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# GROUNDWATER MONITORING PROGRAM EXTRACTION WELL AND MONITORING WELL NETWORK

Marathon Electric Manufacturing Company
Wausau, Wisconsin

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# GROUNDWATER MONITORING PROGRAM EXTRACTION WELL AND MONITORING WELL NETWORK

Marathon Electric Manufacturing Company
Wausau, Wisconsin

AUGUST 1990
REF. NO. 2115 (10)

CONESTOGA-ROVERS & ASSOCIATES

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# 1.0 INTRODUCTION

In accordance with a Record of Decision - Selected Interim Remedial Alternative signed December 23, 1988, Marathon Electric Manufacturing Company (Marathon) is proceeding with an extraction well and associated treatment/discharge outlet installation. The purpose of the extraction well is to create a cone of depression capable of containing a contaminant plume source to prevent further migration toward City production wells.

The extraction well and associated treatment/discharge structures will be installed at the Marathon facility in Wausau, Wisconsin. The Site is located along the west side of the Wisconsin River within the City of Wausau. A regional and site location map are shown in Figures 1.1 and 1.2, respectively. The location of the extraction well and existing monitoring wells are shown on Figure 1.3.

This Groundwater Monitoring Program (GPM) has been prepared to address monitoring requirements necessary to assess the operation of and impacts from the groundwater extraction, treatment and discharge system.

Health and safety considerations to be adhered to during the monitoring activities are addressed herein.

A Quality Assurance Project Plan (QAPP) for the GMP has been prepared by CRA and is submitted under separate cover.

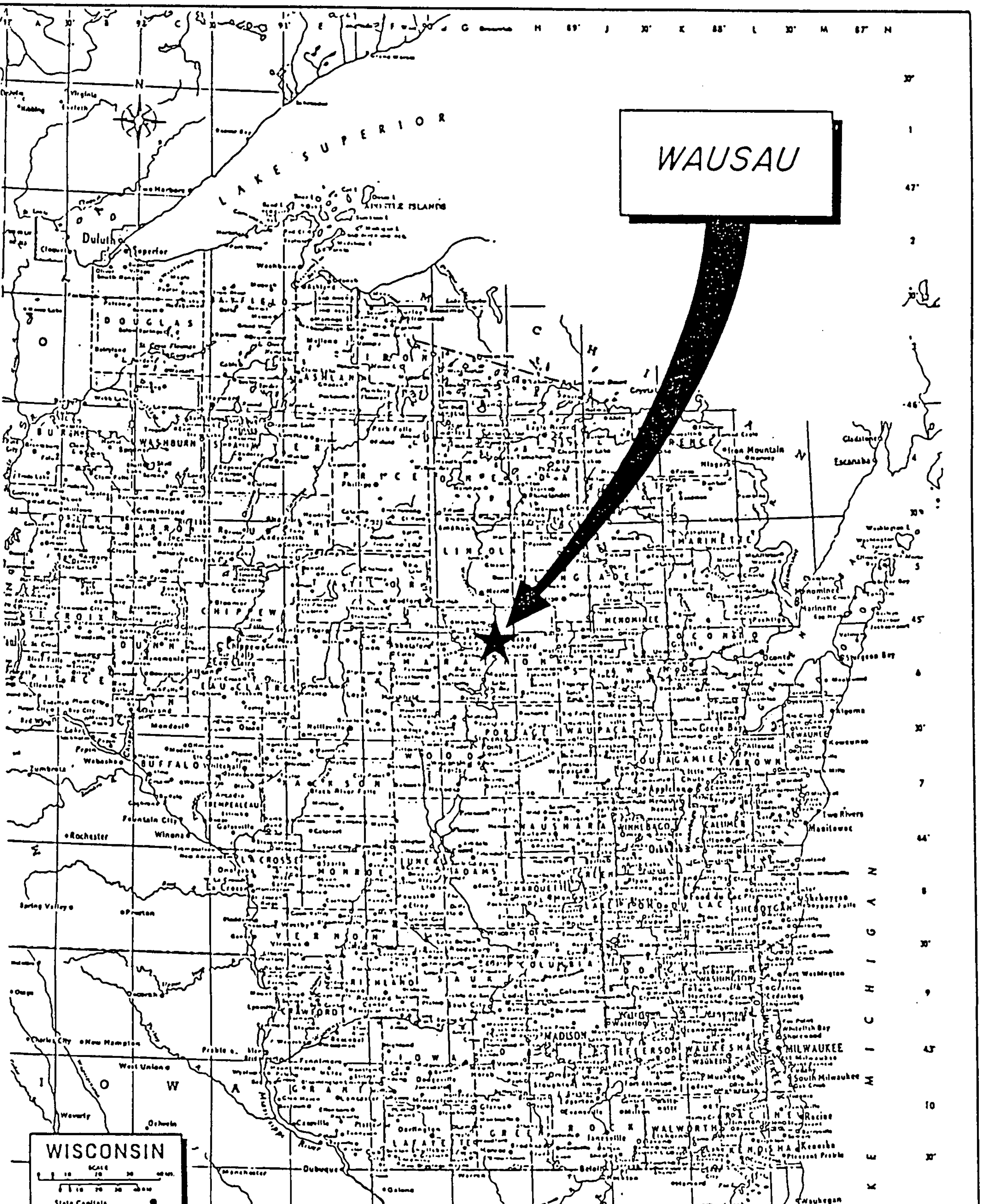
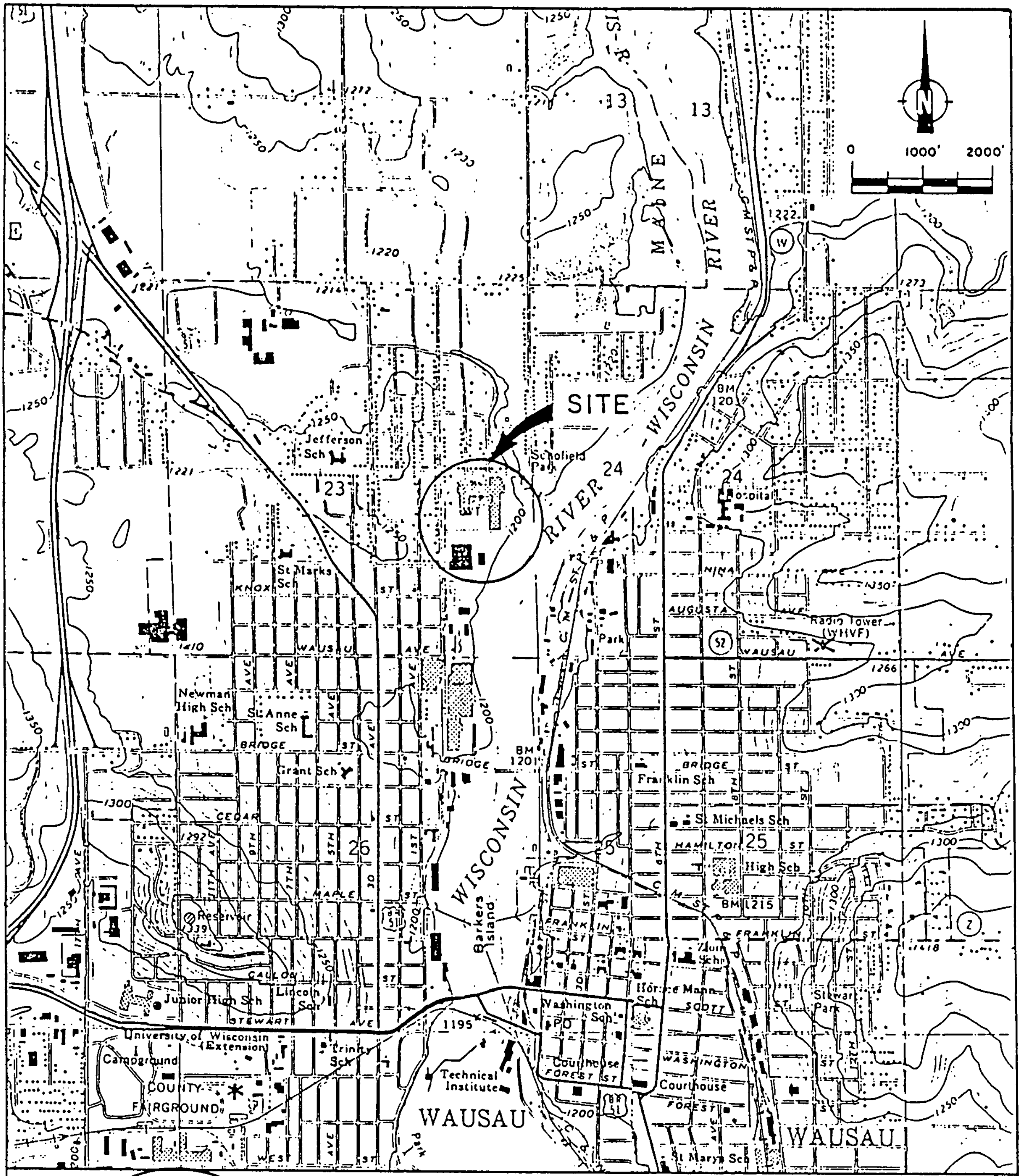


