Contract No. 68-01-6669

Reference 12
Better Brite

EPA

U.S. ENVIRONMENTAL PROTECTION AGENCY

TECHNICAL ASSISTANCE TEAM

Region V

ROY F. WESTON, INC.
Spill Prevention & Emergency Response Division
In Association with Jacobs Engineering Group Inc. Tetra Tech Inc.
and ICF Incorporated

WESTON
DESIGNERS CONSULTANTS

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UNITED STATES GOVERNMENT

2-Way Memo

Subject: Better-Brite

INSTRUCTIONS

Use routing symbols whenever possible.

SENDER (*Originator of message*):
Use brief, informal language.
Conserve space.
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Reply below the message, keep one copy, return one copy.

To : Jim Reyburn
WDNR
1125 N Military Ave.
P.O. Box 10448
Green Bay, Wi. 54307-0448

DATE OF MESSAGE: 10/8/86

ROUTING SYMBOL:

SIGNATURE OF ORIGINATOR: Steven J.

TITLE OF ORIGINATOR: OSC

FOLD

INITIAL MESSAGE

Jim,

Enclosed is a copy of the EAP and Action Memo for Better Brite. Please keep the reports confidential until legal matters are resolved with the responsible parties.

Thank you,

REPLY MESSAGE

RECEIVED D.N.R.
OCT 13 1986
LAKE MICHIGAN DIST. HQ.

From :

DATE OF REPLY

ROUTING SYMBOL

SIGNATURE OF REPLIER

TITLE OF REPLIER

OPTIONAL FORM 27 (Rev. 7-77)

SITE ASSESSMENT AND

EMERGENCY ACTION PLAN

FOR

BETTER BRITE
DEPERE, WISCONSIN

Prepared For:

U.S. Environmental Protection Agency
Region V
230 S. Dearborn Street
Chicago, Illinois

CONTRACT NO. 68-95-0017

TAT-05-F-01078

TDD# 5-8604-27

Prepared by:

WESTON-SPER
Technical Assistance Team
Region V

September 1986

1.0 INTRODUCTION

On April 17, 1986, the U.S. Environmental Protection Agency (U.S. EPA), acting on a request from the Wisconsin Department of Natural Resources (WDNR), tasked the Technical Assistance Team (TAT) to conduct a site investigation of the Better-Brite Plating, Inc., facility in DePere, Wisconsin. The WDNR requested assistance from the U.S. EPA in an effort to initiate a cleanup of the then-closed plating facility. Subsequent to the site investigation, the TAT determined that a removal action at the reopened facility is warranted. Further sampling, however, will be needed to determine the extent of contamination. The report presented herein details the TAT's findings pursuant to this task including a review of WDNR files, and also provides cost estimates of recommendations to mitigate the hazards posed by the site.

2.0 SITE LOCATION AND HISTORY

The Better-Brite Plating Company is located at 519 Lande Street, Brown County, in DePere, Wisconsin (approximate population 14,900) (Figure 1). The site, which covers about 1.5 acres, is situated approximately one-quarter mile west of the Fox River in a primarily residential area. It is bordered to the north by Lande Street, residential homes to the south and west, and railroad tracks and residences to the east (Figure 2).

Better-Brite Plating was founded at 315 South Sixth Street in DePere, which is currently the site of a zinc plating operation. In the late 1970s, Better-Brite Plating opened a chrome plating facility at 519 Lande Street. The Lande Street facility primarily engaged in chrome plating 15-20 foot rollers for paper mills in the area.

According to the WDNR files and Mr. Zenner, the current operator of Better-Brite, chromic acid spilled out the east door of the building sometime in February 1979. Mr. Zenner estimated that the spill contained 2,200 gallons of chrome plating solution of approximately 20 ounces of chrome sulfate per gallon concentration. Under the supervision of the WDNR, the Better-Brite Company moved the frozen chromic rinse water inside the facility before discharging the melted ice into the DePere sanitary/sewer system. Subsequently, the WDNR ordered Better-Brite to install a treatment system for the rinse water.

In addition, ground water monitoring wells, a surface water holding pond, and a retention berm were constructed along the southern and western perimeters of the site in August 1979. Contaminated soils from neighboring properties south and west of the Better-Brite building were excavated and deposited on the Better-Brite property.

