MONITORING PROGRAM PLAN

Wausau Water Supply NPL Site
Wausau, Wisconsin

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Wausau, Wisconsin

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CONESTOGA-ROVERS & ASSOCIATES

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1.0 INTRODUCTION

1.1 BACKGROUND

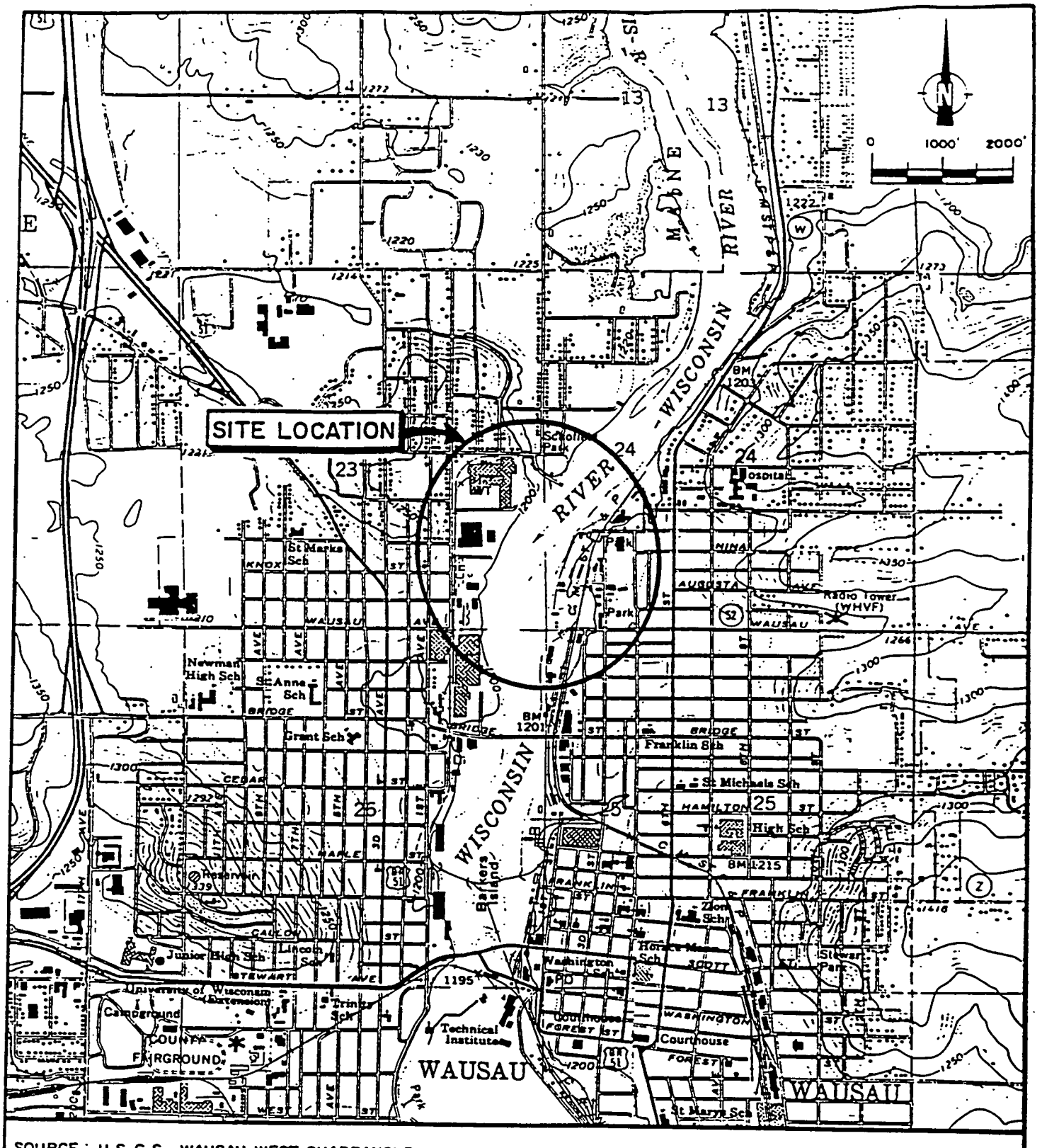
In accordance with the September 29, 1990 Record of Decision (ROD) and the Consent Decree (CD) entered with the court on January 24, 1991, the PRP Group is implementing the final remedial action for the Wausau Superfund Site (site) in Wausau, Wisconsin. Figure 1.1 provides the Site location and Figure 1.2 provides the Site plan. The remedial action consists of:

- Installation of soil vapor extraction (SVE) systems to remove volatile organic compounds (VOCs) in soils at each of three identified source areas;
- SVE off-gas treatment using vapor phase carbon;
- Groundwater remediation utilizing municipal supply wells and operable unit extraction wells; and
- Treatment of groundwater utilizing existing City air strippers and the operable unit extraction well treatment system.

This Monitoring Program Plan (MPP) has been developed in accordance with the requirements specified in Appendix four of the CD (Scope of Work) to address the monitoring requirements necessary to assess the impact of the SVE and groundwater remediation systems at the site and to assure compliance with the ROD and CD. The MPP is a modification to the Compliance Monitoring Plan which was approved as Appendix E to the RD/RA Work Plan, and reflects the details of the final design.

1.2 ZONE OF COMPLIANCE

The Zone of Compliance (ZOC) for the site is defined as the area in which Wisconsin Administrative Code (WAC) NR140



SOURCE: U.S.G.S. WAUSAU WEST QUADRANGLE MAP.

figure 1.1
SITE LOCATION
Wausau Water Supply Site

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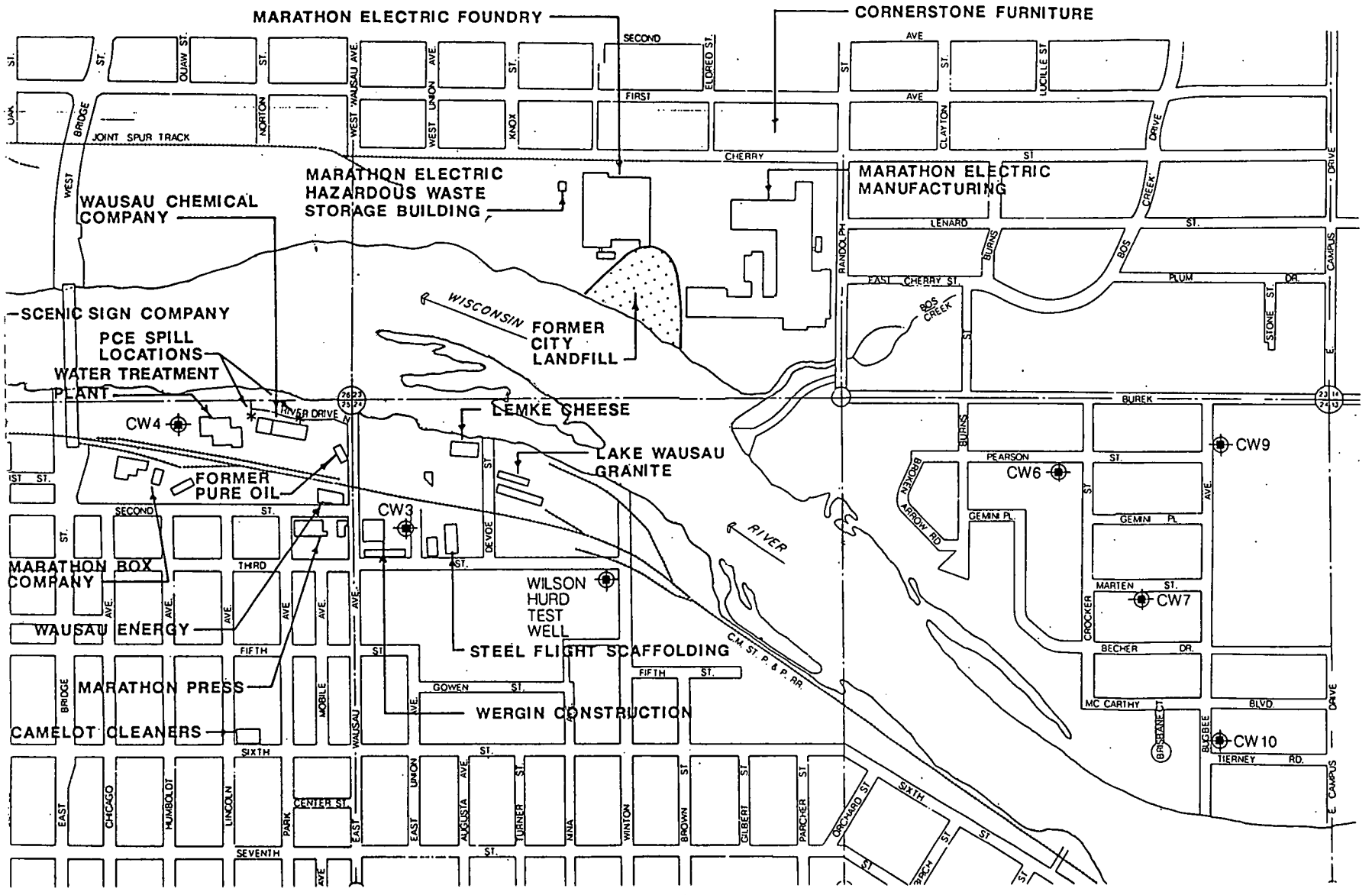

Wausau Energy Bulk Plant 02-37-000179

figure 1.2
SITE PLAN
Wausau Water Supply Site

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(October 1988) Standards must be achieved in the groundwater at specified monitoring points. For the identified VOC contaminants of concern, these levels are:

1.8 µg/L	Trichloroethylene (TCE)
1.0 µg/L	Tetrachloroethylene (PCE)
70 µg/L	1,2-Dichloroethylene (DCE)

Additionally, NR140 (October 1988) levels will apply to any other contaminants of concern identified during the monitoring for the final remedy. For compounds not listed in NR140 (October 1988), the Site groundwater standards will be identified based on the approach described in Section 2.4, below. Based on the data collected during the RI/FS process, the ZOC includes the majority of the site as shown on Figure 1.3. The ZOC will be reevaluated based on data collected during the compliance monitoring program.

1.3 OBJECTIVES

The MPP will be implemented as part of the final remedy at the site to monitor the operation and performance of the SVE and groundwater remediation systems by monitoring the site soils, soil gas, hydraulic capture and water quality performance during systems operations. Groundwater monitoring at the site will be broken into four zones based on the groundwater extraction systems. Soil and soil gas monitoring will be separated into the two source areas based on the configuration of the SVE systems.

The objectives of the MPP are separated based on the three principal elements of the final remedy; SVE, groundwater extraction and groundwater treatment.

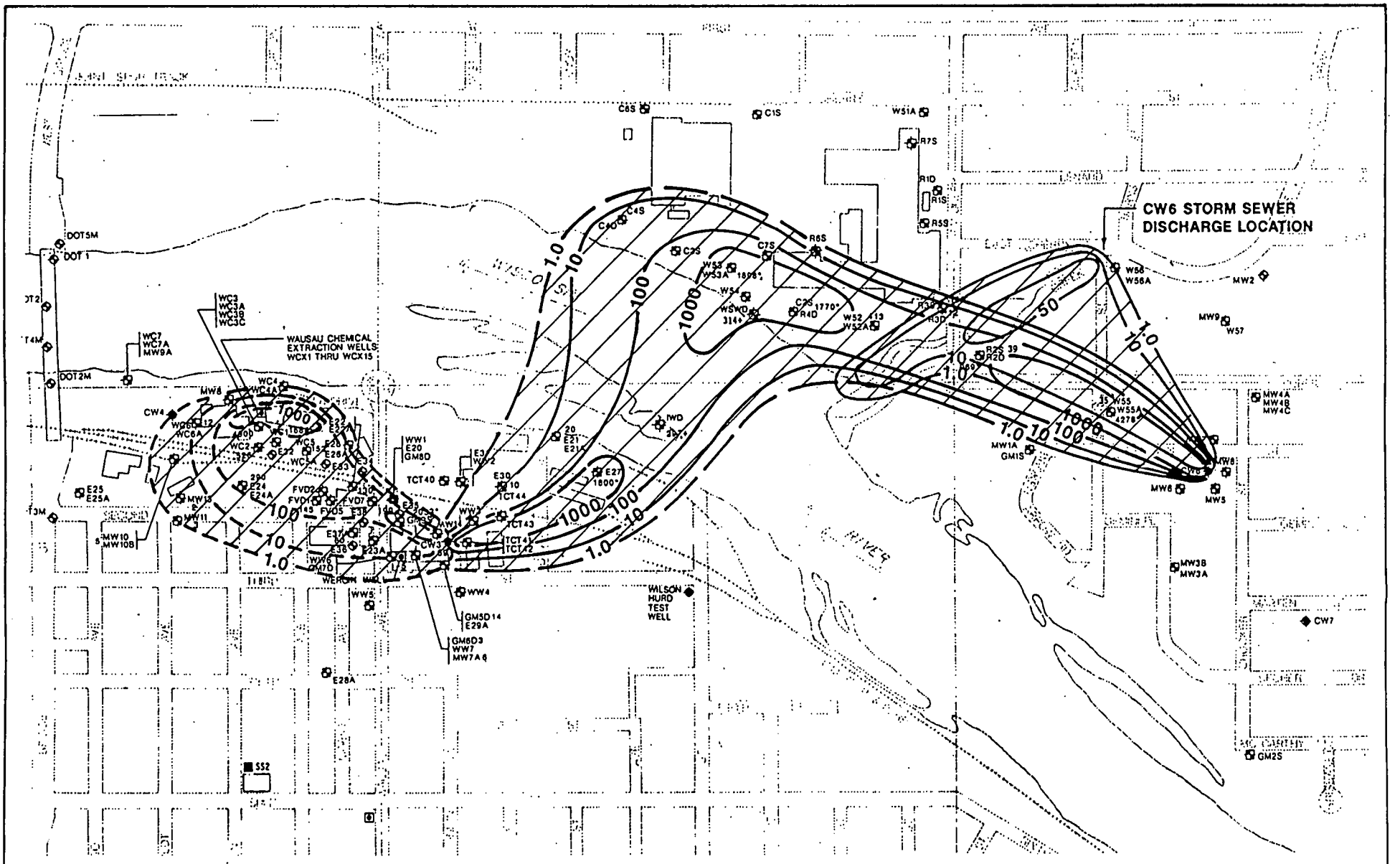

figure 1.3
ZONE OF COMPLIANCE
Wausau Superfund Site

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1.3.1 SVE Systems

- to monitor the long term effectiveness of the SVE systems by collection and analysis of soil samples for VOCs;

- to monitor VOC mass removal from source areas by collection and analysis of SVE extracted air prior to carbon treatment;

- to monitor the potential for additional contaminants at the two source areas by chemical analyses at selected monitoring wells in the vicinity of the sources on an annual basis.