figure 1.1

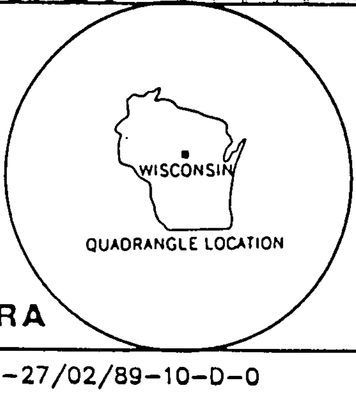
REGIONAL LOCATION MAP

*Marathon Electric Manufacturing Co.*

**CRA**



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



QUADRANGLE LOCATION

CRA

figure 1.2

SITE LOCATION

*Marathon Electric Manufacturing Co.*

2115-27/02/89-10-D-0

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

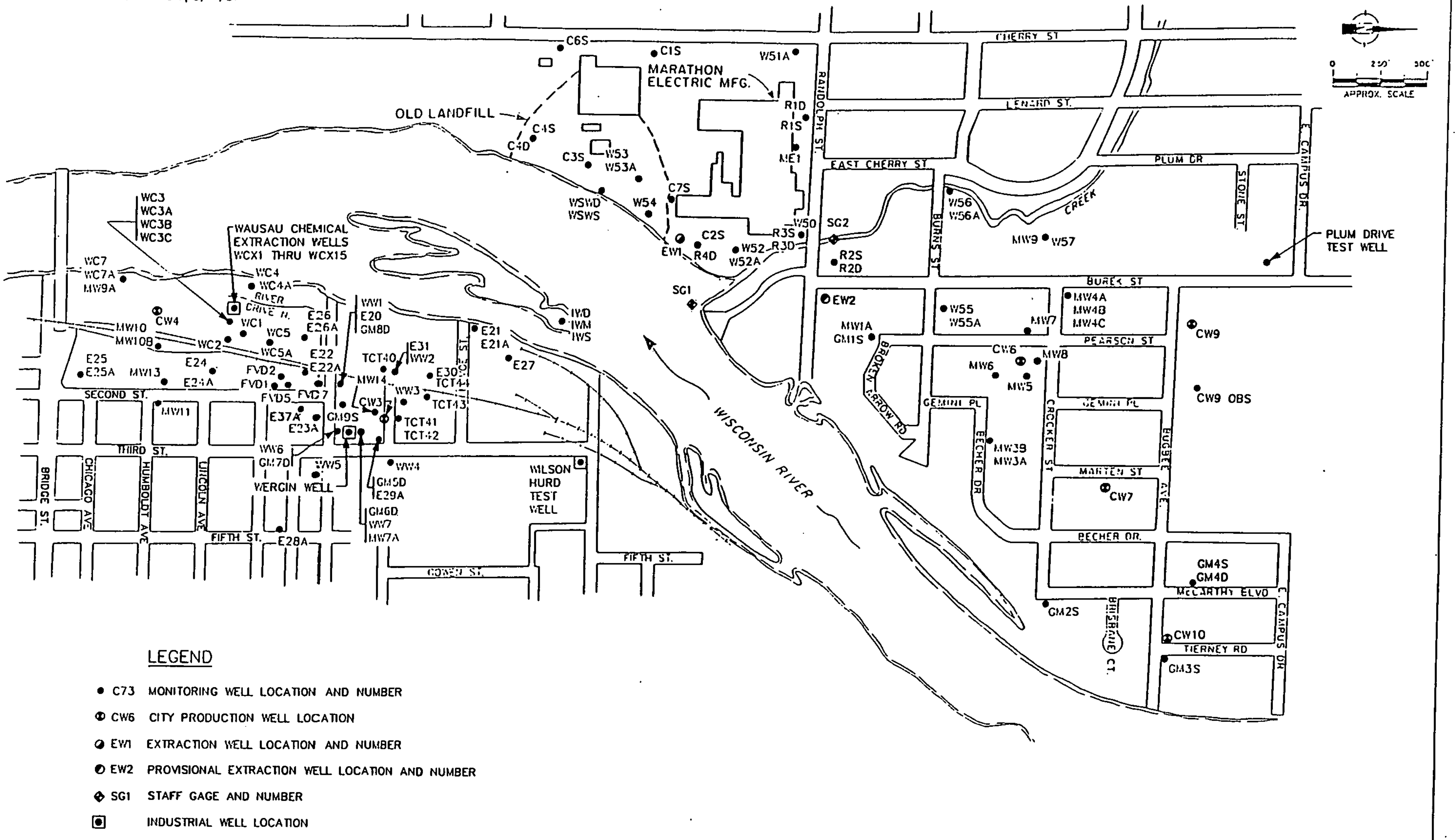


figure 1.3

EXTRACTION WELL AND MONITORING WELL LOCATIONS
*Marathon Electric Manufacturing Co.*

CRA

2115-2/03/89-11-0

## 1.1 STATEMENT OF PURPOSE

The objectives of the GMP are as follows:

- To monitor the effectiveness of the extraction system in reducing VOC groundwater contamination;
- To monitor the effectiveness of extraction system in creating hydraulic conditions (cone of depression) to control a west side plume contaminant source from further migrating to City production wells; and
- To monitor treated groundwater prior to surface water discharge.

In order to provide representative data to satisfy the above objectives, the GMP, presented herein, presents monitoring requirements including networks, parameters, frequencies and protocols to be adhered to.

## 2.0 BACKGROUND INFORMATION

### 2.1 CITY OF WAUSAU WELL FIELD

The City of Wausau is located along the Wisconsin River in Marathon County, Wisconsin. The Wausau Groundwater Contamination Site encompasses an area in the northern section of the city which includes the City Well Field and five of its production wells (see Figure 1.3).

The City of Wausau provides drinking water for approximately 33,000 people. The City presently operates seven groundwater production wells, six of which are located on the north side of the City. The seventh well, Production Well CW8 (CW8), is located adjacent to the Wausau Municipal Airport, on the south side of the City. The water from CW8 has a high concentration of iron and is used only during peak demand periods. Production Wells CW6, CW7, CW9 and CW10 are located west of the Wisconsin River and are collectively referred to as the West Well Field. The West Well Field (Figure 1.2) is located in a predominantly residential area, although a few industrial facilities are located in this area. Production wells CW3 and CW4 are located on the east side of the Wisconsin River and are referred to as the East Well Field. Well CW4 is used only during peak demand periods. The East Well Field is located in a predominantly industrial section of the City.

The seven production wells are screened in an aquifer of glacial outwash and alluvial sand and gravel deposits which underlie and are adjacent to the Wisconsin River. This unconfined aquifer supplies nearly all potable, irrigation, and industrial water to residents and industries located in Wausau and the surrounding areas. Within the study area the alluvial aquifer ranges from 0 to 160 feet thick, and has an irregular base and lateral boundaries.

## 2.2 HISTORICAL WELL FIELD CONTAMINATION

The City of Wausau discovered in early 1982 that its production wells CW3, CW4, and CW6 were contaminated by volatile organic compounds (VOCs) predominantly with the volatile halogenated hydrocarbons (VHHs) tetrachloroethene (PCE), trichloroethene (TCE) and dichloroethene (DCE). Trichloroethene (TCE) is the predominant volatile organic compound detected at CW6, although below method detection limit (BMDL) concentrations for tetrachloroethene (PCE) and 1,2-Dichloroethene (DCE) have also been previously reported (Weston, 1984). Since the contamination was first detected in early 1982, TCE concentrations from CW6 have ranged from 70 micrograms per liter (µg/*l*) to 260 µg/*l*. Sampling conducted in March 1988 indicated TCE concentrations of approximately 160 µg/*l*. Sample results from the East Well Field (CW3 and CW4) have indicated PCE, TCE, and DCE impact at both wells. CW4 has generally indicated steadily decreasing concentrations of the three constituents since February 1984. CW3 has indicated decreasing PCE and DCE concentration since the VOCs were discovered in early 1982. However, TCE concentrations at CW3 have remained relatively constant at concentrations ranging between 80 µg/*l* and 210 µg/*l*.

To reduce VHH concentrations, the City originally instituted a program where uncontaminated water from CW9 and CW7 was blended with water from CW3, CW4, and CW6 to dilute the VHH concentrations.

In 1983, the United States Environmental Protection Agency (U.S. EPA) awarded the City of Wausau a federal grant to help fund the design and installation of a packed tower air stripper in order to provide sufficient water of acceptable quality to City residents. As an interim measure in June 1984, the U.S. EPA installed a granular activated carbon (GAC) treatment system on CW6. Air stripping towers were installed in the Summer and Fall of 1984 at the City water treatment plant to treat water from CW3 and CW4. Subsequently, the GAC system was removed from service in October 1984. In December 1985 the Wausau Groundwater Contamination Site was added to the National Priorities List (NPL) for remedial activities under Superfund.

The City blends water treated for VHH removal with water from uncontaminated supply sources (CW7, CW9 and CW10) to reduce VHH concentrations in the water supply distribution system. In July 1988, an additional crossing was completed, which enabled the City to pipe contaminated water from CW6 to the treatment plant.

Data indicate that prior to treatment (pre-July 1984), the water supply consistently contained trichloroethene (TCE) with concentrations ranging from detectable levels to 80 µg/L. Lower levels of tetrachloroethene (PCE) and 1,2-dichloroethene (DCE) were identified shortly after discovery of the contamination, probably before blending had reduced the levels of VHHs. Following installation of the treatment systems, the water supply distribution system has had relatively low levels of VHHs (generally below detection limits <1.0 µg/L). These levels are dependent on continued effective operation of the packed column air stripper treatment system, the influent VHH concentrations for each well, and continued use of the three clean wells (CW7, CW9 and CW10).

