RECORD OF DECISION DECLARATION
GROUNDWATER OPERABLE UNIT
FINAL REMEDIAL ACTION

Better Brite Site
DePere, WI

Site Name and Location

The Better Brite Chrome and Zinc Shops are located about 2,000 feet apart at 519 Lande Street and 315 South Sixth Street, respectively, in De Pere, Wisconsin. The Chrome Shop property comprises 3.7 acres and the Zinc Shop property comprises 0.61 acre. Both sites are situated approximately ¼ mile west of the Fox River, and are in primarily residential areas, with some light industrial land uses.

Statement of Basis and Purpose

This decision document represents the selected final remedial action for the Better Brite site. This action was developed pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and the National Contingency Plan (NCP). This decision is based on the administrative record for the site.

Assessment of the Site

Actual or threatened releases of hazardous substances from the site, if not addressed by implementing the remedial action selected in this Record of Decision, may present an imminent and substantial danger to public health, welfare, or the environment.

Description of the Remedy

The selected remedy for the groundwater, Alternative F, includes:

- Moving the existing groundwater pretreatment equipment from the Chrome Shop to the Zinc Shop and constructing a new building to house it;
- Continued removal, treatment and discharge to the sanitary sewer of contaminated groundwater from an existing groundwater collection sump at the Zinc Shop;
- Conducting in-situ stabilization and/or solidification treatment of the chromium contaminated soils and groundwater at the Chrome Shop;
- Continued groundwater monitoring; and
- Implementation of proper institutional controls and site access restrictions.

The selected remedy for the basement/foundation drain exposure, Alternative BE, includes:

- Sealing the interior access points of existing foundation drains;
- Waterproofing existing exterior foundation walls;

• Construction of new exterior building foundation drains with collected water treated at the Zinc Shop pretreatment facility;

• Necessary predesign investigations of the structural integrity of the existing buildings near the zinc shop to determine if the above actions are feasible. If it is found that the buildings do not have the structural integrity to construct the actions, the actions will be modified to remove as much risk as possible without endangering building structural integrity;

• Continued groundwater monitoring; and

• Removal and proper treatment/disposal of any contaminated soil that pose health risks or could cause additional groundwater contamination near the Zinc Shop after a predesign soil investigation.

Statutory Determinations

This final remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost effective. This remedy satisfies the statutory preference for remedies which reduce the toxicity, mobility or volume of hazardous substances.

Because this remedy will result in hazardous substances remaining on-site, a review will be conducted to ensure that the remedy continues to provide adequate protection of human health and the environment within 5 years after the commencement of this remedial action.

Wm. E. Muno — 9/24/96

William E. Muno, Director — Date
Superfund Division
U. S. Environmental Protection Agency

George E Meyer — 9/20/96

George Meyer, Secretary — Date
Wisconsin Department of Natural Resources

RECORD OF DECISION SUMMARY
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RECORD OF DECISION SUMMARY

Better Brite Site
DePere, WI

I. SITE DESCRIPTION, HISTORY AND ENFORCEMENT ACTIVITIES

A. Chrome Shop

1. Site Description

The former Better Brite Chrome Shop is located at 519 Lande Street within the City of De Pere, Brown County, Wisconsin and occupies approximately 3.7 acres (Figure 1). The site is bordered to the north by Lande Street, to the east by a railway, and to the south and west by residences. The Chrome Shop lies within a residential area; the nearest homes are about 100 feet from the former facility property boundary. The Chrome Shop is located approximately ¼ mile west of the Fox River, which flows northeast to Green Bay.

2. Site History

Better Brite began its chrome plating division in the mid 1970's at 519 Lande Street, De Pere, Wisconsin. The Chrome Shop primarily engaged in chrome plating 15 to 20 foot rollers for paper mills in the area. Vertical in-ground dip tanks were used to plate the paper rollers.

Based on aerial photographs, a private residence, two large buildings (apparently an elevator and a storage building) and a smaller building (possibly a utility building) were present on the northern portion of the property in 1963. The southern half of the property was open field. In a September 1972 aerial photograph, the southern half of the property had been cleared, possibly in preparation for construction of the building which would house the Chrome Shop. The Site property was deeded to Better Brite in early 1973. A September 1973 aerial photo shows the production building for Better Brite is under construction.

By 1978 the chrome plating operations had begun at the site. The first reported spill documented in WDNR records, estimated at 2,200 gallons, occurred in February 1979. As a result of this spill, a subsurface loading dock on the northwest corner of the building was filled with 2 to 3 feet of frozen yellow water. The WDNR ordered the frozen rinse water be moved inside the facility to be thawed before discharging the melted water to the sanitary sewer. The company was also ordered to remove the contaminated soils located below the frozen water. WDNR records indicate contaminated soils were not removed, and fresh sandy soil was brought to the site and the loading dock filled in to grade without WDNR approval. Better Brite was subsequently ordered to install a groundwater collection and pretreatment system.

Initially, it was thought that most of the contamination at the site resulted from spillage above grade. Therefore, in August 1979, the WDNR ordered the installation of shallow groundwater monitoring wells, a collection trench system, often referred to as the "French Drain" and a surface-water holding pond to intercept any contaminated groundwater and surface water resulting from these spills. This work was performed by Better Brite. In addition, contaminated soils from neighboring properties were removed and stockpiled on the Chrome Shop property.

Better Brite filed for bankruptcy in October 1985. Plating operations were also discontinued at the site at this time. During the bankruptcy proceedings, the WDNR discovered that the vertical tanks located under the building had been leaking. By 1985 it was estimated that between 20,000 and 60,000 gallons of chrome plating solution leaked from the tanks during the time the plant was in operation.

3. Corrective Measures

Several corrective measures have been implemented since 1979 to remove hazardous materials, contaminated soil, and groundwater. The purpose of these removal activities was to reduce the threat of public exposure to contaminants. The following sections provide a summary of the corrective measures conducted at the Chrome Shop.

3.1 Removal Activities

In 1980, contaminated soil from a neighboring property west of the facility was excavated and deposited on the Chrome Shop property. The contaminated soil was disposed of in a licensed landfill as part of the United States Environmental Protection Agency (U.S. EPA) removal activities in 1986.

In April 1986, the U.S. EPA's Technical Assistance Team (TAT) removed four subsurface plating and cleaning tanks from inside the building. Better Brite had previously attempted to remove the tanks and only removed portions of them. Three of the tanks contained approximately 1-1/2 feet of liquid material. Tank #1 had contained a degreaser. Waste plating solutions were stored in tanks #2 and #3. The fourth tank, which had stored muriatic acid (hydrochloric acid), contained about 14 feet of liquid.

The U.S. EPA Emergency Enforcement and Response Branch (EERB) then conducted the Phase I removal activities at the Chrome Shop from September 1986 until April 1987. Activities included the removal of all on-site hazardous materials contained in drums, tanks, and vats, the installation of a site "monitoring well," the removal of visibly stained soils from the south and southwest sides of the building, and removal of wastes from the facility plating pits. The "monitoring well" consisted of a 6-inch diameter pipe placed in the void created by removal of the vertical in-ground tanks. Visibly contaminated soils were excavated around the plating pits and all tanks, vats, and drums were removed and scrapped. In total, the U.S. EPA EERB removed approximately 83 tons of contaminated soil, 9,270 gallons of chromic acid, 3,600 gallons of base/neutral liquids, 550 gallons of cyanide solution, 150 pounds of cyanide sludge, and 500 gallons of flammable liquids.

In the summer of 1989, the Chrome Shop building and contents were sold by the owner of the building, Mr. John Zenner. The City of De Pere and WDNR stipulated to the buyer that the area beneath the building had to be capped and the surface water holding pond closed off by filling with soil. The Chrome Shop facility building was removed and the former building area was capped with clay by the WDNR and the buyer. The area was fenced by the WDNR to prevent public access to possible contaminated soils.

In 1993, the U.S. EPA TAT excavated impacted soil from the area located adjacent to the southwest corner of the former location of the Chrome Shop building (Phase II removal). The approximate limits of this excavation are depicted by the sump boundary on Figure 2. Soil was excavated to a depth of approximately 20 feet below ground surface (bgs). Soil samples collected from the bottom of the excavation confirmed that the soil left in place was not impacted with metals.

During Phase II removal activities, the portion of the concrete foundation of the Chrome Shop that remained in place after previous removal activities was removed and taken off-site for proper disposal. Impacted sand fill beneath the foundation was also excavated and taken off-site for proper disposal.

The U.S. EPA TAT also removed impacted surface soil from around the Chrome Shop and on properties adjacent to the site. Surface soil was excavated to depths of approximately 1.0 to 1.5 feet bgs. Analytical data for surface (0 to 0.5 feet bgs) and subsurface (2.5 to 3.0 feet bgs) soil samples collected from across the Chrome Shop and adjacent properties were used to define the extent of surface soil impacts and direct the excavation activities. At the completion of excavation activities, clean soil was placed over the area from which the impacted surface soil was removed.

A total of approximately 4,236 tons of chromium contaminated soil, concrete, and debris classified as characteristic D007 hazardous waste were removed from the Chrome Shop during the Phase II removal activities. In addition, approximately 6,103 tons of chromium contaminated special waste soil, concrete, and debris were removed from the Chrome Shop.

3.2 Water Treatment

In 1979 and 1980, Better Brite installed ten shallow groundwater monitoring wells, a groundwater collection system, and a surface water control system. The groundwater collection system consisted of a collection trench on the southern and western edge of the southwestern corner of the property (groundwater flow was determined to be to the west), and a 500-gallon sump for temporary storage of the contaminated groundwater. The surface water control system consisted of a retention berm on the south and western sides of the trench alignment that directed water to a surface water holding pond located in the northwest corner of the Chrome Shop property. Surface water could be pumped from the surface water holding pond to the sanitary or storm sewer depending on the concentration of chromium in the water.

The collection trench installed by Better Brite along the southern and western edges of their property had not been pumped since approximately 1986. Groundwater levels had risen during the spring thaw event in 1988, which caused flooding in the low areas between the residences and the Chrome Shop. Chromium-contaminated surface water was collecting in the adjacent neighbors' backyards, causing chromium to deposit in soils and gardens on their properties. Therefore, in March 1988, the U.S. EPA EERB authorized pumping of the water from the previously installed collection trench system into the City of De Pere sanitary sewer as an interim measure to eliminate ponding.

In an effort to eliminate the threat of groundwater contamination and continued off-site movement of contaminants at the Chrome Shop, the U.S. EPA EERB installed an on-site water pretreatment system in September, 1990. The system included a recovery well, a 5,500-gallon holding tank, a 5,000-gallon reaction vessel (tank) and a protective building to house the equipment. The recovery well was the "monitoring well" installed within the void created by the removal of the vertical in-ground tanks in 1986.

Groundwater was pumped via the recovery well and collection trench (French Drain) to the holding tank for temporary storage. Groundwater is then transferred to the reaction tank in batches where the pH is initially lowered to approximately 2.5 by adding sulfuric acid. Reduction of hexavalent chrome to trivalent chrome is facilitated by adding sodium bisulfite ($NaHSO_3$), which is followed by addition of sodium hydroxide to raise pH to approximately 8.5 and precipitate chromium hydroxide. A polymer is added at this point in the treatment process to settle the precipitate. The treated water is decanted off and discharged to the sanitary sewer. The precipitate (sludge) is sent through a filter press. Water produced by the filter press dewatering process is returned to the head of the treatment system. The dewatered sludge is placed in drums and has been determined by laboratory analysis to be hazardous waste.

The system was designed in cooperation with the City of De Pere and is capable of pre-treating approximately 2,000 gallons of chromium-contaminated water per day for discharge into the De Pere sanitary sewer. Contaminants (chromium hydroxide sludge predominantly) removed from the water were initially transported to the Zinc Shop building for temporary storage and then to a metal recovery facility. Currently, Chemical Waste Management is contracted by WDNR to transport the sludge to its Menomonee Falls, Wisconsin facility for appropriate disposal.

After completing the Phase II removal activities, the U.S. EPA TAT replaced the existing recovery well and french drain with a groundwater collection system in 1993. The groundwater collection system was constructed in the pit created by the excavation of impacted soil located adjacent to the southwest corner of the former location of the Chrome Shop building.

An impermeable membrane was placed on the bottom of the pit and 6-inch diameter perforated pipe was then installed on top of the impermeable membrane. Pea gravel was placed around the perforated pipe and a filter fabric was then placed on top of the pea gravel. The excavation was then filled with 3/4-inch diameter washed limestone gravel to approximately 6 feet bgs. Filter fabric was then placed on top of the limestone gravel and a clean clay cap was placed above the filter fabric to ground level. The perforated pipe was connected to a large diameter perforated standpipe (sump) from which the groundwater that collects in the collection system can be extracted. A submersible pump attached to a float is used to pump the groundwater that collects in the groundwater collection system. The groundwater pumped from the groundwater collection system is piped to the on-site pre-treatment plant for removal of chromium before being discharged to the City of De Pere sanitary sewer. Construction of the groundwater collection system is described in Appendix C of the Remedial Investigation report (RI) for the site.

B. Zinc Shop

1. Site Description

The Zinc Shop is located at 315 South Sixth Street in the City of De Pere, Wisconsin (Figure 1). The parcel of land occupied by the Zinc Shop covers approximately 0.61 acre. There are private residences immediately to the north and south of the property and a car detailing facility, leased by a farmers' cooperative, to the east. Across Sixth Street, to the west, are private residences. The municipal well closest to the site is located slightly beyond the homes to the west, approximately 250 feet from the site. The Fox River is approximately 1/4 mile to the north and east of the Zinc Shop. An elementary school, a high school, and a small private college are all located within 1/8 mile of the site.

2. Site History

Better Brite began operations at the 315 South Sixth Street facility in the late 1960s. When the business opened, vertical in-ground dip tanks were used for chromium plating operations.

A 1925 Sanborn map shows the Albers and Rupiper Lumber and Millwork facility at the present day Zinc Shop site. At this time, a bulk station of the Winona Oil Company was located to the southeast of the lumber and millwork facility. The 1951 Sanborn maps indicate that a bulk oil station owned by Standard Oil Company was located to the east of the Zinc Shop site. The gas tanks from the Winona Oil Company were still present to the southeast, but in 1951 they were labeled as belonging to the Progressive Farmers Oil Company. On the 1953 Sanborn map oil tanks are listed to the northeast but not shown.

In February, 1967 Better Brite purchased, by land contract, the Sixth Street property from Leland Rupiper. At this time, the lumber yard at 315 South Sixth Street was converted into a chromium plating operation by Better Brite. In March of 1973 the land contract was satisfied and the deed to the property transferred to Better Brite. Better Brite opened an additional chromium plating facility in the mid 1970's at 519 Lande Street, and in the late 1970's, the main function of the Sixth Street facility shifted from chromium to zinc plating. The Sixth Street facility is now referred to as the Better Brite Zinc Shop (ID# 006132088) and the Lande Street facility as the Better Brite Chrome Shop (ID# 560010118).

Through the 1970's poor operational practices allowed plating solutions and rinse water to flow from the building between the floor and sill plate along the south and east sides of the building. On February 13, 1980, in response to a complaint from a neighbor, the first samples of ponded water were collected by the WDNR and analyses of the soils established the presence of contamination at the site. These samples were collected near the south edge of the

Zinc Shop building along the property line. Laboratory analysis confirmed that the water contained between 8.1 and 56 parts per million (ppm) zinc, between less than 0.1 and 0.6 ppm chromium, and between 0.1 and 0.6 ppm cyanide.

On April 21, 1983, a neighbor complained about spillage of wastewater from the Zinc Shop. WDNR investigated and observed that a hose, extending from a pump in a below grade loading dock to a sanitary sewer, was leaking and forming a puddle. The puddle ultimately flowed to a storm sewer about 150 feet away. Analyses of the water samples collected by the WDNR revealed a concentration of 8.4 ppm dissolved zinc in the puddle; 4.9 ppm dissolved zinc and 25 ppm cyanide at the loading area; and 5.6 ppm total zinc at the inlet to the storm sewer. Analysis for chromium content was not completed.

On May 30, 1983, an inspection of the facility was conducted by personnel from the Air Management Section of WDNR. They observed rinse waters from within the building mixing with spilled chemicals around drums and running out the door, as well as dead vegetation between the sidewalk and South Sixth Street. Two composite surface soil samples were collected and analyses of the soils revealed that the samples contained between 270 and 380 mg/kg cyanide, 2,800 and 2,600 mg/kg sodium, 1,500 and 2,600 mg/kg zinc, 100 and 170 mg/kg chromium and 28 and 38 mg/kg cadmium. Based on this information, it appears sodium cyanide and a mixture of plating solution was spilled out the door of the facility.

On or about September 5, 1985, Better Brite filed a voluntary petition for corporate reorganization under Ch. 11 of the Bankruptcy Code. Between September 16, 1985 and August 27, 1986, John Zenner operated the Zinc Shop as examiner/trustee. During this time, Better Brite installed and operated an industrial wastewater treatment facility. Operation of this system commenced on or about May 11, 1986, and continued until approximately July 14, 1986. During this time, drums of sludge waste were generated. The actual effectiveness of this system is unknown.