1.3.2 Groundwater Extraction

- to monitor the horizontal and vertical hydraulic zone of capture, within the pumped aquifer, by collection and assessment of groundwater levels;

- to monitor flow patterns at the site, as modified by groundwater remediation operation and Wisconsin River fluctuation, by the collection and assessment of groundwater levels;

- to monitor the long term improvement in groundwater quality at the site by the collection and chemical analysis of groundwater samples from monitoring and extraction wells;

1.3.3 Groundwater Treatment

- to monitor the treatment of extracted groundwater for VOC removal efficiencies by the collection and chemical analysis of influent and effluent water samples from the treatment systems;

1.4 SCOPE

In order to provide representative data to satisfy the above objectives, the MPP presented herein presents the monitoring requirements to be followed during the operation of the final remedy.

Groundwater compliance monitoring is a combination of hydraulic and water quality monitoring designed to verify that the groundwater extraction wells are achieving the necessary contaminant capture and that groundwater quality is improving based on source remediation and VOC removal from the aquifer.

Groundwater VOC remediation, at a site like Wausau, is a long-term process that can't be readily measured on a short term basis using water quality data alone. Because of the time necessary to achieve various levels of groundwater remediation, containment of contaminated groundwater is the primary measurable, achievable short-term objective. At Wausau, there are currently four active groundwater extraction systems designed to contain VOC contaminated groundwater during the long-term groundwater remediation program.

The best way to measure contaminant capture for the extraction wells is to measure the hydraulic gradients in proximity to the extraction wells to show that groundwater containing VOCs is flowing toward the wells and are therefore being removed by pumping. The water level monitoring network includes the necessary monitoring points to show that necessary capture is occurring.

Actual remediation of the groundwater is a slower process that is much more difficult to measure using field data on a short-term basis. Accordingly, water quality data is measured periodically on a long-term basis to show the downward trend of VOC concentrations in groundwater. Significant VOC reductions are measured over a period of years rather than weeks or months.

The proposed groundwater monitoring network is designed to measure the long-term water quality improvement by the collection and chemical analysis of groundwater samples from a comprehensive list of wells located at the site on an annual basis. Appreciable changes are not expected on a more frequent basis. In order to verify that significant changes aren't occurring, a group of core locations have been selected for quarterly monitoring to verify the water quality trends.

This approach has been accepted and has been shown to be effective at several other sites including sites in Region V.

The monitoring plan will address groundwater monitoring within the Zone of Compliance by the collection and analysis of samples from groundwater monitoring wells located from areas of higher concentration to the fringes of the site to verify which area(s) exceed WAC NR 140 (October 1988) levels. Hydraulic data will be utilized to show that groundwater exceeding WAC NR 140 (October 1988) levels is being captured by the various extraction wells.

Extraction well performance will be evaluated utilizing water level monitoring data to define the zones of capture for each of the extraction wells. In addition, the extraction wells will be sampled and chemically analyzed to estimate mass removal. Indicator monitoring wells in the centers of the plume will be chemically analyzed to show the reduction of VOCs in the groundwater over time.

2.0 REMEDIAL ACTION MONITORING PROGRAM

2.1 SOIL MONITORING

The soil monitoring program will meet the first objective of the MPP. As required by the CD, soil samples shall be collected prior to SVE system startup, at the midpoint of SVE system operation, and at the completion of operation of each SVE system to evaluate compliance. The soil sampling locations and depths are based on the extent of contaminated soils as defined by the results of the predesign investigation and the configuration of the SVE system. The SVE system configuration is based on the areas of highest VOC concentrations and the area of contaminated soils. Figures 2.1 and 2.2 present the facility layouts for the SVE systems at the Marathon Electric/City Landfill (West Bank) and the Wausau Chemical (East Bank) source areas, respectively. Locations have been selected to provide results which document the level of VOC contamination across the entire zone of compliance at each source area. Figures 2.3 and 2.4 present the locations for compliance soil sampling at the Marathon Electric/City Landfill (West Bank) and Wausau Chemical (East Bank) source areas, respectively.

The second round of performance soil monitoring will be conducted during the second year of SVE operation to evaluate system effectiveness and to determine if SVE system modifications will be necessary. Supplemental sampling locations and depths will be evaluated based on the first year's monitoring results. Sampling locations other than those selected for the first round will concentrate on areas in question based on soil gas monitoring and first round data.

The sampling grid for the soil sampling program is based on a stratified random design superimposed into a grid used for the Site. The analytical results from the soil sampling program will be assessed using a statistical evaluation of the data based on relative concentrations. For statistical purposes, the West Bank will have one concentration region at each of five depth intervals. The East Bank will have two concentration regions at each of two depth intervals. Appendix A provides a description of the

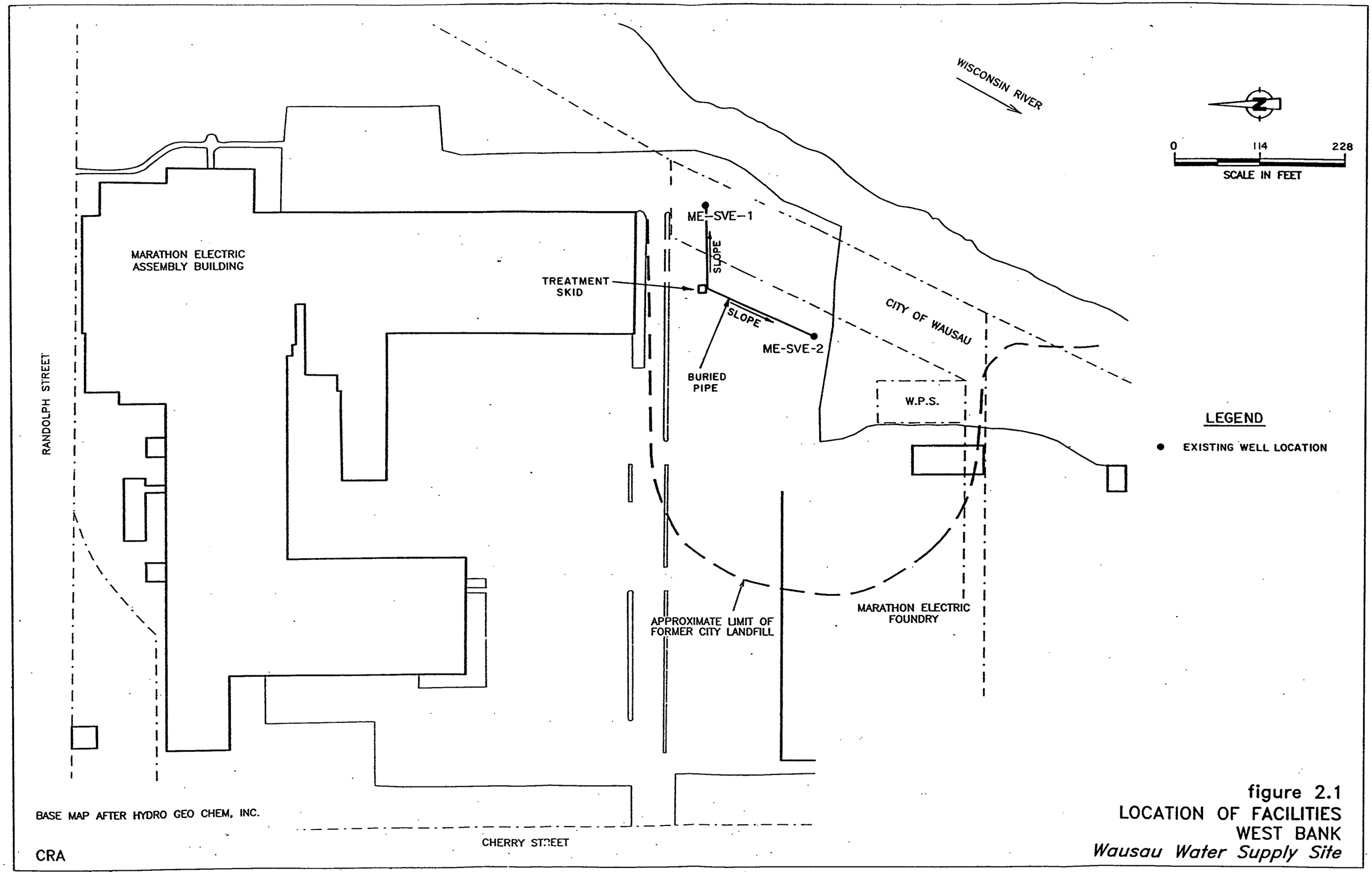
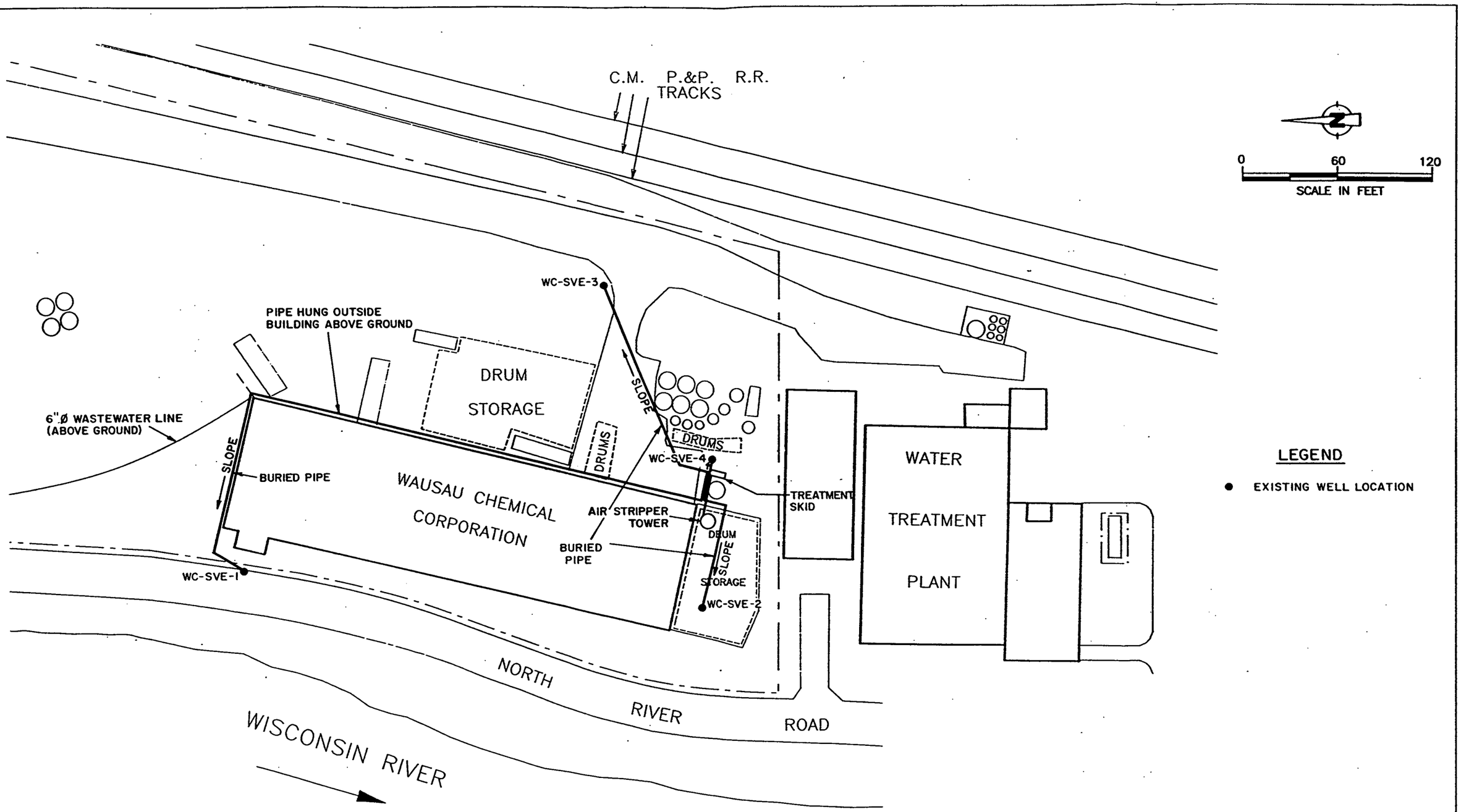


figure 2.1
LOCATION OF FACILITIES
WEST BANK
Wausau Water Supply Site



BASE MAP AFTER HYDRO GEO CHEM, INC.

