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QUALITY ASSURANCE BRANCH

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ENVIRONMENTAL SERVICES DIVISION

PERFORMANCE OF REMEDIAL RESPONSE
ACTIVITIES AT UNCONTROLLED HAZARDOUS
WASTE SITES (REM II)

U.S. EPA CONTRACT NO. 68-01-6939

QUALITY ASSURANCE PROJECT PLAN (QAPP)

FOR

EAU CLAIRE MUNICIPAL WELL FIELD
EAU CLAIRE, WISCONSIN

SEPTEMBER 1986

Prepared for:

U.S. Environmental Protection Agency
Emergency and Remedial Response Branch
Region V
230 South Dearborn Street
Chicago, Illinois 60604

Document No.: 257-WP1-OP-DJHH-1
Work Assignment No.: 153-5LL3



environmental engineers, scientists,
planners, & management consultants

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October 30, 1986

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Subject: Quality Assurance Project Plan for
Eau Claire Municipal Well Field Site
Work Assignment No.: 153-5LL3.0
EPA Contract No.: 68-01-6939
Document No.: 257-WP1-OP-DJHH-1

Dear Mr. Vanderlaan and Ms. Calabrese:

Camp Dresser & McKee Inc. is pleased to submit this Quality Assurance Project Plan (QAPP) for the RI/FS at the Eau Claire Municipal Well Field site in Eau Claire, Wisconsin. We have incorporated the changes requested by Mr. David Payne of the Region V Quality Assurance Office. Upon completion of your review, please either return the volume to WESTON for final production of all copies or forward it to Mr. David Payne for approval.

If you have any questions or require additional information, please contact Mr. Kurt Stimpson.

Very truly yours,

Jun Yoshitani
REM II Region V Manager



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Subject: Quality Assurance Project Plan for
Eau Claire Municipal Well Field Site
Work Assignment No.: 153-5LL3.0
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Dear Mr. Yoshitani:

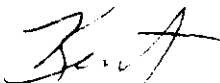
Submitted herewith is one copy of the Quality Assurance Project Plan (QAPP) for the Eau Claire Municipal Well Field located in Eau Claire, Wisconsin. The QAPP has been reviewed by the REM II team previously and this version includes only minor corrections requested by Mr. David Payne. A second review copy has been forwarded to Ms. Calabrese (RPM) for review and submittal to the QAO.

When we receive the approved copy from Mr. David Payne, we will distribute the final copies.

If you have any questions, please do not hesitate to call.

Very truly yours,

ROY F. WESTON, INC.


Kurt S. Stimpson
Site Manager

KSS:amp

Enclosure

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Quality Assurance Project Plan
Eau Claire Municipal Well Field
Section: 1
Revision: 3
September 30, 1986
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QUALITY ASSURANCE PROJECT PLAN
EAU CLAIRE MUNICIPAL WELL FIELD
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
EAU CLAIRE, WISCONSIN

SECTION 1

INTRODUCTION

The United States Environmental Protection Agency (U.S. EPA) requires participation of all U.S. EPA contractors in a centrally managed quality assurance (QA) program. This requirement is applied to all environmental monitoring and measurement efforts mandated or supported by U.S. EPA.

Each contractor generating data has the responsibility to implement minimum procedures to assure that the precision, accuracy, completeness and representativeness of its data are known and documented. To insure the responsibility is met uniformly, each U.S. EPA contractor must prepare a written QA Project Plan (QAPP) covering each project it is contracted to perform.

This QAPP presents the organization, objectives, functional activities and specific QA and quality control (QC) activities associated with the Remedial Investigation/Feasibility Study (RI/FS) at the Eau Claire Municipal Well Field, Eau Claire, Wisconsin. The QAPP is designed to achieve the specific data quality goals of the RI/FS at the Eau Claire Municipal Well Field site.

SECTION 2

PROJECT DESCRIPTION

The remedial investigation portion of the RI/FS is designed to gather specific information necessary to assess if the site presents a hazard to human health or welfare or to the environment and to evaluate potentially feasible remedial actions. All tasks and subtasks are directed toward accomplishment of these primary objectives.

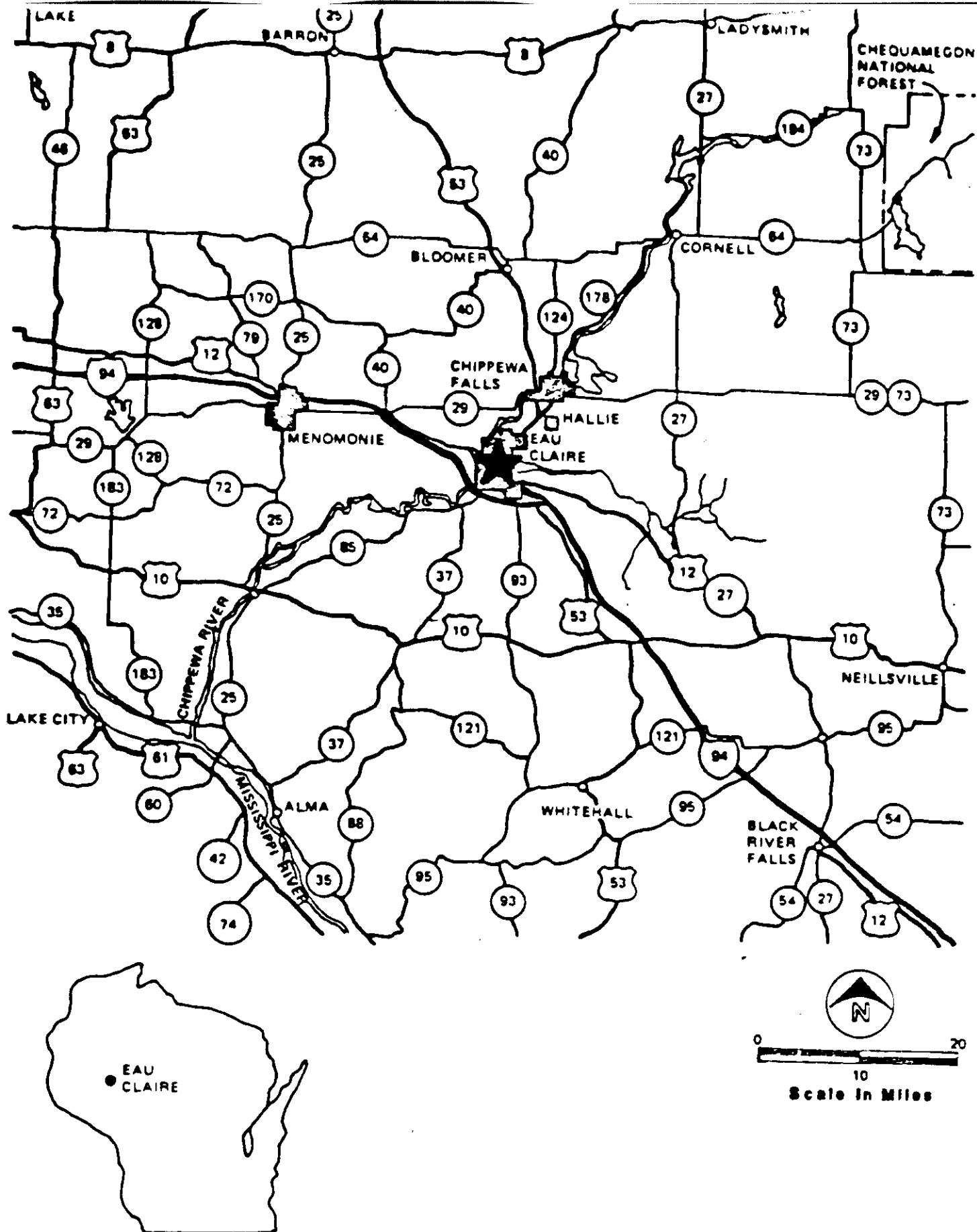
2.1 BACKGROUND

The City of Eau Claire is located in northwest Eau Claire County, Wisconsin (Figure 1) at the confluence of the Eau Claire River and the Chippewa River. At present, the city water system is supplied by groundwater pumped from shallow glacial deposits. The municipal well field, a 500-acre site, is located in the northwest corner of the city on the east bank of the Chippewa River near the Eau Claire County Airport (Figure 2). Land use in the vicinity of the well field consists of light industry east of the airport and residential areas to the west and south of the well field. The city-owned water system includes 14 active wells, a water treatment facility and 3 ground-level storage reservoirs. The water system serves approximately 57,000 residents of Eau Claire and the surrounding community, as well as numerous commercial and industrial establishments.

The 14 currently active wells include 9 wells developed in the north well field and 5 in the south well field. The oldest and newest active wells were drilled in 1934 and 1978, respectively. Total well depths range from 83 to 105 feet, with inner casing diameters of 16 to 20 inches. The existing treatment plant, located on Riverview Drive, has a design capacity of 24 million gallons per day (mgd). The plant provides iron and manganese removal for water from the south well field, then water from the north well field, which has lower iron and manganese concentrations, is blended with the treated water prior to filtration, disinfection, and fluoridation.

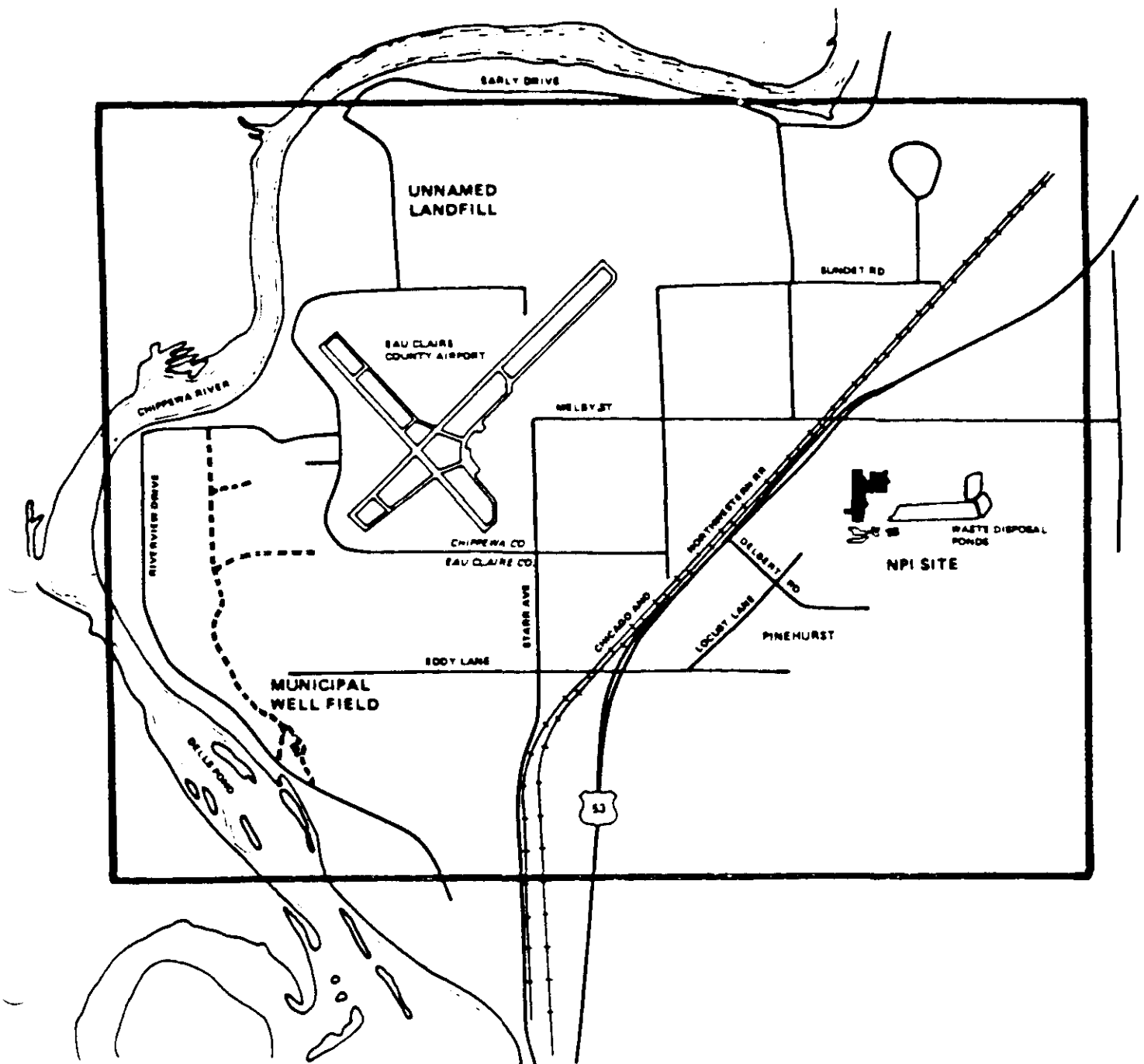
In 1981 an EPA survey of water supplies identified several volatile organic compounds (VOCs) within the city water supply. The compounds detected were 1,1-Dichloroethane, 1,1-Dichloroethylene, 1,1,1-Trichloroethane, and Trichloroethylene (TCE). Further sampling detected VOCs in all but one production well.

In response to the contamination problem, the City of Eau Claire contracted with Hickok and Associates to perform a hydrogeologic investigation. The investigation resulted in several reports documenting the general bedrock topography, the local groundwater flow



Source: CH2M-Hill, June 1985

Figure 1
General Vicinity Map



Source: CH2M-Hill, June 1985

FIGURE 2
AREA OF INVESTIGATION
EAU CLAIRE MUNICIPAL WELL FIELD

system, and a data base of hydrologic and chemical data. As part of the EPA Interim Work Assignment (IWA), CH₂M-Hill has issued a report entitled "Preliminary Hydrogeologic Evaluation - Eau Claire Municipal Well Field." In addition, water samples were collected from municipal supply wells and surrounding residential wells and submitted for chemical analysis by the Central Regional Laboratory (CRL). The samples were collected during two sampling trips (IWA rounds 1 and 2). It should be noted that the required number of sample duplicates and blanks were not obtained in these sampling rounds.

The investigations to date have not identified the source of VOCs in the city water supply. In a report prepared by the Wisconsin Department of Natural Resources (DNR), nine establishments were identified in the area that have current or past VOC disposal practices which may have contributed to the groundwater contamination problem. A potential source of contamination is the National Presto Industries, Inc. (NPI) facility approximately 2.5 miles to the east of the well field. Prior investigations on the waste disposal operations at NPI indicated that groundwater surrounding their waste disposal operations was contaminated with heavy metals and that several of their monitoring wells contained VOCs.

Since the identification of the contamination problem, a significant base of chemical data has been developed for the Eau Claire well field. Data collected prior to the IWA did not include full trace organic scans, and very little inorganic data (trace metals in particular) for the well field was available. The pre-IWA data base is included in Appendix A. It should be noted that no information on the QA/QC protocol used during sample collection and analysis for these data is available. Thus, the validity of the data is unknown. Pre-IWA data are of five general types:

- o VOC data from Eau Claire Municipal Well Field production wells (Table A-1)
- o VOC data from Eau Claire Municipal Well Field test wells (Table A-2)
- o VOC data from NPI monitoring wells and lagoons (Table A-3)
- o Inorganic data from NPI monitoring wells and lagoons (Table A-3)
- o VOC data from private water supply wells (Table A-4)

Also included in Appendix A is a summary of phenols data pertaining to samples collected from NPI.

Figure 3 illustrates the locations of production wells and test wells in the well field. Figure 4 illustrates the locations of NPI monitoring wells. Figure 5 illustrates the locations of wells and surface waters tested in the area as part of IWA rounds 1 and 2.

The data in Appendix A-1 indicate that VOCs are primarily found in supply wells Nos. 11, 15, 16, and 17. All these wells are located in the north and northeastern portion of the well field. Supplemental chemical data to evaluate the extent of contamination within and around the well field were collected during the IWA. These data are included in Appendix B. The QA protocols used during the collection and analysis of these samples is included in later sections of the QAPP. The most prevalent compounds that have been identified at the highest levels within the well field and/or nearby residential wells are:

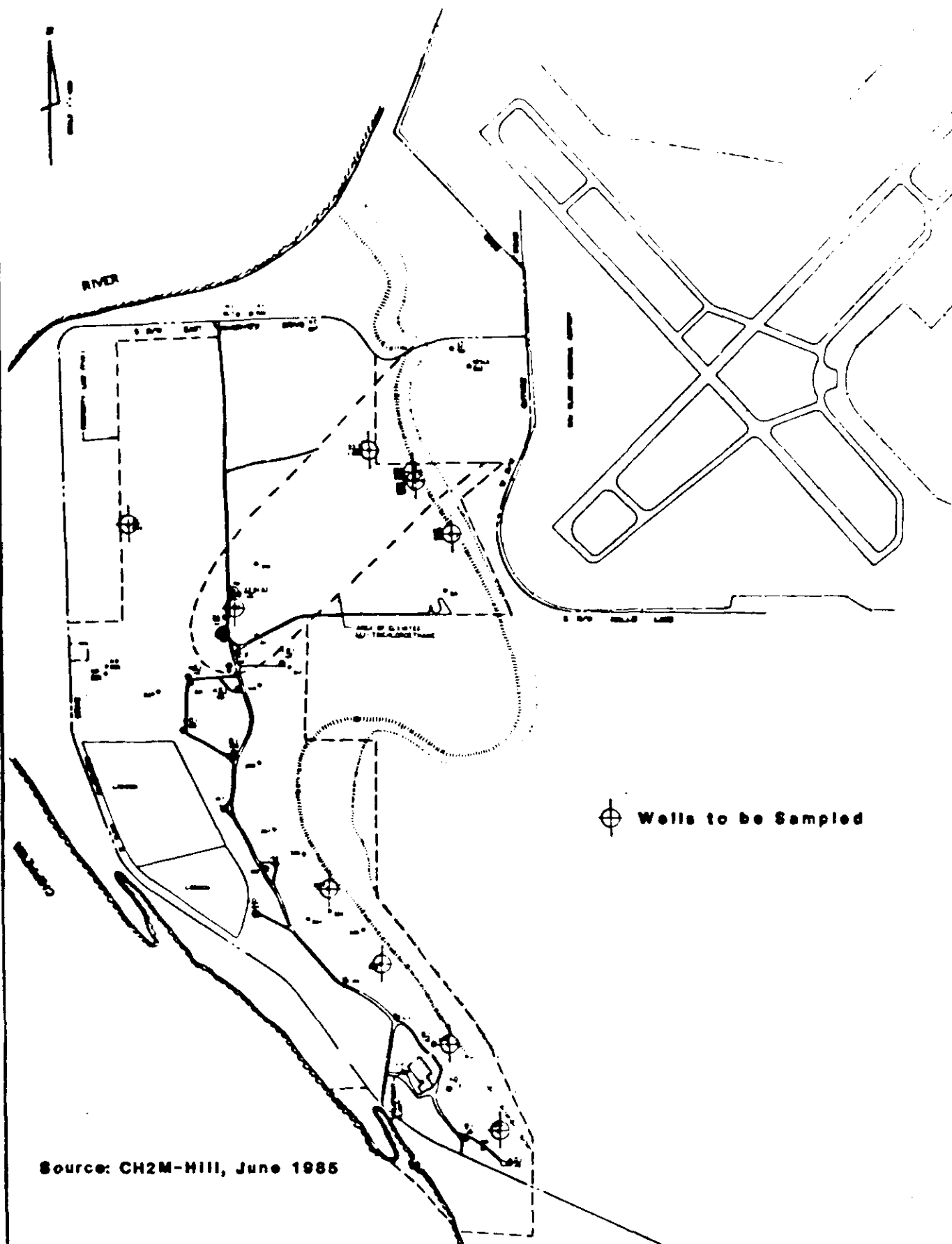
- o 1,1,1 Trichloroethane - 188 ug/L
- o 1,1 Dichloroethane - 10.3 ug/L
- o 1,1 Dichloroethylene - 20 ug/L
- o Trichloroethylene (TCE) - 34.6 ug/L
- o Tetrachloroethylene (PCE) - 17.1 ug/L

All of these compounds with the exception of 1,1-Dichloroethane are known or suspected carcinogens.

2.2 PROJECT OBJECTIVES

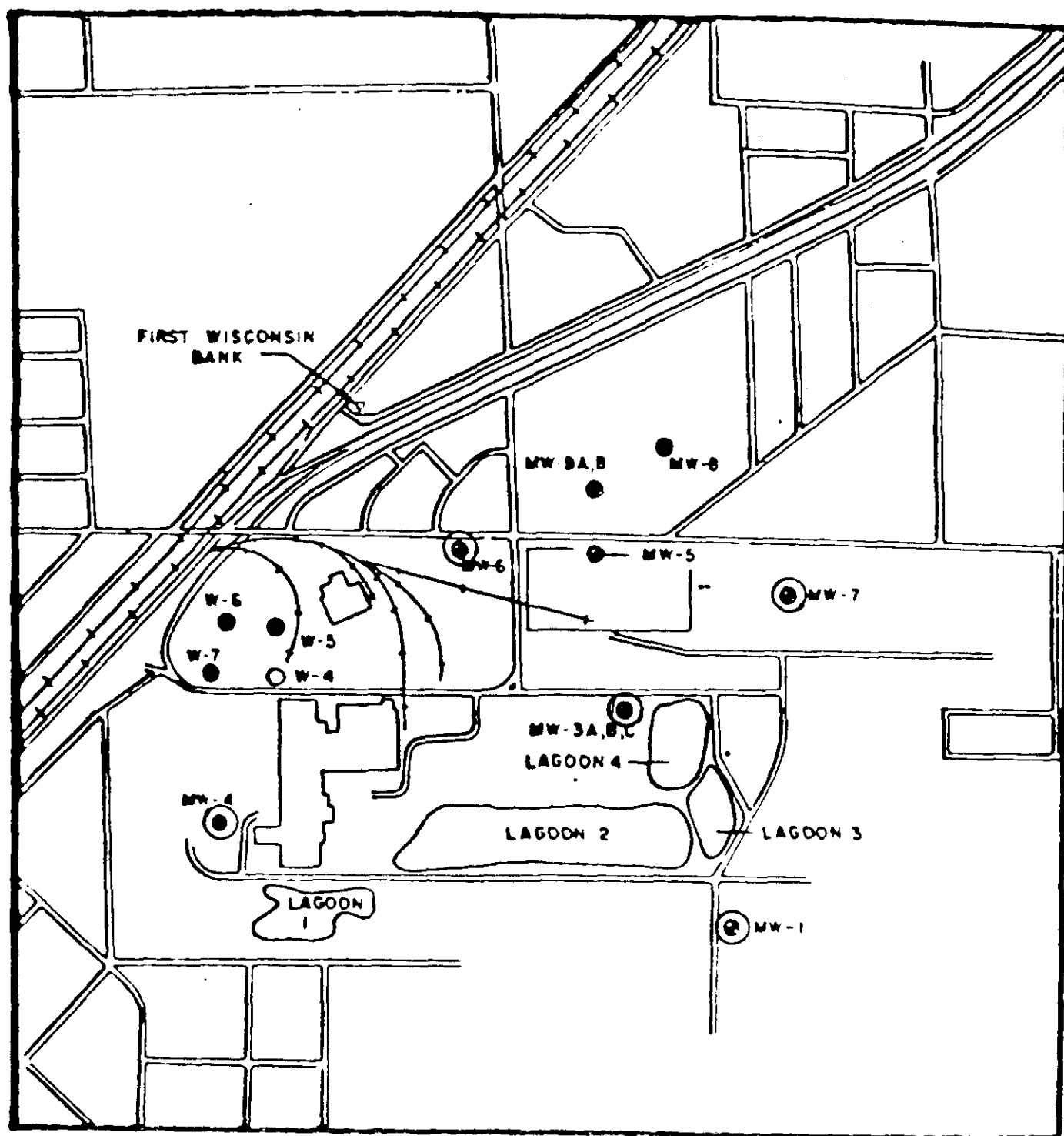
The purpose of this Remedial Investigation Feasibility Study (RI/FS) is to characterize the hazard or threat of hazard posed by the Eau Claire Municipal Well Field site and, if appropriate, to identify a cost-effective, environmentally sound remedial action as provided for by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Natural Oil and Hazardous Substances Contingency Plan, 40 CFR Part 300 Subpart F (NCP). Before alternatives for remedial actions can be considered in the feasibility study, there must be sufficient information available to develop, screen, and evaluate potential alternatives. The remedial investigation will gather and assess information needed to accomplish the following:

- o Assess the type and extent of groundwater contamination in the well field and within the immediate surroundings.
- o Define the hydrologic system encompassing the well field and determine contaminant pathways, loading rates, and probable sources.
- o Assess the type and extent of contamination in nearby residential wells.



Source: CH2M-Hill, June 1985

**FIGURE 3 LOCATION OF PRODUCTION AND TEST WELLS
IN EAU CLAIRE MUNICIPAL WELL FIELD**

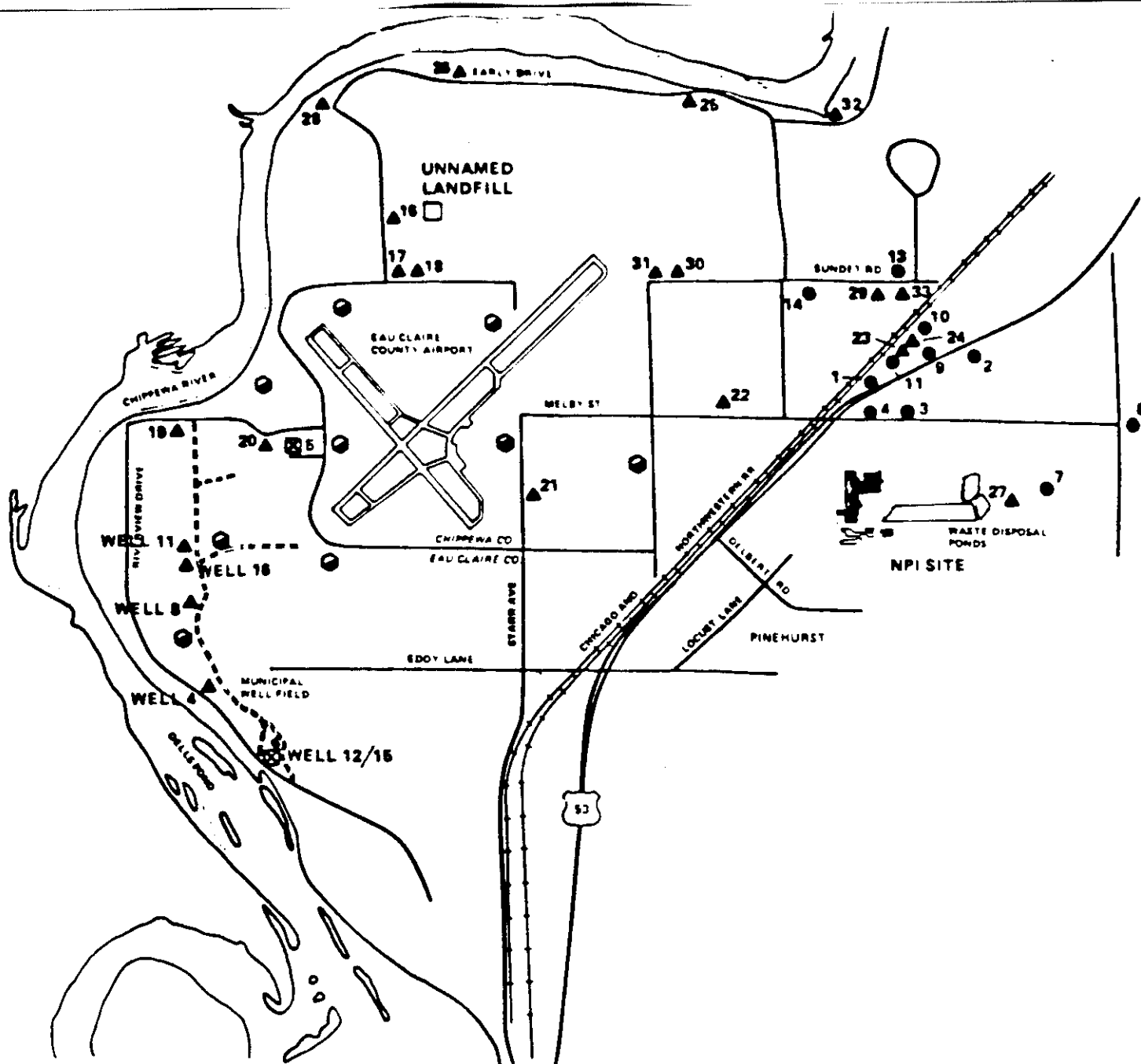


LEGEND

- NATIONAL PRESTO INC MONITORING WELLS
- PRODUCTION WELL
- ABANDONED PRODUCTION WELL
- ⊙ EXISTING WELLS TO BE SAMPLED

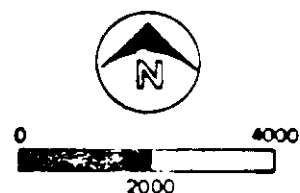
Source: CH2M-Hill, June 1985

FIGURE 4 LOCATION OF NPI MONITOR WELLS
2-7



LEGEND

- INTERIM WORK ASSIGNMENT ROUND 1 SAMPLING LOCATIONS
- ▲ INTERIM WORK ASSIGNMENT ROUND 2 SAMPLING LOCATIONS
- ⊠ INTERIM WORK ASSIGNMENT ROUND 1 AND 2 SAMPLING LOCATIONS
- MONITORING WELL NEST LOCATIONS (TENTATIVE)



Source: CH2M-Hill, June 1985

FIGURE 5
LOCATION OF IWA
SAMPLING POINTS
EAU CLAIRE MUNICIPAL WELL FIELD

- o Evaluate if conditions at the site and contaminant levels in the hydrologic system pose a risk to human health and the environment.
- o Define on-site physical features and facilities that could affect contaminant migration, containment, or cleanup.
- o Develop, screen and evaluate potential remedial action alternatives.
- o Recommend the most cost-effective remedial action alternative(s) that adequately protects health, welfare and the environment.
- o Prepare a conceptual design of the recommended alternative.
- o Identify the source(s) of contamination and supporting documentation for enforcement purposes.

In order to accomplish the goals of the RI, (determination of risk to human health and the environment) water quality criteria must be addressed. The proposed Maximum Contaminant Levels (13 November 1985, 40 CFR Part 141 Federal Register) for the most prevalent compounds identified to date are:

1,1,1-Trichloroethane	-	200 ug/l
1,1-Dichloroethane	-	none established
1,1-Dichloroethylene	-	7 ug/l
Trichloroethylene (TCE)	-	5 ug/L
Tetrachloroethylene (PCE)	-	None established

These values are consistent with approximately 1×10^{-6} excess cancer risk level. The values have been adjusted for lifetime variations in body weight and height.