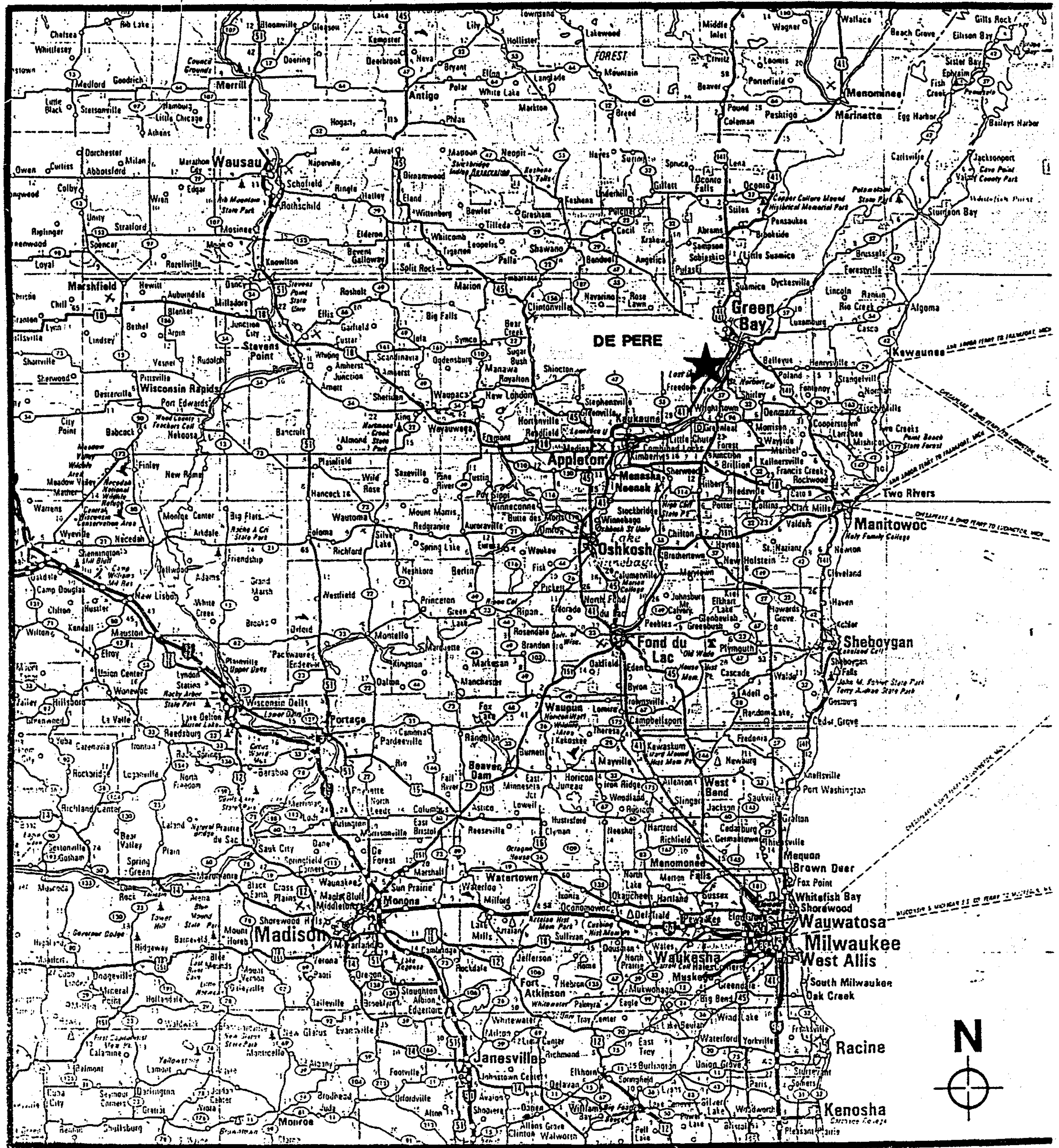


FIGURE 1 BETTER-BRITE PLATING, INC.

519 LANDE STREET

DE PERE, WISCONSIN

ROY F. WESTON, INC.
WESTON
DESIGNERS CONSULTANTS

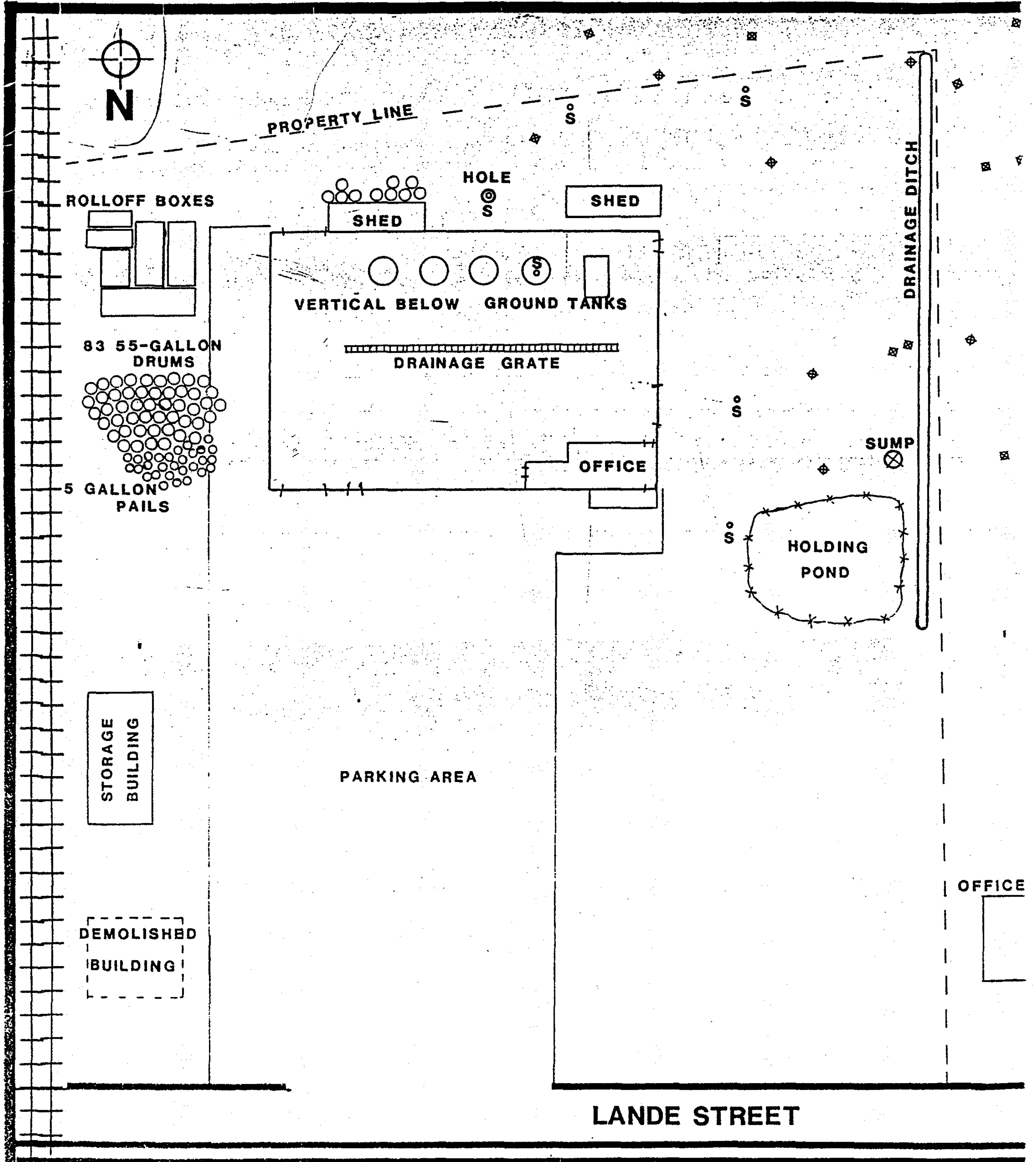


FIGURE 2 BETTER-BRITE PLATING, INC.

J.K.
5/23/86

519 LANDE STREET
DE PERE, WISCONSIN

ROY F. WESTON, INC.