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figure 2.2
LOCATION OF FACILITIES
EAST BANK
Wausau Water Supply Site

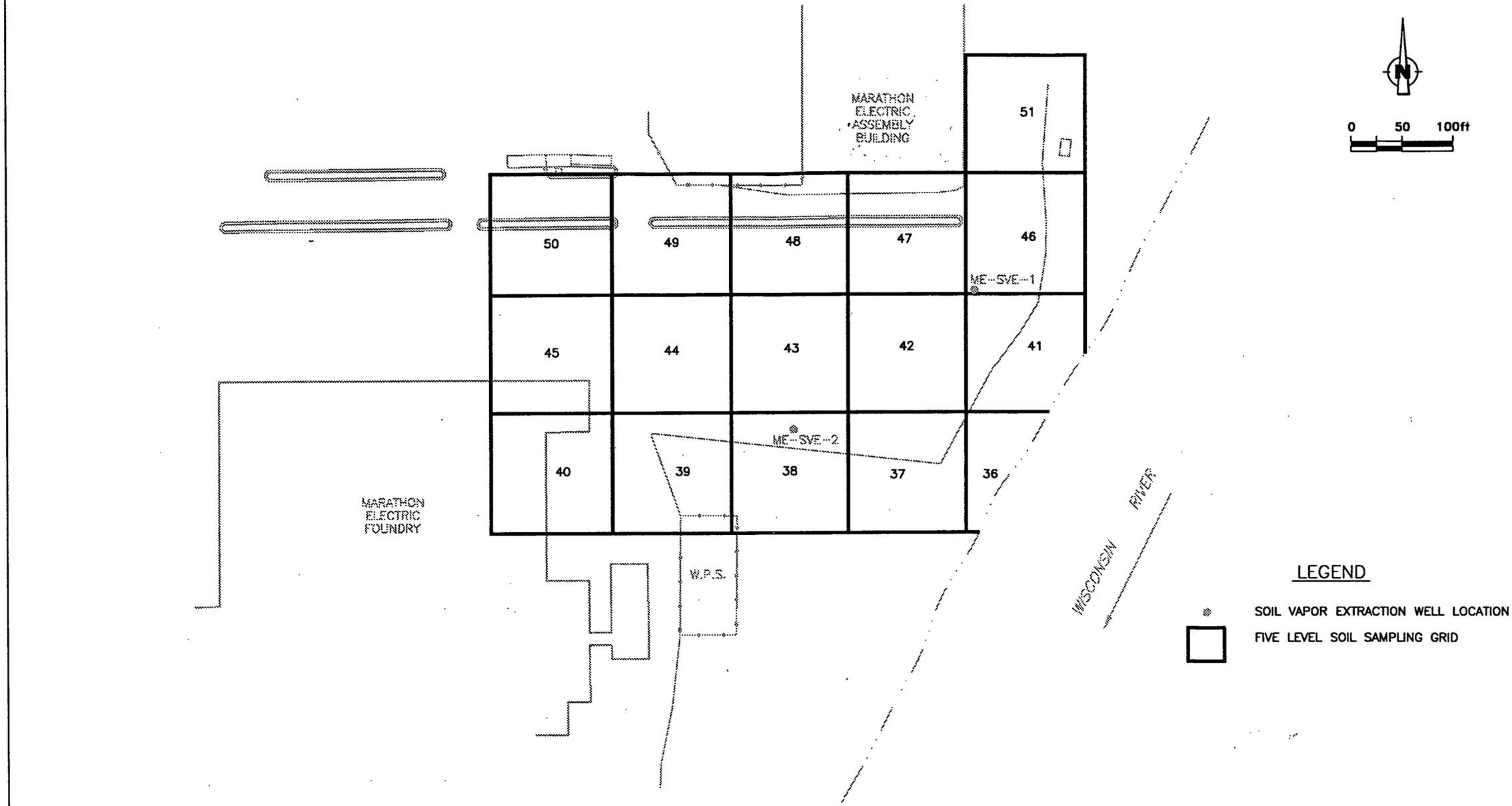

figure 2.3
SOIL SAMPLING LOCATIONS
MARATHON ELECTRIC/CITY OF WAUSAU LANDFILL
Wausau, Wisconsin

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WISCONSIN RIVER

0 20 60ft

WC-SVE-1
WC-SVE-2
WC-SVE-3
WC-SVE-4

WAUSAU CHEMICAL CORPORATION

WATER TREATMENT PLANT

35 34 33
32 31 30 29 28 27 26 25 24
22 21 20 19 23
18 17 16 15 14 13
11 10 9 8 7
6 5 4 3 2 1

LEGEND

SOIL VAPOR EXTRACTION WELL LOCATION

TWO LEVEL SOIL SAMPLING GRID

figure 2.4
SOIL SAMPLING LOCATIONS
WAUSAU CHEMICAL CORPORATION
Wausau, Wisconsin

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3978( )–FEB. 1/94–REV.0 (P–04)(MN)

statistical sampling approach which will be followed for data and compliance evaluation.

The West Bank has 16 sampling grids that will be separated into five groups for statistical analysis based on five depths of samples. The samples will be collected randomly within the grid and at a 6-inch increment every seven feet bgs from 7 feet to 35 feet bgs unless the saturation zone is reached. A larger depth zone was selected due to the lower concentrations of VOCs encountered on the west side of the river.

The East Bank has 35 sampling grids that will be separated into four groups for statistical analysis based on two concentration groups from the soil gas investigation and two depths. The samples will be collected randomly within the grid and at a 6-inch increment at a depth of 4 feet and 8 feet

This procedure will insure that samples from all regions of the zones of compliance will be collected while minimizing the number of samples necessary to statistically characterize each subregion.

The primary goal of the soil performance objective testing is to document the reduction in soil VOC contamination at the Wausau site. The spacing and areas of the grid design at each Site are based on the soil gas concentrations measured during the predesign study. A comparison of SVE soil gas monitoring data and soil monitoring data will be conducted in an effort to correlate the two data sets to assist with the prediction of system performance. This testing program is being conducted to determine when the SVE systems can be decommissioned.

Saturated soil sampling is not a part of the compliance monitoring program due to the matrix interferences from the groundwater. Saturated soil sampling will be conducted at 10 locations representing different expected concentrations for the purpose of comparing data and remediation progress, but not for compliance purposes.

2.2 SOIL GAS MONITORING

A network of permanent soil gas sampling probes will be installed to monitor the reduction in VOC concentrations at each source area as shown in Figures 2.5 and 2.6. The placement of these probes is based on the results of the predesign investigation and SVE system design. Probes will be placed at locations and depths selected to provide results documenting the removal of contaminated portions of the zones of compliance Depths for the West Side soil gas probes will be at 5, 15 and 25 feet bgs for the multiple soil gas probes and at 10 to 25 feet bgs for the depth averaged probes. Depths for the East Side system will be at 4 and 8 feet bgs for the two-level probes and at 2 to 12 feet BGS for the depth averaged probes.

The soil gas monitoring network will be sampled monthly using a portable PID connected to a fitting on the soil gas probe. More frequent measurements may be made during initial systems operation or as appropriate, based on the observed rate of cleanup. The PID results will be used to document the reduction in total VOC concentrations in the soil gas phase during the operational life of the SVE systems and will correlate to the VOC sampling and analysis to make the data more useful.

Soil gas samples will be collected weekly during the first month of SVE operation, monthly for the next two months and quarterly thereafter. Soil gas samples will be collected using a glass sampling syringe and will be analyzed using the on-site mobile laboratory. Duplicate samples will be collected in Summa canisters at 10% of the locations and will be sent off site for TO-14 analysis for the quarterly soil gas rounds during the period of the SVE operation. The first quarterly samples will be collected prior to system startup at each source area. The soil gas analyses will be used as a basis for evaluating on-going system performance and determining when compliance soil samples should be taken.

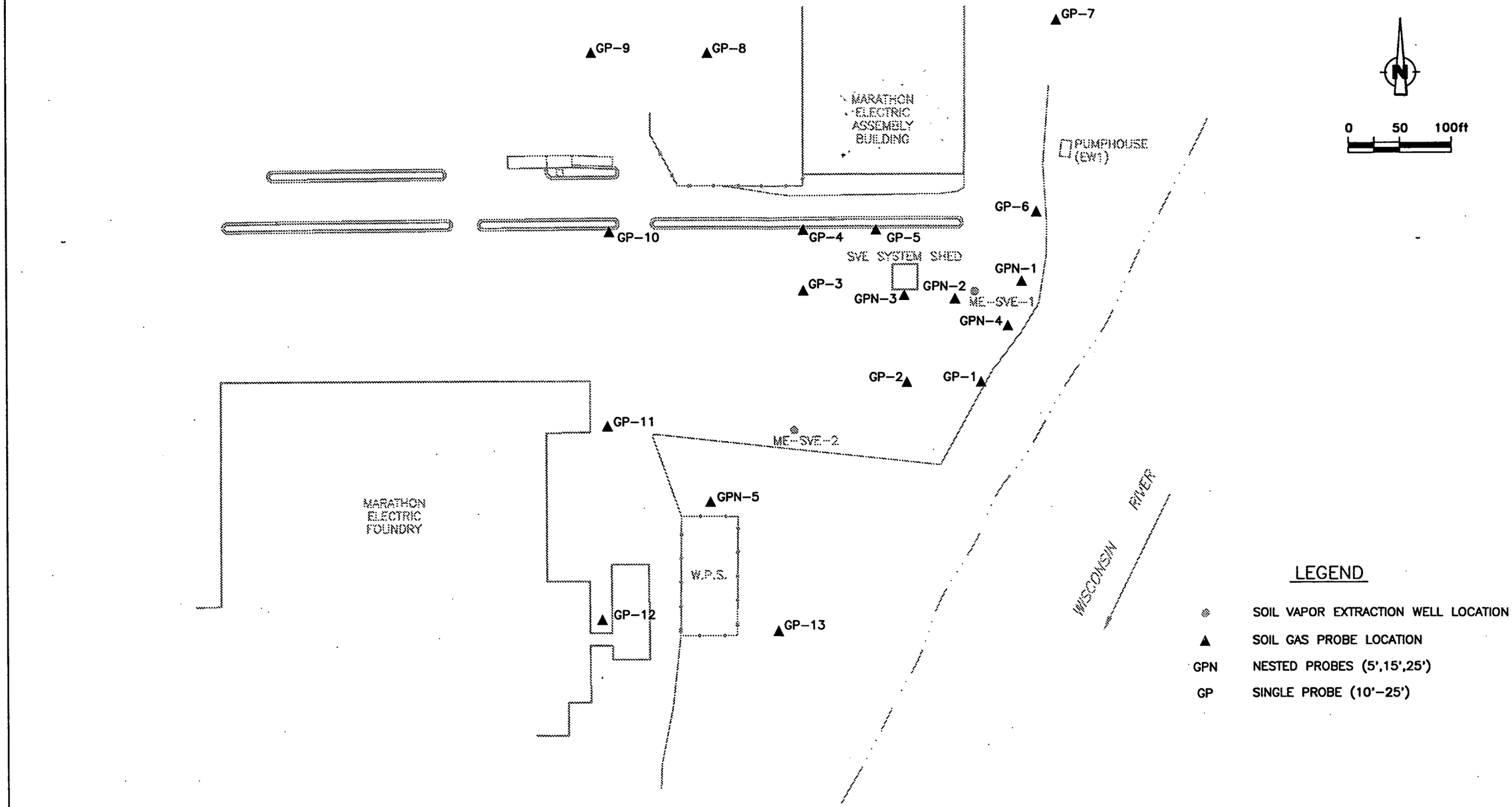

figure 2.5
SOIL GAS PROBE LOCATIONS
MARATHON ELECTRIC/CITY OF WAUSAU LANDFILL
Wausau, Wisconsin

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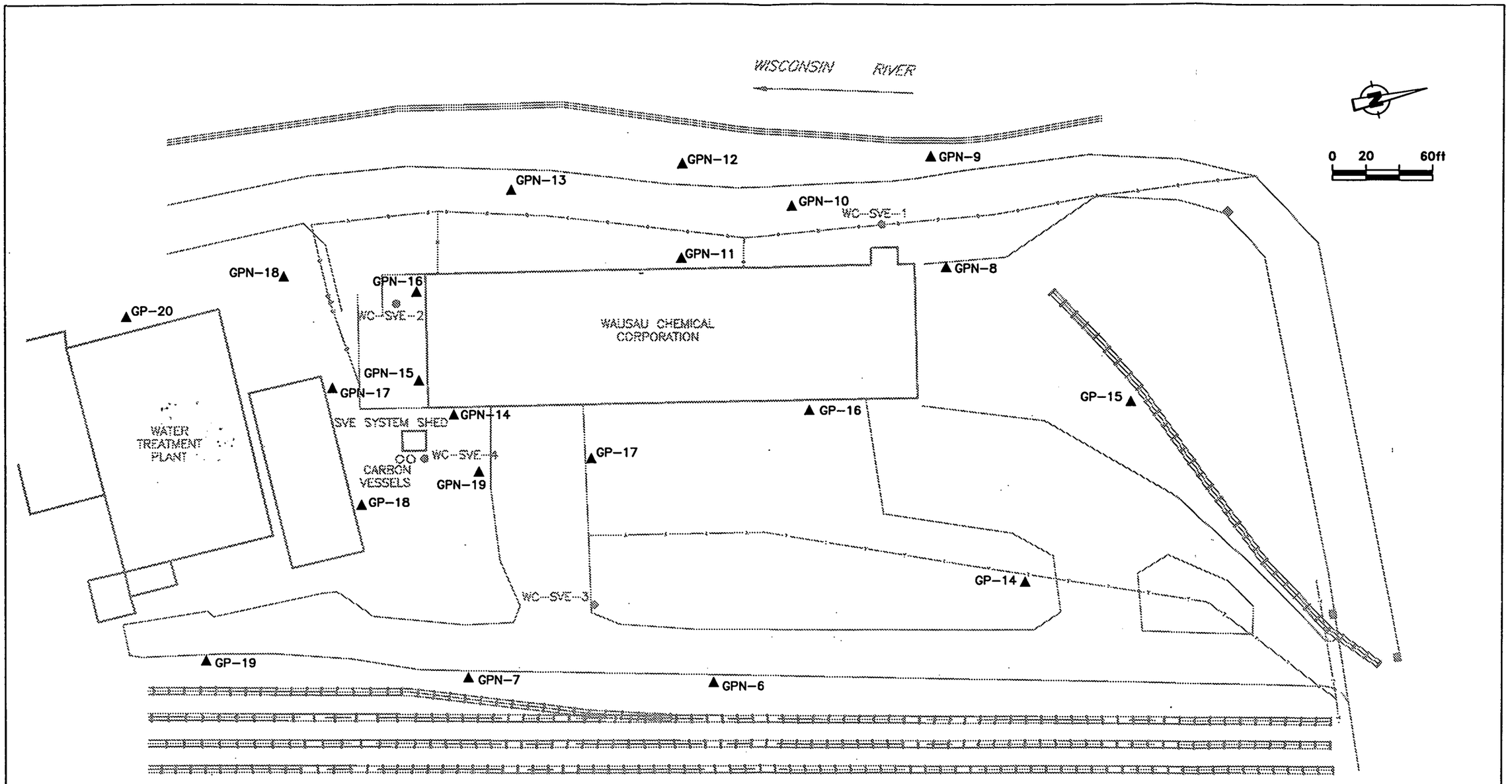

figure 2.6
SOIL GAS PROBE LOCATIONS
WAUSAU CHEMICAL CORPORATION
Wausau, Wisconsin

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2.3 GROUNDWATER LEVEL MONITORING

The groundwater level monitoring task will meet the fourth and fifth objectives of the MPP, namely assessing groundwater capture and hydraulic flow patterns.