The site history and available data base indicate that the boundaries of the study area are ill-defined. Therefore, the scope of the study will be refined as the investigation progresses.

A critical element of the remedial investigation will be to gather high quality analytical data for water quality in the area. Samples have been collected from both the well field and local water supply wells as part of the IWA and will be collected from monitoring wells during the RI. The available data indicate the compounds that are critical for defining the extent of contamination at the site. To gather the necessary chemical data, a three-phased approach will be used:

Phase I:

Water samples have been collected from selected wells (in areas of known contamination) for complete organic and inorganic analyses with emphasis on VOC analyses, as part of the IWA.

Phase II:

Based on these data, and supported by initial sampling during the Site Characterization of the RI, determine the maximum analytical program to both trace the extent of contamination and to "fingerprint" the contamination plume. (This "fingerprinting", in conjunction with data on the hydrologic system, will be useful for defining the source(s) of the groundwater contamination.) The analytical program will include installation of monitoring wells.

Phase III:

Collect data from monitoring wells, in addition to municipal and private wells, if needed, based on the previously defined analytical program. Data must be accurate to levels consistent with 10^{-6} cancer risk levels. Follow-up data will likely also be collected from existing monitoring, production and test wells, as well as newly drilled boreholes.

The data collected will be used for evaluating water quality in accordance with the Clean Water Act and the Safe Drinking Water Act. The data will also be used for assessing endangerment posed to human health and the environment by contaminated materials (soil and water) at the site. Established cancer risks (from the EPA Carcinogen Assessment Group) and allowable daily intake values will be used during this evaluation. The sampling and quality control protocol used during this investigation is consistent with CERCLA guidance.

In general, the data will be used to meet the three primary goals of the RI/FS:

- o Define extent of contamination
- o Evaluation of site risk
- o Identify feasible remedial measures

The RI/FS includes ten general tasks, each having several subtasks. The tasks are described in the RI/FS work plan:

Remedial Investigation (RI) Activities:

- o Task 1 - Interim Work Assignment
- o Task 2 - Site Investigation Support
- o Task 3 - Hydrogeologic Investigation (site characterization)
- o Task 4 - Source Confirmation (optional)
- o Task 5 - Public Health Evaluation
- o Task 6 - Remedial Investigation Report

Feasibility Study FS Activities:

- o Task 7 - Evaluation of Remedial Action Alternatives
- o Task 8 - Preparation of Feasibility Study Report
- o Task 9 - Predesign

Project Management:

- o Task 10 - Project Management and Support Activities

The environmental monitoring and measurement efforts covered by this QAPP are limited to certain subtasks within Tasks 1, 2, and 3.

2.3 SCHEDULE

The Eau Claire Municipal Well Field RI/FS was authorized in October, 1984. The first drafts of the RI/FS Work Plan and QAPP were submitted to U.S. EPA by REM/FTT Contractors CH₂M-Hill on April 18, 1985. CH₂M-Hill submitted second drafts of both of these documents on June 15, 1985. Due to limitations of LOE hours in the REM/FTT Contract, the REM II Contractor, Camp, Dresser and McKee (CDM), was authorized to assume the contractor responsibilities for the RI/FS the week of July 8, 1985. The anticipated date for submission of the Final Work Plan and related Project Plans to the U.S. EPA is February 1986. The RI work tasks will be initiated prior to finalization of the Project Plans.

The four major subtasks in Task 1 - Interim Work Assignment have been described in the Interim Work Plan Memorandum submitted by CH₂M-Hill on January 16, 1985. The first three subtasks: Data Review and Initial Site Evaluation (including a preliminary hydrogeologic report), Residential Well Sampling, and Development of (draft) RI/FS Plans have been completed by CH₂M-Hill. Subtask 4, which included project management, meetings and community relations, was completed as necessary in accomplishing subtasks 1-3. Subtasks of Task 2 - Preliminary Site Support has been sufficiently completed and initiated to allow the start of RI activities. In Subtask 2.1 - Topographic Map Preparation, available topographic maps are sufficient for completion of the RI. It is possible that at discrete locations more detailed topographic maps may be needed for the FS.

Subtask 2-2 - Air Photo Survey and Analysis has been initiated by the U.S. EPA EMSL for incorporation into the RI report.

Assuming 30 days for Agency approval of the RI/FS work plan and at least partial approval of the QAPP, the RI should begin in December 1985. Task 4 - Site Characterization should take about 25 weeks to complete. Depending on the turnaround for analytical data from the CLP, the RI should be finished by the end of Spring, 1986. Task 5, Source Confirmation may extend into Summer 1986 if it is deemed necessary.

The FS will require approximately five months to complete. Following a three week public comment period and Agency review of the Draft Feasibility Report, approximately two months will be needed to prepare the conceptual design of the selected remedial action(s).

The total elapsed time from U.S. EPA approval of the work plan to submission of the final deliverables is estimated to be 18 months. The project schedule is shown in Figure 6. This schedule will be updated as appropriate, throughout the RI/FS project.

2.4 DATA USAGE

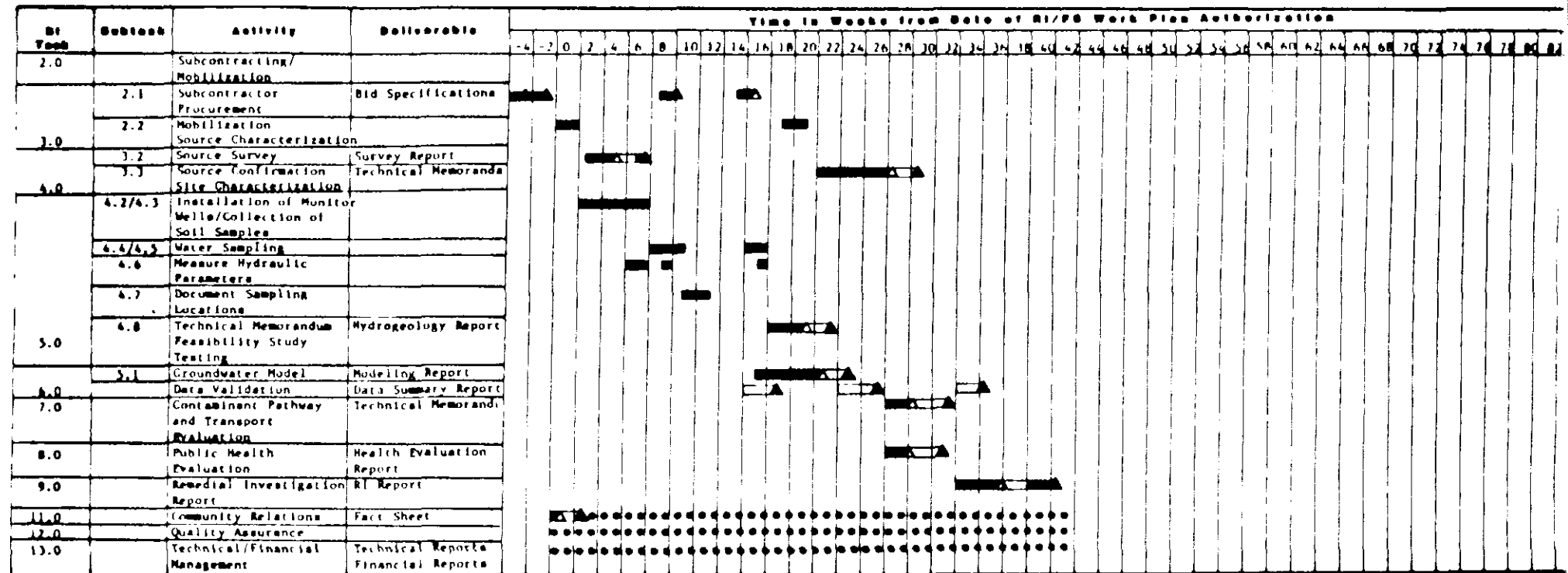
The data obtained during the RI will be used to achieve the objectives outlined above (Subsection 2.2) within the scope and authority of CERCLA. The data obtained from sampling and analysis of municipal and private residential water supply wells will be evaluated with respect to the most current appropriate sections of Safe Drinking Water Act (SDWA) and the most current appropriate sections of the Clean Water Act (CWA), including Recommended Maximum Contaminant Levels (RMCLs). An evaluation of the adequacy of the data for the uses described above will be performed as part of this RI report.






To assure that the RI data can be evaluated with respect to the most current sections of the SDWA and the CWA, as well as State of Wisconsin drinking water guidelines, all samples will be analyzed with methods capable of quantifying contaminant concentrations at or below the proposed recommended maximum contaminant levels.

2.5 SAMPLING NETWORK DESIGN

The objectives of the sampling program to be undertaken as part of the RI/FS at the Eau Claire Municipal Well Field site in Eau Claire, Wisconsin are as follows:

- o To assess the extent of private residential well contamination in the area north of NPI and the airport.
- o To evaluate the position and configuration of the water table on-site and in immediately adjacent, upgradient, downgradient, and off site areas.
- o To evaluate potentiometric heads, groundwater flow, and contaminant conditions in the Eau Claire Municipal Well Field aquifer and the upgradient aquifer.
- o To define the hydrogeologic conditions within the well field and to the east and northeast of the well field within the area of suspected contaminant plume location.



-  RCM H Activity
-  EPA Activity/Review
-  Deliverable-Draft
-  Deliverable-Final
-  Ongoing Activity

Scope of this activity, which include well installation and sampling, will not be defined until approximately week 10.

Figure 6 RI/FS Project Schedule

- o To describe the well field soil stratigraphy, and the soil stratigraphy in adjacent easterly and northeasterly areas.
- o To identify the presence, character, and extent of contamination in the near-surface soils at WDNR-identified establishments that could be possible sources of the VOC contamination in the municipal well field.

The sampling (monitoring) network design to achieve these objectives and the rationale for that design are presented in Section 2 of the Sampling and Analysis Plan, which is attached as Appendix C of the QAPP.

2.6 SAMPLING MATRICES/PARAMETERS/FREQUENCY

The scope of the sampling activities planned at the Eau Claire Municipal Well Field site includes, during the second and third phases, the installation of groundwater monitor wells at a maximum of 19 locations. Monitor wells will be installed at nine locations during Phase II and at 10 locations during Phase III (optional). The media/matrices which have been and will be sampled include potable water supplies, groundwater, surface water, and soil. Field GC and laboratory GC/MS screening of volatile organic compounds will be performed during the installation of the monitor wells in Phase II. Chemical analyses to detect priority pollutants and other hazardous materials (with emphasis on VOCs) have been performed on 37 water supplies and one surface water as part of the IWA (Phase I). Organic and inorganic analyses (with emphasis on VOCs) will be performed on samples, including duplicates and blanks, from up to 66 new (Phase II) and existing monitor wells. Aquifer hydraulic conductivity (slug) tests will be performed on all of the monitor wells installed during Phase II and Phase III. Thirty-six soil samples from the Phase II soil borings will be submitted for grain-size analysis. A water level monitoring program will be conducted to define the water table gradients in the vicinity of the site and assess surface water and groundwater relationships.

The sampling and analysis program is summarized in Table 1, which indicates the specific parameters to be measured, the number and frequency of sampling, and the level of QA effort for each environmental medium/matrix. The parameters to be quantified in RAS organics and inorganics analysis by the CLP are listed in Tables 2 and 3 respectively. Special Analytic Services will be required for field screening (overnight analysis) of groundwater samples collected during Phase II monitor well installation and, it is anticipated, to achieve lower detection limits for organics in groundwater samples from the completed Phase II monitor wells.

SUMMARY OF ANALYTICAL PROGRAM

Study Phase	Sample Matrix	Field Parameters	Laboratory Parameters	Investigative Analysis			Duplicates			Blanks			Matrix Total
				No.	Freq.	Total	No.	Freq.	Total	No.	Freq.	Total	
Hydrogeologic Investigation	Groundwater-RI/FS monitor wells	pH Specific Conductance Temperature	RAS organics package from CLP including 30 tentatively identified compounds	29	2	58	3	2	6	3	2	6	70
			RAS inorganics package from CLP (filtered samples)	29	2	58	3	2	6	3	2	6	70
			SAS for eight specific volatile organics required to attain low detection limits	27	2	54	9	2	18	20	2	40	112
			Volatile organics, EPA method 624 (overnight analysis for non-evidentiary screening purposes)	10	1	10	1	1	1	1	1	1	12
			Field GC during drilling	---	54	1	54	9	1	9	9	1	9
	Groundwater-other monitor wells	pH Specific Conductance Temperature	RAS organics package from CLP including 30 tentatively identified compounds	37	1	37	4	1	4	4	1	4	45
			RAS inorganics package from CLP (filtered samples)	37	1	37	4	1	4	4	1	4	45
			SAS for eight specific volatile organics required to attain low detection limits	37	1	37	4	1	4	26	1	26	67

TABLE 1 (continued)
SUMMARY OF ANALYTICAL PROGRAM

Study Phase	Sample Matrix	Field Parameters	Laboratory Parameters	Investigative Analysis			Duplicates			Blanks			Matrix Total
				No.	Freq.	Total	No.	Freq.	Total	No.	Freq.	Total	
	Soil-RI/FS monitor wells	Qualitative organic vapor screening with HMu	Particles size analysis (ASTM D-422)	36	1	36	4	1	4	-	-	-	40
	Hydraulic Heads	Water Levels											
	-RI/FS monitor wells		---	29	3	87	3	3	9	-	-	-	96
	-Other monitor wells		---	35	3	105	4	3	12	-	-	-	117
	Hydraulic Conductivity	Slug Tests	---	29	1	29	-	-	-	-	-	-	29
	RI/FS monitor wells												
	Surface water-Chippewa River	pH Specific Conductance Temperature	RAS organics package from CLP including 30 tentatively identified compounds	3	1	3	1	1	1	-	-	-	4
			RAS inorganics package from CLP										
			(filtered samples)	3	1	3	1	1	1	-	-	-	4
			SAS for eight specific volatile organics required to attain low detection limits	3	2	6	1	2	2	2	2	4	12

TABLE 1 (continued)
SUMMARY OF ANALYTICAL PROGRAM

Study Phase	Sample Matrix	Field Parameters	Laboratory Parameters	Investigative Analysis			Duplicates			Blanks			Matrix Total
				No.	Freq.	Total	No.	Freq.	Total	No.	Freq.	Total	
Source Confirmation (optional)	Groundwater-R1/FS monitor wells	pH Specific Conductance Temperature	RAS organics package from CLP including 30 tentatively identified compounds	10	1	10	1	1	1	1	1	1	12
			RAS inorganics package from CLP- (filtered samples)	10	1	10	1	1	1	1	1	1	12
	Soil-R1/FS monitor wells	Qualitative organic vapor screening with HNU	RAS organics package from CLP including 30 tentatively identified compounds	40	1	40	4	1	4	-	-	-	44
			RAS inorganics/metals package from CLP	40	1	40	4	1	4	-	-	-	44
			RAS inorganics/cyanide package from CLP	40	1	40	4	1	4	-	-	-	44
	Hydraulic Heads -New monitor wells	Water Levels											
			---	10	3	30	1	3	3	-	-	-	33
			Existing monitor wells	62	1	62	7	1	7	-	-	-	69
	Hydraulic Conductivity	Slug Tests		10	1	10	1	1	1	-	-	-	11

Source: Weston, 1986

Table 2
Method Detection Limits for
RAS Organics from CLP

Volatiles	CAS Number	Detection Limits*	
		Low Water ^a ug/L	Low Soil/Sediment ^b ug/Kg
1. Chloromethane	74-87-3	10	10
2. Bromomethane	74-83-9	10	10
3. Vinyl Chloride	75-01-4	10	10
4. Chloroethane	75-00-3	10	10
5. Methylene Chloride	75-09-2	5	5
6. Acetone	67-64-1	10	10
7. Carbon Disulfide	75-15-0	5	5
8. 1,1-Dichloroethene	75-35-4	5	5
9. 1,1-Dichloroethane	75-35-3	5	5
10. trans-1,2-Dichloroethene	156-60-5	5	5
11. Chloroform	67-66-3	5	5
12. 1,2-Dichloroethane	107-06-2	5	5
13. 2-Butanone	78-93-3	10	10
14. 1,1,1-Trichloroethane	71-55-6	5	5
15. Carbon Tetrachloride	56-23-5	5	5
16. Vinyl Acetate	108-05-4	10	10
17. Bromodichloromethane	75-27-4	5	5
18. 1,1,2,2-Tetrachloroethane	79-34-5	5	5
19. 1,2-Dichloropropane	78-87-5	5	5
20. trans-1,3-Dichloropropene	10061-02-6	5	5
21. Trichloroethene	79-01-6	5	5
22. Dibromochloromethane	124-48-1	5	5
23. 1,1,2-Trichloroethane	79-00-5	5	5
24. Benzene	71-43-2	5	5
25. cis-1,3-Dichloropropene	10061-01-5	5	5

Table 2 (continued)

Volatiles	CAS Number	Detection Limits ^a	
		Low Water ^a ug/L	Low Soil/Sediment ^b ug/Kg
26. 2-Chloroethyl Vinyl Ether	110-75-8	10	10
27. Bromoform	75-25-2	5	5
28. 2-Hexanone	591-78-6	10	10
29. 4-Methyl-2-pentanone	108-10-1	10	10
30. Tetrachloroethene	127-18-4	5	5
31. Toluene	108-88-3	5	5
32. Chlorobenzene	108-90-7	5	5
33. Ethyl Benzene	100-41-4	5	5
34. Styrene	100-42-5	5	5
35. Total Xylenes		5	5

^aMedium Water Contract Required Detection Limits (CRDL) for Volatile HSL Compounds are 100 times the individual Low Water CRDL.

^bMedium Soil/Sediment Contract Required Detection Limits (CRDL) for Volatile HSL Compounds are 100 times the individual Low Soil/Sediment CRDL.

Table 2 (continued)

Semi-Volatiles	CAS Number	Detection Limits*	
		Low Water ^c ug/L	Low Soil/Sediment ^d ug/kg
36. Phenol	108-95-2	10	330
37. bis(2-Chloroethyl) ether	111-44-4	10	330
38. 2-Chlorophenol	95-57-8	10	330
39. 1,3-Dichlorobenzene	541-73-1	10	330
40. 1,4-Dichlorobenzene	106-46-7	10	330
41. Benzyl Alcohol	100-51-6	10	330
42. 1,2-Dichlorobenzene	95-50-1	10	330
43. 2-Methylphenol	95-48-7	10	330
44. bis(2-Chloroisopropyl) ether	39638-32-9	10	330
45. 4-Methylphenol	106-44-5	10	330
46. N-Nitroso-Dipropylamine	621-64-7	10	330
47. Hexachloroethane	67-72-1	10	330
48. Nitrobenzene	98-95-3	10	330
49. Isophorone	78-59-1	10	330
50. 2-Nitrophenol	88-75-5	10	330
51. 2,4-Dimethylphenol	105-67-9	10	330
52. Benzoic Acid	65-85-0	50	1600
53. bis(2-Chloroethoxy) methane	111-91-1	10	330
54. 2,4-Dichlorophenol	120-83-2	10	330
55. 1,2,4-Trichlorobenzene	120-82-1	10	330
56. Naphthalene	91-20-3	10	330
57. 4-Chloroaniline	106-47-8	10	330
58. Hexachlorobutadiene	87-68-3	10	330
59. 4-Chloro-3-methylphenol (para-chloro-meta-cresol)	59-50-7	10	330
60. 2-Methylnaphthalene	91-57-6	10	330
61. Hexachlorocyclopentadiene	77-47-4	10	330
62. 2,4,6-Trichlorophenol	88-06-2	10	330
63. 2,4,5-Trichlorophenol	95-95-4	50	1600

Table 2 (continued)

Semi-Volatiles	CAS Number	Detection Limits*	
		Low Water ^c ug/L	Low Soil/Sediment ^c ug/Kg
64. 2-Chloronaphthalene	91-58-7	10	330
65. 2-Nitroaniline	88-74-4	50	1600
66. Dimethyl Phthalate	131-11-3	10	330
67. Acenaphthylene	208-96-8	10	330
68. 3-Nitroaniline	99-09-2	50	1600
69. Acenaphthene	83-32-9	10	330
70. 2,4-Dinitrophenol	51-28-5	50	1600
71. 4-Nitrophenol	100-02-7	50	1600
72. Dibenzofuran	132-64-9	10	330
73. 2,4-Dinitrotoluene	121-14-2	10	330
74. 2,6-Dinitrotoluene	606-20-2	10	330
75. Diethylphthalate	84-66-2	10	330
76. 4-Chlorophenyl Phenyl ether	7005-72-3	10	330
77. Fluorene	86-73-7	10	330
78. 4-Nitroaniline	100-01-6	50	1600
79. 4,6-Dinitro-2-methylphenol	534-52-1	50	1600
80. N-nitrosodiphenylamine	86-30-6	10	330
81. 4-Bromophenyl Phenyl ether	101-55-3	10	330
82. Hexachlorobenzene	118-74-1	10	330
83. Pentachlorophenol	87-86-5	50	1600
84. Phenanthrene	85-01-8	10	330
85. Anthracene	120-12-7	10	330
86. Di-n-butylphthalate	84-74-2	10	330
87. Fluoranthene	206-44-0	10	330
88. Pyrene	129-00-0	10	330
89. Butyl Benzyl Phthalate	85-68-7	10	330
90. 3,3'-Dichlorobenzidine	91-94-1	20	660
91. Benzo(a)anthracene	56-55-3	10	330
92. bis(2-ethylhexyl)phthalate	117-81-7	10	330
93. Chrysene	218-01-9	10	330
94. Di-n-octyl Phthalate	117-84-0	10	330
95. Benzo(b)fluoranthene	205-99-2	10	330
96. Benzo(k)fluoranthene	207-08-9	10	330
97. Benzo(a)pyrene	50-32-8	10	330

Table 2 (continued)

Semi-Volatiles	CAS Number	Detection Limits*	
		Low Water ^c ug/L	Low Soil/Sediment ^d ug/Kg
98. Indeno(1,2,3-cd)pyrene	193-39-5	10	330
99. Dibenz(a,h)anthracene	53-70-3	10	330
100. Benzo(g,h,i)perylene	191-24-2	10	330

^cMedium Water Contract Required Detection Limits (CRDL) for Semi-Volatile HSL Compounds are 100 times the individual Low Water CRDL.

^dMedium Soil/Sediment Contract Required Detection Limits (CRDL) for Semi-Volatile HSL Compounds are 60 times the individual Low Soil/Sediment CRDL.

Table 2 (continued)

Pesticides	CAS Number	Detection Limits*	
		Low Water ^e ug/L	Low Soil/Sediment ^f ug/Kg
101. alpha-BHC	319-84-6	0.05	8.0
102. beta-BHC	319-85-7	0.05	8.0
103. delta-BHC	319-86-8	0.05	8.0
104. gamma-BHC (Lindane)	58-89-9	0.05	8.0
105. Heptachlor	76-44-8	0.05	8.0
106. Aldrin	309-00-2	0.05	8.0
107. Heptachlor Epoxide	1024-57-3	0.05	8.0
108. Endosulfan I	959-98-8	0.05	8.0
109. Dieldrin	60-57-1	0.10	16.0
110. 4,4'-DDE	72-55-9	0.10	16.0
111. Endrin	72-20-8	0.10	16.0
112. Endosulfan II	33213-65-9	0.10	16.0
113. 4,4'-DDD	72-54-8	0.10	16.0
114. Endosulfan Sulfate	1031-07-8	0.10	16.0
115. 4,4'-DDT	50-29-3	0.10	16.0
116. Endrin Ketone	53494-70-5	0.10	16.0
117. Methoxychlor	72-43-5	0.5	80.0
118. Chlordane	57-74-9	0.5	80.0
119. Toxaphene	8001-35-2	1.0	160.0
120. AROCLOR-1016	12674-11-2	0.5	80.0
121. AROCLOR-1221	11104-28-2	0.5	80.0
122. AROCLOR-1232	11141-16-5	0.5	80.0
123. AROCLOR-1242	53469-21-9	0.5	80.0
124. AROCLOR-1248	12672-29-6	0.5	80.0
125. AROCLOR-1254	11097-69-1	1.0	160.0
126. AROCLOR-1260	11096-82-5	1.0	160.0

*Medium Water Contract Required Detection Limits (CRDL) for Pesticide HSL Compounds are 100 times the individual Low Water CRDL.

^fMedium Soil/Sediment Contract Required Detection Limits (CRDL) for Pesticide HSL compounds are 15 times the individual Low Soil/Sediment CRDL.

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

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

Table 3
Detection Limits for RAS
Inorganics from CLP

Element	Contract Required Detection Level ^{1,2} (ug/L)
Aluminum	200
Antimony	60
Arsenic	10
Barium	200
Beryllium	5
Cadmium	5
Calcium	5000
Chromium	10
Cobalt	50
Copper	25
Iron	100
Lead	5
Magnesium	5000
Manganese	15
Mercury	0.2
Nickel	40
Potassium	5000
Selenium	5
Silver	10
Sodium	5000
Thallium	10
Vanadium	50
Zinc	20
Cyanide	10

- 1: Any analytical method specified in SOW Exhibit D may be utilized as long as the documented instrument or method detection limits meet the Contract Required Detection Level (CRDL) requirements. Higher detection levels may only be used in the following circumstance:

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

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

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

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

SECTION 3

PROJECT ORGANIZATION AND RESPONSIBILITY

Camp Dresser and McKee (CDM) as prime contractor, has overall responsibility for all phases of the RI/FS at the Eau Claire Municipal Well Field site except for community relations. ROY F. WESTON, Inc. (WESTON) is a REM II subcontractor to CDM. WESTON will perform the field investigations and prepare the RI report. WESTON will also perform the development, screening and evaluation of remedial action alternatives; develop the conceptual design of the selected action; and prepare the related reports. CDM will provide administrative oversight and QA/QC for all deliverables. Clement Associates, Inc., which is also a REM II subcontractor to CDM, will provide specialty services in the areas of risk assessment. ICF, Inc. which is also a CDM subcontractor, will provide community relations support services. All four firms will provide project management as appropriate to their responsibilities. All deliverables except community relations deliverables will be issued by CDM. Community relations deliverables will be issued by ICF, Inc.

3.1 OPERATIONAL RESPONSIBILITIES

Operational responsibilities are those involving execution and direct management of the technical and administrative aspects of this project. The following responsibilities have been assigned for the RI/FS at the Eau Claire Municipal Well Field:

- o Remedial Site Project Officer (RSPO)
Joan Calabrese, U.S. EPA, Region V, ERRB
- o REM II Region V Manager
John W. Hawthorn, REM II, CDM
- o Site Manager
John E. Dowden, REM II, WESTON
- o Field Manager
Glenn Wittman, REM II, WESTON
- o Principal Investigator RI
Glenn Wittman, REM II, Weston
- o Principal Investigator FS
P. Krishnan, REM II, WESTON
- o Principal Investigator Conceptual Design
John W. Thorsen, REM II, WESTON

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- o Principal Investigator Risk Assessment
Wayne Reichardt, Clement Associates, REM II
- o Community Relations
Judy Beck, U.S. EPA, Region V, OPA
- o Community Relations Support
Jacqueline Dingfelder, REM II, ICF, Inc.

3.2 LABORATORY RESPONSIBILITIES

Laboratory responsibilities are those involving the performance of analytical services, the preparation of Special Analytical Services (SAS) requests and/or field laboratory procedures, and the assessment of analytical data including review of tentatively identified compounds. The following responsibilities have been assigned for the Eau Claire Municipal Well Field site.

- o RAS and SAS from Contract Laboratory Program
Charles T. Elly, U.S. EPA, Region V, CPSM, CRL
- o Analysis of Water Supply Samples
Central Regional Laboratory
Curtis Ross, U.S. EPA, Region V, CRL-Director
- o Field Laboratory Operations
REM II, Terry Whitt
- o Geotechnical Laboratory
REM II, Subcontractor Pool
- o Preparation of SAS Requests
John E. Dowden, REM II, Weston
- o Preparation of Field Laboratory Procedures
Rae Mindock, REM II, Weston
- o Data Assessment for RAS and SAS from CLP
Contract Management Section, CRL
- o Data Assessment of Analytical Services from CRL
QC Coordinator, CRL
- o Data Assessment for Field Laboratory
Ed McGovern, REM II, Weston
- o Data Assessment for Geotechnical Laboratory
John E. Dowden, REM II, Weston

- o Review of Tentatively Identified Compounds
John E. Dowden, REM II, Weston

3.3 QA RESPONSIBILITY

Quality Assurance (QA) responsibilities are those involved with monitoring and reviewing the procedures used to perform all aspects of this project including data collection, analytical services, and report preparation. Primary responsibility for project quality rests with the Site Manager. Ultimate responsibility for project quality rests with CDM. Prior to any review by CDM, any work performed by the REM II subcontractor firms, WESTON and Clement Associates, will be reviewed by the QA Reviewer for that firm. Specific QA responsibilities for the RI/FS at the Eau Claire Municipal Well Field have been assigned as follows:

- o Overall QA for REM II activities
John W. Hawthorne, REM II, CDM
- o Overall QA for CLP/CRL Activities
Quality Assurance Office, U.S. EPA, Region V
- o QA for Field Activities
David Horsefield, REM II, CDM
- o QA for RAS from CLP
Support Services Branch, OERR, EPA HQ, EMSL Las Vegas
Contract Program Management Section, CRL
- o QA for SAS from CLP
Quality Assurance Office, U.S. EPA, Region V
- o QA for Analytical Services from CRL
QC Coordinator, CRL
Quality Assurance Office, U.S. EPA, Region V
- o Performance and Systems Audits of RAS from CLP
U.S. EPA, EMSL-Las Vegas
- o Performance and Systems Audits of CRL
Quality Assurance Office, U.S. EPA, Region V
QC Coordinator, CRL
- o Systems Audit of Field Activities
David Horsefield, REM II, CDM
- o Systems Audit of Geotechnical Laboratory
David Horsefield, REM II, CDM

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- o CDM QC Review
John W. Hawthorne, REM II, CDM
National Program Management Office, REM II, CDM
- o Weston QC Review
John W. Thorsen, REM II, Weston
- o Clement Associates QC Review
REM II, Clement
- o CH₂M-Hill QC Review
REM/FTT, CH₂M-Hill
- o QA/QC Summaries for Revised RI and FS/CD Reports
John W. Thorsen, REM II, Weston

SECTION 4

QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

The overall QA objective is to develop and implement procedures for field sampling, chain of custody, laboratory analysis and reporting that will provide legally defensible results in a court of law. Specific procedures to be used for sampling, chain of custody, calibration, laboratory analysis, reporting, internal quality control, audits, preventative maintenance and corrective actions are described in other sections of this Quality Assurance Project Plan. The purpose of this section is to define goals for level of QA effort; accuracy, precision and sensitivity of analysis; and completeness, representativeness, and comparability of measurement data from all analytical laboratories. QA objectives for field measurements are also discussed.