On September 27, 1985, a sampling program was conducted by the WDNR around the Zinc Shop facility. Six soil samples were collected at locations where liquids were observed leaking from the building and areas with stressed or no vegetation. Three samples were collected along the southern property line from 0 to 6 inches in depth. The fourth sample was collected immediately adjacent to the Zinc Shop building from 0 to 6 inches in depth from about the middle of the building along its east side. The fifth and sixth samples were collected along the middle of the east wall of the building from depths of 0 to 6 inches and 6 to 12 inches. Analysis of these samples revealed that the soils contained between 410 and 13,000 mg/kg zinc, 6.9 and 64 mg/kg cyanide, 55 and 1,100 mg/kg chromium, 18 and 460 mg/kg lead, and 1 to 43 mg/kg cadmium.

The U.S. EPA air photo review indicated that the building seen along the northern site boundary had been removed by the time the June, 1986 photograph had been taken. On June 27, 1986, the WDNR collected two water samples from the sump in the basement of the [redacted] residence, located immediately south of the Zinc Shop. The samples contained chromium concentrations of 1.1 and 5.8 mg/ℓ.

On August 8, 1986, the WDNR documented a "toxic and hazardous materials incident" at the Zinc Shop facility in which the treatment tank overflowed and approximately 15 gallons of liquid flowed into Sixth Street. The incident was addressed by the facility personnel and the liquid was cleaned up.

In December 1986, John Zenner officially purchased the Zinc building and its equipment (with exception of the hazardous waste accumulated at the site). He leased the property underlying the building and incorporated under the name, The Zinc Shop, Inc. Operations at The Zinc Shop, Inc. continued until July 1989.

Since 1980, there have been ongoing investigations and litigation between the State of Wisconsin and The Zinc Shop, Inc.; Platers, Inc.; Better Brite Plating, Inc.; David Matyas (Bankruptcy Trustee for Better Brite); and John Zenner (Bankruptcy Examiner for Better Brite Plating, Inc. and owner of Platers Inc. and The Zinc Shop, Inc.) in regard to spills, hazardous waste and wastewater violations.

3. Corrective Measures

During the initial investigations, several corrective measures were implemented to remove and/or contain heavy metal and VOC contaminants at the Zinc Shop property. Plating operations at the Zinc Shop were discontinued in 1989, ending the generation of additional hazardous material at the site.

The disposal of hazardous material at the Zinc Shop was completed by the U.S. EPA EERB in early 1990. The disposal included hazardous material stored or abandoned on-site including plating solutions and sludge stored in drums, vats, and tanks. Some of this material had been stored on site in excess of the legal holding time (Wisconsin Administrative Code Chapter NR 600).

The U.S. EPA EERB constructed a groundwater collection sump along the east side of the Zinc Shop building. The sump began operation in August of 1990. Between August of 1990 and March of 1991, approximately 40,000 gallons of contaminated groundwater had been pumped from the underlying aquifer. Between February 1991, and September 1991, approximately 33,000 gallons were transferred from the Zinc Shop to the Chrome Shop for pretreatment in the U.S. EPA constructed pretreatment facility. Extracted groundwater was transported via a tanker truck to the water pre-treatment facility constructed at the Chrome Shop for treatment prior to discharge to the De Pere sanitary sewer.

In March of 1991, the floor of the Zinc Shop building and the carousel plating machinery were decontaminated by U.S. EPA contractors using a steam cleaner. Two floor sumps were also cleaned. Once the building had been decontaminated a sealant was applied to the building floor to limit the potential for exposure.

A fire destroyed the Zinc shop in September of 1992. Because all hazardous substances had been removed from the building during initial removal activities, the fire did not result in the release of any hazardous substances to the environment. After the fire, the ERCS, the TAT and the subcontractor crew began dismantling the remains and removing the foundation. The foundation was finally removed in November 1992. In addition, the two 15-foot long vertical in-ground dip tanks found beneath the foundation of the Zinc Shop were removed, emptied, and disposed of as scrap.

After the foundation was removed, the crew began excavating the soils in the area of the former foundation. The purpose of this excavation was to remove the soils with the highest contaminant concentrations. The final excavation had a total depth of approximately 20 feet and encompassed the area of the former foundation. The approximate limits of the excavation are shown as the boundary of the groundwater collection system completed in 1993 on Figure 3.

The soil excavated from beneath the former location of the Zinc Shop was segregated into characteristic (D007) hazardous waste and special waste soil piles and taken off-site for proper disposal. Approximately 2,752 tons of D007 chromium contaminated soil, concrete, and building debris and 3,280 tons of chromium contaminated special waste soil, concrete, and building debris were removed from the site. Soil samples were collected from the bottom of the pit and submitted for laboratory analyses. The analytical results indicated that no soils were present above allowable concentrations at the bottom of the pit. Excavation activities were completed in January 1993.

The U.S. EPA installed a groundwater extraction sump in the former excavation to facilitate recovery of contaminated groundwater. This system replaced the smaller groundwater collection system constructed at the site during the initial phase of removal activities. Upon completion of excavation activities, a 40-mil liner was spread over the pit bottom. Six-inch diameter perforated pipe and two vertical clean out pipes were installed in trenches at the base of the excavation. The trenches were backfilled with pea gravel and covered with filter fabric. The pit was then backfilled with 3/4-inch washed limestone. The collection pipe for the groundwater collection system is a large vertical standpipe which was placed at the low point of the excavation. The standpipe was wrapped with filter fabric and surrounded with 1½-inch gravel. Groundwater is pumped out of the sump using a vacuum tank truck. The impacted water is then taken to the existing Chrome Shop pretreatment plant for removal of chromium impacts before being discharged to the City of De Pere sanitary sewer.

Two monitoring wells (MW-4 and MW-4A) were installed on a residential property to the west of the Zinc Shop in February 1993 as part of Phase II removal activities (Figure 3). The monitoring wells are located on the west side of South Sixth Street, directly across the street from the Zinc Shop. One well was completed as a water table monitoring well and the second well was completed as a piezometer screened near the top of the bedrock surface. Both wells were constructed of 4-inch inside diameter (ID) polyvinyl chloride (PVC) well materials and were intended for possible use as groundwater extraction wells if impacted groundwater was detected at this location. As a protective measure, the Grant Street municipal well has also been sampled semi-annually instead of the usual annual frequency. The frequency of the well sampling was increased to allow for detection in the event contamination should enter the well head from the site. To date no elevated levels of contaminants of concern have been detected in this well. Sampling for chromium, zinc, and cyanide is currently performed in addition to standard sampling (bacteria, etc.). VOC samples are collected and analyzed periodically.

II. COMMUNITY PARTICIPATION

A Community Relations Plan for the site was finalized in 1991. This document lists contacts and interested parties throughout the local and government community. It also establishes communication pathways to ensure timely dissemination of pertinent information. An information repository has been established at the Brown County Library, DePere Branch. The administrative record is available to the public at the Department's Madison and Northeast Regional offices in Green Bay.

The 7/22/91 Community Relations Plan for the Better Brite site was prepared to outline the methods to be used to solicit and use public participation in the Superfund process for the site. It included the initial mailing list to be used for the site. In May, 1991, the Wisconsin Division of Health (DOH) published and sent out for comment a preliminary Health Assessment. This health assessment included a review of available contaminant data and interview results from residents in the area, and made recommendations for future study and action to better define and reduce risk from exposure to contamination from the site, through surface water, soils and groundwater. On May, 1991, a public meeting was held to discuss the upcoming removal actions, designed to reduce risk of exposure to chromium contaminated soil. This meeting was well attended. On May 22, 1991, a proposed plan was published outlining the interim action/removal action to address site contaminated soils.

In September, 1992, EPA prepared and sent an update on site activities to those on the mailing list. This letter briefly described the interim action and ongoing removal activities.

In February, 1993, the DOH published a health information fact sheet regarding the soil removal activities at the site, and the subsequent impact to risk of resident exposure, and was made available to those people attending the public meeting held on February 16, 1993. The purpose of this meeting was to provide an update on the ongoing soil removal activities and to discuss future cleanup plans. EPA prepared and sent a factsheet announcing this public meeting in February, 1993. Thirty seven people attended this public meeting.

A public meeting was held on June 27, 1994, to provide another update on removal activities and the ongoing remedial investigation. A factsheet was prepared and mailed to those on the mailing list in June 1994, announcing the public meeting. The DOH also prepared an update on health information for this public meeting.

The Proposed Plan for the site was made available for public comment on July 26, 1996. A public meeting to explain the Proposed Plan, and to receive public comments was held on August 8, 1996. All comments which were received by the Department prior to the end of the public comment period, including those expressed verbally at the public meeting, were considered in making the final decision and are addressed in the Responsiveness Summary, which is attached to this decision document.

The Proposed Plan described Alternative BE, Basement Isolation with External Control, to include the construction of new internal walls and floors in the buildings. Based on the comments received during the public comment period, it was determined that new internal walls and floors would not be feasible due to concerns about access to monitor the walls and the past history of basement flooding in the buildings.

The public participation requirements of s. 144.442(6)(f), Wisconsin Statutes, and the community relations requirements in the National Contingency Plan under 40 CFR s. 300.430(f)(3) have been met in this remedy selection process. All the documents listed above are available in the Administrative Record maintained at the Department's Madison and Northeast Regional offices.

III. SCOPE AND ROLE OF THE RESPONSE ACTION

Contaminated groundwater and soil at the site are the affected media that pose a threat to human health and the environment because of the current and future risks identified. Contaminated groundwater at the site poses a possible future threat to human health and the environment because of the risks from possible ingestion of or dermal contact with the groundwater should a well be installed at the site or should the contaminated groundwater reach the bedrock aquifer, which is used as a regional drinking water source.

The selected groundwater remedial action, described as alternative F, addresses the threats posed by the site conditions by containing and/or controlling the groundwater contamination at the site and reducing the levels of contamination in the groundwater. The selected groundwater action also actively restores the groundwater at the Chrome Shop. The selected basement/foundation drain action, described as alternative BE, addresses the threats posed by site conditions by eliminating the potential for direct contact with contaminants of concern in the groundwater and the existing basements.

IV. SUMMARY OF SITE CHARACTERISTICS

A. Nature and Extent of Wastes

1. Chrome Shop

Better Brite began plating activities at the Chrome Shop facility at 519 Lande Street in the mid 1970s. In 1973, the 519 Lande Street property (residence) was purchased by M. J. Hintz with the remainder of the property purchased by Better Brite Plating, Inc. The facility primarily engaged in chrome plating of 15 to 20 foot rollers for paper mills in the area. The site contained four vertical underground storage tanks (USTs) which were believed to contain muriatic acid (hydrochloric acid; one tank), degreaser believed to be composed of chlorinated organic solvents (one tank), and chrome plating solution (two tanks). The rollers were reportedly plated in the vertical USTs which extended 18 to 20 feet below grade.

Chromic acid (H_2Cr0_4) utilized at the Better Brite plating facility contained chromium which was predominantly in the hexavalent form. During the electroplating process, extremely low pHs are produced in the plating solution. At these pHs and chromium concentrations, the main hexavalent forms of chromium are the dichromate ion ($Cr_20_7^{-2}$) and undissociated chromic acid. These substances, commonly used to plate metal products, are powerful oxidizing agents.

The WDNR documented numerous Resource Conservation and Recovery Act (RCRA) violations and spills at the Chrome Shop since December 1978. The first reported spill, estimated to have been 2,200 gallons of chromic acid, occurred in February 1979 at a subsurface loading dock. Numerous allegations by neighboring residents cited frequent dumping outside the loading dock doors. Site inspections conducted by WDNR also document the presence of contaminated soil and ponded surface water in the vicinity of the loading dock.

According to WDNR records, Better Brite released cyanide waste and zinc sludge on the Chrome Shop property during the winter of 1978/1979. In a letter dated August 7, 1979, a former Better Brite employee explained that three 55-gallon drums of cyanide waste and zinc sludge were dumped behind the Chrome Shop building. This event was reported anonymously to the WDNR shortly following the release.

In a signed statement by another Better Brite employee, approximately eight or nine 55-gallon drums of chromic acid were stored in an old grain elevator on the property during the summer of 1981. At least one of the drums allegedly had split along a seam and spilled the contents of chromic acid. The contaminated soil was allegedly covered with clean material. The employee also stated in the months following the alleged spill he noticed yellow surface water ponding in the area. The statement also discussed a separate spill event that allegedly occurred on the same day the employee noted the ruptured 55-gallon drum of chromic acid. The employee stated that a plating bath of chromic acid was spilled on the property, but no further documentation of a spill during the summer of 1981 is in the WDNR files.

In 1985 it was determined that the vertical plating USTs inside the building had been leaking. It was estimated that between 20,000 and 60,000 gallons of chrome plating solution had been released due to the leaking USTs during the Chrome Shop's seven years of operation.

On August 4, 1986, the Chrome Shop was reportedly vandalized which resulted in a spill of rinse water or plating solution. Approximately 300 gallons of rinse water or plating solution was spilled into one of the holes created by removing the vertical USTs and the sanitary sewer.

2. Zinc Shop

In the late 1960s, Better Brite began its electroplating operation at the Zinc Shop location in De Pere. Originally, the facility conducted electroplating with chrome, then in 1978, the focus of the operation shifted to primarily zinc plating. The items which were plated at the facility included large 15 to 20 foot rollers for the paper industry as well as a variety of smaller items.

Since 1980, when the investigation of suspected contamination at the site was initiated, WDNR has documented numerous RCRA violations. On August 8, 1986, 15 gallons of liquid were released from a treatment tank. Specific information pertaining to the types and amounts of the numerous other alleged releases which have occurred at the site are absent from the WDNR file, primarily, it is expected, because most of the releases were never reported by Better Brite (leakage along sill plate, etc.).

Due to the nature of the operation and the products used at the site, the main contaminants at the site are likely to include heavy metals, solvents and acids. The metals consist of primarily zinc and chromium used for plating as well as lead and cadmium which are contained in the electrodes required in the plating process. The solvents used at electroplating facilities typically contain VOCs. Except for a reference to a drum of methyl ethyl ketone (MEK) in 1986, no use or presence of solvents has been documented at the Zinc Shop. However, VOCs have been detected in groundwater at the site. In addition, cyanide is a contaminant of concern, as sodium cyanide solution was used along with the acids in the zinc plating process.

Specific information pertaining to the various chemical compounds used at the site are known from inventories completed by U.S. EPA. In October of 1986, during an inventory of the facility, representatives of U.S. EPA noted approximately 40 drums containing solid plating sludge, sodium hypochlorite, or unknown solids, six vats containing cyanide solutions with varied compositions, acids or other caustic materials, and five tanks with acid, cyanide, or treated effluent.

B. Hydrogeologic Conditions

The groundwater flow regime beneath both sites consists of three distinct water bearing units. These units include the following:

- The saturated thickness of the unconsolidated glacial lacustrine and till deposits,
- Dolomite of the Sinnipee Group consisting of Ordovician-age dolomite, and
- Underlying aquifers consisting of Ordovician and Cambrian-age sandstones.

The glacial deposits are of low productivity and are not utilized for domestic water supply. The dolomite bedrock is not commonly used for water production in the area, although some private wells utilize this aquifer. Based on data gathered during the drilling of the bedrock piezometers, the upper 10 to 15 feet of the dolomite bedrock is capable of producing adequate volumes of water for residential water supplies in localized areas. During bedrock drilling at the Zinc Shop, water-bearing dolomite was intersected within 15 feet of the top of the bedrock while at the Chrome Shop no water was produced from the dolomite during drilling. The sandstone aquifer is the main aquifer for this region and is noted for its high productivity for water supply purposes. The top of the sandstone is estimated at 170 feet bgs based on the well log for the Grant Street Municipal Well.

1. Flow Directions and Gradients

The wells at the Chrome Shop and Zinc Shop can be generally grouped into three categories: water table monitoring wells, shallow piezometers, and bedrock piezometers. The water table wells range in depth between 15 and 17 feet bgs. The configuration of the water table and the direction of groundwater flow in the upper portion of the unconsolidated deposits at the Chrome Shop as measured on October 17, 1994 and May 2 and 3, 1995 are shown on Figures 4 and 5, respectively. The water table configuration and direction of groundwater flow at the Zinc Shop on November 15, 1994 and May 2 and 3, 1995 are shown on Figures 6 and 7, respectively. The water table maps show that the directions of groundwater flow across both sites are affected by the groundwater collection systems indicating that groundwater near the water table at both former shop locations is captured by the extraction systems. The general direction of shallow groundwater flow beyond the control of the groundwater collection systems is to the west at both sites.

Horizontal groundwater gradients vary considerably across both sites. As the groundwater contours show, gradients are highest near the groundwater collection systems and decrease away from systems. Gradients near the Chrome Shop groundwater collection system as calculated are between 0.3 ft/ft and 0.6 ft/ft using the October 17, 1994 and May 2 - 3, 1995 water level data. Gradients north and south of the Chrome Shop groundwater collection system range between 0.03 ft/ft and 0.05 ft/ft west for both the October 17, 1994 and the May 2 - 3, 1995 water level data. At the Zinc Shop, gradients in the vicinity of the groundwater collection system were calculated to be between 0.07 ft/ft and 0.3 ft/ft for the November 15, 1994 water level data, and between 0.04 and 0.2 ft/ft for the May 2 - 3, 1995 water level data. Gradients north and south of the Zinc Shop groundwater collection system were calculated between 0.01 ft/ft and 0.03 ft/ft west using the November 15, 1994 data. Seasonal variations in gradients are probable.