NO SCALE

/ \ DOOR
/ \ GARAGE DOOR
⊕ MONITORING WELL
S ○ SAMPLE LOCATIO

Several subsequent inspections conducted by the WDNR at the Better-Brite facility revealed extensive chromium contamination on the site. As a result, the Wisconsin Attorney General, on behalf of WDNR, filed suit on February 26, 1980, in Brown County Circuit Court ordering Better-Brite Plating to clean up their facilities. The suit cited nine instances between December 1978 and July 1979 during which plating wastes were dumped or spilled on the ground outside the loading dock (west of the building) of the Lande Street building (Attachment B). WDNR files indicate that some of the yellow liquid spilled on the ground contained 1,000 ppm total chrome and 1.0 ppm hexavalent chrome. Better-Brite Plating did not have a discharge permit nor did they notify the WDNR concerning the release of a hazardous substance into the environment.

Perhaps more environmentally hazardous than the spills, though, was the history of tank leakage Mr. Zenner noticed when he gained control of Better-Brite. Between 20,000 and 60,000 gallons of plating solution was estimated by Mr. Zenner to have leaked from the tanks during the seven years of plating operations.

Better-Brite Plating filed for bankruptcy and closed the Lande Street operations in October 1985; however, the South Sixth Street facility is still in operation. Liquidation of the company is being handled by the creditors for the Better-Brite Company through the appointed Trustee, Mr. John Zenner. According to Mr. Zenner, Better-Brite, Inc., purchased a facility in 1985 in nearby Kaukauna, Wisconsin, to treat plating wastes from the South Sixth and Lande street plants. The Kaukauna plant closed on April 21, 1986, due to lack of proper operating permits.

3.0 SITE ASSESSMENT

On April 21, 1986, U.S. EPA On-Scene Coordinator (OSC) William Simes and TAT members Jeffrey Bard and William Scoville met with Mr. John Zenner, the trustee, for a site inspection of the Better-Brite Plating facility at 519 Lande Street. During a walk-through tour of the site, Mr. Zenner indicated that most of the plating equipment no longer remained at this location, and that the former owners allegedly had broken into the office and stolen company records.

As previously indicated, the site is located in a primarily residential area. Residences border the site to the south and west. Access to the site was unrestricted. The building that contained the chrome plating operations was located on the southeast one-quarter of the site, approximately 200 feet from Lande Street (Figure 2). The northern portion of the site contained a gravel entry path and parking lot. Located immediately along the eastern boundary, was the foundation of a demolished storage silo. A small storage building was located directly to the south of the facility. Two puddles of a yellowish liquid were noticed in the parking lot near the storage building (see photographs in Attachment A).

According to WDNR files, chrome-contaminated liquid was dumped on the ground numerous times near the western end of the building. This area contained stressed vegetation and patches void of vegetation. In an area near the northwestern corner of the building was a small holding pond; this pond, according to Mr. Zenner, at one time had overflowed into adjacent residential property. Subsequent to this spill, a dike was constructed, as requested by WDNR, along the western boundary to contain the liquid in the holding pond. A sump located about 10 yards from the pond collected liquid that was pumped into the sanitary sewer where it was ultimately treated at the DePere wastewater treatment plant, with the city's permission.

A series of ground water monitoring wells were located along the western and southern boundaries of the site. One set of wells was located on the Better-Brite property and another on adjacent private property off the western and southern boundaries.

More stressed vegetation was observed close to the southern end of the site. The two small sheds located behind the building were virtually empty. Thirteen 55-gallon drums were situated behind one of the sheds. Some of the drums were slightly rusted and bulging (Attachment A). A few of the drums had labels identifying them as possibly containing 1,1,1-trichloroethane (TCA) and methyl ethyl ketone (MEK).

On the southeastern side of the building, six tarp-covered plating vats of liquid were found. This liquid, according to Mr. Zenner, was pumped from tanks inside the building. One vat contained a small pool of what appeared to be rain water on top of the loosely-secured tarp.

An area on the northeastern side of the building contained approximately 80 55-gallon drums some of which were labeled TCA, MEK, and diesel fuel. Several other drums were placarded as flammables. In addition, approximately 30 5-gallon pails were found next to the drums and were labeled chromic acid.

An inspection of the interior of the building revealed that most of the equipment had been removed. Furthermore, two Better-Brite, Inc., employees were removing the remaining equipment and supplies from the building. Four vertical plating tanks, 20 feet deep, were located inside along the southern wall inside the building. Three of these tanks contained approximately 1 1/2 feet of liquid material. The remaining tank (tank #4) (Figure 2), which had stored muriatic acid (hydrochloric acid) according to Mr. Zenner, contained about 14 feet of liquid. Mr. Zenner also stated that after they removed the liner from tank #4, the tank filled up with water. Tank #1 reportedly had contained degreaser, and waste plating solutions reportedly were contained in tanks #2 and #3. Another underground tank next to tank #4 had been removed by Better-Brite to evaluate the extent of leakage from the tanks.

The OSC and the TAT concluded their discussions with Mr. Zenner in a house located on Lande Street adjacent to the northwestern corner of the property, which was being used as an office and storage for company furniture and files. After obtaining permission from Mr. Zenner to return the next morning to obtain samples, the OSC and the TAT departed the site.

The OSC and the TAT returned to the site the following morning, April 22, 1986, and met with Mr. James Rayburn of the WDNR's Green Bay office. After a brief review of the site conditions, the TAT prepared a site map, took photographs, and commenced sampling activities. The TAT conducted sampling in Level C. Two surface soil samples were collected from the southern and southwestern sides of the site and one soil sample was taken with an auger to a depth of 1 1/2 feet in a drainage trench on the western side of the site (Figure 2). In addition, a sediment sample was retrieved from standing water in a pit near the holding pond (Attachment A). Two liquid samples were also collected, one from a hole located behind the building and the other from tank #4 inside the building. The hole encountered behind the building was approximately two feet deep and may have been buried 55-gallon drum with the top removed.

An air monitoring survey of the site utilizing a HNU photoionization detector revealed no readings of organic vapors above background levels, except a reading of a 5-8 ppm near the tarp-covered vats. It appeared that most of the 55-gallon drums found were either empty or contained very small amounts of liquid. Following the sampling and air monitoring activities, the OSC and the TAT concluded their site investigation.