The air photo study and surveying are field activities where samples will not be collected, but involve measurements where quality assurance concerns are appropriate. The primary QA objective in activities where samples are not collected is to obtain reproducible measurements to a degree of accuracy consistent with the intended use of measurements and to document measurement procedures.

4.1 REGULATORY AND LEGAL REQUIREMENTS

The data used to evaluate compliance with the National Interim Primary Drinking Water Standards should have method detection limits that are less than 20 percent of the maximum allowable levels on a parameter-by-parameter basis. The standard method detection limits for analytical services from the CLP meet this criterion for the required inorganic analyses; however, lower detection limits will be required for several of the organic parameters. The method detection limits for volatile organics shall be established at between 0.05 ug/L and 0.5 ug/L (for use in the public health evaluation), and will require SAS, except for the following compounds: chloromethane, vinyl chloride, chloroethane, acetone, 2-butanone, vinyl acetate, 4-methyl-2-pentanone, and 2-hexanone. The higher method detection limits for these compounds, which will require RAS, are included in Table 2. These RAS detection limits have been met for all samples analyzed by the CRL for samples collected during the IWA. Based upon results to date, it has been determined that SAS (lower detection limits) are required for the following eight compounds in order to obtain accuracy to levels consistent with the pertinent maximum contaminant levels (MCL's). These compounds are:

- o 1,1-Dichloroethene
- o 1,1-Dichloroethane
- o trans-1,2-Dichloroethene
- o Cis-1,2-Dichloroethene

- o 1,1,1-Trichloroethane
- o Trichloroethylene
- o 1,1,2-Trichloroethane
- o Tetrachloroethene

The Special Analytical Services requested for these compounds are described in Appendix D.

4.2 LEVEL OF QA EFFORT

Field duplicates and field blanks will be taken and submitted to the analytical laboratories to provide the means to assess the quality of the data resulting from the field sampling program. Duplicate samples are analyzed to check for sampling and analytical reproducibility. Blank samples will be analyzed to check for procedural contamination and/or ambient conditions at the site which are causing sample contamination. The general level of this QA effort will be one field duplicate and one field blank for every 10 investigative samples. This includes samples collected for field laboratory GC analysis. Reference samples provided by the CLP also will be analyzed as part of the field GC analytical QA effort. Because of the accuracy required for the low level VOC analyses performed by CLP SAS, special QA efforts will be required for these samples. This will include one field blank obtained daily from each sampling device, one trip blank with each sample shipment, two samples of the distilled water used to decontaminate the sampling equipment per week and one duplicate for each 2.5 investigative samples. Soil samples selected for geotechnical testing will include one field duplicate for each ten analyses being performed but not blanks. The aquifer hydraulic conductivity testing will also include one replicate for every ten tests. The specific level of field QA effort for the Eau Claire Municipal Well Field Site RI/FS, itemized by sample matrix and parameter, is shown in Table 1.

The groundwater and soil samples collected at the site during the remaining portion of the RI/FS will be analyzed using the Contract Laboratory Program (CLP). The level of laboratory QA effort for Routine Analytical Services (RAS) provided by the CLP is specified in the Invitations for Bid (IFBs), WA85-J664/680 for organics and WA85-J838/839 for inorganics. The level of QA effort for SAS are described in the individual SAS request forms which are attached in Appendix D.

Samples collected for determination of pH and specific conductance will be tested in the field laboratory. The QA level of effort for the field laboratory consists of pre-measurement calibration and a post-measurement verification using two standard reference solutions each time as appropriate to the sample pH and specific conductance. This audit will be performed for each group of 10 samples tested.

Laboratory QA for the geotechnical testing will require that all equipment used to perform the analyses be calibrated not more than six months prior to actual testing, that all solutions be not more than one month old, and that all calculations be checked by someone other than the person performing the actual testing. The geotechnical laboratory will also be required to test one laboratory duplicate for each type of analysis, that is, to repeat some test using the same material used for the initial testing of that sample.

4.3 ACCURACY, PRECISION, AND SENSITIVITY OF ANALYSES

The fundamental QA objective with respect to accuracy, precision, and sensitivity of laboratory analytical data is to achieve the QC acceptance criteria of the analytical protocols. The accuracy and precision requirements for RAS from the CLP are specified in the IFBs, WA85-J664/680 for organics and WA85-J838/839 for inorganics. The sensitivities required for CLP analyses will be the method detection limits, shown in Tables 2 and 3, from the same IFBs. The accuracy and precision requirements for SAS of the VOCs are described in the individual SAS request form which is attached in Appendix D.

The accuracy of field laboratory measurements of groundwater pH will be assessed through pre-measurement calibrations and post-measurement verifications using at least two standard buffer solutions. The two measurements must each be within ± 0.05 standard units of buffer solution values. Precision will be assessed through replicate measurements of every sample. The standard deviation of four replicate measurements must be less than or equal to 0.1 standard units. (The electrode will be withdrawn, DI-rinsed and re-immersed between each replicate. The calibration and verification will be done before the first replicate and after the last.) The instrument used will be capable of providing measurements to 0.01 standard units.

The geotechnical and field GC data will be considered accurate if the QA criteria with respect to equipment, solutions and calculations are met, and if adherence to appropriate methods can be documented during a systems audit. The precision of the geotechnical data will be assessed using the duplicate results, but no quantitative criteria have been established.

The precision of the field GC data will also be evaluated with duplicate sample analysis. The sample duplicate will be re-analyzed if a deviation of 30 % is reported.

4.4 COMPLETENESS, REPRESENTATIVENESS AND COMPARABILITY

It is expected that the CLP will provide data meeting QC acceptance criteria for 95 percent of all samples tested. Completely valid data are required for samples designated in the Sampling and Analysis Plan (Appendix C) as "background samples". The Special Analytical Services

(SAS), field, and geotechnical laboratories should provide completely valid data, and the reasons for any variances from 100 percent completeness will be documented in writing.

The sampling network was designed to provide data to define the hydrogeologic conditions in the Eau Claire area and to define the plume of contamination in the Eau Claire aquifer. During development of the network, consideration was given to existing information about site hydrogeology (summarized in the Preliminary Hydrogeologic Evaluation, CH₂M-Hill, April, 1985), existing analytical data, WDNR 1984 survey evaluating potential sources of VOC contamination, physical setting and processes, and constraints inherent to the Superfund program. The extent to which existing and planned analytical data will be comparable depends on the similarity of sampling and analytical methods. The procedures used to obtain the planned analytical data are documented in this QAPP. It may be necessary to verify similar documentation for existing analytical data.

4.5 FIELD MEASUREMENTS

Measurement data will be generated in many field activities that are incidental to collecting samples for analytical testing or unrelated to sampling. These activities include, but are not limited to, the following:

- o Documenting time and weather conditions.
- o Locating and determining the elevation of sampling stations.
- o Estimating VOC concentrations in groundwater during well drilling activities with field GC (Photovac).
- o Measuring pH, specific conductance and temperature of water samples.
- o Qualitative organic vapor screening of soil samples using a photoionization detector (HNU).
- o Measuring water levels in a borehole or well.
- o Standard penetration testing.
- o Calculating pumping rates.
- o Verifying well development and pre-sampling purge volumes.
- o Performing aquifer hydraulic conductivity tests.

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The general QA objective for such measurement data is to obtain reproducible and comparable measurements to a degree of accuracy consistent with the intended use of the data throughout the documented use of standardized procedures. The procedures for performing these activities and the standardized formats for documenting them are presented in the Sampling and Analysis Plan (Appendix C).

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SECTION 5

SAMPLING PROCEDURES

The procedures for collecting samples and for performing all related field activities are described in detail in the Sampling and Analysis Plan, which is attached in full as Appendix C.

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SECTION 6

SAMPLE CUSTODY

Region V, U.S. EPA sample custody (chain-of-custody) protocols are described in "NEIC Policies and Procedures". EPA-330/9-78-001-R, Revised February 1983. This custody is in three parts: 1) sample collection, 2) laboratory, and 3) final evidence files. Field custody (sample collection) procedures are also described in the Sampling and Analysis Plan (Appendix C); and laboratory procedures for the CLP are also described in the IFBs, WA85-J664/680 for organics and WA85-J838/839 for inorganics.

SECTION 7

CALIBRATION PROCEDURES AND FREQUENCY

The calibration procedures and frequency of calibration for RAS from the CLP are specified in the IFBs, WA85-J664/680 for organics and WA85-J838/839 for inorganics.

Calibration of equipment used in the field laboratory will be as follows:

- o Balance--calibrated using a reference weight at the beginning of each day of use.
- o pH meter--calibrated using two reference solutions before and after each set of replicate measurements; solutions of pH 4.0 and 7.0 will be used for acidic samples and solutions of pH 7.0 and 10.0 will be used for basic samples.
- o Thermometer--calibrated using a beaker of ice water and a beaker of boiling water at beginning of laboratory work; temperatures must be within $\pm 2^{\circ}\text{C}$ of 0°C and 100°C respectively.
- o Graduated cylinder--calibrated by weighing three volumes of distilled water at room temperature using calibrated balance; weight of water in grams must equal volume of water in milliliters with error margin of ± 1 gm or ml.
- o Portable GC (Photovac)--Calibrated daily before the first batch of samples. The calibration curve should include 3 to 4 standards. In addition, a medium level standard will be analyzed after every 10 samples. Results will be acceptable if within 30% of calibration curve value. One or two standards will be run at the end of each day to complete the equipment calibration.

Calibration of equipment used to perform the geotechnical testing will be in accordance with that specified in the ASTM Method D 422-63 for hydrometer and sieve analyses (Annual Book of ASTM Standards, Volume 04.08, 1984). The equipment calibrations, including those for ovens, thermometers and balances, shall be done not more than six months prior to actual testing.

Calibration of the HNu organic vapor detection devices will be done prior to use each day and after every four hours of use. Calibration will be done using reference gases in accordance with manufacturer's specifications, which are referenced in the Sampling and Analysis Plan (Appendix C).

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Calibration of the field pH meter will be done prior to the collection of each water sample. The field pH meter will be calibrated using two reference solutions as appropriate to the pH of the sample. The YSI specific-conductance/temperature meter will be calibrated using a reference solution of 0.01 N KCl (specific conductance, 1413 umhos/cm at 25°C) on a daily basis. Readings must be within five percent (5%) to be acceptable. The thermometer of the YSI meter will be calibrated against the field laboratory thermometer on a weekly basis. Additional information regarding the calibration of these meters can be found in the Sampling and Analysis Plan (Appendix C).

Tape measures used to locate sampling stations and to determine depths in boreholes or wells will be examined prior to each period of sustained use to verify their calibration.

Electronic sounding devices used to measure water levels in the monitor wells will be examined prior to each period of sustained use for potential circuit breaks and battery strength.

SECTION 8

ANALYTICAL PROCEDURES

Water samples collected during Tasks 3 and 4 of the RI will be analyzed as follows:

Samples from monitoring wells will be analyzed for VOCs. The first round of samples collected in areas of known contamination will be analyzed for acid/base/neutral organics, pesticides, PCB, metals and cyanide. In addition, the compounds identified in Appendix D will be analyzed under SAS. Subsequent sampling efforts may have a reduced analytical program based on the analytical results of the first round of samples.

All analyses will conform to the guidelines in the Users Guide to the U.S. EPA Contract Laboratory Program and to those specified in IFB's WA85-J664/680 for organics and WA85-J838/839 for inorganics.

Computer assisted library searches will be made to tentatively identify as many as 30 organic compounds. However, no more than 4 hours per sample will be spent on the search. The three best matched compounds will be reported via a computerized library search of mass spectral data. Positive peak identification requires at least a five major peak match (including the base peak and molecular ion peak), and the relative intensities of these peaks should not vary to +20 percent compared to the suspected compound. Compounds still unidentified after 4 hours are labeled as UNKNOWN #XXX; where XXX is the scan number where the unknown appears. Purity should also be included.

The analytical procedures for the field measurement of pH, specific conductance and qualitative organic vapor screening using the photoionization detector are described in detail in the following operation manuals:

pH

Instruction Manual for Haake Buchler pH Meter Stick

Specific Conductance

Instruction Manual for YSI Model 33 S-C-T Meter

Photoionization Detector

Instruction Manual for Model PI 101 Photoionization Analyzer, 1975.
HNU Systems, Inc., 160 Charlemont Street, Newton Highlands,
Massachusetts 02161, (617) 964-6690

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Portable GC

The analytical procedure for the field measurement and screening of VOC concentrations in groundwater are described in detail in Appendix A, of the Sampling and Analysis Plan with supplemental information provided in the following operation manual:

Photovac 10A10 Operating Manual, 1984, Photovac Incorporated, Unit 2, 134 Doncaster Avenue, Thurnhill, Ontario, Canada, L3T 1L3, (416) 881-8225.

Physical testing of soil samples will be per appropriate ASTM methods. Grain size and hydrometers will be run using ASTM Method D-422. Testing of soil samples for physical properties follows standard accepted procedures that are used for evaluating the engineering properties of the material.

Accuracy and reproducibility standards for survey activities will be consistent with those given in the standard surveying reference Manual of Surveying Instructions 1973 prepared by the Bureau of Land Management.

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SECTION 9

DATA REDUCTION, VALIDATION AND REPORTING

Analytical data from the CLP will be evaluated by the Sample Management Office and the Contract Program Management Section of the CRL. In addition to the summarized forms for precision and accuracy of the analyses (EPA Form 1320-6), the CRL is requested to provide the analytical results for blanks and duplicates and the recovery data for matrix and surrogate spikes to the Site Manager.

Analytical reports from the field laboratory and the geotechnical laboratory will include all raw data, documentation of reduction methods, and related QA/QC data. The data will be assessed by verification of the reduction results and confirmation of compliance with QA/QC requirements. The field and geotechnical laboratory deliverables packages will be appended to the RI report.

Raw data from field measurements and sample collection activities that are used in project reports will be appropriately identified and appended to the RI report. Where data have been reduced or summarized, the method of reduction will be documented in the report.

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SECTION 10

INTERNAL QUALITY CONTROL PROCEDURES

Internal quality control procedures for RAS from the CLP are specified in IFBs, WA85-J664/680 for organics and WA85-J838/839 for inorganics. These specifications include the types of audits required (sample spikes, surrogate spikes, reference samples, controls, blanks), the frequency of each audit, the compounds to be used for sample spikes and surrogate spikes, and the quality control acceptance criteria for these audits.

The quality control checks and acceptance criteria for data from the field laboratory and the geotechnical laboratory are described above in Subsections 4.2 and 4.3. Quality control procedures for field measurements (pH and specific conductance) are limited to checking the reproducibility of the measurement in the field by obtaining multiple readings and/or by calibrating the instruments (where appropriate). Quality control of field sampling will involve collecting field duplicates and blanks in accordance with the applicable procedures described in the Sampling and Analysis Plan (Appendix C) and the level of effort indicated in Table 1.

SECTION 11

PERFORMANCE AND SYSTEMS AUDITS

For each site where samples are collected, a performance audit investigating conformance with QC procedures may be conducted at the discretion of the REM II QA director or his deputy. If conducted, this audit will be scheduled to allow oversight of as many different field activities as possible. This audit would be performed by the REM II QA team with the Regional QA Coordinator (QAC), David Horsefield, as the Audit Team Leader. The standard REM II performance audit checklist will be utilized in performing this audit. A written report of the results of this audit, along with, as necessary, a notice of nonconformance, will be submitted to the following individuals:

- o REM II Technical Operations Manager
- o Regional Manager
- o Site Manager
- o Field Manager

Either during or at the completion of the RI, at least one systems audit will be performed. The systems audit will verify that a system of QC measures, procedures, reviews, and approvals was established for all activities and is being utilized by project personnel, that the system for project documentation is being utilized, and that all QC records are being maintained as well as the required QC reviews, approvals, and activity records. The standard REM II checklist for systems audits will be used in conducting these audits. The systems audit will be conducted by the REM II Quality Assurance Director (QAD), his deputy, or the QAC. A final report will be prepared which summarizes any deviations from approved methods and their impacts on the project results.

After consultation with the Site Manager and the Field Manager, the QAC may schedule and insure execution of a systems audit of the on-site field laboratory (i.e., GC analysis station), as well as the geotechnical laboratory. At a minimum, the systems audit would include inspection of lab notebooks, control sheets, logsheets, computer files, and equipment calibration and maintenance records. If scheduled, the system audits will be executed by the individuals identified in Subsection 3.3 of this document. A performance audit for the field methodology to determine the VOC concentration in groundwater using a 10A10 Photovac portable GC unit was provided by the Region V Quality Assurance Officer. Additional performance audits of the field and geotechnical laboratories are not required.

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Performance and systems audits of the CLP will be scheduled and executed by EMSL-Las Vegas. Performance audits are based on the laboratory's ability to properly analyze an unknown reference sample and are done on a quarterly basis. Systems audits are based on on-site inspection of the laboratory and are done on an annual basis. Audits of the CRL will be scheduled and executed by the Quality Assurance Office or QC Coordinator, CRL, of Region V, U.S. EPA.

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SECTION 12

PREVENTIVE MAINTENANCE

This section applies solely to field equipment. For this project, this includes a field pH meter, a YSI specific conductance and temperature meter, a Field GC and an HNu photoionization detector. Specific preventive maintenance procedures and spare parts lists for this equipment are referenced in the Sampling and Analysis Plan (Appendix C). The Field Manager will be responsible for implementing and documenting these procedures on a weekly basis during the period of use.

SECTION 13

DATA ASSESSMENT PROCEDURES

Analytical data from the CLP is assessed for accuracy, precision, and completeness by the Contract Program Management Section of the CRL with overview by the Sample Management Office of the CLP in accordance with respective standard procedures.

The assessment of data generated by the CRL is initiated at the bench level and continued at three administrative levels. The bench chemist directly responsible for the test knows the current operating acceptance limits. He can directly accept or reject the data he generates and consult with his Team Leader for any corrective action. Once the bench chemist has reported the data that he feels are acceptable, he initials the report sheet. Any out-of-control results that occurred are flagged and a note is made as to why the result was reported.

The Team Leader receives the data sheets, reviews the quality control data that accompanied the sample run, initials the report sheet, and forwards it to the Section Chief. The Section Chief, after checking the reported data for completeness and quality control results, either initials the report sheet or sends it back to the Team Leader for rerunning of samples. The QC Coordinator reviews the data forwarded to him as acceptable by the Section Chief. Any remaining out-of-control results that, in the opinion of the QC Coordinator, do not necessitate rerunning of the sample are flagged and a memo written to the data user regarding the utility of the data. Data generated from all high priority studies are given a final review by the CRL Director.

Data from the SAS, field, and geotechnical laboratories and data from field measurements will be assessed by thorough review, by the individuals identified above in Subsection 3.3, of QA/QC data (calibrations, standards, blanks, duplicates), documentation that analytical procedures were adhered to, and reports from systems audits.

All data will be reviewed for completeness by the principal investigators as appropriate to their operational responsibilities.

SECTION 14

CORRECTIVE ACTION PROCEDURES

The Regional Quality Assurance Coordinator and the audit team will prepare a report for review by the REM II QAC or this deputy describing the results of the performance and/or system audits. If unacceptable conditions or data, nonconformance with the QC procedure, or a deficiency are identified in the report of the performance or systems audit, the REM II QAC or his deputy will notify the Technical Operations Manager, the Regional Manager, and the Site Manager in writing of the results of the audit. He will also state if the nonconformance is of program significance. The Technical Operations Manager will be responsible for ensuring that action to correct the nonconformance has been developed, initiated and, if needed, that special expertise not normally available to the project team is made available. The Site Manager will be responsible for carrying out the corrective actions. In addition, the Site Manager shall ensure that no additional work, which is dependent on the nonconforming activity, is performed until the nonconformance report is corrected. Corrective action may include:

- o Reanalyzing the samples, if holding time permits
- o Resampling and reanalyzing
- o Evaluating and amending the sampling and analytical procedures
- o Accepting the data and acknowledging its level of uncertainty

The Regional Quality Assurance Coordinator will be responsible for ensuring that the corrective action has indeed been taken, and that it adequately addresses the nonconformance. A Nonconformance Report Form will be filed for all non-CLP laboratory-related deficiencies.

Following the implementation of a satisfactory corrective action, the Regional Quality Assurance Coordinator shall document the completion of the audit by indicating such on a Quality Assurance Notice Form. The notice will indicate the completion of the audit, any identified nonconformance, the corrective action that was taken, the follow-up action, and the final recommendations.

All project staff shall be responsible for reporting all suspected nonconformances while conducting field activities and any suspected technical nonconformances on deliverables or documents by initiating a nonconformance report.

The QAC will be responsible for insuring the corrective actions for nonconformances are implemented by:

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- o Evaluating all reported nonconformances
- o Controlling additional work on nonconforming items
- o Maintaining the log of nonconformances
- o Evaluating disposition or action taken
- o Insuring nonconformance and correction reports are included in the site documentation files

If the systems audit of the field or geotechnical laboratory results in the detection of unacceptable conditions or data, the auditor will notify the QAC, who will be responsible for initiating a nonconformance report and insuring corrective actions are taken.

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SECTION 15

QUALITY ASSURANCE REPORTS

No separate QA report for this project is anticipated. The final RI report and the final FS report will contain separate QA sections that summarize data quality information collected during the project. The Site Manager, who has responsibility for these summaries, will rely on written reports/memoranda documenting the data assessment activities, performance and systems audits, nonconformance notices, corrective action reports, and QA notices.

Records will be maintained to provide evidence of the QA activities. The proper maintenance of QA records is essential to provide support for evidentiary proceedings and to assure the overall quality of the investigation. A QA records index will be started at the beginning of the project. All information received from outside sources or developed during the project will be retained by the project team. Upon termination of an individual task or work assignment, working files will be processed for storage as QA records. Upon termination of the project, all QA records shall be handled as required by U.S. EPA.

The Site Manager shall be responsible for insuring the QA records are being properly stored and that they can be retrieved. Both the site and field managers will be responsible for identifying to the QAC which field documents are to be designated as quality assurance records.

Appendix A
Pre-existing Water Quality Data

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Table A-1

CONCENTRATION OF VOLATILE ORGANIC COMPOUNDS IDENTIFIED IN ERM CLINE MUNICIPAL WELLS (ug/L)

DATE SAMPLED	WELL NUMBER	1	4	6	8	9	10	11	12	13	14	15	16	17	18	POST TREATMENT
TRICHLOROETHYLENE																
3/23/81																1.3
1/15-15/82		0.2	ND		T	ND	ND		ND	T	ND	2.0	0.3	T	T	2.0
6/17/82								5.7				1.7				
8/11/82								6.8				9.3	ND	5.0		
1/31/83		ND						1.0					1.0	2.0		
2/9/83		-0.1						1.0				2.7	2.7	7.7		4.9
6/13/83		ND						2.4		0.9		1.2	2.6	0.7		
7/1/83		0.12	-0.04	-0.04									1.1	1.6		
8/1/83								2.1					0.9	1.4		0.7
11/1/83								2.7					2.0	5.5		
4/15/84			ND				ND		0.1	ND				0.1		
5/7/84																2.0
5/14/84																1.0
8/8/84			ND				ND	6.8	ND	ND				2.4		

NOTES: BLANKS INDICATE NO DATA REPORTED AND POSSIBLY NOT ANALYZED FOR
 "ND" PRIOR TO VALUE INDICATED THAT CONCENTRATION IS LESS THAN THIS VALUE
 "T" INDICATES TRACE CONCENTRATIONS DETECTED, BUT NO VALUE REPORTED
 "ND" INDICATES NOT DETECTED (DETECTION LIMITS UNDEFINED)

SOURCES: WISCONSIN DNR
 CITY OF ERM CLINE
 E.A. HICKER AND ASSOCIATES, Inc. 1983

CONCENTRATION OF VOLATILE ORGANIC COMPOUNDS IN ENU DRAINAGE TEST WELLS (VOLUME)

DATE	WELL NUMBER	1.1.1 TRICHLOROETHYLENE	1.1 DICHLOROETHYLENE	TRICHLOROETHYLENE	1.1 DICHLOROETHYLENE	1.2 DICHLOROETHYLENE	2.1-2.83	8/23/82
8/11/82	1	18.00	31.60	9.09	31.60	31.60	8/11/82	8/23/82
2/1-2/83	2	15.00	34.60	10.30	34.60	34.60	2/1-2/83	8/23/82
3/15/83	3	24.00	21.00	1.30	21.00	21.00	3/15/83	8/23/82
6/3/83	4	21.00	2.30	4.10	2.30	2.30	6/3/83	8/23/82
7/1/83	5	21.00	4.10	2.30	4.10	4.10	7/1/83	8/23/82
8/1/83	6	22.00	5.20	5.20	5.20	5.20	8/1/83	8/23/82
11/1/83	7	30.00	6.20	6.20	6.20	6.20	11/1/83	8/23/82
8/8/84	8	20.00	6.60	6.14	6.60	6.60	8/8/84	8/23/82
11/1/83	9	32.70	19.10	15.50	19.10	19.10	11/1/83	8/23/82
6/1/83	10	13.60	13.60	4.81	13.60	13.60	6/1/83	8/23/82
3/15/83	11	24.00	2.30	2.30	2.30	2.30	3/15/83	8/23/82
2/1-2/83	12	24.00	2.30	2.30	2.30	2.30	2/1-2/83	8/23/82
11/8/82	13	24.00	2.30	2.30	2.30	2.30	11/8/82	8/23/82
8/23/82	14	24.00	2.30	2.30	2.30	2.30	8/23/82	8/23/82
8/11/82	15	24.00	2.30	2.30	2.30	2.30	8/11/82	8/23/82
8/8/84	16	24.00	2.30	2.30	2.30	2.30	8/8/84	8/23/82
4/19/83	17	24.00	2.30	2.30	2.30	2.30	4/19/83	8/23/82
8/8/84	18	24.00	2.30	2.30	2.30	2.30	8/8/84	8/23/82
8/23/82	19	24.00	2.30	2.30	2.30	2.30	8/23/82	8/23/82
8/11/82	20	24.00	2.30	2.30	2.30	2.30	8/11/82	8/23/82
8/8/84	21	24.00	2.30	2.30	2.30	2.30	8/8/84	8/23/82
4/19/83	22	24.00	2.30	2.30	2.30	2.30	4/19/83	8/23/82
8/1/83	23	24.00	2.30	2.30	2.30	2.30	8/1/83	8/23/82
6/3/83	24	24.00	2.30	2.30	2.30	2.30	6/3/83	8/23/82
7/1/83	25	24.00	2.30	2.30	2.30	2.30	7/1/83	8/23/82
8/1/83	26	24.00	2.30	2.30	2.30	2.30	8/1/83	8/23/82
11/1/83	27	24.00	2.30	2.30	2.30	2.30	11/1/83	8/23/82
8/8/84	28	24.00	2.30	2.30	2.30	2.30	8/8/84	8/23/82
4/19/83	29	24.00	2.30	2.30	2.30	2.30	4/19/83	8/23/82
8/1/83	30	24.00	2.30	2.30	2.30	2.30	8/1/83	8/23/82
6/3/83	31	24.00	2.30	2.30	2.30	2.30	6/3/83	8/23/82
7/1/83	32	24.00	2.30	2.30	2.30	2.30	7/1/83	8/23/82
8/1/83	33	24.00	2.30	2.30	2.30	2.30	8/1/83	8/23/82
11/1/83	34	24.00	2.30	2.30	2.30	2.30	11/1/83	8/23/82
8/8/84	35	24.00	2.30	2.30	2.30	2.30	8/8/84	8/23/82
4/19/83	36	24.00	2.30	2.30	2.30	2.30	4/19/83	8/23/82
8/1/83	37	24.00	2.30	2.30	2.30	2.30	8/1/83	8/23/82
6/3/83	38	24.00	2.30	2.30	2.30	2.30	6/3/83	8/23/82

Table R-2
CONCENTRATION OF VOLATILE ORGANIC COMPOUNDS IN EBU CLAUDE TEST WELLS (mg/L)

DATE	WELL NUMBER	1	2	3	4	5	6	7	8
METHYLENE CHLORIDE									
11/1/83							0.00		
1,2 - DICHLORETHANE									
2/1-2/83		0.07	NO	0.16	NO	NO	0.16	NO	NO
CHLOROFORM									
2/1-2/83		NO	NO	NO	NO	NO	0.22	NO	NO
TETRACHLOROETHYLENE AND/OR 1,1,2,2-TETRACHLOROETHANE									
2/1-2/83		NO	NO	NO	NO	NO	0.22	NO	NO
2/1-2/83		2.35	2.35	1.14	1.14	4.57	17.10	2.57	4.00
8/8/84									
DIBROMOCHLOROMETHANE									
8/8/84									

NOTES: BLANKS INDICATE NO DATA REPORTED AND POSSIBLY NOT ANALYZED FOR
 ** PRIOR TO VALUE INDICATES THAT CONCENTRATION IS LESS THAN THIS VALUE
 * INDICATES TRACE CONCENTRATIONS DETECTED, BUT NO VALUE REPORTED
 NO- INDICATES NOT DETECTED (DETECTION LIMIT UNKNOWN)

SOURCES: WISCONSIN DNR
 CITY OF EBU CLAUDE
 E.A. HEDDER AND ASSOCIATES, DEL. 1983

Table A-3

CONCENTRATION OF CHEMICAL CONSTITUENTS IN NATIONAL PRESTO WELLS

(UG/L)

DATE	MONITORING WELL #						SUPPLY WELL #			W-7	PRIMARY POND	SECONDARY POND
	MW-1	MW-3A	MW-3B	MW-3C	MW-4	MW-6	W-4	W-5	W-6			
1,1,1, TRICHLOROETHANE												
2/22/82							0.66	0.78	1.40	0.67		
5/3/82	1.90				-0.01							
6/18/82									2.10			
6/22/82									3.40			
7/6/82	4.00		0.30		0.40							
7/20/82	4.00		0.30		-1.00							
11/8/82	7.20	0.80	0.20	0.20	0.10				2.30		5.00	
11/10/82	2.90	0.30	0.20	0.10	0.90							
9/27/83	6.30	1.40	-1.00	-1.00	-1.00							
10/25/83											85.00	-1.00
5/24/84					1.10					1.00		
10/31/84						1300.00						
12/12/84			0.40			1300.00						
1,1 DICHLOROETHANE												
2/22/82							3.30	3.20	4.10	3.20		
5/3/82	-0.01				-0.01							
6/18/82									10.00			
6/22/82									4.30			
7/6/82	-0.10		4.30		-0.10							
7/20/82	-0.10		4.30		-0.10							
11/8/82		1.70	2.80	3.40	-1.00				6.20		6.20	
11/10/82	-0.10	0.20	0.70	0.80	0.10							
9/27/83	-1.00	-1.00	2.10	2.40	-1.00							
10/25/83											130.00	1.00
5/25/84					0.20					1.70		
10/31/84						49.00						
12/12/84			-1.00			360.00						
TETRACHLOROETHYLENE												
2/22/82							-0.03	-0.03	-0.03	-0.03		
5/3/82	-0.01				-0.01							
6/22/82									-0.10			
7/6/82	-0.10		-0.10		-0.10							
7/20/82	-0.10		-0.10		-0.10							
11/8/82		0.20							0.20			
11/10/82	-0.10	-0.10	-0.10	-0.10	-0.10							
9/27/83	-1.00	-1.00	-1.00	-1.00	-1.00							
10/25/83											2.50	1.70
5/25/84					3.30					0.80		
10/31/84						17.00						
12/12/84			-0.10			12.00						
TRICHLOROETHYLENE												
2/22/82							0.82	1.00	0.84	0.82		
5/3/82	-0.01				-0.01							
6/18/82									0.50			
6/22/82									0.80			
7/6/82	0.30		0.30		-0.10							
7/20/82	-0.10		-0.10		-0.10							
11/8/82	-0.10	0.20	-0.10	-0.10	0.10				0.60		0.30	
11/10/82	-0.10	0.20	0.20	0.30	1.40							
9/27/83	-1.00	-1.00	-1.00	-1.00	-1.00							
10/25/83											2.80	-1.00
5/25/84					0.40					0.80		
10/31/84						1.00						
12/12/84			-0.10			0.60						

CONCENTRATION OF POLYOL CONSTITUENTS IN NATURAL PRESTO HELLS (U.S.A.)