For organization purposes, the site has been divided into four monitoring zones. Figure 2.7 illustrates the four monitoring zones. The monitoring zones were chosen to represent the significant hydraulic and chemical regions at the site. Zone I comprises the Wausau Chemical Corporation source area. Zone II comprises the approximate capture area of CW-3. Zone III comprises the Marathon Electric site and EW-1. Zone IV comprises the approximate capture area of CW-6. Based on these four monitoring zones two networks of monitoring wells were selected.

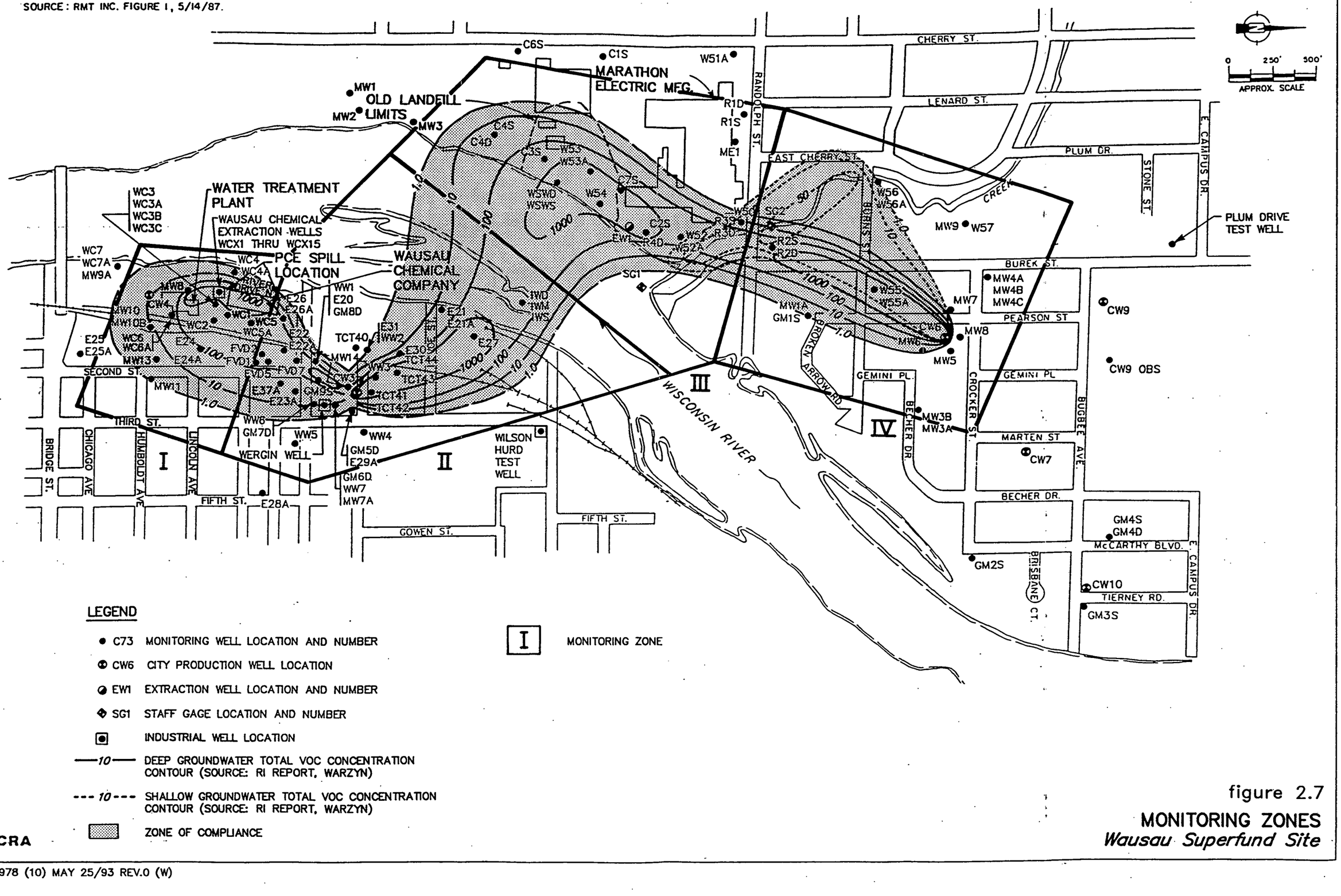
An extensive list of monitoring wells, will be measured at the time of prestart-up sampling and twice per year. These wells are listed in Table 2.1 and are located on Figure 2.8. These data will be utilized to prepare detailed groundwater contour maps of the site in order to monitor the zone of capture for the various groundwater extraction wells and the municipal wells. In addition, water levels will be taken from the core monitoring wells on a quarterly basis at the time of sample collection.

These locations and frequencies will be reevaluated after each year of operation.

2.4 GROUNDWATER QUALITY MONITORING

The groundwater quality monitoring task will meet the third and sixth objectives of the MPP, namely, to monitor the long term improvement of groundwater quality and to monitor for additional contaminants of concern at the site.

SOURCE : RMT INC. FIGURE 1, 5/14/87.



LEGEND

- ● C73 MONITORING WELL LOCATION AND NUMBER
- ⊛ CW6 CITY PRODUCTION WELL LOCATION
- ◍ EW1 EXTRACTION WELL LOCATION AND NUMBER
- ◈ SG1 STAFF GAGE LOCATION AND NUMBER
- ◉ INDUSTRIAL WELL LOCATION
- —10— DEEP GROUNDWATER TOTAL VOC CONCENTRATION CONTOUR (SOURCE: RI REPORT, WARZYN)
- --- 10 --- SHALLOW GROUNDWATER TOTAL VOC CONCENTRATION CONTOUR (SOURCE: RI REPORT, WARZYN)
- ▒ ZONE OF COMPLIANCE

I MONITORING ZONE

CRA

figure 2.7

MONITORING ZONES

Wausau Superfund Site

3978 (10) MAY 25/93 REV.0 (W)

TABLE 2.1

WATER LEVEL MONITORING WELL NETWORK

Monitoring Well	
Zone 1 - Wausau Chemical Source	*Well Depth**
CW4	130.0
WC2	24.0
WC3	161.0
WC3B	24.0
WC4	60.0
WC4A	30.0
WC5	70.0
WC5A	30.0
WC6	70.0
WC6A	30.0
WC7	60.0
WC7A	30.0
MW10A	76.5
MW10B	35.0
FVD5	20.5
E22	93.7
E22A	22.0
E24	85.7
E24A	35.0
E26	95.0
E26A	23.0
E37A	26.0

* Well depth measured from top of casing

TABLE 2.1

WATER LEVEL MONITORING WELL NETWORK

Monitoring Well	
Zone 2 - CW3 Capture Area	*Well Depth**
CW3	92.0
HURD	100.0
WW4	40.0
WW5	37.0
WW6	41.0
FVD5	20.5
TCT5 (44)	23.0
GM6D	126.0
E23A	21.5
E21	129.5
E21A	22.0
E28A	37.0
E30	132.8
E37A	26.0
IWS	15.0
IWM	77.3
IWD	140.4

* Well depth measured from top of casing

TABLE 2.1

WATER LEVEL MONITORING WELL NETWORK

Monitoring Well	
Zone 3 - EW1 Capture Area	*Well Depth**
EW1	143.5
C2S	37.9
C3S	38.9
C4S	32.2
C4D	104.2
C6S	39.5
C7S	36.0
R1S	40.5
R1D	121.0
R3S	32.0
R3D	136.0
R4D	133.0
W50	82.8
W51A	44.7
W52	124.0
W52A	36.0
W53	125.5
W53A	41.3
W54	65.5
WSWS	18.6
WSWD	152.4
MW1	39.6
MW2	40.9
MW3	41.4

* Well depth measured from top of casing

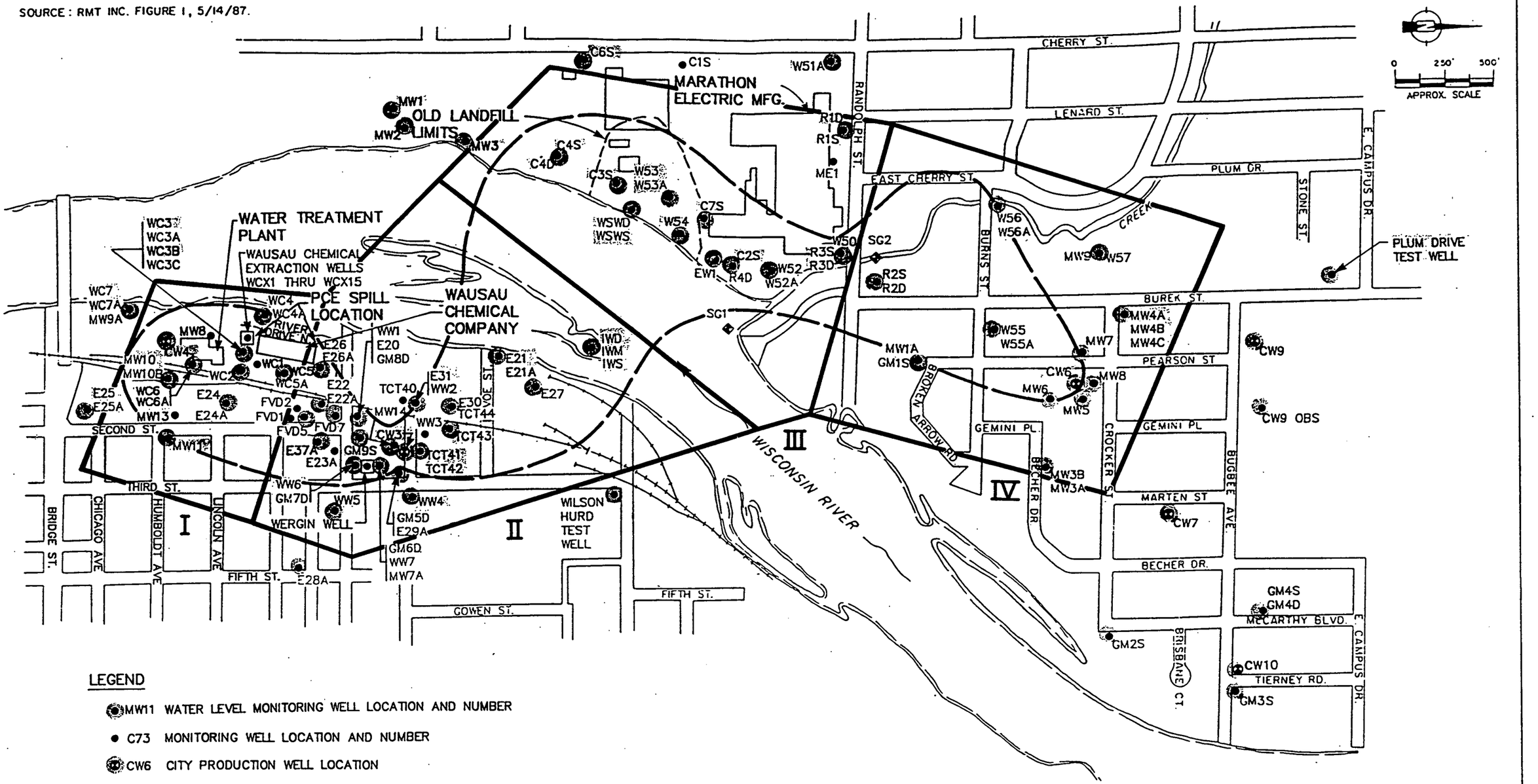
TABLE 2.1

WATER LEVEL MONITORING WELL NETWORK

Monitoring Well	
Zone 4 - CW6 Capture Area	*Well Depth**
CW6	100.0
CW7	100.0
CW9 OBS	78.0
CW10	-
MW1A	130.0
MW3A	140.0
MW3B	74.7
MW4A	100.0
MW4B	60.5
MW4C	40.0
MW7	45.0
R2S	28.0
R2D	135.0
GM1S	37.0
GM2S	34.0
GM4S	36.0
GM4D	145.0
W55	115.5
W55A	43.0
W56	66.5
W56A	20.0
W57	77.5

* Well depth measured from top of casing

SOURCE : RMT INC. FIGURE 1, 5/14/87.