## 2.3 PREVIOUS STUDIES

Previous investigations have identified several potential point sources of VOC contamination in the vicinity of City production wells. Table 2.1 lists the previous studies conducted.

## 2.4 WELL FIELD CURRENT STATUS

### 2.4.1 Current Status

A RI/FS was conducted for U.S. EPA by its contractor, Warzyn Engineering, Inc. The RI entailed two phases of field sampling events. Phase I of the RI field work was conducted from August 1987 through January 1988, results of which are summarized in an April 1988 technical memorandum. Phase II of the RI field work was conducted from June to September 1988. Results of this phase of work are included in the RI report for the site dated July, 1989. A draft final FS, dated August 1989, which

## TABLE 2.1

## HISTORIC REPORTS ON WAUSAU, WISCONSIN WATER SUPPLY SITE

1. Hydrogeological Investigation of Volatile Organic Contamination In Wausau, Wisconsin Municipal Wells, (for U.S.EPA), Roy F. Weston, Inc., September 1985.

2. Subsurface Exploration and Testing Program to Evaluate Ground Water Quality at the Wausau Chemical Facilities in Wausau, Wisconsin, (for Wausau Chemical Company), STS Consultants, Ltd., July 1984.

3. Investigation of An Abandoned City of Wausau Landfill, (for WDNR), CH$_2$M Hill, February 1986.

4. Existing Conditions Report and Exploration Program, Wausau East Municipal Well Field, Wausau, Wisconsin, (for WDNR), Twin City Testing Corporation, August 1986.

5. Groundwater Investigation, (for City of Wausau), Beecher Hoppe Engineers, Inc., 1983.

6. VOC Groundwater Investigation At The Former Wausau Energy Facility In Wausau, Wisconsin, (for Wausau Energy Corporation), Foth & Van Dyke and Associates, Inc., December 1986.

7. Hydrogeological Investigation of the Alluvial Aquifer Beneath City Well 6, Wausau, Wisconsin, (for City of Wausau and Marathon Electric), RMT, Inc. and Geraghty & Miller, Inc., July 1987.

addresses remediation of the entire site has been released for public review and comment.

The Wausau Water Supply Site consists of the City of Wausau well fields located each and west of the Wisconsin River (see Section 2.1). In July 1988, the City placed CW6, located in the west well field, back in service, which changed local hydrologic and hydrogeologic conditions. Due to the changing conditions, USEPA identified the need to begin a remedial response on the west side of the river. Therefore, a Phased Feasibility Study (PFS) was prepared for the west side plume portion of the Wausau Water Supply Site. The PFS was completed in September 1988.

### 2.4.2 West Side Plume

A contaminant plume, composed mainly of TCE, exists in the West Well Field and is being drawn toward CW6 due to pumpage. The apparent source area is located to the south in an area of an old City landfill located on Marathon property.

Until recently, CW6, which the City pumped directly into Bos Creek as waste, served as a blocking well to the rest of the West Well Field. The discharge of CW6 to Bos Creek resulted in a groundwater mound between the source area and CW6. The influence of the groundwater mound may not have fully penetrated the glacial outwash aquifer, but RI data suggest that the mound served effectively to divide the West Well Field contaminant plume into northern and southern portions. However, in summer 1988 the

City of Wausau placed CW6 back in service after completion of a transport pipe to carry contaminated water to the air stripper. Because of this, the pumping rate of CW6 has increased substantially, and the untreated discharge to Bos Creek has been discontinued. These two factors tend to increase the rate of migration from the source area toward CW6. Water from CW6 is treated for VOC removal using the existing air strippers at the water utility (see Section 2.2). However, if no further action is taken, CW6 will continue to serve as an interceptor well, providing the sole protection for the remaining wells in the West Well Field.

The scope of the PFS was limited to the contaminant plume impacting the West Well Field and CW6. Ultimately, the solution to protecting the West Well Field involved additional controls to prevent contaminants from migrating to the north from the source area. Due to the apparently slowed contaminant migration to the north caused by discharge of CW6 to Bos Creek, additional protection of the West Well Field was determined possible by preventing or limiting the extent of future contaminant movement to the north. Implementation of plume migration controls would effectively limit the time during which CW6 draws in contaminants.

The EPA's PFS evaluated alternatives to address plume migration control in the West Well Field of the site. The selected interim remedial alternative to address the West Well Field plume is recorded in the Record of Decision (ROD), dated December 1988.

The selected interim remedial remedy remains consistent with the final ROD for the entire Site and no mid-course corrections are necessary.

## 2.5 WELL FIELD CHARACTERISTICS

### 2.5.1 Hydrogeology

The City production wells are located within glacial outwash and alluvial sediments underlying and adjacent to the Wisconsin River. The aquifer is located within a bedrock valley which is underlain and laterally bounded by relatively impermeable igneous bedrock. Groundwater flow within the unconfined glacial aquifer has been drastically changed by the installation of the production wells. Under non-pumping conditions, groundwater flows toward the Wisconsin River and its tributaries (Bos Creek). Groundwater naturally discharges at the surface water bodies. However, under pumpage conditions, groundwater flows toward the production wells. The natural groundwater flow directions are frequently reversed due to City well pumping which induces recharge of surface water into the aquifer. The cone of depression from the East Well Field appears to affect groundwater flow below and to the west of the Wisconsin River. Monitoring well nests located at Marathon indicate very slight downward gradients adjacent to the Wisconsin River. Below the Wisconsin river, the East Well Field production well pumpage has induced surface water recharge of the aquifer, causing flow downward through the river bed and toward CW3.

Aquifer hydraulic conductivity tests performed indicate hydraulic conductivity values ranging from $1.7 \times 10^{-4}$ cm/sec to $8.1 \times 10^{-2}$ cm/sec. The overall average hydraulic conductivity of the outwash aquifer is approximately $2.2 \times 10^{-2}$ cm/sec, based on the hydraulic conductivity tests. Hydraulic conductivity values determined from pumping tests at CW6 indicate hydraulic conductivity values ranging between $2.8 \times 1.0^{-1}$ cm/sec and $9.7 \times 10^{-2}$ cm/sec.

### 2.5.2 West-Side Plume Chemical Characteristics

Groundwater quality sampling conducted during the RI indicated a vertical and lateral distribution of total chlorinated ethenes which suggested that a minimum of three sources are affecting the City well field.

West side monitoring wells appeared to delineate a deep (greater than 100-foot) north-south trending plume which affected CW6. This plume is predominantly composed of TCE, however, monitoring wells located within the southern portion of the plume also indicated relatively high (up to 890 µg/L) of 1,2-DCE concentrations. The maximum total chlorinated ethene concentrations were encountered within the plume approximately 500 feet south of CW6. Based on the vertical distribution of TCE throughout the aquifer in the vicinity of the former City landfill and the presence of TCE in the unsaturated zone in this area, a source appeared to be located in the area of an old City landfill located on Marathon property. The plume appeared to have migrated northward, under influence of the West Well Field, specifically, pumpage from CW6.

In general, ethene compounds (predominantly TCE and 1,2 DCE) have been found throughout the aquifer beneath the Marathon property/former City landfill. A maximum observed TCE concentration of approximately 5,000 µg/L was reported at the base of the aquifer during drilling of a monitoring well located on the Marathon property/former City landfill. Similar concentrations (>4,000 µg/L) have also been detected approximately 500 feet south of CW6 (approximately 1700 feet north of the Marathon property/former City landfill). Relatively elevated TCE concentrations of up to 1900 µg/L have also been detected in the shallow aquifer below and directly north of the Marathon property/former City landfill.

Several other VOCs have also been detected within the aquifer below the Marathon property/former City landfill. Carbon tetrachloride has been consistently detected at concentrations up to 108 µg/L. Chloroform has also consistently observed at concentrations up to approximately 50 µg/L. 1,1,1 TCA was detected at concentrations ranging up to 20 µg/L.

Complete Target Compound List (semivolatiles, pesticides, PCBs, metals and cyanides) analyses were performed on several of the Marathon property/former City landfill monitoring wells during the RI. No reportable levels of semivolatile compounds, pesticides, PCBs or cyanides were detected within the groundwater beneath the Site. State Preventative

Action Limits (PALs) for dissolved iron (0.15 mg/L) and/or manganese (0.025 mg/L) were exceeded at six monitoring wells. However, groundwater within the aquifer possesses high concentrations of naturally occurring iron and manganese. Therefore, background dissolved iron and manganese levels frequently exceeded PALs. Total chromium was detected at concentrations ranging up to 0.594 mg/L. One on-Site monitoring well also indicated elevated dissolved metal concentrations for zinc (3.24 mg/L) and nickel (0.196 mg/L).

## 3.0 GROUNDWATER MONITORING PROGRAM

The Groundwater Monitoring Program (GMP) has been designed, through discussions with the U.S. EPA and the WDNR, to permit a complete assessment of the effectiveness of the groundwater extraction, treatment and discharge system on:

1) Creating cone of depression which controls the west side plume source;

2) Reducing VOC concentrations in the groundwater to attain specified cleanup standards; and

3) Satisfying Federal Clean Water Act Best Available Technology (BAT) requirements for surface water discharge.