[illegible]

Table A-3

CONCENTRATION OF CHEMICAL CONSTITUENTS IN MONITORING WELLS

(UG/L)

DATE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021	1022	1023	1024	1025	1026	1027	1028	1029	1030	1031	1032	1033	1034	1035	1036	1037	1038	1039	1040	1041	1042	1043	1044	1045	1046	1047	1048	1049	1050	1051	1052	1053	1054	1055	1056	1057	1058	1059	1060	1061	1062	1063	1064	1065	1066	1067	1068	1069	1070	1071	1072	1073	1074	1075	1076	1077	1078	1079	1080	1081	1082	1083	1084	1085	1086	1087	1088	1089	1090	1091	1092	1093	1094	1095	1096	1097	1098	1099	1100	1101	1102	1103	1104	1105	1106	1107	1108	1109	1110	1111	1112	1113	1114	1115	1116	1117	1118	1119	1120	1121	1122	1123	1124	1125	1126	1127	1128	1129	1130	1131	1132	1133	1134	1135	1136	1137	1138	1139	1140	1141	1142	1143	1144	1145	1146	1147	1148	1149	1150	1151	1152	1153	1154	1155	1156	1157	1158	1159	1160	1161	1162	1163	1164	1165	1166	1167	1168	1169	1170	1171	1172	1173	1174	1175	1176	1177	1178	1179	1180	1181	1182	1183	1184	1185	1186	1187	1188	1189	1190	1191	1192	1193	1194	1195	1196	1197	1198	1199	1200	1201	1202	1203	1204	1205	1206	1207	1208	1209	1210	1211	1212	1213	1214	1215	1216	1217	1218	1219	1220	12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CONCENTRATION OF VOLATILE ORGANIC COMPOUNDS IDENTIFIED IN RESIDENTIAL MILLS (b)(7)

[illegible]

Table A-4

CONCENTRATIONS OF VOLATILE ORGANIC COMPOUNDS IDENTIFIED IN RESIDENTIAL WELLS (ug/L)

NAME	ADDRESS	DATE SAMPLED	1,1-DCA	1,1-DCE	1,1,1-TCA	TCE	PCE	1,2-DCE
Stetzer, Gyle	4408 N Richard	30-Sep-82	—	—	1.6	13	—	—
Stetzer, Gyle	4408 N Richard	30-Sep-82	—	—	8.6	13	—	—
Tanpen, Art	Lake Mallie shore	07-Oct-82	—	—	.53*	-1	—	—
Torrington, Raymond	4851 Jones Ave	04-Oct-82	—	—	0.6*	-1	—	—
Vacant House	4509 N Richard	30-Sep-82	—	—	.77*	6	—	—
Welke, Ralph	3428 Delbert Rd	29-Aug-82	—	—	.5	-1	—	—
Wilson, Dorothy	3738 Sundet Rd	06-Oct-82	—	—	16	-1	—	—
Wold, E	3505 Sundet	30-Sep-82	—	—	.77*	-1	—	—
Woodford, Gerald	3502 Bevan Rd	06-Oct-82	—	—	.5*	-1	—	—

NOTE: * - prior to value indicates that the concentration is less than the value given.

ND indicates Not Detected.

* indicates results are questionable because no second column confirmation and values near detection limits.

— indicates data not reported

T indicates trace concentrations detected, but no value given.

SOURCES: Wisconsin DNR
City of Eau Claire

COMPOUNDS:

1,1-DCA — 1,1-Dichloroethane

1,1-DCE — 1,1-Dichloroethene

1,1,1-TCA — 1,1,1-Trichloroethane

TCE — Trichloroethene

PCE — Tetrachloroethene

1,2-DCE — 1,2-Dichloroethene

PHENOLS DATA FROM NATIONAL PRESTO INDUSTRIES
MONITORING WELLS

Analyses for phenols in groundwater at the NPI site were made from 1977-1984. Approximately four samples per year from five monitoring wells have been collected and analyzed. Phenol concentrations are generally less than 10 ug/L but values as high as 40 ug/L have been observed (MW-1).

Appendix B

**Water Quality Data
Interim Work Assignment Sampling**

Table

<u>Identifier</u>	<u>Owner</u>	<u>Address</u>	<u>GLI #</u>
WELL 8			85HC01S02
WELL 12			85HC01S03
RW 17			85HC01S04
WELL 11			85HC01S05
WELL 4			85HC01S06
RW 19			85HC01S07
RW 18			85HC01S08
RW 20			85HC01S09
RW 16			85HC01S11
RW 21			85HC01S13
RW 23	Delux Motel	4387 Joles Ave.	85HC01S14/ S26
RW 27			85HC01S15
RW 22			85HC01S16
RW 24			85HC01S17
RW 25			85HC01S18
RW 30			85HC01S22
RW 26			85HC01S19
RW 28			85HC01S20
RW 29			85HC01S21
RW 31			85HC01S23
RW 32	Lake Hallie		85HC01S24
RW 33			85HC01S25
WELL 16			85HC01S01
RW 1	1st Wisc. Bank	Route 7, Chippewa Falls, WI	85H506S01
RW 2		Chippewa Falls, WI 54729	85H506S02
RW 3	Hovland St. Metal	P.O. Box 226, Eau Claire, WI 54702	85H506S03
RW 4			85H506S04
RW 5			85H506S05/ 85HC01S10
RW 7			85H506S07
RW 8			85H506S08
RW 9			85H506S09
RW 10			85HT06S10
RW 11			85H506S11/ S12
RW 13			85HT06S13
RW 14			85HT06S14
RW 15	Eau Claire Pump Station		85HT06S15

INTERIM WORK ASSIGNMENT SCHEDULE

[illegible]

If density concentration is less than value given.

Alkaloids = alkaline (basic) compounds
 Acids = acid/base/neutral extractable compounds

YOU CAN BE SUCCESSFUL AND AHEAD OF THE
CROWD WITH OUR "NEW" DATA
ANALYSIS AND REPORTING TOOL

[illegible][illegible][illegible]

[illegible]

Account 173

1962

Material	Modulus	Poisson's Ratio	Thermal Expansion Coefficient	Specific Heat	Density
Aluminum	70 GPa	0.33	23.6 $\mu\text{m/m}^\circ\text{C}$	0.896 J/g $^\circ\text{C}$	2.70 g/cm ³
Steel	200 GPa	0.30	11.7 $\mu\text{m/m}^\circ\text{C}$	0.479 J/g $^\circ\text{C}$	7.85 g/cm ³
Concrete	30 GPa	0.20	10.0 $\mu\text{m/m}^\circ\text{C}$	0.880 J/g $^\circ\text{C}$	2.40 g/cm ³
Carbon Fiber	230 GPa	0.28	1.5 $\mu\text{m/m}^\circ\text{C}$	0.712 J/g $^\circ\text{C}$	1.78 g/cm ³
Kevlar	130 GPa	0.35	4.5 $\mu\text{m/m}^\circ\text{C}$	1.27 J/g $^\circ\text{C}$	1.42 g/cm ³
Fiberglass	70 GPa	0.22	5.0 $\mu\text{m/m}^\circ\text{C}$	0.840 J/g $^\circ\text{C}$	2.55 g/cm ³
Polycarbonate	2.4 GPa	0.37	65.0 $\mu\text{m/m}^\circ\text{C}$	1.25 J/g $^\circ\text{C}$	1.20 g/cm ³
Acrylic	2.0 GPa	0.35	70.0 $\mu\text{m/m}^\circ\text{C}$	1.47 J/g $^\circ\text{C}$	1.18 g/cm ³
PMMA	3.0 GPa	0.38	70.0 $\mu\text{m/m}^\circ\text{C}$	1.05 J/g $^\circ\text{C}$	1.18 g/cm ³
PEEK	3.0 GPa	0.20	15.0 $\mu\text{m/m}^\circ\text{C}$	1.25 J/g $^\circ\text{C}$	1.32 g/cm ³
Nylon	0.8 GPa	0.35	15.0 $\mu\text{m/m}^\circ\text{C}$	1.67 J/g $^\circ\text{C}$	1.15 g/cm ³
UHMWPE	0.8 GPa	0.40	15.0 $\mu\text{m/m}^\circ\text{C}$	1.90 J/g $^\circ\text{C}$	0.93 g/cm ³
PTFE	0.5 GPa	0.40	15.0 $\mu\text{m/m}^\circ\text{C}$	1.05 J/g $^\circ\text{C}$	2.20 g/cm ³
SiC	400 GPa	0.17	4.0 $\mu\text{m/m}^\circ\text{C}$	0.712 J/g $^\circ\text{C}$	3.10 g/cm ³
SiN	300 GPa	0.17	2.6 $\mu\text{m/m}^\circ\text{C}$	0.712 J/g $^\circ\text{C}$	3.18 g/cm ³
AlN	330 GPa	0.17	4.0 $\mu\text{m/m}^\circ\text{C}$	0.712 J/g $^\circ\text{C}$	3.26 g/cm ³
GaN	290 GPa	0.17	5.6 $\mu\text{m/m}^\circ\text{C}$	0.712 J/g $^\circ\text{C}$	3.94 g/cm ³
AlGaN	290 GPa	0.17	5.6 $\mu\text{m/m}^\circ\text{C}$	0.712 J/g $^\circ\text{C}$	3.94 g/cm ³
InGaN	290 GPa	0.17	5.6 $\mu\text{m/m}^\circ\text{C}$	0.712 J/g $^\circ\text{C}$	3.94 g/cm ³
GaN/AlGaN	290 GPa	0.17	5.6 $\mu\text{m/m}^\circ\text{C}$	0.712 J/g $^\circ\text{C}$	3.94 g/cm ³
GaN/InGaN	290 GPa	0.17	5.6 $\mu\text{m/m}^\circ\text{C}$	0.712 J/g $^\circ\text{C}$	3.94 g/cm ³
GaN/AlInGaN	290 GPa	0.17	5.6 $\mu\text{m/m}^\circ\text{C}$	0.712 J/g $^\circ\text{C}$	3.94 g/cm ³
GaN/AlInGaN/InGaN	290 GPa	0.17	5.6 $\mu\text{m/m}^\circ\text{C}$	0.712 J/g $^\circ\text{C}$	3.94 g/cm ³
GaN/AlInGaN/InGaN/AlGaN	290 GPa	0.17	5.6 $\mu\text{m/m}^\circ\text{C}$	0.712 J/g $^\circ\text{C}$	3.94 g/cm ³
GaN/AlInGaN/InGaN/AlGaN/GaN	290 GPa	0.17	5.6 $\mu\text{m/m}^\circ\text{C}$	0.712 J/g $^\circ\text{C}$	3.94 g/cm ³
GaN/AlInGaN/InGaN/AlGaN/GaN/AlGaN	290 GPa	0.17	5.6 $\mu\text{m/m}^\circ\text{C}$	0.712 J/g $^\circ\text{C}$	3.94 g/cm ³
GaN/AlInGaN/InGaN/AlGaN/GaN/AlGaN/GaN	290 GPa	0.17	5.6 $\mu\text{m/m}^\circ\text{C}$	0.712 J/g $^\circ\text{C}$	3.94 g/cm ³
GaN/AlInGaN/InGaN/AlGaN/GaN/AlGaN/GaN/AlGaN	290 GPa	0.17	5.6 $\mu\text{m/m}^\circ\text{C}$	0.712 J/g $^\circ\text{C}$	3.94 g/cm ³
GaN/AlInGaN/InGaN/AlGaN/GaN/AlGaN/GaN/AlGaN/GaN	290 GPa	0.17	5.6 $\mu\text{m/m}^\circ\text{C}$	0.712 J/g $^\circ\text{C}$	3.94 g/cm ³
GaN/AlInGaN/InGaN/AlGaN/GaN/AlGaN/GaN/AlGaN/GaN/AlGaN	290 GPa	0.17	5.6 $\mu\text{m/m}^\circ\text{C}$	0.712 J/g $^\circ\text{C}$	3.94 g/cm ³
GaN/AlInGaN/InGaN/AlGaN/GaN/AlGaN/GaN/AlGaN/GaN/AlGaN/GaN	290 GPa	0.17	5.6 $\mu\text{m/m}^\circ\text{C}$	0.712 J/g $^\circ\text{C}$	3.94 g/cm ³
GaN/AlInGaN/InGaN/AlGaN/GaN/AlGaN/GaN/AlGaN/GaN/AlGaN/GaN/AlGaN	290 GPa	0.17	5.6 $\mu\text{m/m}^\circ\text{C}$	0.712 J/g $^\circ\text{C}$	3.94 g/cm ³
GaN/AlInGaN/InGaN/AlGaN/GaN/AlGaN/GaN/AlGaN/GaN/AlGaN/GaN/AlGaN/GaN	290 GPa	0.17	5.6 $\mu\text{m/m}^\circ\text{C}$	0.712 J/g $^\circ\text{C}$	3.94 g/cm ³
GaN/AlInGaN/InGaN/AlGaN/GaN/AlGaN/GaN/AlGaN/GaN/AlGaN/GaN/AlGaN/GaN/AlGaN	290 GPa	0.17	5.6 $\mu\text{m/m}^\circ\text{C}$	0.712 J/g $^\circ\text{C}$	3.94 g/cm ³
GaN/AlInGaN/InGaN/AlGaN/GaN/AlGaN/GaN/AlGaN/GaN/AlGaN/GaN/AlGaN/GaN/AlGaN/GaN	290 GPa	0.17	5.6 $\mu\text{m/m}^\circ\text{C}$	0.712 J/g $^\circ\text{C}$	3.94 g/cm ³

[illegible][illegible]

All cells are of A, except as noted.
 EC derived as indicated or labeled as Control stock.
 A denotes Control cell is from donor cell in plasma.

Appendix C
Sampling and Analysis Plan

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EAU CLAIRE MUNICIPAL WELL FIELD - RI/FS
EAU CLAIRE, WISCONSIN

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SECTION 1

INTRODUCTION

1.1 OBJECTIVES OF SAMPLING PROGRAM

The objectives of the sampling program to be undertaken as part of the RI/FS at the Eau Claire Municipal Well Field in Eau Claire, Wisconsin, are as follows:

- o To establish vertical and horizontal hydraulic gradients, flow directions, and rate of flow, both in the well field and in the general area north of Eau Claire.
- o To establish the lateral and vertical extent of contamination in the area bounded on the west and north by the Chippewa River, the south by Eddy Lane, and on the east by Fairfield Road.
- o To better define contamination near possible sources.
- o To characterize the type of contamination present.
- o To assess the possible presence of contamination in the Mt. Simon Sandstone upgradient of the well field and characterize such contamination.
- o To assess the lateral and vertical extent of the major bedrock channel present in the vicinity of the site.

1.2 SCOPE OF SAMPLING ACTIVITIES

The scope of sampling activities encompassed by this plan includes the installation of groundwater monitor wells and the acquisition and analysis of water and soil samples in three distinct phases of the RI/FS: the Interim Work Assignment (IWA), the Hydrogeologic Investigation (Site Characterization), and the Source Confirmation. The final phase, Source Confirmation, is considered an optional phase at this time, the scope of which will not be completely defined until the completion of the Hydrogeologic Investigation. The sampling activities of the Interim Work Assignment were conducted by CH₂M-Hill under a separate contract. The results of these activities are presented in Appendix B of the Quality Assurance Project Plan and in the report entitled "Preliminary Hydrogeologic Evaluation of the Eau Claire Municipal Well Field" (CH₂M-Hill, 1985).

In the Hydrogeologic Investigation (Phase II) the sampling activities include the installation of up to 29 monitor wells, and the acquisition and analysis of up to 481 samples. Chemical analyses to

Sampling and Analysis Plan
Eau Claire Municipal Well Field
Section: 1
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September 30, 1986
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detect priority pollutants and other hazardous compounds will be performed on 441 of these samples, of which 303 are investigative, 47 are duplicates and 91 are blanks. Four hundred and twenty-nine of the 441 chemical samples are evidentiary while the remaining 12 are for field screening purposes. Geotechnical testing (grain-size analysis) will be performed on not more than 40 soil samples including 4 duplicates.

The tentative scope of work for the Source Confirmation phase (Phase III) includes the installation of 10 monitor wells and the acquisition of 48 samples for chemical analyses. Forty of these samples are investigative, 4 are duplicates and 4 are blanks. Geotechnical testing of samples acquired in this phase is not being considered at this time.

The environmental media to be sampled in the Hydrogeologic Investigation and Source Confirmation phases include groundwater and soil. The sampling effort is summarized in Table 1 and the analysis program is summarized in detail in Table 2.

Although actual collection and analysis of environmental samples are not included in this activity, three rounds of water level measurements in 37 existing well field, WDNR, and NPI monitoring wells will be taken concurrently with the sampling program. A minimum of three rounds of water level measurements will be taken in the newly installed monitoring wells. Because there is little detailed information available to evaluate hydraulic flow directions and rates in the well field, the water level measurements will aid in defining possible migration patterns of VOC contamination.

TABLE 1

SUMMARY OF SAW-LINE EFFORT FOR LABORATORY ANALYSIS

RI/FS Investigative Phase									
Analysis Type	Sample Type	Site Characterization			Source Confirmation			Totals	
		A	B	C	A	B	C		
Chemical Quality									
Groundwater									
-Water Supply		-	-	-	-	-	-	-	-
-RI/FS Monitor Wells		180+	31	50	20	2	2	268	-
-Other Monitor Wells		111	12	34	-	-	-	157	-
Surface Water		12	4	4	-	-	-	20	-
Soils (from Monitor Wells)		-	-	-	120	12	-	132	-
Subtotal		-	-	-	120	12	-	132	-
Geotechnical Soils (from borings)									
Solid		-	-	-	120	12	-	132	-
Liquid		303	47	91	20	2	2	465	-
Subtotal		303	47	91	140	14	2	557	-
Grand Total		303	47	91	140	14	2	657	-

A - Investigative Sample
 B - Duplicate Sample
 C - Blank Sample
 + - Of 180 investigative samples, 170 are evidentiary,
 and 10 are for screening purposes.

Source: Westor, 1986

SUMMARY OF ANALYTICAL PROGRAM

Study Phase	Sample Matrix	Field Parameters	Laboratory Parameters	Investigative Analysis			Duplicates			Blanks			Matrix Total
				No.	Freq.	Total	No.	Freq.	Total	No.	Freq.	Total	
Hydrogeologic Investigation	Groundwater-RI/FS monitor wells	pH Specific Conductance Temperature	RAS organics package from CLP including 30 tentatively identified compounds	29	2	58	3	2	6	3	2	6	70
			RAS inorganics package from CLP-- (filtered samples)	29	2	58	3	2	6	3	2	6	70
			SAS for eight specific volatile organics required to attain low detection limits	27	2	54	9	2	18	20	2	40	112
			Volatile organics, EPA method 624 (overnight analysis for non-evidentiary screening purposes)	10	1	10	1	1	1	1	1	1	12
			Field GC during drilling	54	1	54	9	1	9	9	1	9	72
	Groundwater-other monitor wells	pH Specific Conductance Temperature	RAS organics package from CLP including 30 tentatively identified compounds	37	1	37	4	1	4	4	1	4	45
			RAS inorganics package from CLP-- (filtered samples)	37	1	37	4	1	4	4	1	4	45
			SAS for eight specific volatile organics required to attain low detection limits	37	1	37	4	1	4	26	1	26	67

TABLE 2 (continued)
SUMMARY OF ANALYTICAL PROGRAM

Study Phase	Sample Matrix	Field Parameters	Laboratory Parameters	Investigative Analysis			Duplicates			Blanks			Matrix Total
				No.	Freq.	Total	No.	Freq.	Total	No.	Freq.	Total	
Source Confirmation (optional)	Groundwater-RI/FS monitor wells	pH Specific Conductance Temperature	RAS organics package from CLP including 30 tentatively identified compounds	10	1	10	1	1	1	1	1	1	12
			RAS inorganics package from CLP- (filtered samples)	10	1	10	1	1	1	1	1	1	12
	Soil-RI/FS monitor wells	Qualitative organic vapor screening with HNL	RAS organics package from CLP including 30 tentatively identified compounds	40	1	40	4	1	4	-	-	-	44
			RAS inorganics/metals package from CLP	40	1	40	4	1	4	-	-	-	44
			RAS inorganics/cyanide package from CLP	40	1	40	4	1	4	-	-	-	44
	Hydraulic Heads - New monitor wells	Water Levels	---	10	3	30	1	3	3	-	-	-	33
			---	62	1	62	7	1	7	-	-	-	69
	Hydraulic Conductivity	Slug Tests	---	10	1	10	1	1	1	-	-	-	11

TABLE 2 (continued)
SUMMARY OF ANALYTICAL PROGRAM

Study Phase	Sample Matrix	Field Parameters	Laboratory Parameters	Investigative Analysis			Duplicates			Blanks			Matrix Total
				No.	Freq.	Total	No.	Freq.	Total	No.	Freq.	Total	
	Soil-R1/FS monitor wells	Qualitative organic vapor screening with HNu	Particles size analysis (ASTM D-422)	36	1	36	4	1	4	-	-	-	40
	Hydraulic Heads	Water Levels											
	R1/FS monitor wells		---	29	3	87	3	3	9	-	-	-	96
	Other monitor wells		---	35	3	105	4	3	12	-	-	-	117
	Hydraulic Conductivity R1/FS monitor wells	Slug Tests	---	29	1	29	-	-	-	-	-	-	29
	Surface water-Chippewa River	pH Specific Conductance Temperature	RAS organics package from CLP including 30 tentatively identified compounds	3	1	3	1	1	1	-	-	-	4
			RAS inorganics package from CLP- (filtered samples)	3	1	3	1	1	1	-	-	-	4
			SAS for eight specific volatile organics required to attain low detection limits	3	2	6	1	2	2	2	2	4	12

SECTION 2

SAMPLE LOCATIONS AND RATIONALE

2.1 HYDROGEOLOGIC INVESTIGATION

2.1.1 Monitor Well Installation

The following seven site-specific factors were considered during the design of the monitor well network:

- o Existing groundwater quality data indicates that VOC contaminated groundwater exists beneath the northern portion of the Eau Claire municipal well field and at an area approximately 3 miles to the east of the well field (immediately north of the NPI site). No samples have been obtained from the area between these two sites, consequently any relation between these sites is speculative.
- o An industrial survey conducted by personnel of the Wisconsin DNR revealed 22 industrial and commercial establishments in the area east of the well field which are currently or have formerly handled organic solvents and which therefore may be potential sources of VOC contamination. Two additional potential sources, an unnamed landfill and a private residence, have been identified since the initial survey. The locations of these potential sources are shown in Figure 1.
- o The existing subsurface data indicates the presence of three hydrostratigraphic units beneath the study area. A sand and gravel outwash deposit, 80 to 130 feet thick, occurs immediately beneath the land surface and contains the major water supply aquifer for the Eau Claire municipal service area. This unit is unconformably underlain by the Cambrian-age Mt. Simon Sandstone, which is discontinuous and of variable thickness beneath the Eau Claire area. Although capable of yielding groundwater, this formation is not generally utilized as a water supply source in the Eau Claire area. This formation is in turn underlain by fractured Pre-Cambrian age granites and gneisses. The granite is not utilized as a water supply source in this portion of Wisconsin.
- o Well drilling logs and geophysical surveys indicate the presence of a buried river valley which has been incised into the granite bedrock by proglacial rivers. This valley has been filled with glacial outwash and appears to extend westward from the NPI facility to the well field. The

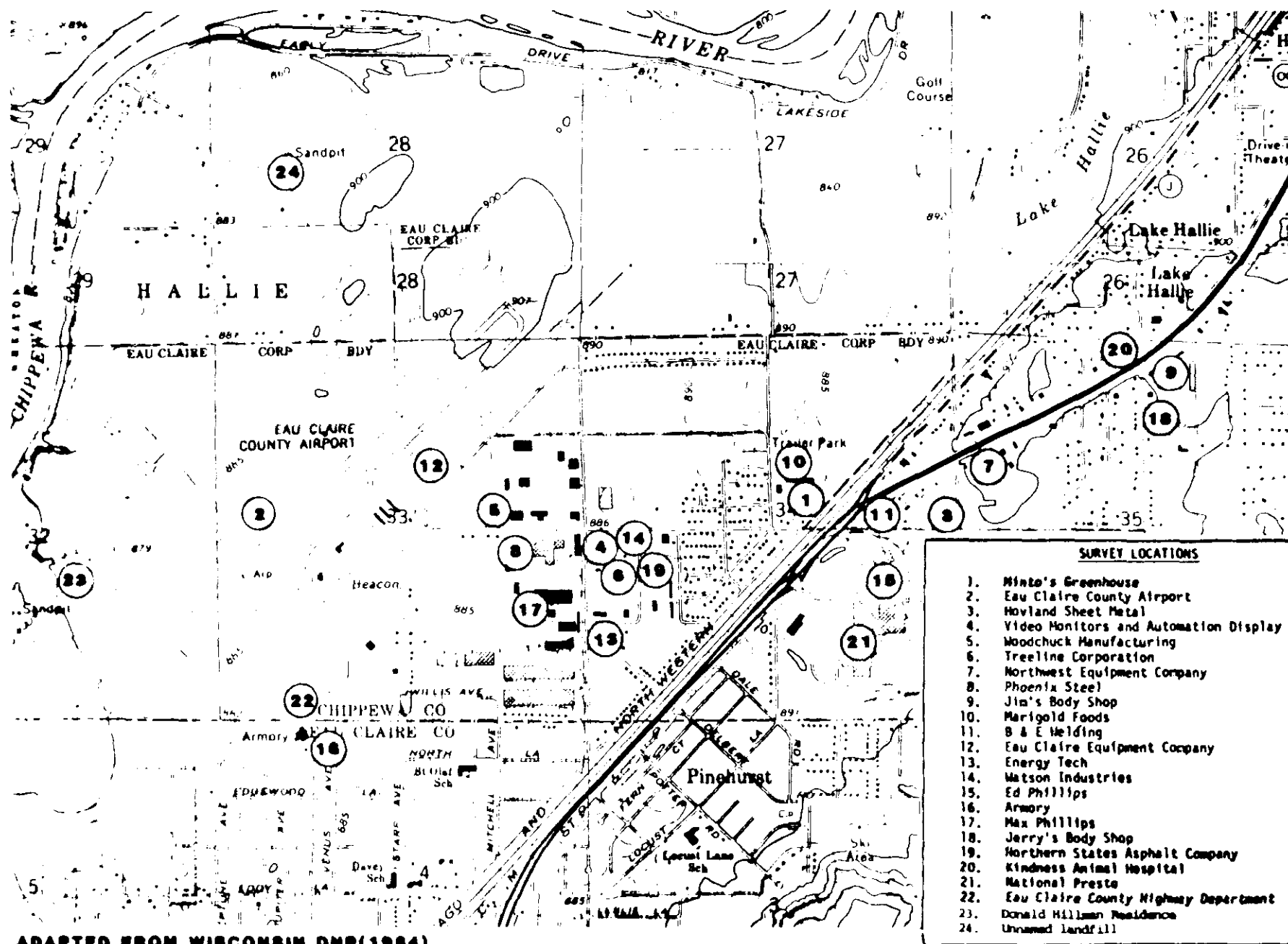


FIGURE 1 LOCATION OF TENTATIVELY IDENTIFIED POTENTIAL VOC SOURCES

outwash is believed to directly overlie the granite along the trace of the valley and varies in thickness from 80 to 150 feet.

- o Although the groundwater in the outwash and Mt. Simon Aquifers flows toward and discharges to the Chippewa River the hydraulic gradient and flow directions within the study area have not been defined. There is also uncertainty as to the significance of vertical hydraulic gradients in the study area. An examination of local base level variations suggests that a groundwater divide may occur between the well field and several of the potential sources.
- o The primary pathway of contaminant migration is believed to be the outwash aquifer. However, the Mt. Simon Sandstone is of moderate permeability and may be capable of transmitting contaminated groundwater. In addition, the Mt. Simon Aquifer is believed to subcrop beneath the first terrace (upgradient of the well field) and probably discharges groundwater into the outwash aquifer penetrated by the well field.
- o The VOCs detected to date generally have a specific gravity greater than that of ambient groundwater. Consequently there exists a potential for vertical stratification of contamination, particularly near the source(s) where the dispersive mechanisms have not yet affected the contaminant distribution.
- o Because of the age of several of the potential major sources, the high permeability of the sand and gravel aquifer and the relatively low VOC concentrations it is possible that the VOC concentrations reported to date are residuals from a plume or plumes, the bulk of which have already passed through the well field. Therefore, the hydrogeologic investigation and monitor well network must be designed to yield information which is sufficient to determine if a source characterization effort is warranted.

