RAC V

RESPONSE ACTION CONTRACT FOR

Remedial, Enforcement Oversight, and
Non-Time Critical Removal Activities at Sites of Release
or Threatened Release of Hazardous Substance in Region V

Site Specific Plans for the N.W. Mauthe Long Term Response Action

WA 007-RARA-056G, Contract No. 68-W6-0025

PREPARED FOR

U.S. Environmental Protection Agency

PREPARED BY

CH2M HILL
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CH2MHILL

September 5, 1997

141695.DU.01-08

Mr. Gary Edelstein
Wisconsin Department of Natural Resources
P.O. Box 7921
Madison, WI 53707-7921

Dear Mr. Edelstein:

Subject: Site Specific Plans for Remedial Action LTRA
N.W. Mauthe Site, WI - RA-LTRA
U.S. EPA Contract No. 68-W6-0025, WA No. 007-RARA-056G

Please find enclosed three copies of the following site specific plans:

- Site Management Plan
- Health and Safety Plan
- Sampling and Analysis Plan
- Quality Assurance Project Plan
- Field Sampling Plan
- Data Management Plan
- Pollution Control and Mitigation Plan
- Transportation and Disposal Plan

These plans were submitted to the U.S. EPA for the Remedial Action Long Term Response Action (LTRA) at the N.W. Mauthe Site, in Outagamie County, Wisconsin. These eight plans are being submitted in a single three ring binder to facilitate incorporating future updates, if deemed necessary. These plans should address your concerns brought up during your review of the Groundwater Treatment Plant Operation and Maintenance Manual. Your comments were addressed as follows: the groundwater monitoring program is described in the Field Sampling Plan; the transportation and disposal of treatment plant sludge is described in the Transportation and Disposal Plan; and the state and federal spill reporting requirements are described in the Contingency Plan as attached to the Site Management Plan.

Please do not hesitate to contact me at 1-414-272-1052 ext. 348 if you have any questions.

Sincerely,

CH2M HILL

Erin E Potts

Erin E. Potts
Site Manager

Enclosures

cc: Jon Peterson, WAM/U.S. EPA, Region 5 (w/o enclosures)
Cathy Barnett, RTL/CH2M HILL, Milwaukee (w/o enclosures)
Cherie Wilson, AA/CH2M HILL, Milwaukee (w/o enclosures)

Site Management Plan

Introduction

This report describes the site management plan for the remedial action long-term response action (LTRA) activities for the N.W. Mauthe Superfund site in Appleton, Wisconsin. This report includes information on how access, security, health and safety, contingency procedures, management responsibilities, and waste disposal are to be handled during the LTRA. The majority of the detailed information regarding these issues can be found in the following supporting plans.

- The Health and Safety Plan (HASP) describes the health and safety procedures to be followed by all personnel onsite during the implementation of the LTRA.
- The Sampling and Analysis Plan (SAP) describes the data collection and quality assurance requirements of any sampling and analysis conducted by CH2M HILL during the implementation of the LTRA.
- The Quality Assurance Project Plan (QAPP) describes the project objectives and organization, functional activities, and quality assurance/quality control (QA/QC) protocols that will be used to achieve the desired data quality objectives during the implementation of the LTRA.
- The Field Sampling Plan (FSP) defines the sampling and data collection methods that will be used to evaluate cleanup progress during the implementation of the LTRA.
- The Data Management Plan defines the procedures for storing, handling, accessing, and securing data collected during the implementation of the LTRA.
- The Pollution Control and Mitigation Plan describes the process, procedures, and safeguards that will be used to ensure contaminants or pollutants are not released offsite during the implementation of the LTRA.
- The Transportation and Disposal Plan describes how wastes that are generated during the LTRA will be managed and disposed.

Site Background and Project Understanding

The N.W. Mauthe Site is a former electroplating facility located at 725 South Outagamie Street in Appleton, Wisconsin. Norbert W. Mauthe was the owner of Wisconsin Chromium Corporation (WC) from its inception in 1946 until 1976. In 1960, WC moved from 1522 West Melvin Street to 725 South Outagamie Street, and engaged in hard chrome plating until 1976. In 1976, Mr. Mauthe sold WC to Southern Plating and Machine Company, and chrome plating ceased. Electroplating of zinc, cadmium, and possibly copper and silver was conducted at an adjacent building on the same property from 1978 until 1987 under the name N.W. Mauthe Company.

Under contract to the Wisconsin Department of Natural Resources (WDNR), CH2M HILL conducted a Remedial Investigation and Feasibility Study (RI/FS) at the site beginning in November 1991. These investigations revealed that the site was contaminated with zinc, cadmium, chromium, and cyanide. Organic compounds including 1,1,1-trichloroethane, trichloroethene, acetone, and other chlorinated hydrocarbons were also present.

In March of 1994, a Record of Decision (ROD) was signed by the agencies which required the following actions to be taken at the Site:

- Demolition and removal of the buildings on the N.W. Mauthe Property
- Excavation and offsite treatment of soils with a total chromium concentration of greater than 500 mg/kg
- Backfilling of the excavation with clean soils, capping the site with 2 feet of clay and topsoil, and the establishment of vegetative cover
- Installation of groundwater collection trenches and construction and operation of a groundwater treatment facility with discharge to the sanitary sewer, to contain and/or control groundwater contamination with ultimate compliance with groundwater applicable or relevant and appropriate requirements (ARARs)
- Improvement or installation of foundation drain systems and cleaning, painting or sealing of basement walls and floors, as needed, for homes or businesses in the area of the site, to prevent seepage of contaminated water into the buildings
- Monitoring of the effectiveness of the groundwater treatment system and groundwater quality
- Operation and maintenance of all systems

Following signature of the ROD, the State of Wisconsin turned the project over to the USEPA to prepare the Remedial Design (RD) and conduct the Remedial Action (RA). The USEPA awarded the contract for the RD to CH2M HILL on May 12, 1994, under the Alternative Remedial Contracting Strategy (ARCS) contract.

The USEPA determined that the RD/RA should be completed in two phases. Phase I involved the excavation of contaminated soils and installation of the groundwater collection trenches. Phase II involved the construction of the groundwater treatment system. The Phase I RD was completed in March 1995 and with CH2M HILL as the USEPA contractor the RA was completed in January 1996. Phase II RA work commenced in June 1996 and was completed in June 1997.

Following the substantial completion of Phase I and II in January 1997, CH2M HILL began implementing the LTRA at the N.W. Mauthe Site. The LTRA is the implementation phase of the site remedial action, i.e., operation and maintenance and performance monitoring of the groundwater collection and treatment systems at the site.

Project Approach

The primary objectives of the LTRA are listed below:

- Operate and maintain the groundwater treatment system, groundwater collection trenches and building foundation drainage systems
- Sample and analyze the influent and effluent from the groundwater treatment facility to monitor process performance and ensure compliance with the City of Appleton Industrial User Pretreatment Permit (No. 97-21)
- Measure groundwater levels in the groundwater monitoring wells to verify capture of the contaminant plume
- Sample and analyze groundwater monitoring well water samples to track the extent of contamination and monitor cleanup

Access

The groundwater treatment plant is accessible by a paved driveway with access on Melvin Street (see Figure 1). General maintenance such as snow removal and grass cutting is the responsibility of the plant operator to perform or coordinate. Access agreements have been obtained by the USEPA from the residences and businesses affected by the groundwater monitoring work including: the Chandelier Tavern; Miller Electric; and the Ludwig, Hency and Ginter residences.

Security

Site security is the responsibility of the plant operator. Locked fences are provided around the groundwater treatment plant and surrounding grounds; the groundwater treatment plant doors are locked when the operator is not present.

Groundwater monitoring wells and piezometers in areas most subject to damage or vandalism are flush mounted and require a special tool to open. All groundwater monitoring wells are also locked either on the exterior or interior cap of the well. The groundwater collection trench manholes are latched and require a special tool to open.

Health and Safety Requirements

The health and safety of the operation and maintenance (O&M) subcontractor personnel is the O&M subcontractor's responsibility. The O&M subcontractor is responsible for the health and safety training (if required) of O&M subcontractor personnel at the site and for supplying health and safety equipment for O&M subcontractor personnel. The O&M subcontractor has submitted a Site HASP to CH2M HILL for review. Updated copies of CH2M HILL's Site HASP were provided to the subcontractor and are maintained onsite and at CH2M HILL's Milwaukee office.

06-AUG-1997
I:\104200\DRAWINGS\FIGURES\fig1.dgv

MW-108
W-2
MW-101
PZ-4
MW-107
MW-102
PZ-1
W-15
MW-104
PZ-2
MW-106
W-8
MW-105
MANHOLE NO. 1
MANHOLE NO. 2

0+50E 1+00E 1+50E 2+00E 2+50E 3+00E 3+50E 4+00E 4+50E

4+00N 3+50N 3+00N 2+50N 2+00N 1+50N 1+00N 0+50N

CONNECT TO EXISTING WATER MAIN
CONNECT TO EXISTING SANITARY SEWER
CONNECT TO EXISTING GAS MAIN
SECURITY FENCE
ASPHALT DRIVEWAY
ELECTRIC SUBSTATION
GROUNDWATER TREATMENT FACILITY
MELVIN STREET
SECOND STREET
OUTAGAMIE STREET
ELECTRICAL TRANSFORMER
BLDG
GAR
HSE
TAVERN
CONC
BITUM
CONC SDWK

LEGEND

- OVERHEAD TELEPHONE
- GAS MAIN
- OVERHEAD POWER
- WATER MAIN
- SANITARY SEWER
- STORM SEWER
- FENCE
- APPROXIMATE PROPERTY LINE
- UTILITY POLE
- TREE
- SHRUB LINE
- 804.0 SPOT ELEVATION
- 804 CONTOUR LINE
- CONC CONCRETE PAVEMENT
- BITUM BITUMNOUS PAVEMENT
- HSE HOUSE
- GAR GARAGE
- MONITORING WELL

N

0 20' 40' 60'

FIGURE NO. 1
SITE PLAN
N.E. MAUTHE LTRA

CH2MHILL

Contingency Procedures

The contingency procedures for this site are included in the Contingency Plan as Attachment No. 1.

Management Responsibilities

CH2M HILL is the LTRA contractor to the USEPA. CH2M HILL manages subcontractors including the O&M subcontractor, laboratory subcontractor, and miscellaneous subcontractors hired for specific tasks. In addition to reporting to the USEPA, CH2M HILL reports information required by the City of Appleton POTW, such as monthly discharge monitoring reports. CH2M HILL manages the project according to the Work Assignment and Work Plan. The project organization chart is contained in the QAPP and Work Plan.

Waste Disposal

The subcontractor will be responsible for the proper disposal of all hazardous and nonhazardous waste/sludge generated during the LTRA. The Transportation and Disposal Plan describes how wastes that are generated during the LTRA will be managed and disposed.

ATTACHMENT NO. 1

Contingency Plan

Pre-Emergency Planning

Refer to Section 11.1 of the Health and Safety Plan.

Emergency Equipment and Supplies

Refer to Section 11.2 of the Health and Safety Plan.

Emergency Medical Treatment

Refer to Section 11.3 of the Health and Safety Plan.

Evacuation

Refer to Section 11.6 of the Health and Safety Plan.

First Aid Medical Information

Refer to all relevant sections of the Health and Safety Plan.

Spill Prevention, Control, and Countermeasures Plan

Refer to the appropriate material safety data sheet (MSDS) for small quantity spills. Additional information is presented below for caustic and ferrous sulfate spills. The ferrous sulfate drum and sodium hydroxide (caustic) drum are located above chemical spill containment sumps to reduce the potential for uncontained spills. Spill prevention, control, and countermeasures for the caustic and ferrous sulfate systems are presented below.

Caustic Drum

A 50 percent caustic solution is stored in a 55-gallon drum. The drum is located toward the north end of the interior east wall of the process room. The drum is located above a chemical containment sump. The containment sump has a drain pipe connecting the sump to the building sump. The building sump pumps its contents to the groundwater storage tank (T-10). Spill control is presented below.

1. Follow the Health and Safety Plan and take actions necessary to minimize the possibility of exposure including evacuation of unprotected personnel, maintaining adequate ventilation, careful assessment of the hazards, planning, notifications, and wearing all appropriate personal protective equipment (PPE) (see the Health and

Safety Plan and MSDS for appropriate PPE). Whenever there is a possibility of exposure to this chemical, a second person should be present in case a emergency develops.

a) Turn off the caustic feed pump from the main control panel in the control room.

b) If the spill is not small and is not contained in the spill containment area, contact the Midwest Contract Operations, Inc. (MCO) project manager, local emergency responders, hazardous materials emergency responder (if different from the local emergency responder), and CH2M HILL.

c) If the spill has been contained in the containment area or it is a small indoor spill, open exterior doors to increase ventilation if it is safe to do so.

d) If the spill has been contained in the containment sump and it is safe to do so:

   i) Set up barricades and warning tape to keep people away from the containment sump.

   ii) Once all free liquid has been removed, arrange a hose to allow flushing of the sump while standing well away from the spill before turning on the water. The reaction between the water and caustic can cause spattering and vapors to be released.

   iii) Leave the hose running to ensure adequate dilution of all caustic residual on the floor and in the floor drain pipe.

e) If it is a small spill (e.g., a small puddle) on the concrete floor or paved area outside the building and there is a floor drain in the area:

   i) Arrange a hose to allow flushing of the spill area into a drain while standing well away from the spill before turning on the water. The reaction between the water and caustic can cause spattering and vapors may be released.

   ii) Wash the spill into a drain leading to the building sump using a hose.

   iii) Leave the hose running to ensure adequate dilution of all caustic residual on the floor and in the floor drain pipe.

f) If it is a small spill (e.g., a small puddle) on a paved surface outside the building and there is no floor drain in the area:

   i) Contain the spill.

   ii) Use a Powersorb Spill Cleanup kit.

   iii) Roll an empty open top 55-gallon drum to the spill area using the drum cart. This drum can be used to dispose of the Powersorb.

   iv) Use a shovel to transfer caustic saturated Powersorb into the drum.

   v) Per the MSDS, neutralize remaining residue with dilute hydrochloric acid. Use pH paper on the residual to determine when it has been neutralized.

g) If it is a small spill on an unpaved surface:

i) Contain the spill.

ii) Roll an empty open top 55-gallon drum to the spill area using the drum cart.

iii) Use a shovel to transfer caustic saturated soil into the drum.

Ferrous Sulfate Drum

A 15- to 25-percent ferrous sulfate solution is stored in a 55-gallon drum. The drum is located toward the north end of the interior east wall of the process room, adjacent to the caustic drum. The drum is located above a chemical containment sump. The containment sump has a drain pipe connecting the sump to the building sump. The building sump pumps its contents to the groundwater storage tank (T-10). Spill control is presented below.

1. Follow the Health and Safety Plan and take actions necessary to minimize the possibility of exposure including evacuation of unprotected personnel, maintaining adequate ventilation, careful assessment of the hazards, planning, notifications, and wearing all appropriate PPE (see the Health and Safety Plan and MSDS for appropriate PPE). Whenever there is a possibility of exposure to this chemical, a second person should be present in case an emergency develops.

a) Turn off the ferrous sulfate feed pump from the main control panel in the control room.

b) If the spill is not small and is not contained in the spill containment area, contact the MCO project manager, local emergency responders, hazardous materials emergency responder (if different from the local emergency responder), and CH2M HILL.

c) If the spill has been contained in the containment area or it is a small indoor spill, open exterior doors to increase ventilation if it is safe to do so.

d) If the spill has been contained in the containment sump and it is safe to do so:

i) Set up barricades and warning tape to keep people away from the containment sump.

ii) Once all free liquid has been removed, arrange a hose to allow flushing of the sump while standing well away from the spill before turning on the water. The reaction between the water and ferrous sulfate can cause spattering and vapors may be released. The vapors and droplets will contain acid.

iii) Leave the hose running to ensure adequate dilution of all ferrous sulfate residual on the floor and in the floor drain pipe.

e) If it is a small spill (e.g., a small puddle) on the concrete floor or paved area outside the building and there is a floor drain in the area:

i) Arrange a hose to allow flushing of the spill area into a drain while standing well away from the spill before turning on the water. The

reaction between the water and ferrous sulfate can cause spattering and vapors to be released.

ii) Wash the spill into a drain leading to the building sump using a hose.

iii) Leave the hose running to ensure adequate dilution of all ferrous sulfate residual on the floor and in the floor drain pipe.

f) If it is a small spill (e.g., a small puddle) on a paved surface outside the building and there is no floor drain in the area:

i) Contain the spill.

ii) Use a Powersorb Spill Cleanup kit.

iii) Roll an empty open top 55-gallon drum to the spill area using the drum cart. This drum can be used to dispose of the Powersorb.

iv) Use a shovel to transfer ferrous sulfate saturated Powersorb into the drum.

v) Per the MSDS, neutralize remaining residue with soda ash or lime. Use pH paper on the residual to determine when it has been neutralized.

g) If it is a small spill on an unpaved surface:

i) Contain the spill.

ii) Roll an empty open top 55-gallon drum to the spill area using the drum cart.

iii) Use a shovel to transfer ferrous sulfate saturated soil into the drum.

Emergency Numbers

Refer to Section 12.1 of the Health and Safety Plan for Emergency Numbers.

When calling an Emergency Response number be prepared to answer the following questions.

Who: **N.W. Mauthe Groundwater Treatment Facility**

Where: **725 South Outagamie Street**
Appleton, WI 54914

How Many Are Injured? _____

Describe type of injuries, illnesses, and first aid being administered.

An individual must meet the emergency vehicle at the site entrance and direct them.

In case of evacuation at site personnel will meet at the intersection of Outagamie Street and Melvin Street.

Emergency Notification Procedure

If an emergency or unusual situation should come to your attention, it is your responsibility to notify others of the situation. An emergency can be an injury to a worker, an evacuation, fire, etc. An unusual situation could involve equipment failures, work that is not being performed appropriately, or anything involving risk or exposure to the public.

Failure to provide notification of any incident places everyone at a disadvantage. This must be avoided. Therefore, if you become aware of any emergency or unusual situation during your work period, provide notification as follows as soon as the conditions permit.

Following notification of emergency services, primary notification is to the CH2M HILL Site Manager or Assistant Site Manager.

Name	Work Telephone	Home Telephone
Erin Potts, Site Manager	414/272-2426	414/761-9059
Dan MacGregor, Assistant Site Manager	414/272-2426	414/375-9647
Richard Rathnow, Health and Safety Manager	414/272-2426	414/650-8467

In addition notify the MCO project manager or assistant project manager.

Randall Much	414/751-4200
Stuart Boerst	414/751-4200

Do not stop calling until at least one of the above CH2M HILL contacts and one of the above MCO contacts has been notified of the situation. Be prepared to identify the facts of the matter, status of emergency services, effect on the public, and any other pertinent information.

Do not talk to any members of the press, even if you are aware of all the facts. Refer the press to Jon Peterson/USEPA (work telephone 312/353-1264). Do not interfere with any rescue or corrective operations. Cooperate and truthfully answer questions put to you by the police or other such official investigators.

Your cooperation in complying with the above emergency notification procedure is required.

Please post in a location for Ready Reference.

HEALTH AND SAFETY PLAN

REMEDIAL ACTION LONG-TERM RESPONSE ACTION

N.W. Mauthe Site
Appleton, Wisconsin

WA No. 007-RARA-056G/Contract 68-W6-0025

August 1997

CH2M HILL

Table of Contents

Attachments

Figures

CH2M HILL HEALTH AND SAFETY PLAN

(Reference CH2M HILL SOP 19, *Health and Safety Plans*)

This health and safety plan will be kept on the site during field activities and will be reviewed and updated as necessary. The plan adopts, by reference, the standards of practice (SOP) in the CH2M HILL *Corporate Health and Safety Program, Program and Training Manual,* and CH2M HILL's *Site safety Notebook* as appropriate. The site safety coordinator (SSC) is to be familiar with these SOPs and the content of this plan. Site personnel must sign Attachment No. 1. In addition, this plan adopts procedures in the work plan for the project.

1 PROJECT INFORMATION AND DESCRIPTION

CLIENT OR OWNER: U.S. EPA Region 5

PROJECT NO: 141695.DU.02

PROJECT MANAGER: Erin Potts/MKE

OFFICE: GLR/MKE

SITE NAME: N.W. Mauthe Superfund Site

SITE ADDRESS: 725 South Outagamie Street, Appleton, WI

DATE HEALTH AND SAFETY PLAN PREPARED: August 5, 1997

DATE(S) OF SITE WORK: June 1996 through November 1998

SITE ACCESS: The site is located on the corner of Melvin Street and Outagamie Street approximately two miles east of Route 41 in Appleton, Wisconsin. See Figure 1-1.

SITE SIZE: 2- acres

SITE TOPOGRAPHY: The site is at an elevation of roughly 805 feet above msl and has less than 5 feet of relief, which slopes to the southeast toward the Fox River. The Fox River is located about ½ mile southeast and is about 70 feet lower in elevation than the site.

SITE DESCRIPTION AND HISTORY:

The N.W. Mauthe Site is a former electroplating facility located at 725 South Outagamie Street in Appleton, Wisconsin. Norbert W. Mauthe was the owner of Wisconsin Chromium Corporation (WC) from its inception in 1946 until 1976. In 1960, WC moved from 1522 West Melvin Street to 725 South Outagamie Street, and engaged in hard chrome plating until 1976. In 1976, Mr. Mauthe sold WC to Southern Plating and Machine Company, and chrome plating ceased. Electroplating of zinc, cadmium, and possibly copper and silver was conducted at an adjacent building on the same property from 1978 until 1987 under the name N.W. Mauthe Company.

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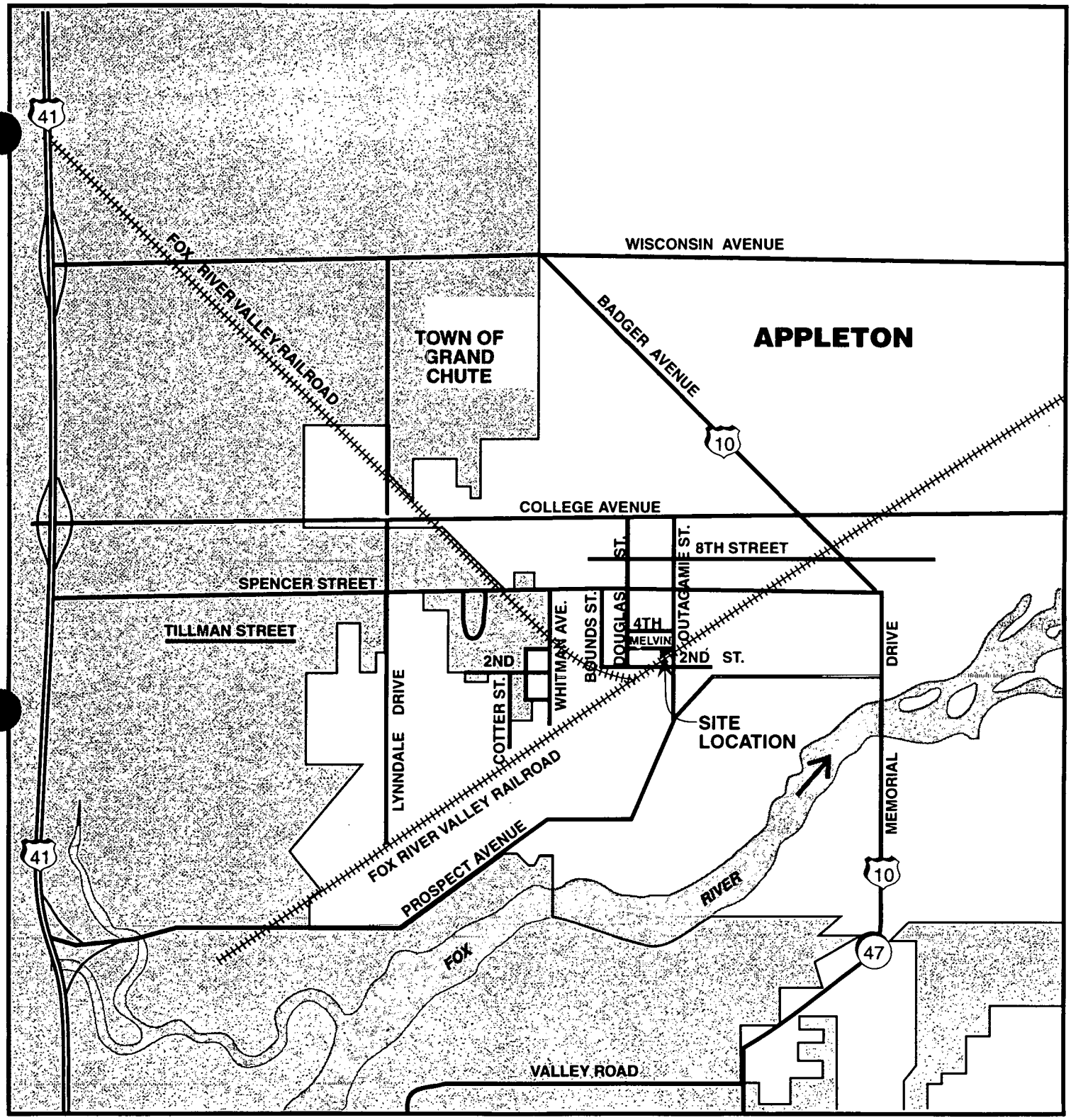
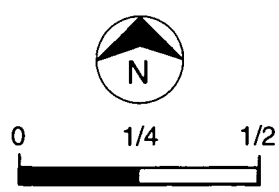
Following the substantial completion of Phase I and II in January 1997, CH2M HILL began implementing the LTRA at the N.W. Mauthe Site. The LTRA is the implementation phase of the site remedial action, i.e., operation and maintenance and performance monitoring of the groundwater collection and treatment systems at the site.

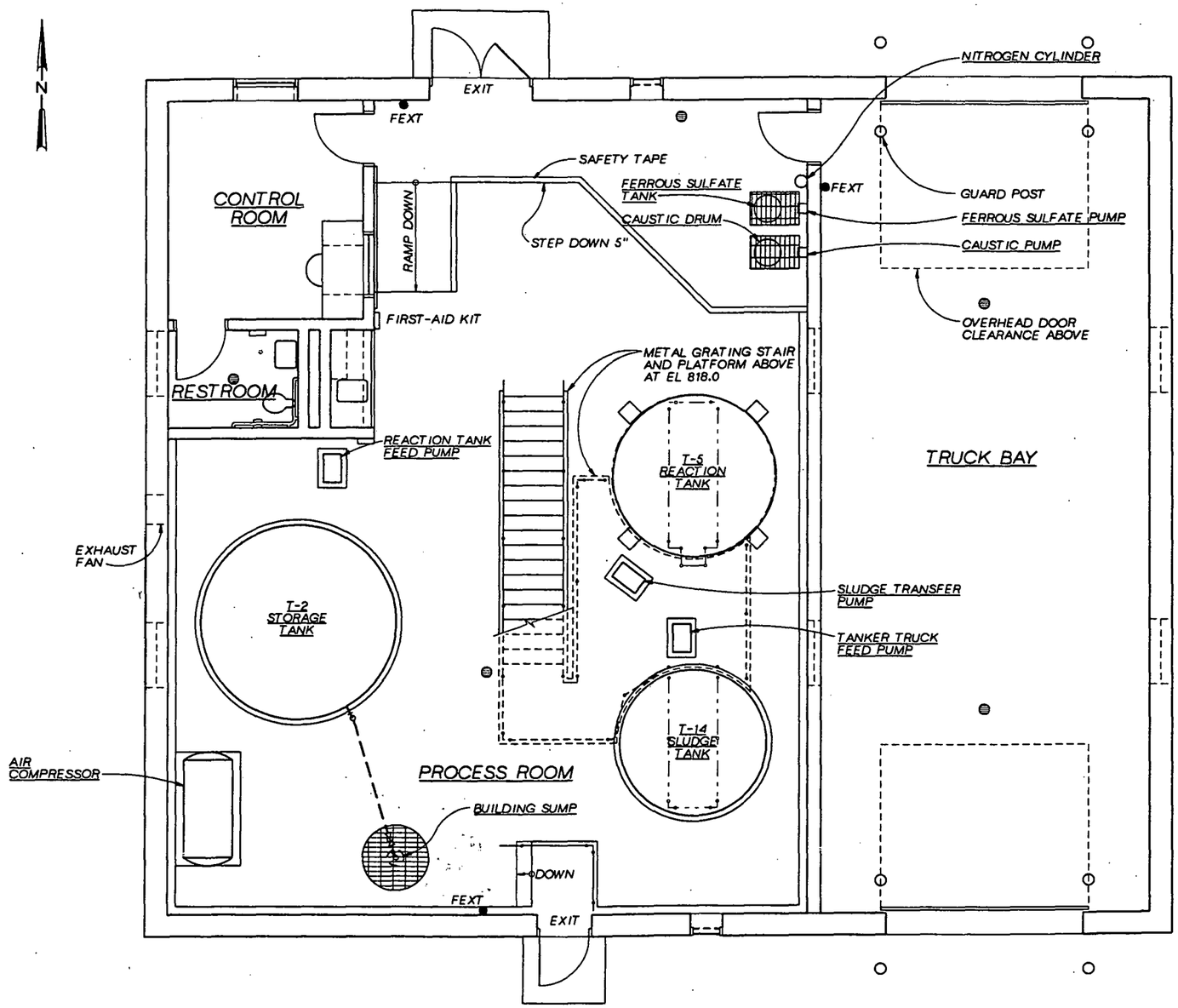




Map Source: R.R. Donnelley & Sons Co. Cartographic Services

FIGURE 1-1
Site Location Map
N.W. Mauthe Site

CH2MHILL



FLOOR PLAN
1/8" = 1'-0"

FIGURE NO. 1-2
TREATMENT FACILITY LAYOUT
N.E. MAUTHE LTRA

CH2MHILL

2 PROJECT ORGANIZATION AND TASKS TO BE PERFORMED UNDER THIS PLAN

2.1 PROJECT ORGANIZATION

CLIENT: U.S. EPA Region 5

CH2M HILL:

Project Manager: Erin Potts/MKE
Field Team Leader: Dan MacGregor/MKE
Refer to Section 4 for field staff.

CONTRACTORS and SUBCONTRACTORS: Refer to Section 4.2.

2.2 DESCRIPTION OF TASKS (Reference Section 1, "Field Activity Start-up Form," of *Site Safety Notebook*)

- Operation and Maintenance of Groundwater Treatment Facility (performed by subcontractor).
- Groundwater Monitoring Sample(s) Collection.
- Process Treatment Plant Effluent Sample Collection.

A health and safety risk analysis has been performed for each task and is incorporated in this plan through task-specific hazard controls and requirements for monitoring and protection. Tasks in addition to those listed below require an approved amendment to this plan before additional work begins. Refer to Section 10.2 for procedures related to tasks that do not involve hazardous waste operations and emergency response (Hazwoper).

2.2.1 HAZWOPER-REGULATED TASKS

- Groundwater Sampling
- Process Treatment Plant Effluent Sampling

2.2.2 NON-HAZWOPER-REGULATED TASKS

Under specific circumstances, the training and medical monitoring requirements of federal or state Hazwoper regulations are not applicable. It must be demonstrated that the tasks can be performed without the possibility of exposure in order to use non-Hazwoper-trained personnel. **Prior approval from the HSM is required before these tasks are conducted on regulated hazardous waste sites.**

TASK	RESTRICTIVE CONDITIONS
• Electrical installation	N/A
• Iron work (installing rebar)	N/A
• Masonry work	N/A
• General heavy equipment work (excavation, grading, etc.)	N/A
• Mechanical installations (equipment, pumps, etc.)	N/A
• Engineering testing/evaluation	N/A
• Building construction	N/A

3 HAZARD EVALUATION AND CONTROL

3.1 HEAT AND COLD STRESS (Reference CH2M HILL SOP HS-09, *Heat and Cold Stress*)

3.1.1 PREVENTING HEAT STRESS

- Drink 16 ounces of water before beginning work, such as in the morning or after lunch. Disposable (e.g., 4-ounce) cups and water maintained at 50° to 60°F should be available. Under severe conditions, drink 1 to 2 cups every 20 minutes, for a total of 1 to 2 gallons per day. Take regular breaks in a cool, preferably air-conditioned, area. Do not use alcohol in place of water or other nonalcoholic fluids. Decrease your intake of coffee and caffeinated soft drinks during working hours. Monitor for signs of heat stress.
- Acclimate to site work conditions by slowly increasing workloads; e.g., do not begin site work with extremely demanding activities.
- Use cooling devices, such as cooling vests, to aid natural body ventilation. The devices add weight, so their use should be balanced against efficiency.
- Use mobile showers or hose-down facilities to reduce body temperature and cool protective clothing.
- During hot weather, conduct field activities in the early morning or evening if possible.
- Provide adequate shelter to protect personnel against radiant heat (sun, flames, hot metal), which can decrease physical efficiency and increase the probability of heat stress.
- In hot weather, rotate shifts of workers.
- Maintain good hygiene standards by frequently changing clothing and by showering. Clothing should be permitted to dry during rest periods. Persons who notice skin problems should consult medical personnel.

3.1.2 SYMPTOMS AND TREATMENT OF HEAT STRESS

	Heat Syncope	Heat Rash (*miliaria rubra*, "prickly heat")	Heat Cramps	Heat Exhaustion	Heat Stroke
Signs and Symptoms	Sluggishness or fainting while standing erect or immobile in heat.	Profuse tiny raised red blister-like vesicles on affected areas, along with prickling sensations during heat exposure.	Painful spasms in muscles used during work (arms, legs, or abdomen); onset during or after work hours.	Fatigue, nausea, headache, giddiness; skin clammy and moist; complexion pale, muddy, or flushed; may faint on standing; rapid thready pulse and low blood pressure; oral temperature normal or low	Red, hot, dry skin; dizziness; confusion; rapid breathing and pulse; high oral temperature.
Treatment	Remove to cooler area. Rest lying down. Increase fluid intake. Recovery usually is prompt and complete.	Use mild drying lotions and powders, and keep skin clean for drying skin and preventing infection.	Remove to cooler area. Rest lying down. Increase fluid intake.	Remove to cooler area. Rest lying down, with head in low position. Administer fluids by mouth. Seek medical attention.	Cool rapidly by soaking in cool– but not cold– water. Call ambulance, and get medical attention immediately!

3.1.3 HEAT-STRESS MONITORING

For field activities part of ongoing site work activities in hot weather, the following procedures should be used to monitor the body's physiological response to heat and to estimate the work-cycle/rest-cycle when workers are performing moderate levels of work. These procedures should be

considered when the ambient air temperature exceeds 70°F, the relative humidity is high(>50%), or when the workers exhibit symptoms of heat stress.

The heart rate should be measured by the radial pulse for 30 seconds, as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 110 beats/minute, or 20 beats/ minute above resting pulse. If the HR is higher, the next work period should be shortened by 33 percent, while the length of the rest period stays the same. If the pulse rate still exceeds 110 beats/ minute at the beginning of the next rest period, the following work cycle should be further shortened by 33 percent. The procedure is continued until the rate is maintained below 110 beats/minute, or 20 beats/minute above resting pulse.

3.1.4 PREVENTING COLD STRESS

- Be aware of the symptoms of cold-related disorders, and ***wear proper clothing for the anticipated fieldwork.***
- Consider monitoring the work conditions and adjusting the work schedule, using guidelines developed by the U.S. Army (wind-chill index) and the National Safety Council (NSC).
- ***Wind-Chill Index.*** This measure relates the dry bulb temperature and the wind velocity. It is used only to estimate the combined effect of wind and low air temperatures on exposed skin. The wind-chill index sometimes is limited in its usefulness because the index does not take into account the body part that is exposed, the level of activity, or the amount or type of clothing worn. For those reasons, it is used only as a guideline to warn workers when they are in a situation that can cause cold-related illnesses. Used in conjunction with the NSC guidelines, the wind-chill index provides a starting point for adjusting work and warm-up schedules.
- ***NSC Guidelines for Work and Warm-Up Schedules.*** The cold-exposure limits recommended by the NSC can be used in conjunction with the wind-chill index to estimate work and warm-up schedules for fieldwork. The guidelines are not absolute; ***workers should be monitored for symptoms of cold-related illness.*** If symptoms are not observed, the work duration can be increased.
- The wind-chill index and the NSC guidelines are in the CH2M HILL *Corporate Health and Safety Program, Program and Training Manual*, SOP HS-09.

3.1.5 SYMPTOMS AND TREATMENT OF COLD STRESS

	Immersion (Trench) Foot	Frostbite	Hypothermia
Signs and Symptoms	Feet discolored and painful; infection and swelling present.	Blanched, white, waxy skin, but tissue resilient; tissue cold and pale.	Shivering, apathy, sleepiness; rapid drop in body temperature; glassy stare; slow pulse; slow respiration.
Treatment	Seek medical treatment immediately.	Remove victim to a warm place. Re-warm area quickly in warm–but not hot–water. Have victim drink warm fluids, but not coffee or alcohol. Do not break blisters. Elevate the injured area, and get medical attention.	Remove victim to a warm place. Have victim drink warm fluids, but not coffee or alcohol. Get medical attention.

3.2 PROCEDURES FOR LOCATING BURIED UTILITIES

Not Required.

3.3 GENERAL PHYSICAL (SAFETY) HAZARDS AND CONTROLS

Engineering and administrative controls are to be implemented by the party in control of the site or the hazard (i.e., CH2M HILL, subcontractor, or contractor). CH2M HILL employees and subcontractors must, at a minimum, remain aware of hazards affecting them regardless of who is responsible for controlling the hazards. Specialty subcontractors are responsible for the safe operation of their equipment (e.g., drill rig, heavy equipment). CH2M HILL employees are not to operate, or assist in the operation of, any subcontractor or contractor equipment.

		Task		
Hazard (Refer to SOP, or HSP Section)	Engineering Controls, Administrative Controls, and Work Practices	O & M of Treatment Facility	Process Water Monitoring	Ground Water Monitoring
Noise > 85 dBA	Noise protection and monitoring required.	X		
Gas cylinders (HS-21)	Instruct employees in the safe use of compressed gases. Make certain gas cylinders are properly anchored and chained. Keep cylinders away from ignition sources. Cap cylinders when not in use.	X		
Electrical	Make certain third wire is properly grounded. Do not tamper with electrical wiring unless qualified to do so. Ground as appropriate. Project field sites should have ground fault circuit interrupters (GFCIs) installed for all wiring, including extension cords. Operate and maintain equipment according to manufacturer's instructions. Use only extension cords that are three-wire grounded. Cords passing through work areas must be covered or elevated to protect from damage. Use only electrical tools and equipment that are either effectively grounded or double-insulated UL approved. Properly label switches, fuses, and circuit breakers. Remove cord from an outlet by grasping the plug, not pulling the cord. Protect all electrical equipment, tools, switches, etc., from elements. Avoid physical contact with power circuit. Only qualified electricians are to install and work on electrical circuits and equipment.	X		X
Slip, trip, fall hazards	Provide slip-resistant surfaces, ropes, and/or other devices to be used. Brace and shore equipment	X	X	X
Back injury (HS-29)	Use proper lifting techniques, or provide mechanical lifting aids.	X	X	X
Confined space entry (Section 9.0)	Space must be evaluated by qualified person. Additional controls and monitoring, training, and an approved entry permit are generally required.	NOT APPROVED		
Protruding objects	Flag visible objects.	X	X	X
Visible lightning	Stop work.			X
Stairways, ladders, and scaffolds (HS-25)	Stairways and ladders are generally required when there is a break in elevation of 19 inches or more. Keep access ways clear. Equipment must meet OSHA specifications. Document employee training.	X		
Elevated work area/falls (HS-31)	Provide guardrail, safety net, floor covers, body harness, and monitoring system, where applicable. Document employee training.	X		
Fire prevention and control (HS-22)	Appropriate firefighting equipment must be available on the site. Extinguishers are to be inspected visually every month and undergo an annual maintenance check. Post "Exit" signs over exiting doors, and post "Fire Extinguisher" signs over extinguisher locations. Keep areas near exits and extinguishers clear. Open flames are prohibited in the vicinity of flammable materials. Combustible materials stored outside should be at least 10 feet from the building. Unnecessary combustible materials and flammable or combustible liquids must not be allowed to accumulate. Flammable or combustible liquids must be kept in approved containers, and must be stored in an approved storage cabinet.	X		

3.4 BIOLOGICAL HAZARDS AND CONTROLS

Hazard and Location	Control Measures
Snakes typically are found in underbrush and tall grassy areas.	If you encounter a snake, stay calm and look around; there may be other snakes. Turn around and walk away on the same path you used to approach the area. If a person is bitten by a snake, wash and immobilize the injured area, keeping it lower than the heart if possible. Seek medical attention immediately. **DO NOT** apply ice, cut the wound, or apply a tourniquet. Carry the victim or have him/her walk slowly if the victim must be moved. Try to identify the type of snake: note color, size, patterns, and markings.
Poison ivy, poison oak, and poison sumac typically are found in brush or wooded areas. They are more commonly found in moist areas or along the edges of wooded areas.	Become familiar with the identity of these plants. Wear protective clothing that covers exposed skin and clothes. Avoid contact with plants and the outside of protective clothing. If skin contacts a plant, wash the area with soap and water immediately. If the reaction is severe or worsens, seek medical attention.
Exposure to **bloodborne pathogens** may occur when rendering first aid or CPR, or when coming into contact with medical or other potentially infectious material, or when coming into contact with landfill waste or waste streams containing such infectious material.	Training is required before a task involving potential exposure is performed. Exposure controls and personal protective equipment (PPE) are required as specified in CH2M HILL SOP HS-36, *Bloodborne Pathogens*. Hepatitis B vaccination must be offered before the person participates in a task where exposure is a possibility.
Bees and other stinging insects may be encountered almost anywhere and may present a serious hazard, particularly to people who are allergic.	Watch for and avoid nests. Keep exposed skin to a minimum. Carry a kit if you have had allergic reactions in the past, and inform the SSC and/or the buddy. If a stinger is present, remove it carefully with tweezers. Wash and disinfect the wound, cover it, and apply ice. Watch for allergic reaction; seek medical attention if a reaction develops.

3.5 TICK BITES (Reference CH2M HILL HS-03, *Tick Bites*)

Ticks typically are in wooded areas, bushes, tall grass, and brush. Ticks are black, black and red, or brown and can be up to one-quarter inch in size.

Prevention against tick bites includes avoiding tick areas; wearing tightly woven light-colored clothing with long sleeves and wearing pant legs tucked into boots or socks; spraying **only outside** of clothing with insect repellent containing permethrin or permanone, and spraying skin with DEET; and checking yourself frequently for ticks and showering as soon as possible. To prevent chemical repellents from interfering with sample analyses, exercise care while using repellents during the collection and handling of environmental samples.

If bitten by a tick, carefully remove the tick with tweezers, grasping the tick as close as possible to the point of attachment while being careful not to crush the tick. After removing the tick, wash your hands and disinfect and press the bite area. The removed tick should be saved. Report the bite to human resources personnel.

Look for symptoms of Lyme disease or Rocky Mountain spotted fever (RMSF). Lyme: a rash that looks like a bullseye with a small welt in the center. RMSF: a rash of red spots under the skin 3 to 10 days after the tick bite. In both cases, chills, fever, headache, fatigue, stiff neck, bone pain may develop. If symptoms appear, seek medical attention.

3.6 RADIOLOGICAL HAZARDS AND CONTROLS

Refer to CH2M HILL's *Corporate Health and Safety Program, Program and Training Manual,* and *Corporate Health and Safety Program, Radiation Protection Program Manual,* for standards of practice for operating in contaminated areas.

Hazards	Controls
None Known	None Required

3.7 HAZARDS POSED BY CHEMICALS BROUGHT ON THE SITE

3.7.1 HAZARD COMMUNICATION

(Reference CH2M HILL *Hazard Communication Manual* and Section 5 of the *Site Safety Notebook*)

CH2M HILL's *Hazard Communication Program Manual,* which is available from area or regional offices and from the Corporate Human Resources Department in Denver. The project manager is to request Material Safety Data Sheets (MSDSs) from the client or from the contractors and the subcontractors for chemicals to which CH2M HILL employees potentially are exposed. The SSC is to do the following:

- Give employees required site-specific HAZCOM training.
- Confirm that the inventory of chemicals brought on the site by subcontractors is available.
- Before or as the chemicals arrive on the site, obtain an MSDS for each hazardous chemical.
- Label chemical containers with the identity of the chemical and with hazard warnings, if any.

The chemical products listed below will be used on the site. Refer to Attachment 2 for MSDSs.

Chemical	Quantity	Location
Nitrogen Gas (treatment chemical)	1600 lb cylinder	Treatment Facility
Ferrous Sulfate (treatment chemical)	55 Gallons	Treatment Facility
Sodium Hydroxide (treatment chemical)	55 Gallons	Treatment Facility
Hydrochloric Acid (sample preservative)	< 500 ml	w/ Field Team
Nitric Acid (sample preservative)	< 500 ml	w/ Field Team
Sodium Hydroxide (sample preservative)	< 500 ml	w/ Field Team
pH Buffers (calibration standard)	< 500 ml	w/ Field Team
Alconox/Liquinox (detergent)	< 1 liter	w/ Field Team

3.7.2 SHIPPING AND TRANSPORTATION OF CHEMICAL PRODUCTS

(Reference CH2M HILL's *Procedures for Shipping and Transporting Dangerous Goods*)

Nearly all chemicals brought to the site are considered hazardous materials by the U.S. Department of Transportation (DOT). All staff who ship the materials or transport them by road must receive the CH2M HILL training in shipping dangerous goods. All hazardous materials that are shipped (e.g., via Federal Express) or are transported by road must be properly identified, labeled, packed, and documented by trained staff. Contact the HSM or the Equipment Coordinator for additional information.

3.8 CONTAMINANTS OF CONCERN

Contaminant	Location and Highest[a] Concentration (ppm)	Exposure Limit[b]	IDLH[c]	Symptoms and Effects of Exposure	PIP[d] (eV)
Chromium (as Cr(II) & Cr (III))	GW: 3600 µ g/L MW-107 PW: 1100 µ g/L	0.5 mg/m^3	25	Irritated eyes, sensitization dermatitis, histologic fibrosis of lungs	NA
Chromium (hexavalent)	PW: 100 µ g/L	0.05 mg/m^3	15	Irritated respiratory system; nasal septum perforation; liver and kidney damage; leucytosis; leupen; monocytosis; eosinophilla; eye injury, conjuctivitis; skin ulcer; sensitization dermatitis	NA

Footnotes:

a: Specify sample-designation and media: GW (Groundwater), PW (process water effluent)
b: Appropriate value of PEL, REL, or TLV listed
c: IDLH = immediately dangerous to life and health (units are the same as specified "Exposure Limit" units for that contaminant);
d: NA = Not applicable

3.9 POTENTIAL ROUTES OF EXPOSURE

DERMAL: Contact with contaminated media. This route of exposure is minimized through proper use of PPE, as specified in Section 5.	**INHALATION**: Vapors and contaminated particulates. This route of exposure is minimized through proper respiratory protection and monitoring, as specified in sections 5 and 6, respectively.	**OTHER**: Inadvertent ingestion of contaminated media. This route should not present a concern if good hygiene practices are followed (e.g., wash hands and face before eating, drinking, or smoking).

4 PERSONNEL

4.1 CH2M HILL EMPLOYEE MEDICAL SURVEILLANCE AND TRAINING

(Reference CH2M HILL SOP HS-01, *Medical Surveillance*, and HS-02, *Health and Safety Training*)

The employees listed below are enrolled in the CH2M HILL Comprehensive Health and Safety Program and meet state and federal hazardous waste operations requirements for 40-hour initial training, 3-day on-the-job experience, and 8-hour annual refresher training. Employees designated "SSC" have received 8 hours of supervisor and instrument training and can serve as site safety coordinator (SSC) for the level of protection indicated. A SSC with a level designation (D, C, B) equal to or greater than the level of protection being used must be present during all tasks performed in exclusion or decontamination zones that involve the potential for exposure to health and safety hazards. Employees designated "FA-CPR" are currently certified by the American Red Cross, or equivalent, in first aid and CPR. At least one FA-CPR designated employee must be present during all tasks performed in exclusion or decontamination zones that involve the potential for exposure to health and safety hazards. The employees listed below are currently active in a medical surveillance program that meets state and federal regulatory requirements for hazardous waste operations. Certain tasks (e.g., confined-space entry) and contaminants (e.g., lead) may require additional training and medical monitoring.

Pregnant employees are to be informed of and are to follow the procedures in CH2M HILL's SOP HS-04, *Reproduction Protection*, including obtaining a physician's statement of the employee's ability to perform hazardous activities, before being assigned fieldwork.

Employee Name	Office	Responsibility	SSC/FA-CPR
Erin Potts	MKE	Project/Site Manager	FA-CPR
Dan MacGregor	MKE	Assistant Site Manager/SSC	SSC (C) /FA-CPR
Patrick Allen	MKE	Field Team Member	FA-CPR
Derek Clayton	MKE	Field Team Member	SSC (C) /FA-CPR
Regina Bayer	MKE	Field Team Member	SSC (D) /FA-CPR
Cathy Barnett	MKE	Review Team Leader	FA-CPR
Rich Baldino	MKE	Field Team Member	SSC (D) /FA-CPR
Dong-Son Pham	MKE	Field Team Member	SSC (D) /FA-CPR
Chris Liethen	MKE	Field Team Member	FA-CPR

4.2 FIELD TEAM CHAIN OF COMMAND AND COMMUNICATION PROCEDURES

4.2.1 CLIENT

Contact Name: Jon Peterson/U.S. EPA Region 5 WAM
Phone: 312/353-1264

4.2.2 CH2M HILL

Project Manager: Erin Potts/MKE
Health and Safety Manager: Richard Rathnow/MKE
Field Team Leader: Dan MacGregor/MKE
Site Safety Coordinator: Dan MacGregor/MKE

The SSC is responsible for contacting the field team leader and the project manager. In general, the project manager either will contact or will identify the client contact. The Health and Safety Manager (HSM) should be contacted as appropriate. The SSC or the project manager must notify the client and the HSM when a serious injury or a death occurs or when health and safety inspections by OSHA or other agencies are conducted. Refer to sections 10 through 12 for emergency procedures and phone numbers.

4.2.3 SUBCONTRACTORS (Reference Section 3, *Corporate Health and Safety Program Manual)*

When specified in the project documents (e.g., contract), this plan may cover CH2M HILL subcontractors. However, this plan does not address hazards associated with tasks and equipment that the subcontractor has expertise in (e.g., operation of drill rig). Specialty subcontractors are responsible for health and safety procedures and plans specific to their work. Specialty subcontractors are to submit plans to CH2M HILL for review and approval before the start of fieldwork. Subcontractors must comply with the established health and safety plan(s). CH2M HILL must monitor and enforce compliance with the established plan(s).

O&M Subcontractor: Midwest Contract Operations, Inc.
Subcontractor Contact: Laurie Stenson
Telephone: 414/751-4299

Should Area Code Be 920

General health and safety communication with subcontractors contracted with CH2M HILL and covered by this plan is to be conducted as follows:

- Request that the subcontractor, if a specialty subcontractor, submit a safety or health plan applicable to their expertise; attach the reviewed plan.
- Supply subcontractors with a copy of this plan, and brief them on its provisions.
- Direct health and safety communication to the subcontractor-designated safety representative.
- Notify the subcontractor-designated representative if a violation of the plan(s) is observed. Specialty subcontractors are responsible for mitigating hazards in which they have expertise.
- If a hazard condition persists, inform the subcontractor. If the hazard is not mitigated, stop affected work as a last resort and notify the project manager.
- When an apparent imminent danger exists, promptly remove all affected personnel. Notify the project manager.
- Make clear that consistent violations of the health and safety plan by a subcontractor may result in termination of the subcontract.

4.2.4 CONTRACTORS (Reference Section 3, *Corporate Health and Safety Program Manual*)

This plan does not cover contractors that are contracted directly to the client or the owner. CH2M HILL is not responsible for directing contractor personnel and is not to assume responsibility through their actions. When the contractor is in control of the site, ask the contractor to conduct a briefing of their health and safety practices and to describe how they apply to CH2M HILL's activities. Request a copy of the contractor's health and safety plan.

No contractors have been identified.

5 PERSONAL PROTECTIVE EQUIPMENT (PPE) (Reference CH2M HILL SOP HS-07, *Personal Protective Equipment*, HS-08, *Respiratory Protection*, Section 2 of the *Site Safety Notebook*)

5.1 PPE SPECIFICATIONS[a]

Task	Level	Body	Head	Respirator[b]
Groundwater and process water monitoring.	D	Work clothes; steel-toe, steel-shank leather work boots; work gloves	Hardhat[c] Safety glasses Ear protection[d]	None required
Working with treatment chemicals: sodium hydroxide and ferrous sulfate	Modified D	**COVERALLS:** Uncoated Tyvek® **BOOTS:** Steel-toe, steel-shank chemical-resistant boots OR steel-toe, steel-shank leather work boots with outer rubber boot covers **GLOVES:** Inner surgical-style nitrile glove AND outer chemical-resistant nitrile glove.	Hardhat[c] Splash shield[c] Safety glasses Ear protection[d]	None required
None.	C	**COVERALLS:** Polycoated Tyvek® **BOOTS:** Steel-toe, steel-shank chemical-resistant boots OR steel-toe, steel-shank leather work boots with outer rubber boot covers **GLOVES:** Inner surgical-style nitrile glove AND outer chemical-resistant nitrile glove.	Hardhat[c] Splash shield[c] Ear protection[d] Spectacle inserts	APR, full face, MSA Ultratwin or equivalent; with GME-H[e] cartridges or equivalent
None.	B	**COVERALLS:** Polycoated Tyvek® **BOOTS:** Steel toe, steel-shank chemical-resistant boots OR steel-toe, steel-shank leather work boots with outer rubber boot covers **GLOVES:** Inner surgical-style nitrile glove AND outer chemical-resistant nitrile glove.	Hardhat[c] Splash shield[c] Ear protection[d] Spectacle inserts	Positive-pressure demand self-contained breathing apparatus (SCBA): MSA Ultralite, or equivalent

[a] Modifications are as indicated. CH2M HILL will provide PPE to only CH2M HILL employees.
[b] No facial hair that would interfere with respirator fit is permitted.
[c] Hardhat and splash-shield areas are to determined by the SSC.
[d] Ear protection should be worn while working around drill rigs or other noise-producing equipment or when conversations cannot be held at distances of 3 feet or less without shouting. Refer to Section 6 for other requirements.
[e] The GME-H cartridge is the new standard-issue cartridge. Available stock of the previously standard GMC-H cartridges may be used for tasks covered by this plan.

5.2 REASONS FOR UPGRADING OR DOWNGRADING LEVEL OF PROTECTION

Upgrade*	Downgrade
• Request from individual performing task. • Change in work task that will increase contact or potential contact with hazardous materials. • Occurrence or likely occurrence of gas or vapor emission. • Known or suspected presence of dermal hazards. • Instrument action levels (Section 6) exceeded.	• New information indicating that situation is less hazardous than originally thought. • Change in site conditions that decreases the hazard. • Change in work task that will reduce contact with hazardous materials.

*Performing a task that requires an upgrade to a higher level of protection (e.g., level D to level C) is permitted only when the PPE requirements have been specified in Section 5 and an SSC who meets the requirements specified in subsection 4.1 is present.

6 AIR MONITORING SPECIFICATIONS (Reference CH2M HILL SOP HS-06, *Air Monitoring*, and Section 2 of the *Site Safety Notebook*)

None Required.

6.1 CALIBRATION SPECIFICATIONS

None Required.

6.2 AIR SAMPLING

Sampling may be required by other OSHA regulations where there may be exposure to certain contaminants. Air sampling typically is required when site contaminants include lead, cadmium, arsenic, asbestos, and certain volatile organic compounds. Contact the HSM immediately if these contaminants are encountered.

7 DECONTAMINATION (REFERENCE CH2M HILL SOP HS-13, *DECONTAMINATION*)

The SSC must monitor the effectiveness of the decontamination procedures. Decontamination procedures found to be ineffective will be modified by the SSC.

7.1 DECONTAMINATION SPECIFICATIONS

Personnel	Sample Equipment
• Glove disposal	• Wash/rinse equipment
• Wash/rinse hands	• Bailer disposal
• **PPE-disposal method:** onsite disposal at treatment facility	• **Equipment-disposal method:** onsite disposal at treatment facility

7.2 DIAGRAM OF PERSONNEL-DECONTAMINATION LINE

None Required.

8 SPILL-CONTAINMENT PROCEDURES

Sorbent material will be maintained by the field team. Incidental spills of sample preservatives or cleaners will be contained with sorbent and will be disposed of properly. Spills of treatment facility chemicals will be handled according to the contingency plan in Attachment No 3.

9 CONFINED-SPACE ENTRY (Reference CH2M HILL SOP HS-17, *Confined Space Entry*)

No confined-space entry will be permitted. Confined-space entry requires additional health and safety procedures, training, and a permit. If conditions change such that confined-space entry is necessary, contact the HSM to develop the required entry permit.

When planned activities will not include confined-space entry, permit-required confined spaces accessible to CH2M HILL personnel are to be identified before the task begins. The SSC is to confirm that permit spaces are properly posted or that employees are informed of their locations and informed of their hazards.

10 SITE-CONTROL PLAN

10.1 SITE-CONTROL PROCEDURES

- The site safety coordinator (SSC) will conduct a site safety briefing (see below) before starting field activities or as tasks and site conditions change.
- Topics for briefing on site safety: general discussion of health and safety plan, site-specific hazards, locations of work zones, PPE requirements, equipment, special procedures, emergencies. Refer to Section 8 of *Site Safety Notebook*.
- The SSC records attendance at safety briefings in a logbook and documents the topics discussed.
- Post the OSHA job-site poster in a central and conspicuous location at sites where project field offices, trailers, or equipment storage boxes are established. Posters can be obtained by calling either 800/548-4776 or 800/999-9111.
- Post "Exit" signs above exit doors, and post "Fire Extinguisher" signs above locations of extinguishers. Keep areas near exits and extinguishers clear.
- Determine wind direction.
- Establish work zones: support, decontamination, and exclusion zones. Delineate work zones with flags or cones as appropriate. Support zone should be upwind of the site.
- Establish decontamination procedures, including respirator-decontamination procedures, and test the procedures.
- Use access control at the entry and exit from each work zone.
- Store chemicals in appropriate containers.
- Make MSDSs available for onsite chemicals to which employees are exposed.
- Establish onsite communication consisting of the following:
  - Line-of-sight and hand signals
  - Air horn
  - Two-way radio or cellular telephone if available
- Establish offsite communication.
- Establish and maintain the "buddy system."
- Establish procedures for disposing of material generated on the site.
- Initial air monitoring is conducted by the SSC in appropriate level of protection.
- The SSC is to conduct periodic inspections of work practices to determine the effectiveness of this plan -- refer to CH2M HILL SOP 18, *Health and Safety* Checklist, or Section 4 of *Site Safety Notebook*. Deficiencies are to be noted, reported to the HSM, and corrected.

10.2 HAZWOPER COMPLIANCE PLAN (Reference CH2M HILL SOP HS-17, *Health and Safety Plans*)

This section outlines procedures to be followed when certain activities do not require 24- or 40-hour training. ***Note, prior approval from the HSM is required before these tasks are conducted on regulated hazardous waste sites.***

- Certain parts of the site work may be covered by state or federal Hazwoper standards and therefore require training and medical monitoring. Anticipated tasks must be included in subsection 2.2.1.

- Air sampling must confirm that there is no exposure to gases or vapors before non-Hazwoper-trained personnel are allowed on the site. Other data (e.g., soil) also must document that there is no potential for exposure. The HSM must approve the interpretation of these data. Refer to subsections 3.8 and 6.2 for contaminant data and air sampling requirements, respectively.

- Non-Hazwoper-trained personnel must be informed of the nature of the existing contamination and its locations, the limits of their access, and the emergency action plan for the site. Non-Hazwoper-trained personnel also must be trained in accordance with all other state and federal OSHA requirements, including 29 CFR 1910.1200 (HAZCOM). Refer to subsection 3.7.1 for hazard communication requirements.

- Treatment system start-ups: Once a treatment system begins to pump and treat contaminated media, the site is, for the purposes of applying the Hazwoper standard, considered a treatment, storage, and disposal facility (TSDF). Therefore, once the system begins operation, only Hazwoper-trained personnel (minimum of 24 hours of training) will be permitted to enter the site. All non-Hazwoper-trained personnel must leave the site.

If Hazwoper-regulated tasks are conducted concurrently with nonregulated tasks, non-Hazwoper-trained subcontractors must be removed from areas of exposure. If non-Hazwoper-trained personnel remain on the site while a Hazwoper-regulated task is conducted, the contaminant/exposure area (exclusion zone) must be posted, non-Hazwoper-trained personnel must be reminded of the locations of restricted areas and the limits of their access, and real-time monitoring must be conducted. Non-Hazwoper-trained personnel at risk of exposure must be removed from the site until it can be demonstrated that there is no longer a potential for exposure to health and safety hazards.

11 EMERGENCY RESPONSE PLAN (REFERENCE CH2M HILL SOP HS-12, *EMERGENCY RESPONSE*)

11.1 PRE-EMERGENCY PLANNING

The SSC performs the applicable pre-emergency planning tasks before starting field activities and coordinates emergency response with the facility and local emergency-service providers as appropriate.

- Review the facility emergency and contingency plans where applicable.
- Locate the nearest telephone; determine what onsite communication equipment is available (e.g., two-way radio, air horn).
- Identify and communicate chemical, safety, radiological, and biological hazards.
- Confirm and post emergency telephone numbers, evacuation routes, assembly areas, and route to hospital; communicate the information to onsite personnel.
- Post site map marked with locations of emergency equipment and supplies, and post OSHA job-site poster. The OSHA job-site poster is required at sites where project field offices, trailers, or equipment-storage boxes are established. Posters can be obtained by calling either 800/548-4776 or 800/999-9111.
- Post "Exit" signs above exit doors, and post "Fire Extinguisher" signs above locations of extinguishers. Keep areas near exits and extinguishers clear.
- Review changed site conditions, onsite operations, and personnel availability in relation to emergency response procedures.
- Evaluate capabilities of local response teams where applicable.
- Where appropriate and acceptable to the client, inform emergency room and ambulance and emergency response teams of anticipated types of site emergencies.
- Designate one vehicle as the emergency vehicle; place hospital directions and map inside; keep keys in ignition during field activities.
- Inventory and check site emergency equipment, supplies, and potable water.
- Communicate emergency procedures for personnel injury, exposures, fires, explosions, chemical and vapor releases.
- Review notification procedures for contacting CH2M HILL's medical consultant and team member's occupational physician.
- Rehearse the emergency response plan once before site activities begin, including driving the route to the hospital.
- Brief new workers on the emergency response plan.
- The SSC will evaluate emergency response actions and initiate appropriate follow-up actions.

11.2 EMERGENCY EQUIPMENT AND SUPPLIES

The SSC should mark the locations of emergency equipment on the site map and should post the map.

Emergency Equipment and Supplies	Location
20 lb (or two 10-lb) fire extinguisher	On west wall of process room in groundwater treatment facility
First aid kit	On west wall of process room in groundwater treatment facility
Eye wash	On north wall of process room in groundwater treatment facility
Potable water	On west wall of process room (lab area) in groundwater treatment facility
Bloodborne-pathogen kit	On west wall of process room (in first aid kit) in groundwater treatment facility
Safety Shower	On north wall of process room in groundwater treatment facility

11.3 EMERGENCY MEDICAL TREATMENT

- Notify appropriate emergency response authorities listed in sections 12 and 13 (e.g., 911).
- During a time of no emergency, contact CH2M HILL's medical consultant for advice and guidance on medical treatment.
- The SSC will assume charge during a medical emergency until the ambulance arrives or until the injured person is admitted to the emergency room.
- Prevent further injury.
- Initiate first aid and CPR where feasible.
- Get medical attention immediately.
- Perform decontamination where feasible; lifesaving and first aid or medical treatment take priority.
- Notify the field team leader and the project manager of the injury.
- Make certain that the injured person is accompanied to the emergency room.
- Notify the health and safety manager.
- Notify the injured person's human resources department within 24 hours.
- Prepare an incident report -- refer to CH2M HILL SOP 12, *Emergency Response and First Aid*, and Section 6 of *Site Safety Notebook*. Submit the report to the corporate director of health and safety and the corporate human resources department (COR) within 48 hours.
- When contacting the medical consultant, state that you are calling about a CH2M HILL matter, and give your name, your telephone number, the name of the injured person, the extent of the injury or exposure, and the name and location of the medical facility where the injured person was taken.

11.4 NONEMERGENCY PROCEDURES

The procedures listed above may be applied to nonemergency incidents. Injuries and illnesses (including overexposure to contaminants) must be reported to Human Resources. If there is doubt about whether medical treatment is necessary, or if the injured person is reluctant to accept medical treatment, contact the CH2M HILL medical consultant.

- When contacting the medical consultant, state that the situation is a CH2M HILL matter, and give your name, your telephone number, the name of the injured person, the extent of the injury or exposure, and the name and location of the medical facility where the injured person was taken.
- Follow these procedures as appropriate.

11.5 INCIDENT RESPONSE

In fires, explosions, or chemical releases, actions to be taken include the following:

- Shut down CH2M HILL operations and evacuate the immediate work area.
- Account for personnel at the designated assembly area(s).
- Notify appropriate response personnel.
- Assess the need for site evacuation, and evacuate the site as warranted.

Instead of implementing a work-area evacuation, note that small fires or spills posing minimal safety or health hazards may be controlled.

11.6 EVACUATION

- Evacuation routes will be designated by the SSC before work begins.
- Onsite and offsite assembly points will be designated before work begins.
- Personnel will leave the exclusion zone and assemble at the onsite assembly point upon hearing the emergency signal for evacuation.
- Personnel will assemble at the offsite point upon hearing the emergency signal for a site evacuation.
- The SSC and a "buddy" will remain on the site after the site has been evacuated (if possible) to assist local responders and advise them of the nature and location of the incident.
- The SSC accounts for all personnel in the onsite assembly zone.
- A person designated by the SSC before work begins will account for personnel at the offsite assembly area.
- The SSC will write up the incident as soon as possible after it occurs and will submit a report to the corporate director of health and safety.

11.7 EVACUATION ROUTES AND ASSEMBLY POINTS

Refer to the site map in Section 1. Evacuation routes and assembly areas (and alternative routes and assembly areas) are specified on the site map.

11.8 EVACUATION SIGNALS

Signal	Meaning
Grasping throat with hand	Emergency–help me.
Thumbs up	OK; understood.
Grasping buddy's wrist	Leave area now.
Continuous sounding of horn	Emergency; leave site now.

12 EMERGENCY RESPONSE

12.1 EMERGENCY RESPONSE TELEPHONE NUMBERS

SITE ADDRESS:
725 S. Outagamie St.