Clean-up standards for the interim remedial action are based on WAC NR 140 Groundwater Quality Standards, Safe Drinking Water Act MCLs, Clean Water Act WQCs, and health based levels, as appropriate. The primary contaminant of concern is TCE. In addition, any contaminants specified in WAC NR 140 or in the Hazardous Substance List (HSL), which may be detected during the monitoring program willl 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 TCE is reduced to 1.8 ppb within the specified groundwater monitoring network (see Section 2.6.3).

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

   a. For additional contaminants which are specified by WAC NR 140, the levels specified for those additional contaminants by WAC NR 140: or

   b. For additional contaminants not specified by WAC NR 140, the levels required by the Safe Drinking Water Act MCLS; or

   c. For additional contaminants not specified by WAC NR 140 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 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); or until

4) the final remedy for the Facility directs otherwise.

An extraction well and observation monitoring program will be established and performed during and following start-up of the groundwater extraction, treatment and discharge system and will include:

1) Water level monitoring on thirty-four monitoring wells, the extraction well, Bos Creek and the Wisconsin River; and

2) Groundwater sample collection and chemical analysis from eleven monitoring wells, four production wells (3, 6, 7, 9), and the extraction well (influent/effluent).

## 3.1 EXTRACTION WELL TESTING

A pumping test shall be conducted on the extraction well, prior to installation of the permanent pump, to verify the well's yield and efficiency. Initially, a step-drawdown test, consisting of three 1-hour steps, shall be conducted at pumping rates up to a minimum of 1,600 gpm. Subsequently, a 24-hour constant rate pumping test shall be performed on the well, at a rate determined in the field, based on the step-drawdown test. Following pump shut down, water level recovery shall be measured in the extraction well and surrounding monitoring wells for an additional eight hours, or until recovery. The pumping test waters shall be discharged to the discharge manhole outlet for treatment. Based on the results gathered during and subsequent to the 24-hour constant rate pumping test the permanent pump installation will be finalized and response characteristics of the aquifer evaluated.

## 3.2 WATER LEVEL MONITORING

### 3.2.1 Water Level Monitoring Network

A total of thirty-four (34) monitoring wells, Bos Creek, Wisconsin River and the extraction well (EW-1) are proposed to form the water level monitoring network. The water level monitoring network is summarized on Table 3.1.

The water level monitoring network will provide sufficient data to determine the extent of the cone of depression created by pumping of the extraction well.

### 3.2.2 Water Level Monitoring Frequency

Water levels will be measured in the well network, immediately prior to and subsequent to start-up of the extraction system, according to the schedule in Table 3.2.

During each water level monitoring event, water level measurements will be collected from the well network over a period of no longer than one working day.

# TABLE 3.1

## WATER LEVEL MONITORING NETWORK GROUNDWATER MONITORING PROGRAM

| *MONITORING WELL NO.* | *MONITORING WELL NO.* | *EXTRACTION WELL NO.* |
|---|---|---|
| C1S | W50 | EW-1 |
| C2S | W51A | |
| C3S | W52A | |
| C4S | W52 | |
| C4D | W53A | |
| C6S | W53 | |
| C7S | W54 | *WISCONSIN RIVER* |
| | W55A | SG1 |
| R1S | W55 | |
| R1D | | |
| R2S | IWD | |
| R2D | IWM | |
| R3S | IWS | |
| R3D | | |
| R4D | WSWD | *BOS CREEK* |
| | WSWS | SG2 |
| E21 | | |
| E21A | | |
| E30 | WC4 | |
| | WC4A | |
| TCT44 | | |

Note: Well locations and staff gage locations shown on Figure 1.3.

# TABLE 3.2

# SUMMARY OF WATER LEVEL MEASUREMENT FOR EACH MONITORING EVENT

| | *Frequency* | |
|---|---|---|
| *Time Period* | *34 Monitoring/Wells*<br>*2 Staff Gages* | *Extraction Well* |
| Prior to Startup | 1 event | 1 event |
| 12 Hr. Subsequent to Startup | 1 event | continuous |
| Week 1 | 2 events | daily |
| Month 1 | twice/month | twice/week |
| Month 2 to 6 | twice/month | twice/month |
| Month 6 onwards | quarterly* | quarterly* |

*Dependent on whether a pattern is established in aquifer.

In addition to the above schedule, water levels will be measured prior to purging and sample collection (see Section 3.3).

The wells, IWD, IWM and IWS, located on the island, will be monitored according to the schedule summarized above, with the following exceptions. Wells IWD, IWM and IWS will not be sampled during the months of December, January and February. Wells IWD, IWM and IWS will not be sampled if they are inaccessible due to weather conditions. If these wells are inaccessible, the EPA project manager will be notified as soon as possible.

### 3.2.3 Water Level Monitoring Protocol

Water level measurements will be taken in accordance with the schedule summarized in Section 3.2.2 and prior to purging and sampling for chemical analysis.

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

1) New disposable latex gloves will be used when measuring each well.

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) The bottom three feet of the measuring device will be cleaned with Alconox or equivalent, triple rinsed with deionized water and allowed air dry prior to use in each well. All rinsings will be collected and either discharged to the sanitary sewer or the storm sewer. Rinse water will not be discharged to the storm sewer if HNu screening (or equivalent) shows elevated levels of contaminants in the rinse water (HNu readings greater than background). In such cases, the rinse water must be discharged to the sanitary sewer.

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.

## 3.3 GROUNDWATER SAMPLING

### 3.3.1 Groundwater Sampling Network

A total of eleven (11) monitoring wells, four (4) City production wells and the extraction well are proposed to form the groundwater sampling network. The groundwater sampling network is summarized on Table 3.3.

The groundwater sampling network will provide sufficient data to assess the effectiveness of the extraction well system to

## TABLE 3.3

## GROUNDWATER SAMPLING NETWORK
## GROUNDWATER MONITORING PROGRAM

| *MONITORING WELL NO.* | *PRODUCTION WELL NO.* | *EXTRACTION WELL NO.* |
|---|---|---|
| C2S | CW3 | EW1 |
| C4D | CW6 | (influent/effluent) |
| R2D | CW7* | |
| R4D | CW9* | |
| W52 | | |
| W53A | | |
| W53 | | |
| W54 | | |
| W55 | | |
| WSWD | | |
| IWD | | |

Note:

* Sampled only during selected sampling events as specified in Section 3.3.3.

control the west side plume source and to monitor the reduction in VOC concentrations in the groundwater over time.

### 3.3.2 Groundwater Sampling Parameters

All groundwater samples collected will be measured in the field for pH, conductivity and temperature. All groundwater samples will be submitted to a laboratory for Target Compound List (TCL), Volatile Organic Compound (VOC) parameter analysis or for the full TCL organic and Target Analyte List (TAL) inorganic parameter analysis. Tables 3.4 through 3.7 summarize all parameters that will be analyzed. All analyses will be conducted in accordance with the QAPP.

### 3.3.3 Groundwater Sampling Frequency

Groundwater samples will be collected from the groundwater sampling network and analyzed for the VOC parameters listed on Table 3.4 according to the schedule in Table 3.8.

Well IWD, located on the island, will be sampled according to the schedule summarized above, with the following exceptions. Well IWD will not be sampled during the months of December, January or February, or if it is inaccessible due to weather conditions. If well IWD is inaccessible, the EPA project manager will be notified as soon as possible.

# TABLE 3.4

## TCL VOLATILE ORGANIC COMPOUNDS (VOCs)<br>GROUNDWATER MONITORING PROGRAM

| *Compound* | *CAS Number* | *PQL*[1] *(μg/L)* | |
|---|---|---|---|
| Acetone | 67-64-1 | 3.0 | |
| Benzene | 21-43-2 | 0.6 | |
| Bromodichloromethane | 75-27-4 | 0.7 | |
| Bromoform | 75-25-2 | 0.5 | |
| Bromomethane | 74-83-9 | 0.5 | |
| 2-Butanone | 78-93-3 | 30[2] | |
| Carbon disulfide | 75-15-0 | 0.5 | |
| Carbon tetrachloride | 56-23-5 | 0.6 | |
| Chlorobenzene | 108-90-7 | 0.7 | |
| Chloroethane | 75-00-3 | 1.0 | |
| Chloroform | 07-00-3 | 0.6 | |
| Chloromethane | 74-87-3 | 0.5 | |
| Dibromochloromethane | 124-48-1 | 0.7 | |
| 1,1-Dichloroethane | 75-35-3 | 0.6 | |
| 1,2-Dichloroethane | 107-06-2 | 0.6 | (0.5)[3] |
| 1,1-Dichloroethene | 75-35-4 | 0.5 | (0.24) |
| 1,2-Dichloroethene (total) | 540-59-0 | 0.5 | |
| 1,2-Dichloropropane | 78-87-5 | 0.5 | |
| *cis*-1,3-Dichloropropene | 10061-01-5 | 0.8 | |
| *trans*-1,3-Dichloropropene | 10061-02-6 | 0.6 | |
| Ethylbenzene | 100-41-4 | 0.6 | |
| 2-Hexanone | 591-78-6 | 1.2 | |
| Methylene Chloride | 75-09-2 | 0.5 | |
| 4-Methyl-2-pentanone | 108-10-1 | 5.0 | |
| Styrene | 100-42-5 | 0.6 | |
| 1,1,2,2-Tetrachloroethane | 29-34-5 | 0.5 | |

---

[1] Sample PQLs are highly matrix and instrument performance dependent. The PQLs listed herein are provided for guidance and may not always be acheivable. All PQLs are lower than existing Wisconsin Regulation NR-140 and Safe Drinking Water Act MCLs.