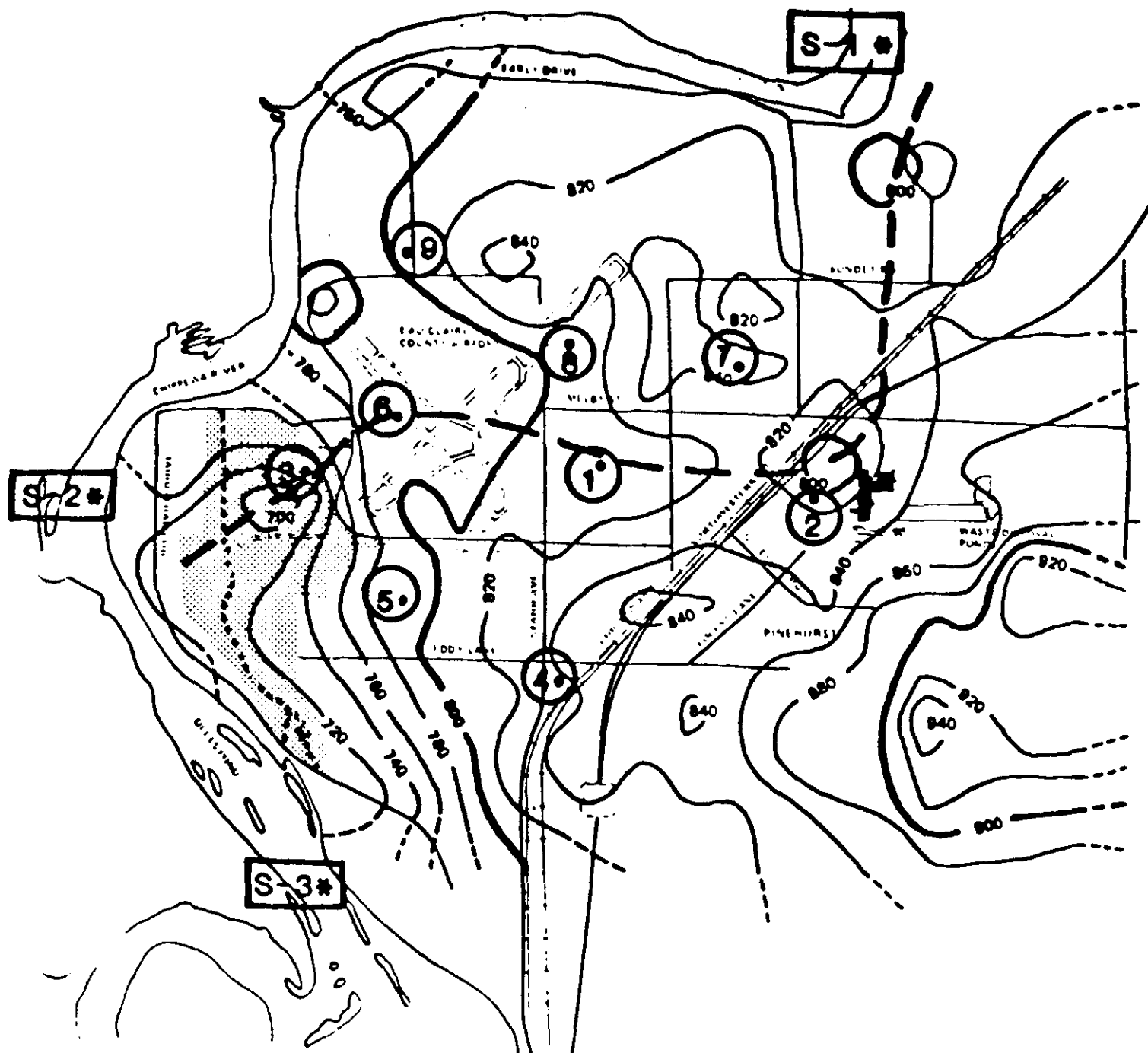
Based on these considerations, a monitor well network was designed to satisfy the following objectives:

- 1) Provide groundwater sampling points between the well field and potential sources.
- 2) Provide sampling access points downgradient of potential sources.

- 3) Facilitate the evaluation of the spatial and temporal distribution of hydraulic heads throughout the area.
- 4) Assess areal extent of contamination in the sand and gravel aquifer.
- 5) Assess magnitude of vertical hydraulic gradients and vertical stratification of contaminants.
- 6) Confirm the presence or absence of VOC contamination in the Mt. Simon Aquifer, and assess the significance of this aquifer as a migration pathway.
- 7) Evaluate the potential for the preferential migration of contaminants through the buried river valley.
- 8) Facilitate the acquisition of samples which are representative of present and future groundwater quality conditions.

To achieve these objectives monitor wells will be installed at the nine locations shown in Figure 2 in the numerical sequence shown. The rationale for these locations is summarized in Table 3. At Location 1, a fully penetrating single-point well, screened through the entire saturated thickness of the sand and gravel aquifer, with standard hollow stem auger methods. Subsequent to the completion and development of monitor well 01, the well will be purged and samples will be acquired from the upper, middle and lower sections of the saturated thickness with the straddle packer system shown in Figure 3. After the acquisition of the straddle packer samples the entire well will be purged and a sample will be obtained from the open well. This sample will be referred to as the integrated or composite sample. The procedures for obtaining these samples is described in Section 4 of this document.

After the installation and development of well 01, three-point well nests will be installed at Location 2 (wells 02A through 02C) and 3 (wells 03A through 03C), with hollow stem auger methods. The well in these nests will have a 10 foot length of screen in the upper, middle and lower portions of the saturated sand and gravel aquifer, and will be utilized to assess the magnitude of vertical contaminant stratification and vertical hydraulic gradients. (The rationale for the selection of Locations 2 and 3 is that because of their relative distances to the source with the highest known concentrations, these sites have the highest and lowest potential, respectively, for exhibiting vertical contaminant stratification). Each well will be developed, purged and sampled with a positive displacement pump and/or bailer as outlined in Section 4. The samples from the single-point fully penetrating well (01) and the three well nests (02 and 03)



LEGEND

- APPROXIMATE CENTERLINE OF BEDROCK CHANNEL
- BEDROCK ELEVATION CONTOURS, DASHED WHERE APPROXIMATE
- Monitoring Wells
- Surface Water Sampling Locations

Municipal Water Area

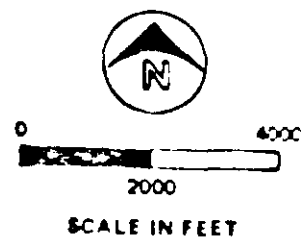


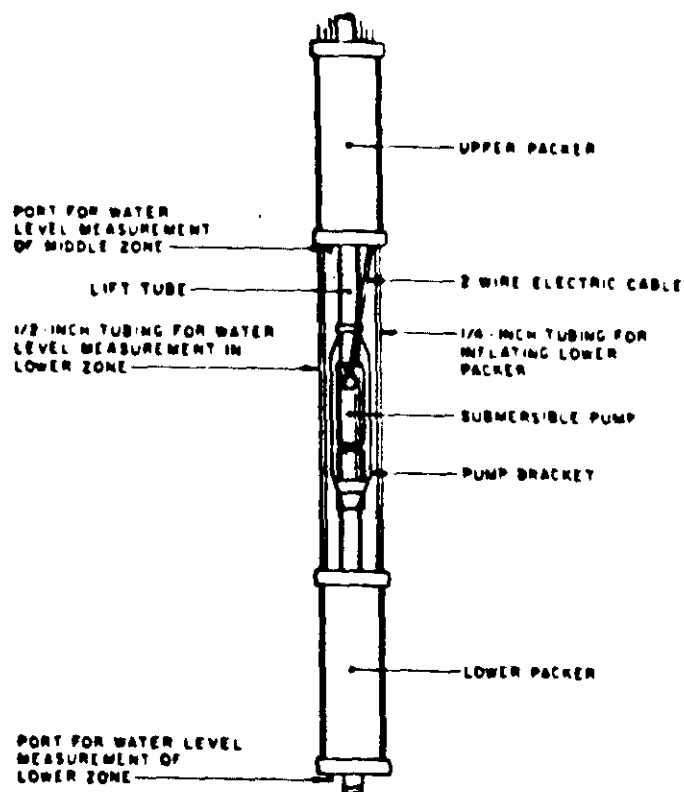
Figure 2 Proposed Monitoring Well Locations

Source: WESTON 1985

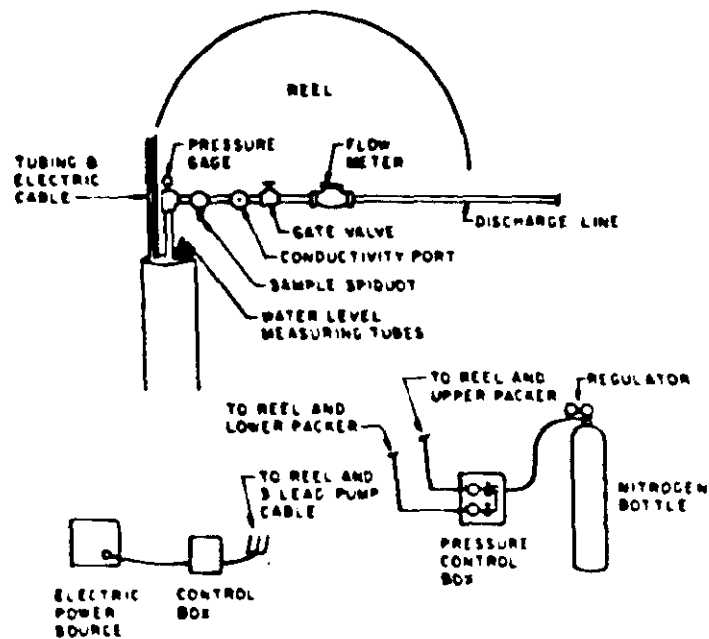
TABLE 3
WELL LOCATION RATIONALE

WELL LOC.	APPROX. ELEV.	APPROX. DEPTH	MONITOR ZONE	RATIONALE
1	885 ft	120 ft	Mt. Simon Sand- stone and saturated outwash*	1. Proximity to possible source (airport) 2. Establish lateral extent of contamination
2	890 ft	100 ft	Mt. Simon Sand- stone and saturated outwash*	1. Proximity to possible source (NPI) 2. Proximity to buried valley
3	880 ft	100 ft	Saturated outwash	1. Proximity to well field 2. Establish lateral extent of contamination
4	890 ft	100 ft	Mt. Simon Sand- stone and saturated outwash*	1. Establish lateral extent of contamination 2. Assess possible contamin- ation in sandstone 3. Hydraulic gradient control
5	885 ft	100 ft	Mt. Simon Sand- stone and saturated outwash*	1. Establish lateral extent of contamination 2. Hydraulic gradient control
6	885 ft	100 ft	Mt. Simon Sand- stone and saturated outwash*	1. Proximity to possible source (airport) 2. Establish lateral extent of contamination 3. Hydraulic gradient control 4. Proximity to buried valley
7	885 ft	100 ft	Saturated Outwash	1. Hydraulic gradient control 2. Establish lateral extent of contamination
8	885 ft	75 ft	Saturated Outwash	1. Establish lateral extent of contamination 2. Proximity to possible source (Eau Claire Equipment Co.) 3. Hydraulic gradient control
9	883 ft	100 ft	Saturated Outwash	1. Hydraulic gradient control 2. Proximity to possible source (landfill)

*It is unknown whether sandstone will be encountered in these borings.
 If so, single-point wells screened in the Mt. Simon Sandstone will
 be completed at the first two location sandstone is found.



A. Borehole Equipment



B. Surface Equipment

Figure 3

**Schematic of Stradle Packer System Instrumentation
Eau Claire, Wi.**

will be packaged and shipped overnight for analysis of volatile organic compounds (EPA Method 624) on the same day(s) they are collected. These samples will be utilized to assess the magnitude of vertical stratification and the ability of the straddle packer system combined with the fully screened well to simulate a nested well installation. The field GC will be used to analyze headspace air from the groundwater samples collected during drilling of the deepest well at each of the nine monitor well locations. This field screening of groundwater samples is described in more detail in Section 4.2. The field GC results may aid in determining vertical distribution of contaminants. These results will augment data from VOC analyses of groundwater samples obtained with the straddle packer sampling system.

The monitor well design for the remaining locations will be determined based on the following decision process:

- o If water level measurements in the three-point well nests indicate significant vertical gradients (greater than 0.005 ft/ft), the three-point well nest design will be used at the remaining six locations. The single-point well will be closed, and a three-point well nest will be installed at Location 1.
- o If significant vertical gradients are not found and the straddle packer technique provides a representative sample of vertical stratification or no vertical stratification is indicated, single-point fully screened wells will be installed at the remaining six locations. If the straddle packer technique does not provide a representative sample of vertical stratification, three-point well nests will be installed at the remaining six locations. The single-point well will be closed and a three-point well nest will be installed at Location 1.

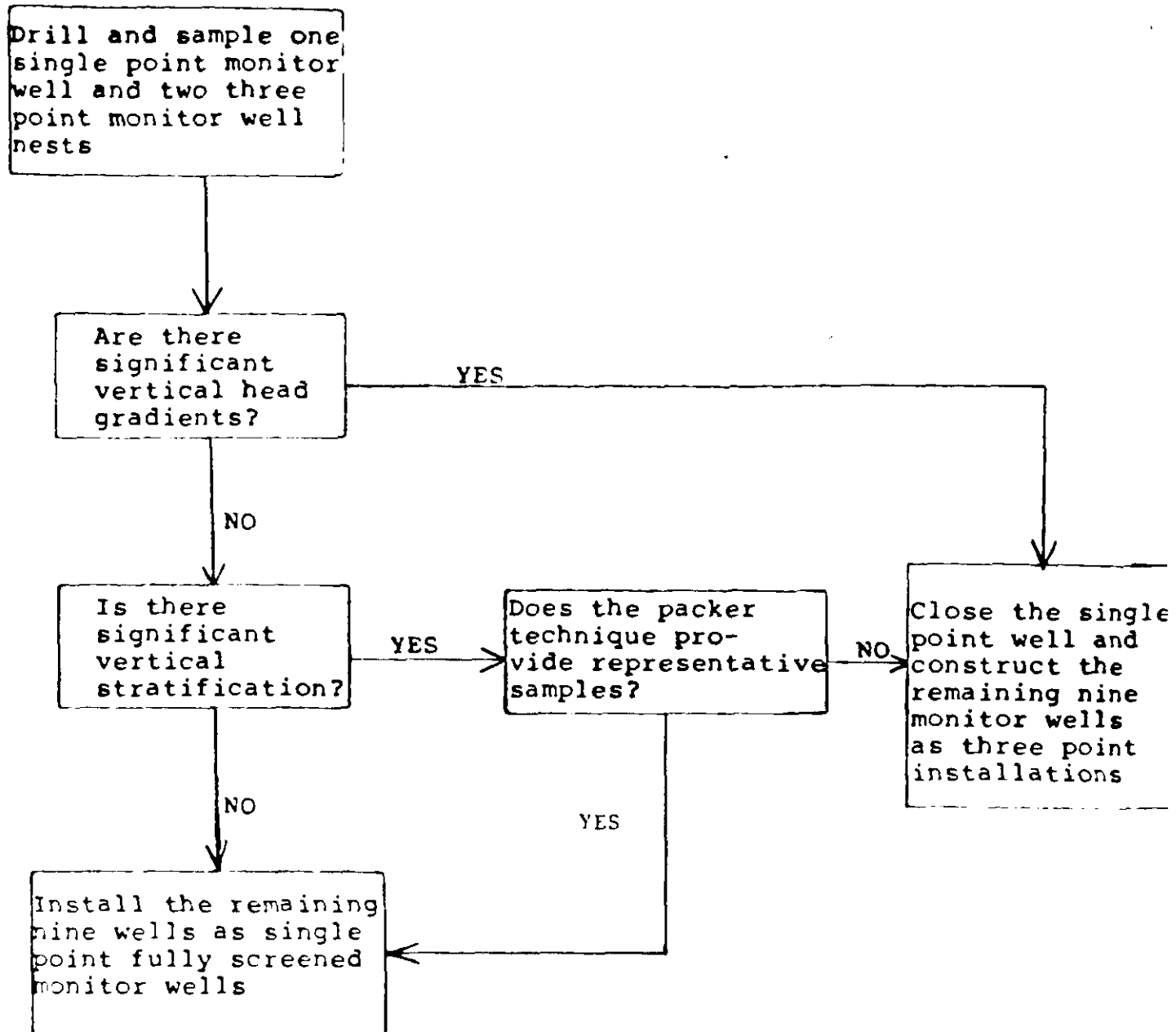
This decision process is summarized in a flow diagram presented in Figure 4.

To assess the nature and extent of contamination in the Mt. Simon Sandstone two monitor wells will be installed in the sandstone with cable-tool drilling techniques. The location of these wells will be selected in the field based on the results of the diamond drill coring conducted during the well installation (refer to Section 4.1). If these happen to coincide with locations at which three-point well nests are installed, the final result will be a four-point well nest. If sandstone is encountered at a single-point well, a two-point well nest will eventually be installed.

To summarize, if vertical stratification can be adequately assessed with the single-point well design and the straddle-packer sampling system, 15 groundwater monitoring wells will be installed. The

FIGURE 4

Decision Tree for Monitor Well Design
Eau Claire Municipal Well Field



monitor network will then consist of two three-point well nests screened in the outwash aquifer, seven single wells screened the entire saturated thickness of the outwash aquifer, and two wells screened in the sandstone bedrock. The wells screened in the sandstone will be at two of the nine drilling locations. If the three-point well nest system is deemed necessary to quantify possible vertical stratification of contamination, a total of 29 groundwater monitoring wells will be installed including seven three-point well nests screened in the outwash and two four-point well nests with three wells screened in the outwash and one well screened in the sandstone. The comparison of data obtained with the two sampling methods will require less than one day and minimal downtime during the drilling is anticipated. It will in no way hamper drilling efforts.

2.1.2 Groundwater Samples

Two rounds of groundwater samples will be obtained from the monitor wells installed in the Hydrogeologic Investigation phase, and submitted for the analyses shown in Table 2. A single round of samples will be obtained from 37 other existing or soon-to-be installed monitor wells in the study area. These wells have been installed by the City of Eau Claire, the Wisconsin DNR and by National Presto Industries.

Water well logs from the City of Eau Claire indicate there are at least 26 existing monitoring wells within the municipal well field boundaries. To better define the extent of contamination within the well field, 10 of these wells will be sampled for the same parameters listed in the preceding section. Twenty-two WDNR and five NPI monitoring wells will be sampled in order to assess the extent of contamination in the area north of Eau Claire. Locations of monitoring wells in the well field and at NPI are shown in Figures 5 and 6. WDNR well locations are shown in Figure 7.

All analytical data for groundwater from both pre-existing and new monitoring wells will be correlated with data obtained from municipal well samples being routinely collected and analyzed by the City of Eau Claire and the Wisconsin Department of Natural Resources.

2.1.3 Measurement of Hydraulic Parameters

In addition to water samples, three rounds of groundwater levels will be obtained from each of the newly installed and existing monitor wells.

Slug test will be performed on each of the wells installed during the RI/FS to assess the hydraulic conductivity of the aquifer materials.

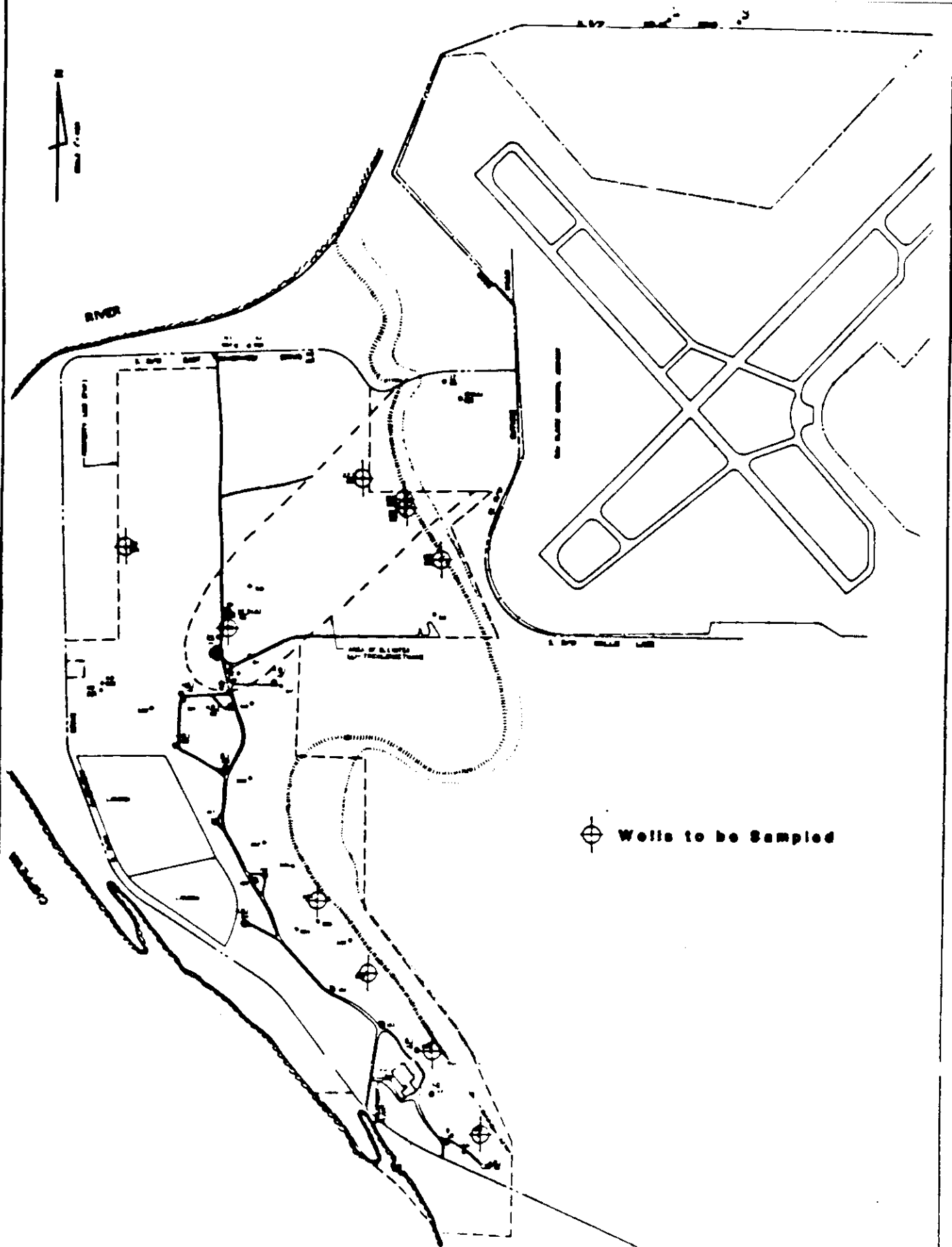
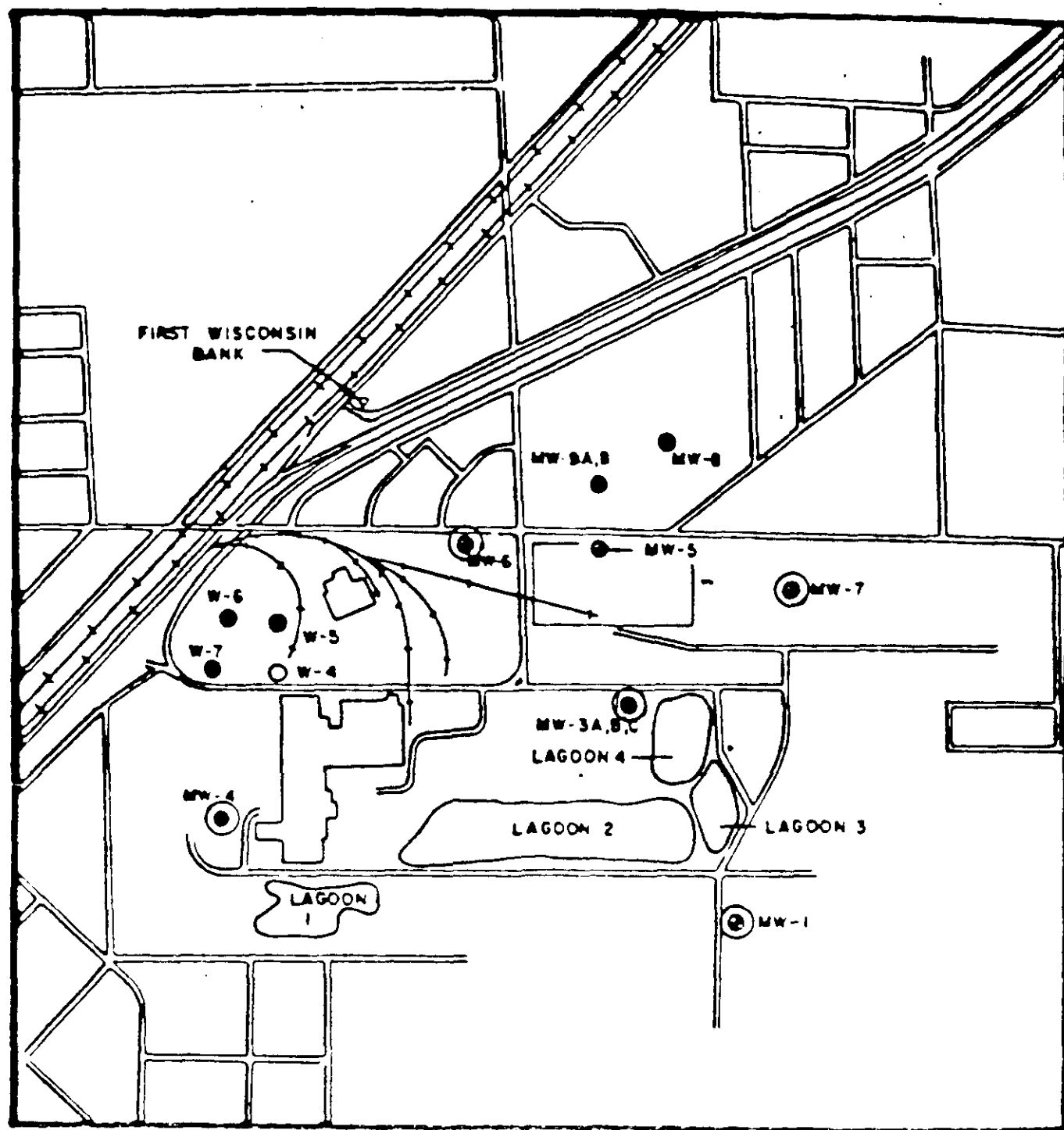


Figure 5 Existing Monitoring Wells to be Sampled (Well Field)



- LEGEND
- NATIONAL PRESTO INC MONITORING WELLS
 - PRODUCTION WELL
 - ABANDONED PRODUCTION WELL
 - ⊙ EXISTING WELLS TO BE SAMPLED

Figure 8 Existing Monitoring Well Locations (NPI)

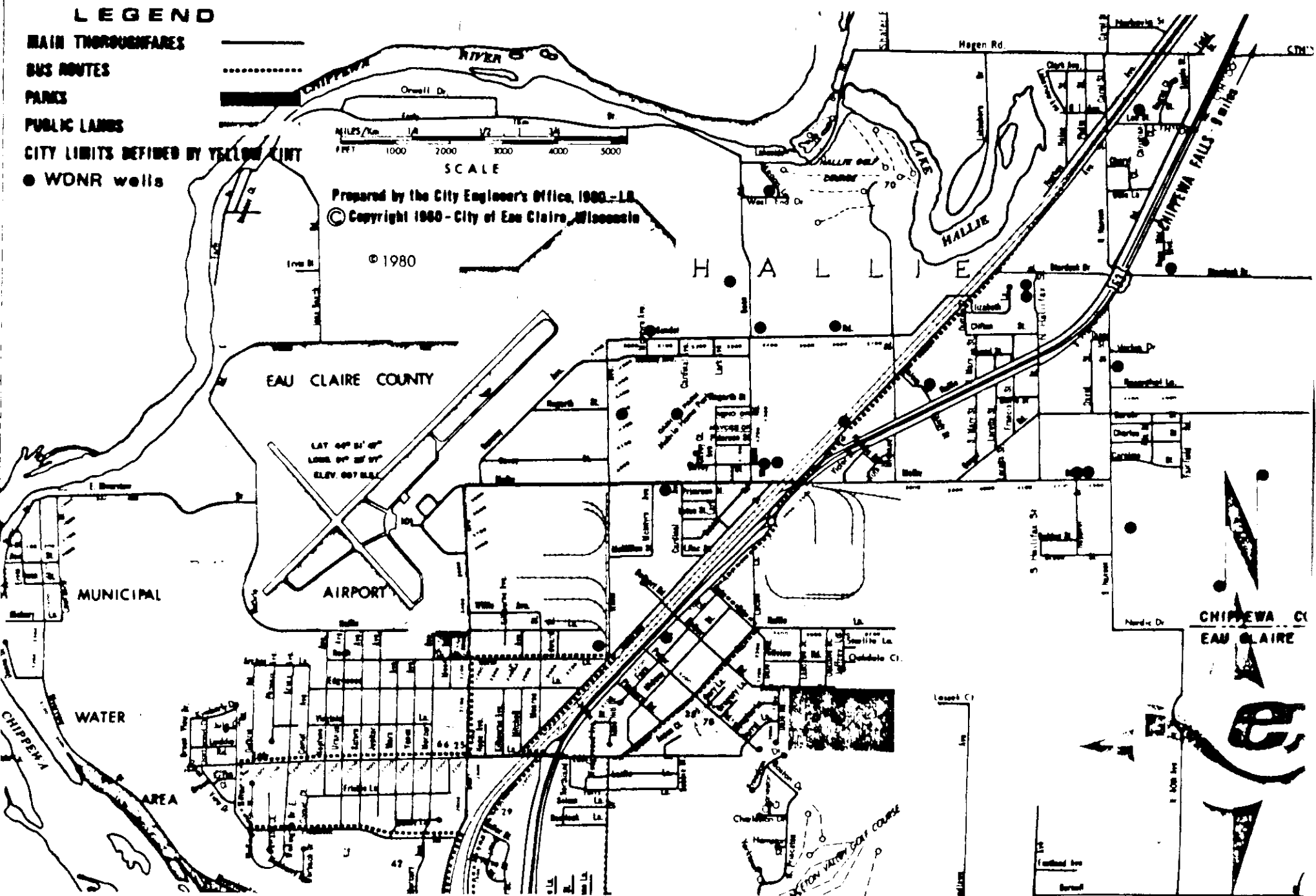


Figure 7 Existing Monitoring Well Locations (WDNR)

2.1.4 Soil Samples Collected During Drilling

Split-spoon samples of the unconsolidated outwash deposits will be obtained at five foot intervals as described in Section 4. Each of these samples will be retained in glass jars and the vapors from the sample will be measured (qualitative) with a photoionization detector (HNU). Four samples from each site will be submitted for grain-size analysis to quantify the textural variations in the primary migration pathway (the outwash aquifer).