Because the samples collected by the TAT on April 22 were not analyzed for hexavalent chromium, additional samples were obtained on June 23, 1986, during a subsequent visit by TAT members Jeffrey Stofferahn and Wendy Martinez along with OSCs William Simes and Kenneth Thiesen. Additional soil and aqueous samples were collected during this visit. Noted changes at the site from the April inspection to the June inspection included the removal of the four underground tanks and subsequent staging of these tanks inside the building. The tank bottoms were damaged. Most of the southern half of the concrete slab floor inside the building had been removed to a depth of approximately six inches, revealing sandy material. Two of the holes were filled with discolored ground water: one hole contained yellow-orange water with stained soil, and the other hole contained a green-colored liquid. The sandy material surrounding the holes was badly stained.

At the time of this visit, plating operations were in progress. Two vats were in use along the southwest side of the building. Mr. Zenner stated that a new "high heat" method for plating was being tested at that time.

The vats outside of the building were still covered with tarp; however, the tarp was not tightly secured. Ponded water was visible on top of the tarp.

TAT members Stofferahn and Martinez collected one sediment sample from the surface impoundment, three off-site soil samples, two on-site soil samples, and one aqueous sample from one of the tank voids. One off-site sample was collected northwest of the site adjacent to a storm sewer manhole. A second off-site sample was taken from the Conrath property west of the site. The third sample was a composite from the garden south of the site. Each off-site sample was taken at a depth of approximately three to four inches. A soil sample was also collected from the stained soil adjacent to the cyclone unit south of the building; the final soil sample was taken from the drainage ditch along the northwest corner of the site. The aqueous sample was pulled from one of the tank voids. The samples were delivered to a laboratory on June 21, 1986, in order to meet the 24-hour maximum holding time requirement for hexavalent chrome detection.

4.0 ANALYTICAL RESULTS

Analytical results of soil and ground water samples taken by the WDNR indicated high levels of chromium at Better-Brite Plating (Table 1). Samples taken on September 7, 1985, showed levels of 8000 ppm total chromium in soils south of the building where a cyclone exhaust fan was formerly housed, and 620 ppm from soils near the property line. The concentration of total chromium in a sample collected off site on the Conrath property, adjacent to the western boundary, was found to be 86 ppm. The average concentration of chromium in U.S. soil is 100 ppm as reported by the U.S. EPA. Of the samples WDNR tested for cadmium, zinc, and lead, only the sample taken near the cyclone fan revealed levels above the reported U.S. average concentration for lead and zinc in soils (10 and 50 ppm, respectively). The levels for total lead and zinc found in the sample from that area were 100 ppm and 2200 ppm, respectively.

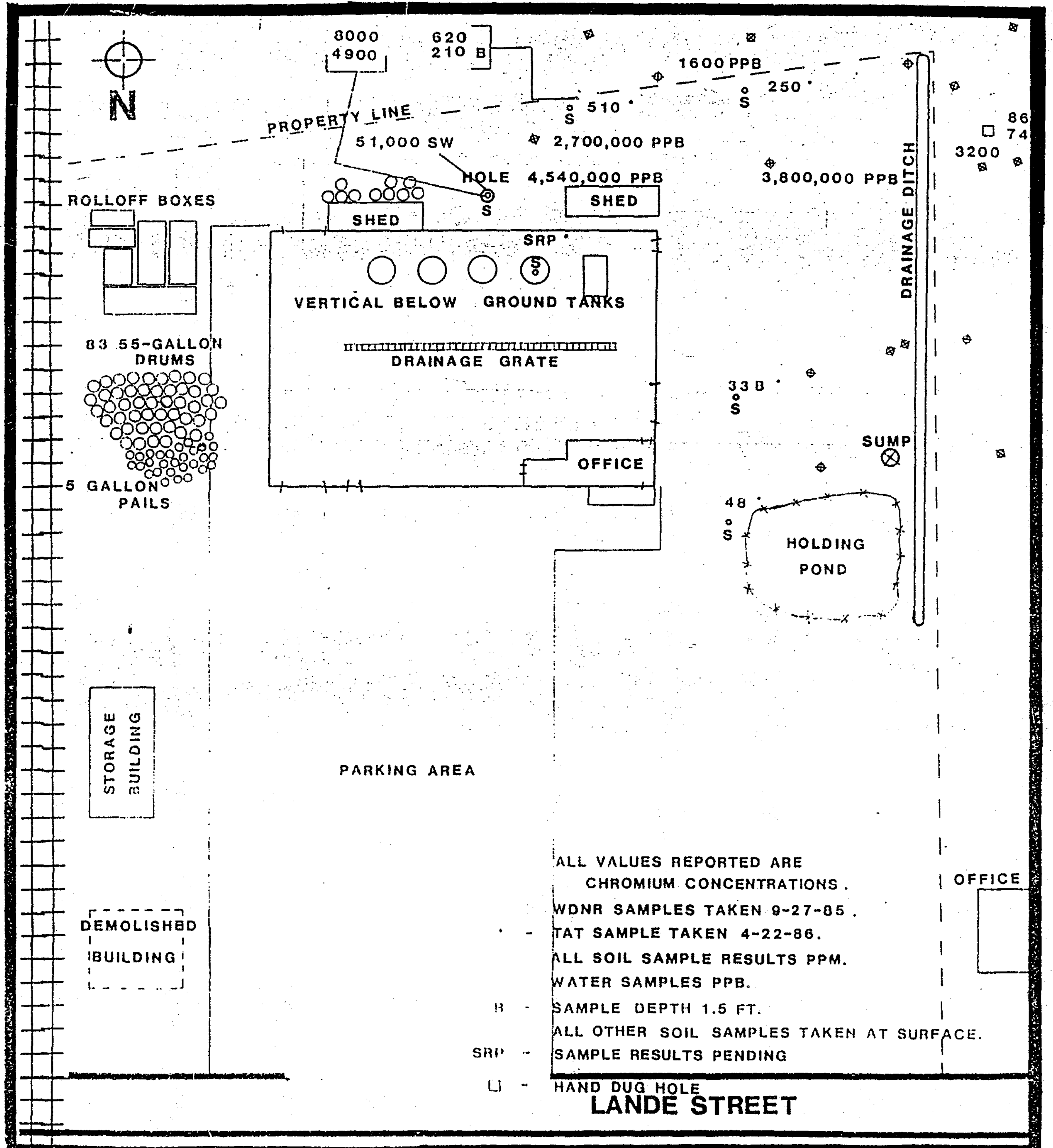
Analytical results from ground water monitoring well samples taken by the WDNR in September 1985 also indicated high concentrations of chromium. Chromium levels in one monitoring well on site (Figure 3) were 3,800,000 ug/l and one off-site well revealed 1,600 ug/l. The U.S. EPA drinking water quality standard for chromium is 50 ug/l.