[2] Based on obtaining 1000 area counts on a 30 μg/L standard.

[3] PQLs listed in parentheses are lower than the CLP-RAS PQLs but are consistent with the Wisconsin Regulation NR-140. CLP-RAS PQLs are all lower than Safe Drinking Water Act MCLs.

# TABLE 3.4

## TCL VOLATILE ORGANIC COMPOUNDS (VOCs) GROUNDWATER MONITORING PROGRAM

| *Compound* | *CAS Number* | *PQL* [1]*(μg/L)* | |
|---|---|---|---|
| Tetrachloroethene | 127-18-4 | 0.6 | |
| Toluene | 108-88-33 | 0.7 | |
| 1,1,1-Trichloroethane | 71-55-6 | 0.6 | |
| 1,1,2-Trichloroethane | 79-00-5 | 0.7 | (0.6)[2] |
| Trichloroethene | 79-01-6 | 0.5 | |
| Vinyl acetate | 108-05-4 | 1.0 | |
| Vinyl chloride | 75-01-4 | 0.5 | (0.015) |
| Xylenes (total) | 1330-20-7 | 0.5 | |

---

[1] Sample PQLs are highly matrix and instrument performance dependent. The PQLs listed herein are provided for guidance and may not always be acheivable.

[2] PQLs listed in parentheses are lower than the CLP-RAS PQLs but are consistent with the Wisconsin Regulation NR-140. CLP-RAS PQLs are all lower than Safe Drinking Water Act MCLs.

# TABLE 3.5

## TCL BASE-NEUTRAL-ACID EXTRACTABLE ORGANIC COMPOUNDS (BNAs) GROUNDWATER MONITORING PROGRAM

| *Semivolatiles* | *CAS Numbers* | *PQL [1] (μg/L)* |
|---|---|---|
| Phenol | 108-95-2 | 10 |
| Bis (2-Chloroethyl)ether | 111-44-4 | 10 |
| 2-Chlorophenol | 95-57-8 | 10 |
| 1,3-Dichlorobenzene | 541-73-1 | 10 |
| 1,4-Dichlorobenzene | 106-46-7 | 10 |
| Benzyl Acohol | 100-51-6 | 10 |
| 1,2-Dichlorobenzene | 95-50-1 | 10 |
| 2-Methylphenol | 95-48-7 | 10 |
| Bis (2-Chloroisopropyl)ether | 108-60-1 | 10 |
| 4-Methylphenol | 106-44-5 | 10 |
| N-Nitroso-di-*n*-dipropylamine | 621-64-7 | 10 |
| Hexachloroethane | 67-72-1 | 10 |
| Nitrobenzene | 98-95-3 | 10 |
| Isophorone | 78-59-1 | 10 |
| 2-Nitrophenol | 88-75-5 | 10 |
| 2,4-Dimethylphenol | 105-67-9 | 10 |
| Benzoic acid | 65-85-0 | 50 |
| Bis (2-chloroethoxy)methane | 111-91-1 | 10 |
| 2,4-Dichlorophenol | 120-83-2 | 10 |
| 1,2,4-Trichlorobenzene | 120-82-1 | 10 |
| Naphthalene | 91-20-3 | 10 |
| 4-Chloroaniline | 106-47-8 | 10 |
| Hexachlorobutadiene | 87-68-3 | 10 |

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[1] Sample PQLs are highly matrix and instrument performance dependent. The PQLs listed herein are provided for guidance and may not always be acheivable. All PQLs are lower than existing Wisconsin Regulation NR-140 and Safe Drinking Water Act MCLs.

# TABLE 3.5

## TCL BASE-NEUTRAL-ACID EXTRACTABLE ORGANIC COMPOUNDS (BNAs) GROUNDWATER MONITORING PROGRAM

| *Semivolatiles* | *CAS Numbers* | *PQL [1] (μg/L)* |
|---|---|---|
| 4-Chloro-3-methylphenol<br>(*para*-chloro-*meta*-cresol) | 59-50-7 | 10 |
| 2-Methylnaphthalene | 91-57-6 | 10 |
| Hexachlorocyclopentadiene | 77-47-4 | 10 |
| 2,4,6-Trichlorophenol | 88-06-2 | 10 |
| 2,4,5-Trichlorophenol | 95-95-4 | 50 |
| 2-Chloronaphthalene | 91-58-7 | 10 |
| 2-Nitroaniline | 88-74-4 | 50 |
| Dimethylphthalate | 131-11-3 | 10 |
| Acenaphthylene | 208-96-8 | 10 |
| 2,6-Dinitrotoluene | 606-20-2 | 10 |
| 3-Nitroaniline | 99-09-2 | 50 |
| Acenaphthene | 83-32-9 | 10 |
| 2,4-Dinitrophenol | 51-28-5 | 50 |
| 4-Nitrophenol | 100-02-7 | 50 |
| Dibenzofuran | 132-64-9 | 10 |
| 2,4-Dinitrotoluene | 121-14-2 | 10 |
| Diethylphthalate | 84-66-2 | 10 |
| 4-Chlorophenyl-phenyl Ether | 7005-72-3 | 10 |
| Fluorene | 86-73-7 | 10 |
| 4-Nitroaniline | 100-01-6 | 50 |
| 4,6-Dinitro-2-methylphenol | 534-52-1 | 50 |
| N-Nitrosodiphenylamine | 86-30-6 | 10 |
| 4-Bromophenyl-phenyl Ether | 101-55-3 | 10 |
| Hexachlorobenzene | 118-74-1 | 10 |
| Pentachlorophenol | 87-86-5 | 50 |
| Phenanthrene | 85-01-8 | 10 |
| Anthracene | 120-12-7 | 10 |

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[1] Sample PQLs are highly matrix and instrument performance dependent. The PQLs listed herein are provided for guidance and may not always be acheivable. All PQLs are lower than existing Wisconsin Regulation NR-140 and Safe Drinking Water Act MCLs.

# TABLE 3.5

## TCL BASE-NEUTRAL-ACID EXTRACTABLE ORGANIC COMPOUNDS (BNAs) GROUNDWATER MONITORING PROGRAM

| *Semivolatiles* | *CAS Numbers* | *PQL* [1] *(µg/L)* |
|---|---|---|
| Di-*n*-butylphthalate | 84-74-2 | 10 |
| Fluoranthene | 206-44-0 | 10 |
| Pyrene | 129-00-0 | 10 |
| Butylbenzylphthalate | 85-68-7 | 10 |
| 3,3'-Dichlorobenzidine | 91-94-1 | 20 |
| Benzo(a)anthracene | 56-55-3 | 10 |
| Chrysene | 218-01-9 | 10 |
| Bis (2-ethylhexyl) phthalate | 117-81-7 | 10 |
| Di-*n*-octylphthalate | 117-84-0 | 10 |
| Benzo(b)fluoranthene | 205-99-2 | 10 |
| Benzo(k)fluoranthene | 207-08-9 | 10 |
| Benzo(a)pyrene | 50-32-8 | 10 |
| Indeno(1,2,3-cd)pyrene | 193-39-5 | 10 |
| Dibenz(a,h)anthracene | 53-70-3 | 10 |
| Benzo(g,h,i)perylene | 191-24-2 | 10 |

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[1] Sample PQLs are highly matrix and instrument performance dependent. The PQLs listed herein are provided for guidance and may not always be acheivable. All PQLs are lower than existing Wisconsin Regulation NR-140 and Safe Drinking Water Act MCLs.

# TABLE 3.6

# TCL PESTICIDES AND POLYCHLORINATED BIPHENYLS (PEST/PCBs) GROUNDWATER MONITORING PROGRAM

| *Pesticides/PCBs* | *CAS Number* | *PQLs [1] (µg/L)* |
|---|---|---|
| *alpha*-BHC | 319-84-6 | 0.05 |
| *beta*-BHC | 319-85-7 | 0.05 |
| *delta*-BHC | 319-86-8 | 0.05 |
| *gamma*-BHC (Lindane) | 58-89-9 | 0.05 |
| Heptachlor | 76-44-8 | 0.05 |
| Aldrin | 309-00-2 | 0.05 |
| Heptachlor expoxide | 1024-57-3 | 0.05 |
| Endosulfan I | 959-98-8 | 0.05 |
| Dieldrin | 60-57-1 | 0.10 |
| 4,4'-DDE | 72-55-9 | 0.10 |
| Endrin | 72-20-8 | 0.10 |
| Endosulfan II | 33213-65-9 | 0.10 |
| 4,4'-DDD | 72-54-8 | 0.10 |
| Endosulfan sulfate | 1031-07-8 | 0.10 |
| 4,4'-DDT | 50-29-3 | 0.10 |
| Methoxychlor | 72-43-5 | 0.5 |
| Endrin ketone | 53494-70-5 | 0.10 |
| *alpha*-Chlordane | 5103-71-9 | 0.5 |
| *gamma*-Chlordane | 5103-74-2 | 0.5 |
| Toxaphene | 8001-35-2 | 1.0 |
| Aroclor - 1016 | 12674-11-2 | 0.5 |
| Aroclor - 1221 | 11104-28-2 | 0.5 |
| Aroclor - 1232 | 11141-16-5 | 0.5 |
| Aroclor - 1242 | 53469-21-9 | 0.5 |
| Aroclor - 1248 | 12672-29-6 | 0.5 |
| Aroclor - 1254 | 11097-69-1 | 1.0 |
| Aroclor - 1260 | 11096-82-5 | 1.0 |

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[1] Sample PQLs are highly matrix and instrument performance dependent. The PQLs listed herein are provided for guidance and may not always be acheivable. All PQLs are lower than existing Wisconsin Regulation NR-140 and Safe Drinking Water Act MCLs.