Since the monitor wells are not located at or adjacent to known or suspected sources, chemical quality testing of soil samples is not believed to be warranted in this phase of the RI/FS.

2.1.5 Surface Water Samples

The three surface water sampling sites shown in Figure 2 have been selected with the following rationale:

- S-1: This site is believed to be upgradient of the section where groundwater from the study area naturally discharges to the Chippewa River.
- S-2: This site is located opposite of the northern portion of the well field and would be representative of the recharge water induced from the river by well field pumpage.
- S-3: This site is believed to be downgradient of the section where groundwater from the study area naturally discharges to the Chippewa River.

One round of samples will be obtained from near the shoreline at each of these sites during base flow conditions (while the river is covered by ice).

2.1.6 Documenting Sampling Locations

The physical locations of all newly-installed monitoring wells will be documented photographically and determined by taping and leveling surveys. Taping surveys will use existing buildings and other fixed objects shown on the topographic map of the area as reference points. At least two reference points will be used to locate each well. The leveling survey will be tied to mean sea level datum. Horizontal accuracy will be within 1.0 foot and vertical accuracy will be to within 0.01 foot.

2.2 SOURCE CONFIRMATION

The scope of the source confirmation presented herein is tentative and has been developed only to provide a basis for the cost estimate presented in Volume II Work Plan-Cost Estimate. The scope of this

effort will be finalized on completion of the Hydrogeologic Investigation.

2.2.1 Monitor Well Locations

A maximum of ten monitor wells will be installed at or adjacent to known or suspected sources. These locations and the design of the monitor wells will be selected based on an analysis of the results of the Hydrogeologic Investigation.

2.2.2 Soil Samples Collected During Drilling

During monitor well installation, soil samples will be collected every five feet with a 3-inch diameter split-spoon sampler as described in Section 4. The samples from the unsaturated zone will be qualitatively screened with an HNu instrument. Based on the readings, a maximum of four samples from each of the wells will be submitted for analysis of both organics and inorganics, as shown in Table 2.

In the area north of Eau Claire, a layer of 15 feet of silty clay loam is occasionally present above the glacial outwash. Solvents and pesticides are greatly attenuated on silts and clays. If loam is present at a drilling location that is near a possible contaminant source, one of the four samples will be a grab sample of the loam soil.

2.2.3 Groundwater Samples

A single round of groundwater samples will be obtained from the 10 (maximum) monitor wells installed during the source confirmation phase, with the procedures outlined in Section 4, and submitted to the CLP for the RAS organic and inorganic packages (see Table 2).

2.2.4 Measurement of Hydraulic Properties

As with the monitor wells installed during the Hydrogeologic Investigation slug tests will be performed on each of the wells to evaluate the hydraulic conductivity of the penetrated aquifer. Three rounds of water level measurements will be obtained from each of the newly installed monitor wells. In addition one round of water level measurements will be obtained from the wells installed during the Hydrogeologic Investigation (maximum of 27 wells) and the 37 existing wells installed as part of other adjacent investigations.

2.2.5 Documenting Sampling Locations

The physical locations of all newly-installed monitoring wells will be documented photographically and determined by taping and leveling surveys. Taping surveys will use existing buildings and other fixed objects shown on the topographic map of the area as reference points. At least two reference points will be used to locate each well. The

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leveling survey will be tied to mean sea level datum. Horizontal accuracy will be within 5.0 feet and vertical accuracy will be to within 0.01 foot.

SECTION 3

SAMPLE NUMBERING SYSTEM

All samples for chemical analysis, including blanks and duplicates, will be given 2 unique sample numbers. A listing of sample numbers, cross-referenced to chain-of-custody and shipment documents, will be maintained in the sample handling logbook. Sample identification is maintained with the use of two distinct sample identification codes: the WESTON sample code (as specified in the site sampling plan) and the CRL sample identification code (as assigned by the sample documentation coordinator). While the WESTON code provides a description of the sample's origin the CRL code provides a "name" or "label" under which the sample can be tracked through the CLP and CRL systems.

3.1 CRL NUMBERING SYSTEM

The CRL sample identification code is described as follows:

Example: 85AJ01S01

Whereby:

- 85 - designates fiscal year
(October 1 through September 30)
- R - indicates sample sent by CDM
- J - designates project manager
(as assigned, A through Z)
- 01 - designates survey number
(as assigned, 01 through 99 for
each project manager A through Z)
- S - indicates sample type
(S = sample, D= duplicate, R = blank)
- 01 - designates sample number within a given survey
(as assigned, 01 through 99 for each survey
01 through 99)

Upon requesting codes from the documentation coordinator, each project manager will be assigned an alphabetic character A through Z which will be used in all his/her sample codes regardless of the specific site. Survey and sample numbers are site-specific and are allocated in blocks for each sampling trip. Individual sample codes are to be assigned to specific samples by the project manager or sample team leader. A record should be kept of these numbers along with other tracking information for each sample.

3.2 WESTON INTERNAL NUMBERING SYSTEM

The WESTON sample numbers will consist of three parts:

- o Project identifier -- a two-letter designation used to identify the site; for the Eau Claire Municipal Well Field, these letters will be EC.
- o Sample type and location -- a two-letter designation of the sample type followed by a two-digit number for the sampling location. For the EPA well installations a single letter will immediately follow the two-digit number to designate the sampling level. For the Eau Claire site they will be the letters SL for soil taken during monitoring well installation and GW for groundwater obtained from those wells. Locations for both will be 1-9. For groundwater samples taken from pre-existing monitoring wells located in the well field, the letters will be WF and the locations will be 10-33.
- o Sequence number -- a two-digit number indicating the first, second, third, etc. sample collected at a given location, or a two-letter code indicating a duplicate (DP) or a blank (FB, TB, DB).

Some examples of the sampling number system include:

- o EC-SL02-03: Eau Claire RI/FS site, soil sample from monitor well installation, location 02, third sample.
- o EC-GW05-DP: Eau Claire RI/FS site, groundwater sample from newly-installed monitoring well, location 05, duplicate.
- o EC-GW01B-01: Eau Claire RI/FS site, groundwater sample from newly installed monitor well, location 01, Level B, first sample.
- o EC-WF18-FB: Eau Claire RI/FS site, groundwater sample from a pre-existing monitoring well, location 18, field blank.

Sample type codes and location numbers are summarized in Table 4.

SECTION 4

SAMPLING EQUIPMENT AND PROCEDURES

4.1 MONITORING WELL INSTALLATION

Although the total number of monitoring wells to be installed will not be determined until after the field program has started, at least two three-point well nests screened in the outwash aquifer, one fully screened single well, and two wells screened in the sandstone bedrock will be installed. The remaining wells will be either six fully screened, fully penetrating single-point wells or eighteen wells in six three-point well nests. Total drilling footage is estimated to range from 1220 to 2400 feet.

4.1.1 Three-Point Well Nests

At least two three-point well nests will be installed beginning at Locations 2 and 3 (Figure 1) and all will be screened in the sand and gravel aquifer. The deepest well, which will be advanced to the top of bedrock, will be drilled first. The following procedure will be used:

- o The working end of the drilling rig and all equipment, tools and well construction materials will be steam cleaned prior to drilling at each location. Provisions will be made to keep the equipment, tools and materials from coming into contact with surficial soils during drilling and well installation.
- o The deepest borehole will be advanced first using hollow stem auger methods (4 1/4" I.D.) to bedrock. The first five feet of auger will be an open-ended screened auger (0.040-inch continuous slot) which will allow vertical sampling of groundwater as the borehole is advanced. (Groundwater sampling is discussed in detail in Section 4.2).
- o The depth of the interface between the unconsolidated sands and gravels and the underlying bedrock will be estimated by the relative ease of auger and split-spoon penetration, and confirmed by diamond core drilling (ASTM Method D2113-83) of the impenetrable strata. (Impenetrable strata is defined as 1 inch or less penetration for 50 blows in accordance with ASTM Method 1586 or other logistical or mechanical criteria that the on-site geologist or drilling supervisor may establish. Because of the stress limitations of the

screened auger the numerical criteria set forth in ASTM 1586 may not be achievable.) Upon encountering impenetrable strata NW size casing (3.5 inch O.D.) will be inserted through the hollow stem augers to seal off the screened auger and maintain fluid circulation during diamond core drilling. Subsequent to setting the casing NW size drill rod will be used to obtain continuous undisturbed core samples. The core will be advanced through the entire thickness of sandstone and a minimum of 5 feet into the granite bedrock.

- o The core drilling, sampling and packaging of the recovered core will be conducted in accordance with ASTM Method D2113-83. The recovered core will be logged and described by the on-site geologist and retained for future analysis and reference. Prior to setting the well points, cement grout will be injected through the NW liner into the core hole.
- o The deepest well-point will be screened across the bottom 10 feet of the outwash aquifer. The intermediate and shallow wells will be drilled with hollow stem auger methods also, but without the screened auger, to depths such that the middle and upper 10 feet of the saturated thickness will be screened. Groundwater in the intermediate and shallow wells will not be sampled during drilling.
- o As stated previously, for purposes of soil sample collection and analysis, samples will be collected every five feet with a 3-inch diameter split-spoon sampler in the deepest well until the bedrock is encountered. As each sample is recovered, it will be qualitatively screened for organic vapors with a photoionization detector. The deep boring will be logged by a geologist or geotechnical engineer and the samples retained for future reference. Of the samples that are collected, at least four from each drilling location will be retained for future reference and geotechnical testing (grain size analysis). An effort will be made to collect soils from various layers encountered during drilling.
- o The wells will be constructed of 2-inch diameter, Schedule 40 PVC with flush-threaded couplings and a 10-foot screened interval at the bottom. The screens will be factory mill-slotted or continuously slotted with openings of 0.010 inches. No glues or solvents will be used. The screen and well casing will be steam cleaned prior to installation.

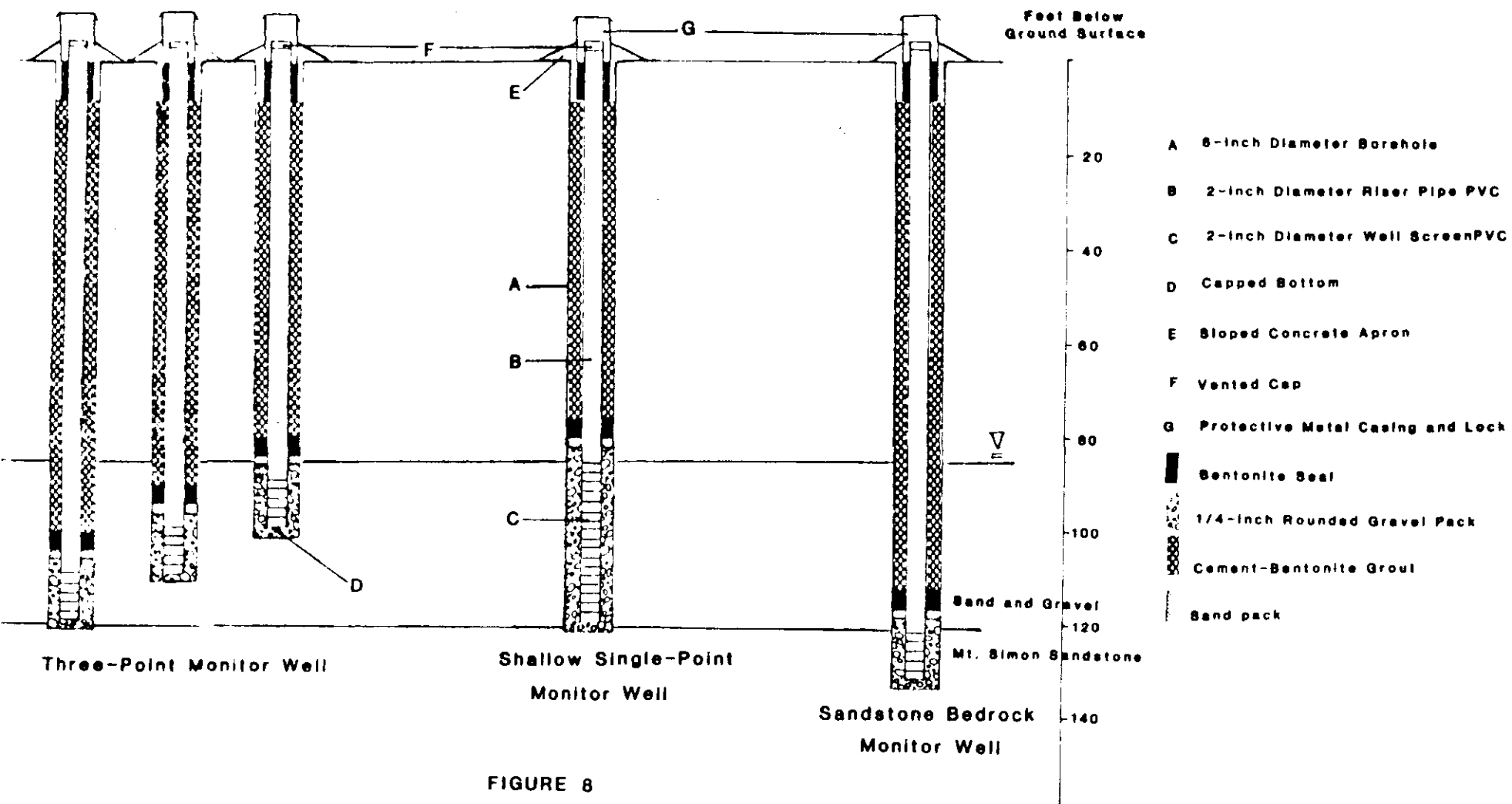


FIGURE 8
WELL CONSTRUCTION SCHEMATIC
EAU CLAIRE WELL FIELD

to the base of the sand and gravel aquifer. Upon completion of all wells screened in the sand and gravel, the two sandstone wells will be installed. The borings will be advanced until 10 feet of saturated thickness of sandstone is encountered using the following procedure:

- o The working end of the drilling rig and all equipment, tools and materials will be steam cleaned prior to drilling at each location. Provisions will be made to keep the equipment, tools and materials from contacting with surficial soils during drilling and well installation.
- o The borehole will be advanced using cable-tool drilling methods with 4-inch casing advanced continuously ahead of the open hole.
- o Drilling will proceed until the borehole is advanced approximately 10 feet into the saturated thickness of the sandstone as estimated from the previously drilled core hole. Upon completion of drilling, the borehole will be flushed with clean water to remove all suspended solids from the inside of the casing.
- o The well will be constructed of 2-inch diameter, Schedule 40 PVC with flush-threaded couplings and a 10-foot screened interval at the bottom. If less than 10 feet of saturated thickness of sandstone is encountered, a shorter screen length will be used. The screen will be factory mill-slotted or continuously slotted with openings of 0.010 inches. No glues or solvents will be used. The screen and well casing will be steam cleaned prior to installation.
- o The annular space around the screen will be backfilled with rounded 1/4" gravel to a height at least 3 feet above the top of the screen. 1 to 2 feet of sand will be placed above to prevent the bentonite from entering the gravel. A three-foot seal of compressed bentonite pellets will be placed above the sand pack.
- o A four-inch diameter, locking protective casing will be installed at the surface with a concrete anchor and runoff diversion apron. The PVC riser will be covered with a loosely fitting, vented PVC cap. Single-keyed locks will be provided.
- o The well will be developed by surging and pumping until five well volumes have been removed and clear water is obtained during pumping. Upon completion of development, a baildown recovery test will be performed to document the sensitivity of the well and provide data for calculating the hydraulic conductivity of the screened interval.

The details of well construction for the sandstone well installations are shown in Figure 6.

4.2 QUANTITATIVE FIELD SCREENING OF GROUNDWATER SAMPLES

Groundwater encountered in the deepest wells of the three-point well nests and the single-point well(s) will be quantitatively screened with a field photoionization gas chromatograph (GC) every ten feet during well drilling.

As discussed in Subsection 4.1.1, a 5 foot long screened auger will be used to facilitate sampling of groundwater. At approximately 10-foot intervals from the water table to the base of the outwash aquifer, water levels and depth of the borehole will be measured with an electronic probe. The volume of water in the borehole will then be calculated. The borehole will be purged by removing up to five volumes of water by use of a submersible pump or bailer at each interval.

After purging at each 10-foot interval, a groundwater sample will be collected with a steel bailer. The sample will be collected in 40-ml VOA vials with Teflon-lined caps, completely filled with no air bubbles. Two 40-ml VOA vials will be collected at every sampling location. The sample will then be iced to 4°C until it is prepared for GC analysis.

To prepare the sample for analysis with the field GC unit, quickly pour a 25 ml portion of sample into a clean 40 ml VOA vial and cover with Teflon-lined cap. Gently invert the bottle and set aside for one hour. After one hour the headspace air will be sampled for analysis; the procedure will consist of removing 100 to 500 ml of gaseous sample from the headspace using a glass syringe and injecting the sample into the model 10A10 GC unit. The results will be compared with calibration curves generated for the following compounds:

- o Dichloroethene
- o Tetrachloroethene
- o Trichloroethene

This method may provide additional information to assess the extent of vertical stratification in the glacial outwash. An instruction manual and quality assurance procedures for the Photovac 10A10 Portable GC are included in Appendix A, which is an outline of the general methods used with GC analysis.

4.3 SOIL SAMPLES COLLECTED DURING DRILLING

Monitoring wells will be installed at nine locations throughout the area north of Eau Claire and east of the well field. Each boring will be sampled at five foot intervals to the bedrock with a 3-inch diameter split-spoon sampler. The over-sized split-spoon is needed to provide enough sample for standard CLP analyses, especially when duplicates are collected.

Upon recovery from the borehole the sampler will be placed on a clean surface and opened. As the spoon is opened, the soil material will be qualitatively screened with a photoionization detector and described by a qualified geologist or geotechnical engineer. The instrument readings and soil description will be entered in the sampling logbook.

During the Hydrogeologic Investigation a maximum of four soil samples will be collected and submitted for grain-size analyses from each drilling location. Although the glacial deposits are believed to be hydraulically homogeneous, there is some layering of sand and gravel. Therefore, an effort will be made in the field to identify strata of contrasting texture and structure and submit samples from these layers for geotechnical (grain-size) analysis. This will facilitate quantifying the magnitude of the heterogeneity and anisotropy and the associated dimensions of the representative elementary volume in the sand and gravel aquifer. Because of the general coarse texture of the glacial deposits Atterberg Limit analyses will not be performed on these soil samples.

During the Source Confirmation phase a maximum of four soil samples will be collected from each boring location and submitted for laboratory analysis of organic and inorganic contaminants. These samples will be selected on the basis of photoionization detection (PID) readings taken in the field. Not more than two samples from any given location will be obtained from below the zone of saturation. If the field PID readings indicate no VOCs, one sample from each location will be submitted for laboratory analysis. This sample will be obtained from the zone immediately above the water table (capillary fringe).

Soil materials will be placed in separate sample containers using stainless steel spatulas. Split-spoons, spatulas and Teflon sheets will be decontaminated in accordance with the standard protocol presented in Table 5 prior to each use. All samples obtained during the field investigation will be retained in labeled, air tight glass jars until the project is completed. These samples will be stored in a refrigerated environment until the analyses are completed and the results reviewed.

TABLE 5

STANDARD DECONTAMINATION PROTOCOL FOR SAMPLING EQUIPMENT

- STEP 1 -- Scrub equipment thoroughly with soft-bristle brushes in a low-sudsing detergent solution.
- STEP 2 -- Rinse equipment with tap water by submerging and/or spraying.
- STEP 3 -- Rinse equipment with methanol by spraying until dripping; retain drippings.
- STEP 4 -- Rinse equipment with distilled water by spraying until dripping.
- STEP 5 -- Rinse equipment with ultra-pure water by spraying until dripping.
- STEP 6 -- Place equipment on plastic or aluminum foil and allow to air-dry for five to ten minutes.
- STEP 7 -- Wrap equipment in plastic or aluminum foil for handling and/or storage until next use.

Notes: In addition to the standard protocol, pumps and discharge lines will be decontaminated by pumping the detergent solution, tap-water rinse and distilled water rinse through the equipment.

4.4 GROUNDWATER SAMPLES

Two rounds of groundwater samples will be collected from all monitoring wells installed for this investigation. For all wells in three-point well nests and sandstone wells, samples will be collected using the following procedures:

- o The depth to the water level in the well will be measured with a weighted steel, fiberglass tape or calibrated electronic probe. The weighted tape will be designed to create a popping sound on contact with the water surface.
- o Based on the water level measurement and the depth of the well, the volume of standing water in the well will be calculated.
- o The well will be purged using a positive displacement pump constructed of chemically inert materials. The standard procedure will be to pump until at least three well volumes have been removed.
- o Beginning with the fourth volume, periodic measurements of pH, specific conductance and temperature will be made using the procedures contained in Appendix B.
- o Purging may cease when measurements for all three parameters have stabilized (± 0.25 pH units, ± 50 umhos/cm, and $\pm 0.5^\circ\text{C}$) for three consecutive readings or after five well volumes have been removed.
- o If the well pumps dry before three volumes have been removed, the well will be allowed to recharge for 15 minutes and then pumped dry again.
- o The sample will be obtained with the positive displacement pump.
- o The sampling and purging equipment will be decontaminated in accordance with the standard protocol presented in Table 5 prior to each use.

For single-point well installation(s), the following sampling procedure will be used.

- o The depth to the water level in the well will be measured with a weighted steel or fiberglass tape or a calibrated electronic probe. The weight will be designed to create a popping sound on contact with the water surface. The depth

to the bottom of the well and the saturated thickness of the outwash will also be determined. All measurements will be to 0.01 foot.

- o The straddle-packer and sampling device, as shown in Section 2, Figure 2, will be lowered slowly to the bottom of the single well(s) because of density differences of the VOCs, concentrations may be higher at the bottom of the well(s).
- o The Viton-coated rubber elements will be inflated to a pressure of about 65 psi to seal off the desired sampling interval, in this case, approximately the bottom 10 feet of the well(s).
- o The well will be purged by removing three volumes of water from the isolated interval by use of a positive displacement pump which will be constructed of chemically inert materials.
- o Purging may cease when measurements for all three parameters have stabilized (± 0.25 pH units, ± 50 $\mu\text{mhos/cm}$, and $\pm 0.5^\circ\text{C}$) for three consecutive readings or after five well volumes have been removed.
- o If the interval pumps dry before three volumes have been removed, the well will be allowed to recharge for 15 minutes and then pumped dry again.
- o The sample will be withdrawn with the displacement pump. Measurements of pH, specific conductance, and temperature will be made using the procedures contained in Appendix B.
- o After the sample has been collected, the straddle-packer and sampling device (pump) will be withdrawn from the well and decontaminated according to the standard protocol presented in Table 5.
- o The sampling process will be repeated for the middle ten feet of the saturated thickness of the aquifer.
- o When the sampling apparatus has been decontaminated the second time, the process will be repeated for the upper ten feet of the saturated thickness of the sand and gravel aquifer.
- o Finally, the sampling apparatus will be decontaminated according to the same protocol before use at the next single-point well.

4.5 GROUNDWATER SAMPLES FROM EXISTING MONITORING WELLS

One round of samples will be obtained from ten of the existing monitoring wells in the well field and submitted for laboratory analysis of organics and inorganics. One sample will be obtained from each of these wells with the procedures defined in Section 4.4 for three-point and sandstone wells.

4.6 QUALITATIVE ORGANIC VAPOR SCREENING OF SOIL SAMPLES

The purpose of this activity is to obtain a preliminary indication of the magnitude and distribution of volatile contaminants in the subsurface. Screening data will also be used to determine which samples will be sent for laboratory analysis.

- o Verify that the HNu has been calibrated within the past 4 hours and that the equipment is functioning properly. (For calibration and operating information refer to "Instruction Manual for Model PI 101, Photoionization Analyzer, HNu Systems, 1975.)
- o As the split-spoon is opened, pass the air intake along the sample at a distance of about one-half inch, noting the location and magnitude of any readings.
- o At roughly 6-inch intervals, position the intake close to the sample and then disturb the soil material with a spatula, noting any readings.
- o If hydrogen sulfide is believed to be interfering with HNu readings, attempt to verify its presence with a Draeger tube.
- o Record the highest reading on the instrument for each six-inch interval of sample recovered, identifying any suspected interferences and basis of measurement.
- o Before the borehole is advanced or the next sample is taken, place the air intake in the borehole, six inches below the ground surface, noting any readings and interferences as above.

4.7 HYDRAULIC CONDUCTIVITY TESTING

The hydraulic conductivity of the penetrated aquifer will be estimated by conducting slug tests of the completed wells. The basic concept behind these tests is that the rate of rise of the water level in a well after an "instantaneous" displacement of a "slug" of water is a function of aquifer hydraulic conductivity. Thus by measuring water

levels at various times following displacement of the slug, the hydraulic conductivity can be calculated. The basic requirements are being able to quickly displace a fairly large volume of water and being able to readily and accurately measure water levels in the well. Analysis of test data should use appropriate computational methods such as that presented by Bouwer, H. and R.C. Rice, 1977, "A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers with Completely or Partially Penetrating Wells," Water Resources Research, Vol. 12, No. 3, pp. 423-428.

Hydraulic conductivity testing of monitoring wells installed at Eau Claire Municipal Well Field will be performed as follows:

- o Not less than 24 hours after development of the well, an initial measurement of static water level will be made.
- o A volume of water will then be displaced as rapidly as possible using a calibrated solid cylinder. Highly permeable conditions ($K \geq 10^{-3}$ cm/sec) are anticipated.
- o Using a pressure transducer or electrical sounding device, water level measurements will be made at the following time intervals (in minutes) -- 0, 0.5, 1, 2, 5, 10, 20, 50 and 100.
- o The data will be plotted in the field (water level vs. log time) using semi-log paper to determine if the data are sufficient to establish a reasonable straight-line relationship.

4.8 STORAGE AND DISPOSAL OF DRILLING AND SAMPLING WASTES

The sampling and drilling activities are expected to generate solid and liquids "wastes." The activities, the anticipated type and amount of waste, and the planned handling of the wastes are summarized below.

- o Monitoring well installation -- solid, approximately 1 cubic foot of cuttings per 10 lineal feet of borehole (a maximum of 270 cubic feet). Cuttings will be left at boring locations if less than 5 ppm volatiles are detected with a photoionization detector. If greater than 5 ppm volatiles are detected, cuttings will be retained in drums for future disposal.
- o Groundwater sampling: solid -- none; liquid, up to 0.8 gallons per lineal foot of well volume of water purged from wells prior to sampling (total not more than 1440 gallons). If greater than 5 ppm volatiles detected with the

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photoionization detector, liquid will be retained in drums for future disposal. If less than 5 ppm volatiles are detected, liquid will be disposed on ground adjacent to well.

SECTION 5

SAMPLE ANALYSIS AND HANDLING

5.1 TESTING PROGRAM

The testing program for the samples collected during implementation of this plan is summarized in Table 2. All sampled groundwater will be tested in the field for pH, specific conductance, and temperature.

The soil samples collected for chemical analysis under Source Confirmation (optional) will be tested for the Routine Analytical Services (RAS) organics package, which uses a GC screening followed by GC/MS analysis for quantification of 126 compounds on the Hazardous Substances List and the RAS inorganics package, which includes 23 metals and cyanide. Based on existing analytical data and site conditions, all samples will be low-concentration samples.

The groundwater samples from Locations 1, 2 and 3 will be sent to a non-contract lab for overnight analysis (organics by EPA Method 624). These samples are for screening purposes only and are not evidentiary. The detection limits for these samples will be those established by the CLP. Groundwater samples collected during drilling of monitoring wells will be analyzed for specific organic compounds listed in Section 4.2 with a field photoionization gas chromatograph. All other samples for chemical analysis will be sent to EPA Contract Laboratory Program (CLP) facilities. Special Analytical Services (SAS) will be requested for determination of eight specific VOCs in groundwater and surface water samples. These VOC samples will be analyzed using the detection limits provided in the SAS request forms (Appendix D) for the eight compounds listed in Section 4.1 of the QAPP. Geotechnical testing (grain size analysis) will be performed on a maximum of forty soil samples collected during monitoring well installation.

5.2 SAMPLE CONTAINERS AND PRESERVATION

Samples collected for chemical analysis through the CLP will be contained and preserved as appropriate for the intended testing and in accordance with U.S.EPA protocols listed in Table 6. If necessary, samples will be placed on ice immediately after collection to maintain a temperature of 4°C.

Groundwater samples (from all nine well locations and existing monitoring wells) collected for RAS inorganics metals analysis will be filtered in the field as soon as possible after collection and prior to the addition of nitric acid preservative. Filtering will be done with a pressure filtration device and 0.45 micron filter paper.

TABLE 6

Required Sample Containers and Preservation
 for Samples Tested by CLP

Organics in Water and Liquids (Low Concentration)

<u>Testing</u>	<u>Containers</u>	<u>Preservation</u>
Extractables (acid, base/neutral pesticides/PCB)	Two 1/2-gallon glass amber bottles with Teflon-lined caps; filled to neck	Iced to 4°C
Volatiles (RAS)	Two 40-ml VOA vials with Teflon-lined caps; completely filled--no air bubbles	Iced to 4°C
Volatiles (SAS)	Four 40-ml VOA vials with Teflon-lined caps; completely filled--no air bubbles	Iced to 4°C

Inorganics in Water and Liquids

<u>Testing</u>	<u>Containers</u>	<u>Preservation</u>
Metals	One 1-liter high density polyethylene bottle; filled to shoulder	1:1 HNO ₃ to pH<2
Cyanide	One 1-liter high density polyethylene bottle; filled to shoulder	6N NaOH to pH>12
Minerals (SAS) Alkalinity Chloride Fluoride Sulfate	One 500-ml high density polyethylene bottles; filled to shoulder	None required
Nutrients (SAS) Ammonia NO ₃ -NO ₂ TKN Total Phosphorous	One 500-ml high density polyethylene bottle; filled to shoulder	1 ml conc. H ₂ SO ₄ to pH<2

TABLE 6 (Cont'd)

Required Sample Containers and Preservation
 for Samples Tested by CLP

Organics in Soil and Sediment (Low Concentration)

<u>Testing</u>	<u>Containers</u>	<u>Preservation</u>
Extractables (acid, base/neutral pesticides/PCB)	One 8-ounce, wide- mouth, glass jar with Teflon-lined lid; filled about 3/4 full	Iced to 4°C
Volatiles	Two 120-ml glass vials with Teflon- lined lid; filled as completely as possible.	Iced to 4°C

Inorganics in Soil (Low Concentration)

<u>Testing</u>	<u>Containers</u>	<u>Preservation</u>
Metals and Cyanide	One 8-ounce, wide- mouth glass jar; filled about 3/4 full	Iced to 4°C (optional)
Fluoride (SAS)	One 8-ounce, wide- mouth glass jar; filled about 3/4 full	Iced to 4°C

Note: Water samples collected for duplicate analysis of organics must be collected at double the volume specified for extractables and at triple the volume specified for volatiles. In addition, one volatile trip blank (distilled-deionized water poured directly into two 40-ml vials) should be supplied per shipment.