Police: 414/832-5500

Fire: 414/832-5810

Ambulance: 911

Water: 414/832-5148

Gas: 800/236-9874

Electric: 800/662-4797

Phone:
Cellular Phone:

Emergency: 911*

Emergency: 911*

Change Area Codes to 920

Appleton Wastewater Treatment Facility: 414/832-5924

*When using a cellular phone outside the telephone's normal calling area, exercise caution in relying on the cellular phone to activate 911. When the caller is outside the normal calling area, the cellular service carrier should connect the caller with emergency services in the area where the call originated, but this may not occur. Telephone numbers of backup emergency services should be provided if a cellular phone is relied on to activate 911.

Hospital: St. Elizabeth
Address: 1506 S. Oneida Street, Appleton WI

Phone: 414/738-2100

Route to Hospital: (See Figure 12-1)

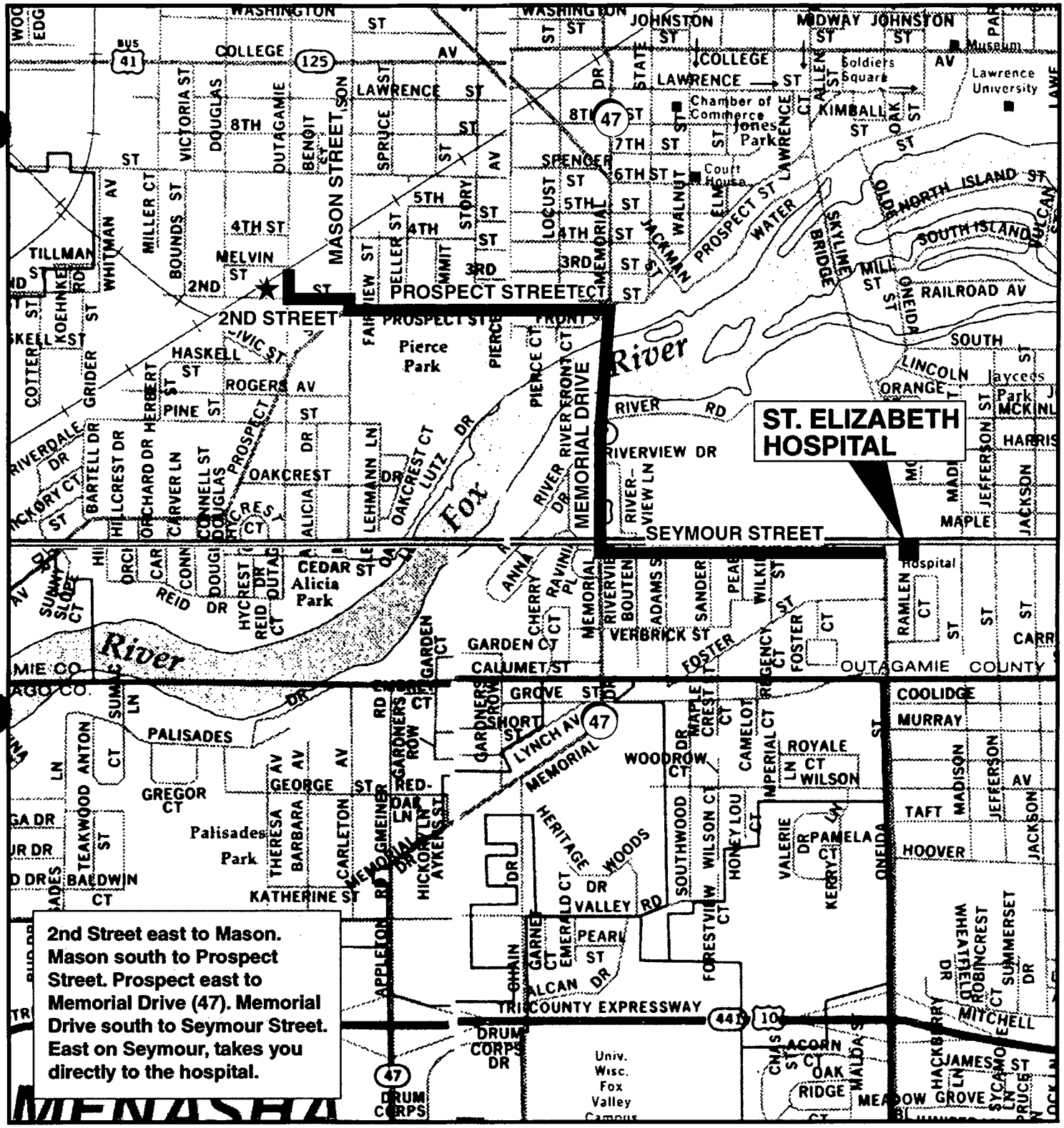
12.2 GOVERNMENT AGENCIES INVOLVED IN PROJECT

Federal Agency and Contact Name: Jon Peterson/U.S. EPA Region 5
Phone: 312/353-1264

State Agency and Contact Name: WDNR Field Office
Phone: 414/832-2826

X

Contact the project manager. Generally, the project manager will contact relevant government agencies.



Map Source: R.R. Donnelley & Sons Co. Cartographic Services

FIGURE 12-1
Route to Hospital
N.W. Mauthe Site

13 EMERGENCY CONTACTS

If an injury occurs, notify the injured person's personnel office as soon as possible after obtaining medical attention for the injured person. Notification MUST be made within 24 hours of the injury.

CH2M HILL Medical Consultant

Dr. Elayne F. Theriault
Environmental Medical Resources, Inc.
Atlanta, Georgia
800/229-3674 OR 770/455-0818
(After-hours calls will be returned within 20 minutes.)

Occupational Physician (Regional or Local)

Concentra Occupational Medical Center # 1567
500 N. 19th Street
Milwaukee, Wisconsin
414/931-7600
Contact: Andi (Michelle Cardenas - office manager)

Corporate Director Health and Safety

Name: Mollie Netherland/SEA
Phone: 425/453-5005

Site Safety Coordinator (SSC)

Name: Dan MacGregor
Phone: 414/272-2426

Medical and Training Administrator

Name: Cindy Carel/SEA
Phone: 425/453-5005

Regional Manager

Name: Pat Klampe/MKE
Phone: 414/272-2426

Health and Safety Manager (HSM)

Name: Rich Rathnow/MKE
Phone: 414/272-2426

Project Manager

Name: Erin Potts/MKE
Phone: 414/272-2426

Radiation Health Manager (RHM)

Name: Dave McCormack/SEA
Phone: 425/453-5005

Regional Human Resources Department

Name: Denise O'Brien-Snell/MKE
Phone: 414/272-2426

Client

Name: Jon Peterson/U.S. EPA Region 5
Phone: 312/353-1264

Corporate Human Resources Department

Name: Julie Zimmerman/COR
Phone: 303/771-0900

Federal Express Dangerous Goods Shipping
Phone: 800/238-5355

CH2M HILL Emergency Number for Shipping Dangerous Goods
Phone: 800/255-3924

Worker's Compensation and Auto Claims

GAB Business Services, Inc.
Phone: 800/747-7222
After hours: 800/621-5410

Report fatalities AND report vehicular accidents involving pedestrians, motorcycles, or more than two cars.

14 APPROVAL

This site-specific health and safety plan has been written for use by CH2M HILL only. CH2M HILL claims no responsibility for its use by others unless that use has been specified and defined in project or contract documents. The plan is written for the specific site conditions, purposes, dates, and personnel specified and must be amended if those conditions change.

14.1 ORIGINAL PLAN

WRITTEN BY: Erin Potts **DATE:** 8/8/97

APPROVED BY: [signature] **DATE:** 8-8-97

CO-REVIEWED BY: Lisa A. Martin **DATE:** 8-8-97

14.2 REVISIONS

REVISIONS MADE BY: **DATE:**

REVISIONS TO PLAN:

REVISIONS APPROVED BY: **DATE:**

15 DISTRIBUTION

Name	Office	Responsibility	Number of Copies
Jerri McCauslin	COR	Senior Program Assistant	1
Rich Rathnow	MKE	Health and Safety Manager/Approver	1
Erin Potts	MKE	Project Manager	1
Dan MacGregor	MKE	Field Team Leader/Site Safety Coordinator	1
Jon Peterson	EPA	Client Project Manager	3
Gary Edelstein	WDNR	Project Manager	3

16 ATTACHMENTS

Attachment 1: Employee Signoff
Attachment 2: Applicable Material Safety Data Sheets
Attachment 3: Contingency Plan
Attachment 4: O&M Subcontractor Health and Safety Plan

Attachment 1
Employee Signoff

EMPLOYEE SIGNOFF

The employees listed below have been given a copy of this health and safety plan, have read and understood it, and agree to abide by its provisions.

EMPLOYEE NAME	EMPLOYEE SIGNATURE AND DATE

Attachment 2
Material Safety Data Sheets

Process Treatment Chemicals

Nitrogen Gas MSDS

Material Safety Data Sheet

From Genium's Reference Collection
Genium Publishing Corporation
1145 Catalyn Street
Schenectady, NY 12303-1836 USA
(518) 377-8855

GENIUM PUBLISHING CORP.

No. 61
NITROGEN
(Revision A)

Issued: April 1980
Revised: April 1986

SECTION 1. MATERIAL IDENTIFICATION

MATERIAL NAME: NITROGEN

DESCRIPTION: Gas supplied in cylinders (2000+ psig) or cold liquid supplied in vented Dewar containers.

OTHER DESIGNATIONS: N_2, CAS #7727-37-9, ASTM #D1933

MANUFACTURER/SUPPLIER: Available from several suppliers, including: Air Products & Chemicals, Inc., Industrial Gas Division, PO Box 538, Allentown, PA 18105; Telephone: (215) 481-4911

Airco Industrial Gases of the Boc Group, Inc., 575 Mountain Avenue, Murray Hill, NJ 07974; Telephone: (201) 464-81000

Union Carbide Corp., Linde Div., 39 Old Ridgebury Rd., Danbury, CT 06817; Telephone: (203) 794-5300

HMIS
H: 2
F: 0
R: 0
PPE*
*See Sect. 8

(Liquified)

R 1
I 1
S 2 (Liquid)
K 0

SECTION 2. INGREDIENTS AND HAZARDS

	%	HAZARD DATA
Nitrogen, CAS #7727-37-9	>99.5	No TLV Established.
Oxygen, CAS # 7782-44-7	< 0.5	

SECTION 3. PHYSICAL DATA

Boiling Point, 760 mm Hg ... -320.4°F (-195.8°C)
Vapor Density (Air = 1) ... 0.967
Solubility in Water @ 20°C, Vols./100 vols. ... 1.6
Density (liq.), g/cm^3 ... 0.8
Melting Point ... -345.7°F (-209.86°C)

Critical Temperature ... -232.8°F (-147.1°C)
Critical Pressure, Atm ... 33.5
Molecular Weight ... 28.01
Expansion Ratio, Liquid to Gas @ 70°F ... 1:696

Appearance and odor: A colorless, odorless, tasteless gas or a cryogenic liquid.

SECTION 4. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temp.	Flammability Limits in Air	LOWER	UPPER
Not Found	Not Found	Nonflammable	Not Found	Not Found

Use extinguishing media that are appropriate to the surrounding fire. Do not discharge solid streams of water into liquid N_2. Use water spray to cool fire-exposed containers or, if desirable, to increase the rate of evaporation of the liquid if the increased rate can be controlled (cryogenic liquid will rapidly freeze water). Nitrogen is a nonflammable material that will not support combustion. It presents no unusual explosion hazard unless the compressed gas is exposed to fire; then containers may rupture violently. Nitrogen cylinders are equipped with pressure-relief devices that are designed to vent N_2 when they are exposed to elevated temperatures and pressures. When liquid nitrogen is spilled it can release a rapidly vaporizing cloud that will create an oxygen-deficient atmosphere.

SECTION 5. REACTIVITY DATA

Nitrogen is stable when stored in closed containers. It does not polymerize. Nitrogen is noncorrosive and is nearly inert at room temperature. At high temperatures it can combine with oxygen to form oxides, and with hydrogen to form ammonia. When heated with carbon in the presence of alkalies or barium oxide it may form cyanides. It can form nitrides with lithium, silicon, calcium, strontium, and barium when it is at a red heat.

It has been reported that nitrogen can be oxidized explosively by ozone.

Lithium and titanium at an elevated temperature can burn in a nitrogen atmosphere. Berylium can be ignited in a mixed nitrogen-and-carbon dioxide atmosphere.

Nitrogen will react with oxygen in the presence of sparking (from an electric arc or a gas-fired furnace) to produce nitric oxide gas.

SECTION 6. HEALTH HAZARD INFORMATION

Nitrogen is not listed as a carcinogen by the NTP, IARC, or OSHA.

This material is nontoxic and is classified as a simple asphyxiant by virtue of its displacement of oxygen. Symptoms of exposure depend on the degree and the duration of oxygen deficiency. They can include increased frequency and volume of breathing, increased pulse rate, muscular incoordination, fatigue, nausea, vomiting, and collapse. Inhalation of pure nitrogen atmosphere produces immediate loss of consciousness; death follows unless air/oxygen breathing can be quickly restored. Contact with liquid nitrogen or cold vapors can cause cryogenic burns (severe frostbite/freeze burns).

FIRST AID: CONTACT WITH LIQUID NITROGEN: Promptly flush areas affected with lots of tepid water to reduce freezing of tissue. (Do not apply direct heat to affected areas!) Do not rub frozen areas. Loosely apply dry, sterile, bulky dressings to protect area from infection and from further injury. Get medical help.*

INHALATION: Caution! Would-be rescuers need to be concerned with their own safety in oxygen-deficient areas. Use self-contained breathing equipment. Remove victim to fresh air. Quickly restore and/or support his breathing as required, administering oxygen if available. Get medical help.*

INGESTION: Get medical help.* ACUTE EFFECTS: Gas - Simple asphyxiation by displacement of oxygen. Liquid - Cryogenic burns. PRIMARY ENTRY: Inhalation

* GET MEDICAL ASSISTANCE = In plant, paramedic, community. Get medical help for further treatment, observation, and support after first aid.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

Notify safety personnel of major nitrogen leaks or spills. Shut off leak if you can do so without risk. Evacuate all personnel from the danger area until ventilation can restore a safe oxygen level. Emergency personnel need self-contained breathing equipment. Minor leaks (which are dangerous in enclosed areas) can be detected by painting the suspected area of leakage with a soap solution. Prevent liquid nitrogen from contacting vulnerable steel structures and vehicle tires (see sect. 9). Allow spilled liquid to evaporate.

DISPOSAL: Remove a liquid nitrogen container or leaking cylinder outdoors or place into a hood with good forced ventilation. Allow gas to discharge at a moderate rate. Defective cylinders should be tagged to indicate defect. Close the valve and return the defective cylinder to supplier.

SECTION 8. SPECIAL PROTECTION INFORMATION

Provide adequate general and local exhaust ventilation to prevent workplace atmospheres from becoming oxygen deficient (minimum O_2 volume = 18%). Provide air-supplied or self-contained breathing equipment for emergency or nonroutine situations where the nitrogen level is excessive. Use a safety line and a standby worker when respirator-protected personnel enter a hazardously nitrogen-enriched area. (The standby worker should have a self-contained breathing apparatus immediately available.) Those working with liquid nitrogen should wear approved insulating gloves, safety glasses, and other protective clothing as required by use conditions to prevent any skin contact with liquid nitrogen. Cuffless trousers should be worn outside high-topped shoes. Safety shoes are recommended for those handling cylinders of gases.

Wear safety gloves and approved insulated gloves. Use air-supplied or self-contained breathing apparatus.

Contact lenses pose a special hazard; soft lenses may absorb irritants, and all lenses concentrate them.

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

STORAGE SEGREGATION: Store in a cool, dry, well-ventilated, low fire-risk area. Protect containers against physical damage.

SPECIAL HANDLING/STORAGE: Protect containers from extremes of temperature and weather. (Do not allow any part of a compressed gas cylinder to be exposed to temperatures above 125°F [51.6°C]). Follow general safety procedures for handling and securing compressed gas cylinders. Liquid nitrogen storage areas should be kept clean and free from flammable materials. Make sure that liquid nitrogen containers are properly vented to prevent buildup of pressure. All pressure equipment and process lines should be designed so that the minimum burst pressure is at least four (4) times the expected maximum pressure. Certain materials are unsuitable for service in contact with liquid nitrogen because they become extremely brittle and can be readily shattered by impact.

DOT Classification: Nonflammable Gas UN1066 (Compressed); UN1977 (Cryogenic Liquid)

LABEL: Nonflammable Gas

Data Source(s) Code: 1, 4-11, 14, 17, 25, 51, 63, 82, 84. CK

Approvals J.O. Ammann 1/87.

Indust. Hygiene/Safety DW 12-86

Medical Review

Ferrous Sulfate MSDS

MSDS

MATERIAL SAFETY DATA SHEET

EAGLEBROOK, INC.

For chemical emergencies—spill, leak, fire or exposure, call CHEMTREC (800)424-9300.

SECTION 1 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

SUPPLIER	•	Eaglebrook, Inc. 1150 Junction Avenue Schererville, Indiana 46375
PHONE NUMBERS	•	(219) 322-2560, (800) 428-3311
EMERGENCIES	•	CHEMTREC (800) 424-9300
TRADE NAME	•	Ferrous Sulfate
CHEMICAL FAMILY	•	Inorganic salts
FORMULA	•	$FeSO_4$
SYNONYM	•	Iron (II) sulfate

SECTION 2 COMPOSITION/INFORMATION ON INGREDIENTS

COMPONENT	PERCENT	ACGIH TLV	CAS NUMBER
Ferrous sulfate	13.0-16.3	1 mg/m³ TWA	7720-78-7
Sulfuric acid	<6	1 mg/m³ TWA	7664-93-9

SECTION 3 HAZARDS IDENTIFICATION

Emergency overview-irritating to skin, eyes, and mucous membranes.

NFPA RATINGS

Health	2
Flammability	0
Reactivity	1
Special Hazards	Corrosive

SECTION 4 FIRST AID MEASURES

INHALATION	Move to fresh air. Give artificial respiration if breathing has stopped. If breathing is difficult, give oxygen. Get medical attention.
EYE CONTACT	Flush with plenty of water. Get medical attention.
SKIN CONTACT	Wash with soap and water. Remove any contaminated clothing and wash before reuse. If irritation develops, get medical attention.
INGESTION	If conscious, drink water or milk of magnesia. DO NOT induce vomiting. Get medical attention.

SECTION 5 FIRE FIGHTING MEASURES

FLASH POINT	NA
FLAMMABLE LIMITS	NA
AUTOIGNITION	NA
HAZARDOUS COMBUSTION PRODUCT	Sulfur oxides
FIRE FIGHTING INSTRUCTIONS	Use whatever extinguishing media that is appropriate. Respiratory and eye protection required.
FIRE AND EXPLOSION HAZARDS	Sulfuric acid could react with metals to produce hydrogen.

SECTION 6 ACCIDENTAL RELEASE MEASURES

Evacuate all unnecessary personnel from the area. Wear appropriate personal protective equipment, and contain and eliminate the release. Neutralize with lime, limestone, or soda ash. This will generate carbon dioxide, so additional ventilation may be necessary. Collect the residues for proper disposal. Notify the appropriate authorities.

SECTION 7 HANDLING AND STORAGE

Keep containers closed. Do not store in metal containers, because the metal will dissolve and generate hydrogen. Vent rubber lined steel containers to avoid pressure build up if the lining fails.

SECTION 8 EXPOSURE CONTROLS/PERSONAL PROTECTION

VENTILATION	There should be enough local ventilation to keep the TLV below the ACGIH limits.
GLOVES	Use neoprene or equivalent. Never use leather.
EYES	Wear chemical goggles or a face shield.
RESPIRATOR	Use an approved respirator with acid mist cartridges, if necessary.
CLOTHING	Protective clothing, if necessary, should be neoprene or equivalent.

When cleaning, decontaminating or performing maintenance on tanks, containers, piping systems and accessories, and in any other situations where airborne contaminants and/or dust could be generated, use proper protective equipment to protect against ingestion or inhalation. HEPA or air supplied respirators, full Tyvek coveralls with head cover, gloves and boots (or chemical suits, gloves and boots) are suggested.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Boiling Point	220-235°F
Specific Gravity (H_2O=1)	1.16-1.25
Vapor Pressure (mm Hg)	NA

Percent Volatile by Vol.	NA
Vapor Density (Air=1)	NA
Evaporation Rate (BuAc=1)	NA
Solubility in Water (%)	Infinite
Appearance	Blue green liquid, slight acidic odor
pH	<1
Freezing Point	Consult your Eaglebrook representative for cold weather handling recommendations.

SECTION 10 STABILITY AND REACTIVITY

STABILITY Stable above 50°F. Starts recrystalizing below 50°F.

HAZARDOUS POLYMERIZATION Does not occur.

HAZARDOUS DECOMPOSITION Produces sulfur oxides.

CONDITIONS TO AVOID Contact with bases or alkalies.

INCOMPATIBLE MATERIALS Metals and metal alloys.

SECTION 11 TOXICOLOGICAL INFORMATION

TOXICOLOGICAL FINDINGS Tests on laboratory animals indicate material may produce adverse mutagenic effects. Cited in RTECS.

SECTION 12 ECOLOGICAL INFORMATION

No data available.

SECTION 13 DISPOSAL CONSIDERATIONS

This material is an RCRA regulated hazardous waste upon disposal due to the corrosivity characteristic. Any residues and/or rinse waters from cleaning of tanks, containers, piping systems and accessories may be a hazardous characteristic waste and must be properly disposed of in accordance with all federal, state, and local laws. Recycle whenever possible.

SECTION 14 TRANSPORT INFORMATION

SHIPPING NAME Corrosive Liquids, Acidic, Inorganic, N.O.S., (Ferrous Sulfate)

HAZARD CLASS 8

DOT NUMBER UN3264

PACKING GROUP II

SECTION 15 REGULATORY INFORMATION

CERCLA RQ 6100-7600 liquid pounds. (Depending on ferrous sulfate concentration.)
Sulfuric acid is a reportable chemical under Section 313 of EPCRA (40 CFR 372).

CHRONIC HAZARD No

FIRE HAZARD No

SECTION 16 OTHER INFORMATION

The information in this document is considered to be reliable, but Eaglebrook does no accept any responsibility for its accuracy. This information is not intended as a warranty of the product's suitability for use with any other material or product, or in any application or process.

—Prepared by Michael M. Mille
September 3, 199

Sodium Hydroxide MSDS

Genium Publishing Corporation
1145 Catalyn Street
Schenectady, NY 12303-1836 USA
(518) 377-8854

Material Safety Data Sheets Collection:

Sheet No. 3A
Sodium Hydroxide, 50% Liquid

Issued: 10/77 Revision: B, 11/91

Section 1. Material Identification

36

Sodium Hydroxide, 50% Liquid (NaOH), Description: Derived by electrolysis of sodium chloride brines, by reacting calcium chloride with sodium carbonate, or by electrolytic production using the diaphragm cell. Sodium hydroxide often contains minimal amounts of sodium chloride, sodium carbonate, sodium sulfate, sodium chlorate, iron, or nickel. Used in making plastics to dissolve casein; in treating cellulose in making rayon and cellophane; in explosives, dyestuffs, electrolytic extraction of zinc, reclaiming rubber, tin plating, oxide coating, etching and electroplating, laundering and bleaching, pulp and paper manufacture; in vegetable oil refining; in peeling fruits and vegetables in the food industry; to hydrolyze fats and form soaps; and in veterinary medicine as a disinfectant.

R 0
I 2
S 4
K 0

NFPA

HMIS
H 3
F 0
R 1
PPG*
* Sec. 8

Other Designations: CAS No. 1310-73-2; Aetznatron; Collo-Grillrein; Collo-Tapette; Feurs Rohp; Lewis-Red Devil Lye; soda lye; soda, lye solution; sodium hydrate solution; sodium hydroxide solution; white caustic solution.
Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*(73) for a suppliers list.

Cautions: Sodium hydroxide is moderately toxic by ingestion and inhalation and can be seriously corrosive to eyes, skin, and mucous membranes.

Section 2. Ingredients and Occupational Exposure Limits

Sodium hydroxide, ca 50% water solution

1990 OSHA PEL
Ceiling: 2 mg/m³

1991-92 ACGIH TLV
Ceiling: 2 mg/m³

1990 DFG (Germany) MAK
2 mg/m³

1990 IDLH Level
250 ppm

1990 NIOSH REL
Ceiling: 2 mg/m³

1985-86 Toxicity Data*
Monkey, eye: 1% solution applied over 24 hr produced severe irritation
Rabbit, eye: 1% solution applied to the eye caused severe irritation
Grasshopper, parenteral: 20 µl produced cytogenic mutations

* See NIOSH, *RTECS* (WB4905000), for additional irritation, mutation and toxicity data.

Section 3. Physical Data

Boiling Point: 284 °F (140 °C)
Freezing Point: 53.6 °F (12 °C)
Viscosity: 50 cP at 68 °F (20 °C)
pH (0.5 % solution): 13
Molecular Weight: 40.01
Specific Gravity: 1.53 at 77 °F (25 °C)
Water Solubility: Completely soluble in water
Other Solubilities: Soluble in alcohol, methanol and glycerol; insoluble in acetone and ether

Appearance and Odor: An odorless, clear liquid.

Section 4. Fire and Explosion Data

Flash Point: None reported	**Autoignition Temperature:** None reported	**LEL:** None reported	**UEL:** None reported

Extinguishing Media: Although noncombustible, when in contact with moisture or water sodium hydroxide, 50% liquid, can generate enough heat to ignite surrounding combustibles. If possible without risk, remove containers from area. Use extinguishing agents suitable for surrounding fire. For small fire, use dry chemical, carbon dioxide (CO_2), or regular foam. Avoid using water spray since water reacts with sodium hydroxide to generate substantial heat. If you must use water, be sure it is as cold as possible. For large fires, use fog or regular foam.
Unusual Fire or Explosion Hazards: Sodium hydroxide solution can become very hot when in contact with water.
Special Fire-fighting Procedures: Since fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Also, wear fully protective clothing. Structural firefighters' protective clothing provides limited protection. Apply cooling water to sides of fire-exposed containers until fire is well out. *Do not* splatter or splash this material. Stay away from ends of tanks. Be aware of runoff from fire control methods. Do not release to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Sodium hydroxide solution is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur. Violent polymerization can occur when in contact with acrolein or acrylonitrile. Since sodium hydroxide readily absorbs water and carbon dioxide from air, keep containers tightly closed.
Chemical Incompatibilities: Since it generates large amounts of heat when in contact with water, sodium hydroxide may steam and splatter. It reacts with mineral acids to form corresponding salts, and with weak-acid gases like hydrogen sulfide, sulfur dioxide and carbon dioxide. Sodium hydroxide can be very corrosive to metals such as aluminum, tin, and zinc, as well as alloys such as steel, and may cause formation of flammable hydrogen gas. An increase in temperature and pressure occurs in closed containers when sodium hydroxide is mixed with acetic anhydride, glacial acetic acid, chlorohydrin, chlorosulfonic acid, ethylene cyanohydrin, glyoxal, oleum, 36% hydrochloric acid, 48.7% hydrofluoric acid, 70% nitric acid, or 96% sulfuric acid.
Conditions to Avoid: Avoid generation of sodium hydroxide mists, and contact with water, metals, and the chemicals listed above.
Hazardous Products of Decomposition: Thermal oxidative decomposition of sodium hydroxide can produce toxic sodium oxide (Na_2O) and peroxide (Na_2O_2) fumes.

Section 6. Health Hazard Data

Carcinogenicity: In 1990 reports, the IARC, NTP, and OSHA do not list sodium hydroxide as a carcinogen (see Chronic Effects).
Summary of Risks: Sodium hydroxide solution is toxic by mist inhalation, ingestion, or direct skin or eye contact. Damage is immediate and without prompt medical attention can become permanent. This strong, corrosive alkaline solution dissolves any living tissue it contacts.
Medical Conditions Aggravated by Long-Term Exposure: None reported.
Target Organs: Eyes, digestive tract, respiratory system, and skin.
Primary Entry Routes: Ingestion, inhalation, and skin and eye contact.
Acute Effects: Ingestion causes immediate burning of mouth, esophagus, and stomach; painful swallowing; excessive salivation; edematous (excess fluid in surrounding tissue) lips, chin, tongue, and pharynx covered with exudate (fluid oozed from swollen tissue); esophageal edema (swelling from fluid buildup in esophagus walls that can prevent swallowing within hours); edematous, gelatinous, and necrotic (localized tissue

Continue on next page

Section 6. Health Hazard Data, *continued*

death) mucous membranes; vomiting (sometimes coffee grounds-like material due to digestive hemorrhage); rapid, faint pulse; and cold, clammy skin. Death commonly occurs due to shock, asphyxia (oxygen loss due to interrupted breathing), or pneumonia by the second or third day after ingestion. Mist inhalation can cause many burns, temporary hair loss (in nasal passages since sodium hydroxide breaks down keratin), and possibly pulmonary edema (fluid in lungs). Skin contact causes slippery, soapy feeling that is usually not painful for 3 min after contact—even though skin damage begins immediately. It causes burns, keratin (hair and nails) destruction, and intracellular edema (excess fluid in skin cells), with damage progressing to severe burns, tissue corrosion, deep ulcerations, and permanent scarring if not washed off immediately. The cornea begins to corrode on contact. Disintegration and sloughing of conjunctival and corneal epithelium may progress to temporary or permanent corneal opacification (cloudiness, becoming impervious to light) or symblepharon (adhesion of lid to eyeball).

Chronic Effects: Dermatitis may result after repeated exposure to dilute solutions. Cases of squamous cell carcinoma (malignant tumors of epithelial origin) of the esophagus are reported 12 to 42 years after ingestion, although it is unclear whether the cancer resulted from scar formation caused by tissue destruction or directly from the chemical's possible carcinogenicity.

FIRST AID: Emergency personnel should protect against contamination.

Eyes: Gently lift the eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. *Do not* allow victim to keep his eyes tightly shut. *Warning!* Although splashed in only one eye, sodium hydroxide may affect the other eye's sight if prompt medical attention is not received. Consult a physician immediately.

Skin: *Quickly* remove contaminated clothing. Rinse with flooding amounts of cold water for at least 15 min. *Be aware* that this substance can become very hot when in contact with water. For reddened or blistered skin, consult a physician. Wash affected area with soap and water.

Inhalation: Remove exposed person to fresh air and support breathing as needed.

Ingestion: Never give anything by mouth to an unconscious or convulsing person. If ingested, have that *conscious and alert* person drink 1 to 2 glasses of water followed by vinegar or fruit juice to neutralize the poison. *Do not* induce vomiting.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Perform endoscopy in all suspected cases of sodium hydroxide ingestion. Perform blood analysis to determine if dehydration, acidosis, or other electrolyte imbalances have occurred.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel, isolate hazard area, deny entry, and stay upwind of spills. Cleanup personnel should protect against vapor inhalation and skin or eye contact. Use water spray to disperse vapors but do not spray directly on spills. Absorb small liquid spills with fly ash or cement powder. Neutralize spill with vinegar or dilute acid. Perlite and Cellosolve WP 3H (hydroxyethyl cellulose) are recommended for vapor suppression and containment of 50% sodium hydroxide solutions. Place material in suitable container (sodium hydroxide corrodes steel at temperatures above 60 °C) for later disposal. For large wet spills, dike flow using soil, sand bags, foamed polyurethane, or foamed concrete to contain for later disposal. Follow applicable OSHA regulations (29 CFR 1910.120).

Environmental Transport: In solid form, sodium hydroxide is not mobile, although it very easily absorbs moisture. Once liquid, sodium hydroxide rapidly leaches into the soil, possibly contaminating water sources.

Environmental Degradation: Ecotoxicity values (as 100% NaOH): TLm, mosquito fish, 125 ppm/96 hr (fresh water); TLm, bluegill, 99 mg/48 hr (tap water).

Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

EPA Designations

Listed as a RCRA Hazardous Waste (40 CFR 261.22): Characteristic of corrosivity

Listed as a CERCLA Hazardous Substance* (40 CFR 302.4), Reportable Quantity (RQ): 1000 lb (454 kg) [* per Clean Water Act, Sec. 311 (b)(4)]

SARA Extremely Hazardous Substance (40 CFR 355): Not listed

SARA Toxic Chemical (40 CFR 372.65): Not listed

OSHA Designations

Sodium hydroxide is listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear protective chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Since contact lens use in industry is controversial, establish your own policy.

Respirator: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. Select the respirator based on its suitability to provide adequate worker protection for the given working conditions, level of airborne contamination, and presence of sufficient oxygen. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.*

Other: Wear impervious gloves, boots, aprons, and gauntlets to prevent any skin contact.

Ventilation: Provide general and local exhaust ventilation systems to maintain airborne concentrations below the OSHA PEL and IDLH values (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.[103]

Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.

Contaminated Equipment: Separate contaminated work clothes from street clothes. Launder contaminated work clothing before wearing. Remove this material from your shoes and clean personal protective equipment.

Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Avoid physical damage to containers. Store in dry, well-ventilated area away from water, acids, metals, flammable liquids and organic halogens. Keep containers tightly closed since sodium hydroxide can decompose to sodium carbonate and carbon dioxide upon exposure to air. Since corrosion occurs easily above 140 °F (60 °C), do not store or transport in aluminum or steel containers when temperatures are near this level. Store containers in rooms equipped with trapped floor drains, curbs, or gutters.

Engineering Controls: To reduce potential health hazards, use sufficient dilution or local exhaust ventilation to control hazardous airborne contaminants and to maintain concentrations at the lowest practical level.

Other Precautions: Institute preplacement and periodic medical exams of exposed workers emphasizing the eyes, skin and respiratory tract. Consider a respiratory protection program that includes regular training, maintenance, inspection, and evaluation. Educate employees to the possible hazards in using sodium hydroxide.

Transportation Data (49 CFR 172.101, .102)

DOT Shipping Name: Sodium hydroxide, liquid *or* solution
DOT Hazard Class: Corrosive material
ID No.: UN1824
DOT Label: Corrosive
DOT Packaging Exceptions: 173.244
DOT Packaging Requirements: 173.249

IMO Shipping Name: Sodium hydroxide, solution
IMO Hazard Class: 8
ID No.: UN1824
IMO Label: Corrosive
IMDG Packaging Group: II

MSDS Collection **References:** 26, 38, 73, 89, 100, 101, 103, 124, 126, 127, 132, 133, 136, 139, 140, 143, 146, 148, 149, 153, 159, 161, 163

Prepared by: M Gannon, BA; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** W Silverman, MD; **Edited by:** JR Stuart, MS

Sample Preservative Chemicals

Hydrochloric Acid MSDS

Genium Publishing Corporation
One Genium Plaza
Schenectady, NY 12304-4690 USA
(518) 377-8854

Material Safety Data Sheets Collection:

Sheet No. 30A
Hydrochloric Acid

Issued: 10/77 Revision: C, 9/92

Section 1. Material Identification

Hydrochloric Acid (HCl) Description: An aqueous solution of hydrogen chloride. Derived by dissolving hydrogen chloride gas in water at various concentrations. Hydrochloric acid is also formed as a byproduct from oxychlorination and/or oxyhydrochlorination of organic materials. Used in metal pickling and cleaning (boiler and heat exchange equipment scale removal), ore reduction, processing (corn syrup, hydrolyzing starch), dye and dye intermediate production, electroplating, leather tanning, in fertilizer, artificial silk, and paint pigment production, refining soaps and edible fats and oils, petroleum extraction, toilet bowl cleaners; as an alcohol denaturant, a chemical intermediate and solvent in organic synthesis, and in the photographic, textile, and rubber industries.

Other Designations: CAS No. 7647-01-0, Caswell No. 486, chlorohydric acid, Muriatic acid, spirits of salt.

Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*[73] for a suppliers list.

Cautions: Hydrochloric acid is highly corrosive and causes serious skin and eye burns as well as acute and chronic respiratory problems.

R	1
I	4
S	4
K	0

NFPA

HMIS
H 2*
F 0
R 0
PPE†
* Chronic effects
† Sec. 8

Section 2. Ingredients and Occupational Exposure Limits

Hydrochloric acid; ~38% (commercial), 20% ("azeotrope"). Trace impurities include ammonia, arsenic, iron, sulfate, free Cl-, and heavy metals.

1991 OSHA PEL
Ceiling: 5 ppm (7 mg/m^3)

1990 IDLH Level
100 ppm

1990 NIOSH REL
Ceiling: 5 ppm (7 mg/m^3)

1992-93 ACGIH TLV
Ceiling: 5 ppm (7.5 mg/m^3)

1990 DFG (Germany) MAK
Ceiling: 5 ppm (7 mg/m^3)
Category 1: local irritants
Peak Exposure Limit: 10 ppm, 5 min momentary value/8 per shift

1985-86 Toxicity Data*
Human, inhalation, LC_{Lo}: 1300 ppm/30 min; toxic effects not yet reviewed
Rabbit, oral, LD_{50}: 900 mg/kg; toxic effects not yet reviewed
Rat, inhalation, TC_{Lo}: 450 mg/m^3/1 hr (1 day prior to pregnancy) produced fetotoxicity (except death) & specific developmental abnormalities (homeostasis).
Rabbit, eye: 100 mg rinse caused mild irritation.

*See NIOSH, *RTECS* (MW4025000), for additional irritation, reproductive, and toxicity data.

Section 3. Physical Data

Boiling Point: -120.64 °F (-84.8 °C)*
Vapor Pressure: 4 atm at 64 °F (17.8 °C)
Vapor Density (Air = 1): 1.257
Surface Tension: 23 at 244.68 (118.16 °C)
Molecular Weight: 36.46
Odor Threshold: 0.1 to 5 ppm
Ionization Potential: 12.74 eV

Freezing Point: 1.1 °F (-17.14 °C) for 10.81%, -51.16 °F (-46.2 °C) for 31.24%
Density: 1.194 at -14.8 °F (-26 °C)
Water Solubility: Soluble, 823 g/L at 32 °F (0 °C); 561 g/L at 140 °F (60 °C).
Other Solubilities: Soluble in alcohol, benzene, and ether; insoluble in hydrocarbons.
pH: 1N (0.1), 0.1N (1.1), 0.01N (2.02), 0.001N (3.02), 0.0001N (4.01)
Refraction Index (1N solution): 1.34168 at 64.4 °F (18 °C/D)

Appearance and Odor: Colorless liquid that fumes in air and has a strong pungent odor. Can be slightly yellow from traces of iron, chlorine, or organic matter. Forms a constant boiling azeotrope at 20 % HCl, 108.58 °C and 760 mm Hg.

* Decomposes at 3239.6 °F (1782 °C).

Section 4. Fire and Explosion Data

Flash Point: Noncombustible	**Autoignition Temperature:** None reported	**LEL:** None reported*	**UEL:** None reported*

Extinguishing Media: Use extinguishing agents suitable for surrounding fire.
Unusual Fire or Explosion Hazards: *Extreme heat or contact with many metals liberates hydrogen gas which has explosion limits of 4 to 75%.
Special Fire-fighting Procedures: Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighter's protective clothing is *ineffective* for fires involving hydrochloric acid. Stay away from ends of tanks. Cool tanks with water spray until well after fire is out. *Do not* release runoff from fire control methods to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Hydrochloric acid has high thermal stability (decomposes at 3239.6 °F/1782 °C). Hazardous polymerization does not occur unless exposed to aldehydes or epoxides.
Chemical Incompatibilities: Polymerizes on contact with aldehydes or epoxides; attacks most metals (except mercury, silver, gold, platinum, tantalum, and some alloys), some plastics, rubber, and coatings; reacts explosively with alcohols + hydrogen cyanide, potassium permanganate, tetraselenium tetranitride; ignites on contact with fluorine, hexalithium disilicide, metal acetylides or carbides (cesium acetylide, rubidium acetylide); and is incompatible with acetic anhydride, 2-amino ethanol, ammonium hydroxide, calcium phosphide, chlorosulfonic acid, 1,1-difluoroethylene, ethylene diamine, ethylene imine, oleum, perchloric acid, ß-propiolacetone, propylene oxide, sodium hydroxide, silver perchlorate + carbon tetrachloride, sulfuric acid, uranium phosphide, acetate, calcium carbide, magnesium bromide, mercuric sulfate, and chlorine + dinitroaniline.
Conditions to Avoid: Avoid contact with incompatibles.
Hazardous Products of Decomposition: Thermal oxidative decomposition of HCl produces toxic chloride fumes and explosive hydrogen gas.

Section 6. Health Hazard Data

Carcinogenicity: The IARC,[164] NTP,[169] and OSHA[164] do not list HCl as a carcinogen.
Summary of Risks: HCl is a highly corrosive liquid and depending on concentration and duration of exposure, symptoms range from irritation to ulcerations and permanent injury. **Target Organs:** Eyes, skin, respiratory tract, and liver (in animals). **Primary Entry Routes:** Inhalation, skin and eye contact. **Medical Conditions Aggravated by Long-Term Exposure:** Respiratory disorders.

Continue on next page

Section 6. Health Hazard Data, *continued*

Acute Effects: Inhalation of vapors or mists is corrosive to the respiratory tract and can cause tracheal and bronchial epithelium necrosis (tissue death), cough, choking, ulceration. Liquid aspiration can cause pulmonary edema, lung collapse, emphysema and damage to the pulmonary blood vessels. Skin contact with HCl solutions causes burns and ulcerations. Permanent eye damage may result from splashes. Ingestion is unlikely but if it occurs, symptoms include gray tongue color, corrosion of mucous membranes, esophagus, and stomach, nausea, vomiting, intense thirst, diarrhea, difficulty swallowing, circulatory collapse and possible death. **Chronic Effects:** Repeated or prolonged exposure can cause dermatitis, conjunctivitis, gastritis, photosensitization, tooth erosion, and repeated exposure to mists from heated-metal pickling solutions can cause nose and gum bleeds, ulceration of oral or nasal mucosa, and "renders facial skin so tender that shaving is painful."[133]

FIRST AID

Eyes: *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately. **Skin:** *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Treat skin with a 5% triethanolamine solution. For reddened or blistered skin, consult a physician. **Inhalation:** Remove exposed person to fresh air and support breathing as needed. **Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have that *conscious and alert* person drink 1 to 2 glasses of water to dilute. *Do not* induce vomiting!

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Consider a chest x-ray in acute overexposure. Gastric lavage with 5% sodium bicarbonate may be helpful.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel, isolate and ventilate area, deny entry, and stay upwind. Neutralize spills with crushed limestone, soda ash, lime, or sodium bicarbonate. After neutralizing, take up small spills with earth, sand, vermiculite, or other absorbent, noncombustible material and place in suitable containers for disposal; flush large spills to containment area and reclaim (if possible) or await disposal. Follow applicable OSHA regulations (29 CFR 1910.120). **Environmental Transport:** In soil, HCl will infiltrate moving faster in the presence of moisture. It may dissolve some soil matter, particularly those of a carbonate base will be neutralized to some degree and will be transported to groundwater. **Ecotoxicity Values:** Chronic plant toxicity = 100 ppm; injurious to irrigatable crops at 350 mg/L; trout, LC_{100}, 10 mg/L/24 hr shrimp, LC_{50}, 100 to 330 ppm/starfish, LC_{50}, 100 to 330 mg/L/48 hr; shore crab, LC_{50}, 240 mg/L/48 hr. **Disposal:** Neutralize to between 5.5 & 8.5 before disposal. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

EPA Designations

Listed as a RCRA Hazardous Waste (40 CFR 261.23, *0.01N solution or higher*): No. D002, Characteristic of corrosivity
Listed as a CERCLA Hazardous Substance* (40 CFR 302.4): Final Reportable Quantity (RQ), 5000 lb (2270 kg) [* per CWA, Sec. 311 (b)(4)]
SARA Extremely Hazardous Substance (40 CFR 355), TPQ: Not listed
Listed as a SARA Toxic Chemical (40 CFR 372.65)

OSHA Designations

Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Because contact lens use in industry is controversial, establish your own policy. **Respirator:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. For < 50 ppm, use a cartridge respirator with acid gas cartridges, or any supplied-air respirator (SAR) or SCBA. For < 100 ppm, use any chemical cartridge respirator with a full facepiece and cartridge that protects against HCl inhalation, or any SAR or SCBA with a full facepiece. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas. **Other:** Wear chemically protective gloves, boots, aprons, and gauntlets to prevent skin contact. Polycarbonate, butyl rubber, polyvinyl chloride, and chlorinated polyethylene are recommended materials for PPE. Polyvinyl alcohol is not recommended. **Ventilation:** Provide general and local exhaust ventilation systems to maintain airborne concentrations below the OSHA PEL (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.[103] **Safety Stations:** Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities. **Contaminated Equipment:** Separate contaminated work clothes from street clothes. Launder contaminated work clothing before wearing. Remove this material from your shoes and clean personal protective equipment. **Comments:** Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Prevent physical damage to containers. Store in a cool, dry, well-ventilated area on a cement floor away from direct sunlight and heat sources. Use decanting pumps or pouring frames to minimize spillage during loading and unloading operations.

Engineering Controls: To reduce potential health hazards, use sufficient dilution or local exhaust ventilation to control airborne contaminants and to maintain concentrations at the lowest practical level. HCl should be manufactured in closed systems. Pay close attention to leak detection. Aqueous scrubbers are used to control hydrogen chloride emissions from vent stacks and other sources. Workers shouldn't enter tanks previously containing HCl until they have been cleaned.

Administrative Controls: Consider preplacement and periodic medical exams of exposed workers with emphasis on the eyes, skin, and respiratory tract. Pulmonary function tests (FEV, FVC) are useful in determining lung disorders. Conduct difficult operations in fume hoods.

Transportation Data (49 CFR 172.101)

DOT Shipping Name: Hydrochloric acid, solution
DOT Hazard Class: 8
ID No.: UN1789
DOT Label: Corrosive
DOT Packing Group: II
Special provisions (172.102): A3, A6, B2, B15, N41, T9, T27

Packaging Authorizations
a) Exceptions: 173.154
b) Non-bulk Packaging: 173.202
c) Bulk Packaging: 173.242

Quantity limitations
a) Passenger, Aircraft, or Railcar: 1 L
b) Cargo Aircraft Only: 30 L

Vessel Stowage Requirements
a) Vessel Stowage: C
b) Other: 8

MSDS Collection **References:** 26, 73, 89, 100, 101, 103, 124, 126, 127, 132, 133, 136, 139, 148, 149, 153, 159, 163, 164, 167, 168, 171, 174, 180
Prepared by: M Gannon, BA; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** AC Darlington, MPH, MD

Nitric Acid MSDS

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Section 1. Material Identification

Nitric Acid (HNO_3) Description: A solution of nitrogen dioxide in water commercially available in many concentrations. Derived by oxidation of ammonia by catalytic process (heated platinum catalyst); or by direct synthesis, combining atmospheric nitrogen and oxygen in an electric arc (an expensive process, thus largely abandoned). HNO_3 is usually found in conjunction with nitrogen dioxide, which is considered more hazardous. Used in fertilizer production (ammonium nitrate), in photoengraving, steel etching, explosives (TNT, nitroglycerin, trinitrophenol); manufacture of metallic nitrates, sulfuric acid, aqua regia and oxalic acid, jewelry, various dyes and dyestuffs, pharmaceuticals; as a laboratory reagant, in metallurgy (*mainly* as a pickling agent) and the printing industy.
Other Designations: CAS No. 7697-37-2, aqua fortis, aqua regia, azotic acid, engravers nitrate, hydrogen nitrate, red fuming nitric acid (RFNA), white fuming nitric acid (WFNA).
Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*[73] for suppliers list.

Cautions: Nitric acid is a corrosive, strong oxidizer that causes irritation or severe burns to the skin, eyes, and respiratory tract. Exposures to high levels of the concentrated acid can be fatal. Increases the flammability of combustibles. Use extreme caution when handling HNO_3.

R	2	HMIS			NFPA
I	4	H	3*	*Fuming* nitric acid	0 / 3 1 / ox
S	4	F	0		
K	0	R	1		
		PPE**			
R	2	HMIS			
I	4	H	3*	*> 40%* nitric acid	0 / 3 0 / ox
S	4	F	0		
K	0	R	1		
		PPE**			
R	2	HMIS			
I	3	H	3*	*≤ 40%* nitric acid	0 / 3 0 / –
S	3	F	0		
K	0	R	0		
		PPE**			

* Chronic effects ** See Sec. 8

Section 2. Ingredients and Occupational Exposure Limits

Nitric acid, various %. Commercially available in nearly all concentrations; most common are 56 and 68%. RFNA (85%), WFNA (97.5%).

1991 OSHA PELs
8-hr TWA: 2 ppm (5 mg/m³)
15-min STEL: 4 ppm (10 mg/m³)

1990 IDLH Level
100 ppm

1990 NIOSH REL
8-hr TWA: 2 ppm (5 mg/m³)
15-min STEL: 4 ppm (10 mg/m³)

1992-93 ACGIH TLVs
TWA: 2 ppm (5.2 mg/m³)
STEL: 4 ppm (10 mg/m³)

1990 DFG (Germany) MAK
2 ppm (5 mg/m³)
Category I: local irritants
Peak Exposure Limit: 2 ppm
5 min momentary value, 8 per shift

1985-86 Toxicity Data*
Man, unreported route, LD_{Lo}: 110 mg/kg; toxic effects not yet reviewed
Rat, oral, TD_{Lo}: 5275 g/kg administered from 1 to 21 days of pregnancy caused post-implantation mortality and specific developmental abnormalities of the musculoskeletal system.
Rat, inhalation, LC_{50}: 67 ppm (NO_2)/4 hr; toxic effects not yet reviewed

* See NIOSH, *RTECS* [QU5775000 (nitric acid), QU5900000 (RFNA), QU6000000 (WFNA)] , for additional reproductive and toxicity data.

Section 3. Physical Data

Boiling Point: 186.8 °F (86 °C)
Melting Point: -43.6 °F (-42 °C)
Vapor Pressure: 67% HNO_3 = 6.8 mm Hg at 68 °F (20 °C); 95 to 98% = 113 at 100.4 °F (38 °C)
Saturated Vapor Density (Air = 1.2 kg/m³): 1.212 kg/m³ or 0.0757 lb/ft³ (67 % HNO_3)
pH: 1

Molecular Weight: 63.02
Density: 1.50269 at 77/39.2 °F (25/4 °C)
Water Solubility: Soluble (releases heat)
Ionization Potential: 11.95 eV

Appearance and Odor: Transparent, clear to yellow, fuming liquid with an acrid, suffocating odor which darkens to a brownish color on aging and exposure to light. "Fuming" nitric acid is red-brown in color.

Section 4. Fire and Explosion Data

Flash Point: Noncombustible	**Autoignition Temperature:** Noncombustible	**LEL:** None reported	**UEL:** None reported

Extinguishing Media: For small fires (< 40% HNO_3), use dry chemical, carbon dioxide (CO_2), water spray, or regular foam. For large fires, use water spray, fog, or regular foam. For small fires (> 40% HNO_3), use water spray, dry chemical, or soda ash. For large fires, flood area with water (*do not* get inside HNO_3 containers). Apply water from as far a distance as possible.
Unusual Fire or Explosion Hazards: HNO_3 is noncombustible but is an oxidizer which increases fire involving combustibles and can initiate an explosion. It releases flammable hydrogen gas in contact with many metals.
Special Fire-fighting Procedures: Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighters' protective clothing is not effective for fires involving nitric acid. Acid-resistant clothing is needed. Apply cooling water to sides of containers until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use monitor nozzles or unmanned hose holders; if impossible, withdraw from area and let fire burn. *Do not* release runoff from fire control methods to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Nitric acid decomposes in air and in contact with light and organic matter. Hazardous polymerization cannot occur.
Chemical Incompatibilities: Nitric acid reacts explosively with combustibles, organics or readily oxidizable materials such as wood, turpentine, metal powder and hydrogen sulfide, carbides, cyanides, and alkalies; causes spattering with strong bases; is corrosive to paper, cloth and most metals (except aluminum, gold, platinum, thorium, and tantalum. Will also attack some forms of plastics, rubber, and coatings. There are at least 150 chemicals and chemical combinations which are incompatible with nitric acid. HNO_3 reacts with water to produce heat and toxic corrosive fumes. Refer to *Genium* references 126 and 159 for further detail. **Conditions to Avoid:** Avoid exposure to moisture, heat, and incompatibles.
Hazardous Decomposition Products: Thermal oxidative decomposition of HNO_3 produces nitrogen peroxide and toxic, irritating nitrogen oxides.

Section 6. Health Hazards Data

Carcinogenicity: The IARC,[164] NTP,[169] and OSHA[164] do not list nitric acid as a carcinogen.
Summary of Risks: Nitric acid is very corrosive to the skin, eyes, digestive and respiratory tract or any tissue it comes in contact with. 58 to 68% (nitric acid) vapors are moderately irritating and can't be tolerated at high concentrations. 95% (nitric acid) vapors cause severe irritation at very low levels and the liquid causes 2nd and 3rd degree burns on short contact with skin or eyes. Vapor inhalation may cause pulmonary edema (fluid in lungs) leading to death. HNO_3 vapor or mist can slowly corrode teeth when chronically exposed. **Medical Conditions Aggravated by Long-Term Exposure:** Chronic respiratory diseases. **Target Organs:** Eyes, skin, respiratory tract, teeth.

Continue on next page

Section 6. Health Hazard Data, continued

Primary Entry Routes: Inhalation, ingestion, skin and eye contact. **Acute Effects:** Inhalation symptoms may take several hours and include throat and nose irritation, cough, chest pain, difficulty breathing, salivation, giddiness, nausea, muscular weakness, ulceration of nasal mucous membranes, pulmonary edema, and chemical pneumonia. Skin contact is moderately irritating to severely corrosive depending on % of nitric acid. Burns may penetrate deeply causing ulcers. Skin may be stained yellowish brown. Dilute solutions cause irritation and tend to harden the epithelium (outer skin layer) without destroying it. HNO_3 liquid causes yellow discoloration of the eyes and severe burns which may result in permanent damage, i.e., sight loss. Ingestion produces immediate pain and digestive tract burns followed by throat swelling, convulsions, risk of stomach perforation (causing a rigid abdomen) and possible coma. **Chronic Effects:** Repeated inhalation of low concentrations may cause chronic bronchitis, tooth erosion, and/or appetite loss. Repeated exposure to $NO_{(x)}$ such as produced by thermal decomposition of HNO_3 is implicated in chronic lung diseases.

FIRST AID

Eyes: *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately. **Skin:** *Quickly* remove contaminated clothing (*do not force removal if stuck to skin*). Rinse with flooding amounts of water for at least 15 min. Apply a 5% triethanolamine solution to affected area. Wash exposed area with soap and water. For reddened or blistered skin, consult a physician. **Inhalation:** Remove exposed person to fresh air and support breathing as needed. **Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have that *conscious and alert* person drink 1 to 2 glasses of water to dilute followed by lime milk or milk of magnesia. Do not induce vomiting. *Do not* give sodium bicarbonate or attempt to neutralize the acid.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Observe for several hours since symptoms such as pulmonary edema may be delayed.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Immediately notify safety personnel, isolate and ventilate area, deny entry, and stay upwind. Cleanup personnel should wear fully-encapsulating vapor-protective clothing. Use water spray to cool and disperse vapor. Keep combustibles away from spilled material. For small spills, take up with earth, sand, vermiculite, or other absorbent, noncombustible material and place in dry containers for disposal. For large spill, flush with water to containment area and neutralize with agricultural (slaked) lime, sodium bicarbonate, crushed limestone, soda ash, or lime. Report any release in excess of 1000 lb. Control runoff and dike for disposal. Follow applicable OSHA regulations (29 CFR 1910.120).

Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

EPA Designations

Listed as a SARA Toxic Chemical (40 CFR 372.65)
Listed as a SARA Extremely Hazardous Substance (40 CFR 355), TPQ: 1000 lb
Listed as a RCRA Hazardous Waste (40 CFR 261.22): No. D001, Characteristic of corrosivity
Listed as a CERCLA Hazardous Substance* (40 CFR 302.4): Final Reportable Quantity (RQ), 1000 lb (454 kg) [* per CWA, Sec. 311(b)(4)]

OSHA Designations

Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)
Listed as a Process Safety Hazardous Chemical (29 CFR 1910.119), TQ: 500 lb

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Because contact lens use in industry is controversial, establish your own policy. **Respirator:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. Select respirator based on its suitability to provide adequate worker protection for given working conditions, level of airborne contamination, and presence of sufficient oxygen. For < 50 ppm, use any supplied-air respirator operated in a continuous-flow mode. For < 100 ppm, use any supplied-air respirator or SCBA with a full facepiece. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas. **Other:** Wear acid-proof gloves, boots, aprons, and gauntlets to prevent skin contact. **Ventilation:** Provide general and local exhaust ventilation systems to maintain airborne concentrations below OSHA PELs (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.[103] **Safety Stations:** Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities. **Contaminated Equipment:** Separate contaminated work clothes from street clothes. Launder contaminated work clothing before wearing. Remove this material from your shoes and clean personal protective equipment. **Comments:** Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Prevent physical damage to containers. Store in aluminum, stainless steel, or glass containers on a cement floor in a cool, dry, well-ventilated area away from incompatibles (Sec. 5). Dike around storage tanks with large kirbs or stills to retain the acid in event of leakage. Keep neutralization agents on hand and install a fire hydrant in storage area. (See NFPA Code 43A). **Engineering Controls:** To reduce potential health hazards, use sufficient dilution or local exhaust ventilation to control airborne contaminants and to maintain concentrations at the lowest practical level. **Administrative Controls:** Consider preplacement and periodic medical exams of exposed workers that emphasize the eyes, skin, respiratory tract and teeth. Pulmonary function tests (FEV< FVC) are helpful. Educate workers about the hazardous properties of nitric acid.

Transportation Data (49 CFR 172.101)

DOT Shipping Name: *, †, ‡, §, ¥, ψ, ϕ
DOT Hazard Class: 8
ID No.: UN1826 (*†), UN1796 (‡§), UN2031 (¥ψ), UN2032 (ϕ)
DOT Packing Group: I (†§¥ϕ), II (*‡ψ)
DOT Packaging Label: Corrosive (*‡¥ψ), Corrosive, Oxidizer (†§), Corrosive, Oxidizer, Poison (ϕ)
Special Provisions (172.102): B2, T12, T27 (*); T12, T27 (†); B2, T12, T27 (‡); T12, T27 (§); B12, B53, T9, T27 (¥); B2, B12, B53, T9, T27(ψ); 2, B9, B32, B74, T38, T43, T45(ϕ)

Packaging Authorizations
a) Exceptions: None
b) Non-bulk Packaging: 173.158 (*†‡§¥ψ), 173.227 (ϕ)
c) Bulk Packaging: 173.242 (*‡ψ), 173.243 (†§¥), 173.244(ϕ)

Quantity limitations
a) Passenger Aircraft or Railcar: Forbidden
b) Cargo Aircraft Only: 30L (*‡ψ), 2.5L (†§¥), Forbidden (ϕ)

Vessel Stowage Requirements
a) Vessel stowage: D
b) Other: 40(*); 40, 66, 89 (†); 40 (‡); 40, 66, 89 (§); 110, 111 (¥); 110, 111 (ψ); 40, 66, 74, 89, 90, 95 (ϕ)

* Nitrating acid mixtures spent, < 50% HNO_3
† Nitrating acid mixtures spent, > 50% HNO_3
‡ Nitrating acid mixtures, < 50% HNO_3
§ Nitrating acid mixtures, > 50% HNO_3
¥ Nitric acid other than red fuming, > 70% HNO_3
ψ Nitric acid other than red fuming, < 70% HNO_3
ϕ Nitric acid, red fuming.

MSDS Collection **References:** 26, 73, 89, 100, 101, 103, 124, 126, 127, 132, 136, 139, 140, 148, 149, 153, 159, 162, 163, 164, 167, 168, 171, 174, 175
Prepared by: M Gannon, BA; **Industrial Hygiene Review:** PA Roy, MPH, CIH; **Medical Review:** W Silverman, MD

Sodium Hydroxide MSDS

Genium Publishing Corporation
1145 Catalyn Street
Schenectady, NY 12303-1836 USA
(518) 377-8854

Material Safety Data Sheets Collection:

Sheet No. 3
Sodium Hydroxide

Issued: 10/77 Revision: C, 11/91

Section 1. Material Identification

Sodium Hydroxide (NaOH) Description: Derived by electrolysis of sodium chloride brines, by reacting calcium chloride with sodium carbonate, or by electrolytic production using the diaphragm cell. Sodium hydroxide often contains as impurities minimal amounts of sodium chloride, sodium carbonate, sodium sulfate, sodium chlorate, iron, or nickel. Used to hydrolyze fats and form soaps; in making plastics to dissolve casein; in treating cellulose to make rayon and cellophane; in explosives, dyestuffs, electrolytic extraction of zinc, reclaiming rubber, tin plating, oxide coating, etching and electroplating, laundering and bleaching, pulp and paper manufacture; in vegetable oil refining; in peeling of fruits and vegetables in the food industry; and in veterinary medicine as a disinfectant.

Other Designations: CAS No. 1310-73-2; Aetznatron; caustic soda; Collo-Grillrein; Collo-Tapette; Feurs Rohp; Lewis-Red Devil Lye; soda, hydrate; soda lye; sodium hydrate.

Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*(73) for a suppliers list.

Cautions: Sodium hydroxide is moderately toxic by ingestion and inhalation and can be seriously corrosive to eyes, skin, and mucous membranes.

R	0
I	2
S	4
K	0

NFPA

HMIS
H 3
F 0
R 1
PPG*
* Sec. 8

Section 2. Ingredients and Occupational Exposure Limits

Sodium hydroxide, ca 100%

1990 OSHA PEL
Ceiling: 2 mg/m³

1990 DFG (Germany) MAK
2 mg/m³

1985-86 Toxicity Data*
Rabbit, oral, LD_{Lo}: 500 mg/kg; no toxic effect noted
Rabbit, skin: 500 mg applied over 24 hr causes severe irritation
Mouse, intraperitoneal, LD_{50}: 40 mg/kg; toxic effects not yet reviewed

1990 IDLH Level
250 mg/m³ (solution mists)

1990 NIOSH REL
Ceiling: 2 mg/m³

1991-92 ACGIH TLV
Ceiling: 2 mg/m³

* See NIOSH, *RTECS* (WB4900000), for additional irritation, mutation, and toxicity data.

Section 3. Physical Data

Boiling Point: 2534 °F (1390 °C)
Melting Point: 605 °F (318.4 °C)
Vapor Pressure: 1 mm Hg at 1362 °F (739 °C)
pH (0.5% solution): 13
Molecular Weight: 40.01

Specific Gravity: 2.13 at 77 °F (25 °C)
Water Solubility: 1 g/0.9 ml water, 1 g/0.3 ml boiling water
Other Solubilities: 1 g/7.2 ml alcohol, 1 g/4.2 ml methanol, soluble in glycerol; insoluble in acetone and ether

Appearance and Odor: Odorless, hydroscopic (readily absorbs water) white flakes, cake, lumps, chips, pellets, or sticks.

Section 4. Fire and Explosion Data

Flash Point: None reported	Autoignition Temperature: None reported	LEL: None reported	UEL: None reported

Extinguishing Media: Although noncombustible as a solid, when in contact with moisture or water sodium hydroxide can generate enough heat to ignite surrounding combustibles. If possible without risk, remove containers from area. Use extinguishing agents suitable for surrounding fire. For small fire, use dry chemical, carbon dioxide (CO_2), or regular foam. Avoid water spray since water reacts with sodium hydroxide to generate substantial heat. If you must use water, be sure it is as cold as possible. For large fires, use fog or regular foam.

Unusual Fire or Explosion Hazards: Sodium hydroxide may melt and flow when heated.

Special Fire-fighting Procedures: Since fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Also, wear fully protective clothing. Structural firefighters' protective clothing provides limited protection. Apply cooling water to fire-exposed sides of container until fire is well out. *Do not* splatter or splash this material. Stay away from ends of tanks. Be aware of runoff from fire control methods. Do not release to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Sodium hydroxide is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur. Violent polymerization can occur when in contact with acrolein or acrylonitrile. Since sodium hydroxide readily absorbs water and carbon dioxide from air, keep containers tightly closed.

Chemical Incompatibilities: Sodium hydroxide generates large amounts of heat when in contact with water and may steam and splatter. It reacts with mineral acids to form corresponding salts; reacts with weak-acid gases like hydrogen sulfide, sulfur dioxide, and carbon dioxide; ignites when in contact with cinnamaldehyde or zinc; and has exploded when exposed to a mixture of chloroform and methane. Sodium hydroxide can be very corrosive to metals such as aluminum, tin, and zinc as well as to alloys such as steel, and may cause formation of flammable hydrogen gas. An increase in temperature and pressure occurs in closed containers when sodium hydroxide is mixed with: acetic anhydride, glacial acetic acid, chlorohydrin, chlorosulfonic acid, ethylene cyanohydrin, glyoxal, oleum, 36% hydrochloric acid, 48.7% hydrofluoric acid, 70% nitric acid, or 96% sulfuric acid.

Conditions to Avoid: Avoid generation of sodium hydroxide dusts, and contact with water, metals, and the chemicals listed above.

Hazardous Products of Decomposition: Thermal oxidative decomposition of sodium hydroxide can produce toxic sodium oxide (Na_2O) and sodium peroxide (Na_2O_2) fumes.

Section 6. Health Hazard Data

Carcinogenicity: In 1990 reports, the IARC, NTP, and OSHA do not list sodium hydroxide as a carcinogen (see Chronic Effects).

Summary of Risks: Sodium hydroxide is toxic by inhalation of dusts or mists, ingestion, or direct skin or eye contact. Damage is immediate and without prompt medical attention can become permanent. This strong, corrosive alkali dissolves any living tissue it contacts.

Medical Conditions Aggravated by Long-Term Exposure: None reported.

Target Organs: Eyes, digestive tract, respiratory system, and skin.

Primary Entry Routes: Ingestion, inhalation, and skin and eye contact.

Continue on next page

Section 6. Health Hazard Data, *continued*

Acute Effects: Ingestion causes immediate burning of mouth, esophagus, and stomach; painful swallowing; excessive salivation; edematous (excess fluid in surrounding tissue) lips, chin, tongue, and pharynx covered with exudate (fluid oozed from swollen tissue); esophageal edema (swelling from fluid buildup in esophagus walls that can prevent all swallowing within hours); possibly edematous, gelatinous, and necrotic (localized tissue death) mucous membranes; vomiting (sometimes coffee grounds-like material due to digestive hemorrhage); and rapid, faint pulse; and cold, clammy skin. Death results commonly from shock, asphyxia (oxygen loss due to interrupted breathing), or pneumonia by the second or third day after ingestion. Dust inhalation can cause many small burns, temporary hair loss (in nasal passages since sodium hydroxide breaks down keratin), and possibly pulmonary edema (fluid in lungs). Skin contact causes slippery, soapy feeling that is not usually painful for 3 min after contact—even though skin damage begins immediately. It causes burns, keratin (hair and nails) destruction, and intracellular edema (excess fluid in skin cells), with damage progressing to severe burns, tissue corrosion, deep ulcerations, and permanent scarring if not immediately washed off. The cornea begins to corrode on contact. Disintegration and sloughing of conjunctival and corneal epithelium may progress to temporary or permanent corneal opacification (cloudiness, becoming impervious to light) or symblepharon (adhesion of lid to eyeball).
Chronic Effects: Dermatitis may result from repeated exposure to dilute solutions. Cases of squamous cell carcinoma (malignant tumors of epithelial origin) of the esophagus are reported 12 to 42 years after sodium hydroxide ingestion, although it is unclear whether the cancer results from scar formation caused by tissue destruction or directly from the chemical's possible carcinogenicity.
FIRST AID: Emergency personnel should protect against contamination.
Eyes: Gently lift the eyelids and flush immediately and continuously with flooding amounts of cold water until transported to an emergency medical facility. *Do not* allow victim to keep eyes tightly shut. *Warning!* Although splashed directly in only one eye, sodium hydroxide may affect the other eye's sight if prompt medical attention is not received. Consult a physician immediately.
Skin: *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. *Be aware* that this substance can become very hot when in contact with water. For reddened or blistered skin, consult a physician. Wash affected area with soap and water.
Inhalation: Remove exposed person to fresh air and support breathing as needed.
Ingestion: Never give anything by mouth to an unconscious or convulsing person. If ingested, have that *conscious and alert* person drink 1 to 2 glasses of water, followed by vinegar or fruit juice to neutralize the poison. *Do not induce vomiting!*
After first aid, get appropriate in-plant, paramedic, or community medical support.
Note to Physicians: Perform endoscopy in all suspected cases of sodium hydroxide ingestion. Perform blood analysis to determine if dehydration, acidosis, or other electrolyte imbalances have occurred.