LEGEND

- MW11 WATER LEVEL MONITORING WELL LOCATION AND NUMBER
- C73 MONITORING WELL LOCATION AND NUMBER
- CW6 CITY PRODUCTION WELL LOCATION
- EW1 EXTRACTION WELL LOCATION AND NUMBER
- SG1 STAFF GAGE LOCATION AND NUMBER
- INDUSTRIAL WELL LOCATION
- I MONITORING ZONE
- —— —— LIMIT OF ZONE OF COMPLIANCE

figure 2.8

WATER LEVEL MONITORING WELL NETWORK

Wausau Superfund Site

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3978 (10) AUG.20/93 (W) REV.0

Clean-up standards for the interim remedial action are based on WAC NR 140 (October 1988) Groundwater Quality Standards. The primary contaminants of concern are TCE, PCE and DCE. In addition, any contaminants specified in WAC NR 140 (October 1988) or in the Hazardous Substance List (HSL), which may be detected during the monitoring program will at that time be considered to be additional contaminants of concern. In accordance with the Consent Decree, the extraction well system will be operated until:

1. the concentration of the contaminants of concern are reduced to 1.8 ppb TCE, 1.0 ppb PCE and 70 ppb DCE within the specified ZOCs;

2. the concentrations of additional contaminants of concern (as listed in WAC NR 140 (October 1988) or in the HSL) are reduced to the following levels:

    a) For additional contaminants which are specified by WAC NR 140 (October 1988), the levels specified for those additional contaminants by WAC NR 140 (October 1988); or

    b) For additional contaminants not specified by WAC NR 140 (October 1988), the levels required by the Safe Drinking Water Act MCLs; or

    c) For additional contaminants not specified by WAC NR 140 (October 1988) and not having a specified MCL, the levels required by the applicable Clean Water Act WQC; or

    d) For additional contaminants not specified by WAC NR 140 (October 1988) and not having a specified MCL, and not having an applicable WQC level, health based levels set by U.S. EPA in consultation with the WDNR; and

3. a demonstration is made that the Water Quality Criteria (water discharge limits) have been complied with (for any discharge to the Wisconsin River).

Two networks of monitoring wells have been identified for sampling and analysis.

A core well network was selected to provide essential monitoring data from each of the four monitoring zones to show general short-term trends in groundwater quality. Wells were selected to monitor plume center (indicator wells) and the plume fringe (sentry wells) for each zone. Table 2.2 presents the core network monitoring wells and the rationale for each. Figure 2.9 locates all core network monitoring wells.

A comprehensive well network was selected to provide sufficient data to construct detailed plume maps and to show long-term trends in groundwater quality improvement. Table 2.3 lists the wells in the comprehensive network. Figure 2.10 locates all comprehensive network monitoring wells. It is to be noted that the comprehensive monitoring well network includes all core network wells.

The core network wells will be sampled quarterly and analyzed for the Site Specific VOC compounds listed in Table 2.4. In this manner, any unforeseen plume variations which may impact the effectiveness of the system would be identified on a quarterly basis. Monitoring well IWD will not be monitored during the months of December, January or March, or if it is inaccessible due to weather conditions. If it is inaccessible the USEPA project manager will be notified as soon as possible.

The comprehensive network will be sampled and analyzed once prior to SVE system start-up, and annually thereafter for any compounds previous detected at the Site as presented in the Site Specific Analyte List Table 2.4. Samples for Site metals will be analyzed as both filtered and unfiltered samples during the initial monitoring round in order to determine the method of future metals sample handling. These data will

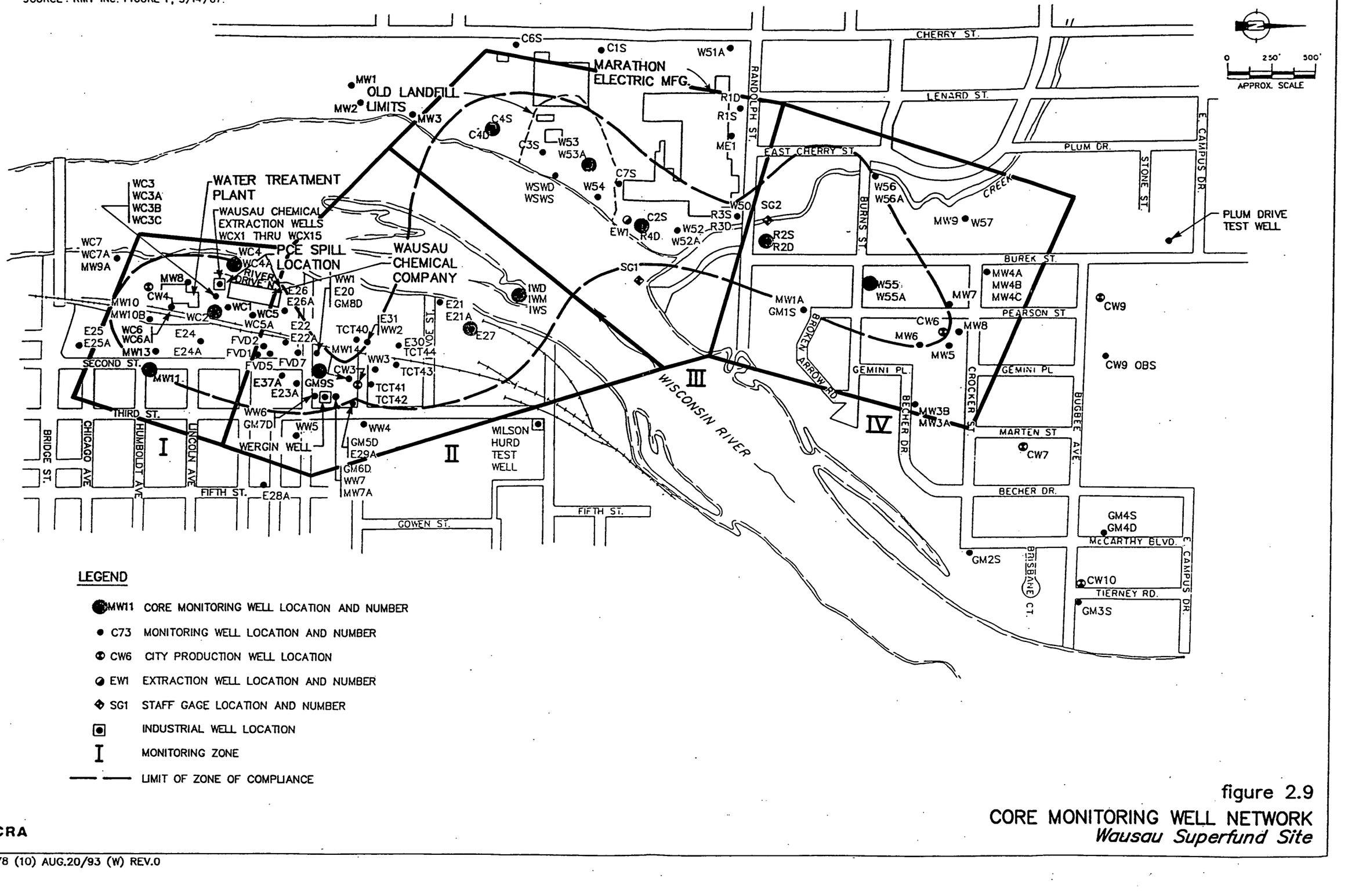
TABLE 2.2

GROUNDWATER MONITORING CORE WELL NETWORK

Monitoring Well	*Well Depth**	*Historical Total VOCs Concentration Approximate (ug/L)*	*Function*
		ZONE 1 - WAUSAU CHEMICAL SOURCE AREA	
WC2	24.0	800	Indicator Well
WC4	60.0	2	Sentry Well - West
		ZONE 2 - CW3 CAPTURE AREA	
IWD	140.4	300	Sentry Well
E21	129.5	21	Indicator Well
E23A	21.5	71	Indicator Well near CW3
		ZONE 3 - EW1 CAPTURE AREA	
C4D	104.2	60	Sentry Well
W53	125.5	1800	Indictor Well
R4D	133.0	3200	Indicator Well near EW1
		ZONE 4 - CW6 CAPTURE AREA	
R2S	28.0	55	Sentry Well - Shallow
R2D	135.0	1000	Sentry Well - Deep
W55A	43.0	45	Indicator Well - Shallow
W55	115.5	4200	Indicator Well - Deep

* Well depth measured from top of casing

SOURCE : RMT INC. FIGURE 1, 5/14/87.



LEGEND

- MW11 CORE MONITORING WELL LOCATION AND NUMBER
- C73 MONITORING WELL LOCATION AND NUMBER
- CW6 CITY PRODUCTION WELL LOCATION
- EW1 EXTRACTION WELL LOCATION AND NUMBER
- SG1 STAFF GAGE LOCATION AND NUMBER
- INDUSTRIAL WELL LOCATION
- I MONITORING ZONE
- —— —— LIMIT OF ZONE OF COMPLIANCE

figure 2.9

CORE MONITORING WELL NETWORK

Wausau Superfund Site

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TABLE 2.3

GROUNDWATER MONITORING
COMPREHENSIVE WELL NETWORK

Monitoring Well	*Well Depth**	*Historical Total VOCs Approximate Concentration (µg/l)*
Zone 1 - Wausau Chemical Source Area		
WC2 (2)	24.0	800
WC3B	24.0	130
WC4	60.0	2
WC4A	30.0	0
WC5	70.0	4
WC5A	30.0	200
WC6	70.0	9
WC6A	30.0	580
MW10A	76.5	6
MW10B	35.0	143
E22A	22.0	131
E24A	22.0	310
Zone 2 - CW3 Capture Area		
WW4	40.0	0
WW5	37.0	8
FVD5	20.5	2,150
GM6D	126.0	17
E23A	21.5	71
E21	129.5	21
E30	132.8	10
E37A	26.0	19
IWD	140.4	300
CW3	92.0	100
Zone 3 - EW1 Capture Area		
C2S (1)	37.9	1,230
C4S	32.2	1,350
C4D	104.2	60
R3S	32.0	35
R3D	136.0	13
R4D (2)	133.0	3,200
W52	124.0	420
W53 (2)	125.5	1,800
W53A (2)	41.3	26
W54 (2)	65.5	460
WSWD	152.4	480
EW1	143.5	400

* Well depth measured from top of casing

TABLE 2.3

GROUNDWATER MONITORING
COMPREHENSIVE WELL NETWORK

Monitoring Well	*Well Depth**	*Historical Total VOCs Approximate Concentration (µg/l)*
Zone 4 - CW6 Capture Area		
MW4B	60.5	6
MW7	45.0	0
R2S	28.0	55
R2D	135.0	1,000
W55 (2)	115.5	4,200
W55A	43.0	45
W56	66.5	20
W56A	20.0	11
GM1S	37.0	1
CW6	100.0	150

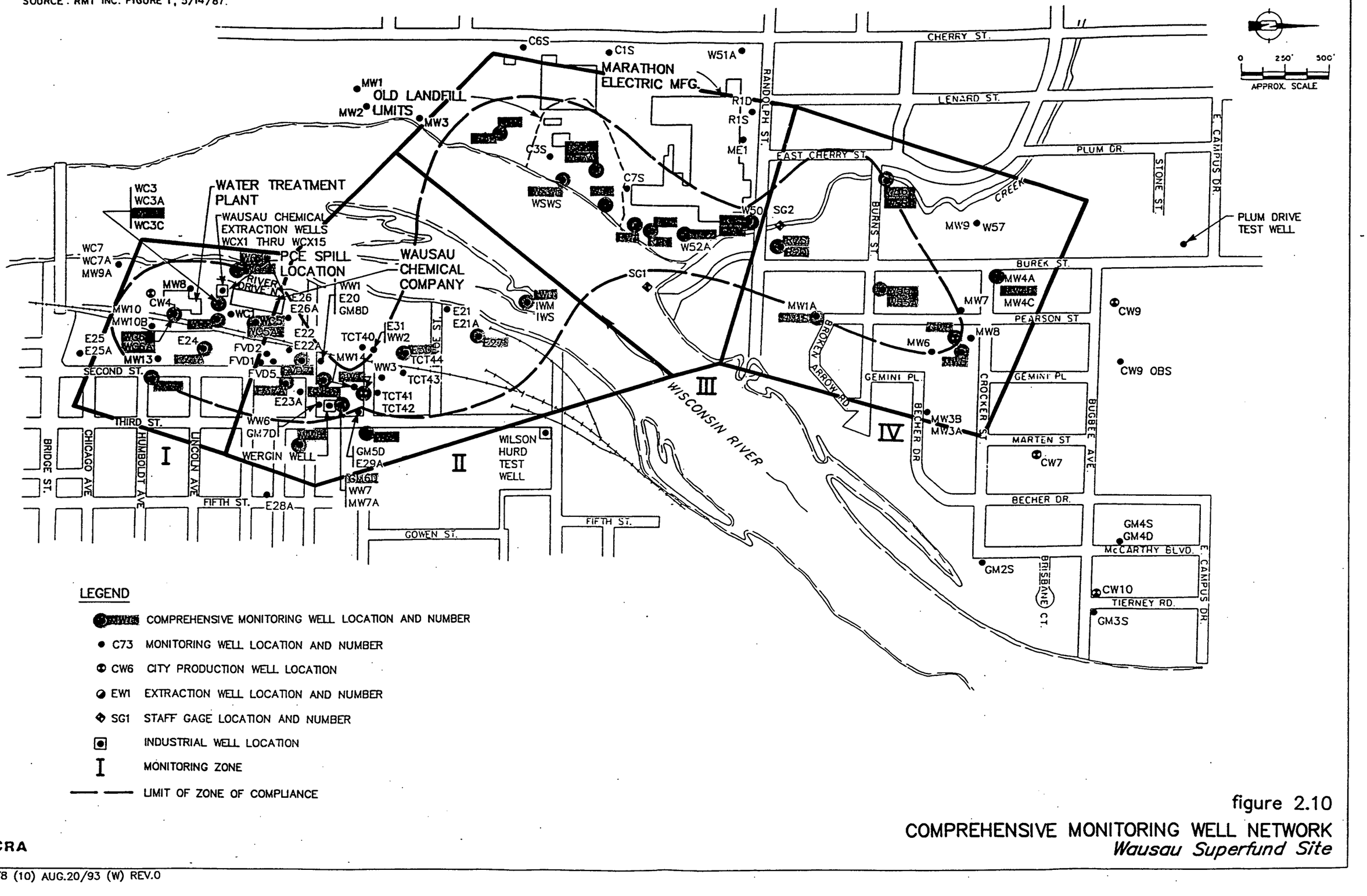
(1) Monitoring well C7S will be monitored in the event that C2S is dry during a particular monitoring event.