5.3 SAMPLE PACKAGING AND SHIPMENT

In preparation for shipment to the analytical laboratories, all samples will be packaged in accordance with the following procedures:

- o Check to make sure that sample is properly preserved; tighten cap securely and seal with tape; mark liquid levels if bottles are partially full.
- o Make sure traffic report labels and custody tags are securely attached to the sample container; place each container in a zip-loc baggie, ensuring that labels can be read.
- o Place containers in a cooler lined with two inches of vermiculite or equivalent absorbent material; surround each sample and fill remaining space in cooler with additional packing material.
- o Put chain-of-custody forms and traffic reports in a manilla envelope; place envelope in a zip-loc baggie and tape to inside of cooler lid.
- o Close cooler and seal shut with strapping tape; if cooler has a drain port, seal it shut with tape; place custody seals across closure at front of cooler.
- o Affix airbill with shipper's and consignee's addresses to top of cooler; if samples are liquid, place "This End Up" labels appropriately.

Organics samples will be shipped within 24 hours of collection via Federal Express, Purolator, or Emery for next-day delivery. Inorganics samples will be shipped within 48 hours of collection for two-day delivery. The Sample Management Office will be notified of each shipment as it is made.

SECTION 6

SAMPLE DOCUMENTATION AND TRACKING

6.1 FIELD RECORDS

Field observations and other pertinent information pertaining to the collection of samples will be recorded in bound log books using black ink. Standard formats will be developed so that data relating to the collection of each type of sample and to the installation of monitoring wells are consistently recorded. These formats will be converted into rubber stamps to reduce the amount of writing required by the sampling team. The data to be recorded will include date, time, samplers, location, sample number, custody tag number, weather, instrument readings and visual description of sample, in addition to other data specific to each sample type. The standard formats are presented in Tables 7 to 9. In addition to written records, photographs will be taken as needed to further clarify sampling activities.

6.2 CHAIN-OF-CUSTODY PROCEDURES

All samples will be collected and handled in accordance with the chain-of-custody procedures presented in detail in Appendix C. These procedures are summarized below:

- o All information required on the custody tag, including the signatures of all sampling team members and a predesignated location description, will be filled out in the field.
- o Prior to relinquishing samples for packaging and shipment, one member of the sampling team will transfer all data contained on the custody tags to a chain-of-custody record, which all team members will sign.
- o The individual who prepared the chain-of-custody record will relinquish the samples to the sample handling technician, who will prepare all CLP traffic reports and affix appropriate traffic report labels to the sample containers.
- o The technician will package the samples for shipment making sure that all traffic reports, chain-of-custody records and custody seals are cross-referenced and that all sample documentation paper work is enclosed.
- o If samples are stored temporarily prior to shipment, they will be kept cool and placed in a secured storage area. Coolers will be sealed and custody seals affixed just prior to shipment.

Eau Claire Well Field

LOGGED BY:

FOR BARRING HANDLING

DATE LOCATION

SAMPLERS

WEATHER

TIME DRILLING BEGAN

HRS

TIME DRILLING ENDED

HRS

LOCATION DESCRIPTION

HAMMER WEIGHT 140 LBS 340 LBS

BLOW COUNT / RECOVERY

0-1.5 FT

1.5-3.0 FT

3.0-4.5 FT

4.5-6.0 FT

6.0-7.5 FT

7.5-9.0 FT

[FOR EACH INTERVAL]

FIELD SAMPLE NO:

DEPTH INTERVAL:

TIME SAMPLE COLLECTED: HRS

SAMPLE DESCRIPTION:

ORGANIC VAPOR SCREENING - BOREHOLE

OVA: PPM

HNU: PPM STANDARD

SAMPLE OVA (PPM) HNU (PPM)

TOP (C)

MIDDLE (B)

BOTTOM (A)

CUSTODY TAG NUMBERS:

EXTRACTABLES:

VOLATILES:

INORGANICS:

FLUORIDE:

REMARKS:

[FOR EACH SPLIT-SPOON]

TABLE 8 STANDARD FORMAT MONITORING WELL INSTALLATION

[illegible]

FIELD SAMPLE NO.	THE SAMPLE COLLECTED	YES
	SAMPLE TYPE, SPLIT-SPOND - SHALLOW TUBE	
	DEPTH INTERVAL:	
	BLOW COUNTS (SPT) / RECOVERY (MINUTES)	
	SAMPLE DESCRIPTION:	
	ORGANIC VAPOUR SCREENING -- BUDGET HOLE	
	OWI PPM	
	H ₂ O PPM	
	OWI PPM	
	H ₂ O PPM	
	SAMPLE	
	TOP(C)	
	MIDDLE(B)	
	BOTTOM(A)	
	CUSTODY TAG NOS: (C)	
	(B)	
	(A)	
	REMARKS:	
	[THE EACH SAMPLE]	

TABLE 8 (continued) STANDARD FORMAT MONITORING WELL INSTALLATION

TOTAL DEPTH OF BORING: _____ FEET

CASING FLUSHED CLEAN: YES--NO

WELL CONSTRUCTION:

SCREEN LENGTH: _____ FEET

SLOT TYPE: HILLED -- CONTINUOUS

SLOT SIZE: _____ INCHES

WELL DIAMETER: _____ INCHES

RISER LENGTH: _____ FEET

RISER MATERIAL:

COUPLING METHOD:

DEPTH TO TIP OF SCREEN: _____ FEET

ANNUALS BACKFILLING (FEET)

CONCRETE: _____ TO _____

C/B GROUT: _____ TO _____

PELLET SEAL: _____ TO _____

THIN SAND: _____ TO _____

CAVES SOIL: _____ TO _____

THIN SAND: _____ TO _____

PELLET SEAL: _____ TO _____

DEPTH OF SURROUNDING ZONE: _____ FEET

PROTECTIVE CASING

DIAMETER: _____ INCHES

LENGTH: _____ FEET

STICK-UP: _____ FEET

LOCKING: YES--NO

WELL DEVELOPMENT

INITIAL WATER DEPTH: _____ FEET

VOLUME IN WELL: _____ GALS

VOLUME REMOVED: _____ GALS

SURGE & PUMP CYCLES: 1-2-3-4-5

FINAL DISCHARGE CLEAR: YES--NO

REMARKS:

[FOR EACH WELL]

PALEWATER RECOVERY TEST

INITIAL WATER DEPTH

WATER DEPTH

WATER DEPTH REMOVED

LOCATION OF PALEWATER

RECOVERY MEASUREMENTS

TIME (MIN)

DEPTH (FEET)

REMARKS

100

50

20

10

5

2

1

1/2

0

[REMARKS]

TABLE 9 STANDARD FORMAT GROUNDWATER SAMPLE COLLECTION

Eau Claire Well Field
 LOCATION: []
 DATE: [] (LOCATION)
 FIELD SAMPLE NO: []
 SAMPLES: []
 ANALYSIS: []
 INITIAL WATER LEVEL: []
 TOTAL WELL DEPTH: []
 WATER VOLUME IN WELL: [] GALS
 TIME PURGING BEGAN: [] HRS
 TIME PURGING ENDED: [] HRS
 TRIP WELL GO DEPT: [] YES--NO
 WATER VOLUME PURGED: [] GALS
 CATCHER DESCRIPTION: []

TIME COLLECTION BEGAN: [] HRS
 TIME COLLECTION ENDED: [] HRS
 SAMPLE DESCRIPTION: []
 FIELD MEASUREMENTS: []
 DI []
 STANDARDS: []
 SPEC. CONC: []
 TEMPERATURE: [] °C
 METALS FIELD FILTERED: [] YES--NO
 CUSTOMER TAG NUMBERS: []
 EXTRACTABLES: []
 VOLATILES: []
 METALS: []
 CYANIDE: []
 FLUORIDE: []
 REMARKS: []

[SEE EACH SAMPLE]

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The sample handling technician will maintain lists cross-referencing site sample numbers, custody tag numbers, traffic report numbers, analyses to be performed, custody seal numbers, shippers' airbill numbers, and consigned laboratories in a bound log book using black ink. (For detailed guidance on completing chain-of-custody and sample tracking paperwork, refer to "Sampling Handbook, U.S. EPA TAT, Region V, Revised 1985.)

SECTION 7

SAMPLING TEAM ORGANIZATION

The sampling team will consist of six individuals whose roles and responsibilities are as follows:

- o Field Manager--responsible for overall execution of the sampling plan; will direct drilling activities for the soil borings and monitoring well installations; will direct a two-man sampling team during other sampling activities.
- o Site Health and Safety Coordinator--responsible for implementation of the site safety plan as contained in the safety evaluation form (SEF); will operate OVA and HNU instruments for screening of soil samples during drilling activities; will direct a two-man sampling team during some of the other sampling activities.
- o Sample Collector--primarily involved in sample collection, may assist with decontamination and/or sample handling; will have the "dirty hands" during drilling activities and when sampling with the field manager or site safety officer.
- o Decontamination Technician--primarily involved in sample packaging and processing of sample custody and tracking paper work, may assist with decontamination and sampling.
- o Field Photoionization Gas Chromatographer Technician--involved in testing groundwater samples collected during drilling with a field GC.

During soil boring and monitoring well installation activities, there will also be a driller and a helper from the firm subcontracted to provide drilling services present on site.

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SECTION 8

SCHEDULING

The schedule for this sampling plan is shown in Figure 9. Mobilization will require about one week. This includes setting up office and decontamination facilities and stockpiling materials and equipment. Drilling activities (monitoring well installation) are estimated at a total of about 25 working days. All other sampling is estimated at four weeks. Because some of the sampling activities can be overlapped, the total duration of the primary field effort is 17 weeks. These estimates have assumed a start date in early December. The second round of surface water and groundwater sampling should only take two weeks, and is shown as occurring one month after the first sample round.

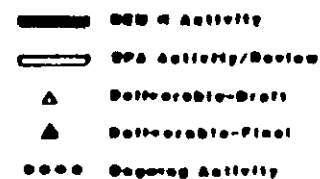
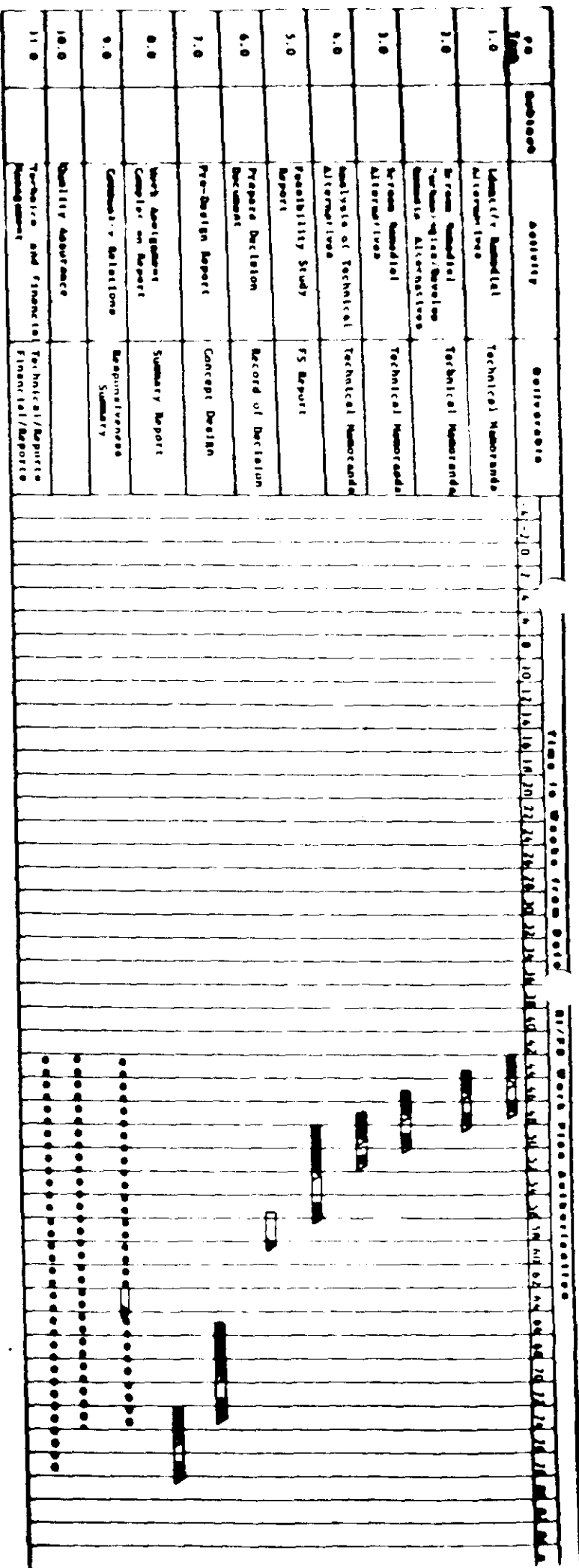


Figure 9 RI/F8 Project Schedule 8-2



■ 100% Activity
 ▬ 75% Activity/Decision
 ▲ 50% Activity/Decision
 ▲ 25% Activity/Decision
 ○○○○ 0% Activity

Figure 9 (cont.) RI/FS Project Schedule

Appendix A

Standard Operating Procedure for
Portable GC

1. Scope and Application

1.1 This operating procedure covers the determination of the concentration of volatile organic compounds in a water matrix using a headspace analysis with a portable field GC. The following parameters may be quantitatively determined by this method:

- o 1,1,2,2-tetrachloroethylene
- o 1,1,2-trichloroethylene
- o 1,1-dichloroethylene

1.2 The method detection limit (MDL) for each parameter is listed in Table 1. The MDL may differ from those listed, depending upon the nature of interferences in the sample matrix.

2. Summary of Method

A static equilibrium is established between a water sample and the airspace contained within the sample vial. The volatile components are transferred from the aqueous phase to the vapor phase. After equilibrium has been established, the gaseous sample is injected with inert gas onto a gas chromatographic column. The gas chromatograph separates and measures individual component concentrations.

3. Interferences

3.1 Impurities in the purge gas and solvent vapors in the field laboratory may account for the majority of contamination problems. The analytical system must be demonstrated to be free from contamination under the conditions of the analysis by running laboratory reagent blanks as described in Section 8.1.3. The use of non-Teflon plastic tubing and non-Teflon thread sealants should be avoided.

3.2 Samples can be contaminated by diffusion of volatile organics through the septum seal into the sample during shipment and storage. A field reagent blank will be prepared each morning from reagent water and carried through the sampling and handling protocol to serve as a check on such contamination.

3.3 Contamination by carry-over can occur whenever high level and low level samples are sequentially analyzed. Whenever an unusually concentrated sample is encountered, it should be followed by an analysis of reagent water to check for cross contamination.

4. Safety

The toxicity or carcinogenicity of each reagent used in the method has not been precisely defined. However each chemical

compound should be treated as a potential health hazard. Exposure to these chemicals must be reduced to the lowest possible level by whatever means available. Primary standards of the compounds should be prepared under a vented hood.

5. Apparatus & Materials

5.1 Sampling Equipment, for Field Sampling

- 5.1.1 Teflon or stainless steel bailer
- 5.1.2 Submersible pump with a pumping rate of 5 gal/min.
- 5.1.3 Vial 40 mL capacity with a screw cap with a hole in the center, provided through CLP.
- 5.1.4 Septum - Teflon-faced silicon.

5.2 Sampling Equipment, for Sample Preparation

- 5.1.1 Vial - See Section 5.1.3.
- 5.1.2 Septum - See Section 5.1.4.

5.3 Portable Gas Chromatograph

- 5.3.1 Gas chromatograph - Photovac Model 10A10, an analytical system with a photoionization detector and all required accessories including syringes, analytical columns, and gases. A chart recorder is used to record peak areas. An integrator was used to measure peak areas during the development of the method performance statements in Section 13 and can be used in the field laboratory.
- 5.3.2 Column - 1.5 ft long x 1/8 inch Teflon tube packed with SE-30. This column was used to develop the method performance statements in Section 13.
- 5.3.3 Syringes - 100 uL gas-tight.

6. Reagents

- 6.1 Reagent water - Reagent water is defined as a water in which an interferent is not observed at the MDL of the parameters of interest. Reagent water will be supplied to the field laboratory.
- 6.2 Methanol - Pesticide quality or equivalent.
- 6.3 1,1,2,2-Trichloroethylene - Pesticide quality or equivalent.
- 6.4 1,1,2-Trichloroethylene - Pesticide quality or equivalent.
- 6.5 1,1-Dichloroethylene - Pesticide quality or equivalent

- 6.6 1,1,1-Trichloroethane - Pesticide quality or equivalent. Used during the development of method performance statements in Section 13.
- 6.7 1,1-Dichloroethane - Pesticide quality or equivalent. Used during the development of method performance statements in Section 13.
- 6.8 Stock Standard Solutions - Stock standard solution will be prepared from pure standard materials. Prepare stock standards solutions in methanol using assayed liquids. Because of the toxicity of some of the compounds, primary dilutions of these materials should be prepared in a hood.
- 6.9 Secondary Dilution Standards - Using stock solution, prepare secondary dilution standards in water that contains the compounds of interest, either singly or mixed together. The secondary dilution standard should be prepared at concentrations such that the aqueous calibration standards prepared in Section 7 will bracket the working range of the analytical system (see Attachment B). Secondary dilution standards should be stored with minimal headspace and should be checked frequently for signs of degradation, especially just prior to preparing calibration standards.
- 6.10 Quality Control Check Sample Concentration (see Section 8.2.1)

7. Calibration

- 7.1 The gas chromatograph must be operated using temperature and flow rate conditions equivalent to those given in Table 1.
- 7.2 Standard calibration procedure - The analyst must demonstrate that the measurement of the standard is not affected by method or matrix interferences.
 - 7.2.1 Prepare calibration standards at a minimum of three concentration levels for each parameter by carefully adding one or more secondary dilution standards to reagent water. One of the calibration standards should be at a concentration near, but above, the MDL (Table 1) and the other concentrations should correspond to the expected range of concentrations found in real samples or should define the working range of the Photovac system.

These aqueous standards can be stored up to 24 h, if held in sealed vials with zero headspace as described in Section 9.2. If not so stored, they must be discarded after 1 h.

- 7.2.2 Analyze each calibration standard according to Section 10 and Section 11. Tabulate the area response or peak height against concentration for each compound and standard, and calculate response factors (RF) for each compound using Equation 1.

Equation 1.

$$RF = \frac{(C_x)}{(A_x)}$$

Where:

A_x = Area or peak height for the parameter to be measured.

C_x = Concentration of the parameter to be measured.

If the RF value over the working range is a constant (<35% RSD), the RF can be assumed to be invariant and the average RF can be used for calculations.

- 7.3 The working calibration curve or RF must be verified on each working day by an initial calibration curve consisting of 3 to 4 points and by the measurement of a check sample throughout the day.
- 7.3.1 Prepare the check sample as described in Section 8.2.2.
- 7.3.2 Analyze the check sample according to the method beginning in Section 10.
- 7.3.3 For each parameter, compare the response (Q) with the corresponding calibration acceptance criteria found in Table 2. If the responses for all parameters of interest fall within the designated ranges, analysis of actual samples can begin. If any individual Q falls outside the range, proceed according to Section 7.3.4. (Note: Calibration acceptance criteria found in Table 2 for 1,1 Dichloroethylene not suitable for comparison; use a comparison of a previous working calibration curve to verify calibration acceptance.)
- 7.3.4 Report the test only for those parameters that failed to meet the calibration acceptance criteria. If the response for a parameter does not fall within the range in this second test, a new calibration curve must be prepared for that parameter according to Section 7.2 or 7.3.

8. Quality Control

- 8.1 The field laboratory must meet the minimum requirements summarized in Table 2 which include an initial

demonstration of laboratory capability and an ongoing analysis of spiked samples to evaluate and document data quality.

- 8.1.1 Each day a water blank must be analyzed to demonstrate that interferences from the analytical system are under control.
- 8.1.2 The field laboratory must demonstrate through the analyses of quality control check standards that the operation of measurement system is in control.
- 8.1.3 The field laboratory must maintained performance records to document the quality of data.
- 8.2 To establish the ability to generate acceptable accuracy and precision a quality control sample will be provided by the U.S. Environmental Protection Agency.
 - 8.2.1 The sample will be prepared and analyzed according to procedures described in Section 10 and Section 11.
 - 8.2.2 The average recovery and standard deviation will be calculated for each parameter.
 - 8.2.3 The recovery and deviation will be compared with acceptable criteria presented in Table 2 and Table 3, if the values are not within acceptable range the procedure will be prepared until according values are reported.

9. Sample Collection, Preservation, and Handling

- 9.1 Samples must be collected in glass vials having a total volume of at least 25 mL. Fill the sample bottle completely and seal the bottle so that no air bubbles are entering in it. Maintain the hermetic seal on the sample until time of analysis.
- 9.2 All samples must be iced or refrigerated from the time of collection until analysis.
- 9.3 All samples must be analyzed within 14 days of collection.

10. Sample Preparation

- 10.1 Pour 25 mL of sample into a clean 40 mL VOA bottle.
- 10.2 Seal the bottle with screw top cap, invert a few times and store inverted for one hour.
- 10.3 Allow one hour for equilibration, then remove 100 mL of headspace using gas tight syringe and inject into Photovac Model 10A10.

11. Gas Chromatography

- 11.1 Table 1 summarizes the recommended operating conditions for the Photovac model 10A10. Included in this table are retention times and MDL that can be achieved under these conditions. Examples of the separations achieved by the column described in Table 1 are shown in Figures 1 and 2.
- 11.2 Calibrate the system daily as described in Section 7.
- 11.3 Inject 100 uL of headspace of sample or standard into the gas chromatograph. Record the volume injected, and the resulting peak size or peak height units.
- 11.4 Identify the parameters in the sample by comparing the retention times of the peaks in the sample chromatographs with those of the peaks in standard chromatographs. The width of the retention time window used to make identifications should be based upon measurements of actual retention time variations of standards over the course of a day.
- 11.5 If the response for a peak exceeds the working range of the system, dilute the sample or decrease the sample size and re-analyze.
- 11.6 If the measurement of the peak response is prevented by the presence of interferences, sample or system clean-up is required.

12. Calculations

- 12.1 When a parameter has been identified the concentration will be calculated using the response factor (RF) determined in Section 7.8.3 and Equation 2.

Equation 2:

$$\text{Concentration [ug/L]} = (A_x)(\text{RF})$$

Where: A_x = Area or peak height for the parameter to be measured.

- 12.2 Report results in ug/L without correction for recovery data.

13. Method Performance

The Method Detection Limit (MDL) is defined as the minimum concentration of a substance that can be measured and reported with 99% confidence. The MDL actually achieved in a given analysis will vary depending on instrument sensitivity and matrix effects.

The data and data evaluations generated to define the MDL are included in Table 2, Table 3 and Attachment A.

TABLE 1

Chromatographic Conditions and Method Detection Limits

<u>Parameter</u>	<u>Retention Time</u> <u>(min)</u>	<u>Method Detection Limit</u> <u>(ug/L)</u>
1,1-Dichloroethylene	0.62	1.0 ppb
1,1,2-Trichloroethylene	3.32	1.0 ppb
1,1,2,2-Tetrachloroethylene	9.68	2.0 ppb

Column Condition: 1.5' SE-30 Support and % coating unknown. Helium carrier gas at 20 ml/min to establish Method Detection Limits. High grade air at 20 ml/min in actual field use. Ambient temperature.

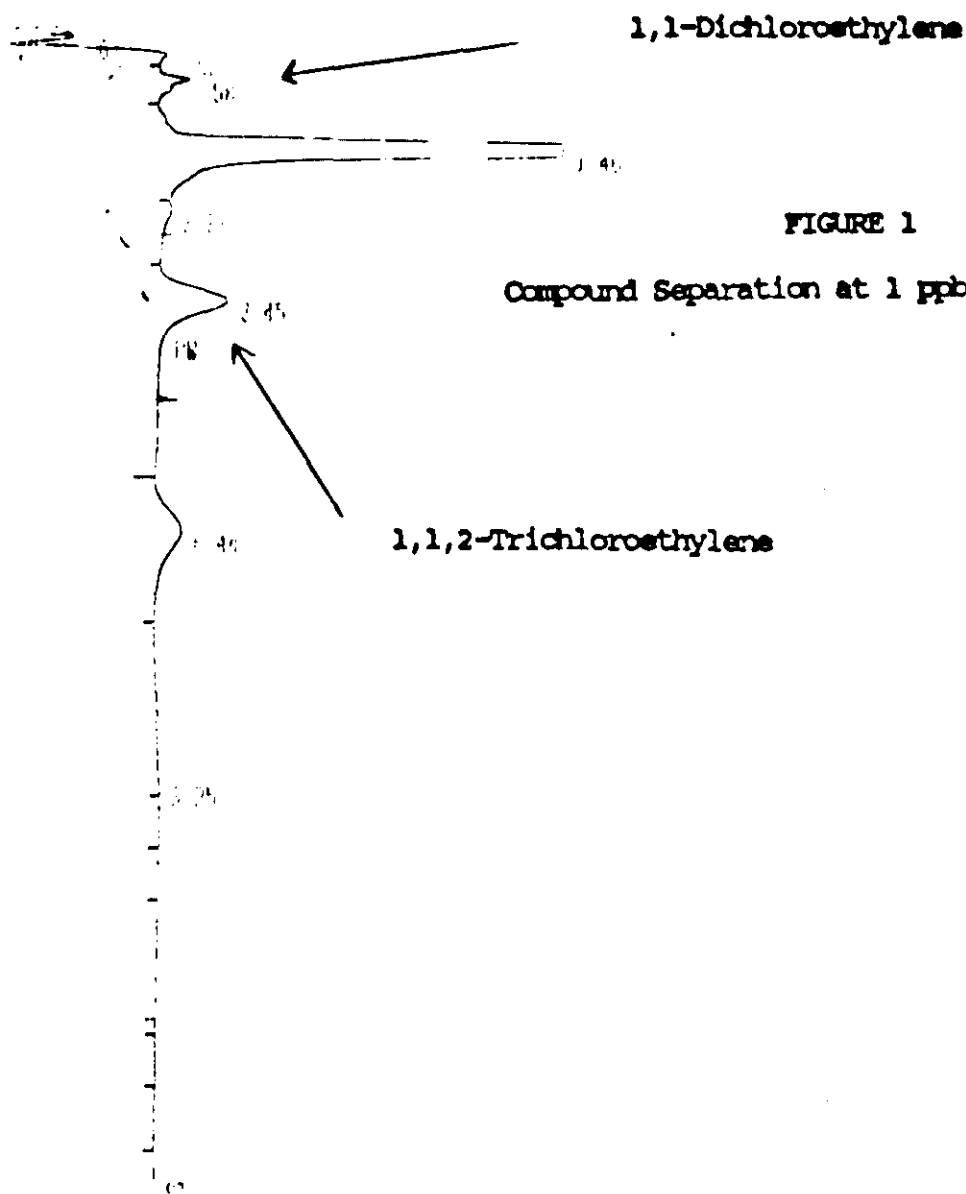


FIGURE 1

Compound Separation at 1 ppb Concentration

RUN # 49

DEL/01 11 13 24 03

RT	AREA	TYPE	AK	AREA
0.63	373370	BP	0.0	1.155
0.86	190700	PV	0.0	6.181
0.98	2187900	VP	0.1	6.220
1.46	2.2053E+07	SPE	0.2	68.239
2.28	82180	TBE	0.2	0.270
2.45	2135400	TBE	0.2	9.202
3.44	1507000	DI	0.2	6.025
3.75	535920	PV	1.0	1.652

TOTAL AREA= 3.2318E+07
MULTI FACTOR= 1.0000E+00

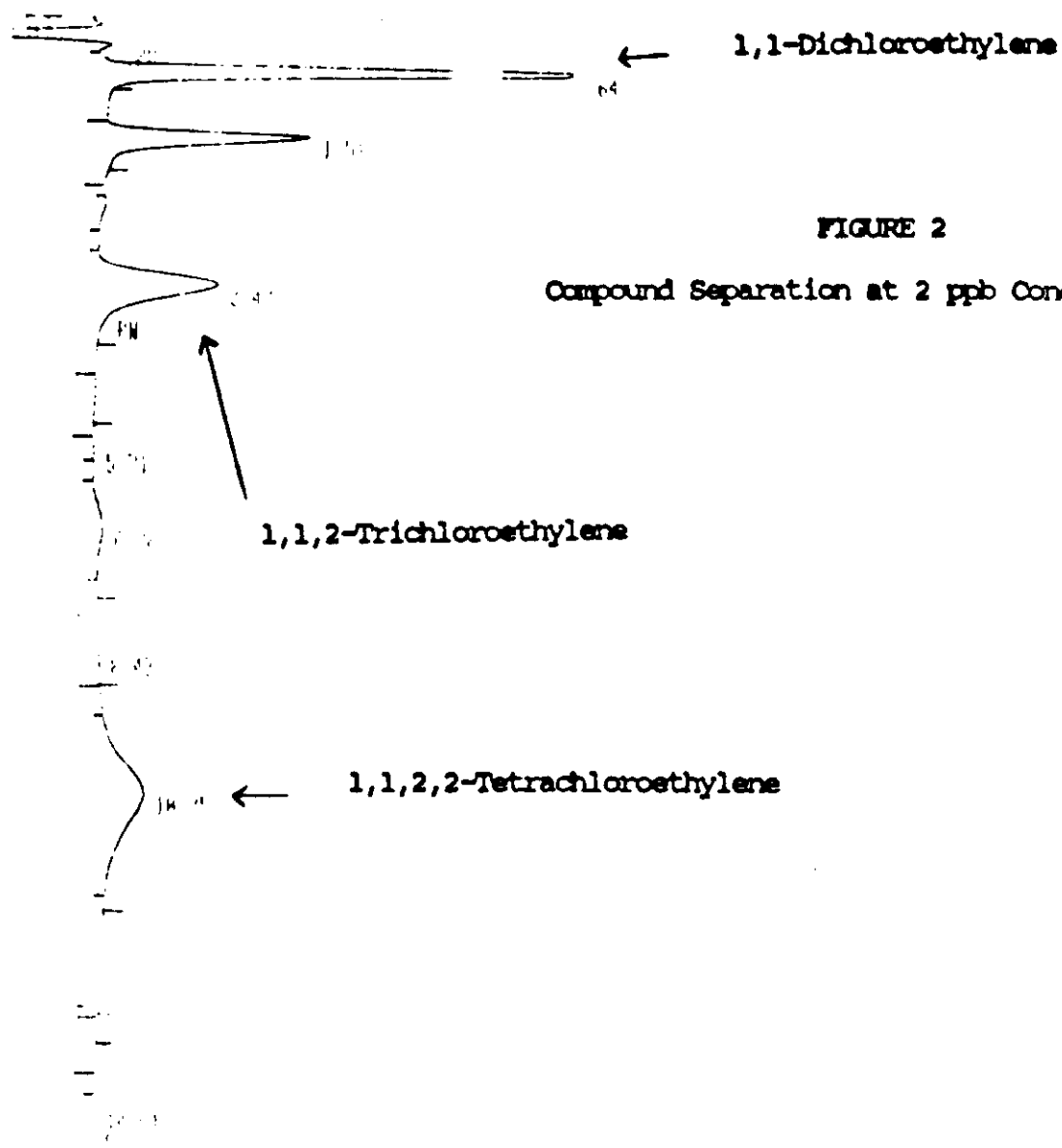


FIGURE 2
Compound Separation at 2 ppb Concentration

Run: 2 Date: 10/20/99 Time: 10:02:11

AREA%	AREA	TYPE	ORIG	AREA%
0.28	1408200	EV	0.1	15.468
0.49	3513109	VE	0.1	39.605
1.51	1100700	EE	0.1	12.050
4.49	1334600	PE	0.1	15.318
5.21	7995	EV	0.1	0.088
6.28	154930	PV	0.1	1.762
7.43	1447	PE	0.1	0.035
9.12	15700	EV	0.1	0.206
10.35	1252000	VV	1.1	15.033
14.61	10897	EE	0.1	0.126

TOTAL AREA: 504400
MIL FACTOR: 1.0e-05

TABLE 2
Calibration Curve

Parameter	Concentration (ug/L)	Range ^a of RF x 10 ⁷ (ug/L)	RFs x 10 ⁷ (ug/L)	$\overline{\text{RF}}$ x 10 ⁷ (ug/L)
1,1-Dichloroethylene*	1	3.92 - 4.77 ^b	0.60	4.35
	5	0.88 - 1.63 ^b	0.53	1.26
	10	4.16 - 9.80	3.99	6.98
	20	11.8 - 13.6	1.04	12.4
	1-20	0.88 - 13.6 ^c	4.83	6.93
1,1,2-Trichloro- ethylene	1	3.19 - 5.06	0.99	4.33
	5	8.81 - 11.3	1.27	10.6
	10	10.6 - 13.3	1.37	11.9
	20	11.9 - 13.7	0.90	12.8
	1-20	3.19 - 13.7 ^d	3.57	9.79
1,1,2,2-Tetrachloro- ethylene	1	14.0 - 18.7 ^b	3.32	16.3
	5	10.5 - 15.1	2.30	12.7
	10	11.8 - 13.4	0.89	12.4
	20	14.5 - 15.3	0.38	14.8
	1-20	10.5 - 18.7 ^c	2.21	14.1

RF = Response Factor calculated using Equation 1

RFs = Standard Deviation of number measurements noted

$\overline{\text{RF}}$ = Mean response factor for measurements

a = Range of 3 measurements, except when noted differently

b = Range of 2 measurements

c = Range of 9 measurements

d = Range of 12 measurements

* Data reported for 1,1 Dichloroethylene not suitable to verify calibration acceptance criteria.