Section 7. Spill, Leak and Disposal Procedures

Spill/Leak: Notify safety personnel, isolate hazard area, deny entry, and stay upwind of spills. Cleanup personnel should protect against vapor inhalation and skin or eye contact. Use water spray to disperse vapors, but do not spray directly on spills. For small dry spills, avoid excess dust generation by carefully scooping or vacuuming (with appropriate filter) into a suitable container (above 60 °C sodium hydroxide corrodes steel) for later disposal. For large dry spills, cover with plastic sheet or other impermeable layer and contain for later disposal. Follow applicable OSHA regulations (29 CFR 1910.120).
Environmental Transport: Sodium hydroxide is not mobile in solid form, although it absorbs moisture very easily. Once liquid, sodium hydroxide leaches rapidly into soil, possibly contaminating water sources.
Environmental Degradation: Ecotoxicity values: TLm, mosquito fish, 125 ppm/96 hr (fresh water); TLm, bluegill, 99 mg/48 hr (tap water).
Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.
EPA Designations
Listed as a RCRA Hazardous Waste (40 CFR 261.22): Characteristic of corrosivity
Listed as a CERCLA Hazardous Substance* (40 CFR 302.4), Reportable Quantity (RQ): 1000 lb (454 kg) [* per Clean Water Act, Sec. 311 (b)(4)]
SARA Extremely Hazardous Substance (40 CFR 355): Not listed
SARA Toxic Chemical (40 CFR 372.65): Not listed

OSHA Designations
Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Since contact lens use in industry is controversial, establish your own policy.
Respirator: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. Select the respirator based on its suitability to provide adequate worker protection for the given working conditions, level of airborne contamination, and presence of sufficient oxygen. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.*
Other: Wear impervious gloves, boots, aprons, and gauntlets to prevent any skin contact.
Ventilation: Provide general and local exhaust ventilation systems to maintain airborne concentrations below the OSHA PEL (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.[103]
Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.
Contaminated Equipment: Separate contaminated work clothes from street clothes. Launder contaminated work clothing before wearing. Remove this material from your shoes and clean personal protective equipment.
Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Avoid physical damage to containers. Store in dry, well-ventilated area away from water, acids, metals, flammable liquids, and organic halogens. Keep containers tightly closed since sodium hydroxide can decompose to sodium carbonate and carbon dioxide upon exposure to air. Since corrosion occurs easily above 140 °F (60 °C), do not store or transport sodium hydroxide in aluminum or steel containers at temperatures near this level. Store containers in rooms equipped with trapped floor drains, curbs, or gutters.
Engineering Controls: To reduce potential health hazards, use sufficient dilution or local exhaust ventilation to control hazardous contaminants and to maintain concentrations at the lowest practical level.
Other Precautions: Consider preplacement and periodic medical examinations of exposed workers that emphasize eyes, skin, and respiratory tract. Consider a respiratory protection program that includes regular training, maintenance, inspection, and evaluation. Inform employees of the possible hazards in using sodium hydroxide.

Transportation Data (49 CFR 172.101, .102)

DOT Shipping Name: Sodium hydroxide; dry, solid, flake, bead *or* granular
DOT Hazard Class: Corrosive material
ID No.: UN1823
DOT Label: Corrosive
DOT Packaging Exceptions: 173.244
DOT Packaging Requirements: 173.245b

IMO Shipping Name: Sodium hydroxide, solid
IMO Hazard Class: 8
ID No.: UN1823
IMO Label: Corrosive
IMDG Packaging Group: II

MSDS Collection **References:** 26, 38, 73, 89, 100, 101, 103, 124, 126, 127, 132, 133, 136, 139, 140, 143, 146, 148, 149, 153, 159, 161, 163
Prepared by: M Gannon, BA; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** W Silverman, MD; **Edited by:** ER O'Connor, MS

Attachment 3
Contingency Plan

ATTACHMENT NO. 3

Contingency Plan

Pre-Emergency Planning

Refer to Section 11.1 of the Health and Safety Plan.

Emergency Equipment and Supplies

Refer to Section 11.2 of the Health and Safety Plan.

Emergency Medical Treatment

Refer to Section 11.3 of the Health and Safety Plan.

Evacuation

Refer to Section 11.6 of the Health and Safety Plan.

First Aid Medical Information

Refer to all relevant sections of the Health and Safety Plan.

Spill Prevention, Control, and Countermeasures Plan

Refer to the appropriate material safety data sheet (MSDS) for small quantity spills. Additional information is presented below for caustic and ferrous sulfate spills. The ferrous sulfate drum and sodium hydroxide (caustic) drum are located above chemical spill containment sumps to reduce the potential for uncontained spills. Spill prevention, control, and countermeasures for the caustic and ferrous sulfate systems are presented below.

Caustic Drum

A 50 percent caustic solution is stored in a 55-gallon drum. The drum is located toward the north end of the interior east wall of the process room. The drum is located above a chemical containment sump. The containment sump has a drain pipe connecting the sump to the building sump. The building sump pumps its contents to the groundwater storage tank (T-10). Spill control is presented below.

1. Follow the Health and Safety Plan and take actions necessary to minimize the possibility of exposure including evacuation of unprotected personnel, maintaining adequate ventilation, careful assessment of the hazards, planning, notifications, and wearing all appropriate personal protective equipment (PPE) (see the Health and

Safety Plan and MSDS for appropriate PPE). Whenever there is a possibility of exposure to this chemical, a second person should be present in case a emergency develops.

a) Turn off the caustic feed pump from the main control panel in the control room.

b) If the spill is not small and is not contained in the spill containment area, contact the Midwest Contract Operations, Inc. (MCO) project manager, local emergency responders, hazardous materials emergency responder (if different from the local emergency responder), and CH2M HILL.

c) If the spill has been contained in the containment area or it is a small indoor spill, open exterior doors to increase ventilation if it is safe to do so.

d) If the spill has been contained in the containment sump and it is safe to do so:

   i) Set up barricades and warning tape to keep people away from the containment sump.

   ii) Once all free liquid has been removed, arrange a hose to allow flushing of the sump while standing well away from the spill before turning on the water. The reaction between the water and caustic can cause spattering and vapors to be released.

   iii) Leave the hose running to ensure adequate dilution of all caustic residual on the floor and in the floor drain pipe.

e) If it is a small spill (e.g., a small puddle) on the concrete floor or paved area outside the building and there is a floor drain in the area:

   i) Arrange a hose to allow flushing of the spill area into a drain while standing well away from the spill before turning on the water. The reaction between the water and caustic can cause spattering and vapors may be released.

   ii) Wash the spill into a drain leading to the building sump using a hose.

   iii) Leave the hose running to ensure adequate dilution of all caustic residual on the floor and in the floor drain pipe.

f) If it is a small spill (e.g., a small puddle) on a paved surface outside the building and there is no floor drain in the area:

   i) Contain the spill.

   ii) Use a Powersorb Spill Cleanup kit.

   iii) Roll an empty open top 55-gallon drum to the spill area using the drum cart. This drum can be used to dispose of the Powersorb.

   iv) Use a shovel to transfer caustic saturated Powersorb into the drum.

v) Per the MSDS, neutralize remaining residue with dilute hydrochloric acid. Use pH paper on the residual to determine when it has been neutralized.

g) If it is a small spill on an unpaved surface:

i) Contain the spill.

ii) Roll an empty open top 55-gallon drum to the spill area using the drum cart.

iii) Use a shovel to transfer caustic saturated soil into the drum.

Ferrous Sulfate Drum

A 15- to 25-percent ferrous sulfate solution is stored in a 55-gallon drum. The drum is located toward the north end of the interior east wall of the process room, adjacent to the caustic drum. The drum is located above a chemical containment sump. The containment sump has a drain pipe connecting the sump to the building sump. The building sump pumps its contents to the groundwater storage tank (T-10). Spill control is presented below.

1. Follow the Health and Safety Plan and take actions necessary to minimize the possibility of exposure including evacuation of unprotected personnel, maintaining adequate ventilation, careful assessment of the hazards, planning, notifications, and wearing all appropriate PPE (see the Health and Safety Plan and MSDS for appropriate PPE). Whenever there is a possibility of exposure to this chemical, a second person should be present in case an emergency develops.

a) Turn off the ferrous sulfate feed pump from the main control panel in the control room.

b) If the spill is not small and is not contained in the spill containment area, contact the MCO project manager, local emergency responders, hazardous materials emergency responder (if different from the local emergency responder), and CH2M HILL.

c) If the spill has been contained in the containment area or it is a small indoor spill, open exterior doors to increase ventilation if it is safe to do so.

d) If the spill has been contained in the containment sump and it is safe to do so:

i) Set up barricades and warning tape to keep people away from the containment sump.

ii) Once all free liquid has been removed, arrange a hose to allow flushing of the sump while standing well away from the spill before turning on the water. The reaction between the water and ferrous sulfate can cause spattering and vapors may be released. The vapors and droplets will contain acid.

iii) Leave the hose running to ensure adequate dilution of all ferrous sulfate residual on the floor and in the floor drain pipe.

e) If it is a small spill (e.g., a small puddle) on the concrete floor or paved area outside the building and there is a floor drain in the area:

   i) Arrange a hose to allow flushing of the spill area into a drain while standing well away from the spill before turning on the water. The reaction between the water and ferrous sulfate can cause spattering and vapors to be released.

   ii) Wash the spill into a drain leading to the building sump using a hose.

   iii) Leave the hose running to ensure adequate dilution of all ferrous sulfate residual on the floor and in the floor drain pipe.

f) If it is a small spill (e.g., a small puddle) on a paved surface outside the building and there is no floor drain in the area:

   i) Contain the spill.

   ii) Use a Powersorb Spill Cleanup kit.

   iii) Roll an empty open top 55-gallon drum to the spill area using the drum cart. This drum can be used to dispose of the Powersorb.

   iv) Use a shovel to transfer ferrous sulfate saturated Powersorb into the drum.

   v) Per the MSDS, neutralize remaining residue with soda ash or lime. Use pH paper on the residual to determine when it has been neutralized.

g) If it is a small spill on an unpaved surface:

   i) Contain the spill.

   ii) Roll an empty open top 55-gallon drum to the spill area using the drum cart.

   iii) Use a shovel to transfer ferrous sulfate saturated soil into the drum.

Emergency Numbers

Refer to Section 12.1 of the Health and Safety Plan for Emergency Numbers.

When calling an Emergency Response number be prepared to answer the following questions.

Who: **N.W. Mauthe Groundwater Treatment Facility**

Where: **725 South Outagamie Street**
Appleton, WI 54914

How Many Are Injured? _____

Describe type of injuries, illnesses, and first aid being administered.

An individual must meet the emergency vehicle at the site entrance and direct them.

In case of evacuation at site personnel will meet at the intersection of Outagamie Street and Melvin Street.

Emergency Notification Procedure

If an emergency or unusual situation should come to your attention, it is your responsibility to notify others of the situation. An emergency can be an injury to a worker, an evacuation, fire, etc. An unusual situation could involve equipment failures, work that is not being performed appropriately, or anything involving risk or exposure to the public.

Failure to provide notification of any incident places everyone at a disadvantage. This must be avoided. Therefore, if you become aware of any emergency or unusual situation during your work period, provide notification as follows as soon as the conditions permit.

Following notification of emergency services, primary notification is to the CH2M HILL Site Manager or Assistant Site Manager.

Name	Work Telephone	Home Telephone
Erin Potts, Site Manager	414/272-2426	414/761-9059
Dan MacGregor, Assistant Site Manager	414/272-2426	414/375-9647
Richard Rathnow Health and Safety Manager	414/272-2426	414/650-8467

In addition notify the MCO project manager or assistant project manager.

Randall Much	414/751-4200
Stuart Boerst	414/751-4200

Change area code to 920

Do not stop calling until at least one of the above CH2M HILL contacts and one of the above MCO contacts has been notified of the situation. Be prepared to identify the facts of the matter, status of emergency services, effect on the public, and any other pertinent information.

Do not talk to any members of the press, even if you are aware of all the facts. Refer the press to Jon Peterson/USEPA (work telephone 312/353-1264). Do not interfere with any rescue or corrective operations. Cooperate and truthfully answer questions put to you by the police or other such official investigators.

Your cooperation in complying with the above emergency notification procedure is required.

Please Post in a Location for Ready Reference.

Attachment 4
O&M Subcontractor Health and Safety Plan

MIDWEST CONTRACT OPERATIONS, INC.

Site-specific Health and Safety Plan

For the Mauthe Groundwater Treatment Facility
Appleton, Wisconsin

CH2M HILL HEALTH AND SAFETY PLAN

(Reference CH2M HILL SOP 19, *Health and Safety Plans*)

This health and safety plan will be kept on the site during field activities and will be reviewed and updated as necessary. The plan adopts, by reference, the standards of practice (SOP) in the CH2M HILL *Corporate Health and Safety Program, Program and Training Manual*, and CH2M HILL's *Site safety Notebook* as appropriate. The site safety coordinator (SSC) is to be familiar with these SOPs and the content of this plan. Site personnel must sign Attachment No. 1. In addition, this plan adopts procedures in the work plan for the project.

1 PROJECT INFORMATION AND DESCRIPTION

CLIENT OR OWNER: U.S. EPA Region 5 **PROJECT NO:** 141695.DU.02

PROJECT MANAGER: Erin Potts/MKE **OFFICE:** GLR/MKE

SITE NAME: N.W. Mauthe Superfund Site

SITE ADDRESS: 725 South Outagamie Street, Appleton, WI

DATE HEALTH AND SAFETY PLAN PREPARED: August 5, 1997

DATE(S) OF SITE WORK: June 1996 through November 1998

SITE ACCESS: The site is located on the corner of Melvin Street and Outagamie Street approximately two miles east of Route 41 in Appleton, Wisconsin. See Figure 1-1.

SITE SIZE: 2- acres

SITE TOPOGRAPHY: The site is at an elevation of roughly 805 feet above msl and has less than 5 feet of relief, which slopes to the southeast toward the Fox River. The Fox River is located about ½ mile southeast and is about 70 feet lower in elevation than the site.

SITE DESCRIPTION AND HISTORY:

The N.W. Mauthe Site is a former electroplating facility located at 725 South Outagamie Street in Appleton, Wisconsin. Norbert W. Mauthe was the owner of Wisconsin Chromium Corporation (WC) from its inception in 1946 until 1976. In 1960, WC moved from 1522 West Melvin Street to 725 South Outagamie Street, and engaged in hard chrome plating until 1976. In 1976, Mr. Mauthe sold WC to Southern Plating and Machine Company, and chrome plating ceased. Electroplating of zinc, cadmium, and possibly copper and silver was conducted at an adjacent building on the same property from 1978 until 1987 under the name N.W. Mauthe Company.

Under contract to the Wisconsin Department of Natural Resources (WDNR), CH2M HILL conducted a Remedial Investigation and Feasibility Study (RI/FS) at the site beginning in November 1991. These investigations revealed that the site was contaminated with zinc, cadmium, chromium, and cyanide. Organic compounds including 1,1,1-trichloroethane, trichloroethene, acetone, and other chlorinated hydrocarbons were also present.

In March of 1994, a Record of Decision (ROD) was signed by the agencies which required the following actions to be taken at the Site:

- Demolition and removal of the buildings on the N.W. Mauthe Property
- Excavation and offsite treatment of soils with a total chromium concentration of greater than 500 mg/kg
- Backfilling of the excavation with clean soils, capping the site with two feet of clay and topsoil, and the establishment of vegetative cover
- Installation of groundwater collection trenches and construction and operation of a groundwater treatment facility with discharge to the sanitary sewer, to contain and/or control groundwater contamination with ultimate compliance with groundwater applicable or relevant and appropriate requirements (ARARs)
- Improvement or installation of foundation drain systems and cleaning, painting or sealing of basement walls and floors, as needed, for homes or businesses in the area of the site, to prevent seepage of contaminated water into the buildings
- Monitoring of the effectiveness of the groundwater treatment system and groundwater quality
- Operation and maintenance of all systems

Following signature of the ROD, the State of Wisconsin turned the project over to the USEPA to prepare the Remedial Design (RD) and conduct the Remedial Action (RA). The USEPA awarded the contract for the RD to CH2M HILL on May 12, 1994 under the Alternative Remedial Contracting Strategy (ARCS) contract.

The USEPA determined that the RD/RA should be broken into two phases. Phase I involved the excavation of contaminated soils and installation of the groundwater collection trenches. Phase II involved the construction of the groundwater treatment system. The Phase I RD was completed in March 1995 and with CH2M HILL as the USEPA contractor the RA was completed in January 1996. Phase II RA work commenced in June 1996 and was completed in June 1997.

Following the substantial completion of Phase I and II in January 1997, CH2M HILL began implementing the LTRA at the N.W. Mauthe Site. The LTRA is the implementation phase of the site remedial action, i.e., operation and maintenance and performance monitoring of the groundwater collection and treatment systems at the site.

MAUTHE SUPERFUND SITE - OPERATION OF THE GROUNDWATER TREATMENT FACILITY

Midwest Contract Operations, Inc., Site-specific Health and Safety Plan

1. INTRODUCTION

This Health and Safety Plan (HASP) describes the program to be implemented by Midwest Contract Operations, Inc. (MCO) when operating the Mauthe Groundwater Treatment Facility in Appleton, Wisconsin.

This plan identifies procedures to be followed to ensure employee health and safety.

2. KEY PERSONNEL

MCO employee John Stoeger has the primary responsibility for all on-site activities associated with the work to be done at the Mauthe Groundwater Treatment Facility. Laurie Stenson has the primary responsibility for implementing the health and safety plan.

John Stoeger (414)751-4280
Laurie Stenson (414)751-4760

Change Area Codes to 920

3. SAFETY AND HEALTH RISK OR HAZARD ANALYSIS

Waste Characteristics

Groundwater at this site is contaminated with hexavalent chromium and other heavy metals. (CH2M HILL Table 3.8 Known Contaminants of Concern, attached to this document)

Field Activities

Activities associated with the operations of the Mauthe Groundwater Treatment Facility have been grouped based on the degree of contact site workers are likely to have with the contaminated groundwater.

- No Contaminated Groundwater Contact Activities

  Activities that involve no contact with contaminated materials during routine operations include:

  - Recordkeeping activities.
  - Groundkeeping activities including snow removal, grass and weed cutting, and trash removal.

- Limited Contaminated Groundwater Contact Activities

  Activities that involve indirect contact or potential for contact with contaminated groundwater operations include:

  - Filling out logs and inspection documents by taking readings of process conditions, groundwater levels, and other parameters discussed in the O&M Manual.
  - Housekeeping activities.

- Packaging, preserving and shipping samples.
- Transportation and disposal of solid wastes.
- Operations troubleshooting
- Chemical addition to the treatment process.
- Maintenance activities.
- Completing daily and weekly inspection/logs forms.
- Operational adjustments of valves and controls.

- Direct Contaminated Groundwater Contact Activities

  Activities which involve direct contact with contaminated groundwater operations include:

  - Sampling process streams (influent and effluent)
  - Performance of onsite laboratory analyses consisting of Hach Kit analysis for total and hexavalent chromium and total suspended solids (TSS).
  - Sludge removal and sampling.

Hazard Assessment

An assessment of hazards has been made for each of the groups of activities to be carried out at the Mauthe Groundwater Treatment Facility. Protective equipment has been selected based on the types and concentrations of substances anticipated at the site and the possible routes of exposure. The following levels of protection are required for the following group activities.

- No Contaminated Groundwater Contact Activities

  The primary hazards are the physical hazards associated with groundkeeping activities, heat and cold, noise, and stones etc. thrown by lawnmowers and snow throwing equipment.

  - Level of Protection - Level D

    - Gloves
    - Hearing Protection
    - Safety Glasses
    - Clothing for Protection from Cold Temperatures

- Limited Contaminated Groundwater Contact Activities

  The primary hazards are the physical hazards associated with maintenance activities and limited skin or eye contact with chemicals or samples.

  - Level of Protection - Level D

    - Gloves
    - Safety Glasses

- Direct Contaminated Groundwater Contact Activities

  The primary hazards are the hazards associated with sample collection activities, skin and eye contact with contaminated groundwater.

  - Level of Protection - Level D

    - Gloves
    - Safety Glasses

Physical Hazards

An assessment for the physical hazards at the Mauthe Groundwater Treatment Facility was conducted. The primary physical hazards are those associated with the groundkeeping and maintenance activities.

- Heat and Cold

  Temperature puts extra physical stress on the body. Long periods of exposure to heat may cause illness, particularly if an employee is not accustomed to working in hot areas or hot weather. Heat stress may occur at the Mauthe Site when lawnmowing or doing other heavy physical labor during the hot summer weather. Overexposure to heat may result in heat stroke, heat exhaustion, heat cramps or fainting. Cold stress is less common but may occur if work is required outdoors in winter months, at this Mauthe Site the main concern is the snow removal activities. Overexposure to cold may result in frostbite or hypothermia.

- Electrocution

  Electrocution may result at the Mauthe Site from contact with energized equipment, use of electrical energized equipment in wet areas, and failure of equipment. Electrical repair and maintenance work must be done only by qualified personnel. Other precautions include using the lockout/tagout procedure for servicing equipment, using properly grounded equipment and cords, and using only equipment in good repair.

- Slips, Trips, and Falls

  Next to traffic accidents, falls kill more people than any other type of accident. Slips, trips, and falls may occur at the Mauthe Site when the employees is using ladders, stairs, working on slippery surfaces or walking from one level to another level in the main treatment area of the site. These hazards can be avoided by: Paying attention to the walking surface; cleaning up spills immediately; cleaning up grease accumulation; keeping work areas well lit and clutter free; paying special attention to the use of ladders and stairways; and constructing proper fall protection when working next to floor or wall openings, on a roof, or when working around open tanks or trenches.

- Flying Objects

  The greatest danger of objects being propelled into the air, is that of stones or other objects being thrown by the lawn mowing or snow removal equipment. Employees should be aware of the hazard and use eye protection as a precaution when using this equipment.

- Noise

  Noise hazards may occur at the Mauthe Site while using lawn mowing equipment, snow throwing equipment and certain process equipment. Excessive exposure to noise is a primary cause of hearing disorders. Hearing protection must be worn while working with equipment which exceeds the allowable decibel levels (>85 dBA).

4. SITE CONTROL

Access to the Mauthe Groundwater Treatment Facility will be limited to authorized personnel. Such personnel include the Contractor's employees, and employees of Midwest Contract Operations, Inc. and subcontractors of Midwest Contract Operations, Inc. The Mauthe Groundwater Treatment Facility is contained in a building, the building will be locked and posted with a "No Trespassing" or other appropriate signs.

Work Zones

To restrict the movements of contaminants from the site to uncontaminated areas, three work zones shall be set up as follows:

Zone 1: Exclusion Zone

The Exclusion Zone is the zone where contamination does or could occur. All persons entering this zone shall wear the level of protection set forth in the Hazard Assessment Section.

Zone 2: Contamination Reduction Zone

The Contamination Reduction Zone provides a transition zone between contaminated and clean areas of the Site. This Zone shall be located directly outside the Exclusion Zone. All personnel and equipment leaving the Exclusion Zone shall be decontaminated in this zone. Procedures for decontamination are specified in Section 8.

Zone 3: Support Zone

The Support Zone is an uncontaminated area from which operations are directed. It is essential that contamination be kept out of this area.

Building layout plan with work zones identified is attached to this document.

5. MEDICAL SURVEILLANCE

Midwest Contract Operations, Inc. (MCO), shall make available medical examinations to all employees involved in the operation of the Mauthe Groundwater Treatment Facility in accordance with 29 CFR 1910.120.

The medical surveillance program shall be instituted for all employees:

Who are or may be exposed to hazardous substances or health hazards at or above the permissible exposure limits, without regard to the use of respirators, for 30 days or more a year;

Who wear a respirator for 30 days or more a year or as required by § 1910.134;

Who are injured, become ill or develop signs and symptoms due to possible overexposure involving hazardous substances or health hazards from an emergency response or hazardous waste operation.

Frequency of Medical Examinations and Consultations

Medical examinations and consultations shall be made available by MCO to each employee covered by the above conditions on the following schedule:

Prior to assignment;

At least once every twelve months for each employee covered unless the attending physician believes a longer interval (not greater than biennially) is appropriate;

At termination of employment or reassignment to an area where the employee would not be covered if the employee has not had an examination within the last six months;

As soon as possible upon notification by an employee that the employee has developed signs or symptoms indicating possible overexposure to hazardous substances or health hazards, or that the employee has been injured or exposed above the permissible exposure limits or published exposure levels in an emergency situation;

At more frequent times, if the examining physician determines that an increased frequency of examination is medically necessary.

Content of Medical Examinations and Consultations

Medical examinations shall include a medical and work history with special emphasis on symptoms related to the handling of hazardous substances and health hazards, and to fitness for duty including the ability to wear any required PPE under conditions (i.e. temperature extremes) that may be expected at the work site.

All medical examinations and procedures shall be performed by or under the supervision of a licensed physician, preferably one knowledgeable in occupational medicine, and shall be provided without cost to the employee, without loss of pay, and at a reasonable time and place.

Information Provided to the Physician

The employer shall provide a copy of 29 CFR 1910.120 and its appendices to the attending physician and in addition, the following for each employee:

A description of the employee's duties as they relate to the employee's exposures.

The employee's exposure levels or anticipated exposure levels.

A description of any personal protective equipment used or to be used.

Information from previous medical examinations or the employee which is not readily available to the examining physician.

Physician's Written Opinion

The employer shall obtain and furnish the employer with a copy of a written opinion from the attending physician containing the following:

The physician's opinion as to whether the employee has any detected medical conditions which would place the employee at increased risk of material impairment of the employee's health from work in hazardous waste operations or emergency response, or from respirator use.

The physician's recommended limitations upon the employee's assigned work.

The results of the medical examination and tests if requested by the employee.

A statement that the employee has been informed by the physician of the results of the medical examination and any medical conditions which require further examination or treatment.

The written opinion obtained by the employer shall not reveal specific findings or diagnoses unrelated to occupational exposures.

Medical Recordkeeping

An accurate record of the medical surveillance shall be retained in accordance with the criteria in 29 CFR 1910.20 and shall include at a minimum:

The name and social security number of the employee;

Physicians written opinions, recommended limitations, and the results of the examination;

Any employee medical complaints related to exposure to hazardous substances;

A copy of the information provided to the physician by the employer.

6. ENVIRONMENTAL MONITORING

Environmental Sampling

Monitoring the treatment system includes periodic sampling and analysis of the treated effluent. Monitoring of the treatment system is done to (1) verify compliance with the Industrial User Permit Limits, and (2) assess the ongoing performance of the process equipment. Techniques for this monitoring are addressed in the O & M Manual.

Self Monitoring

While at the site, MCO employees will be required to monitor their own health and that of co-workers. Visual observations may include: Extreme weakness or fatigue; nausea; headaches, pale or flushed complexion; mental confusion or delirium; irritation of eyes, nose and throat; shortness of breath; increased respiratory rate; vomiting; dizziness; and skin irritation.

7. TRAINING REQUIREMENTS

Basic Training

All employees who will perform work at the site have completed the a 40-hour hazardous waste site training program as required under OSHA 29 CFR 1910.120.

Site-Specific Training

Employees assigned to the site will be given a minimum of three days of site-specific training and field experience to include the following topics:

- Safe operation of the groundwater treatment facility
- Sampling procedures
- Engineering controls and safe work practices associated with the work assignments
- Acute and chronic effects of the toxic chemicals found at the site
- Routes of potential exposure and field activities which could result in such exposures
- Need for personal protective equipment (PPE), types of PPE, and fit effectiveness and limitations
- Site control procedures
- Medical surveillance program
- Work zones established at the site
- Prohibited activities in the Exclusion and Contamination Reduction Zones
- Personal and equipment decontamination procedures
- Emergency response procedures
- Site communication procedures
- Hazard Communication Program
- Lockout/Tagout Procedures
- Occupational Noise Exposure Program
- Employee Emergency Action Plan and Fire Prevention Plan
- Respiratory Protection Program
- Confined Space Entry Procedures

Refresher training will be provided at least annually.

8. DECONTAMINATION

PPE such as gloves and boot covers are for one time use only, and are to be diposed of after use. Equipment, walls and floors, should they become contaminated, will be rinsed down with clean water. The rinse water will be collected in the building sump. Water collected in the sump is returned to the storage tank (T-2) prior to treatment.

9. SPILL CONTAINMENT PROGRAM

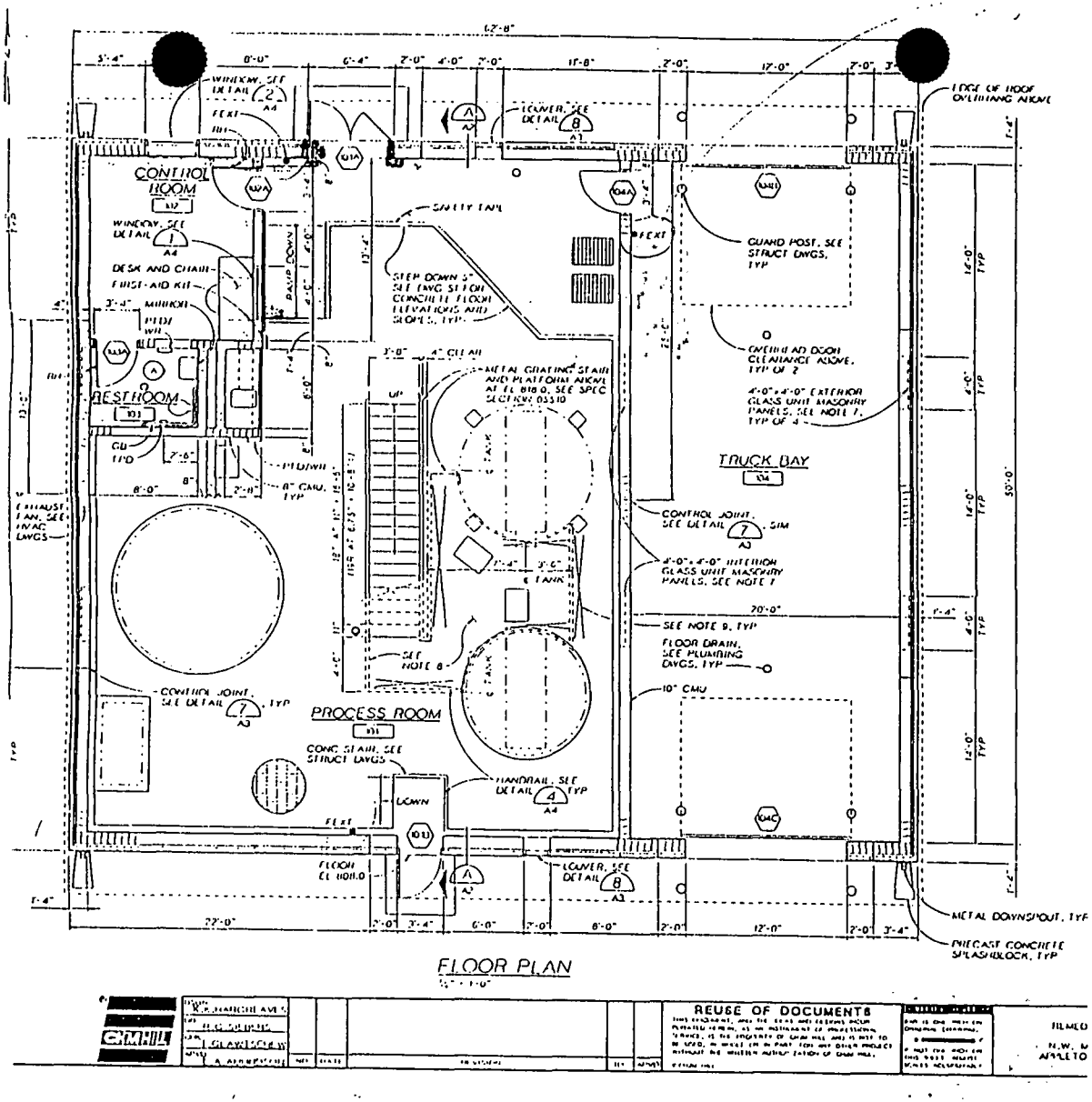
The building sump collects spills and water from the building floor drains and includes air compressor drainage, tank drainage and overflow, tanker truck loadout drainage, treatment process chemical spills. The building sump is an FRP tank with a 400-gallon capacity. Water collected in the sump is returned to the storage tank (T-2) prior to treatment. The building sump pump has a capacity of 83 gpm. If there is an uncontrolled release of contaminated groundwater into the environment, the DNR should be notified.

3.8 CONTAMINANTS OF CONCERN

Contaminant	Location and Highest[a] Concentration (ppm)	Exposure Limit[b]	IDLH[c]	Symptoms and Effects of Exposure	PIP[d] (eV)
Chromium (as Cr(II) & Cr (III))	GW: 3600 µ g/L MW-107 PW: 1100 µ g/L	0.5 mg/m^3	25	Irritated eyes, sensitization dermatitis, histologic fibrosis of lungs	NA
Chromium (hexavalent)	PW: 100 µ g/L	0.05 mg/m^3	15	Irritated respiratory system; nasal septum perforation; liver and kidney damage; leucytosis; leupen; monocytosis; eosinophilla; eye injury, conjuctivitis; skin ulcer; sensitization dermatitis	NA

Footnotes:

a: Specify sample-designation and media: GW (Groundwater), PW (process water effluent)
b: Appropriate value of PEL, REL, or TLV listed
c: IDLH = immediately dangerous to life and health (units are the same as specified "Exposure Limit" units for that contaminant);
d: NA = Not applicable



FLOOR PLAN

REUSE OF DOCUMENTS

WORK ZONES

Zone 1: Exclusion Zone

Zone 2: Contamination Reduction Zone

Zone 3: Support Zone

HAZARD COMMUNICATION

A. GENERAL PROCEDURE

1. Person Responsible for Maintaining Program

Laurie Stenson will be responsible for inventorying all chemicals in the facility and to determine that a Material Safety Data Sheet is on file.

2. File for Material Safety Data Sheets (MSDS) and List of all Chemicals Known to be Present

A list of hazardous chemicals, known to be present, at the Mauthe Groundwater Treatment Facility has been compiled and will be kept with the MSDS. The MSDSs will be kept in a three ring binder at the facility and will be made available to all employees.

3. Description of Labeling System

Midwest Contract Operations, Inc. (MCO) will rely on the chemical supplier to provide accurate labels and MSDS. The labels on containers must include:

a. Identity of hazardous chemical
b. Appropriate hazard warning
c. Name and address of the chemical manufacturer, importer or other responsible party.
d. In-plant labels will be necessary when chemicals are transferred to smaller containers and used for more than one workshift. These labels must contain:

    i. Identity of the substance
    ii. Identity of the hazard

MCO employee John Stoeger will be responsible to ensure that every purchased container is labeled upon receipt of that container. John Stoeger will be responsible to ensure that if chemicals are transferred to smaller containers, those containers will be labeled appropriately.

4. Methods for Non-routine Tasks

Non-routine tasks are those tasks performed on an as-needed basis or a few times per year. If there is a long enough time span between performing the task, where the individual may not remember what precautions to take, the task is considered a non-routine task.

The O & M Manual for the Mauthe Groundwater Treatment Facility addresses procedures for tasks such as emergency shutdown. If additional non-routine tasks arise, procedures to handle those tasks will be developed.

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Non-routine tasks are not anticipated at the Mauthe Groundwater Treatment Facility. If non-routine tasks arise, procedures to handle those tasks will be developed.

B. SPECIFIC PROVISIONS OF THE STANDARD

1. Requirements for MSDS

There is no standard form for a MSDS. They can be in any form, but must contain certain elements.

a. Product Identification

Gives name, address and telephone number of the manufacturer. Here you also learn the chemical name, trade name and any other name by which the chemical is known. This section may also list an emergency phone number.

b. Hazardous Ingredients

This section lists the chemical ingredients that are hazardous. It also lists the concentration of the chemicals to which you can safely be exposed, often listed as the permissible exposure limit (PEL) or the threshold limit value (TVL).

c. Physical Data

This section describes the physical characteristics of the material, the appearance, odor, etc. It also shows information such as boiling point, vapor pressure, etc.

d. Health Hazard Data

This section lists primary routes of entry of the chemical into the body. It also shows signs and symptoms of exposure and medical conditions aggravated by exposure. This section gives emergency and first-aid instructions for treatment of overexposed victims.

e. Fire and Explosion Hazard Data

This section provides information about fire and explosion hazards of the material. You will find at what temperature the chemical ignites, called the flashpoint. If a chemical is flammable, it ignites below 100 F, if it is combustible it ignites at 100 F or above. This section also lists special fire fighting procedures and precautions and fire extinguishing material.

f. Reactivity Data

This section describes what, if anything, the material reacts with. The section describes conditions to avoid and the hazards of decomposition of the material.

g. Spill or Leak Procedures

This section describes methods of handling spills, leaks, disposal and significant environmental hazards.

h. Special Protection Information

This section provides information on precautionary measures such as personal protective equipment and control measures such as ventilation.

i. Special Precautions and Other Information

Additional handling and storing information may be discussed in this section, cleaning and handling of contaminated clothing, etc. This section may also include pertinent government regulations.

2. Hazard Determination

The chemical manufacturer or importer must evaluate chemicals produced in their workplace or imported by them to determine if they are hazardous.

There are two types of hazards when dealing with chemicals, physical and health. Physical hazards are possible when the material is explosive, can cause burns, or can cause harm to you if they touch you. Health hazards are possible when material can cause irritation to the mucous membranes, damage to your organs such as the kidneys or liver and if the material is a carcinogen, or can cause death.

3. Outside Contractors

A list of hazardous chemicals and their location will be provided to the manager/supervisor in charge of the individual or group of outside contractors doing work at this facility.

Any contractor bringing hazardous chemicals onto the facility shall notify MCO, in advance, and provide this facility with the MSDS for such chemicals.

Contractors must sign a statement that they have read and agree to follow the policy outlined above (See attachment A). Contractors will be provided with a copy of MCO's Hazard Communication Program.

The outside contractor will be responsible for reviewing the MSDS and Hazard Communication Program and to train his/her own employees on any hazards they may encounter at this facility.

4. Program Evaluation

An evaluation of the program will be conducted annually. The safety committee will be responsible for the program evaluation. An evaluation form will be used (See attachment B).

5. Other Requirements

The standard requires that the Employer:

a. Respond to Inquiries

The employee must ask for the information through a written request (See attachment C).

C. TRAINING

MCO will provide training to its employees on the use of hazardous chemicals and the use of MSDS. Review and updating sessions will be held annually. Training will be provided by a qualified staff

member or an outside agency. Guest speakers will provide training when possible. Audio-visual, classroom instruction, and handouts will be used during training sessions.

New employees will be trained before any work assignments with hazardous chemicals. If a new hazard is introduced into the workplace, a training session will be held before any work assignments with the new hazard (For a copy of a training session outline, see attachment D).

Attachment A

Per agreement between _____ (Contractor) and Midwest Contract Operations, Inc. (MCO) in which Contractor has agreed to perform certain work on the MCO's property for an agreed fee or rate, Contractor acknowledges that MCO uses and/or produces various substances that may be classified as hazardous substances under OSHA's Hazard Communication Standard. Contractor recognizes this use of hazardous substances by MCO and acknowledges that the MCO has provided Contractor with a description of such substances that may be present in the areas of the facility to which Contractor and its employees may have access during the performance of the job as agreed. Contractor further acknowledges that MCO has also provided suggestions for appropriate protective measures that should be observed when Contractor's employees are in the area of the hazardous substances.

It is the Contractor's sole responsibility to inform its employees of the described hazardous substances and protective measures suggested by MCO. It is the Contractor's further sole responsibility to ensure that Contractor's employees observe protective measures during the performance of their duties that are at least as stringent as the protective measures suggested by MCO.

Contractor agrees that, in the event that it shall be required to bring any hazardous substances onto the property during the performance of its job, it shall notify the MCO, in advance, and suggest to MCO appropriate protective measures to be observed by MCO's employees.

Agreed this _____ day of _____, 19_____.

CONTRACTOR	MIDWEST CONTRACT OPERATIONS, INC.
_____	_____
_____	_____
(signature)	(signature)

Attachment B

HAZARD COMMUNICATION PROGRAM EVALUATION

Department_____ **Date** _____

Evaluated by _____

ITEM **YES** **NO**

Labels

All containers are appropriately labeled. ( ) ( )

Evaluation Procedure:

Tour department, all containers must have a legible label listing the identity, health effects, and, if it is a shipping container, the manufacturer's name and address.

If no, labels not appropriate or missing:

Action taken for correction

Material Safety Data Sheets

Complete MSDSs are available on all hazardous substances. ( ) ( )

Evaluation Procedure:

Choose three products from the department inventory. Locate the MSDSs in the file closest to the department, check for completeness.

If no, MSDSs missing or incomplete:

_____

_____

Action taken for correction: _____

Employee Training

Employees are able to identify hazardous substances and list their health effects and the required protective measures. ( ) ( )

Evaluation Procedure:

Ask three employees to name a hazardous substance in their work area and list the health effects and protective measures. They may do this from memory, by reading the label, or by finding and reading the MSDS.

If no, number of employees unable to do so:

_____

_____

Action taken for correction: _____

Attachment C

REQUEST FORM - CHEMICAL MSDS

Midwest Contract Operations, Inc.

NAME OF MATERIAL _____

DATE OF REQUEST _____

NAME OF EMPLOYEE REQUESTING INFO. _____

RESPONSE: _____

_____

_____

_____

Attachment D

Hazard Communication

Training Session Outline

A. **Discussion of Chemicals at the Mauthe Site**

1910.1200(h)(1)i, (2)(i), (2)(ii), 2(iii)

B. **Videos - (When available)**

C. **Discussion of the Written Program - MCO**

1910.1200(h)(2)(iv)

D. **Learning Activities - (When available)**

E. **Written Test (When available)**

CHEMICALS PRESENT AT THE N.W. MAUTHE SUPERFUND SITE GROUNDWATER TREATMENT FACILITY

Operations

Caustic Soda Liquid (50% Sodium Hydroxide Solution)
Ferrous Sulfate Solution 25%
Nitrogen Gas

Laboratory

ChromaVer - 3 (HACH Chemical)
Indicating DRIERITE

Maintenance/Groundskeeping

Gasoline (Amoco Lead-free)

Cleaning Products

Northwoods Sunbath (Bathroom Cleaner)
Northwoods Brillance (Glass & Mirror Cleaner)

EMPLOYEE EMERGENCY PLAN
AND FIRE PREVENTION PLAN

A. GENERAL PROCEDURE

1. Tornado Procedure

a. Radio Station WAPL (105.7) FM will keep the area informed of the storm's progress.
b. Continue to listen to the radio for information and instructions.
c. Seek shelter, if necessary. Avoid windows, doors, and outside walls. If possible, find shelter in the southwest wall of a basement or try to find shelter under a heavy object such as a desk or table. Protect your head.

2. Fire Prevention

Do all you can to prevent fires. Good housekeeping is the best insurance against fires. Maintain order and neatness in the interest of fire protection. Avoid accumulation of flammable and combustible waste materials and residues so that they do not contribute to a fire emergency. Properly maintain equipment to prevent accidental ignition.

3. Reporting Fires/Emergencies

a. If a fire or other emergency is discovered, keep calm, do not panic.
b. Dial 911 (Emergency Dispatch). Give the location and extent of the fire or other type of emergency.
c. If the fire is small, fight it only if you can do so without endangering yourself. Keep near a door, so that you will have an escape route.
d. The facility is equipped with ABC Fire Extinguishers. The ABC extinguisher is a multi-purpose type and can be used for Class A fires (combustible materials), Class B (flammable liquids, greases, gasoline, oil, etc.) and Class C (electrical equipment, motors, switches, etc.). The fire extinguishers are checked and serviced annually by Automatic Fire Protection. The extinguishers can be operated by following these steps:

    i. Pull the pin.
    ii. Aim the discharge nozzle at the base of the flame.
    iii. Squeeze the operating handle that discharges the extinguisher's contents.
    iv. Sweep the spray nozzle back and forth at the base of the fire.

Remember, it is important to approach the fire in a crouched position, 10 to 30 feet from the base of the flames. Use a sweeping motion and aim at the base of the fire. After the fire is extinguished, move closer to put out any remaining smoldering material, but beware, it could flare up.

e. If the fire gets large, get out and close doors to the fire, if possible.

4. Evacuation Procedure

a. Once a fire has been reported, evacuation should begin immediately.
b. Move calmly to the nearest exit. Do not stop to take personal belongings. Every employee should be aware of the primary and secondary exits for the facility. Exits will be posted on the walls of the work areas.
c. Do not evacuate past a fire scene.
d. Close doors behind you as you go. This will prevent the circulation of smoke and fire feeding oxygen.
e. If smoke becomes heavy, keep low.
f. Feel every door with your hand before opening. If the door is hot, do not open it. If it is cool, open cautiously, but stay behind the door. If heat or pressure comes through the door, shut it immediately.
g. Do not use elevators for evacuation.

5. Accounting for Employees after Evacuation

a. After exiting building, move immediately to the assembly point. The assembly point for this facility is the parking lot.
b. At the assembly point, roll call will be taken to find out if any employees are unaccounted for. Notify the Fire Department if any employees are unaccounted for.
c. Once the "all clear" has been given, by the Fire Department, the employees can return to their work areas. Stay at the assembly point until the "all clear" is given.

6. Medical Emergencies

a. Dial 911 (Emergency Dispatch) if injury warrants. Give the location and extent of the medical emergency.
b. When the injury is in the Exclusion Zone, the injured person will be decontaminated to the extent possible prior to movement to the Support Zone. The appropriate first aid will be administered in the Support Zone. No persons shall re-enter the Exclusion Zone until the cause of the injury or symptom is determined.

B. SPECIFIC PROVISIONS OF THE STANDARD

1. Workplace Hazards

The chemicals and the hazardous waste stored, at the Mauthe Groundwater Treatment Facility, will be of concern in case of fire or other emergencies.

C. TRAINING

The employer must train employees in the procedures for emergency evacuation and the fire hazards of the materials and processes to which they are exposed. Training will be provided annualy by a qualified staff member. Training may include audiovisual material, handouts, and guest speakers.

Where the employer has provided portable fire extinguishers for employee use in the workplace, the employer shall provide an educational program to familiarize employees with the use of fire extinguishers and the hazards involved in the incipient stage of fire fighting.

EMERGENCY RESPONSE TELEPHONE NUMBERS

FACILITY
ADDRESS: 725 South Outagamie Street
Appleton, WI

PHONE:

POLICE: 414/832-5500

EMERGENCY: 911

FIRE: 414/832-5810

EMERGENCY: 911

Change area codes to 920

AMBULANCE: 911

OUTAGAMIE COUNTY
EMERGENCY GOVERNMENT: 414/832-5148

POISON CONTROL CENTER: 1-800-815-8855

APPLETON WASTEWATER
TREATMENT FACILITY: 414/832-5924 NIGHTS/WEEKENDS: 414/832-5945

WISCONSIN NATURAL GAS COMPANY
24-HOUR EMERGENCY SERVICES: 1-800-236-9874

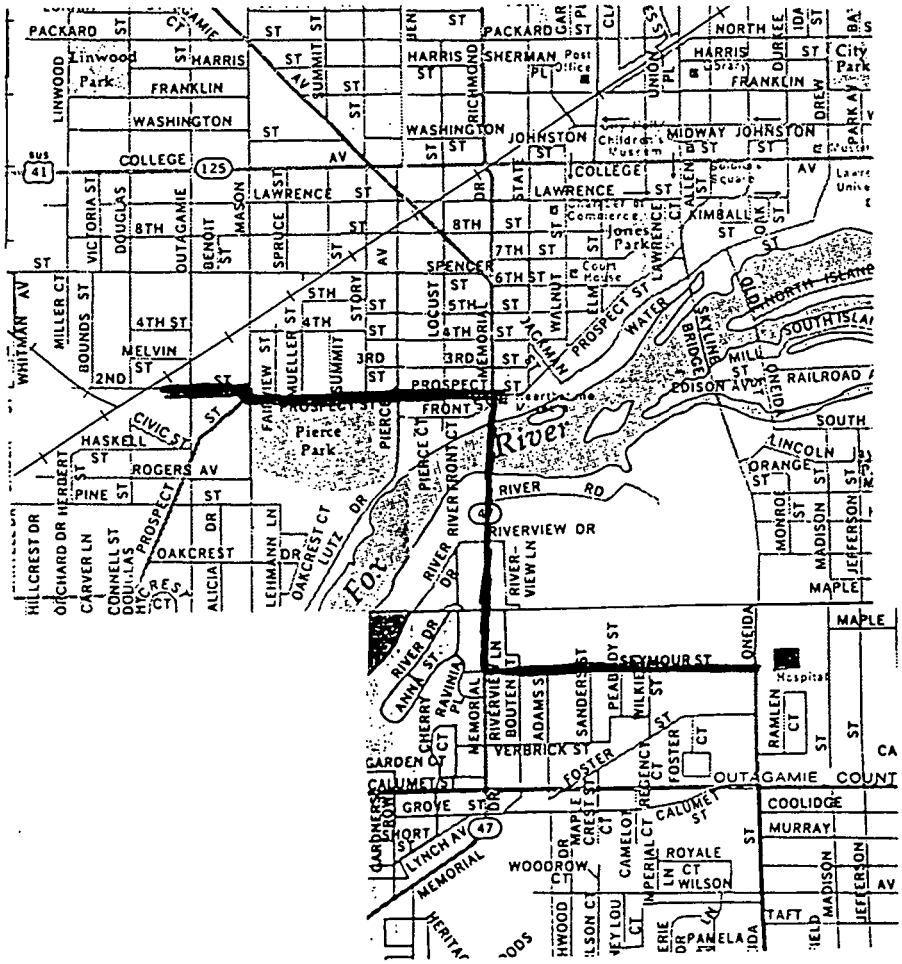
WISCONSIN ELECTRIC POWER COMPANY: 1-800-662-4797

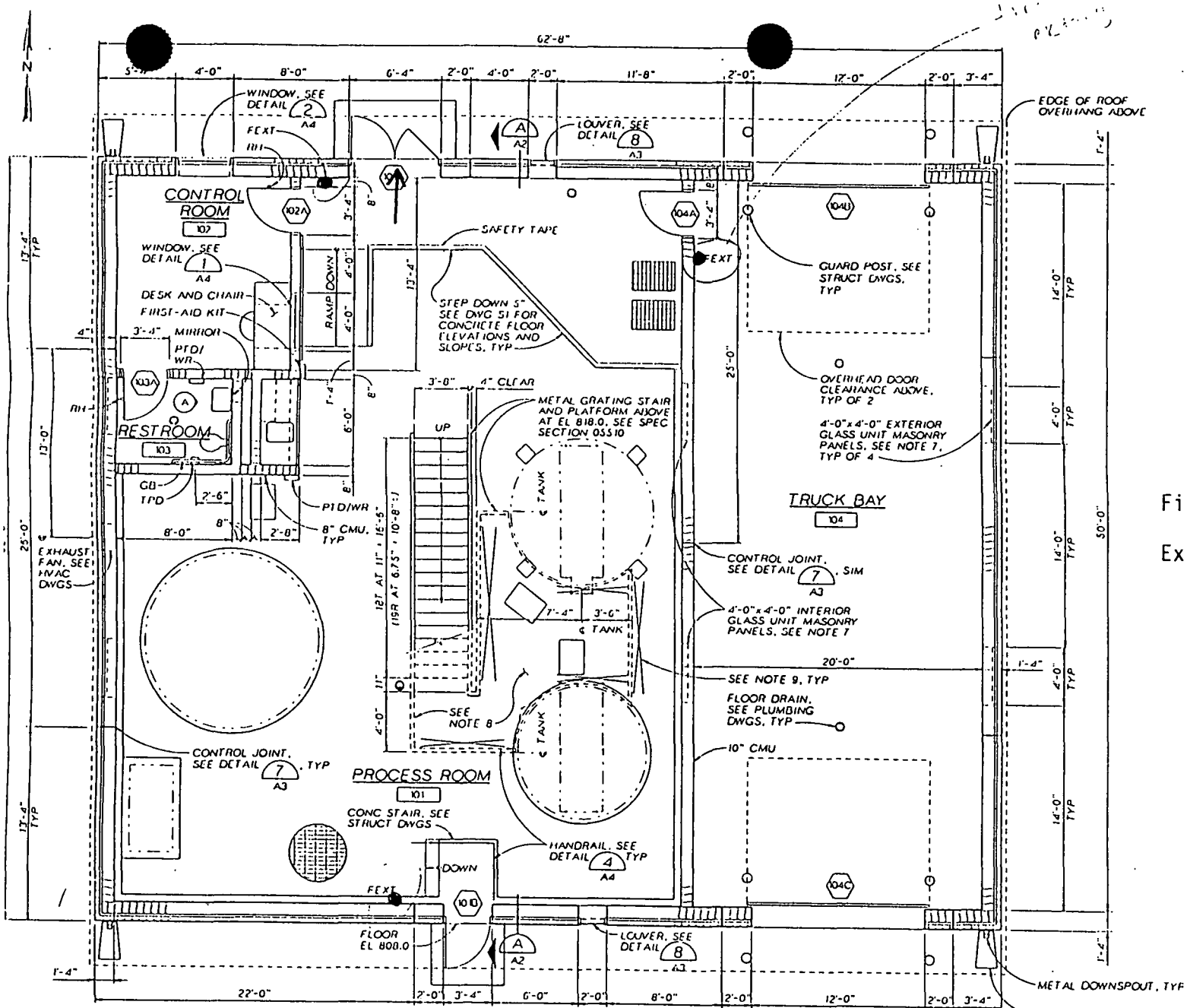
FEDERAL: Jon Peterson/USEPA TELEPHONE: 312/353-264
STATE: WDNR FIELD OFFICE TELEPHONE: 414/8322826
CH2M HILL PROJECT MANAGER: 414/272-2426

HOSPITAL: ST. ELIZABETH
ADDRESS: 1506 S. Oneida Street, Appleton, Wisconsin
TELEPHONE: 414/738-2000
ROUTE TO HOSPITAL: (Refer to Map Next Page)

ST. ELIZABETH HOSPITAL

2nd Street east to Mason. Mason south to Prospect Street. Prospect east to Memorial Drive (47). Memorial Drive south to Seymour Street. East on Seymour, takes you directly to the hospitol.





FLOOR PLAN

¼" = 1'-0"

CH2M HILL

DSGN K.K.HARGREAVES
DR R.G.SIEBELS
CK I.GLAWISCHEW
APVD A.ANUNDSON

NO.	DATE	REVISION	BY	APVD

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VERIFY SCALE

BAR IS ONE INCH ON ORIGINAL DRAWING.
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

REMED
N.W. M
APPLETO

LOCKOUT/TAGOUT

A. GENERAL PROCEDURE

1. Need to Lock or Tagout Equipment

Determine if the equipment in need of servicing or maintenance is to be locked or tagged out.

a. Any piece of equipment, where an unexpected energization, start-up or release of stored energy could cause injury, must be locked/tagged out before servicing or maintenance.

b. Equipment serviced by work orders, the work order will include the direction to lockout and tagout equipment while servicing.

c. Lockout devices will always be used where it is physically possible. If lockout is not physically possible, a tagout device should be used. Effective October 31, 1989, all new equipment should incorporate lockout devices.

d. This standard does not apply to equipment that can be unplugged from the energy source and the plug is under the exclusive control of the employee doing the servicing or maintenance.

2. Preparation for Lockout/Tagout

a. Make a survey to locate and identify all isolating devices to be certain which switch('s), valves, or other energy isolating devices apply to the equipment to be locked or tagged out.

b. Refer to the "Equipment/Lockout Device List" to decide the type(s) of lockout/tagout device(s) to be used.

c. Implementation of lockout or the tagout system shall be done only by authorized employees.

d. Notify all affected employees that a lockout or tagout is in effect and the reason therefore.

3. Equipment Shutdown/Isolation and Application of Locks and Tags

a. If the equipment or machine is operating, shut it down by the normal shutdown procedure.

b. Operate the switch, valve or other energy isolating device(s) so that the equipment is isolated from its energy source(s). Stored energy (such as that in springs, elevated machine members, rotating flywheels, hydraulic systems, and air, gas, steam, or water pressure, etc.) must be dissipated or restrained by methods such as repositioning, blocking, bleeding down, etc.

c. Lockout and/or tagout the energy isolating device(s) with assigned individual lock(s) and tag(s). (See Equipment/Lockout Device List)

d. After ensuring that no personnel are exposed, and as a check on having disconnected the energy sources, operate the push button or other normal operating controls to make certain the equipment will not operate.

RETURN OPERATING CONTROL(S) TO "NEUTRAL" OR "OFF" POSITION AFTER THE TEST

e. The equipment is now locked out or tagged out.

4. Start-up of Equipment After Servicing

a. Check area around the machine or equipment to ensure that no one is exposed.

b. After all tools have been removed from the machine or equipment guards have been reinstalled and employees are clear, remove all lockout tagout devices. Operate the energy isolating devices to restore energy to the machine or equipment. Affected employees will be notified that the lockout or tagout devices have been removed.

c. Each lockout or tagout device shall be removed from each energy isolating device by the employee who applied the device. *

- Exception to removal of Lockout/Tagout devices:

  i. Verification by the employer that the authorized employee who applied the device is not at the facility;
  ii. Making all reasonable efforts to contact the authorized employee to inform him/her that his/her lockout or tagout device has been removed; and
  iii. Ensuring that the authorized employee has this knowledge before he/she resumes work at the facility.

5. Procedure Involving More Than One Person

When the servicing of a single piece of equipment is performed by a crew (more than one individual), each individual will place his/her own lockout device or tagout device on the energy isolating device(s). A single lock may be used to lockout the equipment with the key being placed in a lockout box or cabinet that allows the use of multiple locks to secure it. Each employee will than use his/her own lock to secure the box or cabinet. As each person no longer needs to maintain his/her lockout protection, that person will remove his/her lock from the box or cabinet.

Alternatively, a group lockout device may be used. The authorized employee shall affix his/her lockout device to the group lockout device and shall remove that device when he/she stops working on the machine or equipment being serviced.

6. The Electrical Standard - OSHA 910.333/Working On or Near Exposed Deenergized Parts

This section applies to work on exposed deenergized parts or near enough to them to expose the employee to any electrical hazard they present. Conductors and parts of electric equipment that have been deenergized but have not been locked out or tagged out, will be treated as energized parts, and work on or near energized parts will be conducted as follows:

1. Work on energized equipment. Only qualified persons may work on electrical circuits or equipment that has not been deenergized under the lockout/tagout procedure. Such persons can work safely on energized circuits and will be familiar with the proper use of special precautionary techniques, personal protective equipment, insulating and shielding materials, and insulated tools.

2. Overhead lines. If work is to be done near overhead lines, the lines will be deenergized and grounded, or other protective measures will be provided before work is started. If the lines are to be deenergized, arrangements will be deenergized, arrangements will be made with the person or organization that operates or controls the electric circuits involved to deenergize and ground them. If protective measures, such as guarding, isolating, or insulating, are provided, these precautions shall prevent employees from contacting such lines directly with any part of their body or indirectly through any conductive materials, tools, or equipment.

3. The instructions for unqualified persons and qualified persons shall also be followed according to OSHA 1910.333 ©(3)(i)(ii) and (iii), for work on overhead lines.

4. All other work related to energized electrical parts shall be according to OSHA 1910.333 ©.

B. SPECIFIC PROVISIONS OF THE STANDARD

1. Personnel

a. Authorized Personnel:

A person who locks or implements a tagout system procedure on machines or equipment to perform the servicing or maintenance on that machine or equipment.

Authorized Personnel for the Mauthe Site: John Stoeger

b. Affected Personnel:

An affected employee whose job requires him/her to operate or use a machine or equipment on which servicing is being done under lockout or tagout, or whose job requires him/her to work in an area in which such servicing or maintenance is being done under lockout or tagout.

Affected Personnel for the Mauthe Site: This group includes potentially all the employees at the facility. Authorized personnel should notify all affected personnel before the controls are applied and after they are removed from the machines or equipment.

2. Protective Equipment

Locks, tags, chains, key blocks, etc. are provided by MCO for isolating, securing, blocking of machines or equipment from energy sources.

a. Lockout/Tagout Equipment

i. Shall be used only for controlling energy.

ii. Shall be capable of withstanding the environment to which they are exposed.

iii. Tagout equipment shall be of a construction to withstand wet or damp or corrosive conditions and will not deteriorate or allow the message to become illegible.

iv. Lockout and tagout devices shall meet the requirements of the code; Standardized, substantial, identifiable.

v. Tagout equipment will be attached with a plastic tie that will need to be cutoff to remove it.

3. Inspections

a. Periodic inspections shall be conducted to ensure that the procedures and requirements of this standard are being followed.

b. Inspections will be conducted by the safety committee.

c. Inspections will be designed to correct any deviations or inadequacies observed.

d. Inspections shall include a review, between the inspector and each authorized employee, of that employee's responsibilities under the energy control procedure being inspected.

e. The inspections shall be documented: date, which equipment, the inspector, employees included in the inspection, employer certified.

4. Outside Contractors

Outside contractors will be informed of this in-plant procedure. Contractors shall inform MCO of their lockout/tagout procedure. MCO employees shall comply with and understand the restrictions and prohibitions of the outside contractor's energy control procedure.

C. TRAINING

1. The employer shall train the affected employees to ensure that the purpose and function of the energy control program are understood.

2. Each authorized employee shall receive training in the recognition of applicable hazardous energy sources, the type and magnitude of the energy available in the workplace, and the methods and means necessary for energy isolation and control.

3. Each affected employee shall be instructed in the purpose and use of the energy control procedure.

4. All other employees whose work operations are or may be in an area where energy control procedures may be used, will be instructed about the procedure and about the prohibition relating to attempts to restart or re-energize machines or equipment locked out or tagged out.

5. Employees shall be trained in the limitations of tags as outlined in the standard.

6. Employees shall be retrained periodically to inform them of new hazards or new procedures.

7. The employer shall certify that training has been accomplished and is being kept up to date.

LOCKOUT

CONTROL

PROCEDURES

LOCKOUT CONTROL PROCEDURE FOR:

AIR COMPRESSOR

Specific lockout procedures have been established for this machine. Only authorized personnel and those trained in lockout/tagout shall perform service or maintenance job assignments. Startup and shutdown procedures shall be followed.

AFFECTED AND AUTHORIZED PERSONNEL

Affected	Authorized
1. MCO Staff	1. John Stoeger
2. CH2M Hill Staff	

TYPES OF OPERATOR CONTROLS

1. Local Switch
2. Breaker at MCC
3. Isolation Valve

TYPES OF HAZARDOUS ENERGY

1. Electrical
2. Mechanical

ENERGY SOURCES

Description	Location	Lockable?	Equipment Needed
On Switch	At Compressor	No	Tagout
Breaker	Motor Control Center (MCC)	Yes	Lock/Tag
Isolation Valve	Valve (FV-6)	No	Tagout

LOCKOUT PROCEDURE

1. Notify affected personnel of shutdown
2. Turn off air compressor at the local control switch tag the switch with a "Do not Start" tag.
3. Close the isolation valve (FV-6), tag.
4. Place the breaker in the "OFF" position on the MCC, lock and tag.
5. Attempt to start the air compressor to assure the air compressor is deenergized.
6. Dissipate any residual energy.

LOCK-IN PROCEDURES

1. Remove all tools, parts and people from the air compressor area.
2. Make sure the local control switch at the air compressor is still in the "OFF" position.
3. Remove the lock and tag from the breaker at the MCC, place the breaker in the "ON" position.
4. Remove the "Do not Start" tag from the local control switch at the air compressor.
5. Open isolation valve (FV-6), remove tag.
6. If "All Clear" start up equipment, and notify affected personnel of start up.

LOCKOUT CONTROL PROCEDURE FOR:

REACTION TANK MIXER

Specific lockout procedures have been established for this machine. Only authorized personnel and those trained in lockout/tagout shall perform service or maintenance job assignments. Startup and shutdown procedures shall be followed.

AFFECTED AND AUTHORIZED PERSONNEL

Affected	Authorized
1. MCO Staff	1. John Stoeger
2. CH2M Hill Staff	

TYPES OF OPERATOR CONTROLS

1. Local Switch
2. Breaker at MCC
3. Isolation Valve Tank Discharge

TYPES OF HAZARDOUS ENERGY

1. Electrical
2. Mechanical

ENERGY SOURCES

Description	Location	Lockable?	Equipment Needed
On Switch	At Mixer	No	Tagout
Breaker	Motor Control Center (MCC)	Yes	Lock/Tag
Isolation Valve	Three Discharge Valves Tank	No	Tagout

LOCKOUT PROCEDURE

1. Notify affected personnel of shutdown
2. Turn off reaction tank mixer at the local control switch tag the switch with a "Do not Start" tag.
3. Close the isolation valves, three discharge valves at tank, tag.
4. Place the breaker in the "OFF" position on the MCC, lock and tag.
5. Attempt to start the reaction tank mixer to assure the reaction tank mixer is deenergized.
6. Dissipate any residual energy.

LOCK-IN PROCEDURES

1. Remove all tools, parts and people from the reaction tank mixer area.
2. Make sure the local control switch at the reaction tank mixer is still in the "OFF" position.
3. Remove the lock and tag from the breaker at the MCC, place the breaker in the "ON" position.
4. Remove the "Do not Start" tag from the local control switch at tha reaction tank mixer.
5. Open isolation valves, remove tags.
6. If "All Clear" start up equipment, and notify affected personnel of start up.

LOCKOUT CONTROL PROCEDURE FOR:

REACTION TANK FEED PUMPS

Specific lockout procedures have been established for this machine. Only authorized personnel and those trained in lockout/tagout shall perform service or maintenance job assignments. Startup and shutdown procedures shall be followed.