# TABLE 3.7

## TAL PARAMETERS
## GROUNDWATER MONITORING PROGRAM

| *Analyte* | *PQLs*[1] *(μg/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] Sample PQLs are highly matrix and instrument performance dependent. The PQLs listed herein are provided for guidance and may not always be acheivable. All PQLs are lower than existing Wisconsin Regulation NR-140 and Safe Drinking Water Act MCLs.

# TABLE 3.8

## SUMMARY OF GROUNDWATER SAMPLING FOR EACH MONITORING EVENT

| | *Frequency* | | |
|---|---|---|---|
| *Time Period* | *Monitoring Wells* | *Production Wells* | *Extraction Well (influent/effluent)* |
| Immediately Prior to Start-Up | 1 event | 1 event | 1 event |
| Month 1 | once/week | twice/month* | twice/week |
| Month 2 | once/month | once/month* | once/week |
| Month 3 | once/month | once/month | twice/month |
| Month 4 and 5 | once/month | once/month* | once/month |
| Month 6 onward | quarterly | quarterly | quarterly** |

* only production wells 3 and 6 for these sampling events

** dependent on whether a pattern is established with contaminant levels in aquifer

In addition to analyzing samples for TCL VOCs, six groundwater samples (influent/effluent extraction well samples and four monitoring well samples whose locations will be specified by the EPA) will be collected during a sampling event in the first month of operation and analyzed for the full TCL and TAL parameters. This data will be presented in an assessment report prepared after the first month of operation (see Section 5.0). Subsequent to review of the data, it will be determined, in conjunction with the U.S. EPA and the WDNR, whether a second round of groundwater samples is required to be collected from the six locations for full or partial TCL/TAL analysis. The six sample locations will be sampled annually, thereafter, and analyzed for the full or partial TCL/TAL parameters, as determined necessary in conjunction with the U.S. EPA and WDNR.

The production wells and the extraction well (influent) will be sampled at their respective well heads. A treated groundwater (effluent) sample will also be collected from the rip rap discharge structure, immediately prior to the point where treated groundwater enters the Wisconsin River.

After one month of operation, an assessment report will be prepared (see Section 5.0) which will include an evaluation of the water level and sampling well networks, parameters and frequencies and will recommend revisions, for review/approval with U.S. EPA and WDNR, if necessary. A similar assessment report will follow after six months of operation.

### 3.3.4 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

#### 3.3.4.1 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. The bottom three feet of the measuring device will be cleaned with Alconox or equivalent, triple rinsed with deionized water and allowed to air dry prior to use in each well.

3. Prior to sampling, each well will be purged, using a bottom-unloading stainless steel or teflon bailer attached to a nylon rope; or a 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 and pH 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 precleaned bailer or bladder pump will then be used for sample collection. Prior to use in each well, the bailer or bladder pump will be precleaned as follows:

    1) Rinse thoroughly with Alconox or equivalent;
    2) Triple rinse with deionized water;
    3) Allow to air dry.

    All waste groundwater, not used for samples, will be collected and either discharged to the sanitary sewer or to the storm sewer. Waste groundwater will not be discharged to the storm sewer if HNu screening (or equivalent) shows elevated levels of contaminants in the groundwater (HNu readings greater than background). In such cases, the rinse water must be discharge to the sanitary sewer.

4. Field measurements of pH and conductivity (using a DspH-3 pH/3 RGE Conductivity Meter or equivalent) and temperature (using a YSI Model 33 SCT meter or equivalent) 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 bottom-unloading stainless steel or teflon bailer attached to a nylon rope; or 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 bottom-unloading bailer or collected directly 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 are determined as required by the analytical parameters. Section 4.0 details the requisite sample containers and preservation techniques for chemical parameters. All sample bottles will be provided by Radian and will be prepared consistent with "Specifications and Guidance for Obtaining Contaminant-Free Containers" (USEPA, OSWER, April 1990). The sample bottles will be delivered to the Site in sealed containers. Radian will provide a certified analysis for each sample lot for each parameter.

7. A blind field duplicate sample will be collected at a minimum frequency of one per group of 10 or fewer investigative groundwater samples.

8. Samples for matrix spike and matrix spike duplicate will be collected at a minimum frequency of one per group of 20 or fewer investigative groundwater samples. The matrix spike sample and matrix spike duplicate will be taken from a well where samples do not require consideration for turbidity. Samples will be collected from the well as outlined in (5) above, but in triple the normal volume. The analysis request sheets sent to the laboratory will indicate the sample I.D. of the matrix spike sample and matrix spike duplicate.

9. A rinsate blank (bailer blank) sample will be collected at a minimum frequency of one per group of 10 or fewer investigative samples. The bailer blank sample will consist of deionized water poured into, and then sampled out of, a bailer cleaned using the rinse sequence outlined in (3) above. This will provide a quality assurance check on the field decontamination procedures employed.

10. A volatile organic compounds (VOC) trip blank will be prepared by the project laboratory and will accompany each VOC sample container shipped to the Site. The trip blank will be returned to the laboratory unopened and will be analyzed for VOCs.

11. All disposable gloves and nylon ropes will be placed in DOT approved 55-gallon drums and stored at Marathon's facility. 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.

12. 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).

13. Samples will be placed on ice or cooler pack in laboratory supplied coolers after collection and labeling.

### 3.3.4.2 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 the same as specified for groundwater samples (see Section 3.3.4.1(6)).

4. A blind field duplicate sample will be collected at a minimum frequency of one per group of 10 or fewer investigative groundwater samples.

5. Samples for matrix spike analysis and matrix spike duplicate will be collected at a minimum frequency of one per group of 20 or fewer investigative groundwater samples. Samples will be collected in triple the normal volume. The analysis request sheets sent to the contract laboratory will indicate the sample I.D. of the matrix spike sample and matrix spike duplicate.

6. A volatile organic compounds (VOC) trip blank will be prepared by the project laboratory and will accompany each VOC sample container shipped to the Site. The trip blanks will be returned to the laboratory unopened and will be analyzed for VOCs.

7. Rinsate blank samples will not be collected since there will be no sampling tools used for the surface water sample collection.

8. 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.

9. Samples will be placed on ice or cooler packs in laboratory supplied coolers after collection and labeling.

### 3.3.4.3 Treated Groundwater Effluent Sampling

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

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

2. The sample will be collected by the grab sample method directly into the precleaned sample containers. The sample will be collected from the rip rap lined discharge structure immediately prior to the point where the treated groundwater enters the Wisconsin River.

3. Containers for sample collection and preservation requirements will be the same as specified for groundwater samples (see Section 3.3.4.1(6)).

4. A blind field duplicate sample will be collected at a minimum frequency of one per group of 10 or fewer investigative groundwater samples.

5. Samples for matrix spike analysis and matrix spike duplicate will be collected at a minimum frequency of one per group of 20 or fewer investigative groundwater samples. Samples will be collected in triple the normal volume. The analysis request sheets sent to the contract laboratory will indicate the sample I.D. of the matrix spike sample and matrix spike duplicate.

6. A volatile organic compound (VOC) trip blank will be prepared by the project laboratory and will accompany each VOC sample container shipped to the Site. The trip blank will be returned to the laboratory unopened and will be analyzed for VOCs.

7. Rinsate blank samples will not be collected since there will be no sampling tools used for the treated groundwater (effluent) sample collection.

8. 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.

9. Samples will be placed on ice or cooler packs in laboratory supplied coolers after collection and labeling.

Table 3.9 presents a summary of field quality control procedures established for the GMP. Table 3.10 presents a summary of the sampling and analysis activities for each sampling event.

# TABLE 3.9

## FIELD QUALITY CONTROL SAMPLES
## GROUNDWATER MONITORING PROGRAM

| *Matrix* | *Trip Blank* | *Rinsate Blank* | *Blind Duplicate* | *Matrix Spike/*(1) *Matrix Spike Duplicate* |
|---|---|---|---|---|
| Groundwater | one per shipping cooler of VOC samples | one per group of 10 or fewer investigative samples(2) | one per group of 10 or fewer investigative samples | one per group of 20 or fewer investigative samples |

Notes:

(1) Additional sample (three times the designated volume) will be collected for matrix spiking purposes.

(2) Does not apply to investigative samples collected using the grab sample method.