TABLE 3

Method Accuracy and Precision as Functions
of Concentration

Parameter	Standard Concen- tration (ug/L)	Concen- tration ^a (ug/L)	Range of Q (ug/L)	\overline{Q} (ug/L)	Qs (ug/L)	Percent R
1,1-Dichloro- ethylene	2	2.6	1.65-2.38	2.07	0.38	-
	8 ^a	-	6.0	-	-	75
	15	20.3	6.24-8.21	7.38	7.38	-
1,1,2-Trichloro- ethylene	2	2.2	1.83-2.44	2.14	0.31	-
	8 ^a	-	3.1	-	-	39
	15	17.3	11.71-15.7	13.98	2.08	-
1,1,2,2-Tetra- chloroethylene	2	2.4	1.62-1.96	1.81	0.17	-
	8 ^a	-	3.2	-	-	40
	15	24.1	11.18-15.78	13.50	2.30	-

\overline{Q} = Concentration measured in sample, in ug/L

Qs = Standard deviation of three measurements

R = Spike recovery

a = 2 hour equilibration (Section 10.3)

ATTACHMENT A

ATTACHMENT A

The purpose of this investigation was to determine if analytical data obtained in the laboratory from the Photovac Model 10A10 shows a positive correlation with analytical data obtained in the laboratory from a purge and trap system. Additionally, method detection limits (MDL) will be determined from data obtained from the Photovac Model 10A10 for specified compounds. To demonstrate the correlation of data from these two sources laboratory grade water will be fortified at preselected levels with a methanolic solution of the analytes. The resulting fortified water will be analyzed by both systems. Analyses will be performed in triplicate to establish precision of the measurements.

Five compounds listed below were selected for study:

- o 1,1-dichloroethane
- o 1,1-dichloroethylene
- o 1,1,1-trichloroethane
- o 1,1,2-trichloroethylene
- o 1,1,2,2-tetrachloroethylene.

Water samples fortified with methanolic solutions of the above compounds spanning the concentration range of 0-20 ppb were analyzed in triplicate with both instruments.

Five ml. water samples were analyzed by purge and trap using Method 624.

The Photovac 10A10 accepts only gaseous samples. To accommodate this requirement, headspace samples were prepared for analysis as described in the following paragraph.

Twenty-five ml. of fortified water was placed into a clean 40 ml. VOA bottle. The bottle was sealed, inverted a few times and stored upside down for one hour prior to analysis. After one of equilibration 100 uL of headspace was removed using a gas tight syringe and injected into the Photovac Model 10A10.

Blanks containing methanol equivalent to the volume of spike added were also analyzed in triplicate.

Instrument parameters are given below:

PURGE AND TRAP

Tekmar Liquid Sample Concentrator LSC-2
Tekmar Model ALS Automatic Laboratory Sampler
Hewlett Packard Model 5880A Gas Chromatograph
Tracor Model 700A Hall Elec. Cond. Detector

Carrier: He @ 40 ml./min.

Analytical Column: 8' x 1/8" SS 1% SP 1000 on Cabopak B 60/80 mesh

Volume Purged: 5 ml.

Temperature: 45° for 3 minutes

Program: 8° per minute to 220°
Hold at 220° for 35 minutes

Integrator: Hewlett Packard Model 3390A

PHOTOVAC 10A10

Carrier: He at 20 ml./min.*

Temperature: Ambient approximately (15-24°C)

Injection Volume: 100 ul Teflon

Analytical Column: 1.5' SE-30 Support and % Coating unknown

Integrator: Hewlett Packard Model 3390A

The results indicate the Photovac showed good response for samples containing greater than 1 to 2 ppb of the chloroethylenes; however, samples of the chloroalkanes at 1000 ppb did not exhibit a measurable response and the corresponding alkanes could not be identified.

Chromatograms generated during development of calibration curves and method detection limits are included for reference.

* High purity air was not available in-house and helium was substituted as carrier.

SDMS ADMINISTRATIVE RECORD IMAGERY INSERT FORM

SITE NAME	EAU CLAIRE MUNICIPAL WELL FIELD		
DOC ID #	88963		
DESCRIPTION OF ITEM(S)	TABLES		
REASON WHY UNSCANNABLE	<input checked="" type="checkbox"/> ILLEGIBLE	or	<input type="checkbox"/> FORMAT OVERSIZED
DATE OF ITEM(S)	NONE		
NO. OF ITEMS	19		
PHASE	<input checked="" type="checkbox"/> Remedial <input type="checkbox"/> Removal <input type="checkbox"/> Deletion Docket Volume <u>10</u> of <u>14</u> <input checked="" type="checkbox"/> Original <input type="checkbox"/> Update # <u> </u>		
O.U.			
LOCATION	Box # <u>2</u> Folder # <u>2</u>		
COMMENTS			
<p>FIGURES A1 - A19</p>			

ATTACHMENT B

From Page 10 - Standards Purge & Trap

RT	Compound	1ppb	1ppb	5ppb	10ppb	20ppb
10.30	1,1-dichloroethene	-	-	-	5,216,400	-
11.51	1,1-dichloroethene	-	-	-	5,883,000	-
14.77	1,1,1-Trichloroethene	-	-	-	4,900,400	-
17.75	Trichloroethene	-	-	-	7,179,400	-
23.41	1,1,2,2-Tetrachloroethane	-	-	-	2,674,800	-

Chlorine Trends

	Purge & Trap	Retention
1,1-dichloroethene	10.30	0.65
1,1-dichloroethene	11.50	"
1,1,1-Trichloroethene	14.77	"
Trichloroethene	17.75	3.30
1,1,2,2-Tetrachloroethane	23.30	.80

Photo Vac STDs:

Two STDs due to collision of certain comp's. - See Page 5

- one STD: 6 ml meth plus following: Total Vol 15 ml
3 ml of 100.5 $\mu\text{g/ml}$ TCE = 20.1 $\mu\text{g/ml}$

3 ml of 104.4 $\mu\text{g/ml}$ 1,1-dichloroethene = 20.8 $\mu\text{g/ml}$

3 ml of 100.5 $\mu\text{g/ml}$ PCE = 20.1 $\mu\text{g/ml}$

- one STD: 9 ml meth plus following: Total Vol 15 ml
3 ml of 100.5 $\mu\text{g/ml}$ 1,1-dichloroethene = 20.1 $\mu\text{g/ml}$

3 ml of 97.4 $\mu\text{g/ml}$ 1,1,1-Trichloroethene = 19.5 $\mu\text{g/ml}$

To Page No

Witnessed & Understood by -

Date

Invented by

Steve Abbott - instrument room

Date

Ported 3ml of each component Intermediate STD into vial for total of 15ml

5 Standard Components are:

Purge & Trap STD - Turntop 3 for photo VOC STD

1,1-dichloroethane 100 µg/ml 100 µg/ml

1,1-dichloroethane 100.50 µg/ml 100.50 µg/ml

1,1,1-Trichloroethane 97.44 µg/ml 97.44 µg/ml

Trichloroethene 100 µg/ml 100 µg/ml

1,1,2-Trichloroethane 100 µg/ml 100 µg/ml

Use a Trap & Photo the Sample Runs

Sample	ml of Stock Standard added to 100ml DI H ₂ O	Vol of Injection	Conc of Sample
1	25	5ml	1 ppt
2	50	5ml	5 ppt
3	100	5ml	10 ppt
4	100	5ml	10 ppt
5	100	5ml	10 ppt
6	25	5ml	1 ppt
7	50	5ml	5 ppt
8	100	5ml	10 ppt
9	100	5ml	10 ppt
10	100	5ml	10 ppt

Retention Time for 4-ethylhexane

4-ethylhexane is a branched alkane with a boiling point of 106°C. It is a colorless, odorless liquid. The resulting hydrocarbon is said to be in the liquid phase. Therefore, each sample is run on a gas chromatograph with a flame ionization detector (FID). The detector response is measured as a peak area, which is then compared to the peak area of the standard. The resulting hydrocarbon is said to be in the liquid phase. Therefore, each sample is run on a gas chromatograph with a flame ionization detector (FID). The detector response is measured as a peak area, which is then compared to the peak area of the standard.

12/1/85
Sample Name - 4-ethylhexane
12/1/85

TO F&S

APPENDIX B

Procedures for Field Measurement of pH, Specific Conductance and Temperature of Water Samples

Field Measurement of pH in Water

1. Scope and Application

This method is applicable to samples of stormwater, surface water, water supplies and groundwater with measurement occurring at the sampling location.

2. Summary of Method

The pH of water is determined using a portable, field pH meter with a temperature-compensated combination electrode.

3. Apparatus

- A) Haake Buchler pH Meter Stick
- B) 100 ml disposable beakers

4. Reagents

- A) pH reference buffer solutions:

- 1) pH = 4.00 \pm 0.01
- 2) pH = 7.00 \pm 0.01
- 3) pH = 10.00 \pm 0.01

- B) distilled water

5. Sample Handling and Preparation

Sample aliquots for pH measurement should be obtained directly from the sampling point in 100 ml disposable beakers. Groundwater samples being tested during well purging can be obtained from the pump discharge line.

6. Calibration

Calibrate the meter/electrode using two reference solutions that bracket the expected pH of the sample. Reference solutions should be at room temperature. Immerse the electrode in pH 7.00 solution and adjust the meter as needed. Remove and rinse the electrode and repeat using the second buffer solution. Repeat adjustments until readings are within 0.05 pH units of the reference values.

7. Procedure

Immerse the electrode in the water while gently agitating. After about one-half minute, record the pH reading to the nearest 0.05 units -- provided the meter readings are not fluctuating more than \pm 0.03 units. Be sure that temperature compensation has been provided for. Remove and thoroughly rinse the electrode with distilled water. Repeat the measurement procedure until four readings have been obtained.

8. Interferences

Prolonged immersion of the electrode in turbid solutions can lead to plugging of the liquid junction and erratic meter readings. The electrode should be cleaned by gently blotting with a lab tissue and rinsing with distilled water.

9. Verification of Accuracy

Following the last of the four replicate measurements, immerse the rinsed electrode in each of the reference buffer solutions used to calibrate the meter/electrode prior to sample measurements. If the readings are not within 0.05 units of the reference values, recalibrate the meter/electrode and re-do the measurement of the sample just tested.

10. Assessment of Precision

Calculate the mean and standard deviation of the four replicate measurements. If the standard deviation is greater than 0.1 units, re-do the measurement of the sample just tested including calibration and verification.

11. Reporting

Report the average value of the replicate measurements to the nearest 0.1 units.

Field Measurement of Specific Conductance and Temperature

1. Scope and Application

This method is applicable to samples of stormwater, surface water, water supplies and groundwater with measurement occurring at the sampling point.

2. Summary of Method

The specific conductance and temperature of water is determined using a portable, field conductivity meter having manual temperature compensation.

3. Apparatus

- A) YSI Model 33 S-C-T Meter with weighted probe
- B) 100 ml disposable beakers

4. Reagents

- A) 0.01 N KCl reference solution
- B) distilled water

5. Sample Handling and Preparation

Sample aliquots for specific conductance and temperature should be obtained directly from the sampling point in 100 ml disposable beakers. Groundwater samples being tested during well purging can be obtained from the pump discharge line.

6. Calibration

Calibrate the thermometer in the probe against the thermometer in the field laboratory. Readings should be within $\pm 1^{\circ}\text{C}$. Calibrate the specific conductance meter using the 0.01 N KCl reference solution. The specific conductance of this solution is 1413 $\mu\text{mhos/cm}$ at 25°C . Adjust the meter as needed. Temperature calibration should be performed weekly. Specific conductance calibration should be performed daily during the period of use.

7. Procedure

Check battery condition by turning selector dial to "Red Line". Adjust meter as needed. Immerse the probe in the beaker while gently agitating. Turn selector dial to "Temperature" and record temperature to nearest 0.5°C . Adjust manual temperature compensation dial to temperature of water. Turn selector dial to "Conductivity" at the scale range appropriate to sample conductance. Record specific conductance to three significant digits. Remove and thoroughly rinse the probe with distilled water. Repeat temperature and specific conductance measurements until four sets of readings have been obtained.

8. Assessment of Precision

Calculate the mean and standard deviation of the four specific conductance measurements. If the standard deviation is greater than 5% of the mean, re-do the measurement of the sample just tested.

9. Reporting

Report the average values of the replicate measurements to the nearest 1°C for temperature and to three significant digits for specific conductance.

Appendix D

Special Analytical Services Request Forms

Approved By
Kathleen G. Churchill
11-4-86

SPECIAL ANALYTICAL SERVICES
Regional Request

☐ Regional Transmittal

☐ Telephone Request

A. EPA Region and Site Name: V, Eau Claire Municipal Well Field

B. Regional Representative: Frank Thomas or Dennis Wesolowski

C. Telephone Number: (312) 353-9087 or (312) 886-1971

D. Date of Request: 19 February 1986

Please provide below a description of your request for Special Analytical Services under the Uncontrolled Hazardous Waste Dumpsite Program. In order to most efficiently obtain laboratory capability for your request, please address the following considerations, if applicable. Incomplete or erroneous information may result in delay in the processing of your request. Please continue response on additional sheets, or attach supplementary information as needed.

1. General description of analytical service requested: See Attachment 1

2. Definition and number of work units involved (specify whether whole samples or fractions; whether organics or inorganics; whether aqueous or soil and sediments; and whether low, medium, or high concentration):

See Attachment 2

3. Purpose of analysis (specify whether Superfund (Remedial or Enforcement), RCRA, NPDES, etc.):

Super Fund, Remedial

4. Estimated date(s) of collection: See Attachment 3

5. Estimated date(s) and method of shipment: See Attachment 3

6. Approximate number of days results required after lab receipt of samples: _____

20 days

7. Analytical protocol required (attach copy if other than a protocol currently used in this program):

Method 601-Purgeable Halocarbons, Federal Register, Vol. 49, October 26, 1984. The quantification shall be done by either external or internal standard methods described in Method 601. The normal 5 ml purging volume may be increased to achieve detection limits but should then remain constant throughout the study.

8. Special technical instructions (if outside protocol requirements, specify compound names, CAS numbers, detection limits, etc.):

See Attachment 4

9. Analytical results required (if known, specify format for data sheets, QA/QC reports, Chain-of-Custody documentation, etc.). If not completed, format of results will be left to program discretion.

See Attachment 5

10. Other (use additional sheets or attach supplementary information, as needed):

11. Name of sampling/shipping contact: Jack Dawkins or Cheryl Wittman

Phone: (312) 295-6111

Please return this request to the Sample Management Office as soon as possible to expedite processing of your request for special analytical services. Should you have any questions, please contact the Sample Management Office at (312) 295-6111.

1. Data Requirements

<u>Parameter:</u>	<u>Detection Limit</u>	<u>Precision Desired</u> (\pm % or Conc.)
<u>1,1-Dichloroethene</u>	<u>0.10 ug/L</u>	<u>Matrix spike duplicates</u>
<u>1,1-Dichloroethane</u>	<u>0.10 ug/L</u>	<u>are within +15% at 95%</u>
<u>cis-1,2-Dichloroethene</u>	<u>0.10 ug/L</u>	<u>confidence level. Matrix</u>
<u>trans-1,2-Dichloroethene</u>	<u>0.10 ug/L</u>	<u>spike recovery should be</u>
<u>1,1,1-Trichloroethane</u>	<u>0.10 ug/L</u>	<u>within 80 to 120%.</u>
<u>Trichloroethene</u>	<u>0.10 ug/L</u>	
<u>1,1,2-Trichloroethane</u>	<u>0.10 ug/L</u>	
<u>Tetrachloroethene</u>	<u>0.10 ug/L</u>	

1. QC Requirements See Attachment 6

[illegible]

1. *Action Required if Limits are Exceeded:

Retest samples - Contact Dennis Wesolowski

ATTACHMENT 1

General Description of Analytical Services Requested

Analysis of halogenated volatile organic compounds (VOCs) plus cis-1,2-Dichloroethene, as specified by EPA Method 601. Eight VOCs are known to be present and are of special interest (1,1-Dichloroethene, 1,1-Dichloroethane, trans-1,2-Dichloroethene, cis-1,2-Dichloroethene, 1,1,1-Trichloroethane, Trichloroethene, 1,1,2-Trichloroethane and Tetrachloroethene) and have specific QA objectives as outlined in this Special Analytical Services. Other VOC compounds of Method 601 are not expected but must be identified and quantified if detected using normal Method 601 criteria.

ATTACHMENT 2

Definition and Number of Work Units Involved

Approximately 191 groundwater and surface water samples will be collected in two rounds and analyzed for the above organic compounds. The exact number of samples collected in the second round will be contingent on the results of the first round. A breakdown of the samples by matrix and round is provided in Table 1. All samples are low concentration. A summary of the existing VOC concentration data is provided in Table 2.

TABLE 1
Summary of Sampling Program

<u>Media</u>	<u>Number of Samples</u>		<u>Media Total</u>
	<u>Round 1</u>	<u>Round 2</u>	
Groundwater	64	27	91
Surface Water	3	3	6
Field Blanks	28	10	38
Duplicates	14	10	24
Trip Blanks	14	10	24
Decontamination Blanks	6	2	8
	—	—	—
TOTAL	129	62	191

TABLE 2

MAXIMUM VOLATILE ORGANIC CONCENTRATIONS
DETECTED IN GROUNDWATER

Eau Claire Municipal Well Field and Vicinity
1982 - 1986

(micrograms per liter)

Well Designation	1,1-DCA	1,1-DCE	1,2DCE	PCE	1,1,1-TCA	1,1,2-TCA	TCE
EPA B or C							
MW 01	N.D.	-2	-2	-2	N.D.	N.D.	4.3
02A	N.D.	-2	-2	-2	N.D.	N.D.	4.3
02B	1.0	-2	-2	-2	N.D.	N.D.	4.9
02C	1.0	-2	-2	-2	N.D.	N.D.	4.8
03A	3.9	1.0	-2	-5	24	N.D.	7.2
03B	6.0	2.1	-2	-5	53	N.D.	16
03C	6.6	2.9	-2	-5	52	N.D.	13
04	N.A.	-2	-2	-2	N.A.	N.A.	-2
05	N.A.	-1	-1	4.9	N.A.	N.A.	3.7
06	N.A.	-2	-2	-2	N.A.	N.A.	-2
07	N.A.	-2	-2	-2	N.A.	N.A.	8.8
08	N.A.	-2	-2	-2	N.A.	N.A.	-2
09	N.A.	-1	-1	2.5	N.A.	N.A.	3.5

N.D.: Analyzed but not detected

N.A.: Not analyzed

- prefix: Less than value

Well Designation:

EPA: REM monitoring well or soil boring

WDNR: Wisconsin Department Natural Resources monitoring well

CEC: City of Eau Claire monitoring well

NPI: National Presto Industries monitoring well

Method of Analysis:

A: EPA Method 601

B: EPA Method 624

C: Photona JF, portable GC

TABLE 2 (Cont'd)

MAXIMUM VOLATILE ORGANIC CONCENTRATIONS
DETECTED IN GROUNDWATER

Eau Claire Municipal Well Field and Vicinity
1982 - 1986

(micrograms per liter)

Well Designation	1,1-DCA	1,1-DCE	1,2DCE	PCE	1,1,1-TCA	1,1,2-TCA	TCE
CEC ^A							
MW 01	9.0	20.0	0.2	2.3	188.0	N.A.	31.6
02	10.3	11.4	T	2.3	158.0	N.A.	34.6
03	-0.2	-1.6	N.D.	1.1	0.2	N.A.	0.9
04	-0.2	-1.6	N.D.	1.1	-0.1	N.A.	0.3
05	-0.2	-1.6	N.D.	4.5	0.2	N.A.	1.6
06	3.7	5.7	N.D.	17.1	40.7	N.A.	7.8
07	-0.2	-1.6	N.D.	2.5	0.1	N.A.	0.3
08	-0.2	-1.6	N.D.	4.0	0.1	N.A.	1.2

N.D.: Analyzed but not detected

N.A.: Not analyzed

- prefix: Less than value

Well Designation:

EPA: REM monitoring well or soil boring

WDNR: Wisconsin Department Natural Resources monitoring well

CEC: City of Eau Claire monitoring well

NPI: National Presto Industries monitoring well

Method of Analysis:

A: EPA Method 601

B: EPA Method 624

C: Photovac(R) portable GC

TABLE 2 (Cont'd)

MAXIMUM VOLATILE ORGANIC CONCENTRATIONS
DETECTED IN GROUNDWATER

Eau Claire Municipal Well Field and Vicinity
1982 - 1986

(micrograms per liter)

Well Designation		1,1-DCA	1,1-DCE	1,2DCE	PCE	1,1,1-TCA	1,1,2-TCA	TCE
WDNR ^A								
MW 01		N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
02		N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
03		N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
04		N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
05		N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
05P		0.1	N.D.	N.D.	N.D.	0.4	N.D.	0.1
06		N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
07		N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
08		N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
09		N.D.	N.D.	N.D.	N.D.	0.1	N.D.	N.D.
09P		N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
10		N.D.	N.D.	N.D.	N.D.	2.5	N.D.	N.D.
10P		N.D.	N.D.	N.D.	N.D.	0.6	N.D.	0.1
11		N.D.	N.D.	N.D.	0.1	N.D.	N.D.	N.D.
11P		N.D.	N.D.	N.D.	0.1	N.D.	N.D.	N.D.
12		N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
13		N.D.	N.D.	N.D.	N.D.	0.2	N.D.	N.D.
14		N.D.	N.D.	N.D.	N.D.	0.1	N.D.	N.D.
15		N.D.	N.D.	N.D.	0.1	0.4	N.D.	3.0
16		N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
17		N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
18		N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
19		N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.

N.D.: Analyzed but not detected

N.A.: Not analyzed

- prefix: Less than value

Well Designation:

EPA: REM monitoring well or soil boring

WDNR: Wisconsin Department Natural Resources monitoring well

CEC: City of Eau Claire monitoring well

NPI: National Presto Industries monitoring well

Method of Analysis:

A: EPA Method 601

B: EPA Method 624

C: Photovac(R) portable GC

TABLE 2 (Cont'd)

MAXIMUM VOLATILE ORGANIC CONCENTRATIONS
DETECTED IN GROUNDWATER

Eau Claire Municipal Well Field and Vicinity
1982 - 1986

(micrograms per liter)

Well Designation	1,1-DCA	1,1-DCE	1,2DCE	PCE	1,1,1-TCA	1,1,2-TCA	TCE
NPT ^A							
MW 01	-1.0	-1.0	-0.1	-1.0	7.2	N.A.	-1.0
03A	1.7	-1.0	-0.1	-1.0	1.4	N.A.	-1.0
03B	4.3	-1.0	-0.1	-1.0	-1.0	N.A.	-1.0
03C	3.4	-1.0	-0.1	-1.0	-1.0	N.A.	-1.0
04	-1.0	-1.0	0.4	3.3	1.1	N.A.	1.4
06	360.0	36.0	10.0	17.0	1300.0	N.A.	1.0

N.D.: Analyzed but not detected

N.A.: Not analyzed

- prefix: Less than value

Well Designation:

EPA: REM monitoring well or soil boring

WDNR: Wisconsin Department Natural Resources monitoring well

CEC: City of Eau Claire monitoring well

NPT: National Presto Industries monitoring well

Method of Analysis:

A: EPA Method 601

B: EPA Method 624

C: Protovac(R) portable GC

ATTACHMENT 3

Estimated Dates of Collection and Shipment

The first round of water sampling will begin on 17 March 1986 and will continue through approximately 3 April 1986. The second round of water sampling will begin on 28 April 1986 and continue until 8 May 1986. It is estimated that 5 to 10 samples will be collected daily including Saturday (30 to 60 per week). The samples will be shipped daily. Each daily shipment will include two (2) field blanks and one (1) trip blank. In addition, two (2) decontamination blanks will be submitted weekly.

ATTACHMENT 4

Special Technical Instructions

- 1) GC equipped with a Hall Conductivity Detector will be used for analysis. The primary and secondary chromatography columns of Method 601 are required. Please note that cis- and trans-1,2-Dichloroethene coelute on the primary column of method 601;
- 2) Second column confirmation is required. The secondary column shall be packed with N-Octane or Porisil C (100/120 mesh). GC/MS may be used for confirmatory purposes when the compounds to be confirmed are present in sufficient concentrations;
- 3) The Method Detection Limits (MDL) specified in Method 601 should be achieved under the conditions of no sample interferences. Sample interferences are not expected in most of the samples;
- 4) If dilution is required for any reason the sample must be rerun at a dilution at least one-tenth (0.10) that of the dilution factor used to bring the component on scale in order to achieve the listed Method Detection Limits. It is anticipated that few if any sample concentrations will be of a sufficient magnitude to required dilution (see Attachment 2, Table 2);
- 5) All groundwater samples must be analyzed within 14 days of collection. All surface water samples must be analyzed within 7 days of sample collection;
- 6) A larger sample volume (up to 25 ml) may be used to achieve the Method Detection Limits but must be invariant during the study. Surrogate concentrations should be adjusted proportionally to sample volume.
- 7) Calculate and report percent recovery of three (3) surrogate compounds that may be also used as internal standards. Response for bromochloromethane, 2-bromo-1-chloropropane and 1,4-Dichlorobutane shall not vary by more than $\pm 10\%$ on a daily basis. If this tolerance is exceeded the sample must be re-analyzed;
- 8) Laboratory must establish the MDL prior to each of the two (2) sample rounds by running seven (7) aliquots of five times (5x) the estimated method detection limit and calculating the actual MDL as described in Appendix B of 40 CFR, Part 136, October 26, 1984. All raw data pertaining to this calculation (chromatograms, quantitative reports, tabulated results) must be submitted with analytical results;
- 9) Each sample will be submitted in four (4) 40 ml vials. Additional vials will be provided if requested.

ATTACHMENT 5

Analytical Results Required

- 1) Provide calibration curves, matrix spike and duplicate summary tables, surrogate percent recovery summary and all chromatograms, and quantification and confirmation printouts;
- 2) If GC/MS is used for confirmation, all associated calibration and sample spectra must be submitted;
- 3) Provide all calibration curves (0.5 to 10ppb range);
- 4) Provide response factor table for Internal Standard (I.S.) if used;
- 5) Provide MDL study results per item 8 of Section 8 (Attachment 4).

ATTACHMENT 6

Audits Required

<u>Audit Description</u>	<u>Frequency of Audits</u>	<u>Limits (% or Conc.)</u>
1. Calibration curve check standards (mid-point of calibration curve)	Tested at beginning of run if calibration curve not done and at end of every sample run if calibration curve is performed	+15% recovery
2. Matrix spike duplicates (shall include 8 compounds of interest)	One per 10 samples or 1 per set of samples	80 to 120% recovery; spikes at 2 to 5 ug/L (higher if VOC concentration higher). +15% RPD (@ 95% c.l.) of duplicates
3. Laboratory blanks	One per 10 samples or at least 1 each analysis set	Less than 0.10 ug/L
4. EPA reference samples will be provided by Region V Quality Assurance Office	One set of 2 per month	+25% at true value
5. Surrogates (or I.S.); See Section 8.7 of Method 601 for 3 compounds	Every sample (2 ug/L)	80 to 120% recovery for both external and internal standards;