(2) These wells will also be analyzed for TCL/TAL parameters in Tables 2.6 - 2.9.

(3) CW4 will be sampled during any comprehensive monitoring event if it is operating.

* Well depth measured from top of casing

SOURCE : RMT INC. FIGURE 1, 5/14/87.



LEGEND

- COMPREHENSIVE MONITORING WELL LOCATION AND NUMBER
- C73 MONITORING WELL LOCATION AND NUMBER
- CW6 CITY PRODUCTION WELL LOCATION
- EW1 EXTRACTION WELL LOCATION AND NUMBER
- SG1 STAFF GAGE LOCATION AND NUMBER
- INDUSTRIAL WELL LOCATION
- I MONITORING ZONE
- —— —— LIMIT OF ZONE OF COMPLIANCE

figure 2.10

COMPREHENSIVE MONITORING WELL NETWORK

Wausau Superfund Site

CRA

3978 (10) AUG.20/93 (W) REV.0

TABLE 2.4

SITE SPECIFIC ANALYTE LIST

Volatile Organics

Acetone*
Benzene
2-Butanone*
Carbon tetrachloride
Chlorobenzene
Chloroform*
Chloromethane
1,1-Dichloroethane
1,1-Dichloroethene
cis-1,2-Dichloroethene
trans-1,2-Dichloroethene
Ethylbenzene
Methylene chloride
4-Methyl-2-pentanone*
Tetrachloroethene
Toluene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethene
1,1,2-Trifluoro-1,2,2-trichloroethane*
Vinyl chloride*
Xylenes

Semi-Volatile Organics

Phenol
Napththalene
2-Methylnaphthalene
Fluorene
Pentachlorophenol
Phenanthrene
Bis(2-ethylhexyl)phthalate

TABLE 2.4

SITE SPECIFIC ANALYTE LIST

Metals

Barium
Chromium
Iron
Manganese
Zinc

Note: Any chemical/compound detected prior to system start-up or during the monitoring program will, at that time, be added to the Site Specific Analyte List.

* - Compounds not analyzed during on-Site soil gas analysis.

be utilized to construct detailed VOC plume maps for the site, and to determine if the monitoring plan should be modified, subject to USEPA and WDNR approval.

Groundwater monitoring conducted during the RI/FS included analysis for Target Compounds List (TCL) organic parameters and Target Analyte List (TAL) inorganic parameters at a significant number of monitoring wells. The RI/FS results only identified one semi-volatile compound and three metals at more than one location. Based on these results, it appears that VOCs are the only significant contaminants of concern and are, therefore, the basis of the remediation and monitoring programs. As a precautionary measure, in addition to the VOC analyses conducted on samples collected from monitoring and extraction wells, the selected indicator wells listed in Table 2.5 for each source area will be analyzed for TCL organic parameters and for TAL inorganic parameters prior to system startup to verify that no new contaminants have leached into the groundwater over the past four years. Tables 2.6 through 2.9 summarize the TCL and TAL parameters that will be analyzed. Subsequent to assessment and review of the data, it will be determined, in conjunction with the USEPA and WDNR, whether a second round of groundwater samples is required to be collected from the selected indicator wells for full or partial TCL/TAL analysis. If after review of the data, additional analytes are detected, they will be added to the Site Specific Analyte List. The indicator well sample locations will be sampled annually, thereafter, and will be analyzed for the full or partial TCL/TAL parameters based on the initial sampling as determined necessary in conjunction with the USEPA and WDNR. These analyses will be conducted during the comprehensive well network sampling.

Following evaluation of the first year's data, the settling defendants may submit a proposal for USEPA and WDNR approval for a reduction in the number of parameters analyzed during subsequent quarterly sampling. Subsequent annual sampling will include VOC sampling of all of the wells in the comprehensive network and TCL/TAL or an alternate parameter list for sampling from the plume indicator wells based on lists approved by USEPA and WDNR.

TABLE 2.5

INDICATOR WELLS
FOR TCL AND TAL ANALYSES

	*Well Depth**	*Historical Total VOCs Concentration Approximate ($\mu g/L$)*
Zone I		
WC2	24.0	800
Zone II		
E23A	21.5	71
Zone III		
W53	125.5	1800
W53A	41.3	26
W54	65.5	460
R4D	133.0	3200
Zone IV		
W55	115.5	4200

* Well depth measured from top of casing

TABLE 2.6

TCL VOLATILE ORGANIC COMPOUNDS (VOCs)

Compound	*CAS Number*
Acetone	67-64-1
Benzene	21-43-2
Bromodichloromethane	75-27-4
Bromoform	75-25-2
Bromomethane	74-83-9
Butanone	78-93-3
Carbon disulfide	75-15-0
Carbon tetrachloride	56-23-5
Chlorobenzene	108-90-7
Chloroethane	75-00-3
Chloroform	07-00-3
Chloromethane	74-87-3
Bromochloromethane	74-97-5
1,1-Dichloroethane	75-35-3
1,2-Dichloroethane	107-06-2
1,1-Dichloroethene	75-35-4
cis-1,2-Dichloroethene	156-59-4
trans-1,2-Dichloroethene	156-60-5
1,2-Dichloropropane	78-87-5
cis-1,3-Dichloropropene	10061-01-5
trans-1,3-Dichloropropene	10061-02-6
Ethylbenzene	100-41-4
2-Hexanone	591-78-6
Methylene Chloride	75-09-2
4-Methyl-2-pentanone	108-10-1
Styrene	100-42-5
1,1,2,2-Tetrachloroethane	29-34-5
Tetrachloroethene	127-18-4
Toluene	108-88-33
1,1,1-Trichloroethane	71-55-6
1,1,2-Trichloroethane	79-00-5
Trichloroethene	79-01-6
Vinyl chloride	75-01-4
Xylenes (total)	1330-20-7
Dibromochloromethane	124-48-1
1,2-dibromoethane	106-93-4
1;2-dibromo-3-chloropropane	96-12-8

TABLE 2.7

TCL BASE-NEUTRAL-ACID
EXTRACTABLE ORGANIC COMPOUNDS (BNAs)

Semivolatiles	*CAS Numbers*
Phenol	108-95-2
Bis(2-Chloroethyl)ether	111-44-4
2-Chlorophenol	95-57-8
1,3-Dichlorobenzene	541-73-1
1,4-Dichlorobenzene	106-46-7
1,2-Dichlorobenzene	95-50-1
2-Methylphenol	95-48-7
Bis(2-Chloroisopropyl)ether	108-60-1
4-Methylphenol	106-44-5
N-Nitroso-di-*n*-dipropylamine	621-64-7
Hexachloroethane	67-72-1
Nitrobenzene	98-95-3
Isophorone	78-59-1
2-Nitrophenol	88-75-5
2,4-Dimethylphenol	105-67-9
Bis(2-chloroethoxy)methane	111-91-1
2,4-Dichlorophenol	120-83-2
1,2,4-Trichlorobenzene	120-82-1
Naphthalene	91-20-3
4-Chloroaniline	106-47-8
Hexachlorobutadiene	87-68-3
4-Chloro-3-methylphenol (*para*-chloro-*meta*-cresol)	59-50-7
2-Methylnaphthalene	91-57-6
Hexachlorocyclopentadiene	77-47-4
2,4,6-Trichlorophenol	88-06-2
2,4,5-Trichlorophenol	95-95-4
2-Chloronaphthalene	91-58-7
2-Nitroaniline	88-74-4
Dimethylphthalate	131-11-3
Acenaphthylene	208-96-8
2,6-Dinitrotoluene	606-20-2
3-Nitroaniline	99-09-2
Acenaphthene	83-32-9

TABLE 2.7

TCL BASE-NEUTRAL-ACID
EXTRACTABLE ORGANIC COMPOUNDS (BNAs)

Semivolatiles	*CAS Numbers*
2,4-Dinitrophenol	51-28-5
4-Nitrophenol	100-02-7
Dibenzofuran	132-64-9
2,4-Dinitrotoluene	121-14-2
Diethylphthalate	84-66-2
4-Chlorophenyl-phenyl Ether	7005-72-3
Fluorene	86-73-7
4-Nitroaniline	100-01-6
4,6-Dinitro-2-methylphenol	534-52-1
N-Nitrosodiphenylamine	86-30-6
4-Bromophenyl-phenyl Ether	101-55-3
Hexachlorobenzene	118-74-1
Pentachlorophenol	87-86-5
Phenanthrene	85-01-8
Anthracene	120-12-7
Carbazole	86-74-8
Di-*n*-butylphthalate	84-74-2
Fluoranthene	206-44-0
Pyrene	129-00-0
Butylbenzylphthalate	85-68-7
3,3'-Dichlorobenzidine	91-94-1
Benzo(a)anthracene	56-55-3
Chrysene	218-01-9
Bis(2-ethylhexyl)phthalate	117-81-7
Di-*n*-octylphthalate	117-84-0
Benzo(b)fluoranthene	205-99-2
Benzo(k)fluoranthene	207-08-9
Benzo(a)pyrene	50-32-8
Indeno(1,2,3-cd)pyrene	193-39-5
Dibenz(a,h)anthracene	53-70-3
Benzo(g,h,i)perylene	191-24-2

TABLE 2.8

TCL PESTICIDES AND POLYCHLORINATED BIPHENYLS (PEST/PCBs)

Pesticides/PCBs	*CAS Number*
alpha-BHC	319-84-6
beta-BHC	319-85-7
delta-BHC	319-86-8
gamma-BHC (Lindane)	58-89-9
Heptachlor	76-44-8
Aldrin	309-00-2
Heptachlor Epoxide	1024-57-3
Endosulfan I	959-98-8
Dieldrin	60-57-1
4,4'-DDE	72-55-9
Endrin	72-20-8
Endosulfan II	33213-65-9
4,4'-DDD	72-54-8
Endosulfan Sulfate	1031-07-8
4,4'-DDT	50-29-3
Methoxychlor	72-43-5
Endrin Ketone	53494-70-5
Endrin Aldehyde	7421-36-3
alpha-Chlordane	5103-71-9
gamma-Chlordane	5103-74-2
Toxaphene	8001-35-2
Aroclor - 1016	12674-11-2
Aroclor - 1221	11104-28-2
Aroclor - 1232	11141-16-5
Aroclor - 1242	53469-21-9
Aroclor - 1248	12672-29-6
Aroclor - 1254	11097-69-1
Aroclor - 1260	11096-82-5

TABLE 2.9

TAL PARAMETERS

Analyte
Aluminum
Antimony
Arsenic
Barium
Beryllium
Cadmium
Calcium
Chromium
Cobalt
Copper
Iron
Lead
Magnesium
Manganese
Mercury
Nickel
Potassium
Selenium
Silver
Sodium
Thallium
Vanadium
Zinc
Cyanide

Verification of compliance with groundwater clean-up standards will consist of four quarters of data from the comprehensive list of monitoring wells. The samples will be analyzed for the Site Specific Analytes from Table 2.4, a full TLC VOC scan and any other compound detected at the Site based on previous sampling events.

Sampling procedures are detailed in Section 3.3.

2.5 TREATMENT EFFICIENCY MONITORING

The treatment monitoring task will meet the seventh objective of the MPP, namely, evaluating the quantities of VOCs removed from the soils and groundwater.

EW-1, CW-3, CW-6 and effluent samples from the Wausau municipal air stripper treatment plant and the EW-1 treatment structure will be collected for analysis of the VOCs listed in Table 2.4 on a monthly basis. This effort is required to monitor the efficiency of the treatment system and to characterize effluent water quality for end use. Effluent samples will be analyzed for TCL/TAL during the initial comprehensive monitoring round. In addition, effluent will be monitored for pH and any metals determined necessary based on initial TAL analyses.

Once each year a sample of treated water will be collected from each groundwater extraction center and analyzed for TCL and TAL compounds. This effort is intended to assess the overall quality of the groundwater extracted and treated under the remedial action. The results of these sample analyses will identify the presence of any compounds other than those routinely monitored for following treatment.

2.6 AIR MONITORING

Air emissions from groundwater treatment centers will be calculated by comparing influent VOC mass loading with effluent VOC mass. The difference between these accurately represents the VOC mass removed and discharged by the air stripping systems.

Air monitoring of the exhaust gases from the SVE systems will meet the second objective of the MPP. The Performance Standards for the SVE systems outlined in the CD specify, in part, that the systems "reduce the concentration of total exhaust gas VOCs to 1% of the initial exhaust gas VOC concentration". Measurements of SVE exhaust gas VOC concentrations will be performed weekly, monthly and quarterly to coincide with soil gas monitoring previously discussed in Section 2.2. More frequent monitoring may be required as part of the recommended routine operation and maintenance of the SVE systems. Samples of the SVE exhaust gas will be collected for analysis of TCL VOC concentrations in accordance with the QAPP. Weekly PID measurements will be taken from the influent to the first vessel, in between vessels and from the exhaust from the second vessel in order to monitor the need for carbon change. When breakthrough is measured from the first vessel, the carbon will be changed and the second vessel will become the primary vessel. In this manner, there will always be a safety factor of the second clean vessel.