At the Chrome Shop, the potentiometric surface slopes gradually to the south at nearly a 90° angle to the bedrock surface slope. At the Zinc Shop, the potentiometric surface mimics the bedrock topography with a potentiometric high west of the site and flow in an easterly direction across the site. The horizontal gradient across both sites is approximately 0.03 ft/ft.

The shallow piezometers are completed near the base of the unconsolidated deposits, within 2.5 feet of the top of the bedrock surface. The shallow piezometers range in depth from 24 to 40 feet bgs. A comparison between the potentiometric surface elevations in the shallow piezometers and the groundwater elevations measured in corresponding nested water table monitoring wells indicates that the dominant direction of vertical groundwater flow at both sites is downward. Downward vertical gradients occur at all well nest locations with the exception of well nest MW-4/MW-4A at the Zinc Shop. At the MW-4/MW-4A well nest, the groundwater elevations in MW-4 and MW-4A were identical on two of the dates that water level measurements were collected (11/15/94 and 11/25/94); the vertical gradient was slightly downward on October 17, 1994 and March 20, 1995, and slightly upward on September 28, 1994 and May 2 - 3, 1995. The calculated vertical gradients at the remaining Zinc Shop well nests ranged from 0.08 ft/ft to 0.93 ft/ft downward. Based on the water level data gathered during this RI, the magnitude of the vertical gradients is between 0.18 ft/ft and 0.56 ft/ft downward at the Chrome Shop.

Because the hydraulic conductivity of the glacial deposits is low, the water levels measured in the shallow piezometers purged for development and sampling may not be representative of static conditions. The water level data was collected after all of the monitoring wells installed for the RI were developed, between sampling rounds, and after the second sampling round. Approximately one week to one month elapsed between the time the monitoring wells were purged and water levels were measured. The time interval between purging and water level measurements may not have been long enough for the water levels in the piezometers to recover to static conditions. Following complete recovery, the direction of vertical groundwater flow (downward) is not expected to change; however, the actual magnitude of vertical gradients are likely less than the calculated vertical gradients.

The bedrock piezometers are completed approximately 30 feet below the top of the bedrock surface and range in depth between 59.5 and 71.1 feet bgs. The water levels in the bedrock piezometers did not reach static conditions following development and sampling based on the water level data gathered at both sites for the RI, which was completed in 1995. Initial water levels in some of the bedrock piezometers ranged from 13.48 feet bgs (MW-5B) to 51.28 feet bgs (MW-107B) prior to development but did not recover significantly after development. Pre-development water levels are not considered to be valid because water could have entered the well from more permeable units above the screened interval during construction prior to seal placement, or from water used to hydrate the bentonite annular space seal. The initial water level from existing Chrome Shop bedrock piezometer B-101 was at approximately 26.2 feet bgs, which indicates that given enough time the water levels in the bedrock piezometers will rise significantly over what has been measured in the bedrock piezometers as part of the RI. Because of the uncertainty of the actual potentiometric surface elevations for the bedrock piezometers, the direction of the horizontal component of groundwater flow within the upper bedrock cannot be accurately determined using the existing data. Also, the magnitude of vertical gradients cannot be estimated with great confidence. The water level data and slow recovery rates in the bedrock piezometers indicate that downward vertical gradients likely exist between the unconsolidated deposits and the dolomite bedrock.

2. Hydraulic Properties and Flow Velocities

The glacial deposits in the vicinity of the Better Brite sites have very low hydraulic conductivity values ranging from 4×10^{-5} to 1.2×10^{-7} cm/sec. The geometric mean hydraulic conductivity for the Chrome Shop glacial deposits monitoring wells is 3.8×10^{-6} cm/sec and 2.8×10^{-6} cm/sec for the Zinc Shop glacial deposits monitoring wells. A comparison of the hydraulic conductivity values between the water table monitoring wells and shallow piezometers shows that there is not a significant difference in the values between the two sets of wells. The average hydraulic conductivity for the shallow piezometers and the average hydraulic conductivity for the water table monitoring wells are within approximately an order of magnitude for both sites.

Hydraulic conductivity test data was calculated for one bedrock piezometer at the Chrome Shop (MW-106B) and one bedrock piezometer at the Zinc Shop (MW-4B). No other hydraulic conductivity test data were analyzed for the bedrock piezometers due to the very slow rate of water level recovery in the wells. For the dolomite bedrock, a hydraulic conductivity of 1.0×10^{-8} cm/sec was calculated at MW-106B, and at MW-4B, a hydraulic conductivity of 3.2×10^{-7} cm/sec was calculated. The hydraulic conductivity measured at MW-4B is an order of magnitude higher than at the other bedrock piezometers. This was anticipated, as during drilling within the dolomite at the Zinc Shop, a water-producing zone was intersected in the upper 10 to 15 feet of the dolomite which likely represents a weathered zone or fracture zone within the dolomite.

Estimates of average linear groundwater flow velocity for the glacial deposits beneath the Zinc Shop and Chrome Shop were made. At the Chrome Shop, the average horizontal hydraulic gradient to the north and south of the groundwater collection system was 0.04 ft/ft and the average horizontal gradient within the radius of influence of the extraction sump was 0.45 ft/ft. Estimated groundwater flow velocity values for the area not influenced by the extraction sump at the Chrome Shop are between 0.4 feet/year and 1.3 feet/year. Groundwater within the radius of influence of the extraction system has an average linear velocity of 5.0 feet/year to 15.1 feet/year.

The average horizontal hydraulic gradient for the portions of the Zinc Shop not influenced by the groundwater collection system was 0.02 ft/ft and the average horizontal gradient within the radius of influence of the extraction sump was 0.1 ft/ft. Estimated groundwater flow velocity values for the area not influenced by the extraction sump at the Zinc Shop are between 0.2 feet/year and 0.7 feet/year. Groundwater within the radius of influence of the extraction system has an average linear velocity of 1.1 feet/year to 3.4 feet/year.

Vertical groundwater flow velocity values cannot be accurately estimated because vertical hydraulic conductivity values were not measured. Based on the slow recovery rates of the bedrock piezometers and the water level in Chrome Shop bedrock piezometer B-101 prior to being purged for sampling, downward movement of groundwater from the glacial deposits to the dolomite bedrock constitutes a component of groundwater flow at both sites. The slow recovery rates of the bedrock piezometers also indicates that groundwater movement, including a downward migration of contaminated groundwater, occurs at an extremely slow rate.

C. Contaminant Summary

Two rounds of groundwater samples were collected approximately one month apart from monitoring wells installed during the RI, selected existing site monitoring wells, and the Grant Street municipal water supply well. In addition, one groundwater sample was collected from a nearby private water supply well. Groundwater samples were submitted for laboratory analysis through U.S. EPA Central Regional Laboratory's (CRL's) contract laboratory procedure (CLP) program for target analyte list (TAL) metals, hexavalent chromium, target compound list (TCL) VOCs, cyanide, and total organic carbon (TOC). The samples were also analyzed in the field for pH, temperature, conductivity, color, odor and clarity. Because of the low hydraulic conductivity of the geologic materials at the site, sufficient groundwater was not available at all locations for collection of all parameters.

A summary of all compounds with confirmed detections above enforcement standards (ES) is presented in Table 1.

<u>1. Chrome Shop</u>

<u>1.1 Hexavalent Chromium</u>

The Chrome Shop sump and all monitoring wells installed during the RI and B-101 were sampled on two events for hexavalent chromium except MW-106B, MW-107B, and MW-108B. The three listed bedrock wells did not contain sufficient water for collection of a sample for analysis.

Hexavalent chromium was detected in samples collected from the Chrome sump (620,000 and 300,200 parts per billion ppb)), the French drain (25,800 and 32,000 ppb), MW-109 (6,780, 2,400, and 3,100 (duplicate) ppb) and MW-113 (140, and <10 ppb). A third sample was collected at MW-113 to confirm the presence of hexavalent chromium at this location. The third sample contained 43 ppb hexavalent chromium.

1.2 Inorganic Compounds

The quantity of water in some monitoring wells was not sufficient for collection of samples for metals and cyanide analysis. As a result, monitoring wells MW-106B, MW-107B, MW-108B, and MW-109B were not sampled for metals and cyanide during the RI and B-101 was sampled once for metals (8/94) but never for cyanide. Sampling results are summarized below. Of the 24 inorganic analytes, nine were detected at concentrations in excess of current or proposed NR140 Groundwater Quality Enforcement Standards (ESs) and/or Preventive Action Limits (PALs).

The ES for antimony is 6.0 ppb, and the NR140 PAL is 1.2 ppb. The ES was exceeded in samples collected from the Chrome Shop sump, the french drain, MW-106, MW-109, MW-112, and MW-113 during one sampling event. The laboratory data may be falsely positive and antimony may not be present in groundwater at the Chrome Shop in concentrations of concern. However, the groundwater monitoring plan should include collection of samples for antimony analysis until it is possible to prove or disprove that antimony contamination is present at concentrations of concern in area groundwater.

The samples collected from the Chrome Sump and the french drain in October 1994, exceed the ES of 50 ppb for arsenic; however, arsenic was not detected in the previous sampling event in either sample. Arsenic is not a primary contaminant of concern in groundwater at the Chrome Shop because of its limited extent.

Beryllium was detected in excess of the 4 ppb ES in the October 1994 sample collected from the Chrome Shop sump; however, the beryllium was not detected in the sump sample collected previously (August 1994). Beryllium is not expected to be a primary contaminant of concern at the Chrome Shop site. The groundwater plan for the site should include beryllium analyses until a time when it is possible to prove or disprove that beryllium contamination is present at concentrations of concern in the area groundwater.

Cadmium was detected at 17.7 ppb in the August 1994 sample from the Chrome sump which is in excess of the 5 ppb ES. The August 1994 french drain sample contained cyanide at 74.9 ppb which is in excess of the NR140 40 ppb PAL. Iron was detected at 315 ppb in the October 1994 sample collected from MW-110 which is in excess of the 300 ppb ES. Lead was detected in excess of the 1.5 ppb PAL in August 1994 samples collected from B-101, MW-106, MW-106A, MW-107, MW-110, and MW-113. These were the only cadmium, cyanide, iron and lead detections in excess of NR140 standards at the Chrome Shop.

The NR140 welfare based ES for manganese is 50 ppb; the PAL is 25 ppb. The PAL and ES was exceeded in one or more samples collected from the following locations: french drain, MW-106, MW-107A, MW-108, MW-108A, MW-109A, MW-110, MW-110A, MW-111, MW-113, and MW-114. Only the PAL was exceeded for one or more samples collected from MW-107 and MW-109.

The ES for nickel is 100 ppb; the PAL for nickel is 20 ppb. The August 1994, Chrome Shop Sump sample and the October 1994, MW-107 sample exceed the ES for nickel. The October 1994, Chrome Shop sump sample and the August 1994 MW-110 sample exceeded the PAL for nickel. Silver was detected in excess of the NR140 50 ppb ES in the August 1994 Chrome Shop sump sample. The October 1994 samples collected from the Chrome Shop Sump, the french drain, and MW-106 exceeded the 2 ppb ES for thallium. These were the only nickel, silver, and thallium detections in excess of the current NR140 standards.

The ES for total chromium is 100 ppb; the PAL is 10 ppb. Both samples collected from the Chrome Shop sump, the french drain, and MW-109 exceeded the NR104 ES for total chromium. In addition, the August, 1994 sample collected from MW-113 exceeded the PAL for total chromium. Chromium is the primary contaminant of concern at the Chrome Shop site. The extent of chromium impacts in groundwater is identical to the area affected by hexavalent chromium as shown on Figure 8.

1.3 Volatile Organic Compounds

Due to an insufficient quantity of water, VOC samples could not be collected from B-101, MW-106B, MW-107B, MW-108B, and MW-109B. Results for the remaining samples are summarized below. The August 1994 sample collected from the Chrome Shop sump exceeded the ES for 1,1-dichloroethene (1,1-DCE). The August 1994 sample collected from MW-110A exceeded the ES for 1,2-dichloroethane (1,2-DCA). Both the August and October 1994 samples collected from the Chrome Shop sump exceeded the ESs for 1,1,1-trichloroethane (1,1,1-TCA), trichloroethene (TCE). and tetrachloroethene (PCE). There were no other VOC detections in excess of NR140 standards at the chrome shop site. Only samples collected from the chrome sump and french drain contained VOCs in more than one sampling event. Thus, the presence of VOCs at other locations is suspect because the detections have not been confirmed. The groundwater monitoring plan for the site should include VOC analyses until a time when it is possible to prove or disprove that VOCs are present at concentrations of concern in the groundwater. Figure 9 presents the extent of VOCs in the groundwater surrounding the Chrome Shop site.

2. Zinc Shop

2.1 Hexavalent Chromium

The Zinc Shop sump and all monitoring wells installed during the RI were sampled on two events for hexavalent chromium except MW-5B, MW-6B, and MW-11. The two bedrock wells, MW-5B and MW-6B, did not contain sufficient water for collection of a sample for analysis. MW-11 was not accessible during one sampling event.

Hexavalent chromium was detected in samples collected from the Zinc sump (89,000 and 144,900 ppb), MW-5 (1,590, 460 and 510 (duplicate) ppb), MW-6 (15,900 and 47,000 ppb), MW-9 (400 and 470 ppb), and MW-10 (60,300 and 60,800 ppb).

The highest detected concentration of hexavalent chromium was 144,900 ppb in the October 1994 Zinc Shop sump sample.

2.2 Inorganic Compounds

The quantity of water in some monitoring wells was not sufficient for collection of samples for metals and cyanide analysis. As a result, monitoring wells MW-5B and MW-6B were not sampled for metals and cyanide during the RI, and MW-4B was sampled twice for metals but only once for cyanide. MW-11 was only sampled once for metals and cyanide because the well was inaccessible during one sampling event. Sampling results are summarized below. Of the 24 inorganic analytes, 10 were detected at concentrations in excess of NR140 Groundwater Quality ESs or PALs.

The NR140 ES for antimony is 6.0 ppb, and the PAL is 1.2 ppb. The ES for antimony was exceeded in samples collected from the Zinc Shop sump, MW-4, MW-4A, MW-4B, MW-5, MW-6, MW-7, MW-8, and MW-10 during one sampling event. None exceeded the ES for both sampling events. The groundwater monitoring plan for the site should include continued antimony analysis until it is possible to prove or disprove that antimony contamination is present at concentrations of concern in the groundwater.

The ES for beryllium is 4 ppb; the PAL for beryllium is 0.4 ppb. Beryllium was detected in excess of the ES in one of the two samples collected from the Zinc Shop sump and MW-8. Beryllium is not a likely primary contaminant of concern at the Zinc Shop site. However, the groundwater monitoring plan for the site should include beryllium analysis until it is possible to prove or disprove that beryllium contamination is present at concentrations of concern in area groundwater.

Cyanide was detected in excess of the ES for both samples collected from the Zinc Shop sump, and for one of the two samples collected from MW-10. One of the two Zinc Shop sump samples and one sample from MW-8, MW-12, and MW-13 exceeded the ES for iron. The NR140 ES for lead was exceeded in one of the two samples collected from MW-6A and MW-9. These were the only cyanide, iron, and lead detections in excess of NR140 enforcement standards at the Zinc Shop.

The NR140 welfare based standard for manganese is 50 ppb; the PAL is 25 ppb. The ES was exceeded in one or more samples collected from the following locations: MW-4, MW-4A, MW-4B, MW-6, MW-7, MW-10, MW-12, and MW-13. Nickel was detected in excess of the ES in both samples collected from MW-10. Thallium was detected in excess of the NR140 ES of 2 ppb in one of the two samples collected from the Zinc Shop sump, MW-4, MW-4A, MW-4B, MW-6, MW-10, and MW-13. These were the only manganese, nickel and thallium detections in excess of NR140 enforcement standards.

The ES for chromium is 100 ppb; the PAL is 10 ppb. Both samples collected from the Zinc Shop sump, MW-5, MW-6, MW-9, and MW-10 exceeded the ES for chromium. Chromium is the primary contaminant of concern at the Zinc Shop site. The extent of chromium impacts in groundwater is identical to the area affected by hexavalent chromium as shown on Figure 10.

2.3 Volatile Organic Compounds

Due to an insufficient quantity of water, VOC samples could not be collected from MW-5B during the October, 1994 sampling event and from MW-6B during either sampling event. MW-11 was sampled for VOCs only once because the well was not accessible during one sampling event. The October, 1994 Zinc Shop sump sample contained 5 ppb carbon tetrachloride which is equal to the ES of 5 ppb. The PAL for TCE is 0.5 ppb. The sample collected from MW-5 in August 1994 exceeded the ES of 5 ppb for 1,2-DCA (6 ppb) and the ES of 0.6 ppb for 1,1,2-TCA (3 ppb). MW-13 contained benzene above the 5 ppb ES in both sampling rounds (11 and 7 ppb) and as many as 28 tentatively identified compounds (TICs). MW-13 also had levels of ethylbenzene, toluene, and xylene below groundwater standards in the March 1995 sample. BETX compounds are not found in the Zinc Shop sump area and so the VOCs detected at MW-13 are probably from another source, most likely the former aboveground tank storage area formerly located along the railroad tracks or some other petroleum related source. There were no other VOC detections in excess of NR140 standards at the Zinc Shop site. The extent of VOC impacts in groundwater at the Zinc Shop Site is presented in Figure 11.

