulatory programs, such as the USEPA Contract Laboratory Program (CLP), has been generally adopted or modified by Enseco as the archetype for non-regulatory programs. Enseco also uses the calibration criteria specified in certain methods promulgated by regulatory agencies.

11. INSTRUMENT PREVENTIVE MAINTENANCE

To minimize downtime and interruption of production, preventive maintenance is routinely performed on each analytical instrument. Designated laboratory personnel are factory-trained in routine maintenance procedures of all major instrumentation. When repairs are necessary, they are performed by either the trained staff or the instrument manufacturer under service contracts and warranties.

Each laboratory is required to maintain detailed logbooks of preventive maintenance and repairs for each analytical instrument.

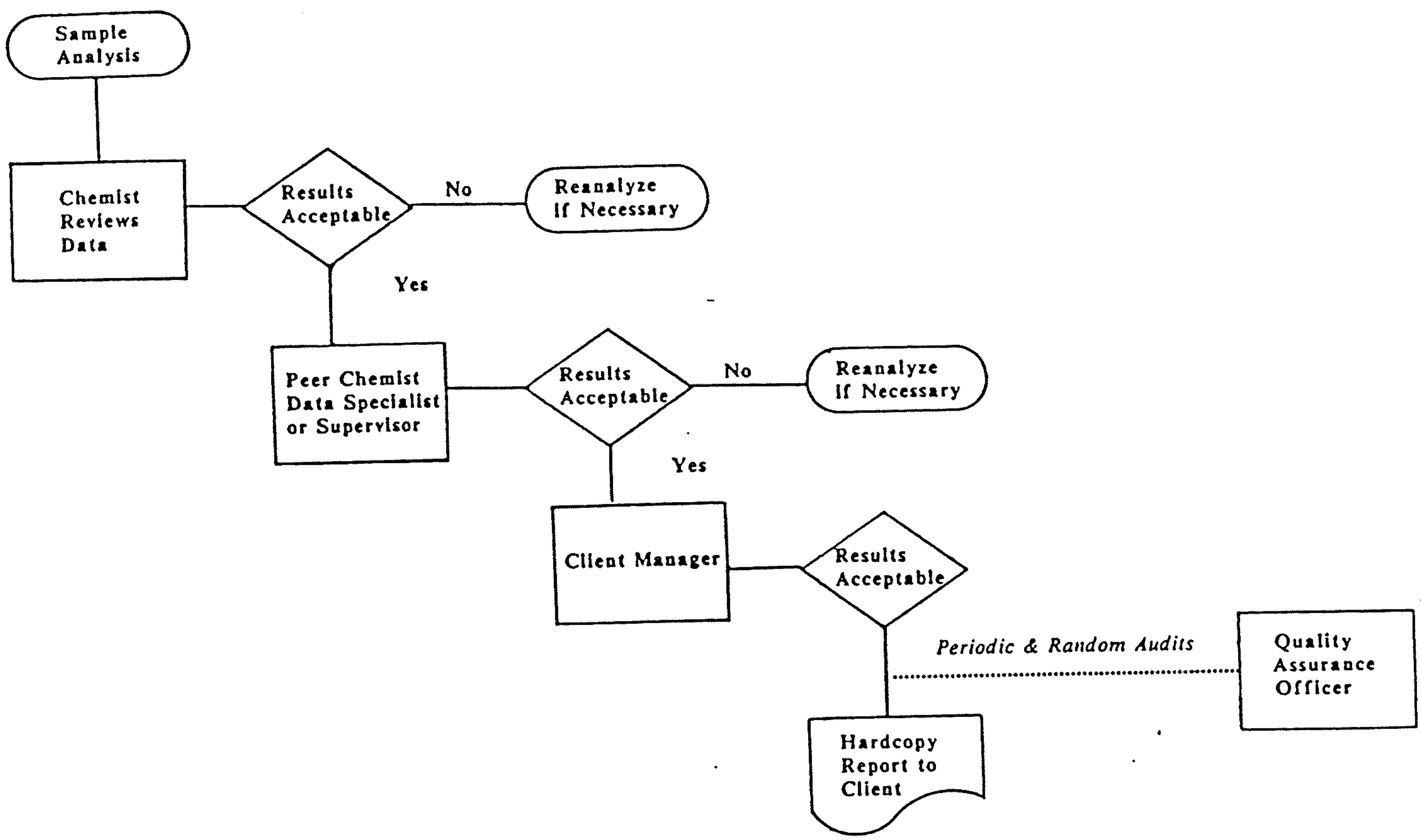
12. DATA REVIEW AND REPORTING

Laboratory data must pass the scrutiny of peer and supervisory review and evaluation before it is considered ready for client use. All data is reviewed first by another analyst, data specialist, or supervisor to ensure that it is complete, that precision, accuracy and detection limits have been met, that interpretation of raw data and calculations are correct, that contractual requirements have been fulfilled, and finally, that all information is well documented. The data is then examined by the laboratory manager who will approve the results. Members of the QA staff may also check the results on selected data sets. (For a typical data reporting scheme, see Figure 3.)

Enseco laboratories use the computerized Laboratory Information Management System (LIMS), as well as a variety of custom applications, to transfer data from instruments to computers, perform calculations, check results, generate reports, and ensure data integrity and security.

A variety of reporting formats, from a computerized data table to complex reports discussing regulatory issues, can be integrated into a client's existing information system. In addition to the regular hardcopy report, clients can also receive analytical results on a floppy disk, magnetic tapes or via electronic mail.

Figure 3. Data Reporting Scheme



13. CORRECTIVE ACTIONS

When errors, deficiencies or out-of-control situations exist, the QA plan provides systematic procedures, called "corrective actions," to resolve problems and restore proper functioning of the analytical system.

Laboratory personnel are alerted that corrective actions may be necessary if:

1) QC data is outside the warning or acceptable windows for precision and accuracy.