An extent-of-contamination study, conducted in September 1979 by Soil Testing Services (STS) of Wisconsin, Inc., for Better Brite, Inc., identified a probable zone of chromium contamination in an area west to southwest of the plating building. STS studies also indicated that the contamination probably extended to the surface water drainage ditch (Figure 2).

Analyses of water samples from three monitoring wells revealed total chrome contamination ranging from 62,000 to 429,000 ug/l and hexavalent chromium 60,000 to 280,000 ug/l. The U.S. EPA drinking water standard ~~is~~ 50 ug/l, and the fresh water 24-hour average is 2,200 ug/l and 21 ug/l for trivalent and hexavalent chromium, respectively. A surface water sample collected in the ditch on the northwestern side of the building in August 1979 by WDNR contained 1,511,000 ug/l total chromium and 1,440,000 ug/l hexavalent chromium.

Analytical results of samples collected by the TAT on April 22, 1986, confirmed the presence of high total chromium concentrations in soils on site. Surface soil samples collected near the site boundary to the south and southwest of the building contained 510 ppm and 250 ppm, respectively. The soil sample taken at a depth of 1.5 feet from the drainage ditch showed 33 ppm total chromium. A liquid sample from the hole located south of the building revealed 4540 mg/l total chromium (Table 2). These samples were not analyzed separately for hexavalent chromium because that requires analysis within 24 hours after the sample is collected. The liquid sample taken from tank #4 inside the building was never analyzed because the laboratory had an insufficient volume due to leakage during shipping.

The samples collected by the TAT on June 20, 1986, indicated high hexavalent chromium concentrations at two locations on



ALL VALUES REPORTED ARE CHROMIUM CONCENTRATIONS.

WDNR SAMPLES TAKEN 9-27-85.

• - TAT SAMPLE TAKEN 4-22-86.

ALL SOIL SAMPLE RESULTS PPM.

WATER SAMPLES PPB.

B - SAMPLE DEPTH 1.5 FT.

ALL OTHER SOIL SAMPLES TAKEN AT SURFACE.

SRP - SAMPLE RESULTS PENDING

□ - HAND DUG HOLE

FIGURE 3 BETTER-BRITE PLATING, INC.

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5/23/86

519 LANDE STREET
DE PERE, WISCONSIN

ROY F. WESTON, INC.
WESTON
ENVIRONMENTAL CONSULTANTS-DESIGNERS

NO SCALE

/\ DOOR
/ \ GARAGE DOOR
⊕ MONITORING WELL
S ○ SAMPLE LOCATION

site (Figure 4). The soil sample from the area adjacent to the cyclone unit contained 14,100 ppm hexavalent chrome; the ground water sample retrieved from the tank void had a hexavalent chrome concentration of 5,110 mg/l. None of the off-site samples indicated detectable amounts of hexavalent chromium.

The TAT also obtained analytical results from on-site ground water monitoring performed by Foth and Van Dyke Engineers/Architects of Green Bay, Wisconsin. Five ground water monitoring wells were sampled periodically from January 1983 until September 1985. In addition, samples were routinely taken from the tank voids, the surface pond, and the pit south of the building. The samples were analyzed for total and hexavalent chromium. Consistently high values of hexavalent chrome were evident in samples from well numbers 3 and 16 and from the tank voids, with concentrations ranging from 1,300 to 4,600 mg/l. Well number 1-A (Figure 5) along with the pit yielded relatively high concentrations ranging from 134 to 1,400 mg/l.

5.0 THREATS TO HEALTH AND ENVIRONMENT

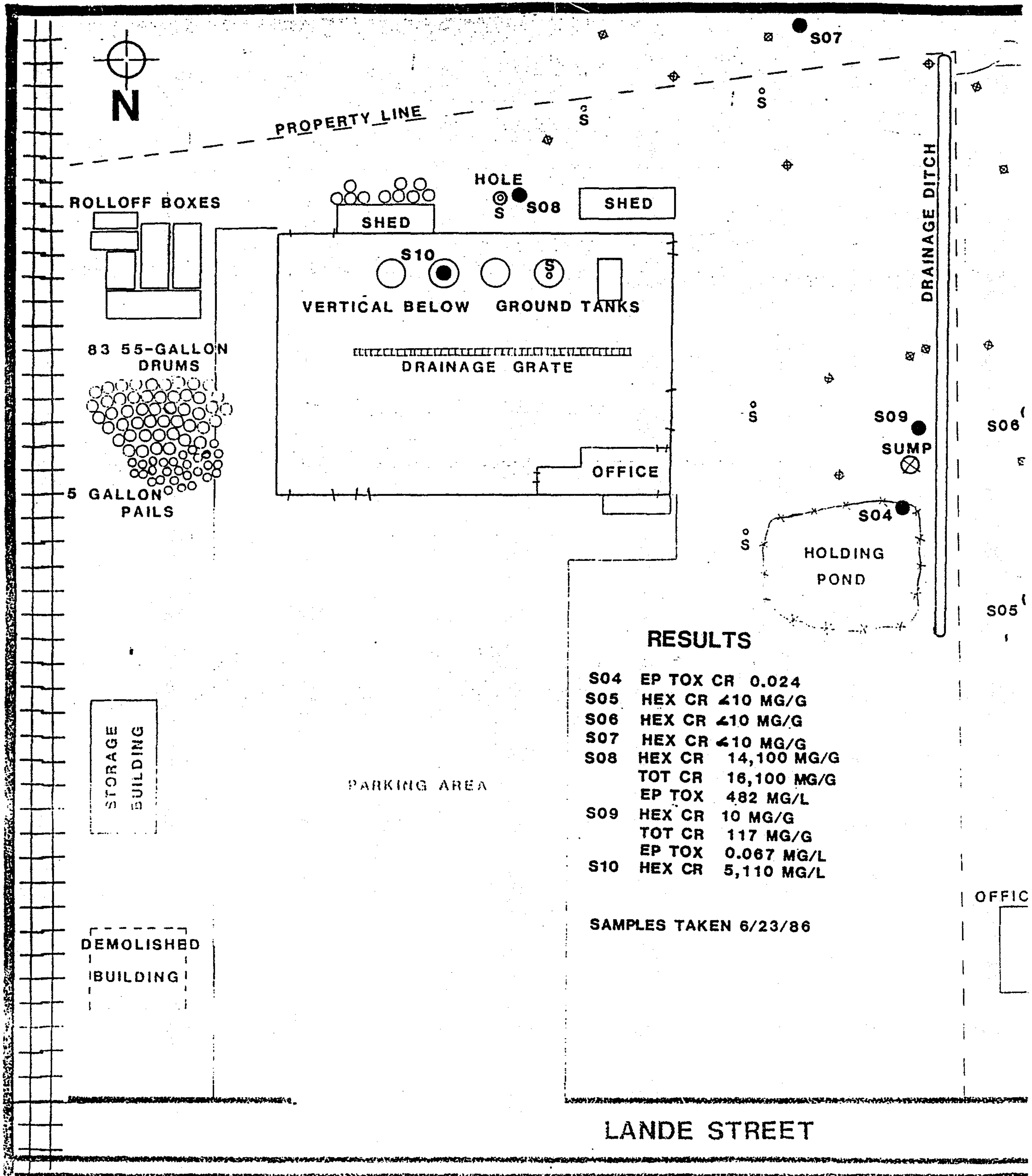
High concentrations of chromium identified at Better-Brite Plating facility in soil and ground water poses an imminent threat to human health and environment. Chromic acid, used in the plating process, is highly toxic and a corrosive substance. Based on the sampling conducted by the WDNR and the TAT, and findings of the site assessment, the Better-Brite Plating site poses several threats to the environment and meets the criteria for a Removal Action set forth in the National Contingency Plan (NCP) 40 CFR Part 300.65(b)(2). These threats include:

1. Actual or potential exposure to hazardous substances or pollutants or contaminants by nearby populations, animals, or food chains;

2. Hazardous substances or pollutants or contaminants in drums, barrels, tanks or other bulk storage containers, that may pose a threat of release;

3. High levels of hazardous substances or pollutants or contaminants in soil largely at or near the surface, that may migrate;

4. Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released.



RESULTS

S04	EP TOX CR	0.024
S05	HEX CR	<10 MG/G
S06	HEX CR	<10 MG/G
S07	HEX CR	<10 MG/G
S08	HEX CR	14,100 MG/G
	TOT CR	16,100 MG/G
	EP TOX	482 MG/L
S09	HEX CR	10 MG/G
	TOT CR	117 MG/G
	EP TOX	0.067 MG/L
S10	HEX CR	5,110 MG/L

SAMPLES TAKEN 6/23/86

FIGURE 4 BETTER-BRITE PLATING, INC.
519 LANDE STREET
DE PERE, WISCONSIN

WESTON

NO SCALE

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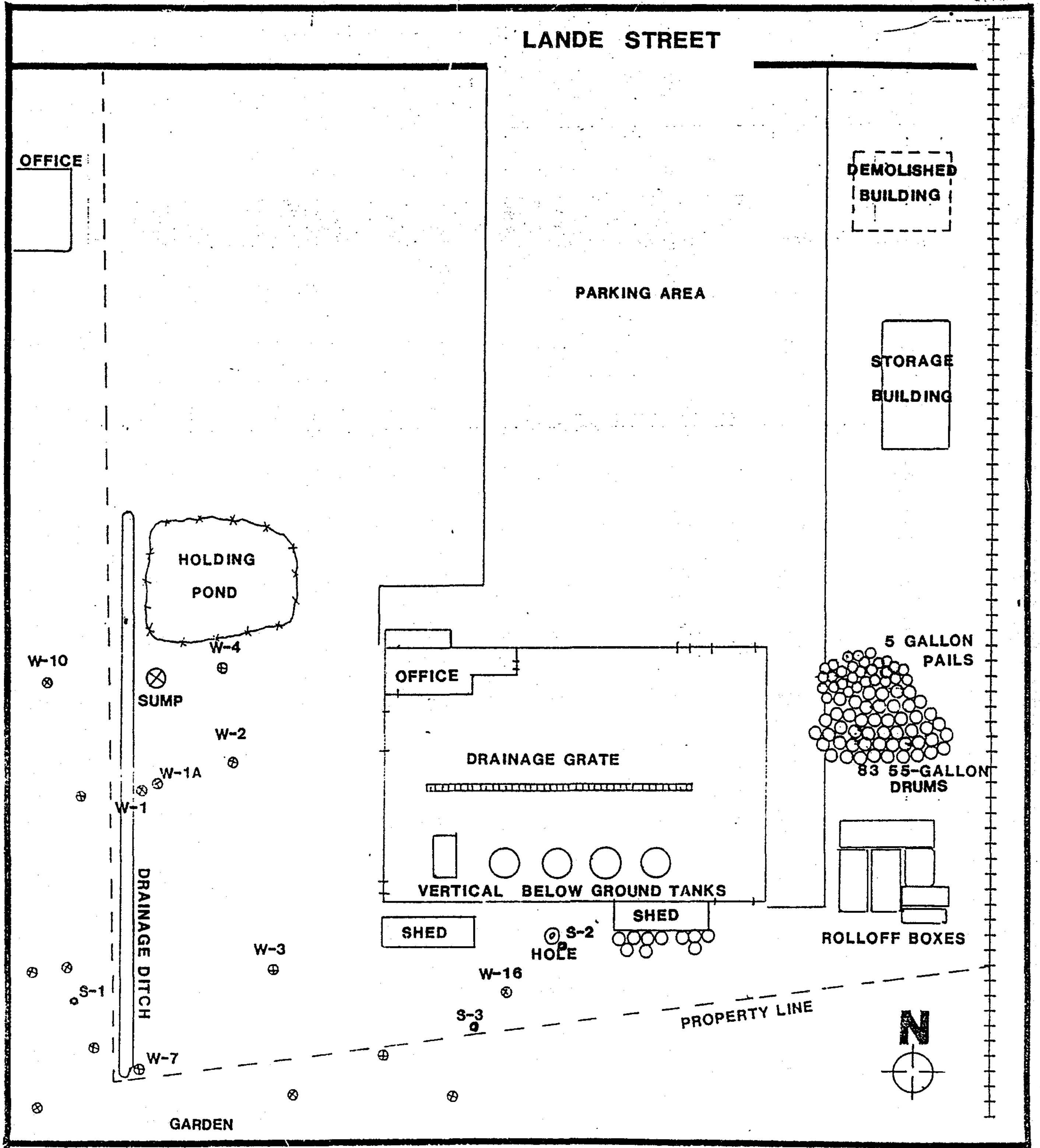

FIGURE 5

BETTER-BRITE PLATING, INC.