3. Municipal Well Water Quality

Two rounds of samples were collected from the Grant Street Municipal well located 250 feet northwest of the Zinc Shop (Figure 2-1). A sample and a duplicate were collected during each sampling event. The samples were analyzed for TAL metals, hexavalent chromium, cyanide, and TCL VOCs. Hexavalent chromium and cyanide were not detected in any of the municipal well samples. The August 1994 sample and duplicate sample both contained an estimated 1 ppb chloroform. The PAL for chloroform is 0.6 ppb; the ES is 6 ppb. There were no other VOCs detected in any of the municipal well samples. The October 1994 sample and duplicate sample contained 154 ppb iron. The NR140 welfare based ES is 150 ppb. There were no other metals detected in the municipal well samples. The municipal well was found to be unaffected by the contamination at the Chrome or Zinc Shops at the time of the sampling.

4. Private Well Water Quality

One private well, located near the Chrome Shop (Figure 1) was sampled as part of the RI. The sample was analyzed for TAL metals, hexavalent chromium, cyanide, and TCL VOCs. There was no hexavalent chromium, cyanide, or VOC compounds detected in the private well sample. There were no TAL metal compounds detected in excess of NR140 groundwater quality standards. The private well was found to be unaffected by the contamination at the Chrome Shop at the time of the sampling.

5. Basement Sump (Foundation Drain) Water Quality

In 1986, three rounds of samples were collected from the [redacted] basement sump south of the Zinc Shop. The samples all contained chromium in excess of groundwater ESs. Ten basement sumps surrounding the Chrome and Zinc shops were sampled as part of the September 1991, WDNR resident basement survey/sampling project. The samples were analyzed for chromium, zinc and cyanide. The chromium concentration in the sample collected from [redacted] Street, located near the Zinc Shop, exceeded the groundwater ES. This was the only ES exceeded during this sampling event. The sump at [redacted] was dry during this event so it could not be resampled. Eight basement sumps were sampled as part of the RI. Of these, the sample collected from [redacted] Street (located near the Zinc Shop) exceeded the ES for total chromium and iron; the [redacted] (located near the Chrome Shop) sample exceeded the ES for iron and manganese; and the [redacted] Street (located near the Chrome Shop) sample exceeded the ES for iron, lead, and manganese. The iron, manganese, and lead detections are not likely related to the former plating operations, but rather the result of natural background conditions in groundwater.

6. USGS Well Background Water Quality

Two wells (USGS and USGS-A) had previously been installed on the West De Pere High School property, approximately 2,000 feet from the Chrome Shop site by the USGS. These wells were sampled as part of the RI to evaluate the background water quality. Well USGS was sampled for TAL metals, hexavalent chromium, TCL VOCs, and TOC. Well USGS-A was sampled for TAL metals, hexavalent chromium, cyanide, TCL VOCs, and TOC. There were no VOC, hexavalent chromium, and cyanide detections in these wells. The highest detected TOC concentration was 9.4 ppb in USGS-A. The USGS-A sample contained 6.5 ppb antimony (ES 6.0 ppb); 1.0 ppb beryllium (PAL 0.4 ppb); 11.9 ppb chromium (ES 10 ppb); 2,790 ppb iron (ES 300 ppb); 4.9 ppb lead (PAL 1.5 ppb); and 38.6 ppb manganese (PAL 25 ppb). The sample collected from well USGS exceeded the PAL for antimony and beryllium. There were no other detections in excess of NR140 standards.

7. Extent of Groundwater Impacts

7.1 Chrome Shop

Nine inorganic compounds were detected at concentrations in excess of NR140 ESs: antimony, arsenic, beryllium, cadmium, chromium, iron, lead, manganese, nickel, silver, and thallium. Antimony, arsenic, beryllium, cadmium, iron, lead, nickel, silver, and thallium detections were present at concentrations in excess of NR140 ESs during only one of the sampling events; thus, the presence of concentrations of these constituents above NR140 ESs was not confirmed. Manganese and chromium, however, were detected above NR140 ES levels at sampling points for more than one sampling event. Manganese concentrations ranged from 10.2 ppb to 197 ppb. Manganese concentrations as high as 50 ppb have been detected in De Pere water supply wells. Variations in manganese concentration do not appear to be related to known site source areas. Based on the widespread, variable occurrence of manganese, and the lack of any known site sources for manganese contamination, it appears likely the detected manganese is related to naturally occurring conditions in the area.

Therefore, chromium (both total and hexavalent) is the primary inorganic contaminant. Chromium was not detected above NR140 PALs in any of the intermediate piezometers, thus, the vertical extent of contamination is limited to the upper 25 feet or less of the unconsolidated deposits. Figure 8 presents the approximate lateral extent of chromium contamination at the Chrome Shop site. The highest total chromium and hexavalent chromium concentrations were detected in the Chrome Shop sump and the french drain. The western extent of the contaminant plume reaches into the yards of the residential properties adjacent to the site, extending to a point between MW-109 and MW-110. The northern extent of the contaminant plume lies between the Chrome Shop sump and MW-106, the eastern extent of the contaminant plume lies between the sump and MW-107, and the southern extent of the contaminant plume lies between the french drain and MW-111/MW-108. Another separate plume is present in the MW-113 location; however, average concentrations calculated from the three samples collected from this location do not appear to exceed NR140 ESs. This plume is likely related to the former drum storage area and is relatively small in extent.

Four volatiles were detected in excess of NR140 ESs in the Chrome Shop sump (1,1-DCE, 1,1,1-TCA, TCE, and PCE). Of these, 1,1,1-TCA, TCE, and PCE were detected during both sampling events. The only other VOC detected at NR140 standard level was an estimated 5 ppb 1,2-DCA (PAL 0.5 ppb, ES 5 ppb) in the August 1994 sample collected from MW-110. No VOCs were confirmed in a later sample collected from MW-110; thus, VOC contaminants in this area are suspect and may not represent actual site conditions. As the VOC detection in MW-110 was only a low, estimated, one-time detection, and the compound is not found at any of the other Chrome Shop sampling locations, it is unlikely that this detection is related to site activities. Therefore, the VOC contaminant plume is limited to the area of the Chrome Shop sump, and is probably related to solvents used while the plant was in operation. However, the groundwater monitoring plan for the site should include collection of samples from MW-110 for VOC analysis until it is possible to prove or disprove that VOC contamination is present at concentrations of concern in the groundwater in this area. Figure 9 presents the extent of VOC impacts in groundwater at the Chrome Shop.

The groundwater extraction sump currently captures much of the groundwater from within the area identified as impacted and captures all impacted groundwater within the main contaminant plume on the Chrome Shop property. However, the groundwater within the impacted area furthest to the west in the vicinity of MW-109 is not likely captured by the existing system. The small chromium contaminant plume at MW-113 is also not likely to be addressed by the existing groundwater extraction and pretreatment system.

7.2 Zinc Shop

Ten inorganic compounds were detected at concentrations in excess of NR140 ESs - antimony, beryllium, chromium, iron, lead, manganese, nickel, selenium, thallium, and cyanide. Of these, only manganese, nickel, cyanide, and chromium were detected above ESs at a given sampling point for more than one sampling event. Manganese concentrations ranged from 1.9 ppb (Zinc Sump, August 1994) to 764 ppb (MW-13, March 1995). Manganese concentrations as high as 50 ppb have been detected in De Pere water supply wells. Variations in manganese concentrations do not appear to be related to known site source areas. Based on the widespread, variable occurrence of manganese, and the lack of any known site source areas for manganese contamination, it appears likely the detected manganese is related to naturally occurring conditions in the area.

Therefore, chromium (both total and hexavalent), cyanide, and nickel are the primary inorganic contaminants. None of these compounds were detected above NR140 PALs in any of the intermediate piezometers, thus the vertical extent of contamination is limited to the upper 25 feet of the consolidated deposits. Figure 10 presents the approximate lateral extent of hexavalent and total chromium contamination at the Zinc Shop site. The chromium concentration exceeded the ES of 100 ppb for both samples collected from the Zinc Shop sump, MW-5, MW-6, MW-9, and MW-10. The ES for cyanide was exceeded for both sump samples and for the August, 1994, MW-10 sample. The ES for nickel was exceeded in both of the samples collected from MW-10. Based on these results, the lateral extent of the contaminant plume has been defined by the current monitoring network, and extends across the Zinc Shop property, partially encompassing adjacent properties to the south, southeast, and east.

Two volatiles were detected in excess of NR140 PALs (1,2-DCA and 1,1,2-TCA) for the August 1994 sample collected from MW-5. The October, 1994 Zinc Sump sample exceeded the ES for carbon tetrachloride. These VOC detections were qualified as estimated by the data validator. Based on the small, one-time detections, there appears to be only limited VOC contamination at the Zinc Shop site. MW-13 contains benzene at concentrations of 7 and 22 ppb which exceeds the 5 ppb ES. MW-13 also has detectable concentrations of petroleum type tentatively identified compounds (TICs) indicating a source other than Better Brite for the groundwater impacts. Figure 11 shows the extent of VOC impacts in groundwater which exceed NR140 standards.

The groundwater extraction sump currently appears to capture the groundwater impacted with chromium. The capture zone created by the extraction sump, combined with the natural groundwater flow pattern, will likely also result in the capture of VOC impacts in the vicinity of MW-13. However, petroleum related impacts near MW-13 likely originated from a source other than the Zinc Shop and their extent has not been completely determined to the north, east, or south.

V. SUMMARY OF SITE RISKS

A. Qualitative Risk Characterization

A qualitative assessment was completed for the site as the remedy to be selected must be protective of human health and the environment, and comply with ARARs. The state groundwater quality standards are protective of human health and the environment. A quantitative risk assessment serves two primary purposes: 1) to indicate whether the risks a site poses to humans and the environment justify further action; and 2) to help determine what levels of environmental remediation are needed. At this site, because these issues are already addressed through the health-based ARARs, it was determined that a qualitative risk assessment was sufficient. Selection of a remedy which complies with state administrative codes therefore will be protective of human health and the environment.

1. Selection of Contaminants of Concern

Contaminants of concern (COCs) are those contaminants migrating from the sites that have the potential to affect human health. Isolating these contaminants from the list of those that may be present at the site allows the assessor to focus on fewer, more important contaminants. COCs for the groundwater pathway are selected by comparing sample results to state standards. These are health based standards developed by the Wisconsin Department of Health (WDOH) and the WDNR to be protective of public health. A contaminant may also be retained as a COC if a health based standard has not been established.

2. Land Use, Water Supplies and Groundwater Use

Both the Chrome and Zinc Shops are located in a mixed residential/commercial area in the City of DePere, WI. Land use is comprised primarily of single family homes. Commercial businesses near the Zinc Shop include a seed company, and overnight freight company, a heating and cooling company and a foundry (located on South Sixth Street). Basic land use near the sites is expected to remain the same into the forseeable future.

The City of DePere water system is comprised of six municipal wells, all of which are within 3 miles of the Better Brite sites. An additional municipal well in the City of Allouez is also within 3 miles of the Better Brite sites. The population of the City of DePere is approximately 16,500 and the population of the City of Allouez is approximately 15,000. City of DePere Well #2 (aka Grant Street Well) is the closest municipal well to both sites. It is located approximately 250 feet from the Zinc Shop and supplies approximately 13% of the City of DePere's water. This well was sampled for contaminants of concern during the RI and is currently sampled annually for chromium and volatile organic compounds (VOCs).

In September, 1991 a door to door survey was conducted by the WDNR and City of DePere to identify any private wells near the Better Brite sites. The results indicated the presence of five unused and two in use private wells. One in use well (located ate 1026 South Seventh Street) was sampled without detection of contamination related to the sites. The other in use well was not sampled because it was located over 3,300 feet from the sites. Of the unused wells, one or two may require abandonment.

The current source of city drinking water is the deep sandstone aquifer. Half of the private wells in the city are generally less than 105 feet deep, indicating that the wells draw water from the dolomite aquifer. Monitoring wells indicate that the contamination at the Zinc and Chrome Shops is restricted to the upper clay till unit and that contamination extends approximately 20 to 25 feet deep. The clay unit is approximately 30 feet deep and is underlain by dolomite. The clay unit can not produce usable quantities of water. However, groundwater gradients at both sites are downward, indicating that if the contaminated groundwater in the clay is not controlled, the deeper dolomite and sandstone units are at risk of contamination. A future risk to the city water supply does exist because of the proximity of private and municipal wells to the sites.

3. Groundwater

There are five unused water supply wells and two actively used private wells in the area of the Better Brite sites. The actively used wells are located at [redacted] and [redacted] (Figure 1). The well at [redacted] has been sampled without detection of contamination related to the Better Brite site. The [redacted] well has not been sampled because it is located approximately 3,300 feet south of the Chrome Shop site. Exact well construction reports are not available. The primary aquifer for the area is the sandstone aquifer that supplies drinking water to all the municipalities in the Lower Fox River Valley. The sandstone aquifer annually receives approximately 2 to 4 inches of recharge from the overlying material. The City of De Pere's Grant Street municipal well, which is completed in the sandstone aquifer, is only 250 feet from the Zinc Shop. The municipal well was sampled as part of the RI. There was no contamination detected in the municipal well related to the Better Brite sites.

As of the date of the RI work, sampling has not detected contamination from the Chrome and Zinc Shops in either the municipal or private wells. Based on contaminant extent and distance from water supply wells, area residents have not been exposed, and are not currently at risk of exposure, to the groundwater impacts except via basement sumps at [redacted] and [redacted] as detailed above. If the migration of the contaminants is not controlled, there is the potential for exposure to contaminated groundwater through water supply wells and additional basement sumps in the future. Residents using untreated contaminated groundwater could ingest contaminants when drinking water, inhale contamination released from the water during domestic uses (cooking, showering, etc.), and absorb contaminants through the skin while bathing and washing in contaminated water. It should be noted that the operation of the groundwater collection systems at each of the sites greatly reduces the likelihood of these future potential exposures. The possibility is discussed to emphasize the necessity for continued control of the groundwater contaminant plume.

Because contaminated groundwater is a potential future exposure pathway, groundwater COCs need to be identified. The standard for determining groundwater COCs is the ES. This is a health based standard developed by the WDOH and the WDNR to be protective of human health and is based on a risk level of 10^{-6}. The PAL is used to identify potential contamination problems. An exceedance of the PAL is not necessarily an indication of a short or long term health hazard. Detected compounds without state standards have also been retained as potential COCs. The highest concentration of each contaminant detected in the groundwater is evaluated as a worst case future exposure scenario.

3.1 Chrome Shop

Table 2 summarizes the compounds which have been detected above the ES in groundwater samples collected at the Chrome Shop as well as other COCs, and the compounds' highest detected concentration. The health (or welfare) based groundwater standard is also presented for those contaminants for which a standard has been developed.

The following compounds are identified as VOC COCs for the future groundwater exposure pathway because the highest detected concentration exceeded the ES: 1,1-DCE; PCE; 1,1,1-TCA; and TCE. Carbon disulfide was also retained as a VOC COC because an ES for this compound has not been developed. Analysis of the groundwater samples for inorganics detected many commonly occurring parameters in groundwater. Of these, the following were identified as inorganic COCs for the future groundwater exposure pathway because the highest detected concentration exceeded the ES: antimony, arsenic, beryllium, chromium, iron, manganese, nickel, silver, and thallium. Aluminum, cadmium, calcium, cobalt, hexavalent chromium, magnesium, potassium, sodium, and vanadium were also included because an ES has not been developed for these compounds. However, many of these compounds exist at background levels for this aquifer. Compounds that exist at background levels are potential site related COCs, not primary COCs.

3.2 Zinc Shop

Table 3 summarizes the compounds which have been detected above the ES in groundwater samples collected at the Zinc Shop as well as other COCs, and the compounds' highest detected concentration. The health (or welfare) based groundwater standard is also presented for those contaminants for which a standard has been developed.

The following compounds are identified as VOC COCs for the future groundwater exposure pathway because the highest detected concentration exceeded the ES: carbon tetrachloride; 1,2-DCA; and 1,1,2-TCA. Carbon disulfide was also retained as a VOC COC because an ES for this compound has not been developed. Analysis of the groundwater samples for inorganics detected many commonly occurring parameters in groundwater. Of these, the following were identified as inorganic COCs for the future groundwater exposure pathway because the highest detected concentration exceeded the ES: antimony, beryllium, chromium, cyanide, iron, lead, manganese, nickel, and thallium. Aluminum, calcium, cobalt, hexavalent chromium, magnesium, potassium, sodium, and vanadium were also identified because an ES has not been developed for these compounds. However, many of these compounds exist at background levels for this aquifer. Compounds that exist at background levels are potential site related COCs, not primary COCs.

B. Public Health Consultation

The Wisconsin Department of Public Heath, with the concurrence of the Agency for Toxic Substances and Disease Registry, completed an evaluation of the public health risks for the private residences near the Zinc Shop. This evaluation is entitled "Public Heath Consultation, Basement Seepage Near the Better Brite Zinc Shop". The evaluation found that the chromium contaminated dust and water seepage within the basements of the homes poses a public heath hazard and recommended that steps be taken to prevent people from being exposed to the contaminants.