A summary of the Remedial Action Monitoring Program is presented in Table 2.10.

TABLE 2.10

COMPLIANCE MONITORING SUMMARY
WAUSAU WATER SUPPLY SITE REMEDIAL ACTION

Task	*Locations*	*Frequency*	*Parameters*
Soil Monitoring	Source Areas[1]	Before, mid-point and at end of SVE operation period	Site VOCs[2]
Soil Gas Monitoring	Source Areas[1]	Prior to SVE start-up, weekly during first month, monthly for two months, Quarterly thereafter	Site VOCs
		Monthly PID reading	Site VOCs
SVE System Monitoring	SVE Exhaust Gas	Weekly during first month, monthly for two months, Quarterly thereafter	TCL VOCs
Water Level Monitoring	Wells listed in Table 2.1	Semi Annual, Quarterly from core wells	Water Levels
Groundwater Quality Monitoring	Core Locations - Table 2.2	Quarterly	Site VOCs
	Comprehensive Locations - Table 2.3	Prior to start-up, annually thereafter	Site Specific Analyte List
	Indicator Wells - Table 2.5	Prior to system start-up and annually thereafter	TCL, TAL
Verification of Compliance Sampling	Comprehensive Locations Table 2.3	Quarterly for one year following achievement of compliance criteria in groundwater	TCL VOCs, Site Specific Analyte List
Groundwater Treatment Monitoring	Treatment System Influents	Monthly	Site VOCs
	Treatment System Effluents	Monthly	pH, Site VOCs and site metals[3]
	Treatment System Effluents	Annual	TCL, TAL

Notes:
1. Source Areas - Specific soil sampling and gas probe locations are shown in figures 2.1 through 2.4
2. Site VOCs - Site specific VOCs listed in Table 2.4.
3. Site Metals - Any metals required based on Site Specific Analyte List and TAL analyses. If no metals are identified at levels of concern, monthly metals analyses would not be conducted following the first year of operation.

3.0 PROTOCOLS

All field protocols will be conducted using the following procedures. Any revisions will be reviewed and approved by USEPA and WDNR.

3.1 WATER LEVEL MONITORING PROTOCOL

Water level measurements will be taken quarterly in accordance with Section 2.2 and prior to purging and sampling for chemical analysis.

All water levels in monitoring wells will be measured according to the following protocols:

1. The sampler will measure and record the depth to water in each well to the nearest 0.01 foot using an electric tape or plopper.

2. The bottom three feet of the measuring device will be rinsed with distilled water prior to use in each well.

Water level in the extraction well will be recorded from a continuous monitoring instrument located at its well head. Water levels in the Wisconsin River and Bos Creek will be recorded from staff gages SG1 and SG2, respectively. Water levels are taken at least weekly from City production wells. Data from these wells will be incorporated during monitoring events.

3.2 SOIL SAMPLING PROTOCOL

3.2.1 Drilling and Sampling Procedure

All boreholes will be advanced with hollow-stem augers with an inside diameter of 4-1/4 inches. However, if difficulties occur with

installation procedures a larger diameter (6-1/4 inches inside diameter) will be used. During the completion of the borehole, continuous split-spoon samples will be collected to define the stratigraphy of the borehole.

All soil samples will be obtained in accordance with ASTM D1586-84. They will be collected with a split spoon sampler fitted with a removable, sealable brass liner. The split-spoon sampler will be attached to the drill rod and driven into the soil the full depth (24 inches) using a 140-pound hammer, free-falling 30 inches. The driving resistance (number of hammer blows) will be recorded for each 6-inch increment of penetration. If the soil is loose, wet, or in any way unconsolidated (as expected), clean basket retainers will be used to retain the soil in the split spoon. Between each sampling, the split spoon will be cleaned as per Section 3.2.2.

All soil samples will be described and classified according to the Unified Soil Classification System and then a portion will be stored in glass jars for geologic record. Soils for geologic record will be collected following collection of samples for VOC analyses. A record of all soil sampling will be recorded on WDNR Soil Boring Log Information forms (Form 4400-122) which will be maintained by the site geologist. All samples retained for geologic record will be stored on site.

The soil samples collected in the split-spoon samplers will be prepared in the following manner for chemical analyses:

1. Prior to each sampling, the split spoon, brass liner and all other instruments used in extracting the soil samples for chemical analyses will be precleaned using the prescribed rinse sequence (Section 3.2.2). A new pair of disposable latex gloves will be used for each sample handled. Disposable gloves and rinsings will be collected and contained for proper disposal.

2. Each soil sample for VOC analyses will be obtained and prepared in the following manner:

a) Upon opening of the split spoon sampler, the brass liner will immediately be trimmed and removed from the spoon. Aluminum foil and an air tight plastic cap will be placed over each end of the brass tube.

b) The sample label will be attached and the sample tube will immediately be placed on ice or cooler packs in laboratory supplied coolers.

3. Containers for sample collection will be prepared in accordance with the QAPP. QA/QC samples (blind field duplicate, matrix spike and matrix spike duplicate, rinsate blank and VOC trip blanks) will be collected or prepared as specified in the QAPP.

4. Soil samples will be labeled noting the sampling location, depth, time and sampler's initials. A separate hard-cover field book will be maintained to document all soil samples and sampling events (including: date and time collected, sample handling and storage, preservation and labeling, field measurements, characteristics of each sample taken, and weather conditions).

3.2.2 Equipment Cleaning

Upon mobilization of the drill rig to the site, and prior to commencing drilling, the rig and all associated equipment will be thoroughly steam cleaned to remove oil, grease, mud and other foreign matter. Cleaning will take place in the designated on-site decontamination area. Subsequently, before initiating drilling at each borehole, the augers, cutting bits, drill steel and associated equipment will be steam cleaned to prevent cross-contamination from the previous drilling location.

Decon water will be collected and discharged to the sanitary sewer. Cleaning of soil sampling equipment (e.g. split spoon

samples) will be accomplished by flushing and wiping the components to remove all visible sediments followed by:

i) clean with tap water and laboratory detergents, using a brush if necessary, to remove particulate matter and surface films;

ii) rinse thoroughly with tap water;

iii) rinse with isopropanol;

iv) allow the equipment to air dry as long as possible;

v) final distilled water rinse; and

vi) wrap with aluminum foil, if appropriate, to prevent contamination if the equipment is going to be stored or transported.

Following final rinse, openings will be visually inspected to verify they are free of soil particulates and other solid material which may contribute to possible sample cross-contamination.

Fluids used for cleaning will not be recycled. All wash water and rinse water will be collected and discharged to the sanitary sewer. Decontamination fluids (isopropanol) will be collected and stored in containers for disposal in accordance with State and Federal regulations.

Soil borings will be backfilled with remaining soil cuttings, if no confining layers have been encountered, to a depth of three feet bgs. The upper three feet will be backfilled with a cement/bentonite grout mixture in accordance with WDNR requirements. Borehole abandonment will be documented using WDNR Well/Drillhole/Borehole Abandonment form (Form 3300-5B).

3.3 GROUNDWATER SAMPLING PROTOCOL

The order of sample collection for each sample fraction will be as follows:

1. Volatile fraction
2. Metals fraction
3. Base, Neutral/Acid fraction
4. Pesticide/PCB fraction
5. Cyanide fraction

3.3.1 Monitoring Well Sampling

All monitoring wells will be sampled according to the following protocols:

1. New disposable latex gloves will be used when sampling each well. Additional glove changes will be made for each sampling.

2 The sampler will measure and record the depth to water in each well to the nearest 0.01 foot using an electric tape or plopper.

3. Prior to sampling, each well will be purged, using a low volume teflon bladder stainless steel pump fitted with teflon purging and air supply lines attached to a nylon rope. A minimum of three times the standing water volume in the well will be removed, or until conductivity, temperature, pH, turbidity, dissolved oxygen and redox potential stabilize in the purge water. In the event that a well is purged dry prior to achieving three well volumes, groundwater will be permitted to recover to a level sufficient for sample collection. The time that the well was purged dry will be noted and well recovery will be monitored. Upon recovery, a bladder pump will then be used for sample collection. In the event that there is insufficient water in the well to use a pump, a bailer will be used to collect the sample. Prior to use in each well, the bladder pump or bailer will be precleaned as follows:

   1) Washed thoroughly with Alconox or equivalent;

   2) Rinsed with potable water;

   3) Rinsed with isopropanol;

   4) Allowed to air dry;

   5) Wrap with new aluminum foil; and

   6) A final distilled water rinse prior to purging.

   All waste groundwater, not used for samples, will be collected and discharged to the sanitary sewer. Waste groundwater from the west side monitoring well sampling will be discharged to the Interim Action treatment manhole if it is in closer proximity than the sanitary sewer.

4. Field measurements of pH, conductivity, turbidity, dissolved oxygen, redox potential and temperature will be recorded prior to sample collection. Calibration of field instruments will be conducted as specified in the QAPP.

5. After the required standing well water has been purged, water samples will be collected using a teflon bladder stainless steel pump, fitted with teflon purging and air supply lines, attached to a nylon rope. The groundwater samples will be collected from the purge line of the bladder pump used to purge the well. New nylon rope, where applicable, will be used for each monitoring well.

6. Containers for sample collection and preservation requirements will be prepared in accordance with the QAPP. QA/QC samples (blind field duplicate, matrix spike and matrix spike duplicate, rinsate blank and VOC trip blanks) will be collected or prepared as specified in the QAPP.

7. All disposable gloves and nylon ropes will be placed in DOT approved 55-gallon drums and stored at a designated area. All drummed waste will be disposed of in accordance with State and Federal regulations. All rinsings will be handled as discussed in item (3), above.

8. Samples will be labeled noting the well location, date, time and sampler's initials. A separate hard-cover bound field notebook will be maintained describing the sampling history (including: date and time of collection, sample handling and storage, preservation and labeling, field measurements, details pertaining to well purging and characteristics of each sample taken, and weather conditions).

9. Samples will be placed on ice or cooler pack in laboratory supplied coolers immediately following collection and labeling.

3.3.2 Well Head Sampling

The production and extraction well (influent) head sampling will be conducted in accordance with the following protocols:

1. New disposable latex gloves will be used when collecting the water samples.

2. The samples will be collected by the grab sample method directly into the precleaned sample containers. The samples will be collected at the well head directly from sampling ports.

3. Containers for sample collection and preservation requirements will be prepared in accordance with the QAPP. QA/QC samples (blind field duplicate, matrix spike and matrix spike duplicate, and VOC trip blanks) will be collected or prepared as specified in the QAPP.

4. Samples will be labeled noting the sampling location, date, time and sampler's initials. A separate hard-cover field book will be maintained to document all samples and sampling events. Weather conditions at the time of sampling will be noted.

5. Samples will be placed on ice or cooler packs in laboratory supplied coolers immediately following collection and labeling.

3.3.3 Treated Groundwater Effluent Sampling

The treated groundwater (effluent) samples will be collected in accordance with the following protocols:

1. New disposable latex gloves will be used when collecting the sample.

2. The samples will be collected by the grab sample method directly into the precleaned sample containers. The Marathon Electric extraction sample will be collected from the rip rap lined discharge structure immediately prior to the point where the treated groundwater enters the Wisconsin River. The City of Wausau sample will be collected from the effluent from the air stripping towers.

3. Containers for sample collection and preservation requirements will be prepared in accordance with the QAPP. QA/QC samples (blind field duplicate, matrix spike and matrix spike duplicate, and VOC trip blanks) will be collected or prepared as specified in the QAPP.

4. Samples will be labeled noting the sampling location, date, time and sampler's initials. A separate hard-cover field book will be maintained to document all samples and sampling events. Weather conditions at the time of sampling will be noted.

5. Samples will be placed on ice or cooler packs in laboratory supplied coolers immediately following collection and labeling.

3.3.4 SVE Exhaust Gas Monitoring

The SVE exhaust gas samples will be collected from the exhaust side of the SVE vacuum blower upstream from the first activated carbon unit and from downstream of the second carbon unit. The samples will be collected in accordance with the following protocols:

1. New disposable latex gloves will be used when collecting the sample.

2. The samples will be collected by attaching a pre-evacuated, 6-liter Summa gas canister to the exhaust sampling port using Swageloc compression tube connectors.

3. The samples will be collected while the vacuum blower is operating at its nominal flow rate and pressure by opening both the sample port valve and the Summa canister valve.

4. The valves will be left open until the pressure on the canister has equilibrated with that on the SVE exhaust line as indicator by a pressure gauge on the intake of the canister.

5. The valve on the canister will be closed and then the valve on the exhaust port will be closed.

6. The canister will be labeled with the location, time, date, sampler name and exhaust pressure as specified in the QAPP. QA/QC samples (duplicates, trip blanks) will be collected as specified in the QAPP.

7. The samples will be shipped to the laboratory within 24 hours of collection.

3.3.5 Soil Gas Monitoring

Permanent discrete soil gas probes will consist of six to twelve inch length slotted or scintered probes connected to one-quarter inch diameter teflon tubing. Probes will be placed at the prescribed depths using a van-mounted Geoprobe™ probe-driving unit. Depth averaged probes will consist of five feet lengths of sampling probe at the East Side site and twenty feet lengths at the West Side site. Where probes cannot be advanced on the West Side site, conventional hollow-stem augering techniques will be utilized. Soil probes will be completed at the surface with steel protective casings.

Soil gas samples will be collected from all of the permanent monitoring probes for on-Site field laboratory analysis according to the following protocols:

1. New disposal latex gloves will be used when collecting the sample.

2. Samples will be collected after the SVE system has been shut-off at least 48 hours for the quarterly sampling. Samples collected during the weekly and monthly sampling will be collected while the SVE system is operating.

3. The soil gas sample will be collected by inserting a syringe needle through the silicone tube and into the sampling valve outlet port.