2) Undesirable trends in concentration, spike recoveries and relative percent difference (RPD) are detected.

3) There are unusual changes in detection limits.

4) Deficiencies are detected by the QA Officer during internal and external audits, weekly walk-throughs, or from the results of performance evaluation samples.

5) Complaints are received from clients.

Corrective action procedures are often handled at the bench level by the analyst, who will review the extraction procedure for possible errors, check the instrument calibration, spike mixes and standard mixes, instrument sensitivity, etc. If the problem persists or cannot be identified, the matter is referred to the laboratory supervisor, manager and/or QA Officer, who will investigate further. When the problem is resolved, the QA Officer is provided with full documentation, which is kept on file in the QA office. Corrective action documentation is routinely reviewed by the Corporate Vice President of Quality Assurance.

14. QA/QC REPORTS

The reporting system is a valuable tool for measuring the overall effectiveness of the QA program; it serves as an instrument for evaluating the program design, identifying problems and trends, and planning for future needs. Each laboratory QA Officer must submit extensive quarterly QA reports to the laboratory president and to the Corporate Vice President of Quality Assurance. These reports include:

1. A systems audit report.
2. Performance evaluation scores and commentary.
3. The number of quality control samples performed and test results.
4. Results of site visits and audits by regulatory agencies and other clients.
5. Status of major contracts, projects, and certifications.
6. Problems encountered and corrective actions taken.
7. Comments and recommendations.

In turn, the Corporate Vice President of Quality Assurance must also submit quarterly reports to the Executive Committee, the Chairman of the Board, and to each laboratory President. These reports summarize the information gathered through the laboratory reporting system; they also contain a thorough review and evaluation of laboratory operations as derived from inspections and audits that the Corporate Vice President of Quality Assurance has personally conducted, and include any recommendations or comments.

Two

1. QUALITY ASSURANCE

The goal of the Quality Assurance plan of the Environmental Division at Enseco/CLE Laboratory is to provide reliable, valid data using appropriate methods for the specific analysis being performed. The standard operating procedures put forth in this document outline the tasks performed by the personnel at Enseco/CLE Laboratory to ensure the realization of this goal.