C. Rationale for Further Action

Actual or threatened releases of hazardous substances from this site, if not addressed by the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

VI. Description of the Remedial Alternatives

A. Remedial Action Objectives

Remedial action objectives were developed for this site to address the groundwater and soil contamination and to provide short and long-term protection of human health and the environment and to meet applicable or relevant and appropriate requirements.

The NCP at Section 300.430(a)(1)(iii)(F), provides that under CERCLA, U.S. EPA will return usable groundwaters to their beneficial uses wherever practicable, within a time frame that is reasonable, given the particular circumstances of the site. When restoration of groundwater to its beneficial uses is not practicable, U.S. EPA expects to prevent further migration of the contaminant plume, prevent exposure to the contaminated groundwater, and to evaluate further risk reduction.

The initial groundwater objective is to protect the underlying bedrock aquifer and contain and/or control the further migration of contaminants. The long term remedial objective for the Better Brite site is to reduce the contaminant concentration in groundwater to meet state and/or federal groundwater quality standards, whichever are more stringent. *An action that meets both objectives quickly may be selected for the site or a portion of the site, if it is* feasible and practicable.

In addition to federal standards, or Maximum Contaminant Levels (MCLs), the State of Wisconsin has established groundwater quality standards in NR 140, Wisconsin Administrative Code (Wis. Adm. Code). Wisconsin's groundwater code, which is an applicable requirement for remediation of the site, is more stringent than federal standards. NR 140, Wis. Adm. Code, requires remediation of groundwater to meet numeric health based standards.

The purpose of the basement/foundation portion of the remedy is to prevent human contact with the contaminated soil, dust and groundwater at the residences near the Zinc Shop.

B. Development of Alternatives

The Focused Feasibility Study (FFS) for the site developed a list of possible remedial technologies to address the remedial action objectives which were screened and narrowed down based on cost, implementability and effectiveness. Alternatives were assembled from the technologies that survived the screening process. In addition to remedial action alternatives, the NCP requires that a no-action alternative also be considered for the site. The no-action alternative serves primarily as a point of comparison for the other alternatives.

C. Description of Alternatives

Groundwater Control Alternatives

1 Alternative A - No Action

Evaluation of a No Action alternative is required by CERCLA guidance in order to provide a baseline against which other alternatives can be compared. This alternative consists only of continued groundwater monitoring at the Better Brite sites. No action would be performed to collect or treat groundwater. The No Action alternative would rely on natural processes such as dilution, dispersion, adsorption, precipitation, and degradation to attenuate the impacted groundwater. The time to fully attenuate the plumes as a result of these natural processes is difficult to predict for several reasons. The attenuation is dependent on a host of soil properties such as cation exchange capacity, effective porosity, and other parameters defining the subsurface geochemistry. All of these properties would also be expected to change with soil type. The actual geochemical processes which work to attenuate the chrome are also subject to much uncertainty. Thus further definition of the downgradient soils and testing of the pertinent soil properties would be helpful but still would not eliminate some of the considerable uncertainty in predicting the attenuation. Additionally the impermeable nature of the soil makes travel times through the aquifer extremely lengthy. Estimates indicate this will likely take in excess of 20,000 years for the No Action alternative to comply with ARARs. Thus, under this alternative, the plume would spread considerably before the concentrations are reduced to within allowable limits.

Semi-annual groundwater sampling and analysis at select monitoring wells would be conducted to document trends in contaminant concentrations. Locations of the wells will be selected to characterize variations in contaminant concentrations near the center of the contaminant plumes, and also near the leading edge of contamination as definable with existing monitoring wells.

To accomplish this monitoring, 14 monitoring wells and the sump would be used at the Chrome Shop and 13 monitoring wells and the sump would be monitored at the Zinc Shop. In addition there is one private and one municipal water supply wells which would also be monitored. All of the selected wells were monitored during the Remedial Investigation (RI) in 1994 and 1995. These wells provide both a representation of the existing plume as well as the most likely contaminant migration pathways.

Groundwater samples will be analyzed for field parameters, VOCs, metals, cyanide, and hexavalent chromium. Additionally, groundwater elevations will be measured at all monitoring wells during each sampling event. This information will be used to confirm groundwater flow direction in the various hydrogeologic units and to confirm previous identification of likely contaminant migration routes. There are no capital costs for this alternative. The annual O&M costs for the alternative are $87,200, and the total present worth cost is $1,082,100, based on monitoring over 30 years.

2 Alternative B - Limited Action

This alternative is comprised of the recovery and treatment activities which are currently in operation at the Better Brite sites, that is, recovery of groundwater from the existing sumps and pretreatment at the existing precipitation pretreatment facility. Water is discharged to the local POTW. Institutional controls would be used to supplement these actions and prohibit any land use which might interfere with the remedial activities. Specifically, this is assumed to include fences around the existing sumps and clay cap to restrict access, and deed restrictions to prevent installation of wells within the impacted aquifer. Inclusion of this alternative in the FS is intended to allow assessment of the feasibility of continued operation and maintenance of the existing recovery and pretreatment equipment.

At the Zinc Shop site, groundwater is collected in the existing sump and is transported via vacuum truck to the holding tank of the water pretreatment system located at the Chrome Shop site. Impacted groundwater from the Chrome Shop site is collected in the sump and is pumped to the holding tank of the water pretreatment system. The total volume of groundwater collected for pretreatment between April 1994 and March 1995 from the Chrome Shop site and the Zinc Shop site was approximately 48,000 gallons and 80,000 gallons, respectively.

Hydrogeological studies have determined that the sump at the Zinc Shop is providing complete capture of the impacted groundwater at the Zinc Shop site. The sump at the Chrome Shop is not providing capture of all of the impacted groundwater from the Chrome Shop site. A small plume of impacted groundwater located west of the Chrome Shop sump is not being completely captured by the existing sump. It should be noted that natural attenuation processes such as dilution, dispersion, adsorption, precipitation, and biodegradation will tend to reduce the organic and inorganic contaminant concentrations present in the groundwater with time. Estimates indicate it will likely take in excess of 1,800 years to comply with ARARs under the limited action alternative. Thus, under this alternative, the non-captured portion of the Chrome Shop plume would spread considerably before the concentrations are reduced to within allowable limits.

The existing batch pretreatment plant, which is housed in a prefabricated building, has a holding tank which is used to store water prior to batch pretreatment. Once the tank is nearly full, the contents of the tank are pumped to the batch pretreatment tank for pretreatment. Typically, a volume of 5,600 gallons of water is pretreated at a time.

Sulfuric acid, sodium bisulfite, and sodium hydroxide are the chemicals used in the precipitation process. The resulting chromium hydroxide precipitate is allowed to settle in the batch pretreatment tank with the aid of an anionic polymer flocculating agent. Other insoluble heavy metal hydroxides such as cadmium, lead, nickel, and silver hydroxides are also insoluble at a pH of approximately 8.5 standard units and also form precipitates during this process.

Metal hydroxide sludge is dewatered in a plate and frame filter press, thus reducing the volume, toxicity and mobility of the waste stream compared to the volume of impacted groundwater being treated. The dewatered metal hydroxide sludge cake is transported and disposed off-site at a licensed RCRA treatment, storage and disposal *facility as characteristic hazardous waste (D007). According to the U.S. EPA document entitled* "A Water Treatment System For Removal of Chromium from Groundwater", one drum (55 gallons) of dewatered sludge is formed for every 5,000 gallons of groundwater treated. This is confirmed by records of the initial period of operation. Therefore, given an estimated groundwater influent rate of approximately 130,000 gallons per year, the amount of dewatered sludge formed annually is expected to be 26 drums.

Pretreated water is decanted from the batch pretreatment tank and is discharged to the City of De Pere sanitary sewer for final treatment at the De Pere POTW. Chromium is the only constituent that requires treatment prior to discharge. Available information from the existing operation indicates that the concentration of total chromium in the treated water is below 1 mg/ℓ which is well below the pretreatment limit of 7.0 mg/ℓ. Therefore, the existing pretreatment system performance adequately meets the pretreatment limits for the De Pere POTW.

The VOCs present in the groundwater are not actively treated by the existing pretreatment plant. It is expected that some of the VOCs are volatilized during the pretreatment process, or possibly adsorbed on the sludge, and the remaining VOCs are discharged for final treatment at the De Pere POTW. The low levels of VOCs in the discharge do not pose a problem at the De Pere POTW. However, VOC removal could become necessary in the future should pretreatment standards for VOCs be established that are below the current discharge concentrations.

The De Pere POTW, which currently operates the pretreatment system, has indicated that there are no indications of problems with the existing pretreatment system. While historical data indicate that some minor difficulties were experienced upon system startup, it appears that the operation of the system is now essentially trouble-free.

The current O&M agreement with the City of De Pere POTW expires during 1996. The extension of the agreement between the WDNR and the City of De Pere to operate the system appears possible based on discussions with both parties. However, there are administrative issues related to manifest responsibilities, monitoring, and maintenance which would need to be addressed if the system is used as a permanent pretreatment alternative. With the City of De Pere's POTW approval, continued discharge of pretreated groundwater to the sanitary sewer would be a more attractive alternate than other discharge alternatives because of the availability of the current infrastructure and the current experience.

Institutional controls and access restrictions would be used to provide additional protection for human health and the environment. These include the construction of fences around both sites to limit access to the wells, equipment, and clay caps; posting warning signs; and obtaining deed restrictions on the present and the future use of the Better Brite sites or other affected properties.

Under this alternative, the only capital costs would be those associated with implementing the institutional controls. This is estimated at $5,000. Groundwater monitoring would also be required under this option as it would be under the No Action alternative. Annual operation and maintenance costs as obtained from WDNR for the existing groundwater extraction and pretreatment system include:

1) Discharge fees to the De Pere POTW;
2) Labor (Plant O&M, Administration, Clerical);
3) Expenses (Phone and Utilities, chemical analyses, supplies);
4) Sludge Transport and Disposal; and,
5) Water transport from Chrome Shop to Zinc Shop.

The estimated annual O&M costs are $118,760 and the 30-year present worth cost is $1,478,700.

3 Alternative C - Supplemental Groundwater Recovery and Treatment

This alternative includes a feasible method of providing supplemental groundwater recovery at the Chrome Shop site to extract groundwater not currently captured by the existing system. It also contains an evaluation of the existing groundwater recovery system and potential alternatives.

Currently, groundwater is collected at both the Chrome Shop and Zinc Shop at each site's respective groundwater sump. The radius of influence of the sump at the Zinc Shop appears to be adequate in capturing the contaminant plume. Therefore, no additional groundwater recovery system is necessary at the Zinc Shop. The sump at the Chrome Shop leaves a small portion of the contaminant plume unaffected. At the Chrome Shop, a comparison of the established groundwater capture zone to the known chromium contaminant plume indicates that the impacted groundwater to the west, in the vicinity of MW-109, is not captured by the existing system.

A groundwater recovery trench is the most appropriate means of recovering groundwater, based on the site's characteristics. The installation of a groundwater extraction trench at the western edge of the contaminant plume would provide the necessary capture to control the entire plume. Based on the groundwater flow direction and the extent of contamination, the groundwater recovery trench should be approximately 100 feet long, 20 feet deep, and should be located as shown on Figure 12. Calculations indicate that a trench of this design would recover approximately 10,000 gallons per year (27 gallons per day).

While treatment technologies other than the existing precipitation system are available with the capacity to meet the standards for discharge, the existing system is the most appropriate for the following reasons:

1) precipitation is a common and proven method for metals removals and the existing system has no operating problems in meeting the discharge limit;

2) no additional capital expenditures are required for the existing system, and

3) alternative technologies do not offer appreciably lower operation and maintenance costs to offset their initial capital expenditures.

One option which was considered was whether a separate pretreatment facility at the Zinc Shop would be economical. An initial cost estimate was completed for a separate precipitation unit at the Zinc Shop. Capital costs were estimated at $195,000, annual operating costs at $26,400, and present worth costs over a 30 year period at $366,000. This compares with the present worth costs for transporting the water and pretreating it at the existing facility of $230,000.

There is little incentive to explore or implement other pretreatment schemes when the existing system is working adequately and has acceptable operating costs. As long as the system can handle the additional load, it appears to be the preferred option for on-site pretreatment of the chromium in the groundwater for both the Chrome Shop and the Zinc Shop.

The batch pretreatment plant, which is housed in a prefabricated building, would be used to pretreat the current 130,000 gallons from the sumps plus an additional 10,000 gallons of groundwater from the proposed supplemental trench. Since a volume of 5,600 gallons of water is pretreated at a time, an additional two batches of groundwater will require pretreatment each year. Given that the existing pretreatment plant processes approximately 24 full batches, each requiring less than one 8-hour shift, the processing of the additional groundwater would require only a minimal increase in time and materials for pretreatment and is well within the capacity of the existing system.

With the addition of the proposed trench, the volume of groundwater pretreated under this alternative would be increased by approximately 8%. It is expected that the required quantities of sulfuric acid, sodium bisulfite, sodium hydroxide, polymer, and labor used on an annual basis would also increase by a similar percentage. Sludge disposal would also increase by a similar factor resulting in an annual total of 28 drums of sludge.

The current system discharges to the De Pere POTW. For reasons discussed under Alternative B, this is the most appropriate discharge option, provided the current discharge agreement can be extended. Infiltration is not a technically feasible option in a clay till environment. Discharge to the storm sewer is a viable option, but would require construction of a line from the existing pretreatment facility to the storm sewer and would also require permitting of the off-site discharge. Discharge standards for this option might dictate that cyanide and VOCs also be pretreated, thus increasing the costs of pretreatment.

As noted with Alternative B, the VOCs present in the groundwater are not actively treated by the existing pretreatment plant. It is expected that some of the VOCs are volatilized during the pretreatment process, or possibly adsorbed on the sludge, and the remaining VOCs are discharged for final treatment at the De Pere POTW. The low levels of VOCs in the discharge do not pose a problem at the De Pere POTW. However, VOC removal could become necessary in the future should pretreatment standards for VOCs be established that are below the current discharge concentrations.

Institutional controls and access restrictions would also be used under this alternative to provide additional protection for human health and the environment as noted in the previous alternatives. Groundwater monitoring would also continue as noted under the No Action alternative.

Capital costs for this alternative consist of the construction of the new trench and sump and the costs for implementing the institutional controls. The capital cost associated with this alternative is $142,600.

Annual operation and maintenance costs are similar to those under Alternative B with an allowance for the added flow. The estimated annual O&M costs are $121,200 and the 30-year present worth cost is $1,646,100.

4. Alternative D - Groundwater Recovery and Off-site Disposal

Under this option, groundwater collected would be treated with an evaporation system located at the Chrome Shop to reduce the volume of water which requires disposal. Groundwater would be collected as noted under the other options.

Evaporation involves the vaporization of a liquid from a solution or a slurry. All evaporation systems require the transfer of sufficient heat from a heating medium to the process fluid to vaporize the volatile solvent which in this case is water. The vaporized water would be discharged to the atmosphere while the inorganic contaminants would be concentrated in the water remaining. Evaporator suppliers indicate that up to 95% of the water could be evaporated but the unit would require frequent cleaning. For the purpose of evaluating this option it has been assumed that a 70% reduction in volume is achievable with only monthly cleaning.

A small evaporator with a capacity of approximately 700 gallons a day would be used and is readily available from several suppliers. The units run on propane or natural gas. Waste water is fed into unit based on water level in the evaporator until the desired concentration is achieved. The unit then shuts down and is drained. A programmable logic controller would be installed to automate the process and reduce operator requirements. It would, however, run almost continuously in an automatic mode. No pretreatment is necessary. A storage tank would be installed downstream of the unit to store the concentrated waste. VOCs in the water would also be vaporized and discharged, but emissions would be well below Wisconsin VOC emission limits.

The capital costs for this alternative, which include an evaporator system, a groundwater recovery trench, storage facilities and institutional controls/access restrictions, is estimated at $237,700. The O & M costs are $164,300 per year. The total 30-year present worth costs of this option are estimated to be $2,275,800.

5 Alternative E - In-situ Enhancements for Groundwater Remediation

This alternative includes using the groundwater recovery and treatment system described under Alternative C and adding the necessary equipment to condition the treated water and inject some of it back into the aquifer. The water would require addition of a reducing agent capable of the in-situ reduction of hexavalent chromium to trivalent chromium. As this water flows through the impacted aquifer towards the recovery sump or trench it would enhance the in-situ attenuation of chrome and thus result in a reduction of chromium concentrations in the groundwater.

This technique is considered experimental but has had some reported success in actual applications. For the Better Brite locations the impermeable soil may have adverse impacts on the treatment, and chromium concentrations, which are considerably higher than those cited in the literature, may exceed the ability of the soil to attenuate the chrome. The urban environment and surrounding land uses at the Zinc Shop make use of this technique impractical because installation of injection trenches through public thoroughfares and private property at the plume boundary isn't feasible. Implementation is possible at the Chrome Shop.

Any effort to implement this technology at the Better Brite site will require a somewhat sophisticated design and study effort to determine important parameters related to injection method and capacity, impacts to groundwater flow patterns, regulatory requirements for injection, attenuation capacity of the soils, and the optimum chemicals and their addition rate. The testing would most likely include a series of laboratory evaluations of potential chromium attenuation to soil using different chemical reductants, followed by a field demonstration of the approach. Field testing might include a yield test on the recovery trench and tracer test in the injection trench to provide data on the time of travel between the trenches and determine the effectiveness of the injection of the conditioned water.