4. The glass sampling syringe will be purged three times prior to collecting a soil gas sample for analysis. The sample will be drawn after a minimum of five probe volumes have been purged from the probe and before the vacuum pump is turned off.

5. After the syringe sample has been collected, the vacuum pump will be turned off and the sampling valve is shut.

6. The silicone tube will then be removed from the sampling valve and a 100 ml. glass syringe is connected.

7. The sampling valve will again be opened and another sample is drawn for field screening, if necessary.

8. On-Site analysis of syringe samples will be conducted as quickly as possible to minimize any VOC losses. Glass/Teflon syringes and syringe valves or needle plugs are used to maintain sample integrity between sample collection and analysis.

Confirmatory soil gas samples will be collected from 10% of the permanent monitoring probes during the quarterly soil gas monitoring events according to the following protocols:

1. New disposable latex gloves will be used when collecting the sample.

2. Samples will be collected after the SVE system has been shut-off at least 48 hours.

3. Samples will be collected by attaching a pre-evacuated Summa gas canister and portable vacuum pump with a T-connector to the probe with the valves on the probe and canister closed.

4. The probe will be evacuated for a sufficient time to remove three probe volumes of gas at standard temperature and pressure. The probe

evacuation volume will be calculated based on the volume of the tubing leading to the sampling interval and the approximate pore volume of the sand pack in the sampling interval.

5. After purging is complete but prior to shutting off the vacuum pump, the valve between the pump and the T-connector will be closed. The vacuum pump will then be shut off.

6. With the probe valve open and the canister valve shut, the probe will be allowed to equilibrate to ambient pressure.

7. After the vacuum gauge on the probe has read zero vacuum for one minute, the valve on the Summa canister will be opened to collect the sample. Sampling will be complete after the vacuum gauge on the probe has read zero vacuum for one minute and the valves on the canister and the probe will be closed.

8. The canister will be labeled with the location, time, date and sampler name as specified in the QAPP. QA/AC samples (duplicates, trip blanks) will be collected as specified in the QAPP.

9. The samples will be shipped to the laboratory within 24 hours of collection.

3.4 REPORTING

3.4.1 Compliance Monitoring Reports

As specified in Section 7.4 of the RD/RA Work Plan, compliance monitoring and testing reports will be completed on a periodic basis and will detail monitoring and testing results. An annual report for each operating year will be submitted summarizing:

- the operations for the year;
- monitoring activities;
- analytical results, and
- progress/status of the Site remediation program.

The annual report will also include any recommended changes to the monitoring program.

3.4.2 Monthly Progress Report

As specified in the Consent Decree, monthly progress reports will be prepared and submitted to the USEPA and WDNR during the duration of the operation of the system and will contain:

- a description and estimate of the percentage of the final remedy completed;
- summaries of all findings;
- summaries of all approved changes made in the final remedy during the reporting period;
- summaries of all contacts with representatives of the local community, public interest groups or State government during the reporting period;
- summaries of all problems or potential problems encountered during the reporting period;
- actions being taken to rectify problems;
- changes in personnel during the reporting period;
- projected work for the next reporting period; and

- copies of daily reports, inspection reports, laboratory/monitoring data, etc.

3.4.3 Modifications

Modifications to the MPP and performance criteria may be suggested by the PRP Group, or required by USEPA/WDNR, based on the compliance monitoring reports. Any modifications to the MPP will require approval by USEPA in consultation with WDNR.

APPENDIX A

WAUSAU WATER SUPPLY NPL SITE
SOIL SAMPLING METHODOLOGY

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WAUSAU WATER SUPPLY NPL SITE
SOIL SAMPLING METHODOLOGY

1) A random sampling procedure will be used in selecting the sampling locations. The random sampling procedure makes the interpretation of the results much simpler and, with an irregularly-shaped region, with varying concentrations, the random sampling procedure is more defensible.

2) Observations regarding the data are:

   There really are three separate populations at a given depth interval which we are trying to learn about. Random sampling only functions when you have no reason to suspect that there are significantly different concentrations (i.e. you presuppose that all of the areas within a 'population' may have the same contaminant level).

   From the soil gas experiments, it is known that the concentration levels in the soil are significantly higher in some regions than the levels in other regions. Sampling will, therefore, be set up as:

   i) Group 1 - low levels of contamination at the East Bank, shallow depth (0 to 5 feet);

   ii) Group 2 - higher levels of contamination at the East Bank, shallow depth (0 to 5 feet); and

   iii) Group 3 - all areas within the area of contamination at the West Bank, shallow depth (0 to 7 feet).

   Groups 1 and 2 will also be applied at the deeper sampling depth at the East Bank. Each depth interval at the West Bank will be treated as a population for statistical purposes.

3) Each sample is a random realization - a possible outcome. The location of one sampling point is selected independently from all others (all that we have to ensure is that each is within the potential area involved).

4) Following the laboratory analyses, the individual sample results will be ranked and plotted on a graph as shown in Figure 1. Each of the separate populations would have their individual graph.

   We look for the data to plot as a reasonably straight line. There are many types of probability paper which may be employed in the plotting but frequently the

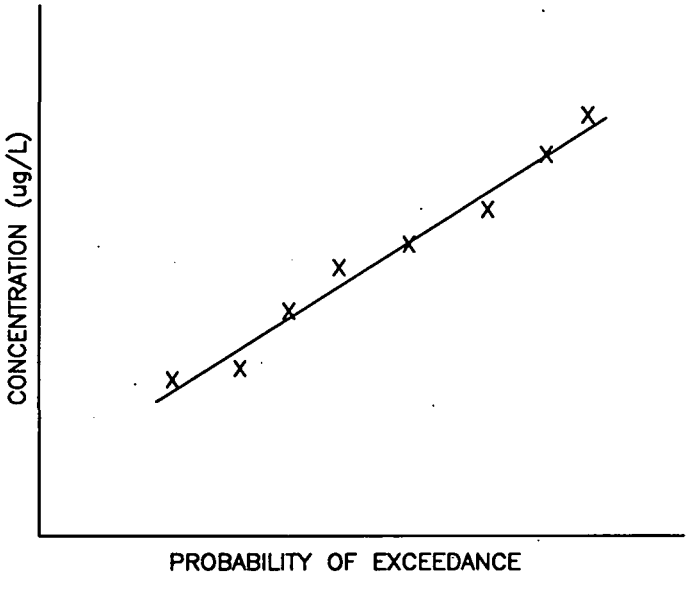

figure 1
SOIL SAMPLING RESULTS
Wausau Water Supply NPL Site

CRA

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lognormal distribution is a useful descriptor. The lognormal distribution is frequently a good descriptor of such data for the following reasons:

i) the distribution is bounded at zero and this coincides with the constraint that you cannot have negative concentrations;

ii) the distribution is unbounded on the high side and this coincides with the idea that there are no limits on the high side of concentrations;

iii) the central limit theorem which essentially indicates that a large number of components, when combined to create a phenomena, tend to have a normal distribution when additive one to another, and tend to have a lognormal distribution when multiplicative one to another.

The lognormal distribution is a two-parameter distribution. This means that only the mean and standard deviation have to be estimated, to estimate probabilities of exceedance. Thus, the distribution is simple to employ.

Once a distribution is determined to characterize the data to an acceptable degree, then estimates of the percentage of the site that exceed a cleanup standard can be obtained from the concentration/probability graph.

The estimation of the mean and variance typically requires ten to fifteen measurements for a lognormal distribution. The smaller areas of higher concentration could have 10 to 12 sampling points, while the larger areas with lower concentrations would have 15 sampling points. Wausau Chemical may require more than 15 sampling points because the lower concentration area includes the north loading lock.

5) Following receipt of the chemical analyses, we will test to see if there are differences between the populations. This can be accomplished by testing for differences between the means and the standard deviations of the sample sets. In the event of no statistically significant differences, the results from the individual populations will be aggregated into larger databases (and analyzed as discussed above).

We will have a re-sample provision where, in the event of a very poor fit of the data (the data do not plot on a reasonably straight line), then additional samples may be needed to be collected during subsequent events.

6) Sampling and Analyses Following Remediation - The results of pre-remediation and post-remediation analyses will be prepared in a manner as indicated above. Assuming the effectiveness of the SVE remediation, then the data should plot as indicated in Figure 2. The post-remediation curve will indicate the percentage of the site that is in excess of the specified cleanup standard (and hopefully be at an

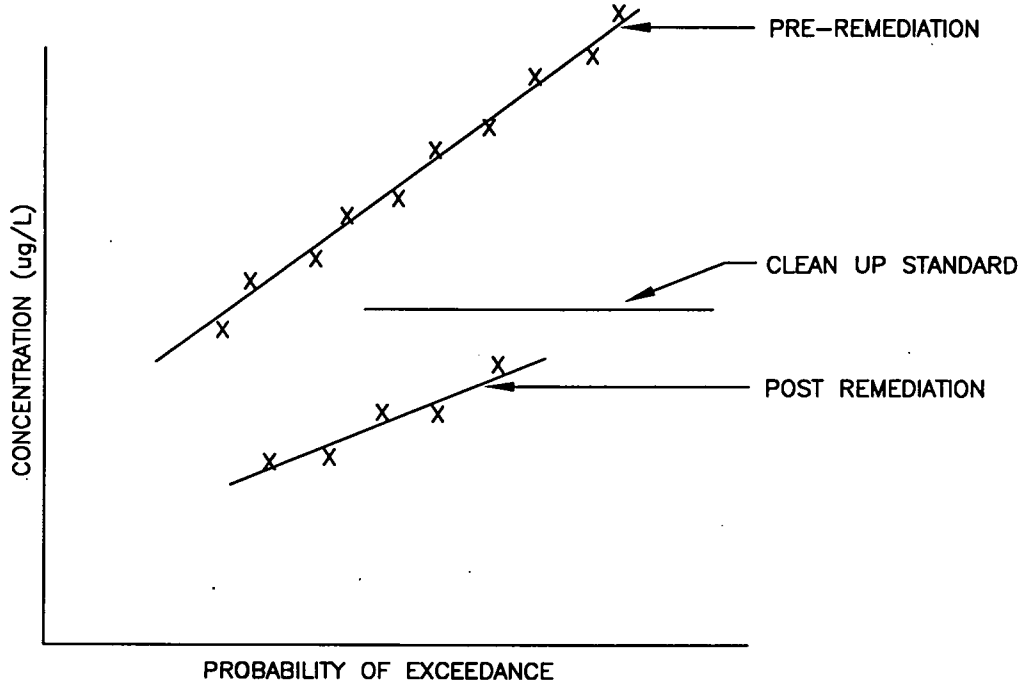

figure 2
SOIL SAMPLING EVALUATION
Wausau Water Supply NPL Site

CRA

inconsequential level).

One potential problem could occur if we get a lot of 'nondetects'. This is effective in showing that the remediation has been effective, but on the data analysis side, it is difficult to develop a statistical fit to the data since all that is known is that a particular value is less than some specific value. If this happens to a large extent, then we will look at correlation structures between various contaminants.

APPENDIX B

1994 - 1995 SAMPLING SCHEDULE

WAUSAU WATER SUPPLY NPL SITE

1994 - 1995 SAMPLING SCHEDULE - WAUSAU WATER SUPPLY NPL SITE SOIL GAS

SOIL GAS/ON-SITE ANALYSIS

Monthly (HNu) (2 Days)		*Quarterly* (Gas Chromatograph (GC)) *(1 Week)*	
1994	***1995***	***1994***	***1995***
*2/7/94	2/6/95	4/11/94	1/9/95
*3/7/94	3/13/95	7/11/94	4/10/95
5/9/94	5/8/95	10/17/94	7/10/95
6/6/94	6/5/95		10/16/95
8/15/94	8/7/95		
9/12/94	9/11/95		
11/14/94	11/13/95		
12/12/94	12/11/95		

* Full GC On-Site Analysis Monthly Round

SVE EXHAUST/OFF-SITE ANALYSIS

Monthly		*Quarterly*	
1994	***1995***	***1994***	***1995***
2/7/94	--	4/11/94	1/9/95
3/7/94		7/11/94	4/10/95
		10/17/94	7/10/95
			10/16/95

Locations of SVE Exhaust samples for off-Site analysis.

1) Blower Exhaust Prior to Carbon
2) Final Exhaust After Carbon

1994 - 1995 SAMPLING SCHEDULE
WAUSAU WATER SUPPLY NPL SITE
SOIL GAS

SVE EXHAUST/ON-SITE ANALYSIS

Locations of sample points for monthly HNu sampling

(Actual Date as per Soil Gas Rounds)

HNu Sampling Locations
1) Blower Exhaust Prior to Carbon Units
2) Between Carbon Units
3) Final Exhaust After Carbon Units
4) Each Well Line

Sample Locations for weekly On-Site HNu sampling by Wausau PRP personnel
1) Blower Exhaust
2) Blower Exhaust between Carbon Units
3) Final Exhaust After 2nd Carbon Unit

Sample Location for Gas Chromatograph (GC)
1) Blower Exhaust
2) Blower Exhaust Between Carbon Units
3) Each Well Line at Manifold

Note:
All sampling rounds consist of all 65 Soil Gas Probes.

1994 - 1995 SAMPLING SCHEDULE
WAUSAU WATER SUPPLY NPL SITE
WATER

Water Treatment System Monthly (1/2 Day) EW1	*Core Wells Quarterly (2 Days) 12 Wells*	*Comprehensive List Annual (7 Days) 44 Wells*
1/25/94	4/11/94	10/17/94
2/21/94	7/11/94	10/17/95
3/21/94	1/17/95	
4/11/94	4/18/95	
5/16/94	7/18/95	
6/20/94		
7/11/94		
8/22/94		
9/19/94		
11/14/94		
12/12/94		
1/17/95		
2/21/95		
3/20/95		
4/18/95		
5/23/95		
6/19/95		
7/18/95		
8/22/95		
9/19/95		