3. FACILITIES AND EQUIPMENT

A. Equipment Inventory

4	Finnigan GC/MS systems
2	Nova 4 INCOS and 2 Nova 4X INCOS GC/MS computer systems
1	Tekmar purge and trap device
1	LC/MS interface (thermospray)
7	GC systems with ECD, FPD, FID and NPD
5	GC autosamplers
6	HPLC systems with fluorescence and electrochemical detectors
6	HPLC autosamplers
3	Scanning UV spectrometers
12	IBM (or compatible)-networked computer systems
3	Nelson Analytical-Chromatography Data Systems

B. Preventive Maintenance

Maintenance logs will be maintained for all major equipment. The purpose of the logs is to keep a record of all preventive maintenance performed and to document any problems and the corrective action taken.

Preventive maintenance procedures recommended by the instrument manufacturer will be followed. These procedures are outlined in detail in the appropriate instrument manuals.

All major equipment is under service contract to qualified technicians.

4. ANALYTICAL METHODOLOGY

A. Standard Operating Procedures

All analytical procedures followed at Enseco/CLE Laboratory, whether established in the literature or developed in-house, will be documented with an SOP which will consist of a step-by-step outline of how the analysis is performed. All procedures will be referenced so that the original document may be readily consulted. All equipment and materials used will be outlined in the original reference, therefore only deviations established at Enseco/CLE Laboratory will be documented in the SOP.

B. Calibration

1. GC Calibration

The GC used for quantitation will be calibrated according to the protocol that is being utilized for a particular analysis. For the analysis of chlorinated pesticides and PCB's the procedure outlined in the EPA CLP Organics Analysis Statement of Work will be followed. For the analysis of drinking water samples submitted for the determination of herbicides and insecticides, the procedure outlined in the corresponding method will be followed.

2. GC/MS Calibration

a. Mass Calibration

All GC/MS instruments will undergo calibration to ensure the quality of the data acquired during any shift. Daily or every 12 hours the mass calibration standard will be analyzed to demonstrate that the instrument meets the standard mass spectral abundance criteria. Whenever any action is taken which may affect the tuning parameters of the instrument (e.g. source cleaning or other maintenance) the mass calibration must be verified regardless of the 12-hour time period. Mass calibration criteria must be met before any analyses (standards, blanks or samples) using EPA protocols may be performed.

b. Decafluorotriphenylphosphine (DFTPP)

Each instrument used for the GC/MS analysis of semi-volatile or pesticide compounds must be tuned to meet EPA criteria when 50 ng of DFTPP is injected. The calibration will be documented. A hardcopy of the bar graph plot and a mass listing of the DFTPP calibration standard will be kept as part of the data package.

c. p-Bromofluorobenzene (BFB)

Each instrument used for the GC/MS analysis of volatile compounds must be tuned to meet EPA criteria when 50 ng of BFB is injected directly or purged from 5.0 mL of reagent water. The calibration will be documented. A hardcopy of the bar graph plot and a mass listing of the BFB calibration standard will be part of the data package.

d. Standard Curves and Daily Calibrations

The GC/MS systems will be calibrated according to the protocol that is being utilized for a particular analysis. For the analysis of volatile, semi-volatile, and pesticide compounds, the procedure outlined in the EPA CLP Organics Analysis Statement of Work will be followed.

TABLE 1

WATER SAMPLES FOR ORGANICS

Measurement	Min Vol	Container	Preservative	Holding Time*
EPA 624 (VOAs)	40 mL	2-40 mL VOA	Cool, 4° C, no bubbles	7 days
EPA 625 (ABNs)	500 mL	1L amber glass	Cool, 4° C	5 days/30 days
EPA 608 (Pesticides/PCBs)	500 mL	1L amber glass	Cool, 4° C	5 days/30 days
Other Extractables	500 mL	1L amber glass	Cool, 4° C	5 days/30 days
Other Pesticides	500 mL	1L amber glass	Cool, 4° C	5 days/30 days

*Two dates indicate extraction/analysis