To alleviate concerns associated with the injection, it has been assumed that an additional four monitoring wells will be installed in the vicinity of the trenches to ensure that flow is not migrating away from the trenches to uncontaminated areas. It has also been assumed that monitoring costs for this alternative will be higher than that for other alternatives in order to assess the impact of the injected water.

Two infiltration trenches are proposed at the Chrome Shop as shown on Figure 13. They are approximately 80 feet long extending along the eastern and western sides of the existing sump. The trench on the western side would allow infiltration both towards the sump and towards the recovery trench. The infiltration gallery on the eastern side of the trench would be sealed with geomembrane on all sides except the one facing the sump to minimize infiltration in other directions. The trenches would be filled with pea gravel and a sump to monitor water level. Based on information obtained during the RI, each open face of the trench will theoretically allow infiltration of approximately 40 and 50 gallons per day. For purposes of this analysis it is assumed that 30 gallons per day will infiltrate through the three proposed open faces. Thus infiltration is estimated at 32,800 gallons annually while recovery is estimated at 50,000 gallons. The remaining 17,200 gallons will be discharged to the sanitary sewer after treatment in the existing system.

The treatment system would be identical to that currently in-place with some additions to the water stream being injected. The water slated for injection would be pumped through an air stripper for removal of residual VOCs. The remaining constituents in the water should then match those concentrations which naturally exist in the aquifer. Following the air stripper, the reducing agent would be injected into the stripper effluent and stored in a tank with a mixer. Water would be pumped from the mix tank to the injection trenches to maintain the desired water level.

All of the elements of Alternative C would be included here along with the added treatment equipment and construction of the trenches. Operation and Maintenance would require little additional work over the basic pump and treat system. The capital cost for this alternative is $517,300. The annual O&M cost is $170,700 and the total present worth cost is $2,635,300.

6 Alternative F - In-Situ Soil Stabilization and/or Solidification

This alternative includes using the institutional controls described in Alternative B and in-situ soil stabilization and/or solidification. At the Chrome Shop, shallow soil mixing would be used to mix a dry or fluid treatment chemical with the in-place soil to produce a solidified or stabilized end product. This technique has been used successfully at many sites across the country. This technique is not considered feasible for the Zinc Shop since the groundwater contaminant plume extends below residences, streets, and other structures. Thus, this alternative assumes Alternative B would be implemented as it pertains to the Zinc Shop.

A treatability study would be performed on representative samples of the Chrome Shop soil (including both the native clay and, if necessary, the pea gravel used to backfill the sump area) to determine the feasibility of this alternative. The treatability study would assess the best stabilization agent for the site, the leachability of the contaminants after treatment, the effect of residual VOCs in the groundwater upon stabilization and/or solidification, and the projected permeability of the clay stabilized and/or solidified soils.

In the event that the treatability study indicates that implementation of this alternative may reduce the concentration of groundwater to below the PALs as specified in the Wisconsin groundwater ARAR, WAC NR140, within a reasonable amount of time, then implementation of this alternative may be feasible. Following the treatability study, a field test may also be appropriate to provide additional information as to the permeability of the stabilized and/or solidified soil and the leachability of the contaminants. Should the treatability study find that the alternative will achieve enforcement standards (ES), or a level between the ES and the PAL, a NR 140.28 exemption would be considered. The granting of a NR 140.28 exemption would not require a revision to this decision document, but would be announced to the public, with comments requested. Should the study find that the alternative will not achieve remediation goals, then other alternatives would be evaluated (a likely alternative in this instance would be alternative C, with a reexamination of contaminated groundwater conveyance options).

During construction, a crane-mounted bottom-opened cylinder is lowered into the soil. Inside the cylinder, mixing blades mix down to the required depth (approximately 20 feet at the Chrome Shop site) in an up and down motion. Meanwhile, fluid or powdered stabilization and/or solidification agent is added into the subsurface. A suction is kept on the head space of the bottom-opened cylinder to pull any dust and vapors to the vapor treatment system comprised of a dust collector and activated carbon treatment tanks. The construction method consists of creating alternating primary columns which are allowed to set. Secondary columns are then installed which overlap the primary columns resulting in continuous treatment of the impacted area. The total volume of soil at the Chrome Shop site which is estimated to require treatment is 10,000 cubic yards. Note that some of this area is on residential property, where access must be obtained. The extent of the area to be treated corresponds to the area of the groundwater contaminant plume, which exceeds WAC NR 140 PALs. The depth to which the treatment would occur is 20 feet bgs, which is coincident with the base of impacted groundwater.

As a result of the stabilization process, the volume of material treated will increase by 10% to 30% depending on the treatment chemicals used. This will result in a mound in the treated area or would require excess material be shipped off site to return the site to its original grade. For purposes of evaluating this alternative, it is assumed that the extra material can be graded and left at the Chrome Shop site. It should also be noted that the nature of the solidified soil left in place will restrict future uses of the property in that future subsurface excavation will not be possible.

Under the existing groundwater recovery and treatment program at the Better Brite sites, groundwater collected at the Zinc Shop site is transported to the existing pretreatment plant at the chrome Shop site for pretreatment and discharge to the DePere POTW. Once stabilization and/or solidification is completed, the groundwater at the Chrome Shop should not require recovery and treatment. However, because stabilization and/or solidification is not feasible for the Zinc Shop site, groundwater extraction and pretreatment will still be necessary for the Zinc Shop site. Therefore, the existing groundwater pretreatment system at the Chrome Shop will be transported and reassembled at the Zinc Shop site as part of Alternative F. Materials and equipment which could be reused at the Zinc Shop include two tanks, a filter press, chemical feed tanks, a control panel, an air compressor, desk and bathroom fixtures. A new concrete pad would need to be constructed at the Zinc Shop site for installation of a new metal walled pretreatment building.

Operation and maintenance of the pretreatment system at the Zinc Shop would be required. The capital cost for this alternative is $1,318,300. The annual O&M cost is $103,400 and the total present worth cost is $2,601,400.

Basement/Foundation Drain Exposure Mitigation Alternatives

<u>1 Alternative BA - No Action</u>

Under this alternative no action would be taken to notify residents of potential risks nor remediate the seepage occurring into the structures currently. The existing exposures would continue and the potential for future exposure would remain. There are no costs associated with this alternative.

<u>2 Alternative BB - Limited Action</u>

Under this alternative the occupants of the affected structures would be notified of the seepage and the potential health risks. Signs warning of possible health impacts could also be provided for posting in the affected structures. It would be up to the residents to heed these warnings and reduce exposure to the contaminants. Deed restrictions on the affected structures and property to limit use and exposure to the impacted areas would be pursued, to ensure that future occupants would be notified of the potential problems. Responsibility to minimize exposure would fall solely on the occupants of the affected structures.

Letters describing the hazards to all the affected property owners and occupants would be sent, signs posted either at the basement entrances or in the impacted basements, and lastly deed restrictions would be placed on the properties limiting the uses of the basements and notifying any prospective purchasers of the potential risks associated with occupancy of the basements. The capital cost for this alternative is $6,400.

<u>3 Alternative BC - Sump (Foundation Drain) Isolation</u>

Under this alterative the institutional controls discussed under alternative BB would be implemented, and, in addition, the necessary actions to seal the basement foundation drain openings in the basements. Impacted groundwater collected in the foundation drains would be routed to the sanitary sewer. This would avoid any casual exposure to the impacted groundwater.

The drains already contain suitable pumps and the only actions necessary to properly seal them is installation of a plexiglass cover with silicone caulking to seal the edges. Additionally the drains would be cleaned, any sediment properly disposed and the sump pump discharge would be rerouted to the sanitary sewer discharge. It is assumed that this can be accomplished by installing approximately 20 feet of pipe with appropriate fittings and valves in the basement without having to do any outside excavation. Ongoing maintenance of the sump pump enclosure is assumed to be the owner's responsibility. The capital cost for this alternative is $8,900.

4 Alternative BD - Wall and Floor Isolation

This alternative includes the institutional controls and the foundation drain isolation included in Alternative BC but also adds the construction of walls and floors within the impacted structures to isolate and reduce exposure not only to the water collected in the drains but also to seepage through the masonry foundation, walls and floors. The construction of secondary walls and floors within the structures will isolate the masonry and the seepage from occupied areas of the basements.

The estimated capital cost for this alternative is $23,900. Maintenance is assumed to be the owners responsibility.

5 Alternative BE - Basement Isolation with External Control

This alternative includes the institutional controls and the foundation drain isolation included in Alternative BC and also adds the sealing of the exterior and interior of the basement walls with impermeable, waterproof substances and constructing a foundation drain with a sump along the base of the exterior basement walls. The area near the basement walls would be regraded to assure surface water drains away from the walls, and roof downspouts would be extended/redirected to prevent surface water from ponding near the walls and being collected in the new foundation drains. Pending a determination of the soundness of the building structures and foundations, soil from the vicinity of the outside walls would require excavation, sampling, and characterization for off-site disposal in order to allow sealing of the outside portions of the walls and construction of foundation drains. There is the possibility that areas of contaminated soil exist near the buildings. A predesign investigation would be performed to determine the extent of any soil contamination that could pose a health risk or cause additional groundwater contamination. If these areas are found, the soil will be removed and properly treated and disposed of. This alternative would isolate and reduce exposure not only to the water collected in the drains, but also to seepage through the masonry foundation, walls, and floors.

Both the outdoor and indoor walls would be waterproofed once with a waterproof plaster and once with a tar substance. Additionally, 4-inch diameter drain tile would be installed and pitched to a collection sump. Accumulated water from the interior and exterior foundation drains would be discharged to the Zinc Shop sump for treatment. The excavated areas would then be restored with gravel, filter fabric, and black dirt to grade. Maintenance is assumed to be the owner's responsibility.

A predesign investigation of the structural integrity of the existing buildings near the Zinc Shop will be undertaken to determine if the above actions are feasible. If it is found that the buildings do not have the structural integrity to construct the actions, the actions will be modified to remove as much risk as possible without endangering building structural integrity. The final determination on this will be made as part of the predesign investigation during the design phase.

The estimated capital cost for this alternative is $44,800.

VII. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

A. Introduction

U.S. EPA has established in the NCP nine criteria that balance health, technical, and cost considerations to determine the most appropriate remedial alternative. The criteria are designed to select a remedy that will be protective of human health and the environment, attain ARARs, utilize permanent solutions and treatment technologies to the maximum extent practicable, and be cost effective. The relative performance of each of the remedial alternatives listed above has been evaluated using the nine criteria set forth in the NCP at 40 CFR 300.430(e)(9)(iii) as the basis of comparison. These nine criteria are summarized as follows:

THRESHOLD CRITERIA - The selected remedy must meet the threshold criteria.

1. Overall Protection of Human Health and the Environment
   A remedy must provide adequate protection and describe how risks are eliminated, reduced or controlled through treatment, engineering controls or institutional controls.

2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)
   A remedy must meet all applicable or relevant and appropriate requirements of federal/state laws. If not, a waiver may be applied.

PRIMARY BALANCING CRITERIA are used to compare the effectiveness of the remedies.

3. Long-term Effectiveness and Permanence
   Once clean up goals have been met, this refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time.

4. Reduction of Toxicity, Mobility or Volume Through Treatment
   The purpose of this criterion is to anticipate the performance of the treatment technologies that may be employed.

5. Short-term Effectiveness
   This refers to how fast a remedy achieves protection. Also, it weighs potential adverse impacts on human health and the environment during the construction and implementation period.

6. Implementability
   This criterion requires consideration of the technical and administrative feasibility of a remedy, including whether needed services and materials are available.

7. Cost
   Capital, operation and maintenance, and 30 year present worth costs are addressed.

MODIFYING CRITERIA deal with support agency and community response to the alternatives.

8. State or Federal Acceptance
   After review of the Feasibility Study and the Proposed Plan, the support agency's concurrence or objections are taken into consideration.

9. Community Acceptance
   This criterion summarizes the public's response to the alternative remedies after the public comment period. The comments from the public are addressed in the Responsiveness Summary attached to this document.

B. Evaluation of the Remedial Alternatives

THRESHOLD CRITERIA - The selected remedy must meet the threshold criteria.

1. Overall Protection of Human Health and the Environment

a. Groundwater Control and Remediation Options

1. Alternative A - No Action

This alternative does not prevent the migration of contaminated groundwater nor return groundwater at the site to its beneficial use, as an actual or potential groundwater source, within a reasonable period of time, nor prevent human contact or ingestion of impacted groundwater above NR140, Wis. Adm. Code, standards. Therefore, it does not meet the threshold criteria and will not be considered further.

2. Alternative B - Limited Action

This alternative does not prevent the migration of contaminated groundwater nor return groundwater at the Chrome Shop to its beneficial use, as an actual or potential groundwater source, within a reasonable period of time, nor prevent human contact or ingestion of impacted groundwater above NR140, Wis. Adm. Code, standards at the Chrome Shop. Therefore, it does not meet the threshold criteria and will not be considered further.

3. Alternative C - Enhanced Groundwater Recovery and Treatment
4. Alternative D - Groundwater Recovery and Off-Site Disposal
5. Alternative E - In-situ Enhancements for Groundwater Remediation
6. Alternative F - In-situ Stabilization and/or Solidification

These 4 alternatives contain all the contaminated groundwater at the site and prevent human contact or ingestion of contaminated groundwater through remediation and institutional controls. Alternative F restores groundwater at the Chrome Shop in a much shorter time frame than the other 3 alternatives.

b. Basement/Foundation Drain Exposure Mitigation Options

1. Alternative BA - No Action

This alternative does not prevent human contact with the contaminated soil, dust and groundwater near the residences near the Zinc Shop, so it does not meet the threshold criteria and will not be considered further.

2. Alternative BB - Limited Action

This alternative depends on the residents to heed posted warnings to prevent exposure to the contaminants.

3. Alternative BC - Sump Isolation
4. Alternative BD - Wall and Floor Isolation
5. Alternative BE - Basement Isolation with External Control

These 3 alternatives offer greater protection by constructing physical barriers to reduce exposure to contaminants in the basements and foundation drains. Option BE goes further by preventing seepage through the walls, and by collecting and treating contaminated water on the exterior of the walls.

2. Compliance with ARARs

a. Groundwater Control and Remediation Options

Ch. NR 140 is the major factor in determining compliance with ARARs. Alternatives C, D, E, and F all contain and control the further migration of contaminants into groundwater and ultimately reduce the contaminant concentrations in groundwater. Alternatives E and F actively restore the groundwater at the Chrome Shop. The remaining ARARs are met for all the alternatives with the possible exceptions of Alternatives E and F. Under Alternative E, injection of groundwater that may not meet NR 140 standards may be necessary to enhance the remediation in an effective manner. Therefore, this alternative may require a temporary exemption under NR 140.28(5) if it is implemented. Under Alternative F, there would need to be a determination as to whether stabilized and/or solidified soil will prevent chromium from leaching in concentrations greater than NR 140 standards.

b. Basement/Foundation Drain Exposure Mitigation Options

Alternative BB has no ARARs associated with it. Alternatives BC and BD may not meet ARARs for a discharge to the sanitary sewer, if the foundation drain water does not meet POTW pretreatment limits. The future characteristics of this water are unknown. Under alternative BE, the water from the foundation drain would be treated to meet POTW pretreatment standards prior to discharge to the sanitary sewer, so it would meet all ARARs.

PRIMARY BALANCING CRITERIA - Alternatives which satisfy the two threshold criteria are then evaluated according to the five primary balancing criteria.

3. Long-term Effectiveness and Permanence

a. Groundwater Control and Remediation Options

Alternatives C and D contain and remove for treatment the entire volume of contaminated groundwater over a very long period of time - more than 200 years. Alternative E contains the plume and removes a majority of the contaminated groundwater but leaves some portion of the chromium at the Chrome Shop stabilized in-situ. Alternative F contains the plume at the Zinc Shop site and stabilizes the contamination at the Chrome Shop site. The residual chrome under Alternatives E and F could represent a potential risk if the soil is ever excavated.

b. Basement/Foundation Drain Exposure Mitigation Options

Alternative BB has uncertain effectiveness because it relies on the residents to heed written warnings. There are no assurances that such warnings will be followed. Alternatives BC through BE provide physical barriers to the contamination, with BC providing the least reliable methods, while BE provides the greatest reliability.

4. Reduction of Toxicity, Mobility or Volume through Treatment

a. Groundwater Control and Remediation Options

Alternatives C, D, E, and F all offer a substantial reduction in mobility, toxicity, and volume through the removal and treatment of a majority of the dissolved subsurface contaminants. All of these alternatives include disposal of inorganic residuals at a licensed RCRA facility. All of these alternatives offer removal of VOCs from the subsurface environment and treatment, disposal, or dispersion in the atmosphere, none of which reduces the toxicity of these compounds. Alternatives E and F include the immobilization of chrome within the subsurface thus reducing both its toxicity and mobility.

b. Basement/Foundation Drain Exposure Mitigation Options

Alternative BB provides no treatment. Alternatives BC through BE all provide some treatment of the contaminated foundation drain water though treatment at the POTW. Alternative BE provides additional treatment at the pretreatment facility prior to discharge to the POTW.