WDNR SAMPLING

519 LANDE STREET
DE PERE, WISCONSIN

ROY F. WESTON INC
WESTON
ENVIRONMENTAL CONSULTANTS-DESIGNERS

KEY

/\ DOOR
/ \ GARAGE DOOR
⊗ MONITORING WELL
⊙ S SAMPLE LOCATION

There is little threat of contamination of surface water except possibly through ground water discharge into the Fox River located approximately one-half mile to the east. Ground water contamination has been documented in monitoring wells on site and on adjacent property. Private residences in the area obtain water from a city well, reportedly a mile from the site. It is not known whether the well is set in a shallow aquifer or not. With the river so close to the site, it is unlikely that contamination from the site would affect city water.

Spills onto the ground documented by WDNR and verified by the soil sampling (Attachment B) also pose a threat to health and environment. Soil samples show high concentrations of chrome, which is a contact or ingestion hazard to animals and humans. At least one spill is known to have flowed onto adjacent property where local residents have gardens.

Drums and vats containing hazardous materials are exposed to the elements, creating a safety hazard. Vats containing chromic acid and other plating wastes are covered only by cloth tarps. Children living in the neighborhood can easily come into contact with flammable and corrosive liquids believed to be in the drums and vats. In addition, flammable waste which may be present (TCE, MEK) pose an explosion and fire hazard.

Chromium occurs naturally in three states: elemental (Cr), trivalent (Cr III), and the more toxic hexavalent (Cr VI). Hexavalent chromium used in the plating industry is present in samples collected at Better-Brite. Most of the analytical results, however, did not differentiate between total and hexavalent chromium concentrations.

Hexavalent chromium is an irritant and corrosive. Prolonged exposure can result in ulcers and dermatitis. Hexavalent chromium has been linked to liver and kidney damage and internal hemorrhaging. Hexavalent chromium is also a well-known carcinogen (OSHA). Immediate symptoms of exposure include nausea, repeated vomiting and diarrhea (U.S. EPA, 1985). The trivalent form of chromium is not considered to be as hazardous as hexavalent chromium.

6.0 RECOMMENDATIONS

The Better Brite Plating facility poses an immediate threat to human health and the environment due to the unsafe storage of hazardous materials. There is a potential of exposure or further release of hazardous materials into the environment, thereby increasing the contamination of soils, ground water and air. Moreover, results from ground and surface water and soil samples taken by the TAT and MDNR indicated significant contamination. It is, therefore, recommended that the Responsible Party (RP) undertake a voluntary cleanup as soon as possible. If the RP is unwilling or unable to perform these tasks, the U.S. EPA should conduct a Removal Action under the authority of the Comprehensive Environmental Response Compensation and Liability Act of 1980 (CERCLA), following the guidelines set out under the National Contingency Plan (NCP).

In order to assist the U.S. EPA in eliminating the threats posed by this facility, the TAT has prepared an Emergency Action Plan (EAP). This EAP outlines a scope of work for removal actions; however, it should be noted that changes may occur during cleanup activities as a complete inventory of wastes at the site has not yet been fully determined. It is recommended that vats and drums be sampled in order to evaluate the waste streams. Additionally, an extent-of-contamination study of soil and ground water is necessary to better define the limits of contamination.

6.1 Immediate Stabilization Actions

To eliminate the immediate threats of direct contact and exposure, the site will be secured by means of a cyclone fence. A six-foot fence with three strands of barbed wire will be erected surrounding the site; two points of entry will be required, one for vehicular traffic and the other for personnel entry. Approximately 1,000 linear feet of fence will be used.

The vats should be covered completely and secured with plywood to prevent further intrusion of precipitation and the possible loss of material into the environment through evaporation. The tarps on the vats should be tightly secured and covered with plywood.

6.2 Removal Actions

A Removal Action is recommended to remove all hazardous materials from the site to eliminate threats posed by the site.

6.2.1 Develop Site Safety and Contingency Plans

It is recommended that a meeting be held between the U.S. EPA, WDNR, the TAT, and the ERCS contractor prior to initiating the cleanup action in order to determine the removal goals, plan of action, and assignment of responsibilities. This meeting will establish the basis of site safety and contingency plans to be compiled by the TAT. The site safety plan will include an evaluation of associated risks, establishment of working zones, personnel protection, and decontamination procedures. The contingency plan will address emergency communications in the event of a release, fire, or explosion, arrangements with the closest medical facility for emergency medical care, and coordination between federal, state, and local governments in the event of an emergency.

6.2.2 Administration

An office trailer and a decontamination trailer will be mobilized to support response personnel. Telephone lines and a metered power connection will be installed.

6.2.3 Conduct Sampling and Compatibility Program

Samples of the materials in the vats and drums, ground water from on- and off-site wells, and soils on and off site will be analyzed to develop proper disposal methods. Sampling will additionally provide information regarding the extent of cleanup required.

Prior to the removal action, the TAT will screen the drum and vat materials for acidic, basic, and neutral organic compounds; this will provide information for developing waste streams. Additionally, a composite sample from each waste stream will be taken and analyzed for disposal parameters. There are approximately 80 55-gallon drums and 32 5-gallon pails. Information gathered from the site assessment indicates that the majority of the drums are empty. For the purpose of this cost estimate, however, it is assumed that 50 drums contain materials requiring disposal.

In addition to the drum and vat sampling, an extent-of-contamination survey will also be performed to determine the limits of chromium contamination. There are no regulatory limits set for acceptable levels of chromium in soils. The Agency for Toxic Substances and Disease Registry (TSDR, formerly the CDC) will perform a risk assessment for a site to determine recommended safe levels. The TSDR review is based on site-specific parameters, such as pathways of contamination, humans potentially affected, physical aspects of the site, and all available data. RCRA has defined hazardous levels of chromium at 5 mg/l EP toxicity chromium. For the subject site, there is little data regarding EP toxicity. A study of chromium mobility in soils (Leonard, 1985) attempted to correlate EP toxicity data with hexavalent chromium data. Correlation with greater than 99.9% significance was obtained; a 100 mg/kg hexavalent chromium value correlated to 5 mg/l EP toxicity, the RCRA limit. It will ultimately be the decision of the U.S. EPA what are acceptable levels of chromium concentration in soils.