AFFECTED AND AUTHORIZED PERSONNEL

Affected	Authorized
1. MCO Staff	1. John Stoeger
2. CH2M Hill Staff	

TYPES OF OPERATOR CONTROLS

1. Local Switch
2. Breaker at MCC
3. Isolation Valve

TYPES OF HAZARDOUS ENERGY

1. Electrical
2. Mechanical

ENERGY SOURCES

Description	Location	Lockable?	Equipment Needed
On Switch	At Pump	No	Tagout
Breaker	Motor Control Center (MCC)	Yes	Lock/Tag
Isolation Valves	At Pump	No	Tagout

LOCKOUT PROCEDURE

1. Notify affected personnel of shutdown
2. Turn off reaction tank feed pumps at the local control switch tag the switch with a "Do not Start" tag.
3. Close the isolation valves, tag.
4. Place the breaker in the "OFF" position on the MCC, lock and tag.
5. Attempt to start the reaction tank feed pump to assure the reaction tank feed pump is denergized.
6. Dissipate any residual energy.

LOCK-IN PROCEDURES

1. Remove all tools, parts and people from the reaction tank feed pump area.
2. Make sure the local control switch at the reaction tank feed pump is still in the "OFF" position.
3. Remove the lock and tag from the breaker at the MCC, place the breaker in the "ON" position.
4. Remove the "Do not Start" tag from the local control switch at tha reaction tank feed pumps.
5. Open isolation valves, remove tags.
6. If "All Clear" start up equipment, and notify affected personnel of start up.

LOCKOUT CONTROL PROCEDURE FOR:

FERROUS SULFATE FEED PUMP

Specific lockout procedures have been established for this machine. Only authorized personnel and those trained in lockout/tagout shall perform service or maintenance job assignments. Startup and shutdown procedures shall be followed.

AFFECTED AND AUTHORIZED PERSONNEL

Affected	Authorized
1. MCO Staff	1. John Stoeger
2. CH2M Hill Staff	

TYPES OF OPERATOR CONTROLS

1. Local Switch
2. Breaker at MCC
3. Isolation Valve

TYPES OF HAZARDOUS ENERGY

1. Electrical
2. Mechanical
3. Chemical

ENERGY SOURCES

Description	Location	Lockable?	Equipment Needed
On Switch	At Pump	No	Tagout
Breaker	Motor Control Center (MCC)	Yes	Lock/Tag
Isolation Valve	At Pump	No	Tagout

LOCKOUT PROCEDURE

1. Notify affected personnel of shutdown
2. Turn off ferrous sulfate feed pump at the local control switch, tag the switch with a "Do not Start" tag.
3. Close the isolation valve, tag.
4. Place the breaker in the "OFF" position on the MCC, lock and tag.
5. Attempt to start the ferrous sulfate feed pump to assure the ferrous sulfate feed pump is deenergized.
6. Dissipate any residual energy.

LOCK-IN PROCEDURES

1. Remove all tools, parts and people from the ferrous sulfate feed pump area.
2. Make sure the local control switch at the ferrous sulfate feed pump is still in the "OFF" position.
3. Remove the lock and tag from the breaker at the MCC, place the breaker in the "ON" position.
4. Remove the "Do not Start" tag from the local control switch at tha ferrous sulfate feed pump.
5. Open isolation valves, remove tags.
6. If "All Clear" start up equipment, and notify affected personnel of start up.

LOCKOUT CONTROL PROCEDURE FOR:

CAUSTIC FEED PUMP

Specific lockout procedures have been established for this machine. Only authorized personnel and those trained in lockout/tagout shall perform service or maintenance job assignments. Startup and shutdown procedures shall be followed.

AFFECTED AND AUTHORIZED PERSONNEL

Affected	Authorized
1. MCO Staff	1. John Stoeger
2. CH2M Hill Staff	

TYPES OF OPERATOR CONTROLS

1. Local Switch
2. Breaker at MCC
3. Isolation Valve

TYPES OF HAZARDOUS ENERGY

1. Electrical
2. Mechanical
3. Chemical

ENERGY SOURCES

Description	Location	Lockable?	Equipment Needed
On Switch	At Pump	No	Tagout
Breaker	Motor Control Center (MCC)	Yes	Lock/Tag
Isolation Valve	At Pump	No	Tagout

LOCKOUT PROCEDURE

1. Notify affected personnel of shutdown
2. Turn off caustic feed pump at the local control switch, tag switch with a "Do not Start" tag.
3. Close the isolation valve, tag.
4. Place the breaker in the "OFF" position on the MCC, lock and tag.
5. Attempt to start the caustic feed pump to assure the caustic feed pump is deenergized.
6. Dissipate any residual energy.

LOCK-IN PROCEDURES

1. Remove all tools, parts and people from the caustic feed pump area.
2. Make sure the local control switch at the caustic feed pump is still in the "OFF" position.
3. Remove the lock and tag from the breaker at the MCC, place the breaker in the "ON" position.
4. Remove the "Do not Start" tag from the local control switch at tha caustic feed pump.
5. Open isolation valves, remove tags.
6. If "All Clear" start up equipment, and notify affected personnel of start up.

LOCKOUT CONTROL PROCEDURE FOR:

FERROUS SULFATE FEED SYSTEM

Specific lockout procedures have been established for this machine. Only authorized personnel and those trained in lockout/tagout shall perform service or maintenance job assignments. Startup and shutdown procedures shall be followed.

AFFECTED AND AUTHORIZED PERSONNEL

Affected	Authorized
1. MCO Staff	1. John Stoeger
2. CH2M Hill Staff	

TYPES OF OPERATOR CONTROLS

1. Local Switch
2. Breaker at MCC
3. Isolation Valve

TYPES OF HAZARDOUS ENERGY

1. Electrical
2. Mechanical
3. Liquid Sludge

ENERGY SOURCES

Description	Location	Lockable?	Equipment Needed
On Switch	At Pump	No	Tagout
Breaker	Motor Control Center (MCC)	Yes	Lock/Tag
Isolation Valve	At Pump	No	Tagout

LOCKOUT PROCEDURE

1. Notify affected personnel of shutdown
2. Turn off sludge transfer pump at the local control switch, tag switch with a "Do not Start" tag.
3. Close the isolation valve, tag.
4. Place the breaker in the "OFF" position on the MCC, lock and tag.
5. Attempt to start the sludge transfer pump to assure the sludge transfer feed pump is denergized
6. Dissipate any residual energy.

LOCK-IN PROCEDURES

1. Remove all tools, parts and people from the sludge transfer pump area.
2. Make sure the local control switch at the sludge transfer pump is still in the "OFF" position.
3. Remove the lock and tag from the breaker at the MCC, place the breaker in the "ON" position.
4. Remove the "Do not Start" tag from the local control switch at tha sludge transfer pump.
5. Open isolation valves, remove tags.
6. If "All Clear" start up equipment, and notify affected personnel of start up.

LOCKOUT CONTROL PROCEDURE FOR:

TANKER TRUCK FEED PUMP

Specific lockout procedures have been established for this machine. Only authorized personnel and those trained in lockout/tagout shall perform service or maintenance job assignments. Startup and shutdown procedures shall be followed.

AFFECTED AND AUTHORIZED PERSONNEL

Affected	Authorized
1. MCO Staff	1. John Stoeger
2. CH2M Hill Staff	

TYPES OF OPERATOR CONTROLS

1. Local Switch
2. Breaker at MCC
3. Isolation Valve

TYPES OF HAZARDOUS ENERGY

1. Electrical
2. Mechanical
3. Liquid Sludge

ENERGY SOURCES

Description	Location	Lockable?	Equipment Needed
On Switch	At Pump	No	Tagout
Breaker	Motor Control Center (MCC)	Yes	Lock/Tag
Isolation Valve	At Pump	No	Tagout

LOCKOUT PROCEDURE

1. Notify affected personnel of shutdown
2. Turn off tanker truck feed pump at the local control switch, tag switch with a "Do not Start" tag.
3. Close the isolation valve, tag.
4. Place the breaker in the "OFF" position on the MCC, lock and tag.
5. Attempt to start the tanker truck feed pump to assure the tanker truck feed pump is deenergized.
6. Dissipate any residual energy.

LOCK-IN PROCEDURES

1. Remove all tools, parts and people from the tanker truck feed pump area.
2. Make sure the local control switch at the tanker truck feed pump is still in the "OFF" position.
3. Remove the lock and tag from the breaker at the MCC, place the breaker in the "ON" position.
4. Remove the "Do not Start" tag from the local control switch at tha tanker truck feed pump.
5. Open isolation valves, remove tags.
6. If "All Clear" start up equipment, and notify affected personnel of start up.

LOCKOUT CONTROL PROCEDURE FOR:

BUILDING SUMP PUMP

Specific lockout procedures have been established for this machine. Only authorized personnel and those trained in lockout/tagout shall perform service or maintenance job assignments. Startup and shutdown procedures shall be followed.

AFFECTED AND AUTHORIZED PERSONNEL

Affected	Authorized
1. MCO Staff	1. John Stoeger
2. CH2M Hill Staff	

TYPES OF OPERATOR CONTROLS

1. Local Switch
2. Breaker at MCC

TYPES OF HAZARDOUS ENERGY

1. Electrical

ENERGY SOURCES

Description	Location	Lockable?	Equipment Needed
On Switch	At Pump	No	Tagout
Breaker	Motor Control Center (MCC)	Yes	Lock/Tag

LOCKOUT PROCEDURE

1. Notify affected personnel of shutdown
2. Turn off building sump pump at the local control switch, tag switch with a "Do not Start" tag.
3. Place the breaker in the "OFF" position on the MCC, lock and tag.
4. Attempt to start the building sump pump to assure the building sump pump is deenergized.
5. Dissipate any residual energy.

LOCK-IN PROCEDURES

1. Remove all tools, parts and people from the building sump pump area.
2. Make sure the local control switch at the building sump pump is still in the "OFF" position.
3. Remove the lock and tag from the breaker at the MCC, place the breaker in the "ON" position.
4. Remove the "Do not Start" tag from the local control switch at tha building sump pump.
5. If "All Clear" start up equipment, and notify affected personnel of start up.

LOCKOUT CONTROL PROCEDURE FOR:

MANHOLE 1&2 SUMP PUMPS

Specific lockout procedures have been established for this machine. Only authorized personnel and those trained in lockout/tagout shall perform service or maintenance job assignments. Startup and shutdown procedures shall be followed.

AFFECTED AND AUTHORIZED PERSONNEL

Affected	Authorized
1. MCO Staff	1. John Stoeger
2. CH2M Hill Staff	

TYPES OF OPERATOR CONTROLS

1. Local Switch
2. Breaker at MCC

TYPES OF HAZARDOUS ENERGY

1. Electrical

ENERGY SOURCES

Description	Location	Lockable?	Equipment Needed
On Switch	At Pump	No	Tagout
Breaker	Motor Control Center (MCC)	Yes	Lock/Tag

LOCKOUT PROCEDURE

1. Notify affected personnel of shutdown
2. Turn off manhole 1 or 2 sump pump at the local control switch, tag the switch with a "Do not Start" tag.
3. Place the breaker in the "OFF" position on the MCC, lock and tag.
4. Attempt to start the manhole 1 or 2 sump pump to assure sump pump is deenergized.
5. Dissipate any residual energy.

LOCK-IN PROCEDURES

1. Remove all tools, parts and people from the sump pump area.
2. Make sure the local control switch at the sump pump is still in the "OFF" position.
3. Remove the lock and tag from the breaker at the MCC, place the breaker in the "ON" position.
4. Remove the "Do not Start" tag from the local control switch at tha building sump feed pump.
5. If "All Clear" start up equipment, and notify affected personnel of start up.

LOCKOUT CONTROL PROCEDURE FOR:

Specific lockout procedures have been established for this machine. Only authorized personnel and those trained in lockout/tagout shall perform service or maintenance job assignments. Startup and shutdown procedures shall be followed.

AFFECTED AND AUTHORIZED PERSONNEL

Affected	Authorized
1.	1.
2.	2.
3.	3.

TYPES OF OPERATOR CONTROLS

1.
2.
3.

TYPES OF HAZARDOUS ENERGY

1.
2.
3.

ENERGY SOURCES

Description	Location	Lockable?	Equipment Needed

LOCKOUT PROCEDURE

LOCK-IN PROCEDURES

OCCUPATIONAL NOISE EXPOSURE

A. GENERAL HEARING CONSERVATION PROGRAM

1. Occupational Exposure

MCO will administer a continuing, effective hearing conservation program, whenever employee noise exposures equal or exceed an 8-hour time-weighted average sound level (TWA) of 85 decibels measured on the A scale(slow response) or, equivalently, a dose of fifty percent. For purposes of the hearing conservation program, employee exposures shall be computed in accordance with Appendix A and Table G-16a (of the OSHA Standard 1910.95), and without any regard to any attenuation provided by the use of personal protective equipment.

When employees are subjected to sound levels exceeding those listed in Table G-16, feasible administrative or engineering controls shall be utilized. If such controls fail to reduce sound levels within the levels of Table G-16, personal protective equipment shall be provided and used to reduce sound levels within the levels of the table.

Wherever sound levels exceed 90 dBA (slow response), the area shall have a posted notice requiring that hearing protection be worn in that area.

Exposure to impulsive or impact noise should not exceed 140 dB peak sound level.

2. Monitoring

When information indicates that any employee's exposure may equal or exceed an 8-hour time-weighted average of 85 decibels, the employer shall develop and implement a monitoring program.

Monitoring shall be repeated whenever a change in production, process, or equipment or controls increases noise exposures to the extent that: Additional employees may be exposed and/or the attenuation provided by the hearing protectors being used by employees may be rendered inadequate.

Instruments used to measure employee noise exposure shall be calibrated to ensure measurement accuracy. The employer shall provide affected employees or their representatives with an opportunity to observe any noise measurements conducted.

The employer shall notify each employee exposed at or above an 8-hour time-weighted average of 85 decibels of the results of the monitoring.

3. Hearing Protectors

MCO shall make hearing protectors available to all employees exposed to an 8-hour time-weighted average of 85 decibels or greater at no cost to the employees. Hearing protectors shall be replaced as necessary.

Hearing protection shall be worn by:

- Employees exposed to sound levels exceeding those listed in Table G-16, (90 dB).
- By any employee who is exposed to an 8-hour time-weighted average of 85 decibels or greater and who:
  - i. Has not yet had a baseline audiogram established pursuant to paragraph 1910.95(g)(5)(ii); or
  - ii. Has experienced a standard threshold shift.

Employees shall be given the opportunity to select their hearing protection from a variety of suitable hearing protectors provided by the employer.

Employees shall be trained in the use and care of all hearing protectors and the employer shall ensure proper initial fitting and supervise the correct use of all hearing protectors.

B. SPECIFIC PROVISIONS OF THE CODE

1. Audiometric Testing Program

Audiometric testing shall be made available to all employees whose exposures equal or exceed an 8-hour time-weighted average of 85 decibels. This program shall be provided at no cost to the employee.

Audiometric tests shall be performed by a licensed or certified audiologist, or other physician or technician as defined in the OSHA Standard 1910.95(g)(3). All audiograms obtained must meet the requirements of OSHA Standard 1910.95, Appendix C: *Audiometric Measuring Instruments.*

Baseline audiograms, annual audiograms and evaluation and follow-up procedures shall be conducted in accordance with OSHA Standard 1910.95(g)(5)-(10). Audiometric test requirements and audiometric calibration shall be in accordance with OSHA Standard 1910.95(h)(1)-(5).

2. Hearing Protector Attenuation

The employer shall evaluate hearing protector attenuation for the specific noise environments in which the protector will be used. The employer shall use one of the evaluation methods described in OSHA 1910.95 Appendix B: *Methods for Estimating the Adequacy of Hearing Protection Attenuation.*

Hearing protectors must attenuate employee exposure at least to an 8-hour time- weighted average of 90 decibels. For employees who have experienced a standard threshold shift, hearing protectors must attenuate employee exposure to an 8-hour time weighted average of 85 decibels or below.

The adequacy of hearing protector attenuation shall be re-evaluated as necessary to provide effective hearing protection.

3. Availability of the Standard

Midwest Contract Operations, Inc. shall make available to affected employees or their representatives copies of this standard and any information and training materials the city has access to. Midwest Contract Operations, Inc. shall post a copy of the standard in the workplace.

4. Recordkeeping

Midwest Contract Operations, Inc. shall maintain accurate records of employee exposure measurements and employee audiometric tests. The records shall be kept in accordance with OSHA Standard 1910.95(m)(1)-(5).

Records shall be kept for the following:

- Noise level monitoring
- Calibration of instrument
- Audiometric testing (for those employees exposed to an 8-hour time-weighted average equal to or greater than 85 decibels) 1910.95(m)(1)-(5).
- Audiometric calibrations
- Training

C. TRAINING

Midwest Contract Operations, Inc. will provide training in the use and care of all hearing protectors provided to the employees.

For all employees who are exposed at or above an 8-hour time-weighted average of 85 decibels, the training shall be repeated annually and shall also include:

- The effects of noise on hearing;
- The purpose of hearing protectors, the advantages, disadvantages, and attenuation of various types, and instruction of selection, fitting, use and care;
- The purpose of audiometric testing, and an explanation of the test procedure; and
- An explanation of the Standard.

BLOODBORNE PATHOGEN

A. GENERAL PROCEDURE

1. Occupational Exposure

All personnel trained in CPR and first aid at the Midwest Contract Operations, Inc. are considered to have occupational exposure to potentially infectious materials. Occupational exposure means anticipated skin, eye, mucous membrane, or parental contact with blood or other potentially infectious materials that may result from the performance of an employee's duties. All job classifications at the Midwest Contract Operations, Inc. have occupational exposure.

Occupational exposure occurs at the Midwest Contract Operations, Inc. when emergency CPR or first aid is administered. The following procedure applies to all CPR and first aid situations.

2. Exposure Control Plan

a. Gloves and a microshield shall be supplied for employee use to prevent the exposure to body fluids. These items must be used when administering CPR or first aid, providing their use will not prevent the delivery of health care or pose an increased hazard to the safety of the worker or co-worker. This personal protective equipment is located in the safety kit at the facility.

b. Biohazard bags shall be provided for disposal of blood-contaminated, body fluid- conntaminated gloves, clothing, etc.

The red biohazard bags, provided and stored at the facility, shall contain the Biohazard Legend:

BIOHAZARD

Rubber gloves shall be worn while handling and removing contaminated material or clothing. Contaminated material shall be placed in the biohazard bag, and double bagged for disposal.

c. Contaminated skin shall be washed/disinfected, as soon as possible after all necessary clothing is removed. Additionally, hands shall be washed/disinfected as soon as possible after all gloves are removed.

d. All equipment and environmental and working surfaces shall be cleaned and decontaminated after contact with blood or other potentially infectious materials, (floors, masks, self-contained breathing apparatus, etc.) Clean with a 10% bleach solution.

e. Any personal clothing of employees that has become contaminated with blood or other infectious material shall be disposed of in the same manner as for all potentially infectious materials. Employees will be reimbursed for the cost of any personal clothing that needs to be disposed of due to contamination.

Under no circumstances should any clothing or uniforms that have come in contact with body fluids be taken home and cleaned in a conventional washing machine.

f. Contaminated sharps means any contaminated object that can penetrate the skin including, but not limited to, needles, scalpels, broken glass, broken capillary tubes, and exposed ends of dental wires.

Exposure to sharps by employees of the Midwest Contract Operations, Inc. will be rare. Broken glass will most likely be the only "sharp" encounter. The following procedure shall be used for the handling of broken glass and contaminated broken glass.

Broken Glass (which has not been contaminated)

i. Avoidance of contaminating the broken glass will be practiced at the Midwest Contract Operations, Inc.. Use mechanical means such as a broom and dust pan or tongs to pickup broken glass.

ii. Glass that is not contaminated with blood will be placed in a container reserved for broken glass and clearly marked. Garbage handlers will then be aware of the broken glass danger when emptying the container.

Broken Glass (which has been contaminated)

i. Use mechanical means such as a broom and dust pan or tongs for picking up potentially contaminated sharp objects from the floor. The mechanical means used to handle the "sharps" will be disinfected after use.

ii. Blood soaked broken glass shall be placed in a puncture proof container, such as a cardboard box or plastic container and seal the container. Place the container in a biohazard bag for disposal.

g. The employer shall make available the hepatitis B vaccine and series to all employees who have occupational exposure, and post-exposure evaluation and follow-up to all employees who have had an exposure incident. The vaccination and any post-exposure and follow-up procedures will be available at no cost to the employee. The employee may decline the vaccine but must sign a declination statement. The vaccine will be made available to any employee who decides to accept the vaccination at a later date, under the original conditions of the rule.

h. Employees will receive training in the bloodborne pathogen procedure. A health care professional shall provide training in the epidemiology and symptoms of bloodborne disease; modes of transmission of bloodborne pathogens; information on the hepatitis B vaccine. All employees will receive a copy of OSHA'S Bloodborne Pathogen Rule.

B. SPECIFIC PROVISIONS OF THE CODE

1. Contaminated Waste Disposal

Collection and disposal of infectious wastes shall be handled according to the Department of Natural Resources, Chapter NR 526 Medical Waste Management.

Collection and Handling

Infectious waste must be place in a container which protects the waste handlers and other persons from exposure to the infectious waste.

Sharps shall be contained in a rigid, puncture-resistant labeled container made of materials including but not limited to metal or rigid plastic, designed to prevent the loss of the contents and labeled with a visible bio-hazard emblem or with the visible words "bio-hazard", "sharps" or "infectious waste".

Infectious waste other than sharps shall be placed in a bag that meets or exceeds ASTM standards. The bag or rigid reusable container shall be securely sealed to prevent leakage or expulsion of the contents under normal handling. Any bag containing infectious waste shall be placed in a rigid container, such as cardboard and shall be labeled with the bio-hazard emblem and the word "biohazard". Bulk containers shall be small enough to be handled by a single person.

Handling

Measures shall be taken to protect the waste handlers from the infectious waste. Care shall be taken to prevent the loss or spilling of the waste, and to prevent damage to the package. Where appropriate, putrescible infectious waste shall be kept transported refrigerated below 42 F. Untreated infectious waste shall not be compacted.

Storage and Transfer

MINIMUM REQUIREMENTS FOR ALL PERSONS STORING INFECTIOUS WASTE.

The storage area shall be kept clean and be impermeable to liquids. Carpeted areas or wooden floors may not be used in storage areas.

The storage area designated for infectious waste may contain only infectious waste and their containers. The storage area may be an area designated within a room.

The storage area shall be in an enclosed building, container or vehicle so that the infectious waste is no exposed to weather.

Access to the area shall be limited to authorized personnel.

Containers of infectious waste shall be removed and emptied as necessary, but at least every 90 days. The facility shall relinquish the infectious waste only to an infectious waste transporter licensed by the department.

Transportation and Shipping

MINIMUM REQUIREMENTS FOR ALL PERSONS TRANSPORTING INFECTIOUS WASTE:

Infectious waste shall be contained and handled according to NR 526.07 and NR 526.08.

The vehicle transporting the waste must be in good repair; cleaned frequently, and the portion containing the waste shall be enclosed to prevent littering, leakage or spillage. The vehicle must be appropriately signed with WDNR and license number.
Waste shall be transported only to solid waste facilities which are licensed by the department.

Disposal

No person may dispose of infectious waste in a solid waste facility unless the infectious waste has undergone infectious waste treatment according to NR 526.11. Infectious waste generators shall ensure that infectious waste generated by them has undergone waste treatment before disposal.

Records and Infectious waste Manifests

Generators must keep records in accordance with NR 526.14.

For more information on infectious waste, call the WDNR Bureau of Solid & Hazardous Waste Management at (608) 266-2111.

2. Recordkeeping

The employer shall establish and maintain an accurate record for each employee with occupational exposure, according to 29 CFR 1910.20.

3. Declination Statement

If an employee declines the Hepatitis B vaccine, the employee must sign the attached declination statement.

C. TRAINING

Employees shall receive training in the Bloodborne Pathogen Procedure. A health care professional shall provide training in the epidemiology and symptoms of bloodborne disease; modes of transmission of bloodborne pathogens; information on the hepatitis B vaccine. Training and information about the code will be provided by a qualified staff member. Training sessions will include handouts and audiovisual material. Review and updating sessions will be held annually.

Attachment A

Appendix A to Section 1910.1030-Hepatitis B Vaccine Declination (Mandatory)

I understand that due to my occupational exposure to blood or other potentially infectious materials, I may be at risk of getting hepatitis B virus (HBV) infection. I have been given the opportunity to be vaccinated with hepatitis B vaccine, at no charge to myself. However, I decline hepatitis B vaccination at this time. I understand that by declining this vaccine, I continue to be at risk of getting hepatitis B, a serious disease. If in the future I continue to have occupational exposure to blood or other potentially infectious materials and I want to be vaccinated with hepatitis B vaccine, I can receive the vaccination series at no charge to me.

Name: _____ **Date:** _____

BLOODBORNE PATHOGEN

Training Session Outline

A. Copy of Standard

Discussion of the Standard

B. Epidemiology and Symptoms of Bloodborne Pathogens/Modes of Transmission, Hepatitis B Vaccine-Health Care Professional

C. Copy of Employers Procedure and Exposure Control Plan and Discussion of Procedure and Plan

D. Explanation of Protective Equipment

E. Explanation of Signs and Labels

F. Opportunity for Questions

RESPIRATORY PROTECTION PROGRAM

The use of respirators or SCBA is not anticipated at this facility. If however, the occasion to use such devices should arise, the following program will apply.

A. GENERAL PROCEDURE

1. **Respirators shall be selected based on the hazards to which the worker is exposed. The correct respirator shall be specified for each job.**
2. **The user shall be fit tested with the appropriate respirator. Workers will each be assigned his/her own respirator.**
3. **The user shall be instructed and trained on the proper use of respirators and their limitations.**
4. **Respirators shall be regularly cleaned and disinfected.**
5. **Respirators for emergency use shall be inspected at least once per month and after each use.**
6. **Respirators shall be stored in a convenient, clean, and sanitary location.**
7. **Appropriate surveillance of work area conditions and degree of employee exposure or stress shall be maintained.**
8. **There shall be regular inspections and evaluations to determine the effectiveness of the program.**
9. **Only personnel determined to be physically able to perform the work and use the equipment shall be assigned to the tasks requiring the use of respirators.**
10. **Respiraotrs shall be selected from those approved by the Mine safety and Health Administration and NIOSH.**
11. **Use of SCBA shall be in accordance with 1910.134.**

CONFINED SPACE ENTRY PROCEDURE

A. GENERAL PROCEDURE

1. Confined Space Entry Permit

If there is any confined space entry work performed at the Mauthe Site, CH2M HILL health and safety personnel will be contacted to review the work and issue a confined space entry permit.

1. All employees assigned to enter a confined space must obtain a Confined Space Entry Permit before any work in a confined space begins. If a job will last longer than one shift, a new permit must be issued at the beginning of each shift during which an employee must work in that confined space.

2. Employees must determine that the atmosphere inside a confined space is safe to breathe and work in before entering. An evaluation of the following conditions must be made using a properly calibrated direct read-out monitoring device before entering, and monitoring will continue while the confined space is occupied.

   a. Oxygen content
   b. Toxic gasses (Hydrogen Sulfide)
   c. Explosive and/or combustible atmospheres
   d. Any toxic substance which is believed to be present

   Testing can be achieved by either using a probe or extension hoses or by lowering the monitoring device into the confined space. Continual testing may be done by an attendant.

   Before entry into the confined space can be made, the following atmospheric conditions must be met and recorded on the Confined Space Entry Permit.

   a. Oxygen level greater than 19.5% but less than 23.5%
   b. Toxic gas (Hydrogen Sulfide) less than 10 ppm.
   c. Combustible gas less than 10% Lower Explosive Limit

3. If, as a result of testing or due to the work to be performed there is the possibility that a harmful atmosphere does or could exist in the confined space, the confined space must be adequately ventilated with fresh air before entering. Fresh air shall be provided by the use of a portable air blower or fan. The blower, itself, must be located in an area where the air is free of contamination.

4. Before entering a confined space, procedures will be established for finding additional help in case of an emergency. At the Mauthe site additional help will be obtained by calling back to MCO by phone for assistance with rescuing the entrant should an emergency occur.

   Communication will be made for additional help before a rescue attempt is made into any confined space. Emergency Services at 911 are summoned to provide necessary services to rescued employees and for preventing unauthorized personnel from attempting a rescue.

   These employees are trained to use properly the personal protective and rescue equipment necessary for making rescues from confined spaces. Each member of the rescue team will be trained to perform the assigned rescue duties and receive the training required of

authorized entrants. Each member of the rescue team shall practice making confined space rescues at least once every 12 months by means of simulated rescue operations.

Each member of the rescue team shall be trained and certified in basic first aid and adult cardiopulmonary resuscitation.

5. Employees in the confined space must immediately exit or not enter the space if the audible alarm and/or flashing lights on the monitoring device are activated.

6. Employees who enter confined spaces and those assigned as attendants must be currently certified in Multimedia First Aid and CPR.

7. Smoking is prohibited inside of and within 20 feet of the confined space.

8. If more than 10% of the LEL is present, the space must be ventilated prior to entry, and employees must use spark-proof hand tools and/or explosion-proof tools and equipment.

9. Entry will not be allowed until an Entry Supervisor has signed and issued the Confined Space Entry Permit.

10. Personal protective equipment shall be provided for use in confined spaces and may include respiratory protection, eye, face, and head protection, ear plugs or ear muffs, rubber boots and gloves, and impervious clothing if required by the nature of the work.

11. An employee entering vertically into a confined space through a manhole or any top opening must wear a full body harness secured to a life line. The life line must be attached to the winch of a tripod or other device used for retrieval.

12. An employee having to make horizontal movement in or into a confined space, such as a sewer, or having to descend in such a manner that makes a winch useless for rescue/retrieval, must be equipped with a self-contained positive pressure breathing apparatus or an air-line respirator with an emergency escape air tank and wear a full body harness attached to a life line.

13. There must be a trained attendant located outside the confined space who shall control the life line and maintain communication with the employee inside. An attendant must contact the employee inside the confined space at least every five minutes by visual/voice signals or radio contact.

14. There must be at least one breathing apparatus available for emergency use. An attendant must not enter the confined space to rescue an employee inside unless he is wearing the breathing apparatus and a full body harness attached to a life line and tripod.

15. An attendant must never leave his post unless he is relieved by another trained attendant familiar with these procedures or he has at least one person in the confined space come out until he returns.

16. If the person inside the confined space is using an air line respirator, it must be remembered that the user has only a five minute emergency air supply if the connection between the user and the air supply is broken. In such circumstances, the person inside shall signal the attendant that he is in trouble by sharp pulls of the life line and remove himself immediately from the confined space.

17. Entrances to confined spaces, which are located in streets, shall be guarded in accordance with the following:
    a. Vehicle's 4-way flashers shall be activated.
    b. Parking the vehicle in such a way that traffic flows in an unobstructed manner.
    c. Vehicle's exhaust fumes shall not enter the confined space.
    d. Traffic cones shall be placed to channel the traffic and shall be visible from all directions.
    e. Additional warning devices, such as barricades and signs, may be needed for high traffic areas.

B. ADMINISTRATION OF THE CODE

1. Authorized Personnel

The standard states that those employees assigned to particular tasks involving confined space entry be named here: Authorized personnel are:

Midwest Contract Operations, Inc. Program Director is Jim Peichl

Authorized Entrants	Authorized Attendants
John Stoeger	John Stoeger
Stuart Boerst	Stuart Boerst
Brian Bates	Brian Bates

These employees have been determined physically fit by a physician to work wearing a respirator. Conditions that prevent a proper facial seal, such as beards, sideburns, glasses, etc. have been corrected or those employees are not assigned tasks involving the use of respirators.

2. DEFINITIONS

Confined Space is any area with limited access and egress where harmful gases or vapors can accumulate or where there may not be enough oxygen to support life. Confined spaces include, but are not limited to, sewers, sumps, boilers, wetwells, digesters, manholes, sludge holding tanks, storage buildings, enclosed trucks, reservoirs, bins, towers, tanks and any other space(s) more than 4 feet deep where air circulation inside is poor or non-existent.

Level 1 - Non-Permit:

A Level I - Non-Permit space shall be a confined space with an atmosphere within the limits specified below and the only source of contamination expected or likely to affect the atmosphere is the employee's activities.

Limits:
- Oxygen level greater than 19.5% but less than 23.5%.
- Toxic Gas (Hydrogen Sulfide) less than 10 ppm.
- Combustible gas less than 10% LEL.

Level 2 - Permit Required:

A Level 2 - Permit Required space shall be a confined space with an atmosphere which falls within one of the following conditions:

a. The air quality is within the limits specified below and the confined space contains sources of contamination other than the employee or the employee's activities which may affect the atmosphere; or

b. The air quality is, or was, at some time previously not within any or all of the limits specified below:

Limits: - Oxygen level greater than 19.5% but less than 23.5%
- Toxic Gas (Hydrogen Sulfide) less than 10 ppm.
- Combustible gas less than 10% LEL

If, as a result of monitoring, a Level 1 - Non-Permit space becomes a Level 2 - Permit Required space, a person in the space must immediately exit and, in the future, that space will be a Level 2 - Permit Required space.

Entry means that any part of a worker's body breaks the plane of the opening of a confined space.

LEL, LFL means the lower explosive limit or lower flammable limit of a gas, vapor or mist in the atmosphere. The lowest concentration (lowest percentage of the substance in air) that will produce a flash of fire when an ignition source (heat, air) flame is present.

Toxic Substance means any substance listed by the American Conference of Governmental Industrial Hygienists in the Standard, "Threshold Limit Values for Chemical Substances in the Work Environment".

Mechanical Ventilation means a powered device such as a motor driven fan or vacuum hose attachment for exhausting contaminants from a workplace, vessel or enclosure.

Attendant means an individual stationed outside one or more permit spaces who monitors the authorized entrants and who performs all attendant's duties assigned in the employer's permit space program.

Authorized Entrant means an employee who is authorized, by the employer, to enter a permit space.

Rescue Team means the personnel designated and trained to rescue employees from confined spaces.

Entry Supervisor means the person (such as the employer, foreman, or crew chief) responsible for determining if acceptable entry conditions are present at a permit space where entry is planned, for authorizing entry and overseeing entry operations and for terminating entry as required by this section.

Authorized Entry Signature means the signature of the Entry Supervisor as above.

3. LIST OF CONFINED SPACES

Confined spaces throughout the Mauthe Site are classified either Level 1 - Non-Permit or Level 2 - Permit Required, as listed below.

Level 1 - Non-Permit Confined Spaces

None

Level 2 - Permit Required Confined Spaces

Manholes
Storage Tank
Building Sump Pit

Confined spaces are clearly labeled with specific confined space warning signs. Safety Officers continuously update areas designated as confined spaces.

4. PERMIT REQUIREMENTS

The OSHA standard designates confined spaces as Non-Permit and Permit Required spaces. A Permit Required space must have a written entry document posted at the work site along with written entry policy procedures. These permits must be signed by an Entry Supervisor before entry can be made. The permit is good only as long as conditions remain the same at the time of completion of the permit. The permit applies to only one work site for the duration of that particular job. The Entry Supervisor will terminate entry and cancel the entry permit when operations, covered by the entry permit, are completed or a condition that is not allowed arises in or near the permit space. The cancelled permit is reviewed, by the Program Director, within 24 hours, to note and correct any problems encountered. Cancelled entry permits are retained for one year.

An example of a Level 2 - Permit Required entry form is found at the end of this "Confined Space Entry Program" section. (Permits will be issued by CH2M HILL)

5. OUTSIDE CONTRACTORS/NON-EMPLOYEES

Prior to entering or performing work within confined spaces, outside contractors and non-employees shall coordinate, with Midwest Contract Operations, Inc. Program Director, and CH2M HILL, procedures to be followed that comply with OSHA 1910.146(c)(8)(9).

6. RECORDKEEPING

Inspection/Maintenance records are kept on all protective equipment supplied to employees entering confined spaces. Records are also kept on replacement and repair of this equipment.

Cancelled Confined Space Entry Permits are kept on file for one year.

Training on the selection, use and care of required breathing apparatus, and fit testing will be documented and kept on file with the Respiratory Protection Program as required by 29 CFR 1910.134.

Medical statements naming who has been determined, by a physician, to be physically fit to wear a respirator are kept on file under the Respiratory Protection Program following this section of the manual.

MSDS sheets are made available to the medical facility treating the exposed entrant and substance information is required to be at the worksite.

Updates on First Aid and CPR training are kept on file.

Records of annual "Hands On" rescue attempt training are kept on file.

C. TRAINING

Training will be provided to each affected employee. Training will include:

- CPR
- Confined Space Entry Procedure
- The Use of the Entry Permit
- Respiratory Protection
- Duties of the Authorized Entrant to include:
    - Hazard Recognition
    - Equipment Use
    - Communications with Attendant
- Duties of the Attendant to include:
    - Hazard Recognition
    - Possible Behavioral Effects of Hazard Exposure
    - Responsibilities of the Attendant
    - Communications with the Entrant
    - Monitoring Equipment
    - Non-entry Rescue Procedures

Per agreement between _____ (Contractor) and the Midwest Contract Operations, Inc. in which Contractor has agreed to perform certain work on the N.W. Mauthe Site property for an agreed fee or rate, Contractor acknowledges that any confined space entry work is allowed only through compliance with OSHA 1910.146(c)(8) and (9).

Contractor recognizes the procedures for confined space entry used by Midwest Contract Operations, Inc. and acknowledges Midwest Contract Operations, Inc. has provided Contractor with a copy of such procedures used by Midwest Contract Operations, Inc. during performance of confined space entry work. Contractor further acknowledges that Midwest Contract Operations, Inc. has also provided suggestions for appropriate protective measures which should be followed when Contractor's employees are working in confined spaces.

It is the Contractor's sole responsibility to inform his employees of the hazards and protective measures suggested byMidwest Contract Operations, Inc. It is the Contractor's further sole responsibility to ensure that the Contractor's employees observe protective measures during performance of their duties which are at least as stringent as the protective measures suggested by Midwest Contract Operations, Inc.

Agreed this _____ day of _____, 19_____.

Contractor	Company
_____	_____
_____	_____
Signature	Signature

CONFINED SPACE ENTRY PERMIT
Level 2 - Permit Required Confined Space
In Case of Emergency - Call 911 - Fire Department

Date and Time Issued _____ Expires _____
Job Site Location _____
Entry Supervisor _____
Description of Work to be Done _____
Entrants _____ Attendants _____
_____ _____

	YES	NO	NA
1. All machinery, pumps, and equipment related to the confined space has been shut-down, locked-out and tagged.	( )	( )	( )
2. Pre-entry atmospheric check:			
Time _____ am/pm LIMITS			
Oxygen _____ 19.5% - 23.5%			
Explosive _____ < 10% LEL			
Toxic _____ < 10 ppm	YES	NO	NA
3. The space must be ventilated.	( )	( )	( )
Post ventilation atmospheric check:			
Time _____ am/pm LIMITS			
Oxygen _____ 19.5% - 23.5%			
Explosive _____ < 10% LEL			
Toxic 1 _____ < 10 ppm	YES	NO	NA
4. The confined space has been tested and found safe for entry.	( )	( )	( )
5. Site and equipment checklist:			
Area secured (posted and flags)	( )	( )	( )
Breathing apparatus	( )	( )	( )
Rescue and retrieval system (tripod)	( )	( )	( )
Full body harness	( )	( )	( )
Life line	( )	( )	( )
Personal protective clothing	( )	( )	( )
Radio and/or telephone communications	( )	( )	( )
6. Entrant to attendant communication method used:			
Visual and/or verbal	( )	( )	( )
Radio	( )	( )	( )
7. All employees involved have successfully completed the required training and certifications are currently up-to-date.	( )	( )	( )

I have inspected and verified each requirement on this permit and, to the best of my knowledge, state that this work can be done safely and in compliance with the rules of Midwest Contract Operations, Inc.

Signature of Entry Supervisor _____ Date _____

Entry Permit terminated; I authorize cancellation of this Entry Permit.

Signature of Entry Supervisor _____ Date _____

*Use backside for comments:

Personal Protective Equipment

A general hazard assessment was conducted at the Mauthe Site.

Personal Protective Equipment (PPE) has been selected to protect workers from the hazards identified. Level D protection has been selected for the Mauthe Site.

A. General Procedure

1. Hand and eye protection shall be used during chemical addition and sludge removal activities. Gloves, tyvek, latex boot covers, should be disposed of after each use.
2. PPE shall be stored in the cabinets under the sink.
3. All PPE shall be of safe design and construction for the work to be performed. All PPE shall properly fit the affected employee.
4. PPE shall be inspected by the wearer prior to use. Defective and damaged equipment shall not be used and shall be replaced.

B. Specific Provisions of the Standard

1. PPE devices alone should not be relied on to provide protection against hazards, but should be used in conjunction with guards, engineering controls, and sound manufacturing practices.
2. In order to access the need for PPE a walk-through survey was conducted. The purpose of the survey was to identify sources of hazards to workers. Consideration was given to the basic hazard categories: a) Impact b) Penetration c) Compression d) Chemical e) Heat f) Harmful Dust g) Light (optical) Radiation
3. An evaluation of the effectiveness of the PPE program shall be conducted one time per month for the initial four month duration of the Mauthe contract. Evaluation for PPE shall be conducted annually thereafter.

C. Training

The employer shall provide training to each employee who is required to wear PPE. Each employee shall be trained to know at least the following:

a) When PPE is necessary,
b) What PPE is necessary,
c) How to properly don, duff, adjust and wear PPE,
d) The limitations of PPE (During temperature extremes, heat stress, and other appropriate medical considerations.) and;
e) The proper care, maintenance, useful life and disposal of the PPE.

Training shall be repeated as necessary.

HYDRITE CHEMICAL CO.
CAUSTIC SODA LIQUID 50%
AL-0050
04/25/94

MATERIAL SAFETY DATA SHEET

12/30/9(

PRODUCT NAME: CAUSTIC SODA LIQUID 50% PAGE 1

DISTRIBUTED BY: HYDRITE CHEMICAL CO.
300 N. PATRICK BLVD.
BROOKFIELD,WI 530080948
(414) 792-1450
24 HOUR EMERGENCY # - (414) 277-1311
CHEMTREC EMERGENCY # - (800) 424-9300

MSDS#:HY941AL0050XX

PREPARED BY:SMJ/NAO
04/25/94

MANUFACTURED BY: OCCIDENTAL, PPG, AND VULCAN

SECTION I - PRODUCT INFORMATION

TRADE NAME: CAUSTIC SODA LIQUID 50%
CHEMICAL NAME SYNONYMS: Sodium Hydroxide
Lye

C.A.S. REGISTRY #: 1310-73-2
CHEMICAL FAMILY: Alkali

FORMULA: 50% NaOH

T PROPER SHIPPING NAME: SODIUM HYDROXIDE SOLUTION

D.O.T. HAZARD CLASS: 8 (CORROSIVE MATERIAL)

D.O.T. IDENTIFICATION #: UN1824 D.O.T. LABEL: CORROSIVE

SECTION II - HAZARDOUS INGREDIENTS

INGREDIENT	PERCENT	TLV LEVEL	PEL LEVEL
Sodium Hydroxide	50%	C 2 mg/m3	C 2 mg/m3

NOTE :C denotes Ceiling Limit.

MATERIAL SAFETY DATA SHEET

SECTION III - PHYSICAL DATA

BOILING POINT (DEG. F): 293
FREEZING POINT (DEG.F): 41 - 51
VAPOR PRESSURE (MM HG): 6.3 @ 104F
VAPOR DENSITY (AIR=1) : N.A.
SOLUBILITY IN WATER: Complete

SPECIFIC GRAVITY: 1.53 @ 60F
PERCENT VOLATILE
BY VOLUME%: N.A
EVAPORATION RATE(N.A.): N.A.

APPEARANCE AND ODOR: Clear, colorless to slightly turbid liquid. No odor.

SECTION IV - FIRE EXPLOSION HAZARD DATA

FLASH POINT (METHOD USED): None.

FLAMMABLE LIMITS LEL: N.A. UEL: N.A.

EXTINGUISHING MEDIA: For fires in area use appropriate media. For example: Water spray. Dry Chemical. Carbon Dioxide. Alcohol Foam.

SPECIAL FIRE FIGHTING PROCEDURES: Evacuate area of unprotected personnel. Wear protective clothing, chemical safety goggles and face shield. Cool fire-exposed containers with water spray. Product generates heat upon addition of water, with possible spattering. Run-off from fire control may cause pollution.

UNUSUAL FIRE EXPLOSION HAZARDS: Product may react with some metals (ex.: Aluminum, Zinc, Tin, etc.) to release flammable Hydrogen gas.

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE: C 2 mg/m3 (OSHA 29 CFR 1910.Z-1-A)
C 2 mg/m3 (ACGIH 1993-94)

MATERIAL SAFETY DATA SHEET

SECTION V - HEALTH HAZARD DATA

EFFECTS OF OVEREXPOSURE

EYE CONTACT: CORROSIVE - Causes severe burns and destruction of tissues. Small quantities can result in permanent damage and loss of vision. Contact may cause blindness.

SKIN CONTACT: CORROSIVE - Irritating to skin. Corrosive action causes burns and frequently deep ulceration with ultimate scarring.

INHALATION: CORROSIVE - Causes burns to respiratory tract. Inhalation of dust or mists can cause damage to the upper respiratory tract and to the lung tissue depending upon the extent of exposure.

INGESTION: CORROSIVE - Ingestion can cause very serious damage to the mouth, esophogus, stomach, and other tissues with which contact is made, and may be fatal.

OTHER: ROUTES OF EXPOSURE: Product can affect the body if it is inhaled, comes in contact with the eyes or skin, or is swallowed. TARGET ORGANS: Eyes. Skin. Respiratory System. MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Preexisting eye and skin disorders may be aggravated by exposure.

EMERGENCY AND FIRST AID PROCEDURES

EYE CONTACT: Immediately flush eyes with plenty of water for at least 15 minutes. Hold eyelids open during this flushing with water. Call a physician immediately.

SKIN CONTACT :Flush area with water while removing contaminated clothing and shoes. Follow by washing with soap and water. Do not reuse clothing or shoes until cleaned. If irritation

SECTION V - HEALTH HAZARD DATA

persists, get medical attention. Do not apply oils or ointments unless ordered by the physician. If skin feels slippery, caustic may still be present in sufficient quantities to cause rash or burn. Continue washing skin until slick skin feeling is gone.

INGESTION: If conscious, drink a quart of water. DO NOT induce vomiting. CALL A PHYSICIAN immediately. If unconscious or in convulsions, take immediately to a hospital or a physician. NEVER induce vomiting or give anything by mouth to an unconscious victim. After dilution with water, fruit juice or diluted vinegar may be administered to accomplish neutralization. Several glasses of milk or several ounces of milk of magnesia may be given for their soothing effect.

INHALATION: Remove victim to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. If breathing is difficult, give oxygen. CALL A PHYSICIAN.

SECTION VI - REACTIVITY DATA

STABILITY: _X_ STABLE ___ UNSTABLE

CONDITIONS TO AVOID: Contact with water may cause violent reaction with evolution of heat. To dilute: Add product slowly to lukewarm water; not water to product.

INCOMPATABILITY: Acids. Metals such as Aluminum, Zinc, Tin, etc. Organic Nitro Compounds. Chlorinated and Fluorinated Hydrocarbons, acetaldehyde, chlorine trifluoride, hydroquinone, maleic anhydride, phosphorous pentoxide, and tetrahydrofuran. Organic materials. Acrolein. Phosphorus. Trichloroethylene. Food sugars. Deadly carbon monoxide gas can form in enclosed or poorly ventilated areas or tanks when alkaline products contact food, beverage, or dairy products. Do not enter such areas until they have been well ventilated and carbon monoxide and oxygen levels have been determined to be within OSHA acceptable limits. If carbon monoxide and oxygen levels cannot be measured, wear NIOSH-approved,

MATERIAL SAFETY DATA SHEET

SECTION VI - REACTIVITY DATA

self-contained breathing apparatus.

HAZARDOUS DECOMPOSITION PRODUCTS: May react with certain metals to produce flammable Hydrogen Gas. May react with various food sugars to form Carbon Monoxide. Reacts with Phosphorus to form spontaneously flammable Phosphine. Reacts with Trichlorethylene to form spontaneously flammable Dichloroacetylene.

HAZARDOUS POLYMERIZATION: ___MAY OCCUR _X_WILL NOT OCCUR

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: CORROSIVE MATERIAL. Evacuate unprotected personnel from area. Maintain adequate ventilation. Use proper Safety Equipment. Contain spill, place into drums for proper disposal. Neutralize remaining residue with dilute Hydrochloric Acid solution and dispose of properly. Avoid direct discharge to sewers and surface waters. Notify authorities if entry occurs. CAUTION: Caustic Soda may react violently with acids and water.

WASTE DISPOSAL METHOD: Observe all Local, State, and Federal Regulations. Dispose of at approved Waste Treatment Facility. If approved, neutralize material and flush to sewer. DO NOT pressurize, cut, weld, braze, solder, drill, grind or expose empty containers to heat, flame, sparks or other sources of ignition.

SECTION VIII - SPECIAL PROTECTION INFORMATION

CONSULT SAFETY EQUIPMENT DISTRIBUTOR

RESPIRATORY PROTECTION: If recommended Exposure Limits are exceeded wear: NIOSH-Approved respirator for dusts and mists. NIOSH-Approved self-contained breathing apparatus. Do not exceed limits established by the respirator manufacturer. Respiratory

MATERIAL SAFETY DATA SHEET

SECTION VIII - SPECIAL PROTECTION INFORMATION

protection programs must comply with 29 CFR 1910.134.

VENTILATION: Maintain adequate ventilation. Do not use in closed or confined space. Keep levels below recommended Exposure Limits. To determine exposure levels, monitoring should be performed regularly. Avoid mist formation.

PROTECTIVE GLOVES: Rubber (Latex). Neoprene. Polyvinyl Chloride.

EYE PROTECTION: Chemical Safety Goggles. Face shield. Do not wear contact lenses.

OTHER PROTECTIVE EQUIPMENT: Eye-wash station. Safety shower. Rubber apron. Chemical safety shoes. Rubber boots. Protective clothing.

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING:
CORROSIVE MATERIAL. Store in cool, well-ventilated area, out of direct sunlight. Do not freeze. Keep containers tightly closed. Highly corrosive to most metals with evolution of Hydrogen Gas. Store away from incompatable materials. Do not store in unlabeled or mislabeled containers. *** ANSI/NSF Standard 60 Maximum Use Level = 100 mg/l ***

OTHER PRECAUTIONS: Avoid contact with skin and eyes. Do not swallow. Avoid dust or mist formation. Use with adequate ventilation. Avoid breathing mists or dusts. Wash thoroughly after handling. Do not eat, drink, or smoke in work area.

MATERIAL SAFETY DATA SHEET

SECTION X - SUPPLEMENTAL HEALTH INFORMATION

CARCINOGEN CONTENT

%	PPM	INGREDIENT	IARC	NTP	OSHA

NOTE : This product does not contain greater than 0.1% of the known or potential carcinogens listed in NTP, IARC, or OSHA.

LD50 ORAL : Rabbit: 1350 mg/kg (Oxy Chem)
LD50 SKIN : Rabbit 50 mg/24 H (Anhydrous NaOH)
LC50 INHALATION : No Data

** ** ** ** ** ** ** ** ** ** **

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HYDRITE CHEMICAL CO.
CAUSTIC SODA LIQUID 50%
AL-0050
04/25/94

ENVIRONMENTAL DATA SHEET

INFORMATION CONTAINED MUST NOT BE DETACHED FROM THE MSDS AND ANY COPYING AND REDISTRIBUTION OF THE MSDS SHALL INCLUDE COPYING AND REDISTRIBUTION OF THE ENVIRONMENTAL DATA SHEET.

PRODUCT NAME: CAUSTIC SODA LIQUID 50%

EDS#: HY941-AL0050-XX-EDS
EMERGENCY NUMBER: (414) 792-1450
(414) 277-1311
CHEMTREC: (800) 424-9300

PART 1: PRODUCT/COMPOSITION

NO.	COMPONENT	CAS NUMBER	PERCENT
P	CAUSTIC SODA LIQUID 50%	1310-73-2	100%
	TYPICAL DISTRIBUTION		
1	Sodium Hydroxide	1310-73-2	50%

PART 2: SARA TITLE III INFORMATION

NO.	RQ (LBS) (*1)	TPQ (LBS) (*2)	SEC 313 (*3)	313 CATEGORY (*4)	311/312 CATEGORIES (*5)
P	*	N/A	N	N/A	A-C-R
1	1,000	N/A	N	N/A	A-C-R

NOTE:* RQ is dependent upon individual ingredients.

FOOTNOTES

*1 = REPORTABLE QUANTITY OF CERCLA HAZARDOUS SUBSTANCE, 40 CFR PART 302, TABLE 302.4
*2 = THRESHOLD PLANNING QUANTITY, EXTREMELY HAZARDOUS SUBSTANCE, SEC. 302
*3 = TOXIC CHEMICAL, SEC. 313
*4 = CATEGORY AS REQUIRED BY SEC 313 (40 CFR 372.42), MUST BE USED ON TOXIC RELEASE INVENTORY FORM
*5 = HAZARD CATEGORY FOR SARA SEC. 311/312 REPORTING
A = IMMEDIATE (ACUTE) HEALTH HAZARD
C = DELAYED (CHRONIC) HEALTH HAZARD
P = SUDDEN RELEASE OF PRESSURE HAZARD
F = FIRE HAZARD
R = REACTIVE HAZARD

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PART 2: SARA TITLE III INFORMATION

PART 3: CERCLA INFORMATION

EPA - COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION AND LIABILITY ACT. UNDER EPA - CERCLA ("SUPERFUND") RELEASES TO AIR, LAND OR WATER MAY BE REPORTABLE TO THE NATIONAL RESPONSE CENTER, 800-424-8802 (CIRCUMSTANCES SURROUNDING THE RELEASE AND CLEANUP DETERMINE REPORTABILITY).

THE REPORTABLE QUANTITY FOR THIS PRODUCT IS: 2000# BASED ON SODIUM HYDROXIDE CONTENT.

PART 4: RCRA INFORMATION

REFER TO LATEST EPA OR STATE REGULATIONS REGARDING PROPER DISPOSAL.

HAZARDOUS WASTE NUMBER = D002 (40 CFR 261.22)

PART 5: HMIS/NFPA LABEL INFORMATION

	HMIS	NFPA	KEY
HEALTH:	3	3	0 - MINIMAL
FLAMMABILITY:	0	0	1 - SLIGHT
REACTIVITY::	2	1	2 - MODERATE
WARNING	N/A		3 - SERIOUS
WARNING	N/A		4 - SEVERE

PERSONAL PROTECTION RATING TO BE SUPPLIED BY USER DEPENDING ON USE CONDITIONS.

HMIS = HAZARDOUS MATERIALS IDENTIFICATION SYSTEM
NFPA = NATIONAL FIRE PROTECTION ASSOCIATION 704

ENVIRONMENTAL DATA SHEET

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PRODUCT NAME: CAUSTIC SODA LIQUID 50%

PART 5: HMIS/NFPA LABEL INFORMATION

HEALTH, FLAMMABILITY, AND REACTIVITY RATINGS SHOULD ONLY BE USED AS A GUIDE. THE MATERIAL SAFETY DATA SHEET FOR THE PRODUCT SHOULD BE CONSULTED WHEN ASSESSING HAZARD INFORMATION.

PART 6: PROPOSITION 65

IF YOUR BUSINESS RESIDES IN THE STATE OF CALIFORNIA OR IF YOU SUPPLY PRODUCTS DIRECTLY OR INDIRECTLY INTO CALIFORNIA, WE ARE PROVIDING THIS INFORMATION TO YOU PURSUANT TO THE CALIFORNIA SAFETY DRINKING WATER AND TOXIC ENFORCEMENT ACT OF 1986 (COMMONLY KNOWN AS PROPOSITION 65). THIS LAW REQUIRES, IN PART, THAT "NO PERSON IN THE COURSE OF DOING BUSINESS SHALL KNOWINGLY AND INTENTIONALLY EXPOSE ANY INDIVIDUAL TO CHEMICAL KNOWN TO THE STATE TO CAUSE CANCER OR REPRODUCTIVE TOXICITY WITHOUT FIRST GIVING CLEAR AND REASONABLE WARNING TO SUCH INDIVIDUAL..." (SECTION 25249.6). THE ACT DOES NOT EXEMPT FROM THE WARNING REQUIREMENT "AN EXPOSURE FOR WHICH THE PERSON RESPONSIBLE CAN SHOW THAT THE EXPOSURE POSES NO SIGNIFICANT RISK..." (SECTION 25249.10).

IT HAS NOT BEEN FEASIBLE TO SUBJECT ALL PRODUCTS TO THE DETAILED ANALYSES REQUIRED TO DETERMINE WHETHER EACH OF THE MATERIALS KNOWN TO CALIFORNIA TO CAUSE CANCER OR REPRODUCTIVE TOXICITY IS PRESENT IN DETECTABLE QUANTITIES. HOWEVER, BASED ON AVAILABLE DATA, THE FOLLOWING CHEMICALS LISTED BY THE GOVERNOR OF CALIFORNIA MAY BE PRESENT IN THIS PRODUCT:

CHEMICAL		CONCENTRATION *
ASBESTOS	(FEB 27, 1987)	< .075 ppm
NICKEL	(OCT 1, 1987)	< 10 ppm
LEAD	(FEB 27, 1987)	< 10 ppm
ARSENIC	(FEB 27, 1987)	< 0.005 ppm
CADMIUM	(OCT 1, 1987)	< 0.005 ppm

* IMPURITY LEVELS

* NOT TO BE CONSTRUED AS SPECIFICATIONS UNLESS SO INDICATED.

ENVIRONMENTAL DATA SHEET

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PRODUCT NAME: CAUSTIC SODA LIQUID 50% PAGE 4

PART 6: PROPOSITION 65

NOTE: The date refers to the initial appearance of the chemical on the list. Based on the manufacturers' evaluation of the above concentration(s) of impurities present in the product's ingredients, the product is believed to not pose a hazard to human health if handled and used as directed on the Material Safety Data Sheet. This information is provided to assure compliance with the requirements of Proposition 65.

** ** ** ** ** ** ** ** ** ** **

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EAGLEBROOK, INC.

MSDS

MATERIAL SAFETY DATA SHEET

For chemical emergencies, spill, leak, fire or exposure call ChemTrec (800) 424-9300

Revised 01/10/94

Printed 02/10/94

Ferrous Sulfate

I. Chemical Product and Company Information

Manufacturer/Distributor ..... EAGLEBROOK, INC.
1150 Junction Ave.
Schererville, IN 46375

Phone Numbers and Available Hours ..... (219) 322-2560
(800) 428-3311
6 a.m. to 12 a.m. (Central Time)

Chemical Name ..... Ferrous Sulfate

Chemical Family ..... Metal Salt

Formula ..... $FeSO_4$

CAS Registry No. 7720-78-7

Synonyms ..... Iron (II) Sulfate

II. Composition/Information on Ingredients

Principle Ingredients	*CAS Number*	*Percent*
Sulfuric Acid	#7664-93-9	2.5% - 6.0%
Ferrous Sulfate, Heptahydrate	#7782-63-0	13.6% - 16.3%

III. Hazards Identification

Emergency Overview ..... May be harmful if inhaled or swallowed.
May be irritating to skin, eyes and mucous membranes.

Appearance and Odor ..... Dark reddish liquid, no odor.

IV. First Aid Measures

Emergency First Aid ..... GET MEDICAL ASSISTANCE FOR ALL CASES OF OVEREXPOSURE

Skin: ..... Wash thoroughly with soap and water.

Eyes: ..... Immediately flush thoroughly with water for at least 15 minutes.

Inhalation: ..... Remove to fresh air; give artificial respiration of breathing has stopped.

Ingestion: ..... If conscious, drink large amounts of water or milk of magnesia. DO NOT INDUCE VOMITING.

Potential Health Effects (Acute and Chronic)

Symptoms of Exposure: ..... Corrosive to eyes.
- Causes irritation to skin (burns if wet)
- Breathing mist can cause damage to nasal and respiratory passages.
- Harmful if swallowed.

Medical Condition Aggravated by Exposure ..... Respiratory, liver conditions

Routes of Entry ..... Inhalation, ingestion

Carcinogenicity ..... The material is not listed (IARC, NTP, OSHA) as cancer causing agent.

V. Fire Fighting Measures

Flash Point (F)..... None

Flammable limits UEL (%)..... N/A

Extinguishing Media..... Use any suitable for adjacent material.

Fire Fighting Procedures..... Wear self-contained breathing apparatus and protective clothing.
•Cool storage tanks to avoid possible rupture.

Fire & Explosion Hazards:..... Decomposes to yield H_2SO_4 on exposure to light. Latent fire and explosion hazard when in contact with metals due to hydrogen gas. Can react violently with ethylene oxide, sodium or potassium.

VI. Accidental Release Measures

Spill Response:.....Evacuate the area of all unnecessary personnel.
•Wear suitable protective equipment listed under Exposure/Personal Protection.
•Eliminate any ignition sources until the area is determined to be free from explosion or fire hazards.
•Contain the release and eliminate its source, if this can be done without risk.
•Take up and containerize for proper disposal as described under Disposal.
•Comply with Federal, State and local regulations on reporting releases. Refer to regulatory Information for reportable quantity and other regulatory data.

VII. Handling and Storage

Handling and Storage:..... Keep container closed and protect from light.
•Store in cool, dry, well ventilated area.
•Use only clean, dry utensils in handling.
•Do not get in eyes, on skin, or on clothing.

Cautions to be taken in Handling and Storage..... Do not store in metal containers. Provide venting for rubber lined steel to avoid potential pressure build-up if lining fails.

VIII. Exposure Controls/Personal Protection

Engineering Controls and Personal Protective Equipment:..... Ventilation, Respiratory Protection, Protective Clothing, Eye Protection
•If workplace exposure limit(s) of product or any component is exceeded a NIOSH/MSHA approved air supplied respirator is advised in absence of proper environmental control. OSHA regulations also permit other NIOSH/MSHA respirators (negative pressure type) under specified conditions (see your safety equipment supplier).
•Engineering and/or administrative controls should be implemented to reduce exposure.
•Protective gloves should be worn to prevent skin contact (Neoprene or equivalent).
•Chemical goggles mandatory, plus face shield optional.

Work/Hygienic Practices:..... Wash thoroughly after handling.
•Do not take internally.
•Eye wash and safety equipment should be readily available.

IX. Physical and Chemical Properties

Boiling Point (F)..... 220°F - 235°F
Specific Gravity (H20=1)..... 1.19 - 1.28
Vapor Pressure (mm Hg)..... N/A
Percent Volatile by Vol. (%).....None
Vapor Density (Air = 1).....N/A
Evaporation Rate (ByAc = 1).... N/A
Solubility in Water (%)..... Infinite
Appearance and odor..... Blue green liquid, slight acidic odor

X. Stability and Reactivity

Stability..... Stable
Hazardous Polymerization..... Will not occur
Hazardous Decomposition..... SO_x
Conditions To Avoid..... Moisture, light
Incompatible Materials..... Rapidly corrodes most metals
•Avoid contact with aluminum/aluminum alloys, carbon steel, copper/copper alloys and nylon. Also avoid contact with all alkaline materials.
Materials to Avoid..... ( ) Water
(X) Acids
(X) Bases and alkaline materials - may cause exothermic reaction
( ) Corrosives
(X) Oxidizers
( ) Other:

XI. Toxicological Information

Toxicological Findings:..... Tests on laboratory animals indicate materials may produce adverse mutagenic effects.

XII. Ecological Information

XIII. Disposal Considerations

EPA Waste Number..... K062
If this product becomes a waste material (e.g. due to a spill) it will be an EPA hazardous waste due to its corrosive characteristics.

ALWAYS CONTACT A PERMITTED WASTE DISPOSER (TSD) TO ASSURE COMPLIANCE WITH ALL CURRENT LOCAL, STATE AND FEDERAL REGULATIONS

XIV. Transportation Information

Proper DOT Shipping Name.... Corrosive Liquid N.O.S. (Ferrous Sulfate)
DOT ID Number..... NA9188
Hazardous Class..... 8
Packing Group..... III
DOT Hazard Class..... Corrosive
Chemical Family..... Acid

INTERSTATE VALWELD

Interstate Welding Sales Corp.
MARQUETTE, MI
110 Meeske Avenue
906-228-9615
FAX 906-228-4061

Interstate Welding Sales Corp.
ESCANABA, MI
906 North Lincoln Road
906-786-5004
FAX 906-786-5511

Interstate Welding Sales Corp.
Corporate Headquarters
Gas Mil Plant and Lab
MARINETTE, WI
1801 Marinette Avenue
PO Box 207
715-732-7850
FAX 715-732-7941

Interstate Welding Sales Corp.
GREEN BAY, WI
1263 Waube Lane
414-339-0540
FAX 414-339-0545

Interstate Welding Sales Corp.
APPLETON, WI
2626 W. Wisconsin Avenue
PO Box 2127
414-734-7773
FAX 414-734-3403

Interstate Welding Sales Corp.
WAUSAU, WI
6007 Master Street
SCHOFIELD WI
715-359-7050
FAX 715-359-3682

Interstate Welding Sales Corp.
FOND DU LAC, WI
667 Hegerville Road
414-921-7650
FAX 414-921-9163

Interstate Welding Sales Corp.
MANITOWOC, WI
2833 North Rapids Road
414-682-0251
FAX 414-682-0303

TO: ATTN: Safety Director
CH2M HILL
411 E WISCONSIN AVE

FROM: INTERSTATE/VALWELD
1801 MARINETTE AVE
MARINETTE, WI. 54143

RE: NITROGEN 304 CF
INV #385042 ITM #IG NI3

DATE: 9-Jan-1997 00:03:07

PAGES: 1 / 5

FAX: 14142724408

AIRCO

Material Safety Data Sheet

NITROGEN

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Airco Gases, a Division of The BOC Group, Inc.
575 Mountain Avenue
Murray Hill, NJ 07974

TELEPHONE NUMBER: (908)464-8100

EMERGENCY TELEPHONE NUMBER
CHEMTREC (800)424-9300

PRODUCT NAME: NITROGEN
CAS NUMBER: 7727-37-9
CHEMICAL FAMILY: Inert Gas
CHEMICAL FORMULA: N2
MSDS IDENTIFICATION CODE/NUMBER: G-7

2. COMPOSITION/INFORMATION ON INGREDIENTS

INGREDIENT NAME	EXPOSURE LIMITS	CONCENTRATION PERCENT BY WEIGHT
NITROGEN CAS NUMBER: 7727-37-9	Simple Asphyxiant - maintain oxygen levels above 19.5 percent	99.995 to 99.999

3. HAZARDS IDENTIFICATION

NO DATA GIVEN

4. FIRST AID MEASURES

EYES
Never introduce ointment or oil into the eyes without medical advice! In case of freezing or cryogenic "burns" caused by rapidly evaporating liquid, DO NOT WASH THE EYES WITH HOT OR EVEN TEPID WATER! Remove victim from the source of contamination. Open eyelids wide to allow liquid to evaporate. If pain is present, refer the victim to an ophthalmologist for treatment and follow up. If the victim cannot tolerate light, protect the eyes with a light bandage.