5. Short-term Effectiveness

a. Groundwater Control and Remediation Options

Alternatives C and D require some mitigation of dust during construction of the proposed trench. Alternative E, with three trenches, also requires dust controls during construction. Alternative F, with 10,000 cubic yards of shallow soil mixing will require dust and VOC control during construction. Institutional controls will be used with all alternatives except the no action alternative, to reduce risks associated with the recovery and treatment operations. Workers would be protected under all alternatives by following standard health and safety procedures. Alternative E will require some additional monitoring to ensure that recharge does not impact areas outside of the current plume boundaries. Alternative F will require bench scale testing to verify the effectiveness of the stabilization and/or solidification. The construction time for all alternatives is essentially equal, requiring only two to six months.

The time to remediate the plumes is difficult to predict; however, Alternative F is expected to be the fastest for the Chrome Shop. Alternative E would be fastest for the Zinc Shop and second quickest for the Chrome Shop. Alternatives C and D would probably require two to five times longer than Alternative E. Even under the most optimistic case using Alternative E, the remediation may require as long as 250 - 500 years. This results from the fact that the soils at the site are very impermeable and do not yield groundwater in sufficient quantities to remediate the aquifer in a shorter time frame. No technologies, short of digging up or stabilizing the impacted areas, are available to speed the remediation appreciably.

b. Basement/Foundation Drain Exposure Mitigation Options

Alternatives BB though BE can be implemented in a few months. Alternatives BD and BE have additional possible short-term risks to construction workers. These risks may be significantly reduced by following proper health and safety procedures and by restricting access to unauthorized persons during construction.

6. Ease of Implementation

a. Groundwater Control and Remediation Options

Alternatives C and D use proven technologies and disposal options. Alternatives E and F use innovative techniques to speed remediation and the feasibility and effectiveness would require testing prior to implementation. Administrative issues such as determining property ownership, obtaining deed restrictions, negotiating a discharge and operating agreement with the local POTW, and obtaining a disposal agreement with a licensed RCRA facility are common to all the alternatives. All these issues appear to be fairly simple to resolve, although access to these services cannot be guaranteed for the lengthy time frames over which they may be required.

b. Basement/Foundation Drain Exposure Mitigation Options

All the alternatives use standard, established construction methods. Building access would have to be obtained from the owners for alternatives BC through BE.

7. Cost

The costs for the groundwater alternatives are presented in Table 4. The costs for the basement/foundation drain alternatives are presented in Table 5.

8. Agency Acceptance

Both the Department of Natural Resources and U.S. Environmental Protection Agency agree with the selection of alternative F for the groundwater and alternative BE for the basement/foundation drain remediation. The heads of both agencies have signed this decision document.

9. Community Acceptance

A Proposed Plan was prepared and released to the public on July 26, 1996. A 30 day public comment period was conducted between July 28, 1996 and August 26, 1996. A public hearing was held on the proposal on August 8, 1996. The substantive concerns of the public included: excluding interior frame walls and floor from the affected basements near the Zinc Shop; existence of "hot spots" of chrome contaminated soil near the Zinc Shop; the long time frame for groundwater cleanup at the Zinc Shop; impact on development potential for the Zinc Shop area; State and Federal experience in using stabilization/solidification for chromium contaminated groundwater; the extent of chromium contaminated groundwater; affected private property owners near the Chrome Shop want assurance (through a clean closure certificate) that their property will be "clean" when groundwater treatment is complete; landscaping of property after stabilization/solidification; use of chemicals for in-situ treatment of chromium and residual effect on groundwater; monitoring of local residents for possible heath effects; possibility of the remedial activities causing health problems to local residents; effect of pumping sumps over the last 3 years on chromium concentrations in groundwater; and a time frame for removing monitoring wells from private property near the Superfund sites. See the responsiveness summary, attached to this decision summary, for additional information on community comments and the WDNR responses to comments.

VIII. THE SELECTED REMEDY

Based upon consideration of the requirements of CERCLA, as amended by SARA, and the NCP, the detailed analysis of the alternatives and public comments, the Wisconsin Department of Natural Resources and U.S. EPA believe that alternative F, the selected remedy for groundwater, and alternative BE, the selected alternative for the basement/foundation drain remediation, are the most appropriate remedy for this site. The selected remedy for the site includes the following:

The contaminated groundwater at the Chrome Shop would be treated in-place by adding solid or liquid treatment chemicals that would stabilize the chromium. If necessary, the soil and groundwater would then be solidified by adding a cement-like substance. Stabilization and/or solidification should also address any other inorganic contaminants present at the site, in addition to chromium. A treatability study must be completed before using this treatment technology. Should the treatability study find that the alternative will achieve the enforcement standards (ES), or a level between the ES and the PAL, an NR 140.28 exemption would be considered. The granting of a NR 140.28 exemption would not require a revision to this decision document, but would be announced to the public, with comments requested. Should the study find that the alternative will not achieve remediation goals, then other alternatives would be evaluated (a likely alternative in this instance would be alternative C, with a reexamination of contaminated groundwater conveyance options). Stabilization and/or solidification cannot be used at the Zinc Shop because buildings, roads and utilities overlie the contaminated groundwater. After treatment, groundwater contamination should no longer exist at the Chrome Shop and the property can be put back into use.

The pretreatment building at the Chrome Shop would be removed and its equipment would be installed in a new building on the Zinc Shop property, eliminating the need to truck contaminated groundwater. The existing groundwater extraction system would continue to operate at the Zinc Shop.

A deed restriction would be placed on the Zinc and Chrome Shop properties to prevent activities which could affect or disturb the effectiveness of the remedy, including future subsurface excavation and water well installation. Groundwater monitoring would be conducted semi-annually at both sites, but the frequency of this monitoring could be modified in the future.

The basement walls and floors of two buildings near the Zinc Shop will be isolated from chromium seepage and foundation drains will be installed. If necessary, any additional soil contamination found near the Zinc Shop will be removed, treated and disposed of.

The remedial action objectives and cleanup goals for the site are presented in Section VI of this Decision Summary. The remedial action objectives include:

- Prevent migration of contaminants in groundwater and in the long term, to remediate the groundwater to protect human health and the environment and to meet state and federal standards; and

- Prevent human exposure to contaminated soils and groundwater that pose unacceptable risks.

In light of the site hydrogeologic conditions at the Zinc Shop, achievement of NR 140 Wis. Adm. Code standards may take a very extended period of time using currently existing technology. As a result, five (5) year reviews conducted pursuant to Sections 300.430 (f)(4)(ii) and 300.430 (f)(5)(iii)(C) of the NCP will assess whether newly developed technologies exist to achieve NR 140 Wis. Adm. Code standards in a significantly shorter time frame at the Zinc Shop. Should a review determine that it is not possible at that time to achieve the groundwater standards or to achieve further reductions at the Zinc Shop, then one of the options discussed in Section IX.A., below, may be exercised. The granting of a NR 140.28 exemption would not necessarily require a revision to this decision document, but would be announced to the public, with comments requested. A decision to invoke a technical impracticability waiver may require an amendment to this decision document.

The WDNR and the U.S. EPA believe the selected remedy will achieve the remedial action objectives for the site.

The estimated capital cost for this remedy is $1,363,100. Annual O&M cost estimate is $103,400. The total present worth cost estimate for the selected alternative is $2,646,200, based on operation over 30 years.

IX. STATUTORY DETERMINATION

A. Protection of Human Health and the Environment

The selected remedy provides adequate protection of human health and the environment through the implementation of the remedy components, including stabilization and/or solidification, groundwater extraction and treatment, basement isolation and monitoring. The remedy is expected to prevent persons from being exposed to contaminated soil and groundwater and contaminants inside of homes. The remedy is expected to restore groundwater quality to meet ch. NR 140 requirements and to minimize the movement of additional contaminants into groundwater at the Chrome Shop. The remedy is expected to contain and/or control contaminated groundwater, and ultimately meet ch. NR 140 requirements at the Zinc Shop.

Given the nature of the selected remedy and the site hydrogeologic conditions at the Zinc Shop, achievement of NR 140 Wis. Adm. Code standards and MCLs may take a very extended period of time at the Zinc Shop using currently existing technology. As a result, five (5) year reviews conducted pursuant to Sections 300.430 (f)(4)(ii) and

300.430 (f)(5)(iii)(C) of the NCP will assess whether newly developed technologies exist to achieve NR 140 Wis. Adm. Code standards in a significantly shorter time frame. Should a review determine that it is not possible at that time to achieve the groundwater standards or to achieve further reductions at the Zinc Shop, then one of the following options may be exercised:

- Continue with the action without modifications and wait until the next review to reassess the situation;

- Consider establishing an Alternative Concentration Limit under the substantive requirements of NR 140.28 Wis. Adm. Code, which can be no higher than the ES;

- Consider a technical impracticability waiver under Section 121(d) of CERCLA, which may be used to set an alternative groundwater goal higher than the ES or establish other approaches to groundwater containment or remediation that are protective of human health and the environment.

The granting of a NR 140.28 exemption would not necessarily require a revision to this decision document, but would be announced to the public, with comments requested. A decision to invoke a technical impracticability waiver may require an amendment to this decision document.

B. Attainment of ARARs

The selected remedy will be designed to meet all applicable, or relevant and appropriate requirements under federal and state environmental laws. The primary ARARs that will be achieved by the selected alternative are:

1. Action Specific ARARs

Resource Conservation and Recovery Act, as amended [42 U.S.C. Sec. 6901 et seq.], Subtitle C; Wisconsin Environmental Protection Law, Hazardous Waste Management Act [Wis. Stat. Sec. 144.60-74]

Most RCRA Subtitle C (hazardous waste) requirements are administered under the State of Wisconsin's implementing regulations. Contaminated soil and groundwater and spoils from any construction and any other contaminated material or waste that is to be managed as part of any remedy construction and operation shall be managed in accordance with applicable solid and/or hazardous waste requirements.

The selected remedy will comply with the following requirements:

Wis. Adm. Code NR 605; 40 CFR 261 - Identification of Hazardous Wastes. These regulations provide requirements for determining when a waste is hazardous. The substantive requirements of these regulations will apply to any on-site TCLP testing of residuals which may be disposed of off-site.

Wis. Adm. Code NR 615; 40 CFR 262 - Standards Applicable to Generators of Hazardous Waste. These regulations provide requirements for the shipment of wastes to treatment, storage or disposal facilities. These requirements may apply to on-site preparations for off-site shipment of treatment residuals and other wastes.

Wis. Adm. Code NR 620; Department of Transportation Hazardous Materials Transportation Act [49 U.S.C. Sec. 1801]; 40 CFR 263 - Standards Applicable to Transporters of Hazardous Waste. These statutes and regulations require record keeping, reporting and manifesting of waste shipments. These requirements may apply to on-site preparations for off-site shipment of treatment residuals and other wastes.

Wis. Adm. Code NR 630.10-17; 40 CFR 264, Subpart B - General Facility Requirements. These regulations establish substantive requirements for security, inspection, personnel training, and materials handling which are relevant and appropriate to on-site activities involving handling of hazardous materials. These requirements may apply to on-site preparations for off-site shipment of treatment residuals and other wastes.

Wis. Adm. Code NR 630.21-22; 40 CFR 264, Subpart D - Contingency Plan and Emergency Procedures. These regulations establish substantive requirements for emergency planning which are relevant and appropriate for on-site activities which may involve handling of hazardous substances.

Wis. Adm. Code NR 675; 40 CFR 268 - Land Disposal Restrictions. These regulations require that hazardous wastes cannot be land disposed unless they satisfy specified treatment standards. These regulations also impose record keeping requirements on such wastes. These requirements apply to on-site activities related to off-site disposal of any treatment residues or other hazardous wastes. Wis. Adm. Code NR 605; 40 CFR 261 - Identification of Hazardous Wastes. This code provides requirements for determining when a waste is hazardous. The substantive requirements of these regulations will apply to any on-site TCLP testing of residuals which may be disposed of off-site.

Resource Conservation and Recovery Act, as amended [42 U.S.C. Sec. 6901 et seq.], Subtitle D; Wisconsin Environmental Protection Law, Subchapter IV - Solid Waste [Wis. Stat. Sec. 144.43-47]

Contaminated soil and groundwater and spoils from any construction and any other contaminated material or waste that is not a hazardous waste that is to be managed as part of any remedy construction and operation shall be managed in accordance with applicable ch. NR 500, WAC series solid waste requirements. It may be possible to dispose of such material or waste in a solid waste landfill facility, provided that facility is approved by the WDNR to accept such material or waste. Hauling companies licensed by WDNR to transport solid waste would be used to take such waste or material to the approved solid waste facility.

Occupational Safety and Health Administration (OSHA) - Regulates worker safety.

Clean Water Act of 1977, as amended [33 U.S.C. Sec. 1317]

Wis. Adm. Code 108 and 211; 40 CFR 403 - Pretreatment Standards - These regulations prohibit discharges to POTWs which pass through or interfere with the operation or performance of the POTW. The requirements of these regulations apply to the groundwater which is collected and discharged to the City of DePere POTW.

2. Chemical Specific ARARs

Safe Drinking Water Act [40 U.S.C. Sec. 300 et seq.]

Wis. Adm. Code NR 109; 40 CFR 141 - Maximum Contaminant Levels (MCLs) - MCLs establish drinking water standards for potential and actual drinking water sources. The selected remedy is intended to achieve compliance with MCLs and non-zero Maximum Contaminant Level Goals.

Wis. Adm. Code NR 140 - Groundwater Quality Standards - This code provides for groundwater quality standards including Preventive Action Limits (PALs), Enforcement Standards (ESs) and (Wisconsin) Alternative Concentration Limits (WACLs). The selected remedy is intended to achieve compliance with PALs at and beyond the point of standards application. To the extent the Department subsequently determines that it is not technically or economically feasible to achieve PALs, NR 140.28 provides substantive standards for granting exemptions from the requirement to achieve PALs. Such exemption levels may not be higher than the ESs, for the compounds of concern at this site.

In light of the site hydrogeologic conditions at the Zinc Shop, achievement of NR 140 Wis. Adm. Code standards may take a very extended period of time using currently existing technology. As a result, five (5) year reviews conducted pursuant to Sections 300.430 (f)(4)(ii) and 300.430 (f)(5)(iii)(C) of the NCP will assess whether newly developed technologies exist to achieve NR 140 Wis. Adm. Code standards in a significantly shorter time frame at the Zinc Shop. Should a review determine that it is not possible at that time to achieve the groundwater standards or to achieve further reductions at the Zinc Shop, then one of the options discussed in Section IX.A., above, may be exercised. The granting of a NR 140.28 exemption would not necessarily require a revision to this decision document, but would be announced to the public, with comments requested. A decision to invoke a technical impracticability waiver may require an amendment to this decision document.

C. Cost Effectiveness

The selected remedy provides for overall cost effectiveness. It has a total present worth cost that is similar to some of the other alternatives evaluated, but provides the most protection and effectiveness in the least amount of time of all the alternatives.

D. Use of Permanent Solutions and Alternative Treatment Technologies

The selected alternative utilizes a permanent and alternative treatment technology, in-situ stabilization and/or solidification. The existing collection sump and new external foundation drains at the Zinc Shop and residences will reduce the amount of contaminants in the groundwater over time.

E. Preference for Treatment as a Principal Element

By treating the contaminated soil in place at the Chrome shop and treating extracted groundwater at the Zinc Shop prior to discharge to the POTW, the remedy satisfies the statutory preference for remedies that employ treatment of the principal contaminant threat to permanently and significantly reduce toxicity, mobility or volume through treatment.

RESPONSIVENESS SUMMARY

This Responsiveness Summary has been prepared to meet the requirements of Sections 113 (k) (2) (B) (iv) and 117(b) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), which requires the United States Environmental Protection Agency (EPA) or the state, for state lead sites, to respond "... to each of the significant comments, criticisms, and new data submitted in written or oral presentations" on a proposed plan or draft Record of Decision for the remedial action. The Responsiveness Summary addresses concerns by the public and potentially responsible parties (PRPs) in written and oral comments received by the state regarding the proposed remedy at the Better Brite site.

A. Proposed Plan (PP) and Public Comment Period

The Proposed Plan for the site was made available for public comment in July, 1996. A public meeting to explain the Proposed Plan, and to receive public comments was held on August 8, 1996. All comments which were received by the Department prior to the end of the public comment period, including those expressed verbally at the public meeting, were considered in making the final decision and are addressed in this Responsiveness Summary.

B. Community Interest

Interest by residents near the site is high.

C. Summary of Significant Public Comments

Comments received during the public comment period are summarized below. Some of the comments are paraphrased to effectively summarize them in this document.

Comment: Alternative BE in the Proposed Plan includes constructing interior wood frame walls with sheet rock and a plywood floor in two affected basements near the Zinc Shop. The wood frame walls would restrict access to and monitoring of the basement foundation for chromium infiltration. In addition, the basements have a history of flooding and the wood walls/floors would exacerbate cleanup efforts if future flooding occurs. Finally, the basement in the home at 401 S. 6th Street is quite small and would be even more restricted in space if interior walls were built.

Response: Due to the above comments, the Agency has chosen to eliminate construction of interior walls and floors from the chosen basement/foundation drain mitigation option, Alternative BE.

Comment: The owner of the property at [redacted] Street believes chrome contaminated soil exists on his property east of the Zinc Shop.

Response: Soil testing off the Zinc Shop property was not conducted in 1993 during the soil removal action. Therefore, this ROD proposes that additional soil testing be conducted on properties surrounding the Zinc Shop. If contaminated soil is discovered, it will be excavated and properly treated and disposed.