## TABLE 3.10

## SUMMARY OF GROUNDWATER SAMPLING AND ANALYSIS PROGRAM FOR EACH MONITORING EVENT
## GROUNDWATER MONITORING PROGRAM

| | | | | QA SAMPLES | | | | |
|---|---|---|---|---|---|---|---|---|
| *Sampling Round* | *Field Parameter* | *Laboratory Parameter*[1] | *Investigative Parameter*[2] | *Rinsate Blanks* | *Field Duplicates* | *Voc Trip Blanks*[3] | *MS/MSD*[4] | *Total Per Round*[5] |
| TCL/TAL | pH<br>specific conductivity<br>temperature<br>static water level[6] | VOC by Appendix A in QAPP | 14 | 2 | 2 | 1 | 1 | 20 |
| | | BN/A by CLP-RAS | 6 | 1 | 1 | -- | 1 | 9 |
| | | PCB and Pesticides by CLP-RAS | 6 | 1 | 1 | -- | 1 | 9 |
| | | Metals by CLP-RAS | | | | | | |
| | | Cyanide by CLP-RAS | 6 | 1 | 1 | -- | 1 | 9 |
| VOC only | pH<br>specific conductivity<br>temperature<br>static water level[6] | VOC by Appendix A in QAPP | 14 | 2 | 2 | 1 | 1 | 20 |

---

1 All analytical methods were taken from SW-846. Method 8240 for VOC analyses was modified by Radian (see Appendix A of QAPP).
2 See Section 3.3 for complete description of groundwater sampling network, parameters and frequency.
3 One trip blank is required for each cooler containing VOC sample vials.
4 Three times the normal sample volume is required for VOC MS/MSD samples, and twice the normal sample volume for the remaining parameters.
5 The total number of samples for each sampling event of the GMP is tentative.
6 See Section 3.2, Tables 3.1 and 3.2 for complete water level monitoring network and frequency, respectively. Water level measurements summarized above are in addition to those discussed in Section 2.6.2.

## 3.4 HEALTH AND SAFETY

### 3.4.1 Water Level Monitoring

Groundwater levels will be measured in the monitoring wells, production wells and extraction wells at the frequency and according to the protocols summarized in Section 3.2.

During groundwater monitoring, Level E protection will be required. Air monitoring is not anticipated for this activity.

### 3.4.2 Water Sample Collection

Water samples will be collected for chemical analysis at the frequency and according to the protocols summarized in Section 3.3.

During groundwater sampling, Level D protection will be required. The potential for dermal contact with dissolved chlorinated solvents exists, and should be kept to a minimum by use of dermal protection and eye and face protection (Level D). Air monitoring, using an HNu meter or equivalent, will be conducted during all groundwater sampling activities.

If air monitoring indicates elevated levels of contaminants (HNu readings greater than 2 ppm over background level), air purifying respirators will be utilized (Level C). Air monitoring requirements will be reviewed in an assessment report prepared after the first six months of operation (see Section 5.0). The continuation of air monitoring requirements will be evaluated based on the first six months sampling activities.

### 3.4.3 Levels of Protection

The following describes the levels of protection which may be implemented during the monitoring activities.

Level E

Level E is to be implemented when water level measuring activities take place where there are no samples collected. Level E may include the following:

- steel toe boots
- hard hat
- disposable latex gloves (when needed)
- coveralls
- participation in medial monitoring program and Health and Safety trained, according to OSHA 20 CFR 1910.120.

Level D

Level D is to be worn during sampling activities when organic vapor air contamination is less than 2 ppm over background concentration (according to the HNu readings), but where dermal protection is warranted. The following list outlines the personal protective equipment to be utilized for Level D:

- Polyethylene (PE) coated Tyvek coveralls
- steel toe/steel shank leather work boots with latex overboots or steel toe/steel shank neoprene boot
- disposable latex gloves
- Nitrile or neoprene gloves
- eye protection (safety glasses or face shield)
- hard hat

Level C

Level C is be worn during sampling activities when organic vapor air contamination is greater than 2 ppm over background concentration (according to the HNu readings). The following outlines this level of protection:

- PE coated tyvek coveralls
- steel toe/steel shank leather work boots with latex overboots or steel toe/steel shank neoprene boots
- disposable latex gloves
- nitrile or neoprene gloves
- half face, air purifying respirator with combination organic vapor/dust and mist cartridge
- hard hat

# 4.0 SAMPLE CONTAINERS, PRESERVATION, LABELING AND CONTROL

## 4.1 SAMPLE CONTAINERS AND PRESERVATION

Required sample containers, container preparation, preservation methods, maximum holding times and filling instructions are summarized on Table 4.1. All sample bottles will be provided by the laboratory and will be prepared consistent with "Specifications and Guidance for Obtaining Contaminant-Free Containers" (USEPA, OSWER, April 1990).

## 4.2 INITIAL LABELING

A unique sample numbering system will be used to identify each collected sample. This system will provide a tracking number to allow retrieval and cross-referencing of sample information. A listing of the sample identification numbers with written descriptions of sample location, type, date, and time will be maintained by sampling field personnel. The sample numbering system to be used is described as follows:

Example: W-MMDDYY-AA-####

where:

| | |
|---|---|
| W | - designates sample type (W - water) |
| MMDDYY | - date of collection (month, day, year) |
| AA | - sampler initials |
| #### | - sequential number starting with 0001 at the start of the project |

# TABLE 4.1

## CONTAINERS, PRESERVATION, SHIPPING AND PACKING REQUIREMENTS GROUNDWATER MONITORING PROGRAM

| Analysis | *Sample* Containers | Preservation | *Maximum* Holding Time[1] | *Volume* of Sample | Shipping[2] | *Normal* Packaging[3] |
|---|---|---|---|---|---|---|
| VOC | Three 40 ml volatile organic analysis (VOA) vials | HCl to pH<2<br>4°C | 14 days | Fill completely no air bubbles | Transported daily by courier | Bubble Pack, Vermiculite or equivalent |
| BN/A | Two 1-l amber glass bottles | 4°C | 7 days until extraction, 40 days after extraction | Fill to neck of bottles | Transported daily by courier | Bubble Pack, Vermiculite or equivalent |
| PEST/PCB | Two 1-l amber glass bottles | 4°C | 7 days until extraction, 40 days after extraction | Fill to neck of bottles | Transported daily by courier | Bubble Pack, Vermiculite or equivalent |
| Metals | One 500 ml polyethylene | $HNO_3$ to pH<2<br>4°C | 6 months (mercury 28 days) | Fill to neck of bottle | Transported daily by courier | Bubble Pack, Vermiculite or equivalent |
| Cyanide | One 1-l polyethylene or glass bottle | NaOH to pH>12<br>4°C | 14 days | Fill to shoulder of bottle | Transported daily by courier | Bubble Pack Vermiculite or equivalent |

---

[1] The maximum sample holding time is calcuated from the date of sample collection.

[2] Samples shall be shipped via Federal Express Priority One.

[3] All samples shall be protected from light.

All sample labels will be firmly affixed to the sample containers they identify. Figure 4.1 illustrates an example of a sample label. Quality Assurance (QA) samples will also be numbered with a unique location number.

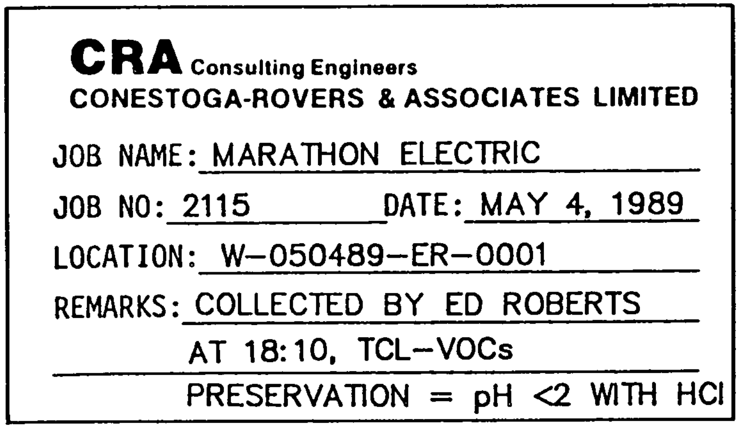
One member of each sampling team will be responsible for recording the sampling activities for each day and will record in the log book the following with respect to each sample:

i) unique sample identification number,
ii) sampling location identification (well number),
iii) date/time of sample collection,
iv) sampling data and other relevant remarks,
v) name of sampler, and
vi) notes on preservation and decontamination.

## 4.3 CHAIN-OF-CUSTODY

A chain-of-custody will be maintained to document the transfer of sample containers. Each sample will be properly sealed. Sample container labels will include sample number, place of collection and date and time of collection. Samples will be delivered to the laboratory by courier.

Each sample container being shipped to the laboratory will contain a chain-of-custody form. The chain-of-custody form consists of four copies which are distributed to the shipper, the receiving laboratory, the CRA



**CRA** Consulting Engineers
**CONESTOGA-ROVERS & ASSOCIATES LIMITED**

JOB NAME: MARATHON ELECTRIC
JOB NO: 2115 DATE: MAY 4, 1989
LOCATION: W-050489-ER-0001
REMARKS: COLLECTED BY ED ROBERTS
AT 18:10, TCL-VOCs
PRESERVATION = pH <2 WITH HCl

NOTE:

1) SAMPLE LABELS WILL BE FIRMLY AFFIXED TO SAMPLE CONTAINERS.