SKIN
For dermal contact or frostbite: Remove contaminated clothing and flush affected areas with lukewarm water. DO NOT USE HOT WATER. A physician should see the patient promptly if the cryogenic "burn" has resulted in blistering of the dermal surface or deep tissue freezing.

INHALATION
PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS.

Conscious persons should be assisted to an uncontaminated area and inhale fresh air. Quick removal from the contaminated area is most important. Unconscious persons should be moved to an uncontaminated area, given artificial resuscitation and supplemental oxygen. Further treatment should be symptomatic and supportive.

Material Safety Data Sheet

NITROGEN

5. FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA
Nonflammable, inert gas

FIRE FIGHTING INSTRUCTIONS
Electrical Classification: Nonhazardous

6. ACCIDENTAL RELEASE MEASURES

Evacuate all personnel from affected areas. Use appropriate protective equipment. If leak is in user's equipment, be certain to purge piping with an inert gas prior to attempting repairs. If leak is in container or container valve, contact CHEMTREC for emergency assistance or call your closest Airco location.

7. HANDLING AND STORAGE

HANDLING AND STORAGE PRECAUTIONS
Use only in well-ventilated areas. Valve protection caps must remain in place unless container is secured with valve protection outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when connecting cylinder to lower pressure (<3000 psig) piping or systems. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder.

Protect cylinders from physical damage. Store in cool, dry, well-ventilated area or non-combustible construction away from heavily trafficked areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 125°F. Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Use a "first in-first out" inventory system to prevent full cylinders being stored for excessive periods of time.

For additional recommendations, consult Compressed Gas Association Pamphlet P-1.

Never carry a compressed gas cylinder or a container of a gas in cryogenic liquid form in an enclosed space such as a car trunk, van or station wagon. A leak can result in a fire, explosion, asphyxiation or a toxic exposure.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS
Local exhaust to prevent accumulation of high concentrations so as to reduce the oxygen level in the air to less than 19.5 percent.

EYE/FACE PROTECTION
Safety goggles or glasses.

SKIN PROTECTION
Protective gloves of any material

RESPIRATORY PROTECTION
Positive pressure air line with mask or self-contained breathing apparatus should be available for emergency use.

OTHER/GENERAL PROTECTION
Safety shoes

Material Safety Data Sheet

NITROGEN

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE
A colorless gas

ODOR
Odorless

BASIC PHYSICAL PROPERTIES
BOILING POINT: -320.4°F -195.8°C
MELTING POINT: -345.9°F -209.9°C
VAPOR PRESSURE: Above critical temp.
VAPOR DENSITY (AIR=1): 0.97
SOLUBILITY (H2O): very slightly Soluble

10. STABILITY AND REACTIVITY

STABILITY: Stable

HAZARDOUS POLYMERIZATION: Will Not Occur

11. TOXICOLOGICAL INFORMATION

EYE EFFECTS
Contact with liquid may cause tissue freezing.

SKIN EFFECTS
Contact with liquid product may cause frostbite.

ACUTE INHALATION EFFECTS
Nitrogen is a simple asphyxiant. Maintain oxygen levels above 19.5% at sea level.

Effects of overexposure to high concentrations so as to displace the oxygen in the air necessary for life may include any, all or none of the following:

- o Loss of balance or dizziness;
- o Tightness in the frontal area of the forehead;
- o Tingling of the tongue, fingertips or toes;
- o Weakened speech leading to the inability to utter sounds;
- o Rapid reduction in the ability to perform movements;
- o Reduced consciousness of surroundings;
- o Loss of tactile sensations;
- o Heightened mental activity;

Nitrogen is nontoxic but the liberation of a large amount in a confined area could displace the amount of oxygen in air necessary to support life. It should be recognized that it is possible that none of the above symptoms may occur in nitrogen asphyxia so that there may be no definite warning symptoms.

MISCELLANEOUS TOXICOLOGICAL INFORMATION
Carcinogenicity -- NTP: No IARC: No OSHA: No

12. ECOLOGICAL INFORMATION

NO DATA GIVEN

Material Safety Data Sheet

NITROGEN

13. DISPOSAL CONSIDERATIONS

Do not attempt to dispose of waste or unused quantities. Return in the shipping container PROPERLY LABELED, WITH ANY VALVE OUTLET PLUGS OR CAPS SECURED AND VALVE PROTECTION CAP IN PLACE to Airco for proper disposal. For emergency disposal, contact the closest Airco location or call the CHEMTREC number listed herein.

14. TRANSPORT INFORMATION

PROPER SHIPPING NAME: Nitrogen or Nitrogen, Compressed

HAZARD CLASS: Nonflammable Gas
DOT IDENTIFICATION NUMBER: UN1066
DOT SHIPPING LABEL: Nonflammable Gas

15. REGULATORY INFORMATION

SARA TITLE III NOTIFICATIONS AND INFORMATION

SARA TITLE III - HAZARD CLASSES: Sudden Release of Pressure Hazard

16. OTHER INFORMATION

Hazard Rating - HEALTH: 1 Slight
- FIRE: 0 Negligible
- REACTIVITY: 0 Negligible

MSDS IDENTIFICATION CODE/NUMBER: G-7

REFERENCE DOCUMENTATION
Nitrogen is non-corrosive and may be used with any common structural material.

Compressed gas cylinders should not be refilled except by qualified producers of compressed gases. Shipments of a compressed gas cylinder, which has not been filled by the owner or with his (written) consent, is a violation of Federal Law (49CFR)

For additional recommendations, consult Compressed Gas Association Pamphlets P-1, P-14, P-9, and Safety Bulletin SB-2.

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES
Although reasonable care has been taken in the preparation of this document, we extend no warranties and make no representations as to the accuracy or completeness of the information contained therein, and assume no responsibility regarding the suitability of this information for the user's intended purposes or for the consequences of its use. Each individual should make a determination as to the suitability of the information for their particular purpose(s).

Airco Gases, a Division of The BOC Group, Inc.

PO#: JOHN STOEGER
HACH ORDER#: 664437

MSDS DATE: 5/07/96
CHANGE NO.: 12068

For Assistance, Contact:
Regulatory Affairs Dept.
PO Box 907 Ames, IA 50010
(800) 227-4224

HACH COMPANY
PO BOX 907
AMES, IA 50010

Emergency Telephone #
Rocky Mountain Poison Ctr.
(303) 623-5716

I. PRODUCT IDENTIFICATION

PRODUCT NAME: ChromaVer ® 3
CAS NO.: NA CHEMICAL NAME: Not applicable
FORMULA: Not applicable CHEMICAL FAMILY: Not applicable
MSDS NUMBER: M00001

II. INGREDIENTS

Potassium Pyrosulfate
PCT: <85 CAS NO.: 7790-62-7 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: Causes eye burns

Magnesium Sulfate Heptahydrate
PCT: <25 CAS NO.: 7487-88-9 SARA: NOT LISTED
TLV: Not established PEL: Not established
HAZARD: Moderately toxic; may cause irritation

Other component
PCT: <1 CAS NO.: NA SARA: NOT LISTED
TLV: Not applicable PEL: Not applicable
HAZARD: Not applicable

Any component of this mixture not specifically listed (eg. "other components") is not considered to present a carcinogen hazard.

III. PHYSICAL DATA

STATE: solid APPEARANCE: White or light pink powder
ODOR: Not determined SOLUBILITY IN: WATER: Slightly soluble
ACID: Soluble OTHER: Not determined BOILING POINT: NA
MELTING PT.: 215C decomp. SPEC GRAVITY: 2.26 pH: of 5% soln. = 1.1
VAPOR PRESSURE: Not appliceble VAPOR DENSITY (air=1): NA
EVAPORATION RATE: NA METAL CORROSIVITY - ALUMINUM: 0.014 in/yr
STEEL: 0.416 in/yr STABILITY: See Conditions to Avoid
STORAGE PRECAUTIONS: Store in a cool, dry place.

IV. FIRE, EXPLOSION HAZARD AND REACTIVITY DATA

FLASH PT.: Not applicable METHOD: NA
FLAMMABILITY LIMITS - LOWER: NA UPPER: NA
SUSCEPTIBILITY TO SPONTANEOUS HEATING: None
SHOCK SENSITIVITY: None AUTOIGNITION PT.: ND
EXTINGUISHING MEDIA: water, carbon dioxide, or dry chemical
FIRE/EXPLOSION HAZARDS: May emit toxic fumes in fire
HAZARDOUS DECOMP. PRODUCTS: May emit toxic fumes of sulfur oxides in fire
OXIDIZER: No NFPA Codes: Health: 2 Flammability: 0 Reactivity: 0
CONDITIONS TO AVOID: Extreme temperatures, excess moisture, exposure to light

V. HEALTH HAZARD DATA

THIS PRODUCT MAY BE: corrosive to eyes, irritating to respiratory tract
ACUTE TOXICITY: Moderately toxic
ROUTES OF EXPOSURE: Ingestion
TARGET ORGANS: central nervous system
CHRONIC TOXICITY: Not determined
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
CANCER INFORMATION: An ingredient of this mixture is an experimental mutagen.
ROUTES OF EXPOSURE: Not determined
TARGET ORGANS: Not determined
OVEREXPOSURE: May cause eye burns, thirst, nausea, vomiting, diarrhea, hypotension, weak and rapid pulse, shortness of breath, clammy skin, circulatory collapse, central nervous system depression, respiratory paralysis, and death.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing eye and skin disorders

VI. PRECAUTIONARY MEASURES

Avoid contact with eyes.
Do not breathe dust.
Wash thoroughly after handling.
Protect from moisture
PROTECTIVE EQUIPMENT: fume hood, lab grade goggles, rubber gloves, lab coat

VII. FIRST AID

EYE AND SKIN CONTACT: Immediately flush eyes with water for 15 minutes. C: physician. Remove contaminated clothing. Wash skin with soap and plenty water.
INGESTION: Do NOT induce vomiting. Give 1 - 2 glasses of water. Call a physician immediately. Never give anything by mouth to an unconscious person.
INHALATION: Remove to fresh air.

VIII. SPILL AND DISPOSAL PROCEDURES

IN CASE OF SPILL OR RELEASE: Scoop spilled material into a beaker and dissolve with water. Neutralize to a pH between 6 and 9 with an alkali such as soda ash. Flush neutralized waste to the drain with an excess of water.
DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.

IX. TRANSPORTATION DATA

D.O.T. PROPER SHIPPING NAME: Corrosive solid, acidic, inorganic, N.O.S. (Potassium Pyrosulphate Mixture)
HAZARD CLASS: 8 ID: UN3260 GROUP: III

I.C.A.O. PROPER SHIPPING NAME: Corrosive solid, acidic, inorganic, N.O.S. (Potassium Pyrosulphate Mixture)
HAZARD CLASS: 8 ID: UN3260 GROUP: III

I.M.O. PROPER SHIPPING NAME: Corrosive solid, acidic, inorganic, N.O.S. (Potassium Pyrosulphate Mixture)
HAZARD CLASS: 8 ID: UN3260 GROUP: III

X. REFERENCES

1) TLV's Threshold Limit Values and Biological Exposure Indices for 1988-1989. American Conference of Governmental Industrial Hygienists, 1988.
2) Air Contaminants, Federal Register, Vol. 54, No. 12, Thursday, January 19, 1989. pp. 2332-2983.
3) In-house information
4) Technical judgment
5) Outside testing.

SPECIAL NOTE: In laboratory tests, when magnesium sulfate was given to pregnant rats, a sharp reduction of both the number and the weight of th offspring was observed.

B2065 D8150-8-9-12-13 D8155, D8156, D8160-4 D8160-4

MATERIAL SAFETY DATA SHEET

IDENTITY: INDICATING DRIERITE DATE PREPARED 2-1-95
DESCRIPTION: 1/16" TO ¼" BLUE GRANULES

SECTION I

MANUFACTURER'S NAME: W. A. HAMMOND DRIERITE CO.
ADDRESS: P. O. BOX 460, 138 DAYTON AVE., XENIA, OH 45385
EMERGENCY PHONE NUMBER: (513) 376-2927
INFORMATION PHONE NUMBER: (513) 376-2927

SECTION II
INGREDIENTS

CHEMICAL IDENTITY	%	OSHA PEL	ACGIH TLV	UNITS	C.A.S. #
CALCIUM SULFATE	97	15	10	mg/M^3	7778-18-9
COBALT CHLORIDE	3	0.05*	0.05*	mg/M^3	7646-79-9

*(AS COBALT METAL)

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM (HMIS)

HEALTH	FLAMMIBILITY	REACTIVITY	PROTECTIVE EQUIPMENT
1	0	1	E

SECTION III
PHYSICAL/CHEMICAL CHARACTERISTICS

SPECIFIC GRAVITY:(H2O=1): 1.87
SOLUBILITY IN WATER: 0.25 GRAMS PER LITER
MELTING POINT: 1450° C DECOMPOSES
APPEARANCE: BLUE GRANULES; NO ODOR

SECTION IV
FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: NONE
EXTINGUISHING MEDIA: NOT COMBUSTIBLE
SPECIAL FIREFIGHTING PROCEDURES: NONE
UNUSUAL FIRE AND EXPLOSION HAZARDS: NONE

SECTION V
REACTIVITY DATA

STABILITY: STABLE
INCOMPATIBILTY (MATERIALS TO AVOID): STRONG ACIDS
HAZARDOUS DECOMPOSITION BYPRODUCTS: Cl_2 AT 318°; SO_3 @ 1450°C
HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

SECTION VI
HEALTH HAZARD DATA

EYES: PARTICLES MAY CAUSE IRRITATION.
SKIN: THIS MATERIAL IS NOT TOXIC. MAY DRY OR IRRITATE SKIN
INHALATION: MAY CAUSE AN IRRITATION OF RESPIRATORY ORGANS OF SENSITIVE PERSONS RESULTING IN THE OBSTRUCTION OF AIRWAYS WITH SHORTNESS OF BREATH.
INGESTION: MAY CAUSE VOMITING, DIARRHEA AND SENSATION OF WARMTH
SIGNS AND SYMPTOMS OF OVER EXPOSURE: EYE, NOSE, THROAT, OR RESPIRATORY IRRITATION
CARCINOGENICITY OF INGREDIENTS:

MATERIAL	IARC	NTP	OSHA
CALCIUM SULFATE	NOT LISTED	NOT LISTED	NOT LISTED
COBALT CHLORIDE	YES*	NO	NO

*(COBALT & COBALT COMPOUNDS ARE CLASSIFIED AS GROUP 2B)

Allegiance Healthcare. **Date: 01/06/97**

Dear Customer,

Enclosed are the material safety data sheets (MSDS'S) for items you recently purchased from Allegiance Healthcare.

Please assure that they are disseminated to the appropriate departments within your organization.

DO NOT DISCARD -- DO NOT RETURN.

If you have any questions about our MSDS program or require further information, please call the MSDS Center at (847) 689-6590

These material safety data sheets were prepared by the firm identified on the MSDS. Allegiance makes no representation with respect to the completeness or accuracy of their contents.

1470341244

CH2M HILL
ATTN CHRIS LIETHEN
725 SOUTH OUTAGAMIE
APPLETON, WI 54914-

P.O. Number: ARC5921
Customer Number: 484601356000

Allegiance makes no representation or warranties with respect to the products described herein including but not limited to any implied warranties of merchant-ability or fitness for a particular purpose. Allegiance neither assumes nor authorizes any other person to assume any additional liability or responsibility as a result of the use of, or reliance upon, the information contained in these material safety data sheets.

MSDS's have been provided (enclosed) for the items listed below:

Vendor Code	Item Description	Allegianc Catalog #	Factory Catalog #
JV	DRIERITE INDICAT 6MESH 1LB/EA	D8150-8	22001

MATERIAL SAFETY DATA SHEET

MSDS No. 03992000
ENGLISH

1.0 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: AMOCO REGULAR LEAD-FREE GASOLINE

MANUFACTURER/SUPPLIER:
Amoco Oil Company
200 East Randolph Drive
Chicago, Illinois 60601 U.S.A.

EMERGENCY HEALTH INFORMATION:
1 (800) 447-8735
EMERGENCY SPILL INFORMATION:
1 (800) 424-9300 CHEMTREC (USA)
OTHER PRODUCT SAFETY INFORMATION:
(312) 856-3907

2.0 COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS#	Range % by Wt.
Gasoline	8006-61-9	85-100
Benzene	71-43-2	1-4
Butane	106-97-8	1-12
Cyclohexane	110-82-7	1-5
Ethylbenzene	100-41-4	1-2
Heptane	142-82-5	1-2
Hexane	110-54-3	1-5
Pentane	109-66-0	1-10
Toluene	108-88-3	1-22
Trimethylbenzene	25551-13-7	1-5
Xylene	1330-20-7	1-10
Methyl tertiary butyl ether (MTBE)	1634-04-4	0-15

(See Section 8.0, "Exposure Controls/Personal Protection", for exposure guidelines)

5.0 FIRE FIGHTING MEASURES

FLASHPOINT: -45.0°F

UEL: 7.6%

LEL: 1.3%

AUTOIGNITION TEMPERATURE: 495.0°F

FLAMMABILITY CLASSIFICATION: Extremely Flammable Liquid.

EXTINGUISHING MEDIA: Agents approved for Class B hazards (e.g., dry chemical, carbon dioxide, foam, steam) or water fog.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Extremely flammable vapor/air mixtures form. Extinguishment of fire before source of vapor is shut off can create an explosive mixture in air.

FIRE-FIGHTING EQUIPMENT: Firefighters should wear full bunker gear, including a positive pressure self-contained breathing apparatus.

PRECAUTIONS: Keep away from ignition sources (e.g., heat, sparks and open flames). Keep container closed. Use with adequate ventilation.

HAZARDOUS COMBUSTION PRODUCTS: Burning can produce carbon monoxide and/or carbon dioxide and other harmful products.

6.0 ACCIDENTAL RELEASE MEASURES

Remove or shut off all sources of ignition. Wear respirator and spray with water to disperse vapors. Increase ventilation if possible. Remove mechanically or contain on an absorbent material such as dry sand or earth. Keep out of sewers and waterways.

7.0 HANDLING AND STORAGE

HANDLING: Use with adequate ventilation. Ground and bond containers when transferring materials. Wash thoroughly after handling.

STORAGE: Store in flammable liquids storage area. Keep container closed. Store away from heat, ignition sources, and open flame in accordance with applicable regulations.

SPECIAL PRECAUTIONS: Keep out of sewers and waterways. Avoid strong oxidizers. Report spills to appropriate authorities. USE AS MOTOR FUEL ONLY.

EXPOSURE GUIDELINES:

Trimethylbenzene	25551-13-7	OSHA PEL: 25 ppm (1989); Not established. (1971) ACGIH TLV-TWA: 25 ppm
Xylene	1330-20-7	OSHA PEL: 100 ppm (1989)(1971) OSHA STEL: 150 ppm (1989); Not established. (1971) ACGIH TLV-TWA: 100 ppm ACGIH TLV-STEL: 150 ppm
Methyl tertiary butyl ether (MTBE)	1634-04-4	ACGIH TLV-TWA: 40 ppm

9.0 CHEMICAL AND PHYSICAL PROPERTIES

APPEARANCE AND ODOR:	Clear. Liquid. Hydrocarbon odor.
pH:	Not determined.
VAPOR PRESSURE:	7-15 lb RVP (ASTM D-323)
VAPOR DENSITY:	3.0 to 4.0
BOILING POINT:	80.0°F to 430.0°F, Range
MELTING POINT:	Not determined.
SOLUBILITY IN WATER:	Negligible, below 0.1%.
SPECIFIC GRAVITY (WATER = 1):	0.75

10.0 STABILITY AND REACTIVITY

STABILITY: Burning can be started easily.

CONDITIONS TO AVOID: Keep away from ignition sources (e.g. heat, sparks, and open flames).

MATERIALS TO AVOID: Avoid chlorine, fluorine, and other strong oxidizers.

HAZARDOUS DECOMPOSITION: None identified.

HAZARDOUS POLYMERIZATION: Will not occur.

11.0 TOXICOLOGICAL INFORMATION

ACUTE TOXICITY DATA:

EYE IRRITATION: Primary eye irritation score 0.0/110.0 (rabbits).

SKIN IRRITATION: Primary dermal irritation score 1.1/8.0 (rabbits). Acute dermal LD50 greater than 5ml/kg (rabbits). Practically nontoxic for acute exposures by this route.

DERMAL LD50: Testing not conducted. See Other Toxicity Data.

ORAL LD50: Acute oral LD50 18.8ml/kg (rats). Practically nontoxic for acute exposures by this route.

INHALATION LC50: Acute LC50 20.7mg/l (rats).

14.0 TRANSPORTATION INFORMATION

U.S. DEPT OF TRANSPORTATION

Shipping Name	:	Gasoline
Hazard Class	:	3
Identification Number	:	UN1203
Packing Group	:	II

INTERNATIONAL INFORMATION:

Sea (IMO/IMDG)
Shipping Name : Not determined.

Air (ICAO/IATA)
Shipping Name : Not determined.

European Road/Rail (ADR/RID)
Shipping Name : Not determined.

Canadian Transportation of Dangerous Goods
Shipping Name : Not determined.

15.0 REGULATORY INFORMATION

CERCLA SECTIONS 102A/103 HAZARDOUS SUBSTANCES (40 CFR PART 302.4): This product is exempt from the CERCLA reporting requirements under 40 CFR Part 302.4. However, if spilled into waters of the United States, it may be reportable under 33 CFR Part 153 if it produces a sheen.

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR PART 355): This product is not regulated under Section 302 of SARA and 40 CFR Part 355.

SARA TITLE III SECTIONS 311/312 HAZARDOUS CATEGORIZATION (40 CFR PART 370): This product is defined as hazardous by OSHA under 29 CFR Part 1910.1200(d).

SARA TITLE III SECTION 313 (40 CFR PART 372): This product contains the following substance(s), which is on the Toxic Chemicals List in 40 CFR Part 372:

Component/CAS Number	Weight Percent
Benzene 71-43-2	4
Cyclohexane 110-82-7	5
Ethylbenzene 100-41-4	2
Xylene 1330-20-7	10
Methyl tertiary butyl ether (MTBE) 1634-04-4	15
Hexane 110-54-3	5
Toluene 108-88-3	22

U.S. INVENTORY (TSCA): Listed on inventory.

OSHA HAZARD COMMUNICATION STANDARD: Flammable liquid. Irritant. Contains components listed by ACGIH. Contains components listed by OSHA. Contains a carcinogenic component.

MATERIAL SAFETY DATA SHEET

N/A = Not Applicable (Prepared According To 29 CFR 1910. 1200) Effective Date 3/94

SECTION 1 - PRODUCT IDENTIFICATION

Product Name: North Woods™ Brilliance

Chemical Family: N/A

Generic Name: Glass & surface cleaner.

Formula: N/A

Suppliers Name: SUPERIOR CHEMICAL CORP. Phone 414-457-4481
Suppliers Address: 1331 Wisconsin Avenue Sheboygan, WI 53081

NPCA Hazardous Materials Identification System

Health	1
Flammability	0
Reactivity	0
Maximum Personal Protection	A

SECTION 2 - HAZARDOUS INGREDIENTS

CHEMICAL NAME	CAS NO.	WT.%	PEL	TWA-TLV	STEL-TLV	CARCINOGEN
2-Propanol	67-63-0	10 to 15	400ppm	400ppm	500ppm	No
2-Butoxyethanol*	111-76-2	2.28	25ppm	25ppm	N/A	No

*Subject to the reporting requirements of Section 313 of the Emergency Planning & Community Right-To-Know Act of 1986 & 40 CFR372.

SECTION 3 - PHYSICAL DATA

Boiling Range (°F): 209°F initial
Specific Gravity: .96
Vapor Pressure: 25mm Hg@68°F
Vapor Density: >1
% Volatile: 100
pH: 10.5 - 11.5
Solubility in Water: 100%
Evaporation Rate: >1
Physical Description: Thin clear green liquid with characteristic odor.

SECTION 4 - FIRE & EXPLOSION HAZARD DATA

Flash Point (method used): 102°F (TCC)
Upper Explosive Limit: N/A
Lower Explosive Limit: N/A
Extinguishing Media: N/A
Special Fire Fighting Procedures: N/A
Unusual Fire & Explosion Hazards: N/A

SECTION 5 - REACTIVITY DATA

Stability: Stable.
Hazardous Polymerization: Will not occur.
Incompatibility (materials to avoid): None known.

Hazardous Decomposition Products: None known.

SECTION 6 - STORAGE & HANDLING INFORMATION

Precautions To Be Taken In Handling & Storage:
Keep out of reach of children. Keep container closed during storage. For industrial and institutional use only.

SECTION 7 - HEALTH HAZARDS AND FIRST AID

Effects of Overexposure:
Primary Route of Entry:

Skin: Irritant. May cause moderate redness and swelling.

Eyes: Irritant. Liquid and mists may damage the eyes causing corneal injury.

Inhalation: Vapors may be irritating to mucous membranes of nose, throat and lungs.

Ingestion: May cause headache, dizziness, nausea, vomiting and diarrhea.

First Aid Procedures:

Skin: Flush with large quantities of water. Seek medical attention if irritation persists.

Eyes: Flush with large quantities of water. Seek medical attention if irritation persists.

Inhalation: Get to fresh air. Seek medical attention if irritation persists.

Ingestion: Drink two glasses of water and INDUCE vomiting. Seek medical attention immediately.

SECTION 8 - SPECIAL PROTECTION INFORMATION

Respiratory Protection: Use with adequate ventilation.

Ventilation: Good general ventilation should be sufficient for most conditions.

Protective Gloves: Waterproof recommended.

Eyes: Safety glasses recommended.

Other Protective Equipment: N/A

SECTION 9 - SPILL OR LEAK PROCEDURES

Steps to be taken in case material is released or spilled:
Mop up or otherwise absorb and hold for disposal.

Waste disposal method:
Any method in accordance with applicable laws.

N/A = Not Applicable (Prepared According To 29 CFR 1910. 1200) Effective Date 11/92

SECTION 1 - PRODUCT IDENTIFICATION

Product Name: North Woods™ Sunbath **Chemical Family:** N/A
Generic Name: Disinfectant cleaner. **Formula:** N/A
Suppliers Name: SUPERIOR CHEMICAL CORP. **Phone** 414-457-4481
Suppliers Address: 1331 Wisconsin Avenue Sheboygan, WI 53081
Proper Shipping Name: Compound Cleaning Liquid

NPCA Hazardous Materials Identification System

Health	2
Flammability	0
Reactivity	0
Maximum Personal Protection	B

SECTION 2 - INGREDIENTS

CHEMICAL NAME	CAS NO.	WT.%	PEL	TWA-TLV	STEL-TLV	CARCINOGEN
2-Butoxyethanol*	111-76-2	3.0	25ppm	25ppm	N/A	No

*Subject to the reporting requirements of section 313 of the Emergency Planning and Community Right-To-Know Act of 1986 & 40 CFR 372.

SECTION 3 - PHYSICAL DATA

Boiling Range (°F): 213°F initial **Specific Gravity:** 1.01
Vapor Pressure: 20mm Hg@68°F **Vapor Density:** >1
% Volatile: 90+ **pH:** 11.5-12.5
Solubility in Water: 100% **Evaporation Rate:** <1
Physical Description: Thin blue liquid with pleasant odor.

SECTION 4 - FIRE & EXPLOSION HAZARD DATA

Flash Point (method used): N/A
Upper Explosive Limit: N/A **Lower Explosive Limit:** N/A
Extinguishing Media: N/A
Special Fire Fighting Procedures: N/A
Unusual Fire & Explosion Hazards: N/A

SECTION 5 - REACTIVITY DATA

Stability: Stable. **Hazardous Polymerization:** Will not occur.
Incompatibility (materials to avoid): None known.

Hazardous Decomposition Products: None known.

SECTION 6 - STORAGE & HANDLING INFORMATION

Precautions To Be Taken In Handling & Storage:
Keep out of reach of children. For use by trained personnel only. Keep container closed during storage. For institutional and industrial use only.

SECTION 7 - HEALTH HAZARDS AND FIRST AID

Effects of Overexposure:
Primary Route of Entry:

Skin: Skin irritant. Prolonged or repeated exposure may cause moderate reddening or swelling.

Eyes: Severe eye irritant. Liquid and mists may cause corneal injury.

Inhalation: Vapors may be irritating to mucous membranes of nose, throat and lungs.

Ingestion: May be irritating to mouth, throat, esophagus and gastrointestinal system. Vomiting and diarrhea expected with large doses.

First Aid Procedures:

Skin: Wash affected area with soap and water. Seek medical attention if irritation persists.

Eyes: Flush with large quantities of water for 15 minutes. Seek medical attention.

Inhalation: Get to fresh air. Seek medical attention if irritation persists.

Ingestion: Drink promptly a large quantity of water. DO NOT INDUCE vomiting. Avoid alcohol. Seek medical attention.

SECTION 8 - SPECIAL PROTECTION INFORMATION

Respiratory Protection: Use with adequate ventilation.

Protective Gloves: Waterproof recommended.

Other Protective Equipment: N/A

Ventilation: Provide local exhaust to keep TLV of Section 2 ingredients below acceptable limit.

Eyes: Safety glasses recommended.

SECTION 9 - SPILL OR LEAK PROCEDURES

Steps to be taken in case material is released or spilled:
Mop up or otherwise absorb and hold for disposal.

Waste disposal method:
Any method in accordance with applicable laws.

Sampling and Analysis Plan

Introduction

This plan describes the sampling and analysis program for the long term response action (LTRA) activities for the N.W. Mauthe Superfund site located in Appleton, Wisconsin. This plan describes the data collection and quality assurance requirements for sampling and analysis conducted by CH2M HILL during the implementation of the LTRA. The majority of the detailed information regarding these issues can be found in the supporting plans. The supporting plans consist of the following:

- A Field Sampling Plan (FSP) that defines the sampling and data collection methods that will be used to evaluate clean.up progress during the implementation of the LTRA.

- A Quality Assurance Project Plan (QAPP) that describes the project objectives and organization, functional activities, and quality assurance/quality control (QA/QC) protocols that will be used to achieve the desired data quality objectives during the implementation of the LTRA.

Site Background and Project Understanding

The N.W. Mauthe Site is a former electroplating facility located at 725 South Outagamie Street in Appleton, Wisconsin. Norbert W. Mauthe was the owner of Wisconsin Chromium Corporation (WC) from its inception in 1946 until 1976. In 1960, WC moved from 1522 West Melvin Street to 725 South Outagamie Street, and engaged in hard chrome plating until 1976. In 1976, Mr. Mauthe sold WC to Southern Plating and Machine Company, and chrome plating ceased. Electroplating of zinc, cadmium, and possibly copper and silver was conducted at an adjacent building on the same property from 1978 until 1987 under the name N.W. Mauthe Company.

Under contract to the Wisconsin Department of Natural Resources (WDNR), CH2M HILL conducted a Remedial Investigation and Feasibility Study (RI/FS) at the site beginning in November 1991. These investigations revealed that the site was contaminated with zinc, cadmium, chromium, and cyanide. Organic compounds including 1,1,1-trichloroethane, trichloroethene, acetone, and other chlorinated hydrocarbons were also present.

In March of 1994, a Record of Decision (ROD) was signed by the agencies which required the following actions to be taken at the Site:

- Demolition and removal of the buildings on the N.W. Mauthe Property
- Excavation and offsite treatment of soils with a total chromium concentration of greater than 500 mg/kg
- Backfilling of the excavation with clean soils, capping the site with two feet of clay and topsoil, and the establishment of vegetative cover

- Installation of groundwater collection trenches and construction and operation of a groundwater treatment facility with discharge to the sanitary sewer. The purpose of the treatment system is to contain and/or control groundwater contamination with the ultimate goal of compliance with groundwater applicable or relevant and appropriate requirements (ARARs)
- Improvement or installation of foundation drain systems and cleaning, painting or sealing of basement walls and floors, as needed, for homes or businesses in the area of the site, to prevent seepage of contaminated water into the buildings
- Monitoring of the effectiveness of the groundwater treatment system and groundwater quality
- Operation and maintenance of all systems

Following signature of the ROD, the State of Wisconsin turned the project over to the USEPA to prepare the Remedial Design (RD) and conduct the Remedial Action (RA). The USEPA awarded the contract for the RD to CH2M HILL on May 12, 1994 under the Alternative Remedial Contracting Strategy (ARCS) contract.

The USEPA determined that the RD/RA should be broken into two phases. Phase I involved the excavation of contaminated soils and installation of the groundwater collection trenches. Phase II involved the construction of the groundwater treatment system. The Phase I RD was completed in March 1995 and with CH2M HILL as the USEPA contractor the RA was completed in January 1996. Phase II RA work commenced in June 1996 and was completed in June 1997.

Following the substantial completion of Phase I and II in January 1997, CH2M HILL began implementing the LTRA at the N.W. Mauthe Site. The LTRA is the implementation phase of the site remedial action, i.e., operation and maintenance and performance monitoring of the groundwater collection and treatment systems at the site.

Project Objectives

The long term remedial action objectives, as stated in the ROD, are to "reduce the contaminant concentrations in groundwater to achieve federal drinking water standards and/or state groundwater quality standards, whichever are more stringent". Table 1 presents the state and federal standards for the contaminants found at the N.W. Mauthe site.

TABLE 1
Groundwater Quality Standards for Contaminants of Concern
N.W. Mauthe Site

Contaminants	State Enforcement Std[1] (µg/L)	State PAL[1] (µg/L)	Federal MCL[2] (µg/L)
Cadmium	10	1	5
Chromium	50	5	100
Cyanide	200	40	200
Copper	1,000	500	---

TABLE 1
Groundwater Quality Standards for Contaminants of Concern
N.W. Mauthe Site

Contaminants	State Enforcement Std[1] (µg/L)	State PAL[1] (µg/L)	Federal MCL[2] (µg/L)
Mercury	2	0.2	2
Manganese	50	25	---
Zinc	5,000	2,500	5,000[3]
Chloroform	6	0.6	100
1,1-Dichloroethane	850	85	---
1,1-Dichloroethene	7	0.024	7
1,2-Dichloroethene (cis/trans)	100/100	10/20	70/100
Toluene	343	68.6	1,000
1,1,1-Trichloroethane	200	40	200
1,1,2-Trichloroethane	0.6	0.06	5
Trichloroethene	5	0.18	5
Benzene	5	0.067	5
Xylene (Total)	620	124	10,000

[1] Wis. Adm. Code NR 140.10.
[2] 40 CFR 141.61 and 141.62.
[3] Secondary MCL.

Groundwater Collection, Treatment and Monitoring Systems

The long term remedial action activities at the N.W. Mauthe site include the collection, treatment and monitoring of contaminated groundwater. The locations of the groundwater collection trenches, treatment system and monitoring wells are shown on Figure 1.

Groundwater Collection System

The collection system is designed to influence the extent of the groundwater plume that exceeds Wisconsin groundwater criteria for chromium. The collection trench system consists of the west, central, and southeast segments, which are approximately 200, 280, and 600 feet in length, respectively. The coarse sand-filled trenches influence groundwater flow, based on the head differential between the local water table and the level maintained in the trench. Perforated drain pipe in the bottom of the trench drains water from the trench to one of two manholes after which the groundwater is pumped to the groundwater treatment facility.

Groundwater Treatment System

The groundwater treatment system uses a fully automated batch treatment process designed for control of total chromium. Each batch operation treats 2,600 gallons of influent groundwater and takes about 6 hours to complete a cycle (i.e., from the start of filling the reaction tank to finishing the discharge to the POTW). The system was designed to treat a maximum of 10,000 gallons per day (gpd) (i.e., four batches per day), although the expected

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MW-108
W-2
MELVIN STREET
CONNECT TO EXISTING WATER MAIN
CONNECT TO EXISTING SANITARY SEWER
CONNECT TO EXISTING GAS MAIN
SECURITY FENCE
ELECTRIC SUBSTATION
ASPHALT DRIVEWAY
PZ-4
WEST GROUNDWATER COLLECTION TRENCH
MW-101
GROUNDWATER TREATMENT FACILITY
MW-107
MANHOLE NO. 2
MW-102
HSE
CONC
CENTRAL GROUNDWATER COLLECTION TRENCH
PZ-3
FOUNDATION CONC DRAIN LATERAL
PZ-1
MW-103
W-15
MANHOLE NO. 1
ELECTRICAL TRANSFORMER
BLDG
FOUNDATION DRAIN LATERAL
GAR
MW-104
HSE
HSE
TAVERN
TAVERN
SUMP EFFLUENT PIPE
PZ-2
MW-106
FOUNDATION DRAIN LATERAL
OUTAGAMIE STREET
SECOND STREET
SOUTH EAST GROUNDWATER COLLECTION TRENCH
W-8
MW-105

0+50E 1+00E 1+50E 2+00E 2+50E 3+00E 3+50E 4+00E 4+50E
4+00N 3+50N 3+00N 2+50N 2+00N 1+50N 1+00N 0+50N

LEGEND

- T — OVERHEAD TELEPHONE
- G — GAS MAIN
- P — OVERHEAD POWER
- W — WATER MAIN
- SAN — SANITARY SEWER
- STM — STORM SEWER
- FENCE
- APPROXIMATE PROPERTY LINE
- UTILITY POLE
- TREE
- SHRUB LINE
- 804.0 SPOT ELEVATION
- 804 CONTOUR LINE
- CONC CONCRETE PAVEMENT
- BITUM BITUMNOUS PAVEMENT
- HSE HOUSE
- GAR GARAGE
- MONITORING WELL

N
0 20' 40' 60'

FIGURE NO. 1
COLLECTION TRENCH AND MONITORING WELL LOCATIONS
N.E. MAUTHE LTRA

CH2MHILL

daily volume is approximately 2,600 gallons. A complete description of the treatment facility can be found in the Groundwater Treatment System Operation and Maintenance (O&M) Manual, April 1997.

Groundwater Monitoring Network

The groundwater monitoring well network was designed to provide information on containment of the groundwater and on water quality at the site and adjacent residential properties. The monitoring network is comprised of eleven wells constructed during the RI and the RA activities (W-2, W-8, W-15, MW-101, MW-102, MW-103, MW-104, MW-105, MW-106, MW-107, MW-108).

- Monitoring wells W-2 and MW-108 are located upgradient of the site to monitor background conditions. W-2 will also monitor any petroleum contamination that may be migrating onsite from an upgradient source.

- Monitoring well MW-101, which is located west of the site, will be used to monitor the effectiveness of the West Trench in preventing the migration of groundwater contamination.

- Three downgradient wells—MW-102, MW-103, and MW-104— will be used to monitor changes in groundwater quality downgradient of the Central Trench and to monitor hydraulic gradient control.

- Four wells—W-8, MW-15, MW-105, and MW-106—will be used to monitor changes in groundwater quality outside of the Southeast Trench. Monitoring wells MW-106 and W-15 will also be used to monitor hydraulic gradient control of the Southeast Trench.

- Monitoring well MW-107 will used to provide source area groundwater quality data and hydraulic gradient information upgradient of the Central Trench.

Groundwater monitoring and treatment system monitoring will be conducted as part of the LTRA monitoring. The specific objectives for the monitoring activities are described below.

Groundwater Monitoring and Analysis

Groundwater monitoring will be used to evaluate groundwater quality, water table elevations and groundwater flow at the site. Groundwater samples from the monitoring wells will be analyzed for the compounds listed previously in Table 1. The samples will be analyzed in accordance with the analytical procedures detailed in the QAPP. Field temperature and pH will also be recorded for each well during sampling events. Field sampling procedures, methods of analyses, and QA/QC protocols for analyses will be conducted in accordance with the QAPP.

Procedures for measuring water levels, performing field tests, and collecting the groundwater samples are described in the Field Sampling Plan. Standard operating procedures (SOPS) related to specific sampling and decontamination procedures, sampling frequencies, and analytical requirements are discussed in the QAPP.

Treatment System Monitoring and Analysis

The City of Appleton POTW Industrial User Permit (Permit No. 97-21) requires monitoring of the treatment system effluent and reporting in order to verify compliance with permit limits. The POTW has designated the treatment system discharge as Outfall 001. Outfall 001 enters the city sewer at Manhole 30-14 on Melvin Street. Compliance monitoring includes collection and analysis of the treatment facility effluent samples.

Treatment system effluent analysis includes onsite and offsite analyses. Onsite analysis includes collecting an effluent sample for each discharge event which is analyzed for hexavalent chromium using an onsite Hach colorimetric test kit. Offsite analyses include: yearly effluent samples for aluminum, arsenic, cadmium, hexavalent chromium, copper, cyanide, lead, mercury, nickel and zinc; and quarterly effluent samples for total chromium.

Project Schedule

The field sampling plan includes quarterly sampling events for the monitoring wells and treatment system. Sampling for each batch treated by the treatment plant is performed by the O&M subcontractor. Monthly discharge monitoring reports are prepared for compliance with the City of Appleton POTW discharge permit. The sampling schedule will be evaluated annually and adjusted as needed depending on the analytical results and the operation of the collection and treatment system.

The results of the sampling and analysis program will be compiled annually. The analytical results will be averaged and the data evaluated to examine spatial and temporal trends. This analysis will also include groundwater elevation readings. The types of spatial and temporal trends conducted will be evaluated after each year of sampling.

The entire monitoring program will be reevaluated annually. Specific adjustments to the program such as recommended changes to the analyte list, monitoring well network, and sampling frequency will be made annually.

Quality Assurance Project Plan Addendum No. 2
for the
Remedial Action

N.W. Mauthe Company
Appleton, Wisconsin

WA No. 007-RARA-056G / Contract 68-W6-0025

CH2MHILL

August 15, 1997

Quality Assurance Project Plan Addendum No. 2

Project Title:	N.W. Mauthe Company Appleton, Wisconsin
Work Assignment:	007-RARA-056G
EPA Contract No.:	68-W6-0025
EPA Remedial Project Manager:	Jon Peterson

Prepared by: **CH2M HILL** Date: August 15, 1997

Approved by: _____ Date: _____
Erin Potts
CH2M HILL Site Manager

Approved by: _____ Date: _____
John Fleissner
CH2M HILL Quality Assurance Manager

Approved by: _____ Date: _____
Jon Petersen
EPA Region 5
Remedial Project Manager

Approved by: _____ Date: _____
EPA Region 5
Quality Assurance Reviewer

SECTION 1

Introduction

This Quality Assurance Project Plan (QAPjP) addendum was written to address the change to the Long Term Response Action (LTRA) activities at the N.W. Mauthe Company Site in Appleton, Wisconsin, from the Alternative Remedial Contracts Strategy (ACRS) to the Response Action Contract (RAC). The new Work Assignment number is No. 68-W6-0025. Sections of the January 1997 Addendum No. 1 to the original QAPjP (January 20, 1995) have been modified to reflect this change. Sections of the QAPjP where there are no changes have been noted.

SECTION 2

Contents

SECTION 3

Project Description

Project description of the Approved QAPjP, dated January 20, 1995, is applicable except for additional information that is to be inserted in the Sections 3.6, 3.7, and 3.8.

3.6 Parameters to be Tested and Frequency

The analytical parameters to be tested, practical quantification limits, and testing frequency (Tables 3-1, 3-2, and 3-4) are unchanged from Addendum No. 1. The total number of samples to be collected, and subsequently the number of QC samples to be collected, are reduced and are presented in Table 3-3. The sludge sampling and analysis is now the responsibility of the onsite operations and maintenance subcontract staff.

3.7 Data Quality Objectives

Data quality objectives (DQOs) are both qualitative and quantitative statements that define the type, quality, and quantity of data necessary to support project decisions. The DQO process that will be used for PART projects follows the guidance of the U.S. Environmental Protection Agency (USEPA, 1995).

There are two end uses for the project data: screening and definitive. Screening data may include such field measurements as temperature, pH, reduction-oxygen (redox) potential, and conductivity; however, screening can also include organic and inorganic analyses performed in the field. Screening data are generally performed without the QA/QC and documentation required for a rigorous review of data quality.

Screening data are data where QA/QC and documentation requirements do not allow for definitive assessment of analytical performance. Screening data might not be validated, or validation may consist simply of a completeness check. Definitive data are results of known and documented quality. The definitive data may be validated according to the Functional Guidelines or in a manner developed from them. The tiered approach provides sufficient latitude so that the data receive only the required level of data validation to support the actual use of that data.

Data Type

Screening Data

Screening data may include such field measurements as temperature, pH, reduction-oxygen (redox) potential, and conductivity, but can also include organic and inorganic analyses performed in the field. Screening data are generally performed without the QA/QC and documentation required for a rigorous review of data quality.

The screening data will be QC reviewed by the FTL or, as appropriate, the field chemist. Data will be accepted or rejected by the reviewer. Unusual readings will be recorded in the field logbook, along with the rationale for accepting or rejecting the data.

Definitive data are the data of documented quality. This type of data includes the results that demonstrate that the LTRA is containing the contaminated water, and that the contaminated water is being properly treated prior to being discharged to the local POTW. Definitive data can be generated by a variety of measurements, ranging from onsite field Hach Kit analyses to laboratory analyses.

Definitive data can be generated by a variety of measurements, ranging from onsite field analyses to laboratory analyses.

The following parameters will be Screening Data:

- pH
- Temperature
- Specific conductance
- Flow
- Total suspended solids (TSS)
- Color
- Transparency

The following performance monitoring analyses will be Definitive Data:

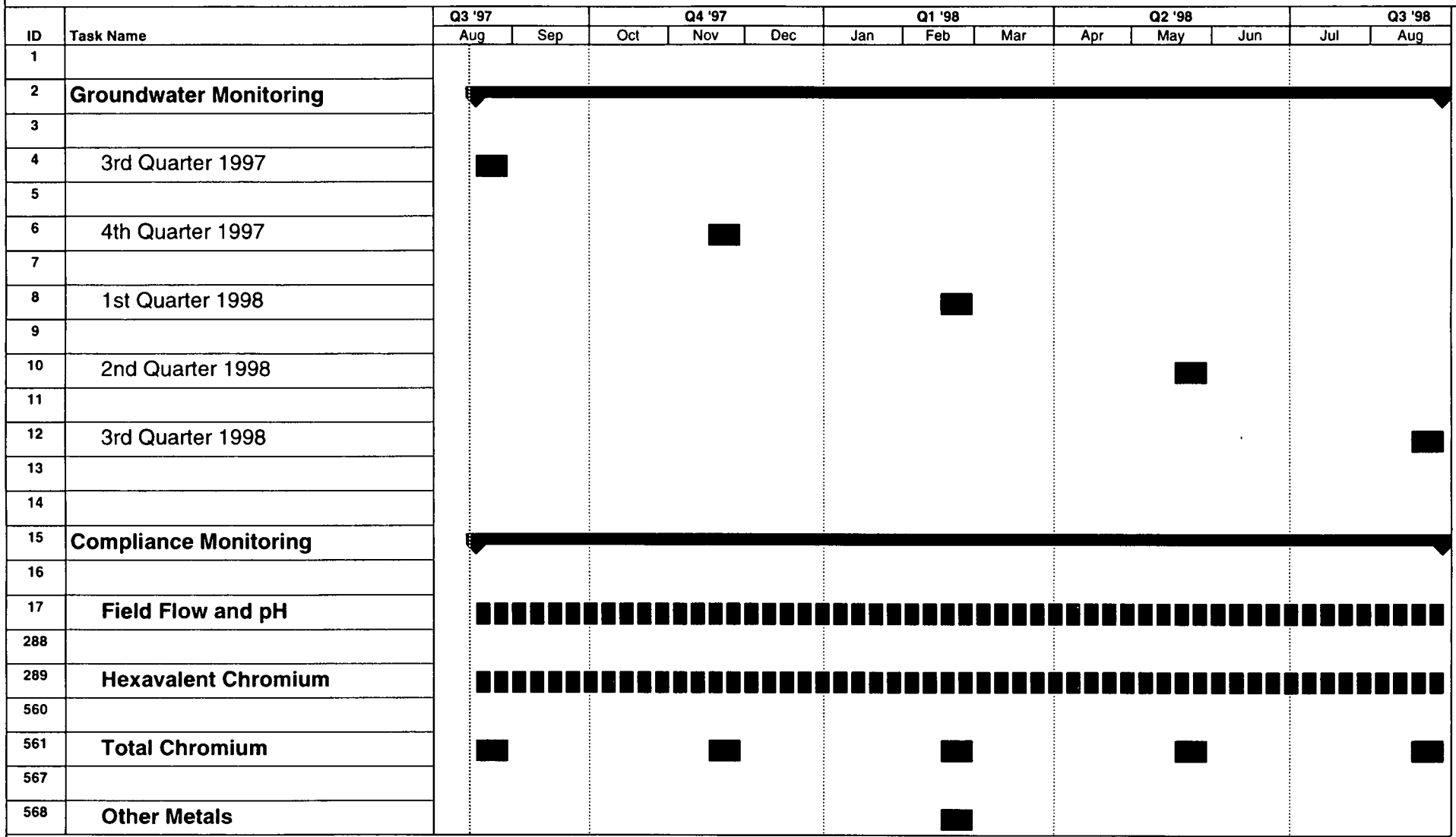
- Process water Hach Kit analysis for total chromium
- Process water Hach Kit analysis for hexavalent chromium
- Groundwater monitoring for select VOCs
- Groundwater monitoring for select metals
- Groundwater monitoring for cyanide
- Compliance monitoring for select metals
- Compliance monitoring for cyanide
- Performance monitoring for TCLP metals and percent solids

3.8 Project Schedule

The proposed schedule for field activities is shown in Figure 3-1.

There are no other changes to Section 3 of the Quality Assurance Project Plan dated January 20, 1995, or Addendum No. 1 dated January 1997.

Figure 3-1
N.W. Mauthe Superfund Site
Groundwater Monitoring and Groundwater Treatment System Monitoring



Project: N.W. Mauthe
Date: 8/15/97

Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress

SECTION 4

Project Organization and Responsibility

The project organization is provided in Figure 4-1.

There are no other changes to Section 4 of the Quality Assurance Project Plan dated January 20, 1995, or Addendum No. 1 dated January 1997.

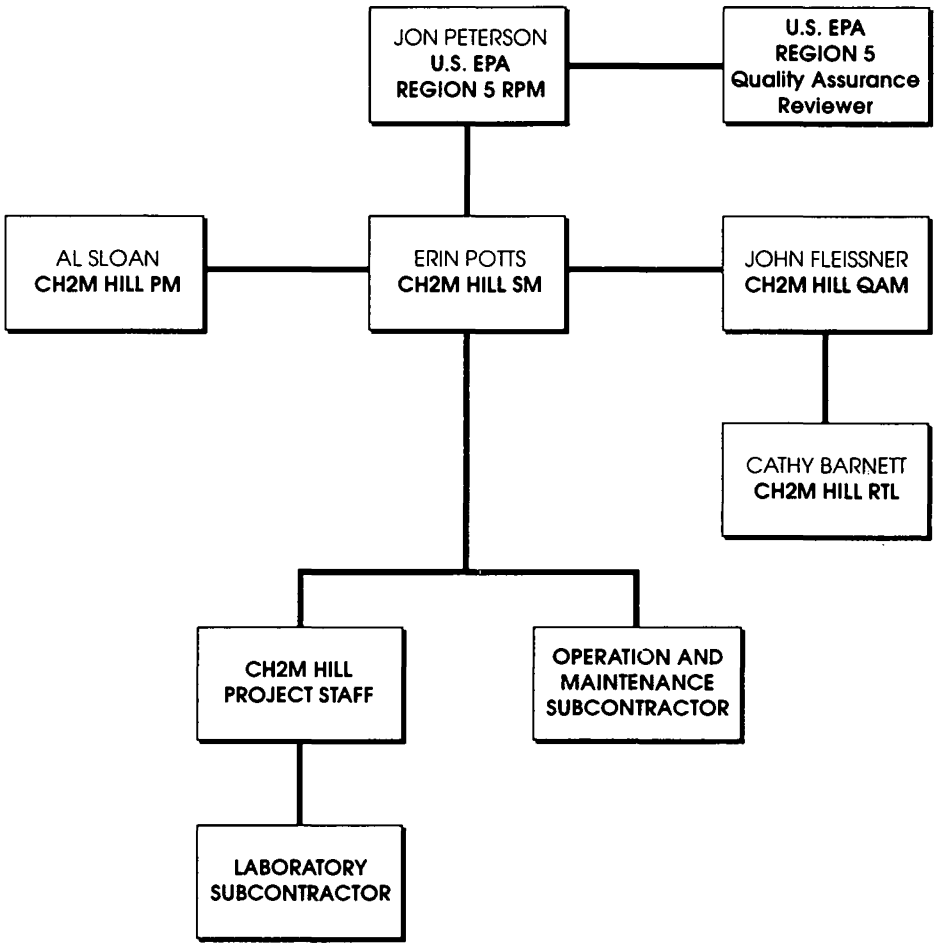


FIGURE 4-1
Project Organization
N.W. Mauthe Site

SECTION 5

Quality Assurance Objectives for Measurement Data

The number of QC samples to be collected is listed in Table 3-3.

There are no other changes to Section 5 of the Quality Assurance Project Plan dated January 20, 1995, or Addendum No. 1 dated January 1997.

SECTION 6

Sampling Procedures

There is no change to Section 6 of the Quality Assurance Project Plan dated January 20, 1995, or Addendum No. 1 dated January 1997.

SECTION 7

Sample Custody

There is no change to Section 7 of the Quality Assurance Project Plan dated January 20, 1995, or Addendum No. 1 dated January 1997.

SECTION 8

Calibration Procedures and Frequency

There is no change to Section 8 of the Quality Assurance Project Plan dated January 20, 1995, or Addendum No. 1 dated January 1997.

SECTION 9

Analytical Procedures

There is no change to Section 9 of the Quality Assurance Project Plan dated January 20, 1995, or Addendum No. 1 dated January 1997.

SECTION 10

Internal QC Checks

There is no change to Section 10 of the Quality Assurance Project Plan dated January 20, 1995, or Addendum No. 1 dated January 1997.

SECTION 11

Data Reduction, Validation, and Reporting

There is no change to Section 11 of the Quality Assurance Project Plan dated January 20, 1995, or Addendum No. 1 dated January 1997.

SECTION 12

Performance and System Audits

There is no change to Section 12 of the Quality Assurance Project Plan dated January 20, 1995, or Addendum No. 1 dated January 1997.

SECTION 13

Preventive Maintenance Procedures

There is no change to Section 13 of the Quality Assurance Project Plan dated January 20, 1995, or Addendum No. 1 dated January 1997.

SECTION 14

Specific Routine Procedures to Assess Data Precision, Accuracy, and Completeness

There is no change to Section 14 of the Quality Assurance Project Plan dated January 20, 1995, or Addendum No. 1 dated January 1997.

SECTION 15

Corrective Actions

There is no change to Section 15 of the Quality Assurance Project Plan dated January 20, 1995, or Addendum No. 1 dated January 1997.

SECTION 16

Quality Assurance Reports to Management

There is no change to Section 16 of the Quality Assurance Project Plan dated January 20, 1995, or Addendum No. 1 dated January 1997.

Field Sampling Plan
Long Term Response Action

N.W. Mauthe Site
Appleton, Wisconsin

WA No. 003-RARA-056G
Contract No. 68-W6-0025

Prepared by

CH2MHILL

August 1997

Contents

Field Sampling Plan

Introduction

This plan describes the field sampling program for the long-term response action (LTRA) activities for the N.W. Mauthe Superfund site located in Appleton, Wisconsin (Figure 1). The field sampling program is designed to monitor the effectiveness of the groundwater collection, treatment and monitoring systems in meeting the requirements of the ROD. This plan defines the monitoring, sampling and data collection methods that will be used to evaluate cleanup progress during the implementation of the LTRA.

Monitoring will consist of groundwater sampling to evaluate changes in groundwater quality and measurements of water table elevations to evaluate groundwater flow at the site. Sampling will also include collection of groundwater treatment plant effluent samples to evaluate the effectiveness of the treatment facility in removing the contamination and meeting the City of Appleton POTW Industrial User Discharge permit requirements.

Site Background and Project Understanding

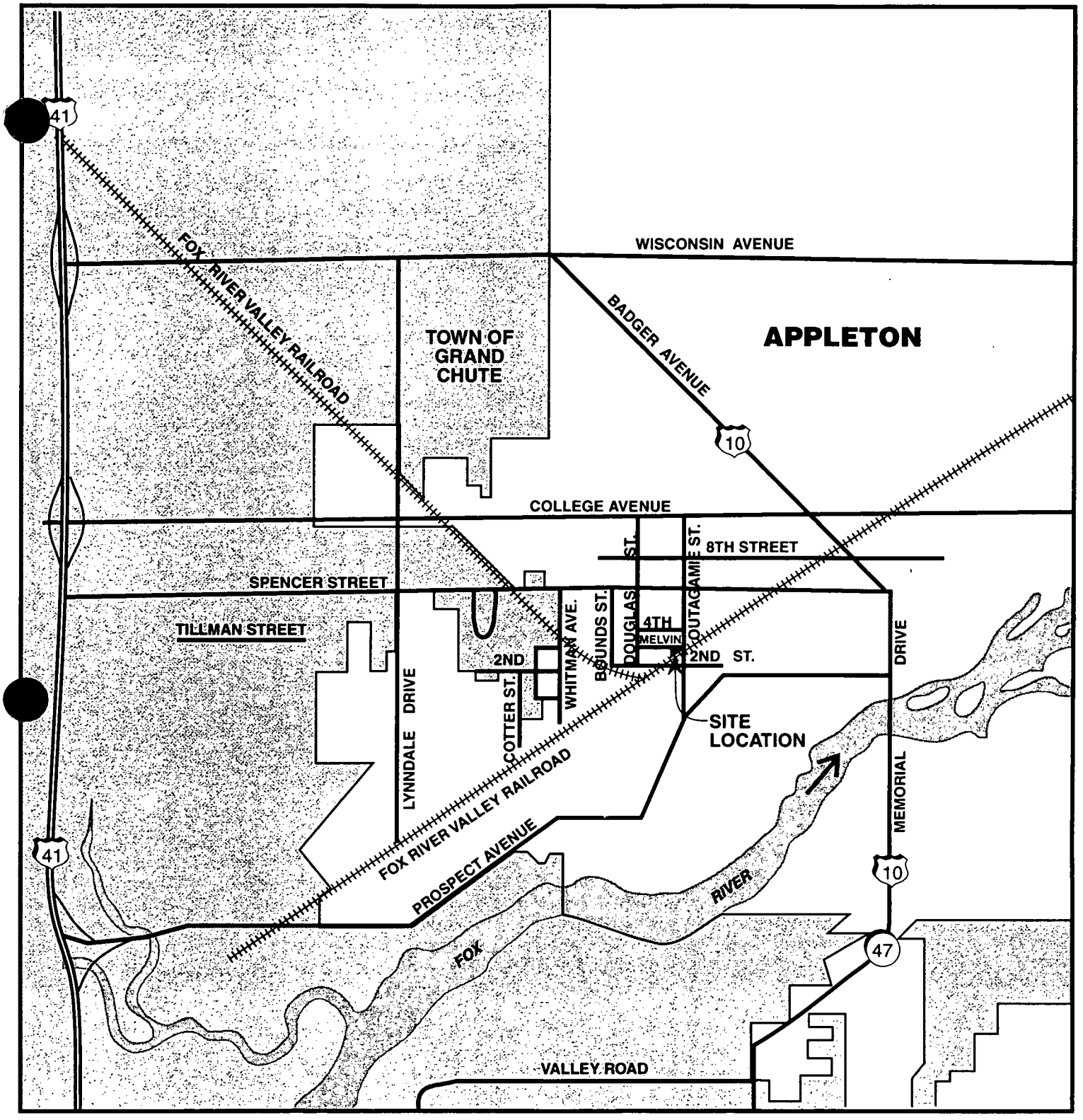
The N.W. Mauthe Site is a former electroplating facility located at 725 South Outagamie Street in Appleton, Wisconsin. Norbert W. Mauthe was the owner of Wisconsin Chromium Corporation (WC) from its inception in 1946 until 1976. In 1960, WC moved from 1522 West Melvin Street to 725 South Outagamie Street, and engaged in hard chrome plating until 1976. In 1976, Mr. Mauthe sold WC to Southern Plating and Machine Company, and chrome plating ceased. Electroplating of zinc, cadmium, and possibly copper and silver was conducted at an adjacent building on the same property from 1978 until 1987 under the name N.W. Mauthe Company.

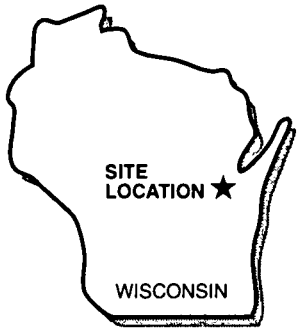
Under contract to the Wisconsin Department of Natural Resources (WDNR), CH2M HILL conducted a Remedial Investigation and Feasibility Study (RI/FS) at the site beginning in November 1991. These investigations revealed that the site was contaminated with zinc, cadmium, chromium, and cyanide. Organic compounds including 1,1,1-trichloroethane, trichloroethene, acetone, and other chlorinated hydrocarbons were also present.

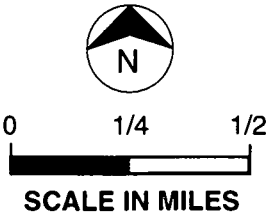
Record of Decision Goals

The Record of Decision (ROD), signed in March of 1994, defines the selected remedy and addresses the goals of the remedial action. The selected action for the remedy includes the following remedial actions for groundwater:

- Installation of groundwater collection trenches and construction and operation of a groundwater treatment facility with discharge to the sanitary sewer, to contain and/or control groundwater contamination with ultimate compliance with groundwater applicable or relevant and appropriate requirements (ARARs)







Map Source: R.R. Donnelley & Sons Co. Cartographic Services

FIGURE 1
Site Location Map
N.W. Mauthe Site

- Improvement or installation of foundation drain systems and cleaning, painting or sealing of basement walls and floors, as needed, for homes or businesses in the area of the site, to prevent seepage of contaminated water into the buildings
- Institutional controls, such as deed restrictions or easements and site access controls that are intended to prevent access, excavation, disturbance of the cap, future soil excavation in the railroad corridor for areas in the corridor where contaminated soil will remain and installation of drinking water wells;
- Monitoring of the effectiveness of the groundwater treatment system and groundwater quality
- Operation and maintenance of all systems

Purpose

The purpose of this plan is to provide or reference procedures for quarterly monitoring of the groundwater and groundwater treatment system. Monitoring is necessary to verify that the groundwater collection system is containing the contaminated groundwater and preventing its migration, to assess if the treatment system is reducing the level of contaminants in the plume, and to evaluate the operation of the groundwater treatment facility.

This plan includes the following sections:

- Groundwater cleanup standards
- Sampling rationale and intended data use
- Groundwater collection, treatment and monitoring systems
- Sampling schedule and frequency
- Analytical procedures
- Data analysis and evaluation
- Sampling equipment and procedures
- Reporting procedures

The guidelines presented in this field sampling plan are based on the best available information at the time of design and may not account for unanticipated field conditions. Therefore, the results of each data set collected shall be evaluated in the context of satisfying the intent of the ROD.

Groundwater Cleanup Standards

The long term remedial action objectives, as stated in the ROD, are to "reduce the contaminant concentrations in groundwater to achieve federal drinking water standards and/or state groundwater quality standards, whichever are more stringent". Table 1 presents the state and federal standards for the contaminants found at the N.W. Mauthe site.

TABLE 1
Groundwater Quality Standards for Contaminants of Concern
N.W. Mauthe Site

Contaminants	State Enforcement Std[1] (µg/L)	State PAL[1] (µg/L)	Federal MCL[2] (µg/L)
Cadmium	10	1	5
Chromium	50	5	100
Cyanide	200	40	200
Copper	1,000	500	—
Mercury	2	0.2	2
Manganese	50	25	—
Zinc	5,000	2,500	5,000[3]
Chloroform	6	0.6	100
1,1-Dichloroethane	850	85	—
1,1-Dichloroethene	7	0.024	7
1,2-Dichloroethene (cis/trans)	100/100	10/20	70/100
Toluene	343	68.6	1,000
1,1,1-Trichloroethane	200	40	200
1,1,2-Trichloroethane	0.6	0.06	5
Trichloroethene	5	0.18	5
Benzene	5	0.067	5
Xylene (Total)	620	124	10,000

[1] Wis. Adm. Code NR 140.10.
[2] 40 CFR 141.61 and 141.62.
[3] Secondary MCL.

If it becomes apparent that it is technically or economically infeasible to achieve a Wisconsin PAL, then a Wisconsin alternative concentration limit (ACL) may be considered.

If it becomes apparent that it is technically impractical to achieve the groundwater cleanup standards, including any ACL established, then alternate methods of controlling the groundwater plume or source would be considered. If those alternate methods are not able to attain the groundwater cleanup standards or an ACL, then a Comprehensive Environmental Response and Compensation Liability Act (CERCLA) waiver may be considered.

Sampling Rationale and Intended Data Use

The objectives of the groundwater monitoring program are to:

- Provide data to evaluate the effects of hydraulic gradient control and collection of contaminated groundwater within the aquifer
- Provide data to evaluate reduction of groundwater contaminant concentrations in the aquifer onsite in relation to associated cleanup criteria
- Provide a trigger for the implementation of additional or corrective measures if it is determined that the system is not performing effectively

These data shall be used to evaluate the effectiveness of the remedial action design and determine when groundwater collection may cease.

Groundwater Collection, Treatment and Monitoring Systems

The long term remedial action activities at the N.W. Mauthe site include the collection, treatment and monitoring of contaminated groundwater. The locations of the groundwater collection trenches, treatment system and monitoring wells are shown on Figure 2.

Groundwater Collection System

The collection system is designed to influence the extent of the groundwater plume that exceeds Wisconsin groundwater criteria for chromium. The collection trench system consists of the west, central, and southeast segments, which are approximately 200, 280, and 600 feet in length, respectively. The coarse sand-filled trenches influence groundwater flow, based on the head differential between the local water table and the level maintained in the trench. There are four piezometers (PZ-1, PZ-2, PZ-3 and PZ-4) located throughout the collection system (see Figure 2) that can be used to determine the water level in the collection trench, if necessary, for purposes of assessing trench conditions. Perforated drain pipe in the bottom of the trench drains water from the trench to one of two manholes after which the groundwater is pumped to the groundwater treatment facility.

Groundwater Treatment System

The groundwater treatment system uses a fully automated batch treatment process designed for control of total chromium. Each batch operation treats 2,600 gallons of influent groundwater and takes about 6 hours to complete a cycle (i.e., from the start of filling the reaction tank to finishing the discharge to the POTW). The system was designed to treat a maximum of 10,000 gallons per day (gpd) (i.e., four batches per day), although the expected daily volume is approximately 2,600 gallons. A complete description of the treatment facility can be found in the Groundwater Treatment System Operation and Maintenance (O&M) Manual, April 1997.