Comment: What kind of time frame can be expected for cleanup at the off-site areas at the Zinc Shop?

Response: We estimate that the cleanup time will be greater than 200 years. One flushing of contaminated groundwater at the Zinc Shop is estimated to take 50 years and several flushings will be necessary to reduce chromium levels to State groundwater standards. It is very difficult to accurately estimate the cleanup time in the tight clay soils that exist at the Zinc Shop.

Comment: The continuing contamination at the Zinc Shop will have some impact on the salability of affected off-site areas near the Zinc Shop.

Response: This may well be the case. City water is provided to the entire area. The only real limitation on use of off site properties within the groundwater contamination zone is that foundation drains need to be provided for basements below the water table.

Comment: What is the success rate for stabilization and/or solidification? Does it totally cleanup the contamination?

Response: The use of stabilization and/or solidification is very site specific. Treatability testing will be done before the technology is designed for the Chrome Shop to ensure the most effective treatment occurs. Only after the treatability tests will we be able to determine "how clean" the groundwater and soils will be after treatment. We have not used this technology to treat chromium in the State of Wisconsin. We have used stabilization/solidification successfully on other types of contaminants and chromium has been successfully treated in other states.

Comment: How does the WDNR know the western extent of groundwater contamination at the Chrome Shop?

Response: We know the extent of contamination lies between well nests 109 and 110. In addition, a bedrock divide and a storm water drain runs between these two well locations and we believe the divide and storm water drain are defining the western extent of groundwater contamination at this time.

Comment: Will off-site property owners at the Chrome Shop be given a document saying their land is clean and no one in the future has to do any additional cleanup?

Response: The WDNR does give "clean closure letters" to property owners where contamination has been cleaned to applicable standards. Such a letter could be given to the landowners where the stabilization and/or solidification will be performed. We will be confirming that the groundwater has been cleaned up by groundwater monitoring after treatment.

Comment: Will the property that is treated at the Chrome Shop be landscaped after treatment?

Response: The property at the Chrome Shop as well as off-site property that is affected by the treatment process will be re-landscaped to ensure useability and aesthetics of the land.

Comment: It seems strange that you have to use chemicals to get rid of chemicals.

Response: One of the important aspects of the treatability study is to find suitable treatment chemicals that won't cause harm to the environment. Usually a chemical called ferrous sulfate is used to change the chromium from the toxic hexavalent type to the non-toxic trivalent kind. In the treatment process, the ferrous iron is changed to ferric iron, which holds tightly to the soil particles and doesn't migrate in the groundwater. Neither ferrous nor ferric iron is toxic. Likewise, sulfate is not toxic.

Comment: Is there any provision for residents near the Better Brite sites that get sick and need long-term care?

Response: There are no provisions for such care. Rather, the Division of Health works hard to ensure that residents are not exposed to conditions that cause ill health effects. Advise is given to residents (such as those with chromium exposure in their basement) on how to reduce their exposure. In addition, our proposed course of action should eliminate exposure for those residents.

Comment: Is there a possibility that remedial activities will cause ill health effects for local residents?

Response: The treatment process at the Chrome Shop provides for protection of workers and residents by using a volatile hood to control dust and emissions. Any excavation of contaminated soil at the Zinc Shop will provide for dust control, which is the main concern for chromium contaminated soil.

Comment: Is the groundwater showing a decrease of toxicity now?

Response: The large sumps have been operating at the Zinc and Chrome Shops for approximately 3 years. Because groundwater travels so slowly in these clay soils, we would not expect to see reduced chromium concentrations in the groundwater monitoring wells near the sites. We have only collected the water closest to the sumps, which is the most contaminated groundwater. Toxicity has been reduced by removing this water, but the reduction is likely not demonstrated in the groundwater monitoring wells.

Comment: When will the monitoring wells that are currently located on private property be removed?

Response: The WDNR's consultant is evaluating which wells can be removed and which need to be retained for future monitoring. We know that it can be an inconvenience to have the wells on private property, as well as raise red flags for potential buyers.

SAMPLING LOCATION MAPS

HAS BEEN REDACTED – 12 PAGES

CONTAINS POTENTIAL PERSONALLY-IDENTIFYING INFORMATION

TABLE 1
SUMMARY OF CONFIRMED NR 140 GROUNDWATER ENFORCEMENT STANDARD EXCEEDANCES

BETTER BRITE CHROME SHOP

CONSTITUENTS	ES	PAL	Chrome Sump		French Drain		MW-108		MW-108A	
DATE			8/94	10/94	8/94	10/94	8/94	10/94	8/94	10/94
Chromium	100	10	694,000	297,000	22,000	31,700				
Manganese*	50	25			123	197	55.9	67.1	55.0	132
VOCS										
1,1,1-Trichloroethane	200	40	1,100	950						
Tetrachloroethene	5	0.5	59	22						
Trichloroethene	5	0.5	59	39						

CONSTITUENTS	ES	PAL	MW-109		MW-110		MW-113		
DATE			8/94	10/94	8/94	10/94	8/94	10/94	5/95
Chromium	100	10	9,570	1,980					
Manganese*	50	25			64.3	126	191	391	545

* = Public Welfare Standard   Units are in ug/l (ppb)   Blank spaces = ES not exceeded

NOTE: This table summarizes all NR 140, WI Adm. Code, Enforcement Standard Exceedances that were detected in two rounds of sampling. Enforcement Standards were exceeded in one sampling round (but not confirmed) for: Antimony; Arsenic; Beryllium; Cadmium; Silver; Thallium; 1,1-Dichloroethene; 1,1,1-Trichloroethane; Carbon Tetrachloride; 1,2-Dichloroethane; and 1,1,2-Trichloroethane.

TABLE 1 (p. 2)

SUMMARY OF CONFIRMED NR 140 GROUNDWATER ENFORCEMENT STANDARD EXCEEDANCES

BETTER BRITE ZINC SHOP

CONSTITUENTS	ES	PAL	MW-4		MW-4A		MW-4B		MW-5	
DATE			8/94	10/94	8/94	10/94	8/94	10/94	8/94	10/94
Chromium	100	10							827	299
Manganese*	50	25	387	160	255	258	103	86.1		

CONSTITUENTS	ES	PAL	MW-6		MW-7		MW-9		MW-10	
DATE			8/94	10/94	8/94	10/94	8/94	10/94	8/94	10/94
Chromium	100	10	39,000	41,900			697	442	53,100	43,500
Nickel	100	20							146	137
Manganese*	50	25	63.6	59.8	103	55.8				

CONSTITUENTS	ES	PAL	MW-12		MW-13		Zinc Sump	
DATE			3/95	5/95	3/95	5/95	8/94	10/94
Chromium	100	10					209,000	277,000
Iron*	300	150			732	6,240		
Manganese*	50	25	84.5	77.4	764	1,250		
Cyanide	200	40					939	570

* = Public Welfare Standard   Units are in ug/l (ppb)   Blank spaces = ES not exceeded

Table 2 Chrome Shop Contaminants of Concern

Contaminant	Ground Water (ppb)	
	High	Enforcement Standard
INORGANICS		
Aluminum	1,340	NA
Antimony	1,370	6
Arsenic	902	50
Beryllium	9.0	4
Cadmium	17.7	5
Calcium	331,000	NA
Cobalt	57.3	NA
Chromium	694,000	100
Hexavalent Cr	620,000	NA
Iron	315	300*
Magnesium	200,00	NA
Manganese	391	50*
Nickel	173	100
Potassium	27,500	NA
Silver	66.6	50
Sodium	270,000	NA
Thallium	111	2
Vanadium	7,310	NA
VOLATILE ORGANIC COMPOUNDS		
Carbon Disulfide	32	NA
1,1-Dichloroethene	7	7
Tetrachloroethene	59	5
1,1,1-Trichloroethane	1,100	200
Trichloroethene	59	5

Notes: * = Public Welfare Standard
High = Highest detected concentration
NA = Not Available

Enforcement standard as regulated under WAC NR140

Table 3 Zinc Shop Contaminants of Concern

Contaminant	Ground Water (ppb)	
	High	Enforcement Standard
INORGANICS		
Aluminum	151	NA
Antimony	3,190	6
Beryllium	5.4	4
Calcium	236,000	NA
Cobalt	124	NA
Chromium	277,000	100
Hexavalent Cr	144,900	NA
Cyanide	939	200
Iron	1,290	300*
Lead	18.2	15
Magnesium	155,000	NA
Manganese	387	50*
Nickel	146	100
Potassium	6,820	NA
Sodium	134,000	NA
Thallium	60.2	2
Vanadium	114	NA
VOLATILE ORGANIC COMPOUNDS		
Carbon Disulfide	32	NA
Carbon Tetrachloride	5	5
1,2-Dichloroethane	6	5
1,1,2-Trichloroethane	3	0.6

Notes: * = Public Welfare Standard
High = Highest detected concentration
NA = Not Available
Enforcement Standard as regulated under WAC NR140

Better Brite ROD Table 4 Costs for Groundwater Alternatives

EVALUATION CRITERIA	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
	No Action	Limited Action	Ground-Water Recovery and Treatment Enhancement	Ground-Water Recovery and Off-Site Disposal	In Situ Enhancements	In Situ Solidification/Stabilization
Cost	Ground water monitoring only Capital $ 0 Annual O&M $ 87,200 Present Worth $1,082,100	Moderate costs Capital $ 5,000 Annual O&M $ 118,800 Present Worth $1,478,700	Moderate Costs Capital $ 142,600 Annual O&M $ 121,200 Present Worth $1,646,100	Moderate Costs Capital $ 237,700 Annual O&M $ 164,300 Present Worth $2,275,800	Moderate to High Costs Capital $ 517,300 Annual O&M $ 170,680 Present Worth $2,635,300	Moderate to High costs Capital $1,318,300 Annual O&M $ 103,400 Present Worth $2,601,400

Better Brite ROD Table 5 Costs for Basement/Foundation Drain Alternatives

Basement/Foundation Drain Alternatives	Alternative BA	Alternative BB	Alternative BC	Alternative BD	Alternative BE
	No Action	Limited Action	Sump Isolation	Wall and Floor Isolation	Basement Isolation
Cost	$ 0	$ 6,400	$ 8,900	$ 23,900	$ 44,800

Administrative Record Index
Better Brite Chrome and Zinc, De Pere WI
FID# 405011090

No.	Date	Title/Regarding	Pg.	Author	Recipient	Doc.Type
	9/24/86	Action Memo	5	Browning	Adamkus	memo
	2/2/87	Notice of Noncompliance	2	Reyburn	Zenner	letter
	10/21/87	Soil Boring, Mon. Well, GW Sampling	100+	STS	DNR	report
	9/15/88	Emergency Action	2	Reyburn	Giesfeldt	memo
	10/31/88	Sale of Property	1	Zenner	Reyburn	letter
	11/7/88	Emergency Action	2	Reyburn	Giesfeldt	letter
	12/2/88	Summary of Potential Impacts	3	Stoll	Barnum	memo
	1/18/89	Comments on Remedy for GW	1	Giesfeldt	Faryan	letter
	3/15/90	Update/Letters from Public	9	Weissbach	file	memo
	5/7/90	Administrative Order on Consent	16	Bowden	Zenner	order
	6/4/90	Unilateral Administrative Order	22	Ullrich	Zenner	order
	5/1/91	Preliminary Health Assessment	36	DOH	file	report
	5/91	Health Factsheet	4	DOH	public	factsheet

5/9/91	Public Meeting Transcript	87	Bay Rprtg.	WDNR	report
5/16/91	Comments/Proposed Plan	14	Koehn	public	memo
5/22/91	Proposed Plan/Interim Action	1	Boushon	Koehn	memo
7/22/91	Community Relations Plan	31	DNR	file	report
10/15/91	Monitoring Well Installation	1	Baumeister	Koehn	memo
10/18/91	Monitoring Well Installation	3	Koehn	Linnear	letter
10/23/91	Private Well Survey and Abandonment	2	Koehn	Linnear	letter
11/20/91	Private Well Survey	5	Koehn	file	report
11/21/91	Monitoring Well Survey	5	Koehn	file	report
12/12/91	Chrome Treatment of Groundwater	25	Faryan	file	report
1/29/92	Zinc Shop GW Analytical Results	7	Koehn	file	memo
2/3/92	Hazardous Waste Determination	1	Lynch	Koehn	memo
3/13/92	Site Evaluation Report/RIFS Revision/Task 1 Vol. I, II	>100	Hydro-Search	WDNR	report
7/30/92	Amended Action Memo	11	Nied	Ullrich	memo
8/7/92	Removal Action	3	Mayka	Giesfeldt	letter
9/8/92	Pollution Report	1	Nied	EPA/DNR	memo
9/17/92	Status Letter to Public	3	Cozza	public	letter

9/21/92	Action Memo	13	Faryan	Adamkus	memo
10/12/92	Comments on QAPP, SAP, DMP and HSP	35	Fassbender	Koehn	letter
10/13/92	Comments on Draft Project Plans	34	Fassbender	Koehn	letter
10/14/92	RI/FS Better Brite Plating Inc.	>100	Hydro-Search	WDNR	report
10/19/92	Remedy Selection for Removal Action	38	Cozza	Edelstein	letter
10/28/92	Response re. Insitu Treatment	3	Cozza	Edelstein	letter
10/29/92	Pollution Report	1	Nied	EPA/DNR	memo
11/5/92	Pollution Report	1	Nied	EPA/DNR	memo
11/12/92	Pollution Report	1	Nied	EPA/DNR	memo
11/13/92	Alternatives Evaluation	6	Edelstein	Cozza	letter
11/19/92	Pollution Report	1	Nied	EPA/DNR	memo
12/3/92	Pollution Report	1	Nied	EPA/DNR	memo
12/10/92	Pollution Report	1	Nied	EPA/DNR	memo
12/17/92	Pollution Report	1	Nied	EPA/DNR	memo
12/23/92	Pollution Report	1	Nied	EPA/DNR	memo
1/7/93	TAT Report	35	E&E, Inc.	EPA	report
1/7/93	Pollution Report	1	Nied	EPA/DNR	memo
1/14/93	Pollution Report	1	Nied	EPA/DNR	memo

1/22/93	Pollution Report	1	Nied	EPA/DNR	memo
1/29/93	Pollution Report	1	Nied	EPA/DNR	memo
2/93	Health Factsheet	4	DOH	public	factsheet
2/93	EPA Factsheet	2	EPA	public	factsheet
2/4/93	Pollution Report	1	Nied	DNR/EPA	memo
2/8/93	Health Evaluation	1	Bro	Cozza	memo
2/11/93	Pollution Report	1	Nied	DNR/EPA	memo
2/19/93	Pollution Report	1	Nied	DNR/EPA	memo
2/23/93	Trip Report re. Public Meeting	2	Pastor	Lesser	memo
3/4/93	Pollution Report	1	Nied	EPA/DNR	memo
3/8/93	Excavation Inorganic Sampling Results	32	Cozza	file	report
3/11/93	Pollution Report	1	Nied	EPA/DNR	memo
3/16/93	Pollution Report	1	Nied	EPA/DNR	memo
3/26/93	Excavation Organic Sampling Results	34	Cozza	file	report
3/24/93	Pollution Report	1	Nied	EPA/DNR	memo
4/1/93	Pollution Report	1	Nied	EPA/DNR	memo
4/8/93	Pollution Report	1	Nied	EPA/DNR	memo
4/15/93	Pollution Report	1	Nied	EPA/DNR	memo
4/22/93	Pollution Report	1	Nied	EPA/DNR	memo

4/28/93	RI/FS Status Meeting	4	Linnear	Koehn	letter
4/29/93	Pollution Report	1	Nied	EPA/DNR	memo
5/6/93	Pollution Report	1	Nied	EPA/DNR	memo
5/13/93	Pollution Report	1	Nied	EPA/DNR	memo
5/25/93	Pollution Report	1	Nied	EPA/DNR	memo
5/27/93	Modified Scope for RI/FS	5	Koehn	Linnear	letter
6/1/93	Pollution Report	1	Nied	EPA/DNR	memo
6/4/93	Pollution Report	1	Nied	EPA/DNR	memo
6/18/93	Pollution Report	1	Nied	EPA/DNR	memo
8/2/93	Pollution Report	3	Nied	EPA/DNR	memo
9/15/93	Chrome Shop Surface Water Samples	7	Koehn	file	memo
2/25/94	Monitoring Well Evaluation	20	Manthey	Kozol	letter
2/28/94	SAP, RIFS - Revision/Task 2	>100	Hydro-Search	WDNR	report
2/28/94	RI/FS Workplan	>100	Hydro-Search	WDNR	report
5/17/94	Approval of Workplan, SAP	1	Kozol	Fassbender	letter
6/94	SF Factsheet	4	DNR	public	factsheet
12/14/94	GW Impacts/Add'l Investigation	32	Manthey	Freiberg	letter
9/18/95	Remedial Investigation	>100	Hydro-Search	WDNR	report

Vol. I, II, III

3/14/96	Feasibility Study	100+	Hydro-Search	DNR	report
7/96	Proposed Plan	15	DNR	Public	factsheet
7/19/96	Comments on PP	3	Peterson	Evanson	letter
7/24/96	Revisions to Focused FS	30+	Hydro-Search	DNR	letters
8/7/96	Public Health Consultation	7	WDOH	DNR	report
9/ /96	Record of Decision				