2) ALL SAMPLE LABELS WILL BE COMPLETED USING WATER INSOLUBLE INK.

figure 4.1

TYPICAL SAMPLE LABEL
GROUNDWATER MONITORING PROGRAM
*Marathon Electric Manufacturing Co.*

**CRA**

2115-27/02/89-10-D-0

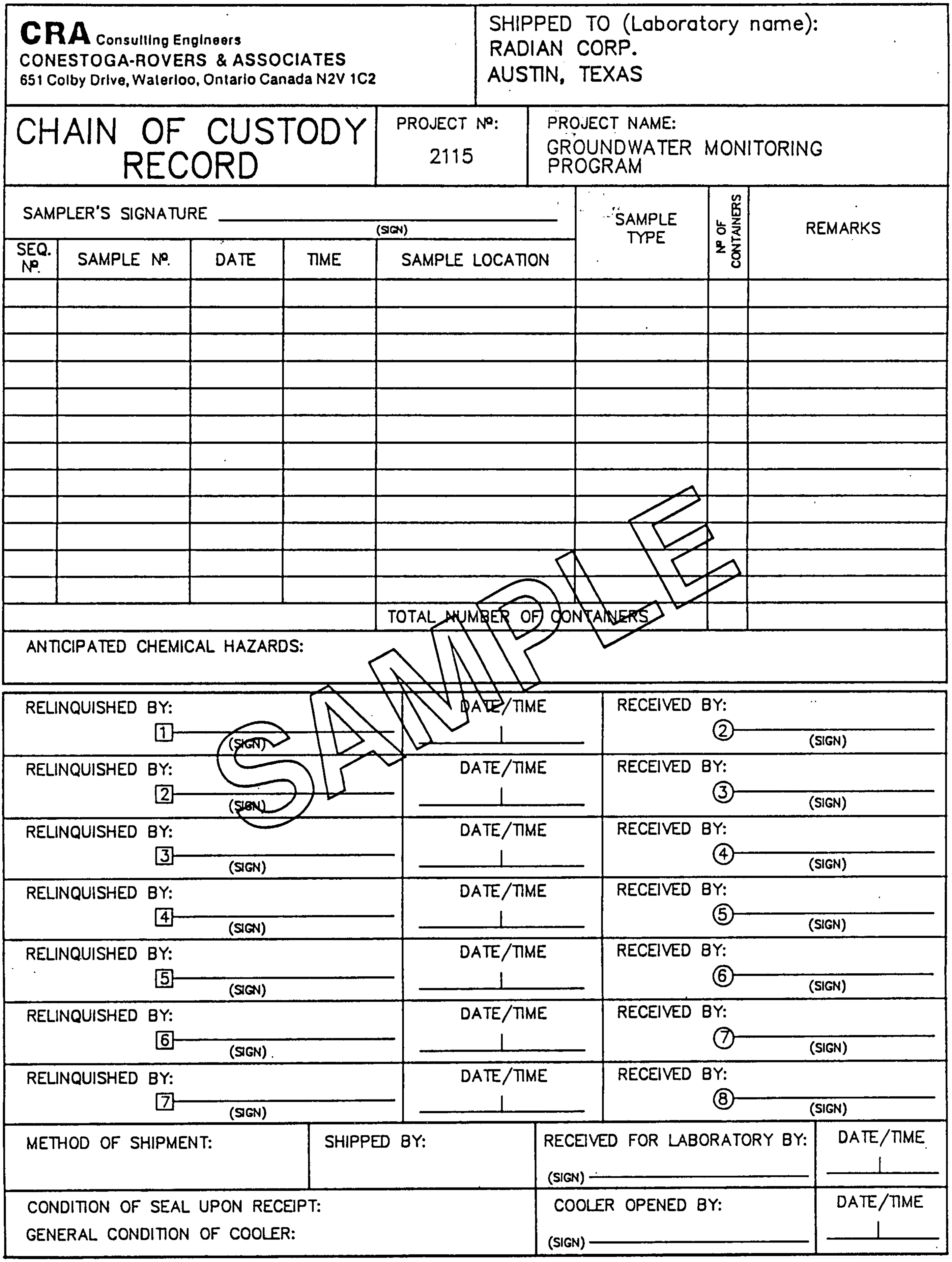
laboratory, and the CRA office file. The shipper will maintain his copy while the other three copies are enclosed in a waterproof envelope within the cooler with the samples. The laboratory, upon receiving the samples, will complete the three remaining copies. The laboratory will maintain one copy for their records. One copy will be returned to CRA upon receipt of the samples by the laboratory. One copy will be returned to CRA with the data deliverables package. A sample Chain of Custody form is presented on Figure 4.2. Each sample number of each sample shipped will be recorded on the sheet. The container will then be sealed properly for shipment.

Upon receipt of the container at the laboratory, the container will be inspected by the designated sample custodian. The condition of the container will be noted on the chain-of-custody record sheet by the sample custodian. The sample custodian will document the date and time of receipt of the container, and sign the form.

If damage or discrepancies are noticed, it will be recorded in the remarks column of the record sheet, dated and signed. Any damage or discrepancies will be reported to the lab supervisor who will inform the lab manager and QA officer.

## 4.4 SAMPLE PACKAGING

All samples shall be wrapped in protective material and placed in coolers for delivery to the laboratory. Coolers will not be overpacked. Samples will be cushioned within the shipment cooler using



**CRA** Consulting Engineers
CONESTOGA-ROVERS & ASSOCIATES
651 Colby Drive, Waterloo, Ontario Canada N2V 1C2

SHIPPED TO (Laboratory name):
RADIAN CORP.
AUSTIN, TEXAS

| CHAIN OF CUSTODY RECORD | PROJECT №: | PROJECT NAME: |
|---|---|---|
| | 2115 | GROUNDWATER MONITORING PROGRAM |

SAMPLER'S SIGNATURE ______________________ (SIGN)

| SEQ. № | SAMPLE № | DATE | TIME | SAMPLE LOCATION | SAMPLE TYPE | № OF CONTAINERS | REMARKS |
|---|---|---|---|---|---|---|---|
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| | | | | | | | |
| | | | | TOTAL NUMBER OF CONTAINERS | | | |

ANTICIPATED CHEMICAL HAZARDS:

| | | |
|---|---|---|
| RELINQUISHED BY: 1 ______ (SIGN) | DATE/TIME | RECEIVED BY: ② ______ (SIGN) |
| RELINQUISHED BY: 2 ______ (SIGN) | DATE/TIME | RECEIVED BY: ③ ______ (SIGN) |
| RELINQUISHED BY: 3 ______ (SIGN) | DATE/TIME | RECEIVED BY: ④ ______ (SIGN) |
| RELINQUISHED BY: 4 ______ (SIGN) | DATE/TIME | RECEIVED BY: ⑤ ______ (SIGN) |
| RELINQUISHED BY: 5 ______ (SIGN) | DATE/TIME | RECEIVED BY: ⑥ ______ (SIGN) |
| RELINQUISHED BY: 6 ______ (SIGN) | DATE/TIME | RECEIVED BY: ⑦ ______ (SIGN) |
| RELINQUISHED BY: 7 ______ (SIGN) | DATE/TIME | RECEIVED BY: ⑧ ______ (SIGN) |

| | | | |
|---|---|---|---|
| METHOD OF SHIPMENT: | SHIPPED BY: | RECEIVED FOR LABORATORY BY: (SIGN) ______ | DATE/TIME |
| CONDITION OF SEAL UPON RECEIPT:<br>GENERAL CONDITION OF COOLER: | | COOLER OPENED BY: (SIGN) ______ | DATE/TIME |

SAMPLE

| | |
|---|---|
| WHITE | – CRA OFFICE COPY |
| YELLOW | – RECEIVING LABORATORY COPY |
| PINK | – CRA LABORATORY COPY |
| GOLDENROD | – SHIPPERS |

figure 4.2

TYPICAL CHAIN OF CUSTODY FORM
GROUNDWATER MONITORING PROGRAM
*Marathon Electric Manufacturing Co.*

"bubble wrap" and/or foam and/or vermiculite. Sample shipments will be cooled by placing zip-lock bags of ice and/or cooler packs around the sample containers. Any remaining space will be filled with vermiculite or an equivalent packing material.

## 4.5 CUSTODY SEALS

All samples will be sealed individually with custody seal tape and then sealed inside plastic bags prior to shipment.

The chain-of-custody record for each sample shipment will be packaged in a waterproof envelope and sent with the samples to the assigned laboratory. A separate chain-of-custody form will be developed for the contents of each cooler and will be included within the respective cooler.

Two custody seals will be placed over the lid on the front of each shipping cooler, prior to shipment, to secure the lid and provide evidence that the samples have not been tampered with enroute to the laboratory. Clear tape will be placed over the seals to ensure that they are not accidentally broken during shipment. The condition of the seal and the general condition of the cooler will be noted by the laboratory sample custodian on the chain-of-custody record upon receipt and inspection of the cooler.

## 5.0 REPORTING

### 5.1 DATA REPORTS

Data reports will be prepared and submitted to the U.S. EPA and WDNR monthly for the first six months of data collection and quarterly thereafter. The data reports will be submitted by the 12th of each month. The data reports will include, at a minimum, a summary of sampling activities and all available data received or generated.

### 5.2 ASSESSMENT REPORTS

The first assessment report will be prepared and submitted to U.S. EPA and WDNR after the first month of operation. The second report will be submitted after six months and further reports annually thereafter. The assessment reports will include an evaluation of water level and sampling data and an assessment toward achieving overall objectives of source reduction and control.

### 5.3 MODIFICATIONS

Modifications to the GMP and performance criteria may be suggested by Marathon Electric, or required by U.S.EPA/WDNR, based on the assessment reports. Any modifications to the GMP will require approval by U.S. EPA in consultation with WDNR.