Groundwater Monitoring Network

The groundwater monitoring well network was designed to provide information on water quality at the site and adjacent residential properties and on containment of the groundwater. A groundwater model was developed as part of the feasibility study (FS). Based on this model, the capture zone for the groundwater collection trenches was estimated to range from 2 to 40 feet with a log average of 8 feet. Monitoring wells were positioned within 10 feet of the centerline of the groundwater collection trenches to monitor containment. Additional monitoring wells were placed onsite (behind the Central Trench) and between the Central Trench and the Southeast Trench to determine if groundwater mounding is occurring and to provide information on hydraulic gradient control. Groundwater wells are also positioned both upgradient and downgradient of the site to monitor groundwater quality. In addition, a Stevens continuous water level recorder was placed in the Central Trench manhole to monitor water levels in the trench. This data will allow for the evaluation of trench performance and any potential plugging or fouling issues.

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MW-108
W-2
0+50E
1+00E
1+50E
2+00E
2+50E
3+00E
3+50E
4+00E
4+50E
4+00N
3+50N
3+00N
2+50N
2+00N
1+50N
1+00N
0+50N
CONNECT TO EXISTING WATER MAIN
CONNECT TO EXISTING SANITARY SEWER
CONNECT TO EXISTING GAS MAIN
SECURITY FENCE
MELVIN STREET
ELECTRIC SUBSTATION
ASPHALT DRIVEWAY
PZ-4
WEST GROUNDWATER COLLECTION TRENCH
GROUNDWATER TREATMENT FACILITY
MW-101
MW-107
MANHOLE NO. 1
MANHOLE NO. 2
MW-102
HSE
CONC
CENTRAL GROUNDWATER COLLECTION TRENCH
PZ-3
FOUNDATION CONC DRAIN LATERAL
PZ-1
MW-103
FOUNDATION DRAIN LATERAL
W-15
ELECTRICAL TRANSFORMER
BLDG
GAR
MW-104
TAVERN
SUMP EFFLUENT PIPE
HSE
PZ-2
MW-106
FOUNDATION DRAIN LATERAL
OUTAGAMIE STREET
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SECOND STREET
W-8
MW-105
BITUM
CONC SDWK
SAN
STM
W
G
P

LEGEND

- T — OVERHEAD TELEPHONE
- G — GAS MAIN
- P — OVERHEAD POWER
- W — WATER MAIN
- SAN — SANITARY SEWER
- STM — STORM SEWER
- FENCE
- APPROXIMATE PROPERTY LINE
- UTILITY POLE
- TREE
- SHRUB LINE
- 804.0 SPOT ELEVATION
- 804 CONTOUR LINE
- CONC CONCRETE PAVEMENT
- BITUM BITUMNOUS PAVEMENT
- HSE HOUSE
- GAR GARAGE
- MONITORING WELL

N

0 20' 40' 60'

FIGURE NO. 2

COLLECTION TRENCH AND MONITORING WELL LOCATIONS

N.E. MAUTHE LTRA

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The groundwater monitoring well network was designed to provide information on containment of the groundwater and on water quality at the site and adjacent residential properties. The monitoring network is comprised of eleven wells constructed during the RI and the RA activities (W-2, W-8, W-15, MW-101, MW-102, MW-103, MW-104, MW-105, MW-106, MW-107, MW-108).

- Monitoring wells W-2 and MW-108 are located upgradient of the site to monitor background conditions. W-2 will also monitor any petroleum contamination that may be migrating onsite from an upgradient source.

- Monitoring well MW-101, which is located west of the site, will be used to monitor the effectiveness of the West Trench in preventing the migration of groundwater contamination.

- Three downgradient wells—MW-102, MW-103, and MW-104— will be used to monitor changes in groundwater quality downgradient of the Central Trench and to monitor hydraulic gradient control.

- Four wells—W-8, W-15, MW-105, and MW-106—will be used to monitor changes in groundwater quality outside of the Southeast Trench. Monitoring wells MW-106 and W-15 will also be used to monitor hydraulic gradient control of the Southeast Trench.

- Monitoring well MW-107 will used to provide source area groundwater quality data and hydraulic gradient information upgradient of the Central Trench.

Sampling Schedule and Frequency

The field sampling plan includes quarterly sampling of the monitoring wells and treatment plant effluent, yearly sampling of the treatment plant effluent, and collection of quarterly groundwater elevation data from the monitoring wells.

The sampling schedule will be evaluated annually and adjusted as needed depending on the analytical results and the operation of the collection and treatment system. The sampling plan is described below.

Quarterly Sampling and Elevation Measurements

The primary objectives of the quarterly sampling and elevation measurements are to monitor the reduction of contaminant concentrations in the aquifer and to evaluate the groundwater collection and treatment system for effective operation. Quarterly groundwater samples from the eleven monitoring wells will be collected during August, November, February, and May. Quarterly samples will be analyzed for the parameters shown in Table 1. Quarterly groundwater elevation measurements will be taken from the monitoring wells prior to sampling.

Treatment System Monitoring and Analysis

The City of Appleton POTW Industrial User Permit (Permit No. 97-21) requires monitoring of the treatment system effluent and reporting in order to verify compliance with permit limits. The POTW has designated the treatment system discharge as Outfall 001. Outfall 001

enters the city sewer at Manhole 30-14 on Melvin Street. Compliance monitoring includes collection and analysis of the treatment facility effluent samples. The effluent samples are collected from the reaction tank effluent sample port. The layout of the treatment facility is shown in Figure 3.

Treatment system effluent analysis includes onsite and offsite analyses. Onsite analysis includes collecting an effluent sample for each discharge event which is analyzed for hexavalent chromium using an onsite *Hach* colorimetric test kit. Onsite analyses are performed by the operation and maintenance subcontractor personnel. Offsite analyses include: yearly effluent samples for aluminum, arsenic, cadmium, hexavalent chromium, copper, cyanide, lead, mercury, nickel and zinc; and quarterly effluent samples for total chromium.

Analytical Procedures

Groundwater and treatment plant samples will be analyzed in accordance with the analytical procedures specified in the quality assurance project plan (QAPP). Field temperature, conductivity and pH will also be recorded for each well during sampling events. Field sampling procedures, methods of analyses, and QA/QC protocols for analyses will be conducted in accordance with the QAPP.

Data Analysis and Evaluation

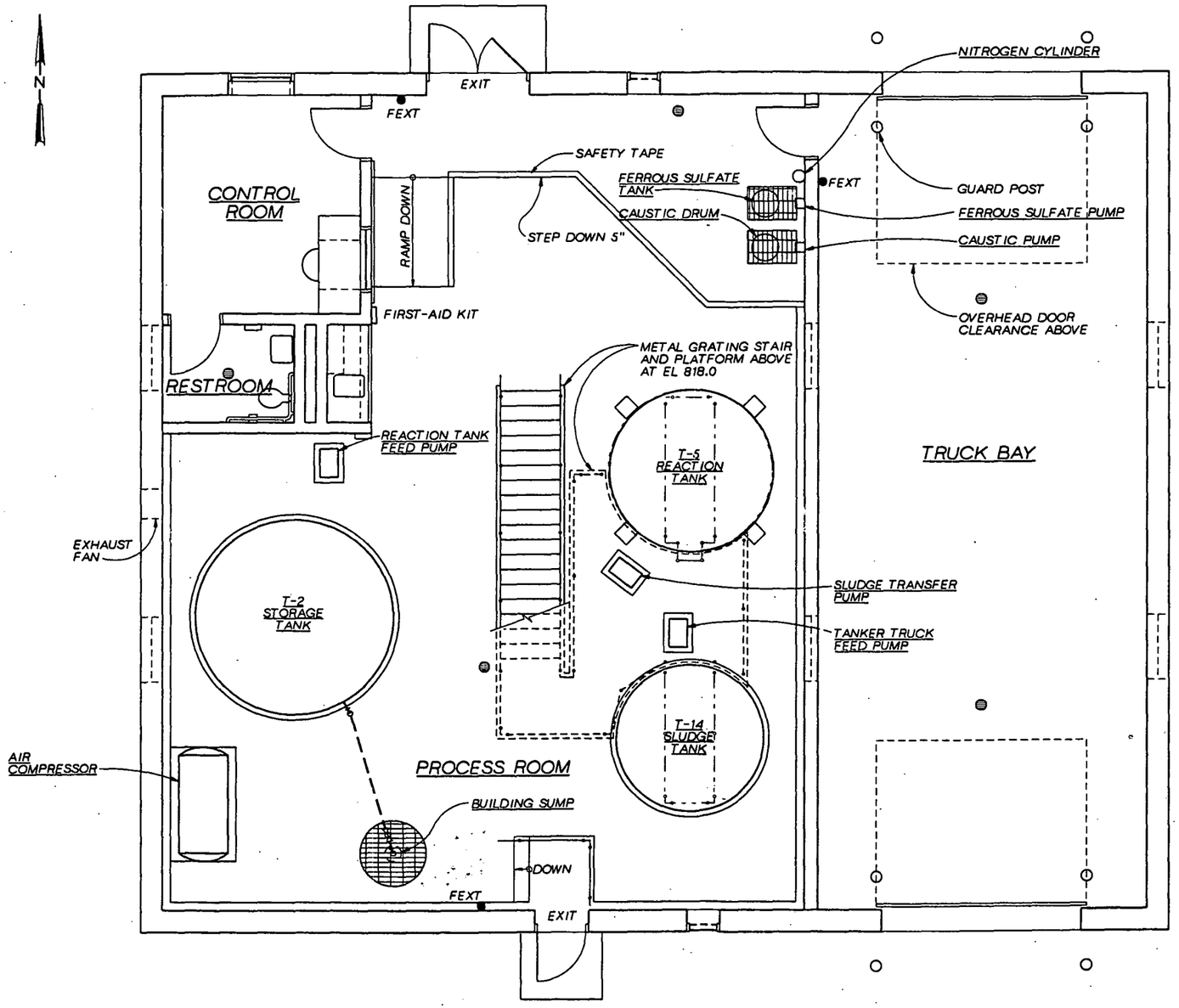
After each year of quarterly sampling, the analytical results from each well will be compiled and used to monitor aquifer concentrations and evaluate the performance of the groundwater collection and treatment system. These data will be used to identify and implement any corrective action required to maintain reliable operation.

The quarterly results of the sampling and analysis program will be analyzed every year. The analytical results will be averaged and the data evaluated to examine spatial and temporal trends. This analysis will also include groundwater elevation readings. The types of spatial and temporal trends conducted will be evaluated after each year of sampling. Initially, the analysis will include:

- Plots of mean concentration versus time for each parameter analyzed for the individual wells
- Plots of concentration versus time of moving averages for each parameter analyzed for individual wells
- Regression analyses on plots of moving average concentration versus time to determine direction of trends

The entire monitoring program also will be reevaluated annually. Specific adjustments to the program that may be necessary include:

- Analyte list—Do analytes need to be added or deleted?
- Sampling frequencies—Are quarterly sampling and groundwater elevation readings adequate or excessive?



FLOOR PLAN
1/8" = 1'-0"

FIGURE NO. 3
TREATMENT FACILITY LAYOUT
N.E. MAUTHE LTRA

CH2MHILL

- Monitoring well network—Is the monitoring well network adequate? Does any well need to be replaced? Should additional wells be installed? Can some of the monitoring wells be deleted from the sampling program?
- Sampling program—Do the analytical data indicate that the overall concentrations are decreasing? Should the monitoring program continue?

At the end of the fifth year, all sampling results will be compiled. These analytical results will be averaged and evaluated for temporal trend. Compound concentrations will be compared with groundwater standards (PALs).

Sampling Equipment and Procedures

General procedures for measuring water levels, performing field tests, and collecting water quality samples are described below. Additional details related to specific sampling and decontamination procedures, sampling frequencies, and analytical requirements are discussed in the QAPP.

All wells will be sampled using the same equipment and procedures. Wells installed during the remedial investigation were constructed using both PVC and stainless steel riser and screens. The wells installed during remedial action were constructed using 2-inch Schedule 40 PVC. Well depth and screen information is included in Table 2.

TABLE 2
Monitoring Well Information

Monitoring Well Number	Approximate Total Depth (ft)	Well Screen Length (ft)	Type of Protective Cover
W-2	15	10	FMC
W-8	15	10	FMC
W-15	15	10	FMC
MW-101	28	20	FMC
MW-102	28	20	FMC
MW-103	27	20	FMC
MW-104	26	20	FMC
MW-105	16	10	FMC
MW-106	16	10	FMC
MW-107	30.5	20	PSC
MW-108	28	20	FMC

FMC = Flush Mount Cover
PSC = Protective Steel Casing

All groundwater samples will be collected using the equipment identified below.

Field Equipment

The following equipment is required to sample the wells:

- Equipment needed to open the wells
  - Key to unlock wells and gates

  - Organic vapor detector (HNu, OVM, or OVA)
  - T-bar, socket set, or screw driver to remove flush mount covers
  - Bolt cutters (if lock is rusted and cannot be opened)

- Equipment for measuring water levels
  - Electronic water level indicator
- Equipment for purging wells
  - Bailer (disposable ones can be used)
  - Nylon cord (approximately 1000 feet needed)
  - Buckets or containers of known volume to measure purge water quantity
- Sample collection and field testing equipment
  - Bailer
  - Sample containers with preservatives and labels provided by the analytical laboratory
  - Coolers (approximately 8 needed)
  - Ice
  - pH with temperature meter
  - Decontamination solutions (TSP, 10 percent methanol, and distilled water), containers, brushes, etc.
  - HPLC-quality water for field blanks (approximately 2 gallons needed)
  - Peristaltic pump (for filtering metal samples)
  - Tubing for peristaltic pump (approximately 40 feet needed)
  - Inline 0.45 micron filters (approximately 22 needed)
- General Supplies
  - Packing supplies (bubble wrap, utility knife, strapping tape)
  - Ziplock baggies (quart and gallon size)
  - Duct tape and clear tape
  - Garbage bags
  - Paper towels
  - First aid kit
- Sample Records
  - Field notebooks
  - Chain-of-custody forms

Preventive Maintenance

Well Covers and Protection

The well covers require minimum maintenance. The protective steel casings require periodic painting to prevent rusting. Damaged locks on well covers will be replaced as needed. Damaged concrete surface pads around wells will be repaired or replaced as needed.

Field Equipment

Each piece of field equipment will be tested prior to each use to verify it is in proper working order before it is sent to the site. Only properly-working equipment will be sent to the site. The instrument operator's manual will dictate the frequency of calibration and maintenance.

Groundwater Sampling and Measurements

Each well consists of a 2-inch-diameter Schedule 40 PVC well riser and well screen. The general sampling procedures and sequence described below are recommended as a guide to sampling each well. Groundwater measurements and sampling will proceed in the following sequence:

1. Organize and decontaminate sampling equipment and calibrate instruments
2. Remove padlock
3. Open well cover and remove well riser cap
4. Monitor inside well casing with an organic vapor detector, if organic vapor concentrations exceed safety limits, allow the trapped air to sparge and take corrective action (see Health and Safety Plan for additional information)
5. Measure and record static water level relative to the north side of the top of the casing per procedures summarized below (see Groundwater Elevation Measurements)
6. Calculate and record the volume of water in the well in accordance with the following formula:

   Wellbore water volume = $\pi \times r^2 \times h$,

   where h = height of water column
   r = radius of well bore

   (Note: Units must be consistent in all calculations)
7. Purge well per procedures summarized below (see Procedures to Purge Wells)
8. Perform field analyses; record pH and temperature readings
9. Collect water samples per procedures outlined below (see Water Sample Collection Procedures)
10. Preserve samples for storage and laboratory analyses

11. Complete sample records and chain-of-custody forms and seals

12. Ship samples via overnight courier to analytical laboratory

Wisconsin DNR guidelines for groundwater sampling are presented in "Groundwater Sampling Desk Reference" [3] and "Groundwater Sampling Field Manual" (Appendix A).

Groundwater Elevation Measurements

Determine the depth to water in the well to the nearest 0.01 foot using an electronic water level indicator. When the electrode or probe comes into contact with the water, an electrical circuit is completed, activating the meter light and beeper. Determine the depth of water using the following steps:

1. Lower the electrode or probe into the well by pulling the cable from the hand-held reel.
2. Continue lowering until completion of the circuit is indicated by illumination of the small light, a beep, or deflection of the ammeter needle.
3. Measure the length of cable in the well from the marked edge on the top of the north side of the well casing to the probe (depth to the water table) to the nearest 0.01 foot. This length is subtracted from the top of the casing elevation to determine the water table elevation.
4. Record depth in the field notebook.

Procedures to Purge Wells

Prior to sampling, wells will be purged by removing three to five standing water column volumes as calculated previously. The amount of purge water will be measured by filling and counting 5-gallon buckets. Disposal of purge water will follow procedures in the waste disposal plan discussed below.

Water Sample Collection Methods

Samples will be collected after the requisite volume has been purged from the well. Volatile organic analysis (VOA) vials will be filled first; containers for filtered metals will be filled last. Place the mouth of the VOA vial at the end of the bailer and allow bottle to fill slowly. Fill vial in a steady, gentle stream with a minimum of agitation. Fill until a meniscus forms on the mouth of the VOA vial. Cap vial and check for air bubbles by inverting vial and tapping on the palm of the hand. If bubbles are present, do not dump the water out of the vial (you'll lose your preservative), but carefully add a little more water to the vial and repeat until a bubble-free sample is obtained.

Fill remaining sample containers to the shoulder.

Sample Shipping

Coolers will be used to transport samples from the field to the analytical laboratory. Samples requiring preservation by cooling will be kept at 4 °C at all times.

All shipments will be accompanied by a chain-of-custody record identifying the contents. The original record will accompany the shipment, and a copy will be retained by the sampler.

The copy of the airbill accompanying each shipping container will be retained as part of the permanent documentation. Commercial carriers are not required to sign the custody form as long as the custody forms are sealed inside the sample cooler and the custody seals remain intact.

Waste Disposal

Wastes generated during sampling will consist of well purge water, wastes from decontamination, and protective clothing.

If HNu reading (or equivalent photoionization device) exceeds 1 part per million (ppm), the water will be treated in the onsite groundwater treatment system. If HNu headspace readings are less than 1 ppm, purge water will be discharged to the ground.

Decontamination

Field equipment used in well sampling will be decontaminated between wells with a TSP and distilled water solution, followed by a 10 percent methanol and distilled water solution, followed by two distilled water rinses. At the conclusion of the sampling event, sampling equipment will be decontaminated again with this procedure.

Documentation

Field activities should be documented in the field notebook and on chain-of custody forms. The following items should be included in the field book documentation:

- Site
- Sample team
- Daily weather conditions
- Daily activities and time of activities
- Visitors to the site
- Instruments used including make/model, serial no., and calibration results
- Well observations
  - Well number
  - Well condition including condition of lock
  - Depth of well
  - Depth to water
  - Purge volume
  - Water appearance (clarity, color, odor)
  - Field parameter readings
  - Sample information (date, time, sample no., type of sample)

Information on completing chain-of-custody forms is in Appendix B.

Field Corrections

Deviations from routine procedures and subsequent corrective measures will be documented in a field log book and reported to the appropriate agency. Because possible deviations are dependent upon unknown field conditions, corrective measures cannot be specified. For field measurements, the corrective action must be suited to the situation and may include:

- Repetition of measurement to check the error
- Checking batteries
- Recalibration of the instrument
- Replacement of the instrument

Reporting Procedures

An annual report will be submitted to the U. S, EPA and Wisconsin Department of Natural Resources and will consist of the following:

- Date and time of the sampling events
- Personnel involved in the sampling events and their respective responsibilities
- List of the wells sampled during the event
- Summary of the procedures used during the sampling event, including any deviations from standard procedures
- List of pertinent observations taken during the sampling event
- Summary of the analytical results received from the laboratory and the validated results
- Temporal and spatial trends of the contaminant plume concentrations
- A summary of average concentrations (for each well) for the contaminants of concern
- Recommendations of changes to monitoring program including additions to the contaminants of concern
- Appendix addressing the analytical data and the QA/QA evaluations of the laboratory data

Data attachments to the annual report will include:

- Data validation report
- Chain-of-custody forms
- Data table of compiled groundwater elevation values for all monitoring wells
- Potentiometric surface map (groundwater contour map) drawn using the groundwater elevation values collected during the sampling event
- Summary table of field parameters

The annual report will be delivered within 60 days after receipt of all analytical data and quality assurance (QA) reviews for the quarterly sampling rounds.

References

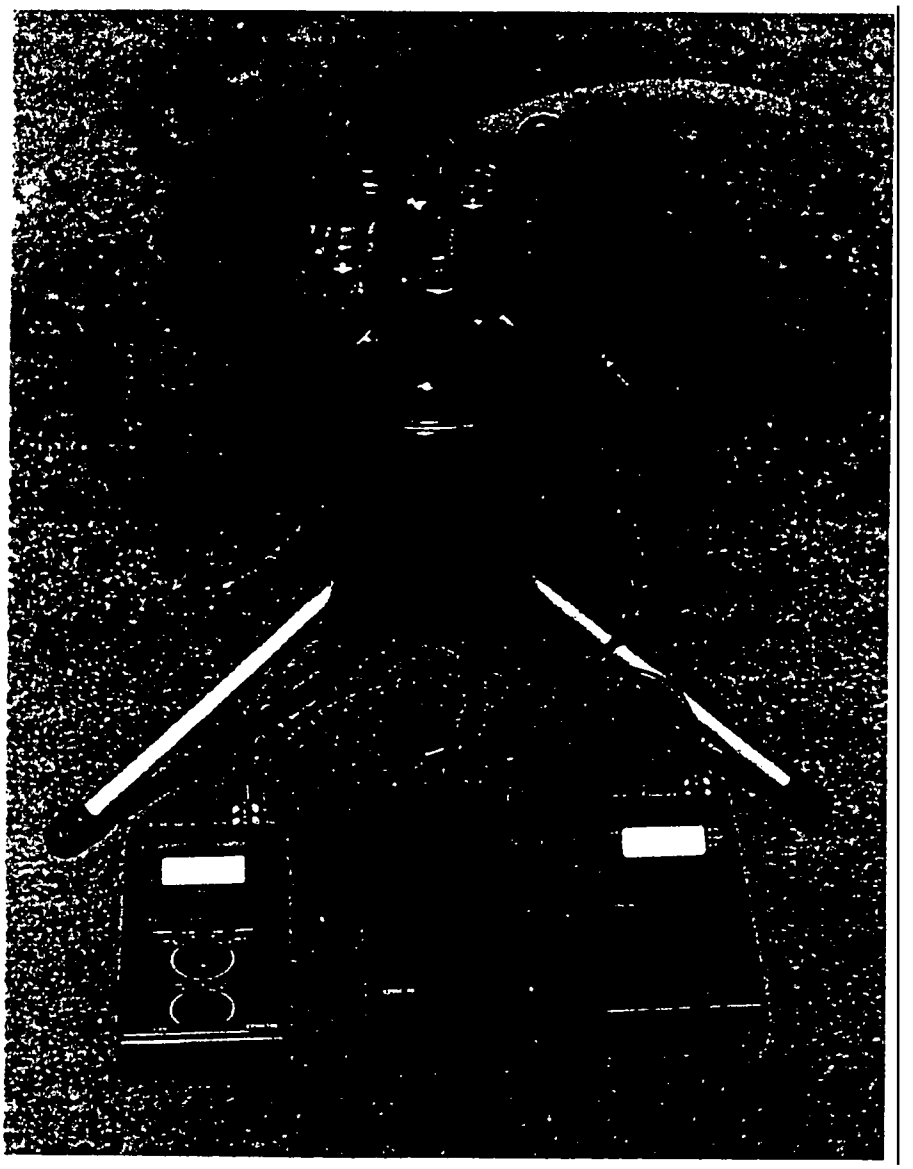
[1] *Operation and Maintenance Summary Manual, Groundwater Treatment Remedial Action.* CH2M HILL. August 1994.

[2] *Methods for Determining Compliance with Groundwater Quality Regulations at Waste Disposal Facilities.* Wisconsin Department of Natural Resources. January 1989.

[3] *Groundwater Sampling Desk Reference,* Wisconsin DNR, PUBL-DG-037 96, September 1996

Appendix A
Groundwater Sampling Field Manual

Groundwater Sampling Field Manual



Groundwater Sampling Field Manual

PUBL-DG-038 96

Produced by the Wisconsin Department of Natural Resources
Bureau of Drinking Water and Groundwater
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DISCLAIMER

The mention of trade names or commercial products in this document does not constitute an endorsement or recommendation by the Wisconsin Department of Natural Resources. Also, while this document and the accompanying Desk Reference include brief mention of health and safety issues, neither document adequately addresses all health and safety issues and requirements. Both documents should be supplemented with other appropriate references, requirements and training on health and safety.

ADDITIONAL COPIES

Additional copies of this document titled **Groundwater Sampling Field Manual, Stock # 1729,** and the accompanying document titled **Groundwater Sampling Desk Reference, Stock # 1728,** may be purchased from Wisconsin Department of Administration, Document Sales Unit. Call Document Sales at (608) 266-3358 or TTY (608) 264-8499 for pricing information (business hours 7:45 am to 4:30 pm).

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GROUNDWATER SAMPLING FIELD MANUAL

1.0 INTRODUCTION

1.1 PURPOSE AND USE OF THIS FIELD MANUAL

This field manual provides you with easy-to-use, WDNR-recommended procedures for consistently collecting quality, representative groundwater samples and measurements.

Before going out in the field, you should develop a sampling plan and a QA/QC plan. All sampling personnel should read these plans. The *Groundwater Sampling Desk Reference, PUBL-DG-037-96 REV,* contains detailed information on creating such plans. Consistently follow the procedures and protocols specified in these plans ***throughout a project's life. Always*** clearly document any deviations from them, including reasons for the deviations.

Most sections of this manual contain an "Alternative Methods" subsection to help you consider alternative procedures and equipment not covered in this manual. This manual contains commonly used equipment and procedures and is not intended to limit your choice of procedures and equipment to use for a specific site or project. Therefore, WDNR will allow alternative procedures as long as they provide scientifically valid and legally defensible groundwater data.

This manual uses the ☞ iconic symbol to highlight key points to follow for all procedural options. This manual also uses "***Note***", "***Important note***", "***Caution***", and "***Tip***" to highlight important points that apply to a specific subsection or procedural option (e.g., coated tapes).

1.2 PRELIMINARY SITE DATA

Instructions on collecting subsurface stratigraphy data and preliminary screening discrete-depth groundwater samples are beyond this field manual's scope. Refer to Section 2.0 of the *Groundwater Sampling Desk Reference* for a more detailed discussion on the collection, use and limitations of such data. In addition, refer to the instructions and specifications provided by the manufacturer of your sampling and monitoring equipment.

1.3 VADOSE ZONE SOIL-WATER MONITORING

Instructions on vadose zone soil-water sampling and monitoring are beyond this field manual's scope. Refer to Section 5.0 of the *Groundwater Sampling Desk Reference* for a more detailed discussion on the collection, use and limitations of such data. In addition, refer to the instructions and specifications provided by the manufacturer of your sampling and monitoring equipment.

2.0 SAMPLING PROCEDURES FOR MONITORING WELLS

2.1 PRE-FIELD CHECKLISTS AND DOCUMENTATION

Pre-field Checklists (Included in Appendix A)

Go through the following two checklists before heading out to the field. You may modify these checklists to meet specific project needs.

1. Pre-field Work Procedures Checklist - Monitoring Wells.
2. Equipment Checklist - Monitoring Well Sampling.

Documentation of the Sampling Event

1. **Sampling Plan.** The sampling plan documents the equipment and procedures you use during a sampling event. ***Document any deviations*** from the sampling plan; use the "Field Procedures Documentation" sheet included in Appendix A. Or, create your own form to record deviations.

2. **Well-Specific Field Sheet - Monitoring Wells (Appendix A).** Document well, purging and sampling information, measurements, etc., on this sheet. Or, customize your own data sheet.

3. **Field Procedures Documentation (Appendix A).** If a sampling plan is not available, you may use the "Field Procedures Documentation" sheet included in Appendix A. Customize this sheet as necessary.

4. **Chain of Custody Form (Appendix A).** Document the possession of groundwater samples collected by filling out a chain of custody form. Use this form to document each time the samples change possession. Refer to the "Chain of Custody for Samples Requiring Strict Custody" instruction included in Appendix C when collecting enforcement samples.

2.2 MEASURING STATIC WATER LEVEL

☞ Measure the static water level for a well ***before*** purging, sampling or inserting any other instrument or device into a well's water column.

☞ Collect water level measurements from all site wells within a reasonably short time, preferably the same day.

- ☞ Collect measurements in the order of least contaminated to most contaminated wells (if known). Decontaminate the measuring device between each well.

- ☞ Read water level measurements to the nearest 0.01 foot from a permanently-marked spot on the well (e.g., top of casing or reference elevation).

- ☞ When possible, use one measuring device for all site wells. If using more than one measuring instrument, check the calibration of both instruments against the same well to ensure that they provide the same water level measurements.

- ☞ After removing a ***water/air tight well cap*** (e.g., flush mounted well), allow the water level in the well to stabilize. This may be especially important for wells screened in silt and clay (low permeability) formations. Take several measurements to ensure that the water level has stabilized.

- ☞ Bring along records of previous water level measurements taken on the well.

Electronic Water Level Indicator

1. Lower the decontaminated probe or electrode into the well until the instrument indicates that you've reached the water column.

2. Slowly raise and lower the probe or electrode in and out of the water column until you are satisfied that the instrument is providing a reliable water level reading. If necessary, adjust the instrument's sensitivity according to the manufacturer's instructions.

3. Read the measurement on the cable or tape to the nearest 0.01 foot against the top of casing or reference elevation on the well. Record this measurement as "depth to water."

Popper

1. Lower the decontaminated popper and tape into the well until you hear a "pop," indicating that you've reached the water column.

2. Raise and lower the popper, listening for a repeating "pop" sound. Continue doing this until you are satisfied that you have a reliable reading.

3. Read the measurement on the tape to the nearest 0.01 foot against the top of casing or reference elevation on the well. Record this measurement as "depth to water."

4. You can also use the popper to measure the ***well depth*** by lowering the popper and tape through the water column until the tape becomes slack. Slowly pull the tape up until it just becomes taut again. Read the tape against the top of casing or reference elevation on the well and record this measurement as "depth to well bottom."

Caution! Deep wells, water table wells, high noise areas and floating products in wells may make it difficult to hear the "pop" and collect a reliable "depth to water" reading. Some individuals can "feel" the water surface without hearing a pop; however, if you are not confident you are collecting a reliable reading, use another measuring method.

Indicator Substance

Important Note: If you use a tape coated with an indicator substance, you ***must ensure*** that the indicator substance will not contaminate the well or subsequent samples collected from that well. If you have any doubt, choose another water level measurement method.

1. Coat at least 2 feet of the end of the tape.

2. Lower the coated tape into the well until you hear or feel the tape reach the water column. Lower the tape a few inches into the water and wait at least five seconds.

3. Without moving the tape, read and record the tape measurement to the nearest 0.01 foot against the top of casing or reference elevation on the well.

4. Withdraw the tape from the well and record the measurement where the wetted and dry portions of the tape intersect.

5. Subtract the measurements (Step 3 minus Step 4). Record this measurement as "depth to water."

Alternative Methods

Alternative water level measuring devices or methods are acceptable if they (1) are consistently accurate to ±0.01 foot; (2) do not affect the integrity and chemistry of groundwater samples; (3) do not affect the groundwater geochemistry or well materials; and (4) can be thoroughly decontaminated between wells. Document the type of alternative device or alternative method used. Include this information in the sampling plan and groundwater data reports generated for the site or project. Follow the manufacturer's instructions for the instrument's use and its limitations.

Refer to the *Groundwater Sampling Desk Reference* regarding procedures for using transducers, air-line or bubble tubes, float methods or ultrasonic methods for measuring depth to water in a well.

Calculating Groundwater Elevation

After obtaining depth to water measurements, subtract the "depth to water" from the "top of casing or reference elevation" and record this data as "groundwater elevation."

2.3 MEASURING AND SAMPLING IMMISCIBLE LAYERS

☞ Measure and sample light non-aqueous phase liquid (LNAPL) and dense non-aqueous phase liguid (DNAPL) layers ***before*** purging a well.

☞ Disposable equipment (e.g., disposable bailers or disposable peristaltic pump tubing) is recommended because equipment decontamination may be quite difficult.

☞ A single or double check valve bailer works well for LNAPL collection and double check valve bailer works well for DNAPL collection. Peristaltic pumps may also be effective.

Measuring the Thickness of Immiscible Layers

1a. Measure **LNAPL** thickness with either an LNAPL/water interface probe or a weighted tape coated with a water and LNAPL-sensitive substance to distinguish between the air/LNAPL and LNAPL/water interfaces.

1b. You may also measure **DNAPL** thickness with an interface probe.

Sampling Immiscible Layer > 1 foot Thick in Well

Sampling LNAPLs

1. Slowly lower the bailer into the LNAPL, but not into the water, and then bring the LNAPL sample to the surface.

2. If both water and LNAPL are present in the bailer, allow the liquids to separate, then drain the water into a waste container.

3. Fill the sample containers with the remaining LNAPL.

Sampling DNAPLs

1. Slowly lower a double check valve bailer to the bottom of the well and allow it to fill with the DNAPL. ***Slowly*** raise the bailer out of the water column.

2. Drain any sediment-laden DNAPL or water into a waste container.

3. Fill the sample containers with the remaining DNAPL.

Sampling Immiscible Layer < 1 foot Thick in Well

Note: A ***top-filling*** stainless steel bailer or weighted top-filling bailer usually works best. Most bottom emptying bailers can be temporarily sealed at the bottom.

Sampling LNAPLs

1. Use the apparent LNAPL thickness and depth to water sample measurements to determine how far to lower the top of the bailer into the well. Slowly lower the bailer until its ***top*** is in the upper half of the LNAPL's thickness. Allow the bailer to fill with the LNAPL.

2. After a few seconds, raise the bailer out of the well. If both water and LNAPL are present, allow the liquids to separate, then drain the water into a waste container.

3. Fill the sample containers with the LNAPL remaining in the bailer.

Sampling DNAPLs

1. Use the same procedures just described for DNAPLs in layers thicker than 1 foot.

2.4 PURGING AND SAMPLING PROCEDURES

The ***goal of purging*** is either to remove stagnant water from the well or prevent stagnant water from entering samples as you are collecting them. Stagnant water does not represent groundwater.

The ***goal of sampling*** is to collect unaltered samples that represent the physical and chemical composition of groundwater.

☞ Purge and sample wells in order of least-to-most contaminated. (This is not necessary if you use dedicated or disposable equipment.) If you do not know this order, sample the upgradient wells first, then the furthest down-gradient or side-gradient wells, and finally the wells closest to, but down-gradient of the most contaminated area.

☞ Wait at least one week before sampling a newly-constructed and developed well; waiting a month or more may be appropriate for wells constructed in silt or clay.

☞ When using a bailer, purge and sample ***SLOWLY AND CAREFULLY***. Use a bottom-emptying device to decant samples from the bailer.

☞ Do ***not*** use cotton or cloth rope or line; use stainless steel cord, Teflon®-coated cord, nylon, or equivalent cord that can be decontaminated between each well. Or, use disposable rope or line.

☞ Decontaminate all equipment and accessories between use in each well. Store and transport all equipment in clean containers.

☞ Place a clean plastic sheet or other protective covering around the base of the well to prevent the equipment from contacting the ground. If you do not use a protective covering, ensure that your equipment does not touch the ground or a contaminated surface.

Wells that do NOT Purge Dry

This section applies to wells that take less than ~ 1 hour for their water levels to recover, or nearly so, after they have been purged.

The following purging and sampling procedures are recommended for wells that do not purge dry. The first procedure (A) consistently yields the ***highest level of data quality.*** The last procedure (C) may yield a ***lower level of data quality***:

A. Low-flow Purging < 1 L/min (0.26 gpm), Low-flow Sampling < 300 ml/min (0.3 L/min or 0.1 gpm) and Monitoring Indicator Parameters for Stability in a Closed Flow-through Cell

1. SLOWLY lower the pump to the ***middle*** of the well's screened area. (A dedicated system is recommended.) Securely fasten the power cable and sample tubing at the top of the well. Connect the power source, controller box, gas source, etc., to the pumping equipment.

2. Connect the sample tubing to the water entry point of the closed flow-through cell.

   Closed Flow-Through Cell

   Air pockets may exist in the upper neck of each port hole that has a probe inserted into it – this is not a problem. Just make sure the probe's sensors are completely submerged in water during use.

   Avoid exposing the flow-through cell to extreme heat and sun in the summer and freezing temperatures in the winter.

3. Set up and calibrate all indicator parameter instruments and place each probe into its respective port of the closed flow-through cell.

4. Set the pump controller to the desired purging rate (i.e., < 1 L/min). Do ***not*** use a valve to reduce the flow from a pump; valves can cause an "orifice" effect that can cause sample agitation and alteration.

5. Record the "purging time start," and start purging the well at a rate of 1 L/min or less. During purging, the water level in the well should not decrease significantly and should stabilize after purging for a few minutes. If the water level continues to decline while purging, decrease the purging rate if possible. Record the "purging

flow rate" as an average. Use a graduated beaker, cylinder, calibrated bucket or other device to measure the flow rate while purging and sampling.

6a. Purge the well until you have taken at least three consecutive readings, spaced ~ 2 minutes or ~ 0.5 well volumes or more apart, are within the following ranges for the following indicator parameters:

Dissolved Oxygen	± 0.2 mg/L
Specific Conductance	± 5.0 µmhos/cm for values < 1000 µmhos/cm ± 10.0 µmhos/cm for values > 1000 µmhos/cm
pH	± 0.1 pH units
Temperature	± 0.1 °C
Turbidity	< 5 NTUs (***Required*** if metals samples will not be filtered. ***Recommended*** if sorptive compounds or elements are collected. ***Optional***, but recommended, if other compounds or elements are collected).
Eh (***optional***)	± 30 mv

Stable dissolved oxygen, specific conductance and turbidity readings are considered the most reliable parameters for indicating that stagnant water has been replaced by formation water. You may adjust the ± ranges and which indicator parameters you use to indicate that stagnant water has been replaced by formation water to reflect site-specific data, geochemistry, and hydrogeologic conditions.

Turbidity stabilization and NTU readings below 5 are required if you will not be filtering metals samples. In addition, monitor turbidity stabilization when collecting sorptive, hydrophobic, or high octanol-water partition coefficient (Kow) compounds or elements.

OR

6b. Purge the well until the readings for indicator parameters listed above (or well-specific indicator parameters) vary within ±10% over three or more consecutive readings, spaced ~2 minutes or ~ 0.5 well volumes or more apart.

7. Record the final three stable readings for each indicator parameter on the "Well Specific Field Sheet - Monitoring Wells" (Appendix A). Or, use your own customized data sheet. Record indicator parameter data measured before stabilization on graph paper. Or, customize your own data sheet.

8. Record the "volume purged," "purging time stop," "purged dry (Y/N)," and any problems purging.

9. Collect samples as described under Section 2.5. Record "sample flow rate" as an average, "time sample collected," and any other pertinent information related to the sampling event.

B. Purging FOUR Well Volumes with a Standard pump and Sampling with a Pump or Grab Sampler

1. SLOWLY lower the pump to the ***middle*** of the screened area of the well. Securely fasten the power cable and sample tubing. Connect the power source, controller box, gas source, etc., to the pumping equipment.

2. Use **Equation 1** or **Table 1** (see the following this section) to calculate the number of gallons to remove ***four*** well volumes from the well. Record this data as "four well volumes."

3a. Using a **pump** to *purge **and** sample* the well: Record the "purging time start" and start purging the well. Minimize well drawdown; it should stabilize before sampling. If the water level continues to decline during purging, try using a lower purging rate. Use a graduated beaker, cylinder, calibrated bucket or other device to calculate the flow rate while purging and sampling.

3b. Using a **pump** to *purge* the well and then using a **grab sampler** to *sample* the well: Record the "purging time start" and start purging the well with the pump's inlet at the ***top*** of the water column. As you are purging, ***slowly lower the pump*** so that, after four well volumes are purged, the pump's inlet is near the bottom of the well (within ~ 1 foot). ***Important note*:** Before collecting samples with a grab sampler, you must lower the pump while purging the well, thus removing any stagnant water before collecting samples.

4. Record "purging flow rate" as an average, "volume purged," "purging time stop," "purged dry (Y/N)," and any problems purging.

5a. If you use a **pump** to collect samples, the sampling flow rate should be as low as possible, and preferably less than the purging flow rate.

5b. If you use a **grab sampler**, try not to disturb the samples. If you use a bailer, use a bottom-emptying device to decant your samples.

6. Collect samples as described under Section 2.5. Record "sample flow rate" as an average, "time sample collected," and any other pertinent information related to the sampling event.

C. Purging FOUR Well Volumes with a Bailer and then Sampling with a Bailer or Other Grab Sampler

1. Use **Equation 1** or **Table 1** (see the following section) to calculate the number of gallons needed for removing ***four*** well volumes. Record this data as "four well volumes."

2. Record the "purging time start." Lower and raise a decontaminated bailer in and out of the water column ***very slowly*** and purge four well volumes.

   Tip! To hasten purging and sampling with a bailer, tie an overhand knot, string or other easily-removable marker to the rope or cable just short of the well's depth to water. You can then rapidly lower the bailer into the well to just above the water column, then ***gently and slowly*** lower it into, then out of the water column.

3. Use a calibrated bucket or other device to keep track of the volume of water you remove. Purge four well volumes.

4. Record "volume purged," "purging time stop," "purged dry (Y/N)," and any problems purging.

5. Sample the well by ***slowly and gently*** lowering the bailer until it is submerged and in the middle of the well screen. Do not allow the bailer to contact the bottom of the well. ***Very slowly and carefully*** raise the bailer out of the water column and to the surface. Do not bang it against the side of the well (typical of the "helicoptering" technique).

6. Collect samples as described under Section 2.5. Use of a bottom-emptying device to decant samples from a bailer. Record "time sample collected" and any other pertinent information related to the sampling event.

EQUATION 1
Volume to be Purged from a Monitoring Well

$$V = \pi \times (D/2)^2 \times H \times 4 \times 7.48 \text{ gallons/ft}^3$$

Where:
- V = Total purge volumes (i.e., four well volumes in gallons)
- π = Pi (3.1416)
- D = Inside diameter of well casing (feet)
- H = Feet of water in well (depth to well bottom minus depth to water)

TABLE 1
Four Well Volumes of Water (in gallons) per One-Foot Section of Well Casing

Nominal casing or pipe size (inch)	Well casing or pipe schedule	Actual inside diameter of well casing (inch)	Four well volumes per one foot of water in well
1	40	1.05	0.18
1	80	0.96	0.15
1.25	40	1.38	0.31
1.25	80	1.28	0.27
1.5	40	1.61	0.42
1.5	80	1.50	0.37
2	5	2.25	0.82
2	40	2.07	0.70
2	80	1.94	0.61
3	40	3.07	1.54
3	80	2.90	1.37
4	5	4.33	3.07
4	40	4.03	2.65
4	80	3.83	2.39

How to calculate four well volumes using Table 1

Step 1: Measure the actual inside diameter of the well casing - find on column three of chart. You may also use the nominal pipe size and schedule in lieu of a measurement.

Step 2: Calculate feet of water in the well casing (depth to well bottom minus depth to water).

Step 3: Multiply step 2 by the applicable value in column four. For example, you have a 2-inch, schedule 40 casing that measures 2.07 inside diameter and you have 20 feet of water (step 2) in the well. Multiply 20 feet by 0.70 (column 4) = 14 gallons; therefore, you must purge 14 gallons from the well before collecting samples.

To Convert:
Gallons to liters, multiply gallons by 3.785
Liters to gallons, multiply liters by 0.2642
Milliliters to gallons, multiply milliliters by 0.0002642
Feet to meters, multiply feet by 0.3048
Centimeters to feet, multiply centimeters by 0.03281

Wells that Purge Dry

This section applies to wells that take ~ 1 or more hours to recover, or nearly so, after they have been purged dry, or nearly so.

A. Low-flow Purging and Sampling in a WATER TABLE WELL (water level intersects the well screen)

1. Slowly lower the pump to the ***lower portion*** of the screened area of the well but without setting it at the very bottom of the well. Secure the power cable and sample tubing. A dedicated system is recommended over a portable system.

2. Record the "purging time start" and start purging the well at < 300 ml/min or <0.1 gpm. Purge until drawdown reaches the top of the pump or until the pump runs dry, then shut the pump off immediately! (***Caution!*** Some pumps can be damaged by running them dry - follow the manufacturer's instructions.) Record the "purging flow rate" as an average.

   Note: A pressure transducer or electric water level indicator can assist in determining when drawdown reaches the top of the pump. If you use an electric water level indicator, lower the probe tip to the well pump and turn the instrument on before pumping. Start pumping, then shut off the pump when the water level indicator shuts off.

3. Allow the well to recover, or nearly so. If time permits, purge the well a second time and allow the water to recover again before sampling. To save time, purge a well the first time, move on to the next well and purge it, then come back to the first well to purge it again before sampling. (With portable equipment - decontaminate first.) Record "volume purged," "purging time stop," "purged dry (Y)," and any problems purging.

4. Collect samples as described under Section 2.5. (Collect samples within 24 hours of purging, if possible.) Record "sampling flow rate" as an average, "time sample collected," and any other pertinent information related to the sampling event.

B. Low-flow Purging and Sampling in a PIEZOMETER (water level is above the top of well screen)

1. SLOWLY lower the pump to the ***lower portion*** of the screened area of the well but do not set the pump on the very bottom of the well. Secure the power cable and sample tubing at the top of the well. A dedicated system is recommended over a portable system.

2. Record the "purging time start" and start purging the well at <300 ml/min or <0.1 gpm. Purge the well until the water level is just below the top of the well screen. (Use a pressure transducer, water level indicator or similar method.) Shut off the

pump and record the "purging flow rate" as an average, "volume purged," "purging time (stop)," "purged dry (Y)," and any problems purging.

3. Allow the well to recover, or nearly so, then begin collecting samples as described under Section 2.5. (Collect samples within 24 hours of purging, if possible.) If the water level in the well reaches the top of the screen before all samples are collected, shut off the pump, allow the well to recover again, then resume collecting the rest of the samples. Record "sample flow rate" as an average, "time samples collected," and any other pertinent information related to the sampling event.

C. Purging and Sampling with a BAILER, or other grab sampler, in a Water Table Well or Piezometer

1. Record "purging time start" and bail the well dry, or nearly so. Take extra care to purge the well very slowly and very gently. Do not allow the bailer to contact the bottom of the well.

2. Allow the well to recover, or nearly so. If time permits, purge the well dry, or nearly so, a second time. Record "volume purged," "purging time stop," "well purged dry (Y)," and any problems purging.

3. Collect samples as described under Section 2.5, within 24 hours of well recovery, if possible. Use a bottom-emptying device to decant samples from the bailer. Record "time sample collected" and any other pertinent information related to the sampling event.

Alternative Methods

Alternative purging and sampling methods and equipment are acceptable if they provide representative groundwater samples. Your purging and sampling method and your equipment must not adversely affect sample integrity, chemistry, temperature and turbidity. In addition, alternative equipment must have minimal or no effect on groundwater geochemistry, aquifer permeability and well materials. Equipment materials must minimize sorption and leaching. Use the equipment in a manner that minimally alters the groundwater samples. If you meet these conditions, WDNR pre-approval is not required; however, verbal or written approval from WDNR is recommended before you use alternative purging and sampling equipment or procedures.

Document and describe any alternative equipment and procedures you use to purge a well and collect samples. Include this information in the sampling plan and groundwater data reports you generate for a site or project.

2.5 SAMPLE COLLECTION

Sample Collection and Filling Procedures

☞ Take in-field water quality measurements before or ***immediately*** after sample collection. (See Section 2.6.)

☞ Open only one sample container or one set of sample containers immediately before filling. Preserve samples within 15 minutes of collection and immediately place on ice.

☞ Minimize the contact of extraneous contamination with sample containers and equipment. Common extraneous contaminants include perfumes, cosmetics, bug spray, sun tan lotion, Sharpie®, spray lubricants (e.g., WD-40®) and engine fumes. Sample up wind or remove extraneous contaminants before opening containers and collecting samples.

☞ Use waterproof labels. Write on them with a permanent, waterproof marking device (e.g., grease pencil). Labels should include:

- ✓ A unique sample number and WUWN (if applicable).
- ✓ Site/project name or other identifier.
- ✓ Date and time sample collected.
- ✓ Sample collectors initials.
- ✓ Type of preservation added and analysis required.

☞ Appendix C includes a table that indicates a substance's potential to volatilize from a water sample during sample collection. Use extra caution when collecting samples that have a "medium" or "high" potential to volatalize from water.

☞ Remember to keep complete and accurate records. Record all field information before proceeding to the next well.

Order of Filling Sample Containers

Collect sample parameters in the following order:

1. Unfiltered samples for in-field water quality measurements. (This is not necessary if you take down-well or closed flow-through cell measurements.)
2. Volatile organic compounds (VOCs).
3. Non-filtered, non-preserved (e.g., sulfate, total chromium VI, mercury, semi- and non-volatiles, pesticides, PCBs).
4. Non-filtered, preserved (e.g., nitrogen series [ammonia, nitrates, nitrites, etc.], phenolics, total phosphorous, total metals, cyanide, total organic carbon).
5. Filtered, non-preserved (e.g., dissolved chromium VI).
6. Filtered, preserved immediately (e.g., dissolved metals)
7. Miscellaneous parameters.

Note: Collect sulfate samples before sulfuric acid preserved samples (e.g., nitrogen series). Collect nitrogen series samples before nitric acid preserved samples (e.g., boron, dissolved metals).

Procedures for Filling Sample Containers

Note: If a sample container already has preservative in it before you fill it (common for VOC vials), do not rinse the container before filling and take care to minimize sample overflow that may dilute the preservative.

1. Tip the sample container at a slight angle and allow a slow steady stream of water to run down its inner wall. Hold the sampling discharge tube close to the sample container but do not touch it.

2. Immediately after filling a sample container, if not already done, add any required preservative (filter first, if required), replace the cap, add the label, and place the sample in a plastic bag (optional) on ice in a cooler.

3. Record the "time sample collected." To avoid confusion, you may wish to record sample collection time in military time (e.g., 1300 instead of 1:00 pm, 1845 instead of 6:45 pm, etc.,)

Volatile Organic Compounds (VOCs)

Note: Do ***not*** filter VOC or other organic samples. Turn off any nearby gasoline engines or sample up wind of any engine exhaust. Remember to store one trip blank per cooler when collecting volatile (VOCs, GRO, and PVOCs) samples. Store empty VOC containers on ice to help you reduce VOC volatilization when you fill them.

1. If a laboratory hasn't already done so, add sufficient preservation to the container.

2. Tip the container at a slight angle and allow a slow, steady stream of water to run down its inner wall.

3. Fill the sample container until the water forms a positive meniscus at the brim, then immediately replace the cap.

4. Invert the sample container and tap it lightly to check for bubbles. If bubbles are present, fill a new sample container (containing preservative) and check for bubbles the same way. If bubbles are unavoidable, collect numerous samples and save those with the least amount of bubbles. Do not try to reopen and add more water to samples that have bubbles.

   Refill a ***used*** container only if you again add sufficient preservative ***and*** refill it with water from the same well, to avoid cross-contamination between samples.

5. Label the sample, place it in a plastic bag (optional), then immediately place it on ice in a cooler. Record the "time sample collected."

Semi-volatiles and Pesticides

When collecting semi-volatiles and pesticides, unless project objectives or regulations require otherwise, use similar, but less rigourous, procedures as those described for collecting VOC samples. Use the same equipment decontamination and storage procedures you use for collecting VOC samples.

When collecting semi-volatiles and pesticides, the type of sample container, volume and preservative may be quite different than that required for VOC samples. In addition, leave approximately ½ inch of air space when filling sample bottles to allow for expansion. Otherwise, the bottles may break.

> *Note:* The number of sample bottles required depends on the number of different extraction, clean-up, analytical methods and quality control (QC) needed for the project. Remember that laboratories are required to duplicate and spike samples at a set frequency. Collecting insufficient sample volumes may result in higher detection limits, because sample volume must be reduced to accommodate QC requirements.

Inorganics

Inorganic samples (e.g., dissolved metals) are quite susceptible to aeration, oxidation, precipitation, coprecipitation, extraneous contamination and cross-contamination during sampling, filtering and handling. Therefore, take extra care to avoid sample aeration before filtering (if required) and preserving. Unless WDNR requires or approves otherwise, ***field filter*** inorganic samples and ***preserve immediately*** after collection. Refer to Section 2.7 regarding filtering procedures

Other Sample Parameters

Other sample parameters subject to rapid change (by aeration and subsequent changes in redox state, or addition or loss of dissolved gasses) once groundwater is removed from a well include: chromium VI, pH, Eh, oxygen, inorganic carbon, alkalinity, TOC, ammonium, nitrate/nitrite, sulfide, cyanide, molybdenum, mercury, selenium, dissolved iron (ferrous iron - FE^{+2}), manganese, zinc, cadmium, lead, vanadium, arsenic and phosphate. Take precautions to avoid altering these parameters during sampling. Add preservative, if required, ***immediately*** and place on ice in a cooler.

For those interested in monitoring indicators of biodegredation that may be occurring in groundwater at a site, use a field test kit (e.g., colorimetric), sensor probe or other field test (e.g., portable gas chromatogram) to quantify pH, dissolved oxygen, nitrate, sulfate, ferrous iron, redox potential and manganese ***in the field*** immediately after sample collection. In addition, alkalinity, methane and carbon dioxide should be measured in the field immediately after collection, or less preferably, in the laboratory.

Contact a qualified laboratory for specific directions on collecting, preserving and handling samples not discussed in this manual.

2.6 FIELD WATER QUALITY MEASUREMENTS

☞ Use a closed flow-through cell. Or, you can use a down well measuring probe; however, well water must be flowing past the probe during measurements (i.e., the probe is near the pump's inlet during purging or is lowered and raised in the screened portion of the well).

☞ If you do not use a closed flow-through cell or a down-well probe, take in-field measurements immediately, or less preferably, within 30 minutes of collection.

☞ Avoid exposing instruments and samples to extreme heat or cold.

☞ Specific conductance, pH, dissolved oxygen and Eh can change rapidly due to aeration, oxidation and the loss or gain of dissolved gasses as you remove groundwater from a well. Minimize atmospheric contact with the sample.

Following are procedures for "***out of the well***" (i.e., closed flow-through cell or sample bottle) water quality measurements. Your equipment's operation manual may deviate from guidelines provided here. Follow the manufacturer's instructions for your instrument and familiarize yourself with the methodology in the most recent version of *Standard Methods for the Examination of Water and Wastewater*.

Temperature

1. Place the thermometer or probe into a closed flow-through cell or sample bottle and allow the purge water to continuously flow past the thermometer or probe. If you use a sample bottle, allow the water to overflow while measuring temperature.

2. Allow the thermometer or probe to equilibrate with the water for a minute or more, then record the temperature. Do not remove the thermometer or probe from the water when taking the reading.

3. Decontaminate the thermometer or probe and store properly.

Specific Conductance (conductivity and electric conductance)

Note: Measure specific conductance ***before*** pH (unless using a flow-through cell). In addition, as specific conductance is a temperature sensitive measurement, adjust readings to 25°C.

1. Calibrate the conductivity instrument and probe against a standard potassium chloride (KCl) solution. Do this in the field, or less preferably, in the laboratory. Calibrate the instrument according to the manufacturer's instructions. Recalibrate at least daily; more often is recommended and prudent. Record calibration data.

2. If required, set the instrument to the anticipated range for measurement (e.g., *x*100 µmhos/cm).

3a. If your instrument ***automatically compensates for temperature***, record the measurement as "field specific conductance at 25°C." Don't forget to multiply the measurement by the range at which the instrument is set.

3b. If your instrument ***does not automatically compensate for temperature***, measure the temperature of the sample and set the instrument's temperature dial to the sample temperature. Record the measurement as the "field specific conductance at 25°C." Don't forget to multiply the measurement by the range at which the instrument is set.

3c. If your instrument cannot compensate for temperature, apply a correction factor as specified in the manufacturer's instructions or by using the following formula:

$$\textbf{specific conductance @ 25°C} = \frac{\textbf{sample conductivity (µmhos/cm)}}{\textbf{1 + 0.0191 } x \textbf{ (sample temp. in °C - 25)}}$$

Note: Conductivity meters that do not automatically correct readings to 25°C usually include a conversion table or chart for correcting data to 25°C.

4. Decontaminate the electrode and store properly.

Note: Most problems related to collecting poor conductivity data include: weak batteries; fouling of the electrode (chemical cleaning may be necessary); insufficient submersion of the probe into the sample; allowing the probe to touch the container walls; improper or no instrument calibration; not allowing the probe to equalize with the sample temperature; and improperly or not converting readings to 25°C.

pH

1. Calibrate the pH instrument with pH buffer solutions that span the range of expected groundwater pH values. Two fresh pH buffer solutions (7.00 and 4.00 *or* 7.00 and 10.00) having temperatures within 5°C of the groundwater samples are required for instrument calibration. Properly fill the probe with a salt solution, if required. Follow the manufacturer's instructions for the procedures and frequency of instrument calibration. Calibrate the instrument at least daily; more often is recommended and prudent. Record calibration data.

2a. Place the calibrated pH probe into a closed flow-through cell and allow the purge water to continuously flow past the probe.

2b. If you measure pH from a sample container, fill a container for this measurement ***only***. Do not insert a pH probe into a sample that will later be analyzed for other parameters.

3. Allow the pH probe to equilibrate with the water for a minute or more, then record pH. Do not remove the pH probe from the water while taking the reading. Read pH measurements to the nearest 0.1 pH units.

4. Rinse the pH probe with reagent grade water and store in the buffer solution or as recommended by the equipment's manufacturer.

Turbidity

Measure the turbidity of a sample the same day you collect it, preferably in the field immediately after collection.

If you cannot measure sample turbidity soon after collection, you may store samples in the dark for up to 24 hours before measuring turbidity. Shake the sample vigorously before measuring. *Standard Methods for the Examination of Water and Wastewater* discusses interferences and procedures for measuring turbidity.

1a. Use a turbidity meter according to the manufacturer's instructions. Read turbidity to the nearest 0.1 Nephelometric Turbidity Unit (NTU) and record your measurement. In addition, provide this measurement to the laboratory if any well samples will be analyzed for metals.

1b. When you do not use a turbidity meter, describe the turbidity (e.g., slight, moderate) and record your observations or have a laboratory determine sample turbidity within 24 hours of sample collection.

Dissolved Oxygen

You can measure dissolved oxygen (DO) with an electrometric method (dissolved oxygen meter), colorimetric method, the Winkler method, or with the iodometric method. (See most recent version of *Standard Methods for the Examination of Water and Wastewater*.) Dissolved oxygen meters usually require calibration before use and a visual check of the probe to verify that the membrane is not damaged.

To function properly, most DO probes require that water continuously flow past the membrane while measurements are being taken. Therefore, for down-well measurements of DO after purging a well, use either a DO probe equipped with a stirring rod or, less preferably, slowly raise and lower the probe in the water column while taking readings. If you use a DO probe on a water sample removed from the well, either use a probe equipped with a stirring rod or, while purging the well, allow the purge water to overflow from the sample container while taking DO readings.

If your DO meter is not responding as expected or is very sluggish, you may need to change the probe's membrane; follow the manufacturer's instructions for doing this. Lowering a probe into a deep well may also result in sluggish performance because signal strength weakens with cable distance.

Color

1. Note the color against a white background. If filtering is required, note the color ***after*** filtering. Document whether you noted sample color for a filtered or nonfiltered sample.

2. Describe the color by common descriptors (e.g., light gray), or use an industry-recognized and standardized color description method (e.g., a color comparison disk for water). Record your observations.

Odor

Important Note: WDNR neither requires nor advocates smelling groundwater samples.

1a. If you do not know the type and approximate concentration of substances in a sample, do ***not*** attempt to smell it. Record sample odor only if you notice it unintentionally.

1b. If the type and concentration of substances are known and below safe values as established by Occupational Safety and Health Association (OSHA) or the National Institute for Occupational Safety and Health (NIOSH) *Pocket Guide to Chemical Hazards*, carefully wave your hand over the sample and note any distinct odor. Do not "stick your nose" in the sample to check for odor. Record any noticeable odor (e.g., pungent, solvent).

Eh (Oxidation-reduction potential)

Eh is usually measured with a noble metal (e.g., platinum) and a reference electrode system using a pH meter that reads millivolts. Take field measurements of Eh in an air-tight flow-through cell or similar air-tight device. Read Eh measurements to the nearest 10 millivolts (mV).

Follow the equipment manufacturer's instructions and refer to the most recent version of *Standard Methods for the Examination of Water and Wastewater.*

Other Water Quality Measurements

Other water quality measurements that may change physically and chemically soon after collection include dissolved carbon dioxide and alkalinity. These parameters are best measured in-field and immediately after collection. Follow the equipment manufacturer's instructions and the most recent version of *Standard Methods for the Examination of Water and Wastewater* for measuring these parameters.

2.7 SAMPLE FILTRATION

☞ WDNR ***strongly recommends*** direct, in-line filtering of samples. It is fast, simple and greatly reduces sample alteration. Direct, in-line filtering means that you attach the filter ***directly*** to a pump's discharge line or to the discharge tube of a grab sampler (e.g., bailer). If you place a sample into any type of container or transfer vessel before filtering, any filtering that follows is not direct, in-line filtering.

☞ If you do not use direct, in-line filtration, filter samples ***immediately*** after collection, document when you filtered the samples.

☞ Use a 0.45 micron pore size filter membrane for filtering. If possible, rinse or flush the filter membrane and filtering device with a minimum of 0.5 liters (500 mls) of reagent grade water before use.

☞ Avoid applying high pressure (>50 psi) when filtering samples. For silt-laden or turbid samples, try using a pre-filter (e.g., glass microfiber), a filter membrane of larger diameter or larger surface area, or a slower pumping rate or bailing technique. If high turbidity is a recurring problem, the well may need to be redeveloped or rehabilitated.

☞ If possible, allow 150 mls or so of sample to pass through the filtering device before filling sample containers. If possible, rinse sample containers once with filtrate.

Filtration Procedures

IMPORTANT: ***Immediately*** after or during collection, ***field filter*** samples collected for metals analyses. There are three exceptions:

1) Total metals results are required. This requirement may be in a Wastewater permit, administrative rule, sampling contract or other requirement or agreement.

2) WDNR grants a verbal or written approval to the responsible party, or its representative, allowing unfiltered metal sample results.

3) Low-flow sampling procedures are used, three consecutive in-field turbidity readings (spaced ~2 minutes or ~ 0.5 well volumes or more apart) are all 5 NTUs or less ***and*** WDNR grants verbal or written approval to the responsible party, or its representative, allowing unfiltered metal sample results.

A. <u>Low-flow Purging and Sampling, NO FILTRATION and Three Consecutive Turbidity Readings of 5 NTUs or less</u>

This procedure involves purging a well at 1 L/min (0.26 gpm) or less and sampling the well at 300 ml/min (0.3 L/min or 0.1 gpm) or less. The sample does not require filtering if low-flow sampling procedures are used, three consecutive in-field turbidity readings (spaced ~2 minutes or ~ 0.5 well volumes or more apart) are all 5 NTUs or less ***and***

WDNR grants verbal or written approval to the responsible party, or its representative, allowing unfiltered metal sample results. Record that the samples were not filtered and that they have turbidity readings of 5 NTUs or less.

Under this scenario, purging and sampling rates should be at or less than natural flow conditions existing in the aquifer. Low turbidity values (<5 NTUs) for the sample should reflect the naturally mobile colloids and particulates moving through the groundwater.

B. Low-flow Purging and Sampling, and Direct, In-line Filtration

1. After completing well purging as described under Section 2.4, reduce the pumping rate as low as possible to deliver a slow discharge. Do not use a valve to reduce the flow rate.

2. Attach the direct, in-line filter ***directly*** to the pump's discharge line. (If applicable, remove the sample tubing from the flow-through cell first.)

3. Discard the first 150 mls or so of filtered sample. Collect the subsequent filtered samples into appropriate sample containers.

4. Immediately preserve the samples, replace the cap, label the samples, and place them on ice in a cooler.

5. Record "sample field filtered (Y)" and the "time samples filtered." Dispose of the used in-line filter - ***do not*** reuse it.

C. Purging and Sampling with a Bailer and Direct, In-line Filtration

1. Purge and sample the well as described under Section 2.4.

2. Connect the direct, in-line filter to the bailer as described by the manufacturer's instructions. Pressure-fed systems are recommended over gravity-fed systems.

3. If the bailer's volume allows, discard the first 150 mls or so of filtered sample. Collect the subsequent filtered samples into appropriate sample containers.

4. Immediately preserve the samples, replace the cap, label the samples and place them on ice in a cooler.

5. Record "sample field filtered (Y)" and the "time samples filtered." Dispose of the used in-line filter - ***do not*** reuse it.

D. Sample Transfer and Pressure Filtration: Field Filtering Immediately After Sample Collection

Note: Use positive pressure filtration rather than vacuum filtration, which causes excessive sample aeration and agitation.

1a. If you use a **self-contained filtering device**, gently pour the sample (preferably directly from the pump's or grab sampler's discharge line) directly into the self-contained device fitted with a disposable filter membrane. Attach the pressure line to the device.

1b. If you use a **transfer vessel**, gently pour the sample (preferably directly from the pump's or grab sampler's discharge line) into the transfer vessel. Set up the reusable filtering device with a disposable filter membrane or use a disposable, in-line filter in conjunction with the transfer vessel.

Note: Some laboratories may recommend a dilute nitric acid/reagent grade water rinse of the filtering equipment (i.e., described in "1a" and "1b") to prevent extraneous contamination of filtered samples.

2. If you have sufficient sample volume, discard the first 150 mls or so of filtered sample. Collect the rest of the filtered sample into appropriate sample containers.

3. Immediately preserve the samples, replace the cap, label the samples and place them on ice in a cooler. Record "time samples filtered" and "samples field filtered (Y)."

4. Dispose of the used filter membrane - ***do not*** reuse it. Decontaminate the transfer vessel and filtering device and store for later use.

E. Sample Transfer and Filtration: Field Filtering NOT Done Immediately or Sample is Filtered Later in a Laboratory

Unless the parameters being collected are not subject to change during sample storage (e.g., changes in dissolved gas content, pH, Eh, redox potential, and dissolved/solid phases), filter samples in the field ***immediately*** after collection. If a sample is not subject to change and is held for extended periods of time, filtering may be done later. Record the filtering place, time and method.

Alternative Methods

Alternative filtration techniques are acceptable if you use a 0.45 micron pore size filter membrane that is nonsorptive and does not leach contaminants into the sample. The materials and operation of the filtering device must have little or no physical or chemical effect on the sample being filtered. Follow the manufacturer's instructions for proper use.

Document and describe the device, membrane and procedure used for filtering. This information must appear in your sampling plan and groundwater data reports for a site or project.

2.8 SAMPLE PRESERVATION AND HANDLING

Sample Preservation

Appendix C includes sample preservation for a variety of compounds and parameters. You may add preservative to sample bottles before or immediately after sample collection. (Filter the sample, if required, before adding preservative.) If you add preservative to a container before adding the sample, take care to minimize sample overflow that may dilute the preservative.

Checking and Adjusting the pH of a Preserved Sample

Note: Do ***not*** check the pH of VOC samples.

When using a pH meter to check the pH of a preserved sample, follow these procedures:

1. If applicable, check and fill the reference electrode with solution as recommended by the instrument's manufacturer.

2. Calibrate the instrument according to the manufacturer's instruction. Two fresh pH buffer solutions (7.00 and 4.00 ***or*** 7.00 and 10.00) having temperatures within 5°C of the groundwater samples are typically required for instrument calibration.

3. Pour a small portion of the preserved sample into a separate container. Immerse the electrode into the separate container and wait for the reading to stabilize. Do not swirl or stir the electrode while taking the reading unless recommended by the manufacturer.

4a. If sample pH needs adjustment, add additional preservative to the original sample and repeat Step 3.

4b. If sample pH is acceptable, dispose of the separate sample (do ***not*** pour it back into the original sample container), replace the lid on the original sample and place it on ice in a cooler.

5. Rinse the electrode with reagent grade water and store the electrode in the buffer solution or as recommended by the manufacturer.

When using pH paper to check the pH of a preserved sample, follow these procedures:

1. Gently tip the sample container on its side to wet the inside of the lid and remove the lid.

2. Touch the pH paper to the droplets inside the lid and read the pH. Do ***not*** put the pH paper directly into the sample container. Compare the color of the pH paper to color-pH provided by the manufacturer.

3a. If sample pH needs adjustment, add additional preservative to the sample, rinse the container lid with reagent grade water, replace the container lid and repeat Steps 1 and 2.

3b. If sample pH is acceptable, rinse the container lid with reagent grade water, shake the lid to remove any excess water and replace the lid.

Sample Handling and Storage

After samples are collected, filtered (if required), labeled and preserved (if required), they must be placed ***immediately*** on ice. Keep samples at or below 4°C, but above freezing throughout storage, handling and shipping. Make sure there is enough ice for the duration of sample storage and transport. WDNR ***discourages*** using frozen cold packs (e.g., "blue ice"). If you do use them, place a temperature blank in the cooler so the laboratory can document the temperature of the samples when they arrive.

Breakable sample containers (e.g., glass VOC vials) should be separated by bubble wrap, foam, ice, etc. At least a portion of each container must contact the ice, otherwise the protective layer (e.g., bubble wrap) may insulate the sample from the cooling effects of the ice. Placing samples in a plastic bag can help minimize the chance of cross-contamination among samples should a container break.

2.9 QUALITY ASSURANCE/QUALITY CONTROL

☞ Field QA/QC efforts must match the data quality objectives established or required for the project and sampling event.

☞ Remember that QA/QC procedures and samples are not optional. Each WDNR program may have different QA/QC requirements. Check WDNR program guidance or contact a WDNR project manager for details.

☞ All QA/QC samples must be collected, handled and processed in the ***same exact manner*** as the other analytical samples being collected. Make sure the laboratory receives sufficient sample volumes or additional containers to perform required QC procedures.

☞ All purging, sampling and decontamination wastewaters and materials must be stored, handled and disposed of properly. Contact your WDNR project manager or WDNR program for details.

Quality Control Samples

Trip Blank

Include one trip blank per cooler if collecting volatiles (i.e., VOCs, GRO, or PVOCs). Prepare trip blanks with laboratory ***reagent grade water***. ***Do not*** prepare them with water (even if distilled or deionized) purchased at a store; there is no guarantee that store-bought water is free of contamination. Trip blanks must be analyzed by the same laboratory that is analyzing the volatile samples. The trip blanks should not be opened until they are analyzed.

WDNR typically requires one trip blank per vehicle and one trip blank per cooler. Store, transport and ship all volatile samples in one cooler to minimize the number of trip blanks.

Note: If holding times permit, trip blanks do not need to be analyzed if VOC, GRO and PVOC compounds are not detected in ***any*** of the groundwater samples. The holding time for a trip blank begins when groundwater samples are being collected.

Field Blank (field rinsate blank, decontamination blank, equipment blank)

Collect one field blank for every 10 samples or less collected. Decontaminate the sampling equipment for the field blank the same way you do when collecting other samples. After decontaminating the sampling device (e.g., bailer or pump), fill it with laboratory ***reagent grade water***, then collect a sample of the reagent grade water - this is your field blank. Collect the field blank from equipment used in a site's most contaminated well, if possible. The field blank should be analyzed for the same parameters as the samples. Field blanks are ***not*** required if you use dedicated sampling equipment ("permanently" left in the well) or disposable sampling equipment.

Field Duplicate

Collect one field duplicate for every 10 samples or less collected. Collect the field duplicate from the most contaminated well, if possible. The field duplicate should be analyzed for the same parameters as the samples. When using a grab sampler (e.g., bailer), collect the duplicate from the same bailer of water as the original sample is collected, bailer volume permitting.

Field Split Samples

Typically not required. Collect the sample from the well, filter if required, and dispense into two or more containers. Preserve the samples if required and send them

to separate laboratories for analysis. The samples must be analyzed by identical laboratory analytical methods to be comparable.

Sequential Samples

Typically not required. Sequential samples are taken from the same well during the same sampling event but are collected with different equipment or procedures. These samples can be used to detect variability in analytical results caused by different sampling equipment or procedures.

Equipment Decontamination

Check with your laboratory for recommended equipment cleaning solutions and procedures for each analyte you are sampling. Collection of inorganic compounds may necessitate a dilute acid equipment rinse first. Collection of organic compounds may require a pesticide grade isopropanol, acetone, methanol or hexane equipment rinse. If you use pesticide grade hexane, take extra safety precautions because hexane is quite flammable. Use your professional judgment to decide which of the following procedures to use:

Minimum Decontamination Procedures

1. Disassemble the equipment if possible. Use a weak non-phosphate detergent (e.g., Alquinox®, Liquinox®) and water solution, and scrub the equipment inside and out. Visually inspect the equipment to ensure no visible contamination is present.

   Note: If welfare or indicator parameters (Table 2 and 3, respectively, of ch. NR 140), or non-sorptive elements or compounds are the only contaminants to come in contact with the equipment, Step 1 may not be necessary. Consult with WDNR staff if you are uncertain.

2. Thoroughly rinse the equipment with organic-free tap water. Reassemble the equipment, if applicable.

3. Store and transport the equipment in clean plastic, aluminum foil, or a container that will protect the equipment from extraneous contamination.

More Rigorous Decontamination Procedures

1. Wash equipment with a non-phosphate detergent solution and scrub with an inert brush. For internal mechanisms and tubing, circulate the detergent solution through the equipment.

2. Thoroughly rinse the equipment with organic-free tap water.

3a. For ***organic*** (e.g., VOCs) sample collection, rinse equipment with an organic desorbing agent (e.g., pesticide grade isopropanol, acetone, methanol or hexane).

3b. For ***inorganic*** sample collection, rinse equipment with inorganic desorbing agent (e.g., dilute [0.1 Normal] reagent grade hydrochloric acid or nitric acid solution). For stainless steel and low-carbon steel, a more dilute hydrochloric acid solution (1 percent) is recommended.

Note: If you use organic or inorganic desorbing agents, check with your laboratory regarding potential analytical interferences caused by desorbing agents and their proper use and disposal.

4. Rinse the equipment with organic-free tap water only if you are using an ***inorganic*** desorbing agent.

5. Rinse with laboratory reagent grade water. If practical, allow the equipment to air dry before its next use or storage.

6. Store and transport the equipment in clean plastic, aluminum foil or a container that will protect it from extraneous contamination.

Other decontamination methods such as high pressure steam cleaning, hot-water power wash, ultrasonic cleaning and other methods decontaminate most equipment satisfactorily. Refer to the manufacturer's instructions for use.

Note: Dedicated sampling equipment ("permanently" left in the well) significantly reduces the need for equipment decontamination. Sampling equipment used in wells containing free product should be dedicated (suspended above the water column) or disposable.

Sample Tracking, Security and Chain of Custody Procedures

Sample tracking, security and chain of custody procedures provide a legal record of sample transport, possession and handling.

Sample Identification

Use waterproof labels or a similar method to identify each sample container. Use a permanent waterproof marker. Avoid placing labels on container lids; however, if you do place a label on a lid, make sure it's attached to the container as well. Labels should include the following information:

- ✓ a unique sample number and WUWN (if applicable)
- ✓ site/project name
- ✓ date and time sample collected
- ✓ sample collectors initials
- ✓ preservation and analysis required

Sample Seals

Some sampling protocols require sample seals. Affix the seal to the sample container so that it has to be broken to open the container. Write your initials, the date and time on the seal.

Shipping Custody Seal

Use tape or a lock to seal the container for shipping. If you use tape, write your signature, the date and time on the tape.

Chain of Custody Record

Complete a chain of custody (COC) record for each sampling event. Each time the samples change possession, whoever relinquishes and whoever receives the samples must sign, date and time the chain of custody form.

> ***Note:*** If you place the chain of custody record in a sealed shipper, you do not need to have the commercial courier (e.g., UPS) sign, date and time the record; however, the courier should have a record of when he or she picked up the samples and where they were sent.

Appendix A includes an example chain of custody form. Check with the WDNR program, WDNR project manager, and the laboratory for more specific chain of custody procedures or forms required. Appendix C contains "Chain of Custody for Samples Requiring Strict Custody" when collecting enforcement samples.

3.0 SAMPLING PROCEDURES FOR WATER SUPPLY WELLS

Important note: This section addresses the collection and measurement of ***raw, untreated groundwater samples*** from water supply wells. Ch. NR 809 and SDWA compliance monitoring and sampling are beyond this manual's scope and intent; contact a WDNR water supply specialist or investigator when collecting these samples.

3.1 PRE-FIELD CHECKLISTS AND DOCUMENTATION

Pre-field Checklists (Included in Appendix B)

Go through the following two checklists before heading out to the field. You can modify these checklists to meet specific project needs.

1. Pre-field Work Procedures Checklist - Water Supply Wells.
2. Equipment Checklist - Water Supply Well Sampling.

Documentation of the Sampling Event

1. **Sampling Plan.** The sampling plan documents equipment and procedures used during a sampling event. All sampling personnel must read it before heading out to the field and must bring it to each sampling event. Any deviations from the sampling plan must be documented on the "Field Procedures Documentation" sheet included in Appendix B, or on a customized documentation sheet.

2. **Well-Specific Field Sheet - Water Supply Wells (Appendix B).** Document well information, purging and sampling information, measurements, etc., on this sheet or customize your own data sheet.

3. **Field Procedures Documentation (Appendix B).** If a sampling plan is not available, you can use the "Field Procedures Documentation" sheet included in Appendix B. Customize this sheet to meet specific needs.

4. **Groundwater Monitoring Inventory Form (Appendix B).** Complete this form if a well has not previously been monitored. This form documents information about the well so it can be entered into WDNR's computerized data base.

5. **Assigning a Wisconsin Unique Well Number (WUWN).** All public and private water supply wells must be documented with a WUWN. Each well must have only ***one*** WUWN. Refer to Section 3.2 for WUWN private well labeling procedures.

6. **Chain of Custody Form (Appendix B).** Document the procession of samples collected from water supply wells by completing a chain of custody form and documenting each time the samples change procession.

3.2 INITIAL PROCEDURES

Coordination with the Well Owner/Operator

1. Call the well owner/operator at least 24 hours before you plan to collect measurements and samples from the well. If you are sampling a private or domestic well, call the well owner at least one week in advance. Briefly explain to the well owner what you plan to do and why. Explain your procedures for measuring the water level, well casing depth and total well depth, and for collecting any samples.

2. If the well owner/operator allows you to perform these measurements, ask if it is all right to add chlorine or an alternative disinfectant to the well after taking the measurements. Explain to the owner why disinfection is essential and what disinfection technique you plan to use. If the owner rejects having the well disinfected, do not take measurements on the well. If obtaining measurements is crucial, ask an appropriate WDNR representative in the Bureau of Drinking Water and Groundwater to talk to the well owner to further explain the necessity of the measurements and that the well will be properly disinfected afterwards.

3. If the well owner/operator allows measurements and disinfection of the well, ask the well owner/operator to use a minimal amount of water in the morning/afternoon before your arrival, so the water level in the well recovers before being measured.

4. Before collecting any water level, well casing depth or well depth measurements, ask the well owner to turn off the pump to avoid an electrical hazard and to prevent the pump from starting when you are collecting measurements.

Initial Coliform Bacteria Testing

Before performing ***any*** tasks on the well, collect a water sample for coliform bacteria analysis using sampling procedures described under Section 3.7.

Wisconsin Unique Well Number (WUWN) Labeling Procedures

1. Determine if the well already has a WUWN - this is ***absolutely*** necessary to ensure that each well has ***only one*** WUWN assigned to it! WDNR water supply specialists/investigators at WDNR regional offices can tell you which water supply wells already have a WUWN - ask them for the most up-to-date list.

2. Determine which type of WUWN label is needed for the private well (i.e., printronix, blank, and preprinted labels). If you are uncertain which label is required, refer to the *Groundwater Sampling Desk Reference* or contact a WDNR regional office water supply specialist/investigator. If you assign a WUWN to a private well, you must fill out a "Groundwater Monitoring Inventory Form" (Form 330-67 Rev. 12-92), and send it to the Bureau of Drinking Water and Groundwater, P.O. Box 7921, Madison, WI 53707-7921.

3. If the well owner consents to it, you should place WUWN labels on the well's fuse box and sampling tap. Attach one of the WUWN labels to the home's main electric fuse box. Attach a second label to the pipe next to the sampling tap located ***before*** the pressure tank. Wipe the pipe as clean and dry as possible and wrap duct tape around the pipe to provide a dry surface to affix the label. Attach the label horizontally to the duct tape.

   Note: While public water supply wells have WUWNs assigned to them, they normally do ***not*** have WUWN labels placed on them unless requested by the public water utility, in which case a specialized label is provided. Contact the Bureau of Drinking Water and Groundwater in Madison for further details.

3.3 MEASURING WATER LEVEL, CASING DEPTH AND TOTAL WELL DEPTH

☞ Measure the water level, well casing depth, and total well depth only after receiving training from someone experienced in the proper procedures. If the well has a pitless adaptor, it may be impossible to collect these measurements.

☞ If available, use a well construction log to obtain well casing depth and total well depth information. If this information is not available, you may need to remove the well's pump, if the well owner permits, before measuring well casing depth or total well depth. Use ***extreme care*** so as not to damage or contaminate the well or pump. A licensed well driller, arranged for far in advance, should remove and replace the pump.

☞ Before taking any well measurements, ask the well owner/operator to turn off the pump. This is for your own personal safety and to protect the pump from damage as equipment is lowered into the well. Make sure the well and wiring are not damaged during measuring and sampling.

Disinfection Procedures for Equipment

Important Note: Before placing ***any*** equipment into a water supply well, potable or non-potable, properly disinfect the equipment.

1. Disinfect all equipment before and after placing it into the well to prevent the introduction of coliform bacteria, iron bacteria, or any other source of contamination.

2. Rinse all equipment parts inside and out that will enter the well (e.g., steel tape, water level indicator, weighted magnet, etc.,). Rinse with a dilute chlorine solution, about 50 ppm, i.e., about 2 capfuls of liquid chlorine bleach to 1 gallon of water. The liquid chlorine bleach must not contain any additives such as "fresh scent." You may also use dry calcium hypochlorite granules to make the chlorine solution.

3. If there are no inside parts that may become contaminated, you may use a clean cloth or paper towels soaked in a dilute chlorine solution to sterilize your equipment. Do not reuse the towels.

4. Place disinfected equipment on a clean cloth or on plastic, not on bare ground.

Measuring Water Level

Note: Refer to Section 2.2 when using an electric water level indicator, popper or coated tape to measure the static water level in a well.

1. Take a series of water level measurements to determine if the well is still recovering. If at least three consecutive readings separated by a minute or more are within ± 0.01 foot, then use this as your reading. Record the reading and method used to collect this measurement. Disinfect the equipment.

2. If you are taking water level measurements to determine groundwater elevations, mark the side of the casing where the water level is measured to provide a marking point for surveying.

Measuring Well Casing Depth

1. Use a weighted magnet that is strong enough to cling to the steel casing but will also slide down it. The tape or cable should be calibrated and marked to tenths of a foot.

2. Lower the disinfected magnet, which is attached to a marked disinfected cable, along the steel casing until the magnet slips off the end of the casing.

3. Measure the length of the steel casing to it top. Repeat this process until you are satisfied you have a reliable reading.

4. Record this measurement and the method used for collecting it. Disinfect the equipment and store properly.

Measuring Total Well Depth

1. Measure the total well depth with a weighted synthetic tape or cord (***not*** cotton or cloth) calibrated and marked to tenths of a foot. Any tape or cord used must have very little or no stretch under tension.

2. Lower the disinfected weighted tape or cord through the water column until it becomes slack. Slowly pull the tape or cord until it just becomes taut.

3. Read the tape against the top of the well casing to the nearest 0.1 foot and record the measurement. Disinfect the equipment and store properly.

Disinfection of Well after Measurements

Properly disinfect the well after taking any measurements. While there are no formal standards for proper concentrations of the chlorine disinfection solution, a 50 ppm chlorine solution should be adequate for chlorinating wells as a preventive assurance method.

After Water Level Measurements

1. Pour one cup of full-strength liquid chlorine bleach or drop three to five HTH tablets down the well to disinfect 20 feet of standing water in a 6-inch diameter well. Re-seal the well.

2. Allow the solution to remain in the well at least 30 minutes, although at least 8 hours is recommended.

3. Tell the well owner/user to run all taps until the chlorine odor and taste disappear (usually less than one hour).

After Well Casing and Total Well Depth Measurements

If you are measuring only the well casing depth, the amount of 50 ppm chlorine solution you need to displace the affected portion of the well will depend upon how far you lower the magnet into the water. If measuring total well depth, disinfect the entire well by displacing all water out of the well. The total amount of 50 ppm chorine solution to add will depend upon the diameter, depth, and amount of water in the well. For a 50 ppm chlorine solution made from common household bleach (approx. 5 percent available chlorine as sodium hypochlorite):

> Add about 1 gallon of bleach (no additives) to 1,000 gallons of water or about 1 pint of bleach to 125 gallons of water.

For a 50 ppm chlorine solution made from dry calcium hypochlorite (approx. 70 percent available chlorine):

> Add about 1 pound (approx. 16 oz.) of dry hypochlorite to 1,000 gallons of water or about 0.1 pounds (approx. 2 oz.) to 100 gallons of water.

Approximate amount of chlorine solution (CS) to displace the water in a well:

2" diameter well	Add 2 gallons of CS per 10 feet of well water
4" diameter well	Add 7 gallons of CS per 10 feet of well water
6" diameter well	Add 15 gallons of CS per 10 feet of well water
8" diameter well	Add 25 gallons of CS per 10 feet of well water

1. Mix the appropriate amount of chlorine solution for the volume of water to be displaced.

2. Pour the entire chlorine solution, in a circular motion, down the well's inside casing, pump equipment and wiring. Reseal the well.

3. Activate the well pump and turn on all taps, both hot and cold, until you detect a bleach smell at each tap, then shutoff all taps. To save energy, turn off the hot water heater.

4. Allow the chlorine solution to remain in the well and piping at least 8 to 12 hours, preferably 24 hours, to ensure that the well and piping are thoroughly disinfected.

5. After at least 8 hours, tell the well owner to flush the well and piping system free of the chlorine solution.

Discharge of Chlorinated Water

Unfortunately, there really is no good place to discharge the chlorine solution that comes out of the well and faucets. Do not discharge the solution directly to a lake, stream, wetland, lawn, garden, sanitary or storm sewer. Large quantities of chlorine may disrupt a septic system. Discharge the pumped water to an area that will not harm fish or sensitive plants.

Probably the best place to discharge the chlorine solution is onto a driveway or other paved area, preferably on a hot, sunny day so the solution can evaporate. Discharging the chlorinated solution to a ditch may also be appropriate.

Post Disinfection Coliform Bacteria Testing Procedures

After the system is ***completely*** free of any chlorine smell and taste, and after waiting several days to a week, collect a second coliform bacteria sample (refer to Section 3.7) from the same tap as the first sample. Properly-trained well owners, WDNR staff, local health staff or special consultants may collect the sample. When collecting post-disinfection coliform samples, you may need to use a thiosulfate sample bottle since a chlorine residual may remain in the well.

If either the initial coliform test or the post disinfection coliform test is ***positive*** for bacteria, ***immediately*** contact a WDNR drinking water specialist/investigator for further instructions.

3.4 WELL PURGING

☞ Draw a diagram of where you purge the well and collect samples.

Large Water Supply Systems (i.e., public water supplies with distribution systems)

1. Purge and collect samples from a sample tap or faucet near the pump and ahead of treatment, storage or pressure systems.

2. Make sure the pump is activated, that water is flowing from the tap for at least five minutes and that the water is cold before you collect any samples.

Small Water Supply Systems (i.e., private water supply and distribution systems)

1. Purge and collect samples from a sample tap as close to the well's pump as possible, before the water passes through any softener, heater, storage or pressure system, or tank. Document if you cannot collect a sample located before a water heater or treatment system.

2. If possible, remove any aerators, filters or other devices from the tap before collecting any samples. If you must collect the sample from an outside tap, remove any hoses first.

3a. If you collect samples from a tap located ***before*** the pressure tank, first make sure the pump is activated and allow the water to run from the tap for at least two minutes – until the water is cold or for one full pump cycle.

3b. If you collect samples from a tap located ***after*** the pressure tank, first allow the water to run from the tap for at least five minutes – until the water is cold or for one full pump cycle. Run the water until the pressure tank and pump cycle the water two or three times. Document that you've collected samples from a tap located after the pressure tank.

3.5 FIELD WATER QUALITY MEASUREMENTS

Take in-field water quality measurements on unfiltered water supply well samples according to the procedures in Section 2.6.

3.6 SAMPLE FILTRATION

Do ***not*** filter groundwater samples from water supply wells.

3.7 SAMPLE COLLECTION, PRESERVATION, AND HANDLING

Collect, preserve and handle water supply samples according to the procedures, where applicable, described in Sections 2.5 and 2.8. Collection of bacteriological samples are an exception; those procedures are described in this section.

Procedural exception when collecting VOCs from water supply wells:

If the sampling tap has an aerator, filter or other device, remove it. Run the water for at least two minutes, until cold. Reduce the water flow to a thin stream, then collect the VOC samples as described in Section 2.5.

Bacteriological Sampling

Select a sampling faucet least likely to provide an erroneous "unsafe" test result due to bacteriological contamination originating from the faucet. Use the following criteria to select a faucet:

- Choose cold-water faucets only.
- Choose a faucet ***not*** connected to the building's water softener.
- Avoid swing faucets.
- Choose a smooth-end faucet over a threaded-end faucet, if possible.
- Never sample from a flexible hose.
- Never sample a drinking fountain.
- Never sample a faucet that cannot be thoroughly flamed, such as a dripping faucet, outside hose bibb with an unremovable vacuum breaker, a faucet with an unremovable aerator, a plastic bathroom fixture, or a metal fixture with external plastic or rubber inserts (sometimes on the bottom of the fixture).
- Avoid faucets that cannot deliver a smooth stream of water.
- Avoid faucets that are seldom used.
- Never sample a fire hydrant.

1. Remove the aerator and any washers.

2. Run water from the faucet to determine if it can deliver a smooth stream of water.

3. Flame the faucet for at least 15 seconds. Use a propane or butane torch. Do ***not*** use a candle, cigarette lighter, rolled newspaper, etc. Flame the outside and inside of the faucet. The flame must come into direct contact with the inside of the faucet. If possible, look at the inside surface of the faucet – if it is still wet, keep flaming.

4. Do ***not*** touch the faucet after it has been flamed.

5. Before collecting a sample, run the water for at least three minutes. Turn the faucet on so it delivers a smooth steady stream of water with minimal splashing. The flow rate should be high enough to deliver a smooth stream of water but low enough to permit the filling of sample bottles without turning the valve down before sampling.

Rule of thumb: The longer the water runs from the faucet, the greater your chance for collecting a representative sample.

6. Do ***not*** readjust the flow rate before collecting samples. Fill the sample bottles ¾ full. This provides space for the laboratory to shake the sample to ensure uniform sample quality.

7. Replace the sample cap tightly! Place the sample container in a clean, unused sealable plastic bag to minimize exposure to any extraneous contamination during storage and transport. Bacteriological samples usually have to be analyzed soon after collection (within 30 hours of their collection for samples sent to the SLOH).

Important note: If you even ***think or suspect*** that a sample may have become accidentally contaminated, throw it out and collect a new sample following Steps 1 to 7.

Other Sample Parameters

Make sure you have the appropriate sample bottles as required by your laboratory and that they are pre-cleaned as appropriate for the parameters you are analyzing. Follow your laboratory's instructions for sample collection.

If you are unfamiliar with proper sampling procedures or need to know from which sample taps to collect other parameters (e.g., inorganic, radiological, total trihalomethanes [TTHM], etc.), ask a WDNR representative in the Water Supply program for instructions.

3.8 QUALITY ASSURANCE/QUALITY CONTROL

Refer to and follow the procedures described in Section 2.9. Appendix B includes an example chain of custody form you may use when collecting water supply well samples.

APPENDIX A

MONITORING WELLS

Checklists

- Pre-field Work Procedures Checklist - Monitoring Wells
- Equipment Checklist - Monitoring Well Sampling

Documentation Sheets and Forms

- Well Specific Field Sheet (WSFS) - Monitoring Wells
- Groundwater Sampling Field Procedures Documentation
- Chain of Custody Form for the LUST Program (Form 4400-151)

* Master copies of the above forms are also located in the plastic sheet protector at the back of this manual. Please keep these masters and copy as needed.

PRE-FIELD WORK PROCEDURES CHECKLIST - MONITORING WELLS

All the following procedures may not be necessary for each sampling event. Use those procedures applicable to your sampling plan or customize this list.

LOGISTICS

___ Arrange for site access with the land/home/facility owner and tenants.
___ Locate the nearest post office, UPS office, Fedex drop off spot, etc., if you will need to ship the samples from the field. (UPS has a 70 lb. restriction per container.)

LABORATORY ARRANGEMENTS

___ Select a qualified laboratory to perform the sample analysis. Check that the laboratory (and subcontracted lab) is certified to perform the required analysis.
___ Make sure you have sufficient numbers, types, and volumes of sample containers – **get extras!** Remember QA/QC sample containers and trip blanks.
___ Discuss sample preservation, holding time, shipping requirements, and QA/QC expectations with the laboratory.
___ Inform the laboratory of the date and number of samples you will send.
___ Familiarize yourself with chain of custody and other sample tracking procedures.

SITE HISTORY

___ Review past water quality data or SAP to determine the well sampling order.

EQUIPMENT AND FIELD PREPARATION

___ Review the sampling and analysis plan (SAP) and QA/QC plan.
___ Organize equipment (Equipment Checklist - Monitoring Well Sampling).
___ Check that equipment is in good working condition:

- ✓ Test and recharge/replace batteries as necessary.
- ✓ Test the equipment with tap water or calibration standards.
- ✓ Inspect the equipment for defects, loose bolts, frayed wiring, etc.
- ✓ Check the instruments' ability to calibrate and function properly.

___ Check that all equipment is properly decontaminated and stored for transport.
___ Fill out the Well Specific Field Sheet (WSFS) as much as possible before heading out to the field.

HEALTH AND SAFETY EQUIPMENT AND PREPARATION

___ If required, prepare and follow a health and safety plan (HSP).
___ Inform sub-contractors and other site personnel of contaminants and site hazards.

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EQUIPMENT CHECKLIST - MONITORING WELL SAMPLING

All the following items may not be necessary for each sampling event. Check those items applicable to your sampling plan or customize this list.

GENERAL AND LOGISTICS

___ Permission/notification to land/home owner/tenant
___ Directions to the site and site access roads/site access keys
___ Contact names, addresses and phone numbers
___ Site map showing well locations, keys for well locks
___ Calculator and/or purge volume conversion tables
___ _____

DOCUMENTATION AND REFERENCE MATERIALS

___ *Groundwater Sampling Field Manual*
___ Sampling and analysis plan (SAP), QA/QC plan, and health and safety plan (HSF)
___ Well Specific Field Sheet (WSFS) and Field Procedures Documentation sheet
___ Well and boring logs
___ Field note book and waterproof pens
___ Clipboard with waterproof cover
___ Chain of custody forms and other sample tracking forms
___ Camera and film
___ _____

PURGING AND SAMPLING EQUIPMENT

___ Plastic sheet or equivalent ground cover
___ Purging pump or bailer and accessories (inert material)
___ Sampling pump or bailer and accessories (inert material)
___ Pump or bailer rope/cable (no cotton or cloth) and tripod
___ Pump sample tubing (inert material)
___ Pump power supply, air compressor, inert gas, etc.
___ Calibrated buckets or similar device for purge water
___ Waterproof grease markers or pens (Sharpies™ are a potential source of VOCs)
___ Sample containers (provided by lab) - **bring extra**, and water proof labels/tags
___ QA/QC sample bottles (VOC trip blanks filled by lab)
___ Sample transfer containers and wide mouth funnel
___ Filtering apparatus and all accessories
___ Filter membranes (0.45 micron) and pre-filters, or
___ Disposable in-line filters
___ 55 gallon drums for wastewater and drum labels
___ _____

FIELD MEASUREMENTS AND EQUIPMENT

___ Water level measuring instrument (0.01 foot increments) and backup device
___ Thermometer or temperature instrument
___ Conductivity meter and calibration standards (KCl)
___ pH meter, buffer solutions (pH 4, 7 and 10) and beakers
___ Dissolved oxygen meter and membrane replacement kit and/or Eh meter
___ Turbidity meter
___ All meters fully charged and operational; spare batteries
___ Closed flow through cell
___ Squirt bottles filled with reagent grade water
___ _____

DECONTAMINATION EQUIPMENT

___ Non-phosphate cleaner and scrub brushes
___ Wash and rinse tubs or buckets and wastewater containers
___ Laboratory reagent grade water (two gallons/well usually sufficient)
___ Clean containers to transport equipment
___ _____

SAMPLE PRESERVATION AND SHIPPING

___ Sample preservatives, transfer pipettes and pH paper
___ Coolers sufficiently large to hold all samples, including QA/QC samples
___ Crushed or cubed ice (frozen cold packs discouraged, need temp. blank)
___ Bubble wrap, Ziplock™ bags or equivalent to protect sample containers
___ Strapping tape, postage, Fedex or UPS shipping labels, COC forms, etc.,
___ _____

TOOLS AND MISCELLANEOUS

___ Extra locks, keys for wells, flashlight, rain gear, etc.
___ Propane torch for frozen locks and bolt cutters for corroded locks
___ Adjustable wrench, screw drivers, hammer, scissors, knife, duct tape, etc.
___ Plastic garbage bags for contaminated waste
___ Bailer retrieval device (e.g., weighted hook)
___ Drum bung wrench and racket socket set (typ. 15/16" socket for 55 gallon drums)
___ _____

PERSONAL PROTECTIVE EQUIPMENT

___ Respirators and cartridges (compatible for contaminants)
___ Safety glasses and/or splash shield
___ Inner and outer gloves (compatible for contaminants)
___ Hard hat and steel toed boots
___ Air monitoring equipment
___ First aid kit and eye wash kit
___ _____

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WELL SPECIFIC FIELD SHEET - MONITORING WELLS (Sheet ___ of ___)

Facility/Project Name: _____ Date: _____
Section/Grid or Address: _____
License or Permit #: _____
Weather today and past weeks (precipitation): _____
Persons Sampling: _____

Well Name					
DNR Well ID No.					
Wis. Unique Well No. (WUWN)					
Damage to Well? (Y/N)					
Top of Casing or Reference Elevation (MSL)					
Depth to Water (to 0.01 ft)					
Groundwater Elevation (MSL)					
Depth to Well Bottom (ft)					
4 Well Volumes (gal. or liters)					
Purging Device; dedicated (D) or portable (PT)					
Purge Device Intake Depth (ft)					
Purging Time (start - stop)					
Average Purging Flow Rate (gpm or L/min)					
Volume Purged (gal. or liters)					
Purged Dry? (Y/N)					
Problems Purging? (Y/N)					
Sampling Device (D or PT)					
Sampler Intake Depth (ft)					
Average Sampling Flow Rate (gpm or L/min)					
Time Sample Collected					
Preservative (e.g., HCL)					
Field Temperature (°C)					
Field Specific Conductance @25°C (µMhos/cm)					
Time Measured					

Well Name					
Field pH (standard units)					
Time Measured					
Turbidity (NTUs or describe) (e.g. slight, moderate)					
Time Measured					
Dissolved Oxygen (mg/l)					
Time Measured					
Eh - redox potential (mv)					
Time Measured					
Color (describe - grey, etc)					
Odor (describe - pungent, etc)					
Sample Field Filtered? (Y/N)					
Time Samples Filtered					
Well Capped & Locked? (Y/N)					

Comments (Discuss well damage, purging or sampling problems, deviations from sampling plan, etc.):

Sheet Completed by _____ Date _____

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GROUNDWATER SAMPLING FIELD PROCEDURES DOCUMENTATION

Facility/Project Name: _____ Date: _____

Section/Grid Location or Address: _____

Facility Type: _____ License/Permit #: _____

DNR Regulatory Program: _____

Weather (temp., cloudiness, bar. pres., wind): _____

_____

Persons Sampling and Title: _____

_____

_____

Water Level Equipment (type, model): _____

Purging Equipment (type, model, material): _____

_____

Purging Method (4 well vol. or stabilization): _____

How Purge Volume Measured? (eg., calibrated bucket): _____

Sample Collection Equipment (type, model, material): _____

_____

Method of Sample Withdrawal (bottom emptying device, low flow): _____

Type of Transfer Containers: _____

Filtering Equipment (type, material): _____

Filter Membrane (type, pore size): _____

When Were Samples Sent to Lab? _____

What Lab Were the Samples Sent to? _____

Were Enforcement Samples Sent? _____

How Were Samples Kept Cool (ice, other)? _____

Equipment Decontamination Procedures? _____

_____

Decontamination Water Disposal? _____

_____

pH Meter (type, model): _____

Person calibrating: _____

Frequency calibrated: _____

Calibration procedures (buffers used): _____

Problems with meter: _____

Conductivity Meter (type, model): _____

Person calibrating: _____

Frequency calibrated: _____

Calibration procedures: _____

Problems with meter: _____

Turbidity Equipment (type, model): _____

Person calibrating/set-up: _____

Frequency calibrated: _____

Calibration procedures: _____

Problems with meter: _____

Dissolved Oxygen Meter (type, model): _____

Person calibrating/set-up: _____

Frequency calibrated: _____

Calibration procedures: _____

Problems with meter: _____

When Were In-field Measurements Taken (immediately after collection or XX minutes after collection)?: _____

Comments (difficulties, questionable data, deviations from sampling plan, etc): _____

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State of W[redacted]sin
Department of Natural Resources

CHAIN OF CUSTODY RECORD
LUST PROGRAM
Form 4400-151 Rev. 4-93

Note: Use of this form is voluntary but is requested by the Department pursuant to ch. NR 149, NR 500-540, NR 158 and NR 419, Wis. Adm. Code. Personally identifiable information will be used for no other purpose.

Sample Collector(s)	Title/Work Station/Company	Telephone Number (include area code)
Property Owner	Property Address	Telephone Number (include area code)

I hereby certify that I received, properly handled, and disposed of these samples as noted below:

Relinquished By (Signature)	Date/Time	Received By (Signature)
Relinquished By (Signature)	Date/Time	Received By (Signature)
Relinquished By (Signature)	Date/Time	Received for Laboratory By (Signature)

Sample Condition on Receipt by Laboratory
LABORATORY USE ONLY

Temperature of temperature blank: _____

If samples were received on ice and there was ice remaining, you may report the temperature as "received on ice". If all of the ice was melted, the temperature of the melt may be substituted for a temperature blank.

Field ID Number [1]	Date Collected	Time Collected	Sample Type [2]	Sample Device [3]	Preserv. Type	Field Screening	Description	Analysis Type	Lab ID Number	No./Type of Containers	Cracked /Broken	Improperly Sealed	Good Condition	Other Comments

[1] Sample description must clearly correlate the sample ID to the sampling location shown on a map.

[2] Specify groundwater, surface water, soil, leachate, sludge, etc.

[3] Type of sampling device; split spoon, hand auger, metal spatula, soil syringe, etc.

DEPARTMENT USE/OPTIONAL FOR SOIL SAMPLERS

Disposition of unused portion of sample

Laboratory should: ☐ Dispose ☐ Retain for ____ days
☐ Return ☐ Other

DEPARTMENT USE ONLY

Split samples: Offered? ☐ Yes ☐ No (Check one)
Accepted? ☐ Yes ☐ No (Check one)

Accepted By:

APPENDIX B

WATER SUPPLY WELLS

Checklists

- Pre-field Work Procedures Checklist - Water Supply Wells
- Equipment Checklist - Water Supply Well Sampling

Documentation Sheets and Forms

- Well Specific Field Sheet (WSFS) - Water Supply Wells
- Groundwater Sampling Field Procedures Documentation
- Groundwater Monitoring Inventory Form
  (Form 330-67 Rev. 12-92)
- Chain of Custody Form

* Master copies of the above forms are also located in the plastic sheet protector at the back of this manual. Please keep these masters and copy as needed.

PRE-FIELD WORK PROCEDURES CHECKLIST - WATER SUPPLY WELLS

All the following procedures may not be necessary for each sampling event. Use those procedures applicable to your sampling protocol or customize this list.

LOGISTICS

___ Contact the well owner to confirm the location, sampling date and time, and to discuss any site access issues.
___ Determine if the well has been inventoried. If not, obtain a WDNR well inventory number (Wisconsin Unique Well Number - WUWN).
___ Locate the nearest post office, UPS office, Fedex drop off spot, etc., if you will need to ship samples from the field. (UPS has a 70 lb. restriction per container.)

LABORATORY ARRANGEMENTS

___ Select a qualified laboratory to perform the sample analysis. Check that the laboratory (and subcontracted lab) is certified to perform the required sample analysis.
___ Make sure you have sufficient numbers, types, and volumes of sample containers needed - **get extras!** Remember QA/QC sample containers and trip blanks.
___ Discuss sample preservation, holding time, shipping requirements, and QA/QC expectations with the laboratory.
___ Inform the lab of the date and number of samples you will send.
___ Familiarize yourself with chain of custody and other sample tracking procedures.

SITE HISTORY

___ Review past water quality data to determine the well sampling order.
___ Review the site hydrogeology and information available on the well.

EQUIPMENT AND FIELD PREPARATION

___ Organize equipment (Equipment Checklist - Water Supply Well Sampling).
___ Check that equipment is in good working condition:

- ✓ Test and recharge/replace batteries as necessary.
- ✓ Test equipment with tap water or calibration standards.
- ✓ Inspect the equipment for defects, loose bolts, frayed wiring, etc.
- ✓ Check the instruments' ability to calibrate and function properly.

___ Check that all the equipment is properly decontaminated and stored for transport.

HEALTH AND SAFETY EQUIPMENT AND PREPARATION

___ If required, prepare and follow a safety and health plan (SHP).
___ Inform sub-contractors and other site personnel of contaminants and site hazards.

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EQUIPMENT CHECKLIST - WATER SUPPLY WELL SAMPLING

All the following items may not be necessary for each sampling event.

GENERAL AND LOGISTICS

___ Permission/notification to well owner and site access keys
___ Directions to the site, access roads and location of wells
___ Contact names, addresses and phone numbers
___ _____

DOCUMENTATION AND REFERENCE MATERIALS

___ *Groundwater Sampling Procedures Field Manual*, sampling plan & QA/QC plan
___ Field note book, waterproof pens and clipboard
___ Inventory sheets or field data sheets
___ Chain of custody forms and other sample tracking forms
___ _____

EQUIPMENT AND SUPPLIES

___ Thermometer or temperature instrument
___ Conductivity meter and calibration standards (KCl)
___ pH meter, buffer solutions (pH 4, 7 and 10) and beakers
___ All meters and equipment fully charged/operational; spare batteries
___ Reagent grade water, gloves, ground cloth
___ Paper towels or disposable clean rags
___ Inert plastic bags to transport pump sample tubing, etc.
___ _____

PURGING AND SAMPLING

___ Special tap connection(s) and sampling tube for inaccesable sample taps
___ Calibrated buckets or similar device for purge water
___ Waterproof grease markers (Sharpies™ are a potential source of VOCs)
___ Sample containers (provided by lab) - **bring extra**, and waterproof labels/tags
___ QA/QC sample bottles (VOC trip blanks filled by lab)
___ _____

PRESERVATION AND SHIPPING

___ Sample preservatives, transfer pipettes and coolers with ice
___ Bubble wrap, Ziplock™ bags or equivalent to protect sample containers
___ Strapping tape, postage, Fedex or UPS shipping labels, etc

TOOLS AND MISCELLANEOUS

___ Flashlight and first aid kit
___ Adjustable wrench, screw drivers, hammer, scissors, knife, duct tape, etc.
___ _____

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WELL SPECIFIC FIELD SHEET - WATER SUPPLY WELLS

Name of Well Owner: _____ Date: _____
Section/Grid or Address: _____
License or Permit #: _____
Weather Conditions (temp, rain): _____
Person(s) Sampling: _____

Well verified on well construction report? _____

Does well have a WUWN and what is it? _____

Depth to water in well to nearest 0.1 feet [1] _____

Depth to bottom of well casing [1] _____

Depth to bottom of well [1] _____

Location of tap used for purging (before or after pressure tank) _____

_____

Length of time well purged (minutes) _____

Location of tap used for collecting the samples (before or after pressure tank) _____

_____

Time sample collected _____

Field temperature (°C) _____

Field Specific Conductance @ 25°C _____ Time _____

Field pH (standard units) _____ Time _____

Color (describe) _____

Odor (describe) _____

Turbidity (NTUs or describe) _____

Comments (problems, procedures): _____

_____

_____

_____

_____

_____

[1] Describe how measured in comments

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GROUNDWATER SAMPLING FIELD PROCEDURES DOCUMENTATION

Facility/Project Name: _____ Date: _____

Section/Grid Location or Address: _____

Facility Type: _____ License/Permit #: _____

DNR Regulatory Program: _____

Weather (temp., cloudiness, bar. pres., wind): _____

_____

Persons Sampling and Title: _____

_____

_____

Water Level Equipment (type, model): _____

Purging Equipment (type, model, material): _____

_____

Purging Method (4 well vol. or stabilization): _____

How Purge Volume Measured? (eg., calibrated bucket): _____

Sample Collection Equipment (type, model, material): _____

_____

Method of Sample Withdrawal (bottom emptying device, low flow): _____

Type of Transfer Containers: _____

Filtering Equipment (type, material): _____

Filter Membrane (type, pore size): _____

When Were Samples Sent to Lab? _____

What Lab Were the Samples Sent to? _____

Were Enforcement Samples Sent? _____

How Were Samples Kept Cool (ice, other)? _____

Equipment Decontamination Procedures? _____

_____

Decontamination Water Disposal? _____

_____

pH Meter (type, model): _____

Person calibrating: _____

Frequency calibrated: _____

Calibration procedures (buffers used): _____

Problems with meter: _____

Conductivity Meter (type, model): _____

Person calibrating: _____

Frequency calibrated: _____

Calibration procedures: _____

Problems with meter: _____

Turbidity Equipment (type, model): _____

Person calibrating/set-up: _____

Frequency calibrated: _____

Calibration procedures: _____

Problems with meter: _____

Dissolved Oxygen Meter (type, model): _____

Person calibrating/set-up: _____

Frequency calibrated: _____

Calibration procedures: _____

Problems with meter: _____

When Were In-field Measurements Taken (immediately after collection or XX minutes after collection)?: _____

Comments (difficulties, questionable data, deviations from sampling plan, etc): _____

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Department of Natural Resources

GROUNDWATER MONITORING INVENTORY FORM

Form 3300-67 Rev. 8-95

Wisconsin Unique Well Number ☐☐☐☐☐☐☐☐ ☐ Add ☐ Change

Inventory Completed By (Last Name, First, MI) _____

Date __ __/__ __/__ __ __ __ (m m d d y y y y)

With ☐ DNR ☐ _____

Facility Name _____

Facility ID # _____

Local Well ID _____

High Cap Well # _____

Primary Contact Name (Last, First, MI)

Telephone Number ( )

Mailing Address

City State Zip Code

☐ Owner ☐ Driller ☐ Operator ☐ Business ☐ Occupant ☐ Facility ☐ Consultant ☐ Sampler ☐ Manager ☐ Other ☐ Contractor

Other Contact Name (Last, First, MI)

Telephone Number ( )

Mailing Address

City State Zip Code

☐ Owner ☐ Driller ☐ Operator ☐ Business ☐ Occupant ☐ Facility ☐ Consultant ☐ Sampler ☐ Manager ☐ Other ☐ Contractor

Well Location

☐ Town ☐ City ☐ Village

Fire # (If avail.)

County

Grid or Street Address or Road (If avail.)

Govt. Lot # _____

OR

____1/4 of ____1/4 of Section _____

Subdivision Name Lot Block

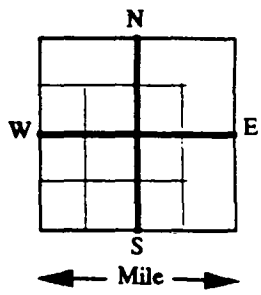
T _____; R _____ ☐ E ☐ W

OR Deg. Min. Sec.

Latitude _____ _____ _____

Longitude _____ _____ _____

(X) 1/4 1/4 Sec. Location



Construction Type

☐ Drilled ☐ Dug ☐ Driven Point ☐ Spring ☐ Jetted ☐ Other

Land Surface Elevation _____ ft. MSL

Number of Wells on Property _____

Construction Date __ __/__ __/__ __ __ __ (m m d d y y y y)

Constructor

Well Use

☐ Private Potable ☐ Community-Municipal ☐ Priv. Non-Potable ☐ Community OTM ☐ Monitoring Well ☐ Non Transient Non-Com. ☐ Transient Non-Com.

Source of Well Data

☐ Well Report ☐ Owner/Occupant ☐ Other*

Well Status

☐ Active Use ☐ Inactive ☐ Perm Filled

Depth From Land Surface To:

Bedrock _____ ft.

Well Bottom _____ ft.

Static Water _____ ft.

Casing Bottom _____ ft.

Casing Diameter _____ in.

Water Bearing Formation

☐ Unconsolidated ☐ Limestone ☐ Sandstone ☐ Shale ☐ Crystalline

Comments: eg. reason for inventory, samples taken, directions to property, details of well location on property, collected before or after water softener. _____

*For "Other", enter a description in the comment area if needed.

Instructions

1. All wells sampled by DNR employees must be inventoried and assigned a Wisconsin Unique Well ID in the Department's data system. Use this form to create a new inventory record or to change an existing record for a well . Use a separate form for each well.

2. Mandatory fields are indicated by shadowing and MUST be completed or your form will not be entered into the computer system. Fill in all applicable portions of the form as completely as possible.

3. If the well is being inventoried for the first time, check the "add" box in the upper right corner of the form. If there is a change to existing information, check the "change" box in the upper right corner and then fill in the Wisconsin Unique Well Number and ONLY THE INFORMATION THAT NEEDS TO BE CHANGED.

   If the form is filled out by DNR staff, check the DNR box. If the person completing this inventory form is associated with another agency; fill in the agency acronym letters.

4. For a private well, the primary contact should be the well owner or the resident occupant of the property served by the well, if the owner or occupant is known.

5. Check only ONE contact type code box for each contact name. Check the one that is the most relevant if more than one applies. If the well owner is the occupant, check "Owner" as the contact type. Check the facility or business box ONLY if there is not a person to contact.

6. Wells should be located as precisely as possible. If the well is located by Public Land Survey, record the T, R, S, 1/4 1/4 section. If the well is located by latitude and longitude, record the location to the nearest second. If the well is located in a government lot, record the latitude and longitude as well as the government lot number.

7. Check only ONE box in the Well Use section. If a spring is being inventoried, check Spring under Construction Type in addition to the well use box.

8. County Codes and Names:

1. Adams	19. Florence	37. Marathon	55. Rusk
2. Ashland	20. Fond Du Lac	38. Marinette	56. St. Croix
3. Barron	21. Forest	39. Marquette	57. Sauk
4. Bayfield	22. Grant	40. Menominee	58. Sawyer
5. Brown	23. Green	41. Milwaukee	59. Shawano
6. Buffalo	24. Green Lake	42. Monroe	60. Sheboygan
7. Burnett	25. Iowa	43. Oconto	61. Taylor
8. Calumet	26. Iron	44. Oneida	62. Trempealeau
9. Chippewa	27. Jackson	45. Outagamie	63. Vernon
10. Clark	28. Jefferson	46. Ozaukee	64. Vilas
11. Columbia	29. Juneau	47. Pepin	65. Walworth
12. Crawford	30. Kenosha	48. Pierce	66. Washburn
13. Dane	31. Kewaunee	49. Polk	67. Washington
14. Dodge	32. La Crosse	50. Portage	68. Waukesha
15. Door	33. Lafayette	51. Price	69. Waupaca
16. Douglas	34. Langlade	52. Racine	70. Waushara
17. Dunn	35. Lincoln	53. Richland	71. Winnebago
18. Eau Claire	36. Manitowoc	54. Rock	72. Wood

9. Return this form to the DNR Bureau of Water Supply, P.O. Box 7921, Madison, WI 53707-7921, unless you are part of a special sampling program and have been instructed to return the form elsewhere.

State of Wisconsin
Department of Natural Resources

CHAIN OF CUSTODY RECORD

Form 4100-145 7-87

Sample Collector(s)	Title/Work Station	Telephone No. (include area code)
Property Owner	Property Address	Telephone No. (include area code)

Split Samples: Offered? ☐ Yes ☐ No (Check One)
Accepted? ☐ Yes ☐ No (Check One) Accepted By: _____
Signature

Field ID No.	Date	Time	Sample Type		Station Location Sample Description	Lab ID Number	No. of Containers	Comments
			Comp	Grab				

I hereby certify that I received, properly handled, and disposed of these samples as noted below:

Relinquished By (Signature)	Date/Time	Received by: (Signature)
Relinquished By (Signature)	Date/Time	Received by: (Signature)
Relinquished By (Signature)	Date/Time	Received for Laboratory By: (Signature)

Disposition of Unused Portion of Sample:

Dispose _____ Retain for _____ days

Return _____ Other _____

APPENDIX C

REFERENCE MATERIALS

- Sample Containers, Preservation and Holding Time Requirements
- Chain of Custody Procedures for Enforcement Samples
- Potential of a Substance for Volatilizing from a Water Sample
- Equivalency and Conversion Tables

Sample Containers, Preservation and Holding Time Requirements

Parameter	Volume[3] (ml)	Container[1]	Preservation[2]	Holding Time
Alkalinity ($CaCO_3$)	200	G,P	Cool 4°C	14 days
BOD - 5 Day	500 - 1000	G,P	Cool 4°C	48 hrs
BOD - Long Term	500	G,P	Cool 4°C	24 hrs
Boron	50 - 100	P	HNO_3 pH<2 Cool 4°C	28 days
Chemical Oxygen Demand (COD)	50 - 250	G,P	H_2SO_4 pH<2 Cool 4°C	28 days
Chloride	100 - 200	G,P	Cool 4°C	28 days
Chloride - I.C.[4]	25	G,P	Cool 4°C	28 days
Color	50 - 500	G,P	Cool 4°C	48 hrs
Corrosivity	1000		Cool 4°C	
Cyanide - Total[6]	1000	G,P	NaOH pH>12 Cool 4°C	14 days
Cyanide - Amendable to chlorination[6]	1000	G,P	NaOH pH>12[6] Cool 4°C	14 days
Fluoride	250 - 300	G,P	Cool 4°C	28 days
Metals - dissolved (except mercury & Cr^{+6})	250 - 1000[5]	P	Filter immed. HNO_3 pH<2 Cool 4°C	180 days
Hexavalent Chromium (Cr^{+6})	50 - 100	P	Cool 4°C	24 hrs
Mercury - dissolved	500[5]	P or Teflon®	Filter immed. HNO_3 pH<2 Cool 4°C	28 days

Parameter	Volume[3] (ml)	Container[1]	Preservation[2]	Holding Time
NITROGEN				
Ammonia	500	G,P	H_2SO_4 pH<2 Cool 4°C	28 days
Nitrate + Nitrite	100 - 200	G,P	H_2SO_4 pH<2 Cool 4°C	28 days
Nitrate/Nitrite (Drinking water only)	100	G,P	Cool 4°C	48 hrs
Nitrate - I.C.[4]	60	G,P	Cool 4°C	48 hrs
Nitrite - I.C.[4]	60	G,P	Cool 4°C	48 hrs
Total Kjeldahl	500	G,P	H_2SO_4 pH<2 Cool 4°C	28 days
Oil & Grease	2000	G only widemouth	H_2SO_4 pH<2 Cool 4°C	28 days
Pesticides & PCBs	Consult Laboratory	G amber/TLS	Cool 4°C	7 days to extraction
pH	25	G,P	None	immed. & on-site
Phenolics	1000[5]	G only/TLS	H_2SO_4 pH<2 Cool 4°C	28 days
PHOSPHOROUS				
Dissolved (soluble)	50 - 250	G,P	Filter, H_2SO_4 Cool 4°C	28 days
Total	50 - 250	G,P	H_2SO_4 pH<2 Cool 4°C	28 days
RESIDUE				
Dissolved Filterable	100	G,P	Cool 4°C	48 hrs
Total & Total Volatile	100	G,P	Cool 4°C	7 days
Semi-volatiles to extract	2 liters	G amber/TLS	Cool 4°C	7 days
Silica - dissolved	50 - 100	P only	Cool 4°C	28 days
Specific Conductance	100	G,P	Cool 4°C	28 days

Parameter	Volume[3] (ml)	Container[1]	Preservation[2]	Holding Time
Sulfate	50 - 100	G,P	Cool 4°C	28 days
Sulfide	100 - 625[5]	G,P	2 ml 2 N zinc acetate and NaOH ph>9 Cool 4°C	7 days
Sulfite	100 - 625[5]	G,P	Add EDTA Cool 4°C	immed.
Surfactants (MBAS)	250	G,P	Cool 4°C	48 hrs
Turbidity	100 - 250	G,P	Cool 4°C store in dark	48 hrs
Volatile Organics (VOCs)	2 to 4 40 ml vials	G vials/TLS	HCL pH<2 No headspace Cool 4°C	14 days

ABBREVIATIONS and ENDNOTES:

G Glass bottle (typically borosilicate)
P Plastic bottle (typically polypropylene, polyethylene or PVC)
TLS Teflon® lined septa

1 In many cases, Teflon® and stainless steel containers (except for metals) are acceptable. For metals, polyethylene with a polypropylene cap (no liner) is preferred - a dilute nitric acid rinse may be recommended by some laboratories.

2 Preserve samples immediately after collection. Consult the laboratory for volumes of preservative required per sample. Verify the pH of the sample (except VOCs).

3 Volume listed may not include quality control (QC) volume required by laboratory (except those volumes that include a number 5 superscript). Check with the laboratory if unsure of the laboratories QC volume requirements.

4 Ion chromatography (IC) analysis only. Ion chromatography is not universally available at certified laboratories and may require special arrangements.

5 Volume includes quality control (QC) effort required by laboratories.

6 Cyanide samples containing residual chlorine should be treated with 0.6 grams ascorbic acid/L of sample at the time of collection. Sulfide will interfere with the cyanide test and must be removed before the pH is adjusted. Contact the laboratory for special instructions for collecting samples containing sulfide.

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Chain of Custody for Samples Requiring Strict Custody

To be admissible as evidence, sample results must be traceable back through their collection, storage, handling, shipment and analysis so that the court is satisfied how the sample results submitted as evidence were collected, transferred and claimed. This is accomplished by a written record documenting the sample identity from collection to introduction as evidence.

Field records identifying sampling personnel, equipment, collection, storage and transfer techniques, and field conditions are required. The sample collector is responsible for maintaining sample custody and integrity until the samples are transferred via a dated and signed chain of custody form to a carrier or are personally delivered and transferred directly to the laboratory.

A sample is in custody if it is:

1. In physical possession, or
2. In view, after being in physical possession, or
3. Secured so that no one can tamper with it.

The courts have accepted two degrees of chain of custody. The first, described below, involves physical possession of the sample from collection to laboratory possession. With this chain of custody method, the sample collector or other person to which sample possession was transferred to delivers the samples to the laboratory. The second chain of custody method is by shipping the samples through a mail carrier. Mail carriers may not assume any liability or responsibility for compromised sample integrity during shipping (e.g., broken samples and/or containers, ice melting in cooler, etc.).

In both cases, a written record must be transferred with the samples. However, when using the second method described above, the sample collector fills out a chain of custody record, seals it in a shipping container, and mails it by a carrier to the laboratory. Upon arrival, a pre-determined laboratory custodian receives the samples, notes the shippers condition (whether sealed or unsealed), each sample container's condition (broken samples, ice present in cooler, etc.), and assumes custody of the samples by signing and dating the chain of custody record. The laboratory maintains possession of the chain of custody record until the sample analysis is complete and then sends the analytical results, along with the chain of custody record, to the sample collector or other pre-designated receiver of the analytical results and chain of custody records.

For routing surveillance samples, the second chain of custody method should suffice. If enforcement action may occur based on the type of samples and/or regulatory programs or agencies involved, the first chain of custody method involving the sample collector physically delivering and transferring possession of the samples to the laboratory is recommended.

Field Chain of Custody Procedures

1. Limit sample collection and handling to as few people as possible. If sample transfers are necessary, use signed receipts of possession. The chain of custody record must accompany the samples. Keep a copy of the chain of custody record for your own records.

2. If the samples are known or suspected of being hazardous, give a receipt for each sample collected to the property or facility owner (s. 144.69, Wis. stats.). The property or facility owner may request split samples.

3. If the samples are known or suspected of being hazardous (e.g., explosion or corrosion hazard), special shipping procedures may be required by the mail carrier. Check with the mail carrier for restrictions and procedures.

4. Follow the Quality Assurance/Quality Control procedures discussed in Section 2.9 of this manual and in the *Groundwater Sampling Desk Reference Manual.*

5. Record field measurements and other important data in a bound field note book, on field measurement data sheets provided by WDNR, or on modified data sheets that meet site-specific needs. For legal purposes, indelible ink should be used for recording all data and errors in field records should be crossed out with one line and initialed.

6. Complete appropriate laboratory tracking forms and attach them to the chain of custody record. Complete these forms in indelible ink.

7. When required or applicable, document with photographs sample locations, pollution sources, violations, etc. If possible, use cameras that print the date the photos were taken.

8. Maintain physical possession and sample integrity of the collected samples until they are properly transferred to the laboratory custodian or the mail carrier.

9. Obtain a sample possession transfer receipt (a copy of the dated and signed chain of custody record) after transferring possession of the samples to the laboratory custodian or the mail carrier.

Sample Security When Strict Custody Procedures are Necessary

Use the following procedures when securing and transferring possession of strict custody samples:

1. Use sample seals. Tape the sample container so that the tape must be cut or ripped to open the container. Use nylon-reinforced tape or other tape that cannot be tampered with without being noticed upon receipt. Sign and date the tape across the top.

2. Using an indelible permanent marker or ink, write the following information on the security tape, writing across the overlapping ends:

    a. Name of the sample collector(s), date, time, well number, facility name, etc., where the samples were collected.

    b. Write the words "**Strict Custody Requirements**," or similar language indicating that sample security is critical.

    c. Write "To be opened by _____ personnel only." In the blank, specify water chemistry unit, pesticide and organic chemistry unit, water microbiological unit, or other appropriate personnel.

    d. If all the samples are organic, specify "organic." If they are all inorganic, specify "inorganic." If the samples are a combination of both or others, specify accordingly.

By overlapping and writing over the edges of the security tape, it will be possible to detect if someone has tampered with the sample container. If someone were to remove the tape and then reseal it, it would be difficult to seamlessly realign the writing.

Do not use sealing wax to seal the tape. Sealing wax is brittle and will chip and break during normal use. This gives the appearance of tampering even when none has occurred.

Sample containers labeled "Strict Custody Requirements," or with similar language, must be locked up by the laboratory upon receipt and not removed from the locked refrigerator until ready to be analyzed. The laboratory will hold all strict custody samples until notified otherwise. When the case is resolved, either by trial or stipulation, the enforcement specialist should notify the laboratory that the samples associated with the case may be discarded or destroyed.

Potential of a Substance for Volatilizing from a Water Sample

Substance	CAS Number	Henry's Law Constant (atm-m^3/mole)	Potential for Volatilizing from Water
Acenaphthylene	208-96-8	1.1×10^{-5}	Low
Acetone	67-64-1	3.9×10^{-5}	Low
Aldicarb	116-06-3	1.4×10^{-9}	Low
Ammonia	7664-41-7	3.2×10^{-4}	Moderate
Anthracene	120-12-7	6.5×10^{-5}	Low
Atrazine	1912-24-9	2.6×10^{-13}	Low
Benzene	71-43-2	5.6×10^{-3}	High
Benzo(a)pyrene	50-32-8	1.1×10^{-4}	Moderate
Benzo(b)fluoranthene	205-99-2	1.1×10^{-4}	Moderate
Bromodichloromethane	75-27-4	1.6×10^{-3}	High
Bromoform	75-25-2	5.5×10^{-4}	Moderate
Bromomethane	74-83-9	6.2×10^{-3}	High
Carbaryl	63-25-2	4.4×10^{-9}	Low
Carbofuran	1563-66-2	9.2×10^{-5}	Low
Carbon tetrachloride	56-23-5	3.0×10^{-2}	High
Carbon disulfide	75-15-0	3.0×10^{-2}	High
Chlordane	57-74-9	4.9×10^{-5}	Low
Chloroethane	75-00-3	6.2×10^{-4}	Moderate
Chloroform	67-66-3	2.7×10^{-3}	High
Chloromethane	74-87-3	8.8×10^{-3}	High
Chrysene	218-01-9	9.5×10^{-5}	Low
1,2-Dibromoethane (EDB)	106-93-4	6.7×10^{-4}	Moderate
Dibromochloromethane	124-48-1	8.7×10^{-4}	Moderate
1,2-Dibromo-3-chloropropane	96-12-8	1.5×10^{-4}	Moderate
Dibutyl phthalate	84-74-2	1.8×10^{-6}	Low
Dicamba	1918-00-9	7.9×10^{-9}	Low
1,2-Dichlorobenzene	95-50-1	1.9×10^{-3}	High
1,3-Dichlorobenzene	541-73-1	3.3×10^{-3}	High
1,4-Dichlorobenzene	106-46-7	2.4×10^{-3}	High
Dichlorodifluoromethane	75-71-8	3.4×10^{-1}	High
1,1-Dichloroethane	75-34-3	5.6×10^{-3}	High

Substance	CAS Number	Henry's Law Constant (atm-m^3/mole)	Potential for Volatilizing from Water
1,2-Dichloroethane	107-06-2	9.8×10^{-4}	Moderate
1,2-Dichloroethylene (cis)	156-59-2	4.1×10^{-3}	High
1,2-Dichloroethylene (trans)	156-60-5	9.4×10^{-3}	High
1,1-Dichloroethylene	75-35-4	2.6×10^{-2}	High
2,4-Dichlorophenoxyacetic acid	94-75-7	1.0×10^{-8}	Low
1,2-Dichloropropane	78-87-5	2.8×10^{-3}	High
1,3-Dichloropropene (cis/trans)	542-75-6	1.8×10^{-2}	High
Di (2-ethylhexyl) phthalate	117-81-7	3.6×10^{-7}	Low
Dimethoate	60-51-5	6.2×10^{-11}	Low
2,4-Dinitrotoluene	121-14-2	1.3×10^{-7}	Low
2,6-Dinitrotoluene	606-20-2	7.5×10^{-7}	Low
Dinoseb	88-85-7	4.6×10^{-7}	Low
Dioxins	1746-01-6	5.6×10^{-3}	High
Endrin	72-20-8	7.5×10^{-6}	Low
Ethylbenzene	100-41-4	8.4×10^{-3}	High
Fluoranthene	206-44-0	6.5×10^{-6}	Low
Fluorene	86-73-7	1.0×10^{-4}	Moderate
Fluoride	16984-48-8	6.0×10^{-8}	Low
Fluorotrichloromethane (freon 11)	75-69-4	9.7×10^{-2}	High
Formaldehyde	50-00-0	1.7×10^{-7}	Low
Heptachlor	76-44-8	1.1×10^{-3}	High
Heptachlor epoxide	1024-57-3	3.2×10^{-5}	Low
Hexachlorobenzene	118-74-1	1.3×10^{-3}	High
Lindane	58-89-9	1.4×10^{-5}	Low
Mercury	7439-97-6	1.1×10^{-2}	High
Methanol	67-56-1	4.5×10^{-6}	Low
Methoxychlor	72-43-5	1.6×10^{-5}	Low
Methyl isobutyl ketone	108-10-1	1.4×10^{-4}	Moderate
Methyl ethyl ketone (MEK)	78-93-3	2.7×10^{-5}	Low
Methylene chloride	75-09-2	2.0×10^{-3}	High
Monochlorobenzene	108-90-7	3.8×10^{-3}	High
n-Hexane	110-54-3	1.4×10^{-2}	High
Naphthalene	91-20-3	4.8×10^{-4}	Moderate

Substance	CAS Number	Henry's Law Constant (atm-m^3/mole)	Potential for Volatilizing from Water
Pentachlorophenol	87-86-5	2.4×10^{-6}	Low
Phenol	108-95-2	3.3×10^{-7}	Low
Polychlorinated biphenyls	1336-36-3	1.1×10^{-3}	High
Pyrene	129-00-0	1.1×10^{-5}	Low
Pyridine	110-86-1	8.9×10^{-6}	Low
Simazine	122-34-9	2.7×10^{-9}	Low
Styrene	100-42-5	2.8×10^{-3}	High
1,1,1,2-Tetrachloroethane	630-20-6	2.4×10^{-3}	High
1,1,2,2-Tetrachloroethane	79-34-5	4.6×10^{-4}	Moderate
Tetrachloroethylene	127-18-4	1.8×10^{-2}	High
Toluene	108-88-3	6.6×10^{-3}	High
Toxaphene	8001-35-2	6.6×10^{-6}	Low
1,2,4-Trichlorobenzene	120-82-1	1.4×10^{-3}	High
1,1,1-Trichloroethane	71-55-6	1.7×10^{-2}	High
1,1,2-Trichloroethane	79-00-5	9.1×10^{-4}	Moderate
1,2,3-Trichloropropane	96-18-4	3.4×10^{-4}	Moderate
Trichloroethylene	79-01-6	1.0×10^{-2}	High
2,4,5-Trichlorophenoxy-propionic acid (2,4,5-TP)	93-72-1	8.7×10^{-9}	Low
Trifluralin	1582-09-8	2.6×10^{-5}	Low
1,2,4-Trimethylbenzene	95-63-6	5.6×10^{-3}	High
Vinyl chloride	75-01-4	2.7×10^{-2}	High
Xylene (mixed o-, m-, and p-)	1330-20-7	7.0×10^{-3}	High

CAS Number: Chemical Abstract Service (CAS) registry numbers are unique numbers assigned to a chemical substance and are widely used in scientific publications.

Note: Most metals (exception - mercury) and inorganics are not susceptable to volatilizing from a groundwater sample under normal sampling conditions and temperatures.

(Sources: USEPA Superfund Chemical Data Matrix [SCDM] March 1993 data tables. U.S. Environmental Protection Agency (EPA). 1990. *Basics of Pump-and-Treat Ground-Water Remediation Technology*. U.S. Environmental Protection Agency. Washington, D.C. EPA/600/8-90/003.)

henryalb.tb2

Equivalency and Conversion Tables

Volume Equivalents

unit	cc	in^3	liters	Quarts	Gals	ft^3
cc	1	.06102	.001	.00106	.00026	.00004
in^3	16.387	1	.01639	.01732	.00433	.00058
Pints	473.18	28.875	.47318	.5	.125	.01671
liters	1000	61.023	1	1.0567	.26417	.03531
Quarts	946.36	57.75	.94636	1	.25	.03342
Gallons	3785.4	231	3.7854	4	1	.13368
ft^3	28317.0	1728	28.317	29.922	7.4805	1
$meter^3$	100000	61023.4	1000	908.08	227.02	35.314

Equivalent Pumping Rate Table

Milliliters per Minute (ml/min)	Liters per Minute (L/min)	Gallons per Minute (gpm)
100	0.1	0.026
200	0.2	0.05
300	0.3	0.08
400	0.4	0.11
500	0.5	0.13
600	0.6	0.16
700	0.7	0.18
800	0.8	0.21
900	0.9	0.24
1000	1	0.26
2000	2	0.53
3000	3	0.79
4000	4	1.06
5000	5	1.32

Conversion formulas for rates not included in this table:
Liters per minute X 0.26417 = gallons per minute
Gallons per minute X 3.7854 = liters per minute

Length

To Convert From	To	Multiply By
inches	centimeters	2.540
inches	feet	0.0833
feet	meters	0.3048
feet	miles	0.0001894
meters	miles	6.214×10^{-4}
meters	yards	1.094

1 meter = 10 decimeters = 100 centimeters = 1000 millimeters

Volume

To Convert From	To	Multiply By
cubic centimeters	cubic inches	0.06102
cubic inches	cubic feet	0.00058
cubic inches	liters	0.01639
cubic inches	gallons	0.00433
liters	gallons	0.14546
gallons	cubic feet	0.13368

1 liter = 1 cubic decimeter = 10 deciliters = 100 centiliters = 1000 milliliters = 1000 cubic centimeters

Water attributes

Cubic foot
7.48 gallons
28,317 milliliters
28.317 liters
62.428 lbs

Gallon
231 cubic inches
3,785 milliliters
3.785 liters
8.345 lbs

Liter
0.2642 gallons
61 cubic inches
2.205 lbs

Cubic meter
1,000 liters
264.2 gallons
22.045 lbs

Appendix B
Sample Documentation

EPA Paperwork Preparation

TO: N.W. Mauthe Groundwater and Treatment Water Samplers

COPIES: Dan MacGregor

FROM: Erin Potts

DATE: July 21, 1997

This memorandum summarizes the EPA paperwork preparation for the N.W. Mauthe project site. At N.W. Mauthe, Special Analytical Services (SAS) chain of custody (COC) forms are used and tags are filled out for each sample container.

Chain of Custody Forms

Blank SAS/COC forms can be obtained from Lynn Bong/MKE. SAS/COC forms should be filled out as indicated in Figure 1 and the key listed below. Spaces lettered or filled in on the example SAS/COC form in Figure 1 must be filled in as shown.

A. Obtain SAS/COC No. from Dave Shekoski or Lynn Bong prior to sampling. A unique SAS/COC No. is assigned to each sampling event.
B. List the date of shipment.
C. List the carrier, typically this is Federal Express.
D. List the sampler's name.
E. List the airbill no. of the carrier.
F. The sampler's signature.
G. List the laboratory's contact and address.
H. List the sample no. This should consist of "SAS No.-XXX." The "XXX" is the sequential numbering of samples. For example the first sample obtained would be, the SAS number followed by -001 or "SAS No.-001."
I. The matrix is "2" which indicates groundwater.
J. The concentrations are low and this column should be marked with a "L."
K. The samples are grab samples so this column should be marked with a "G."
L. This column should be marked with the appropriate number:

No.	Preservative	Analysis
1	HCl	VOC
2	HNO_3	Metals
4	H_2SO_4	Oil & Grease
6	Ice only	Odor, Miscellaneous Inorganics

M. The analysis should be listed in this space. Several analyses can be listed together as long as they all have the same preservative and were all taken at the same sampling point.
N. The numbers from the sample tags attached to each sample container should be listed.
O. The well name or private well resident should be indicated.
P. Sample date and time should be indicated.

Q. The samplers initials should be recorded.
R. Field QC samples should be indicated. This includes:

B	Field Blank
B	Trip Blank
D	Field Duplicate

This column is for field QC samples only. Laboratory QC samples such as matrix spike (MS) and matrix spike duplicates (MSD) are to be listed in the box marked with a U, not in column J. Field QC samples are given a unique sample number.
S. This box should be indicated with "N" until the sampling is complete and then the last SAS/COC set can be marked with "Y."
T. List which chain of custody the sheet is out of the set for the cooler.
U. Laboratory QC samples should be indicated here. Laboratory QC samples include matrix spikes (MS) and matrix spike duplicates (MSD). Laboratory QC samples are **not** given unique sample numbers, but are assigned and listed with the regular samples. Basically, laboratory QC samples represent extra volume taken for a particular sample number. The extra volume is used for laboratory QC testing. The sample numbers where these extra volumes were taken should be listed in this box.
V. If more than one sampler performed the work, this is where the additional samplers should sign.
W. The chain of custody seal numbers to be used to seal the cooler should be listed here.
X. A sampler should sign here.
Y. The date and time of the sampler's signature should be recorded.

Sample Tags

Sample tags can be obtained from Lynn Bong. Approximately 100 sample tags are needed for each sampling event. An example tag is shown in Figure 2 and described below.

A. SAS No.
B. Sample No. = XXX, the first sample would be 001, the second sample would be 002, etc. Field QC samples (duplicates, blanks) are given their own sample no., but laboratory QC samples (matrix spikes (MS), matrix spike duplicates (MSD)) are given the same sample no. as the original sample taken at that location.
C. Date.
D. Time.
E. Grab sample should be marked.
F. The well number or name of private resident should be indicated, exactly as it appears on the COC.
G. Samplers signature.
H. The preservative type should be marked.
I. The analysis should be marked.
J. VOC tags—The method should be indicated here. Groundwater monitoring wells are method 502.2 or 524.2.
Metal tags—These should be noted as being filtered.
Cyanide tags
K. Laboratory QC samples should be marked here for matrix spikes and matrix spike duplicates.
L. This is the tag number (including the "5-") which should be recorded in the "Regional Specific Tracking Number or Tag Numbers" column of the SAS/COC.

Sample tags can and should be filled out prior to going into the field to save time. Four sample containers are collected at each well as listed below:

No. of containers/ No. of tags	Analysis
3	VOCs
2	Select Metals (total)
1	Cyanide, total
1	pH, temperature, conductance

Every quarter one sample container is collected from the effluent discharge monitoring location as listed below:

No. of containers/ No. of tags	Analysis
1	Total Chromium

Once per year, four sample containers are collected from the effluent discharge monitoring location as listed below:

No. of containers/ No. of tags	Analysis
2	Total Metals
1	Hexavalent Chromium

Packing Instructions

Listed below are several packing tips for the quarterly N.W. Mauthe groundwater sampling events:

- VOCs should all be packed in one cooler.
- Trip blanks should be placed in each cooler containing VOCs.
- If an error is made on any documentation, DO NOT correct it by writing over it. Draw a single line through the error, make the correction next to it, and initial and date the correction. Make sure all copies are legible.
- The bottom two copies of the SAS/COC forms should accompany each cooler. They should be placed in ziplock bags and taped to the base of the lid of the cooler. The top two copies are returned to CH2M HILL.
- When multiple shipping containers are sent, each one must contain a COC form for the contents of the shipping container.
- Ice should be double bagged in ziplock baggies.
- Coolers should be shipped via Federal Express for priority overnight delivery.
- Call for a Federal Express pick-up at 1-800-238-5355, or deliver the package directly to Federal Express, the office located at the Outagamie County Airport, west of Appleton closes at 7:00 p.m.

QA/QC Samples

QA/QC samples should be obtained as indicated below:

Groundwater

No.	Type	Analyses
2	Trip Blanks	VOCs (method 8260)
2	Field Blank	All parameters
2	Field Duplicate	All parameters
1	MS/MSD	All parameters

Treatment System Water

No.	Type	Analyses
1	Field Blank	All parameters
1	Field Duplicate	All parameters
1	MS/MSD	Chromium, total

EPA

United States Enviromental Protection Agency
Contract Laboratory Program

Special Analytical Services Packing List/Chain of Custody

SAS No.: A

Case No.:

1. Project Code	Account Code	2. Region No.	Sampling Co.	4. Date Shipped	Carrier
		5	CH2M HILL	B	C

Regional Information	Sampler *(Name)*	Airbill Number
TGB-102	D	E

Non-Superfund Program	Sampler Signature	5. Ship To
	F	G

Site Name	3. Purpose*						5. Ship To
ONALASKA MUNICIPAL LDF	Lead: [X] SF, [ ] PRP, [ ] ST, [ ] FED	Early Action: [ ] CLEM, [ ] PA, [ ] REM	[ ] SI, [ ] ESI, [ ] RI, [ ] OIL, [ ] UST	Long-Term Action: [ ] FS, [ ] RD, [ ] RA, [X] O&M, [ ] NPLD			ATTN:
City, State: ONALASKA, WI	Site Spill ID: L5						

6. Matrix *(Enter in Column A)*
1. Surface Water
2. Ground Water
3. Leachate
4. Field QC
5. Soil/Sediment
6. Oil
7. Waste
8. Other *(Specify in Column A)*

7. Preservative *(Enter in Column D)*
1. HCl
2. HNO3
3. NAHSO4
4. H2SO4
5. NAOH
6. Ice Only
7. Other *(Specify in Column D)*
N. Not Preserved

Sample Numbers (From Labels)	A Matrix (from Box 6) Other:	B Conc.: Low Med High	C Sample Type Comp./ Grab	D Preservative (from Box 7) Other:	E Analysis	F Regional Specific Tracking Number or Tag Numbers	G Station Location Identifier	H Mo/Day/ Year/Time Sample Collection	I Sampler Initials	J Field QC Qualifier B=Blank S=Spike D=Duplicate R=Rinsate PE=Perform. eval. -=Not a QC Sample
H	I	J	K	L	M	N	O	P	Q	R

Shipment for SAS Complete? (Y/N)	Page	Sample(s) to be Used for Laboratory QC	Additional Sampler Signatures	Chain of Custody Seal Number(s)
S	T of ___	U	V	W

CHAIN OF CUSTODY RECORD

Relinquished by: *(Signature)*	Date/Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date/Time	Received by: *(Signature)*
X	Y				
Relinquished by: *(Signature)*	Date/Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date/Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date/Time	Received for Laboratory by: *(Signature)*	Date/Time	Remarks Is custody seal intact? Y / N / none	

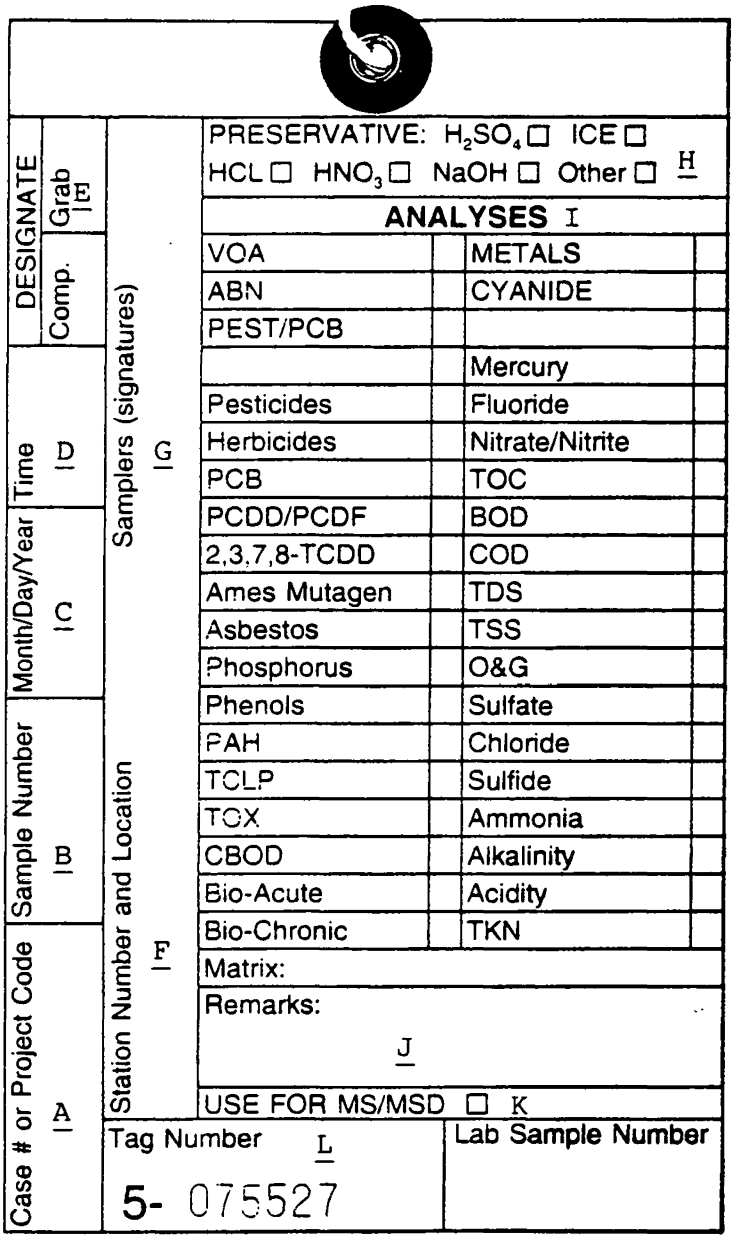
DISTRIBUTION: White – Region Copy; Gold – Lab Copy for Return to Region; Yellow – Data User**; Pink – Lab Copy for Return to Data User**

EPA Form 9110-3

SEE REVERSE FOR ADDITIONAL STANDARD INSTRUCTIONS
*SEE REVERSE FOR PURPOSE CODE DEFINITIONS

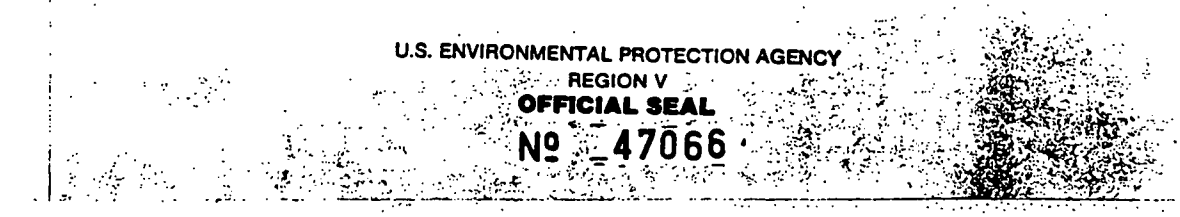
A21-012-7 REV. 3/94

Figure 1



Case # or Project Code A	Sample Number B	Month/Day/Year C	Time D	DESIGNATE Comp.	DESIGNATE Grab E	Station Number and Location F	Samplers (signatures) G	PRESERVATIVE: H_2SO_4 ☐ ICE ☐ HCL ☐ HNO_3 ☐ NaOH ☐ Other ☐ H	ANALYSES I			
									VOA		METALS	
									ABN		CYANIDE	
									PEST/PCB			
											Mercury	
									Pesticides		Fluoride	
									Herbicides		Nitrate/Nitrite	
									PCB		TOC	
									PCDD/PCDF		BOD	
									2,3,7,8-TCDD		COD	
									Ames Mutagen		TDS	
									Asbestos		TSS	
									Phosphorus		O&G	
									Phenols		Sulfate	
									PAH		Chloride	
									TCLP		Sulfide	
									TOX		Ammonia	
									CBOD		Alkalinity	
									Bio-Acute		Acidity	
									Bio-Chronic		TKN	
									Matrix:			
									Remarks: J			
									USE FOR MS/MSD ☐ K			
Tag Number L 5- 075527									Lab Sample Number			

Figure 2
Sample Container Tag



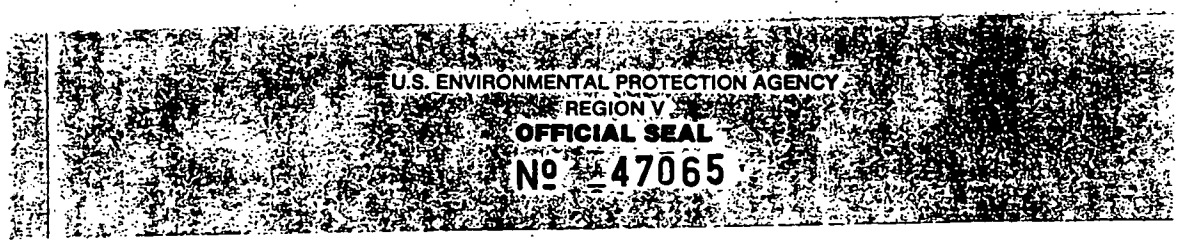


Figure 3
Custody Seals

Data Management Plan

Introduction

The data management plan defines the procedures for storing, handling, accessing, and securing data collected during the implementation of the LTRA. The data management plan describes the type of records that are to be included as part of the field and laboratory data generation and how that data is to be recorded, reported, and archived.

Field Data

Specific information is collected in the field during sampling events, which includes sampling location, sample collection, groundwater level measurements, and field analyses. These types of information are discussed below.

Sampling Location Information

Sampling location information describes where sampling took place. A sampling location can be a soil boring, a sediment scraping, a monitor well, or a dip into a stream or pond. Each sampling location is defined by a Station Identification value (StationID). The StationID values must be unique for the entire program. Examples of StationID values are as follows:

StationID	Description
MW3-16	Monitor well
SB1-9	Soil boring No. 9 in zone 1
SD5-1	Sediment location No. 1 in zone 5
SW7-2	Surface water location No. 1 in zone 7

Other items of information required to describe a sampling location include the following:

- Station type (e.g., monitor well, soil boring, sediment scrape)
- Survey coordinates (e.g., northing, easting, elevation to reference point, elevation to top of casing, elevation to casing outer)
- Survey method (e.g., estimate from map, transit, gps)
- Text description of sampling location

These types of information should be documented in the field log books, soil boring diagram sheets, test pit diagram sheets, or well completion diagram sheets. The field team leader (FTL) is responsible for verifying the entered information.

Sample Collection Information

Sample collection information describes the act of collecting the samples and placing them into containers. Each sample is an amount of material taken from a station of a certain

matrix (medium) at a particular date and time and for a particular project. The sample is identified by the SampleID.

A station refers to the point on the map where measurements can and shall be taken one or more times over the lifetime of the site. A sample refers to a portion of a station that is taken on a particular date and time, and is measured *in situ* or sent away for analysis. A sample is a snapshot of a station, not the station itself.

These types of information should be documented in the field log books.

Groundwater Level Information

Groundwater level information is used by the hydrologists to model groundwater movement. Groundwater level measurements are identified by the well name (StationID) and the date and time the measurement was taken. The following types of groundwater level information must be recorded:

- Well identifier, which should be the same as the sampling location identifier
- The date and time that the water level was measured
- The depth to water from the measurement reference point, which is typically the top of the well casing

Groundwater level information is typically found in the field log books.

Field Analytical Information

Field analytical information is defined as physical or chemical properties of a sample that is measured in the field immediately following sample collection. These field measurements include the following types of information:

- StationID
- SampleID
- Date and time the sample was collected
- Volume of sample required to develop the well
- pH (in pH units)
- Temperature (in centigrade)
- Conductivity (in µmhos/cm) of the water sample
- Dissolved oxygen level (in mg/L) in the water sample

The measurements entered in the logbook are those taken after the conditions have been stabilized. The field analytical parameter measurements are typically found in the field log book.

Laboratory Analytical Data

Analytical data for the project shall be obtained from the laboratory in two formats: hard copy and electronic data (EDD) file(s). Data for all analytical parameters shall be provided in an EDD ASCII file format. The laboratory shall report the EDD in the format as described in the laboratory subcontract. The information in electronic form must be consistent with, if not identical to, the information on the hard copy reports. The contents of the hard copy and EDD reports shall be as provided in the analytical subcontract. At a minimum, the

reports shall contain data on sample preparation and analysis, and the analytical and quality control sample results.

Sample Preparation and Analysis Information

Sample preparation and analysis information describes when, by whom, by what analytical method the samples were prepared. It also describes the analytical method used to quantify the sample parameter concentration. This information assists the project chemists in assessing the validity of the analyses and the manner in which the samples were prepared and analyzed. Sample preparation and analysis information is typically listed on the analytical reports from the laboratory.

Analytical Result Information

Analytical result information describes the concentrations, detection limits, and other numeric and text results of the analytical methods. These analytical results, which are the ultimate usable end product of the laboratory analyses, shall be used for further characteristics of the project site.

Analytical results are typically listed on the analytical results sheets in the hard copy report.

Data Reporting

Laboratory Reports

The laboratory shall prepare full analytical and QC documentation as required by the special analytical services (SAS) request forms.

The laboratory shall report the data in the same chronological order in which it was analyzed along with QC data. The data for this project shall be collected and documented in such a manner that shall allow the generation of data packages that can be used by an external data auditor to reconstruct the analytical process. The data provided by the laboratory must be legible and properly labeled. The laboratory shall provide, as a minimum, the following information as part of each analytical data package:

1. Cover sheets listing the samples included in the report and narrative comments describing problems encountered in analysis
2. Tabulated results of inorganic and organic compounds identified and quantified.
3. Analytical results for QC sample spikes, sample duplicates, initial and a continuous calibration verifications of standards and blanks, standard procedural blanks, laboratory control samplers, and ICP interference check samples
4. Tabulation of instrument detection limits determined in pure water
5. Raw data system printouts (or legible photocopies) identifying
    - date of analyses, analyst, parameters determined, calibration curve, calibration verifications, method blanks, sample and any dilutions, sample duplicates, spikes and control samples

- for organic analyses, the data packages must include matrix spikes, matrix spike duplicates, surrogate spike recoveries, chromatogram, GC/MS spectra, and computer printouts

Operations Reports

The operations and maintenance (O&M) subcontractor shall complete weekly and daily inspection/monitoring sheets including all onsite laboratory results. The onsite laboratory results include weekly influent and daily/batch discharge effluent monitoring results. The log sheets shall be submitted to CH2M HILL every 2 weeks. The information contained in these log sheets shall be used by CH2M HILL to complete monthly discharge monitoring reports (DMRs) for submittal to the City of Appleton.

The DMRs shall be submitted in accordance with the City of Appleton Industrial User Permit No. 97-21 issued for the site on April 30, 1997. The permit requires a monthly submittal of the total flow and the minimum, maximum, and average pH values for each discharge event. The permit also requires quarterly and yearly offsite laboratory effluent results for submittal to the City of Appleton in a biannual compliance report. Copies of these reports shall be provided to the USEPA Work Assignment Manager and maintained on file by CH2M HILL for a minimum of 3 years.

Groundwater Monitoring

Data from each sampling event is incorporated in a report that is distributed to the USEPA and the WDNR. Copies of these reports are maintained by CH2M HILL.

Other Reports

Data accumulated from trouble shooting and other miscellaneous investigations is reported to the USEPA in the monthly technical status reports. Investigations involving larger amounts of data are included in a technical memorandum or report and are submitted to the USEPA. A copy of the technical status reports, technical memorandums, or reports shall be maintained by CH2M HILL.

Data Storage/Archiving

The project data shall be available for controlled access by the Project Manager and authorized personnel.

The laboratory shall prepare and retain full analytical and QC documentation as required by the special analytical services (SAS) request forms. Such retained documentation need not be hard copy, but may be in other storage media (e.g., magnetic tape). The laboratory shall supply hard copy of the retained information, as needed.

The laboratory shall store all data records associated with the receipt, preparation, analysis, and reporting of all samples for a minimum of 7 years. CH2M HILL shall store/archive all data records, and reports associated the project in accordance with their contract with the USEPA.

At the end of the data storage requirements, the data shall be disposed of in accordance with USEPA guidelines.

Pollution Control and Mitigation Plan

Introduction

This plan describes the pollution control and mitigation program for the long-term response action (LTRA) activities for the N.W. Mauthe Superfund site located in Appleton, Wisconsin. This plan describes the process, procedures, and safeguards that will be used to ensure contaminants or pollutants are not released offsite during CH2M HILL's implementation of the LTRA.

Groundwater Monitoring System

The primary procedure for ensuring that contaminants are not released offsite involves periodic monitoring of the groundwater and groundwater collection system. Periodic monitoring is necessary to verify that the groundwater collection system is containing the contaminated groundwater and preventing its migration, and to determine whether the system is reducing the level of contaminants in the plume.

The groundwater monitoring well network was designed to provide information on containment of the groundwater and on water quality at the site and adjacent residential properties. The monitoring network is comprised of eleven wells constructed during the RI and the RA activities.

- Monitoring well MW-101, which is located west of the site, is used to monitor the effectiveness of the West Trench in preventing the migration of groundwater contamination.

- Three downgradient wells—MW-102, MW-103, and MW-104, are used to monitor changes in groundwater quality downgradient of the Central Trench and to monitor hydraulic gradient control.

- Four wells—W-8, MW-15, MW-105, and MW-106—are used to monitor changes in groundwater quality outside of the Southeast Trench. Monitoring wells MW-106 and W-15 will also be used to monitor hydraulic gradient control of the Southeast Trench.

Groundwater Treatment System

The groundwater treatment system is a source of contaminants and pollutants since it collects contaminated groundwater and treats the groundwater using several process treatment chemicals.

The groundwater treatment system building is designed to routinely collect and contain spills of groundwater contaminants and chemical pollutants. The floor drain system is designed to collect air compressor drainage, tank drainage, tank overflows, tanker truck loadout drainage, and treatment process chemical spills.

The treatment process chemicals located at the groundwater treatment facility are ferrous sulfate and sodium hydroxide (caustic). These chemicals are contained in 55 gallons drums which are located above chemical spill containment sumps to reduce the potential for uncontained spills. The containment sumps have a drain pipe connecting the sumps to the building sump. Additional spill prevention, control, and countermeasures for the caustic and ferrous sulfate systems are presented in the Contingency Plan (Attachment No. 1 of the Site Management Plan).

Spills and water from the all of the building floor drains are directed to the building sump. The building sump is a 400-gallon FRP tank with a pumping capacity of 83 gpm. The building sump pumps its contents to the groundwater storage tank where the water is pumped to the reaction tank for treatment prior to discharge to the City of Appleton POTW.

Spill Reporting and Notification Procedure

If there is an unusual and/or catastrophic situation which causes an uncontrolled release of hazardous waste or contaminated groundwater into the environment, the appropriate state, local and federal agencies should be notified. These agencies include the United States Environmental Protection Agency (USEPA), the Wisconsin Department of Natural Resources (WDNR), and/or the City of Appleton POTW. Refer to the contingency plan and/or Site Health and Safety Plan for the agency contacts. In addition to these agency contacts, a 24-hour hotline operated by the division of emergency management in cooperation with the WDNR can be reached at 1-800-943-0003.

Determining Applicability of WDNR Notification Requirements

Wis. Adm. Code NR 706.05 (a)—Unless the discharge is specifically exempted under NR 706.07, persons who cause the discharge to the environment of a hazardous substance or who possess or control a hazardous substance which is discharged to the environment shall immediately notify the department of the discharge. For the purpose of determining if a substance is hazardous and whether its discharge is required to be reported, responsible parties shall consider the quantity, concentration and physical, chemical and infectious characteristics of the substance and the location where the discharge occurred, and whether the substance has been discharged to the environment. A hazardous substance that is "discharged" into a secondary containment structure, that is completely contained and can be recovered with no discharge to the environment, is not subject to the discharge notification requirements in s. 292.11 (2), Stats.

City of Appleton POTW Notification Requirements

The City of Appleton POTW Director of Utilities shall be notified immediately by telephone of an upset, spill, or other slug that has a reasonable potential to cause a violation of a pretreatment standard or has the potential to upset the POTW. The report shall contain the location, time, and date of the incident; the character and volume of the discharge; and the containment or corrective actions taken. Within 5 days of the report required above, a written report shall be submitted to the Director of Utilities describing the cause of the discharge, the duration of the discharge, and the measures to be taken to prevent similar discharges in the future.

Transportation and Disposal Plan

Introduction

This plan describes the transportation and disposal program for the long-term response action (LTRA) activities for the N.W. Mauthe Superfund site located in Appleton, Wisconsin. The LTRA is the implementation phase of the site remedial action, i.e., operation and maintenance and performance monitoring of the groundwater collection and treatment systems at the site. Wastes that are generated during treatment of the groundwater include the treatment plant effluent (wastewater) and the solids generated during the treatment process (sludge). Wastewater disposal requirements are dictated by state and federal requirements as well as the requirements identified in the City of Appleton POTW Industrial User Discharge Permit No. 97-21. A copy of this permit is included as Attachment No. 1. Sludge disposal requirements are dictated by state and federal requirements. The testing, transportation and disposal requirements for these wastes are summarized in the following sections.

Applicable State and Federal Requirements

Waste management activities shall be performed in accordance with all applicable state and federal requirements as follows:

Clean Water Act of 1977, an Amended [33 U.S .C. S 1317} 40 CFR 403—Pretreatment Standards. This states that waste waters discharged into a POTW satisfy both general and specific requirements to protect against damage to POTWs. Any waste to be discharged to the POTW must, if necessary, be treated to satisfy these applicable standards prior to discharge. These pretreatment requirements are administered under WI Adm. Code NR 211 and NR 108. The substantive requirements of these regulations apply to the collected and/or treated groundwater transported through the sanitary sewer to the POTW.

WI Adm. Code NR 605; 40 CFR 261—Identification of Hazardous Wastes. This provides requirements for determining when a waste is hazardous. The substantive requirements of these regulations apply to the TCLP testing of the sludge.

WI Adm. Code NR 615; 40 CFR 262—Standards Applicable to Generators of Hazardous Waste. This provides requirements for the shipment of wastes to treatment, storage or disposal facilities.

WI Adm. Code NR 620; Dept. of Transportation Hazardous Materials Transportation Act (49 U.S.C. S 1801); 40 CFR 263—Standards Applicable to Transporters of Hazardous Waste. This requires recordkeeping, reporting and manifesting of waste shipments.

WI Adm. Code NR 675; 40 CFR 268—Land Disposal Restrictions (LDRs). If the sludge contains hazardous substances in sufficient concentrations to be classified as hazardous waste based on the RCRA characteristics, it is subject to RCRA LDRs. The sludge at this site is determined as hazardous on the basis of the RCRA characteristic of toxicity as

determined through TCLP testing. The restricted wastes must meet treatment standards before land disposal. Characteristic hazardous waste that has been treated to meet the treatment standard is no longer considered hazardous after the characteristic is eliminated, and can be disposed of in a Subtitle D waste landfill.

Wastewater Disposal

Wastewater Discharge Permit Limits

The wastewater generated at the site is discharged to the City of Appleton POTW in accordance with Industrial User Permit No. 97-21, issued for the site on April 30, 1997. Wastewater discharge limitations (from Part 1 of the permit) are listed on Table 1. Only local limits, not categorical limits, apply to the discharge since it is for groundwater remediation and the site is not an active production facility.

TABLE 1
Outfall 001 Effluent Limitations

Parameter (units)	Daily Maximum Limit
pH (standard units)	5.0 to 12.4
Aluminum, total (mg/L)	70.0
Arsenic, total (mg/L)	1.0
Cadmium, total (mg/L)	0.3
Chromium, total (mg/L)	7.0
Chromium, hexavalent (mg/L)	4.5
Copper, total (mg/L)	3.5
Cyanide, total (mg/L)	1.0
Lead, total (mg/L)	2.0
Mercury, total (µ/L)	2.0 *micrograms/L*
Nickel, total (mg/L)	2.0
Zinc, total (mg/L)	10.0

The discharge from Outfall 001 shall comply with Sections 20-81 and 20-83, Chapter 20, Utilities; and Part 5—PROHIBITIONS contained in the Industrial User Permit (No. 97-21).

Discharge Monitoring

Monitoring the treatment system includes periodic sampling and analysis of the treated effluent. Compliance monitoring requirements are listed in Part 2 of the Industrial User permit. Monitoring will consist of collecting effluent samples for onsite and offsite analysis.

Onsite analysis includes collecting an effluent sample for each discharge event. The effluent samples are analyzed for hexavalent chromium using the onsite *Hach* colorimetric test kit. Onsite analyses will be performed by the system operator.

Offsite analyses include collecting effluent samples for all other parameters, as shown in Attachment No. 1. The offsite analyses will be completed by an offsite laboratory. The laboratory must be certified by the WDNR. The POTW will also perform sampling and

analysis at the site twice per year for verification of the permittee's results. Specific monitoring requirements are listed in the permit.

Monthly and Biannual reports must be submitted to the POTW summarizing the monitoring results. Required items for the report and the reporting address are discussed in Industrial User Permit, Part 4.

Sludge Disposal

This section describes the sludge disposal activities conducted by CH2M HILL during the implementation of the LTRA.

TCLP Testing

A sludge sample will be collected by the operation and maintenance (O&M) subcontractor from the sludge tank located at the groundwater treatment facility. The sample will be analyzed for all parameters per Protocal B disposal requirements which require a Toxicity Characteristic Leaching Procedure (TCLP) analysis. The sample analysis is the responsibility of the O&M subcontractor (Midwest Contract Operation, Inc. [MCO]) who has designated that the analysis will be performed by the following laboratory:

Northern Lab Service, Inc.
400 North Lake Avenue
Crandon, WI 54520

Further tests of the sludge will be dependent upon the requirements of the sludge disposal company. A Generators Waste Profile Sheet will be completed to provide background information on the sludge generation process. This form, in conjunction with the analytical data will be the basis for approval of the sludge for transportation and disposal. A copy of all forms and data will be retained both at CH2M HILL's Milwaukee Office and the groundwater treatment facility.

If the sludge is determined to be a RCRA hazardous waste through TCLP testing then the treatment facility will be considered a very small quantity hazardous waste generator and will be subject to Wis. Adm. Code NR 600 Standards. The definition of a very small quantity generator according to NR 610.07 is "any person who generates in a calendar month a total of less than 100 kilograms (220 lbs) of hazardous waste and does not accumulate at any time quantities of hazardous waste greater than 1000 kilograms (2205 lbs)".

If the sludge is determined to be non-hazardous through TCLP testing than the regulatory requirements for hazardous waste generator, storage, reporting and manifesting are not applicable.

Sludge Transportation and Disposal

MCO has designated that sludge transportation and disposal services will be provided by:

Chief Liquid Wastes, Inc.
6062 Memorial Drive
Winneconne, WI 54986

Chief Liquid Wastes is a sludge transportation company who will take on the responsibility for sludge disposal. Based on the results of the sludge testing, Chief Liquid Wastes will determine the type and location of the ultimate disposal facility (i.e., incineration, landfill, treatment, etc.). Appropriate manifests for transportation and disposal of the sludge will be required. An example copy of a completed manifest is shown in Attachment No. 2. Manifests shall be signed by a CH2M HILL employee on the behalf of the USEPA.

Attachment No. 1

City Of Appleton

DEPARTMENT OF UTILITIES

WASTEWATER DIVISION • CENTRAL BUILDING MAINTENANCE DIVISION
2006 East Newberry Street • Appleton, WI 54915
414/832-5945 • 414/832-5514 • FAX 414/832-5949

INDUSTRIAL USER PERMIT
TRANSMITTAL LETTER

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Cathy Barnett,
Mauthe Site Project Manager
CH2M HILL
411 East Wisconsin Avenue, Suite 1600
Milwaukee, Wisconsin 53202

as Authorized Representative for Discharger: **USEPA Region 5, Chicago, Illinois**

RE: Issuance of Industrial User Permit toUSEPA Region 5 / N. W. Mauthe Superfund Site By the City of Appleton.
Permit No. 97 - 21.

Dear Ms. Barnett:

Your application for an industrial user pretreatment permit has been reviewed and processed in accordance with section 20.4.

The enclosed permit, 97 - 21, covers the wastewater discharged from the facility located at 725 South Outagamie Street into the City of Appleton sewer system. All discharges from this facility and actions and reports relating thereto shall be in accordance with the terms and conditions of this permit.

If you wish to appeal or challenge any conditions imposed in this permit, a petition shall be filed for modification or reissuance of this permit in accordance with the requirements of section 20-108, within 20 days of your receipt of this correspondence. Pursuant to section 20-108, failure to petition for reconsideration of the permit within the allotted time is deemed a waiver by the permittee of his right to challenge the terms of this permit.

By: Duane Leaf

Duane Leaf
Director of Utilities

Issued this **30th** day of **April, 1997**

COVER PAGE

Permit No. **97 - 21**

INDUSTRIAL USER (WASTEWATER DISCHARGE) PERMIT

In accordance with the provisions of Division 4 and 5, Article III, Chapter 20, Utilities, City of Appleton Ordinance,

N. W. Mauthe Superfund Site
c/o United States Environmental Protection Agency Region 5
77 West Jackson Boulevard
Chicago, Illinois 60604

is hereby authorized to discharge industrial wastewater from the above identified facility and through the outfalls identified herein into the City of Appleton sewer system in accordance with the conditions set forth in this permit. Compliance with this permit does not relieve the permittee of its obligation to comply with any or all applicable pretreatment regulations, standards or requirements under local, State, and Federal laws, including any such regulations, standards, requirements, or laws that may become effective during the terms of this permit.

Noncompliance with any terms or condition of this permit shall constitute a violation of the Chapter 20, Utilities, City of Appleton Ordinance.

This permit shall become effective on the date of signature and shall expire at midnight on **May 31, 2000**.

If the permittee wishes to continue to discharge after the expiration date of this permit, an application must be filed for a renewal permit in accordance with the requirements of Section 20-132, Chapter 20, Utilities, City of Appleton Ordinance, a minimum of 90 days prior to the expiration date.

By: Duane Leaf

Duane Leaf
Director of Utilities

Issued this **30 th** day of **April 1997**

INTRODUCTION

Discharges from the outfall(s) regulated by this permit are subject to the local limits established by the City of Appleton in Section 20-83, Chapter 20, Utilities. These requirements are set forth in Part 1 of this permit.

PART 1 - EFFLUENT LIMITATIONS

A. Outfall(s) Description

Outfall 001 is located in the pretreatment building constructed solely to remediate groundwater collected from the property located at 725 South Outagamie Street. This property , the former N. W. Mauthe plating company, is now a USEPA designated Superfund site. Discharged wastewater from this facility is not related to any current production activities and only represents contaminated groundwater remediation efforts at the site. As such, groundwater is collected and treated for discharge on a batch-wise basis only. There is no continuous, unmonitored, wastestream entering the sanitary sewer outfall at this facility.

This outfall enters the City sewer system at manhole 30 - 14 on Melvin Street between the intersections of Douglas Street and Outagamie Street.

B. Effluent Limitations for pH

Outfall 001

(1) The pH of the permittee's discharge shall be greater than 5.0 s.u. and less than 12.4 s.u. at all times.

C. Effluent Limitations

(1) Outfall 001

Applicable Categorical Pretreatment Standards

Parameter	Daily maximum (mg/l)	Monthly average (mg/1)

(THIS OUTFALL IS NOT REGULATED BY CATEGORICAL PRETREATMENT STANDARDS)

Discharge from this site is not associated with any current production activity.

Applicable Local Limits

Parameter :	**Daily Maximum** :	**(mg/L or as noted)** :
Aluminum, total	70.0	
Arsenic, total	1.0	
Cadmium, total	0.3	
Chromium, total	7.0	
Chromium, hexavalent	4.5	
Copper, total	3.5	
Cyanide, total	1.0	
Lead, total	2.0	
Mercury, total	2.0	µg / L
Nickel, total	2.0	
Zinc, total	10.0	

The discharge from **Outfall 001** shall comply with Sections 20-81 and 20-83, Chapter 20, Utilities; and PART 5 - PROHIBITIONS contained in this permit.

PART 2 - MONITORING REQUIREMENTS

A. Outfall 001

Samples shall be collected at **Outfall 001**.

Sample Parameter (units)	Sample Frequency	Sample Type	Analytical Method[1]
	(PROCESS COMPLIANCE PARAMETERS)		
Flow (gpd)	during discharge	Meter[2]	
pH[3] (s.u.)	during discharge	Meter	
Chromium, total (mg/l)	1/quarter	FPC[4]	200.7, 218.1, 218.2 or 218.3
Chromium, hexavalent (mg/l)	during discharge	Grab[5]	218.4
	(LOCAL LIMIT COMPLIANCE PARAMETERS)		
Aluminum, total (mg/L)	1/year[6]	FPC	202.1, or 202.2
Arsenic, total (mg/L)	1/year	FPC	206.2, 206.3, 206.4, or 206.5
Cadmium, total (mg/L)	1/year	FPC	200.7, 213.1 or 213.2
Chromium,total (mg/L)	1/year	FPC	200.7, 218.1, 218.2 or 218.3
Chromium, hexavalent (mg/L)	1/year	FPC	218.4
Copper, total (mg/L)	1/year	FPC	200.7, 220.1 or 220.2
Cyanide, total (mg/L)	1/year	Grab	335.1 or 335.2
Lead, total (mg/L)	1/year	FPC	200.7, 239.1 or 239.2
Mercury, total (µg/L)	1/year	FPC	245.1 or 245.2
Nickel, total (mg/L)	1/year	FPC	200.7, 249.1 or 249.2
Zinc, total (mg/L)	1/year	FPC	200.7, 289.1 or 289.2

[1] These analytical methods are set forth in 40 CFR Part 136 or references cited in that regulation.

[2] Daily flows are to be recorded from the permittee's flow meter. This data will be submitted monthly to the Pretreatment Coordinator. The flow meter shall be calibrated annually to ensure its accuracy.

[3] Daily high, low, and average pH values will be recorded, with any excursions beyond the limits set in the permit noted with an explanation of the cause of the excursion. This data will be submitted monthly to the Pretreatment Coordinator.

(Part 2: Monitoring Requirements Cont.)

[4] Flow Proportional Composite (FPC): the Director of Utilities may waive flow proportional composite sampling techniques for the permittee that demonstrates that flow proportional composite sampling is infeasible. In such cases time proportional sampling or grab sampling may be utilized.

[5] Composite samples are not appropriate for these parameters; grab samples must be used for hexavalent chromium, pH, and cyanide.

[6] The permittee shall monitor at least once during the period January 1 through June 30 for the pollutants listed in Part 1, Section C of this permit. This monitoring report is due July 15.

B. Monitoring shall represent production activities and discharges normally occurring during the reporting period.

C. All equipment used for sampling and analysis must be routinely calibrated, inspected and maintained to ensure their accuracy. Monitoring points shall not be changed without notification to and the approval of the Director of Utilities.

D. All handling and preservation of collected samples and laboratory analyses of samples shall be performed in accordance with 40 CFR Part 136, Table II or ch. NR 219, Wis. Admin. Code unless other sampling and analytical techniques are approved by the Department of Natural Resources and specified in the monitoring conditions of this permit.

E. All laboratory analyses of all required monitoring shall be performed in accordance with procedures and techniques set forth in 40 CFR part 136. Alternatively, laboratory analyses shall be performed by laboratories certified by the Department of Natural Resources under ch. NR 149, Wis. Admin. Code.

F. The permittee shall measure pH continuously when required by the Director of Utilities. When pH is measured otherwise, the permittee shall use either a portable pH meter or a grab sample free of acidic or alkaline preservatives.

PART 3 - (RESERVED)

PART 4 - REPORTING REQUIREMENTS

A. Report on Compliance with Categorical Pretreatment Standard

If the permittee is subject to a categorical pretreatment standard, the permittee shall submit a ninety (90) day report to the Director of Utilities including information described below. If the permittee is subject to equivalent mass or concentration limits, then the permittee shall include a reasonable measure of the permittee's long term production rate. If the permittee's categorical pretreatment standards are expressed in production based standards, the permittee shall report the user's actual production during the sampling period.

(1) Information showing the measured average daily and maximum daily flow, in gallons per day, to the POTW from regulated process streams and other streams, as necessary, to allow use of the combined wastestream formula set out in 40 CFR 403.6 (e).

(2) The categorical pretreatment standard applicable to each regulated process.

(a) The results of sampling and analysis identifying the nature and concentration, and/or mass, where required by the standard or by the Director of Utilities, of regulated pollutants in the discharge from each regulated process. Instantaneous, daily maximum, and long-term average concentrations, or mass where required, shall be reported.

(3) A statement, reviewed by the user's authorized representative and certified by a qualified professional, indicating whether pretreatment standards are being met on a consistent basis, and if not, whether additional operation and maintenance (O & M) and/or additional pretreatment is required to meet the pretreatment standards and requirements.

The report shall be submitted ninety (90) days after final compliance with the applicable categorical pretreatment standard.

B. Periodic Compliance Reports

During the months of June and December, unless required more frequently in the pretreatment standard or by the Director of Utilities, the permittee shall report the results of all sampling required in Part 2 A. of this permit. If the permittee is subject to equivalent mass or concentration limits, the report shall include a reasonable measure of the industrial user's long term production rate. If the permittee's categorical pretreatment standards are expressed in production based standards, the permittee shall report the actual production during the sampling period. If the permittee monitors a pollutant more frequently than required by this permit, then the permittee shall also report the results of this monitoring to the Director of Utilities. The report shall be submitted no later than July 15 for the June report and no later than January 15 for the December report.

(Part 4: Reporting Requirements Cont.)

C. Report of Violation and Resampling

If the results of the permittee's wastewater analysis indicates that a violation of this permit has occurred, the permittee must:

(1) Inform the Director of Utilities of the violation within twenty-four (24) hours; and

(2) Repeat the sampling and pollutant analysis and submit, in writing, the results of this second analysis within thrity (30) days of the first violation.

D. Report of Upsets, Spills, Slugs and other Emergencies

The permittee shall notify the Director of Utilities immediately of an upset, spill or other slug that has a reasonable potential to cause a violation of a pretreatment standard or has the potential to upset the POTW. The report shall contain the following information:

(1) location, date and time of discharge

(2) character and volume of discharge

(3) containment or corrective action taken by permittee

Within five days of the report required above, the user shall submit a written report to the Director of Utilities describing the cause of the discharge, the duration of the discharge, and the measures to be taken to prevent similar discharges in the future.

E. Report of Changed Discharge

The permittee shall promptly notify the Director of Utilities in advance of any substantial change in the volume or character of pollutants in its discharge, including the listed or characteristic hazardous wastes for which the permittee has submitted initial notification.

(Part 4: Report Requirements Cont.)

F. Report of Hazardous Waste Discharge

The permittee shall notify the Director of Utilities, in writing, of any discharge in to the POTW of a substance which, if otherwise disposed of, would be a hazardous waste. A hazardous waste is:

(1) Any amount of a substance that would be considered an acute hazardous waste according to 40 CFR 261.30(d) and 261.33(e) or s. NR 605.09(1) (d) or (3) (b), Wis. Admin. Code; or

(2) Substances that:
- (a) If otherwise disposed of would be considered hazardous waste under 40 CFR part 261 or ch. NR 605, and
- (b) are discharged in quantities of fifteen (15) kilograms or more per month.

The report shall contain the following information:

(1) name of the hazardous waste

(2) the hazardous waste number

(3) whether the discharge is continuous, batch or other;

(4) a certification that the industrial user has a program in place to reduce the volume and toxicity of hazardous wastes generated to the degree it has determined to be economically practical. If the permittee discharges more than one hundred (100) kilograms of wastes described in (2) (a) above, the report shall contain the following additional information:

- (a) an identification of the hazardous constituents in the waste
- (b) an estimation of the mass and concentration of such constituents in the wastestream discharged during each month
- (c) an estimation of the mass and concentration of such constituents in the wastestream expected to be discharged during the following twelve (12)months.

The report shall be submitted no later than one hundred eighty (180) days after the commencement of the discharge or no later than ninety (90) days after new federal or state regulations define as a hazardous waste, substances that the user discharges in quantities that make the user subject to this section. This report need only be submitted once. Any reports of changed conditions should be submitted according to the requirements outlined in PART 3, Section E of this permit. If other reports required by the Director of Utilities contain the information required in the Hazardous Waste Report, then the Hazardous Waste Report is not required.

(Part 4: Reporting Requirements Cont.)

G. Sampling and Analyses Reporting

Records of sampling and analyses required for reports in this permit shall include:

(1) The date, exact place, time, and methods of sampling or measurements, and sample preservation techniques or procedures;

(2) Who performed the sampling or measurements;

(3) The date(s) analyses were performed;

(4) Who performed the analyses;

(5) The analytical techniques or methods used; and

(6) The results of such analyses

H. Report of Flow Meter Calibration

A statement from a qualified professional verifying that the flow meter has been calibrated shall be submitted with the Periodic Compliance Report for period ending in June or December, annually.

I. NR 101 Report

If the permittee is subject to NR 101 reporting requirements by the Department of Natural Resources, a copy of the annual NR 101 report shall be sent to the Director of Utilities.

J. Signatory Requirement

All applications, reports, or information submitted to the Director of Utilities must contain the following certification statement and be signed as required in Section 20-106, Chapter 20, Utilities.

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations".

(Part 4: Reporting Requirements Cont.)

K. Reporting Address

All reports required by this permit shall be submitted to the Pretreatment Coordinator at the following address:

City of Appleton
Pretreatment Coordinator
2006 East Newberry Street
Appleton, WI 54915

PART 5 - PROHIBITIONS

A. General Prohibitions

Pass Through and Interference

The permittee shall not introduce or cause to be introduced into the City of Appleton sewer system any pollutant or wastewater which causes pass through or interference. This general prohibition applies to all users of the sewer system whether or not they are subject to categorical pretreatment standards or any other National, State, or local pretreatment standards or requirements.

Pass through is the discharge of pollutants through the POTW to waters of the state in quantities or concentrations which, alone or in conjunction with the discharge or discharges from other sources, causes a violation or increases the magnitude or duration of a violation of any requirement of the POTW's WPDES permit.

Interference is the inhibition or disruption of a POTW's sewer system, treatment processes, or operations by a discharge which, alone or in conjunction with the discharge or discharges from other sources, causes a violation or increases the magnitude or duration of a violation of any requirement of the POTW's WPDES permit, including the impairment of the use or disposal of POTW sludge under chs. 144 and 147, Stats.

B. Specific Prohibitions

The permittee shall not introduce or cause to be introduced into the City of Appleton sewer system any of the following substances, pollutants, or wastewater:

(1) Pollutants which create a fire or explosive hazard in the POTW, including, but not limited to, wastestreams with a closed-cup flashpoint of less than 140 °F (60°C) using the test method specified in 40 CFR 261.21;

(2) Pollutants that will cause corrosive structural damage to the sewerage system, including but not limited to discharges with a pH lower than 5.0 s.u. or higher than 12.4 s.u.

(Part 5: Prohibitions Cont.)

(3) Solid or viscous substances in amounts which will cause obstruction of the flow in the sewerage system or otherwise interfere with the operation of the POTW resulting in interference;

(4) Pollutants, including oxygen-demanding pollutants (BOD, etc.) released in a discharge at a flow rate and/or pollutant concentration which, either singly or by interaction with other pollutants, will cause interference with the POTW;

(5) Wastewater having a temperature greater than 150 °F (65° C), or which will inhibit biological activity in the treatment plant resulting in interference, but in no case wastewater which causes the temperature at the introduction into the treatment plant to exceed 104 °F (40 °C);

(6) Petroleum oil, nonbiodegradable cutting oil, or products of mineral oil origin, in concentrations greater than twenty-five (25) mg/L;

(7) Pollutants which result in the presence of toxic gases, vapors, or fumes within the POTW in quantity that may cause acute worker health and safety problems;

(8) Trucked or hauled pollutants, except at discharge points designated by the Director of Utilities in accordance with Section 20-94, Chapter 20, Utilities.

(9) Noxious or malodorous liquids, gases, solids, or other wastewater which, either singly or by interaction with other wastes, are sufficient to create a public nuisance or a hazard to life, or to prevent entry into the sewers for maintenance or repair;

(10) Wastewater which imparts color which cannot be removed by the treatment process, such as, but not limited to, dye wastes and vegetable tanning solutions, which consequently imparts color to the treatment plant's effluent.

(11) Wastewater containing any radioactive wastes or isotopes except in compliance with applicable State and Federal regulations;

(12) Storm water, surface water, ground water, artesian well water, roof runoff, subsurface drainage, swimming pool drainage, condensate, deionized water, noncontact cooling water, and unpolluted wastewater, unless specifically authorized by the Director of Utilities;

(13) Sludges, screenings, or other residues from the pretreatment of industrial wastes;

(14) Medical wastes, except as specifically authorized by the Director of Utilities in a wastewater discharge permit;

(Part 5: Prohibitions Cont.)

(15) Wastewater causing, alone or in conjunction with other sources, the treatment plant's effluent to fail a toxicity test;

(16) Detergents, surface-active agents, or other substances which may cause excessive foaming in the POTW;

(17) Fats, oils, or greases of animal or vegetable origin in concentrations greater than one hundred (100) mg/L;

(18) Wastewater causing two readings on an explosion hazard meter at the point of discharge into the POTW, or at any point in the POTW, of more than five percent (5%) or any single reading over ten percent (10%) of the Lower Explosive Limit of the meter; or

(19) Wastewater containing any garbage that has not been ground by household type or other suitable garbage grinders.

Pollutants, substances, or wastewater prohibited by this section of the permit hall not be processed or stored in such a manner that they could be discharge to the POTW.

C. Dilution Prohibition

The permittee shall not increase the use of potable or process water or, in any way, attempt to dilute a discharge as a partial or complete substitute for adequate treatment to achieve compliance with the limitations contained in this permit. The Director of Utilities may impose mass limitations on permittees which are using dilution to meet applicable pretreatment standards or requirements, or in other cases where the imposition of mass limitations is appropriate.

D. Bypass Prohibition

A bypass is the intentional diversion of wastes from any portion of a permittee's treatment facility. For the purposes of this section, severe property damage means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

(1) Bypass is prohibited, and the Director of Utilities may take enforcement action against a permittee for a bypass, unless

(a) Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

(Part 5: Prohibitions Cont.)

(b) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgement to prevent a bypass which occurred during normal periods of equipment downtime or preventative maintenance;

(c) The permittee submitted notices as required under paragraph (d) of this section.

(2) The permittee may allow bypass to occur which does not cause effluent limitations to be exceeded, but only if it is also for essential maintenance to assure efficient operation.

(3) Notification of bypass:

(a) Anticipated bypass. If the permittee knows in advance of the need for bypass, it shall submit prior written notice, at least ten (10) days before the date of the bypass, to the Director of Utilities.

(b) Unanticipated bypass. The permittee shall orally notify the Director of Utilities within twenty-four (24) hours from the time the permittee becomes aware of the bypass. A written notice shall also be provided within five (5) days of the time the permittee becomes aware of the bypass.

This written report shall specify:

(I) A description of the bypass, its cause, and its duration, including exact dates and times;

(ii) Whether the bypass has been corrected; and

(iii) The steps being taken or to be taken to reduce eliminate and prevent a reoccurrence of the bypass.

PART 6 - GENERAL CONDITIONS

A. Compliance With All Local, State and Federal Requirements

Compliance with this permit does not relieve the permittee from its obligations regarding compliance with any and all applicable local, State and Federal pretreatment standards and requirements including any such standards or requirements that may become effective during the term of this permit.

B. Compliance with Categorical Pretreatment Standards

All industrial users, except new sources, shall comply with the applicable categorical pretreatment standards within three (3) years from the effective date of the standard or within a shorter period if specified in the applicable standard. A direct discharger which becomes an industrial user after promulgation of an applicable categorical pretreatment standard may not be considered a new source unless it falls within the definition of a "new source" contained in Section 20-69, Chapter 20, Utilities.

C. Combined Wastestreams

Alternative Limit Calculations

When wastewater subject to a categorical pretreatment standard is mixed with wastewater not regulated by the same standard, the Director of Utilities shall impose an alternate limit using the combined wastestream formula found in 40 CFR 403.6 (e).

Where a treated regulated process wastestream is combined prior to treatment with wastewaters other than those generated by the regulated process, the permittee may monitor either the segregated process wastestream or the combined wastestream for the purpose of determining compliance with applicable pretreatment standards. If the permittee chooses to monitor the segregated process wastestream, it shall apply the applicable categorical pretreatment standard. If the permittee chooses to monitor the combined wastestream, it shall apply an alternative discharge limit calculated using the combined wastestream formula as provided in this section. The permittee may change monitoring points only after receiving approval from the Director of Utilities.

D. Slug Control Plans

At least once every two years, the Director of Utilities will evaluate the permittee's need for a plan to control slug discharges. A slug discharge is any discharge of a non-routine, episodic nature, including but not limited to an accidental spill or non-customary batch discharge. If the Director of Utilities decides that a slug control plan is needed, the permittee shall submit, at a minimum, the following information:

(1) A description of discharge practices, including non-routine batch discharges;

(Part 6: General Conditions Cont.)

(2) A description of stored chemicals

(3) Procedures for immediately notifying the POTW of slug discharges, including any discharge that would violate a prohibition under Section 20-81, Chapter 20, Utilities

(4) If necessary, procedures to prevent adverse impact from accidental spills, including inspection and maintenance of storage area, handling and transfer of materials, loading and unloading operations, control of plant site run-off, worker training, building of containment structures or equipment, measures for containing toxic organic pollutants (including solvents), and/or measures and equipment necessary for emergency response.

E. Proper Disposal of Pretreatment Sludges

The permittee shall dispose of sludges generated by wastewater treatment sludges according to all applicable local, state and federal requirements.

F. Duty to Comply

The permittee shall comply with all conditions of this permit. Failure to comply with the requirements of this permit may be grounds for enforcement action as outlined in Division 10 of Article III; Chapter 20, Utilities, City of Appleton Ordinance.

G. Duty to Mitigate

The permittee shall take all reasonable steps to minimize or correct any adverse impact to the public treatment plant or the environment resulting from noncompliance with this permit, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge.

H. Duty to Provide Information

The permittee shall furnish to the Director of Utilities any information requested to determine whether cause exists for modifying, revoking and reissuing this permit or to determine compliance with this permit. This information shall be furnished within ten (10) days of the request.

I. Property Rights

This permit does not create nor convey any property rights of any sort.

(Part 6: General Conditions Cont.)

J. Permit Modifications

This wastewater discharge permit may be modified to incorporate new or revised Federal, State or local pretreatment standards or requirements or for any other good causes including, but not limited to, those listed in Section 20-109, Chapter 20, Utilities.

K. Permit Transfer

This wastewater discharge permit is issued to the permittee for specific processes and operations at a specific location. If a person is seeking a transfer of the permit, that person must make application to the Director of Utilities prior to becoming the owner or operator of the facility. The permit transfer must comply with Section 20-110, Chapter 20, Utilities. If an owner or operator changes without prior approval of the Director of Utilities, then this permit is void.

L. Permit Termination

This wastewater discharge permit may be terminated for good cause, including, but not limited to those listed in Section 20-111, Chapter 20, Utilities.

M. Permit Appeal Process

The permittee may petition the Director of Utilities to reconsider the terms of this permit within twenty (20) days of its issuance in accordance with Section 20-108, Chapter 20, Utilities.

N. Permit Reissuance

If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must submit an application for a new permit at least ninety (90) days before the expiration date of this permit.

O. Continuation of Expired Permits

An expired permit will continue to be effective and enforceable until the permit is reissued if:

(1) The permittee has submitted a complete permit application at least ninety (90) days prior to the expiration date of the user's existing permit.

(2) The failure to reissue the permit, prior to expiration of the previous permit, is not due to any act or failure to act on the part of the permittee.

(Part 6: General Conditions Cont.)

P. Proper Operation and Maintenance

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance includes but is not limited to: effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls, including appropriate quality assurance procedures.

Q. Monitoring Location

The permittee shall not change the monitoring location of the discharge without the prior approval of the Director of Utilities. The Director of Utilities shall ensure that any change in the permittee's monitoring location will not allow the user to substitute dilution for adequate treatment.

R. Inspection and Entry

The permittee shall allow the Director of Utilities, or an authorized representative to enter the permittee's premises for the purposes of inspection, sampling or record access.

S. Record-keeping Requirements

(1) The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart records for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least three years from the date of the sample, measurement, report or application.

This period may be extended by request of the Director of Utilities.

(2) All records that pertain to matters that are the subject of special orders or any other enforcement of litigation activities shall be retained by the permittee until all enforcement activities have concluded and all periods of limitation with respect to any and all appeals have expired.

T. Falsifying Information

Knowingly making any false statement on any report or other document required by this permit or knowingly rendering any monitoring device or method inaccurate, is a crime and may result in the referral of the permittee by the Director of Utilities to the proper authorities for criminal sanctions and/or civil penalties.

PART 7 - ENFORCEMENT AND PENALTIES

A. Annual Publication

A list of all industrial users which were in significant noncompliance at any time during the twelve (12) previous months shall be published at least annually by the Director of Utilities in the largest daily newspaper within its service area. For the purposes of this provision, a permittee is in significant noncompliance if its violation meets one or more of the following criteria:

(1) Chronic violations of wastewater discharge limits, defined here as those in which sixty-six percent (66%) or more of wastewater measurements taken during a six- (6-) month period exceed the daily maximum limit for the same pollutant parameter by any amount;

(2) Technical Review Criteria (TRC) violations, defined here as those in which thirty-three percent (33%) or more of wastewater measurements taken for each pollutant parameter during a six-(6) month period equals or exceeds the product of the daily maximum limit or the average limit multiplied by the applicable criteria (1.4) for BOD, TSS, fats, oils and grease, and (1.2) for all other pollutants except pH;

(3) Any other discharge violation that the Director of Utilities believes has caused, alone or in combination with other discharges, interference or pass through, including endangering the health of POTW personnel or the general public;

(4) Any discharge of pollutants that has imminent endangerment to the public or to the environment, or has resulted in the Director of Utilities exercise of its emergency authority to halt or prevent such a discharge;

(5) Failure to meet, within ninety (90) days of the scheduled date, a compliance schedule milestone contained in a wastewater discharge permit or enforcement order for starting construction, completing construction, or attaining final compliance;

(6) Failure to provide within thirty (30) days after the due date, any required reports, including baseline monitoring reports, reports on compliance with categorical pretreatment standard deadlines, periodic self-monitoring reports, and reports on compliance with compliance schedules;

(7) Failure to accurately report noncompliance; or

(8) Any other violation(s) which the Director of Utilities determines will adversely affect the operation or implementation of the local pretreatment program.

(Part 7: Enforcement and Penalties Cont.)

B. Civil Liability

Nothing in this permit shall be construed to relieve the permittee from civil penalties for noncompliance under Section 20-187, Chapter 20, Utilities or State or Federal laws or regulations.

C. Penalties for Violations of Permit Conditions

(1) Section 20-187, Chapter 20, Utilities, provides that any person who violates a permit condition shall be liable to the City of Appleton for a maximum civil penalty of ten thousand dollars ($10,000.00) per violation, per day.

(2) Any person who willfully or negligently violates permit conditions may be subject to prosecution under the criminal laws of the State of Wisconsin or the United States, in addition to actions for civil remedies.

Attachment No. 2

SPRINGFIELD, ILLINOIS 62794-9276 (217) 782-6761

State Form LPC 62 8/81 IL532-0610

FOR SHIPMENT OF HAZARDOUS AND SPECIAL WASTE

PLEASE TYPE (Form designed for use on elite (12-pitch) typewriter.)

EPA Form 8700-22 (Rev. 6-89)

Form Approved. OMB No. 2050-0039. Expires 9-30-94

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No. WID 083290981 | Manifest Document No. 30228 | 2. Page 1 of | Information in the shaded areas is not required by Federal law, but is required by Illinois law.

3. Generator's Name and Mailing Address
USEPA
725 S. Wisconsin St.
Appleton WIS 54914

Location If Different

A. State Manifest Document Number [redacted]005 FEE PAID IF APPLICABLE

4. 24 HOUR EMERGENCY AND SPILL ASSISTANCE NUMBERS: (414) 830-1054

B. State Generator's ID [redacted]5101875016 1

5. Transporter 1 Company Name: OZinga Transportation | 6. US EPA ID Number: ILD 982067175 | C. State Transporter's ID: ILDT D

D. [redacted]257 Transporter's Phone

7. Transporter 2 Company Name | 8. US EPA ID Number | E. State Transporter's ID | F. Transporter's Phone

9. Designated Facility Name and Site Address
Envirite Corp.
16435 S. Cotter
Harvey, IL. 60426

10. US EPA ID Number: ILD 000606200

G. State Facility's ID [redacted]0531111010101

H. Facility's Phone [redacted]596-7040

11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No.
a. R.Q. Hazardous Waste Liquid, N.O.S., 9, NA 3082, PG III, (D007)	001	TT	05000	G	EPA HW Number XXD010101 Authorization Number 0001169
b.					EPA HW Number XX Authorization Number
c.					EPA HW Number XX Authorization Number
d.					EPA HW Number XX Authorization Number

J. Additional Descriptions for Materials Listed Above
[redacted]

K. Handling Codes for Wastes Listed Above in Item 14:
G = Gallons [redacted] = Cubic Yards
[redacted]

15. Special Handling Instructions and Additional Information

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations.

If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford. ON BEHALF OF U.S. EPA

Printed/Typed Name	Signature	Month Day Year
ALAN C. PARKER	Alan C. Parker	100695

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month Day Year
BEN BRUNIUS	[signature]	100695

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month Day Year

FACILITY

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in item 19.

Printed/Typed Name	Signature	Month Day Year

This Agency is authorized to require, pursuant to Illinois Revised Statute, 1989, Chapter 111 1/2, Section 1004 and 1021, that this information be submitted to the Agency. Failure to provide this information may result in a civil penalty against the owner or operator not to exceed $25,000 per day of violation. Falsification of this information may result in a fine up to $50,000 per day of violation and imprisonment up to 5 years. This form has been approved by the Forms Management Center.

COPY 1. TSD MAIL TO GENERATOR

File C7651

SPECIAL WASTE MANIFEST DISPOSAL TICKET

Nº 1446

RIDGEVIEW RECYCLING and DISPOSAL FACILITY

A Waste Management Company

BILL TO: Envirocon, Inc.

TRANSPORTER: Ray McCoy Trucking

GENERATOR: USEPA/Mauthe Site

GENERATORS SIGNATURE: on behalf of the USEPA 7/ 28 / 95 Date

WASTE DESCRIPTION: Chromium Contaminated Soil XRF 416 ppm

PROFILE #: RVW MW 32574

ACCEPTED BY: _____ / ___ / ___ Date

DRIVERS SIGNATURE: 07/ 28 / 95 Date TRUCK NO. 665 20 TONS (YARDS)

WHITE & YELLOW - TRANSPORTER COPY / PINK - DISPOSAL SITE COPY / GOLD - GENERATOR COPY

FILE C7652