A sampling grid will be established to assess the extent of contamination in the soil surrounding the facility. Those areas containing visibly contaminated soil will be excavated to a depth of six inches initially, prior to sampling. These areas include the soils surrounding the cyclone unit south of the building and the soils around the vats. Additionally, the area west of the building where spills allegedly occurred which has not been overlain with fill will be excavated approximately six inches to its original elevation before sampling. The entire site will then be sampled; sample locations will be determined using a hexagonal grid system, which provides reliable data with a minimum number of locations. Additional locations will be sampled west and south of the building where previous data indicate high chromium concentrations. Samples will be taken at depths of 0 to 6 inches, 6 inches to 12 inches, 1 foot to two feet, and so on as required. This cost projection assumed that 1,000 cubic yards of soil will be excavated. Approximately 50 loads will be removed. For the purposes of this estimate, costs are based on transporting and disposing of the material to the Chemical Waste Management Landfill in Emelle, Alabama.

The excavated areas will be backfilled with clay overlain with four to six inches of top soil. The site will be graded to its original contours. The site will then be seeded to provide a vegetative cover.

The excavation operation will take approximately three days. Restoration will take one day.

6.2.4 Disposal of Hazardous Materials

The material in the vats will be treated and disposed on or off site at a RCRA-approved facility; however, until analytical results have been obtained, the most appropriate method cannot be selected. For the purpose of this cost estimate, it is assumed that the vats contain 4,000 gallons of chromic acid, 2,000 gallons of hydrochloric acid, and 2,000 gallons of degreaser. The 55-gallon drums are assumed to contain organic materials with a total volume estimated to be 2,750 gallons.

The chromic acid in the vat can be treated at a chemical processing facility off site; however, if the U.S. EPA decides to treat the ground water, it will be more economical to treat the chromic acid on site. The costs for on-site treatment are outlined in Sections 7.8-7.10. Costs for off-site treatment at Chem Clear in Chicago, Illinois, have been used. The material will be pumped from the vats into a 5,000 gallon tanker trailer for transport to Chem Clear.

The hydrochloric acid will also be shipped to a chemical processing facility for neutralization. Initially costs were developed for treating the acid on site; however, the costs were higher for on-site treatment than those for treatment off site. On-site treatment would require additional time; furthermore, it is uncertain whether the neutralized material could then be discharged via the sanitary sewer. Off-site treatment will entail transferring the material into a 3,500 gallon vacuum truck and transporting it to a treatment facility. Again, Chem Clear in Chicago, Illinois, was assumed as the disposal facility for estimating costs.

The degreasing solution in the vats will be transferred into a 3,500-gallon vacuum truck and transported to a solvent recovery facility. The drummed material will also be sent to a solvent recovery facility. Most of the drums appear to be in good condition and can be loaded directly onto a truck for transport. Those drums which are deteriorated will be overpacked in 85-gallon drums and then loaded onto the truck. For the purposes of this cost estimate, Milwaukee Solvents in Menominee Falls, Wisconsin, was assumed to be the solvent recovery facility.

6.3 Treatment of Ground Water

The limited ground water sampling at the Better Brite site indicate there has been chromic acid contamination in the ground water. The ground water sample taken by the TAT at the previous location of one of the plating tanks contains 5,100 ppm of hexavalent chrome. Foth and Van Dyke, Inc., sampled the ground water from wells on site periodically from 1983 until 1985; results from this sampling indicate consistently elevated levels of hexavalent chromium at well numbers 3 and 16 located in the southwest quadrant of the site.

Because of the high level of hexavalent chromium, it is recommended that the ground water be pumped and treated. Initially, ground water should be sampled at wells located off site to determine the extent of contamination. Existing wells are located on and off site south and west of the facility; however, there are no wells north or east of the site. A monitoring well should be installed at a predetermined location northeast of the building in order to better understand the local groundwater movement; this well can also serve as a background sample location.

Neither the volume of contaminated ground water requiring treatment nor the exact concentration of the contaminants can be precisely determined with the limited data available. Both of these factors have a significant impact on the selection of a treatment method and the resulting costs. However, for the purpose of this cost estimate certain assumptions have been made. A minimum and maximum volume of ground water to be treated have been calculated which will be used for estimating treatment costs. The minimum estimated volume of contaminated water totals 330,000 gallons and represents the volume of water beneath the area where spills allegedly occurred, a maximum volume of 2,000,000 gallons assumes contamination throughout the site. The depth to bedrock, 30 feet, was determined from STS boring logs. It is also assumed that the hexavalent chrome concentration is 5,000 ppm. It should be noted that while one sample has indicated hexavalent chrome greater than 5,000 ppm, this level will likely drop rapidly during treatment. Therefore, treatment costs will also decrease.

There are several options available for treatment of the ground water. The methods included are:

- o Off-site treatment at a chemical treatment facility;
- o On-site treatment using a conventional precipitation/flocculation system;
- o On-site treatment using an ion exchange system;
- o On-site treatment using an electrochemical treatment system.

Each method will be outlined in the following sections in greater detail. Costs are included in Section 7. Each option contains a cost break-down of capital costs and daily operating and maintenance costs so that total costs for the maximum and minimum ground water volumes can be determined. An additional assumption included in the costs regards the ground water pumping and treatment rates. Each on-site treatment option is based upon a pumping rate of five gallons per minute (gpm). This assumed rate allows for continuous 24-hour treatment. Field tests should be performed to determine optimum pumping rates.

Because of the significant volumes of ground water to be extracted and to ensure proper flushing of the contaminants through the soil, it is recommended that a portion of the treated effluent be recharged. A water spreading method of artificial recharge will be the most effective and economical. A flat-bottomed ditch will be excavated near the building; it may be lined with gravel, if necessary, to prevent excess siltation. A portion of the treated ground water will be diverted to the ditch; this effluent will infiltrate into the ground and then percolate to the water table. The rate of infiltration will also be determined by performing field tests.

6.3.1 Off-Site Ground Water Treatment

This option entails pumping the contaminated ground water and transporting it to an off-site treatment facility. The ground water would be pumped from each of the underground tank locations using submersible pumps and loaded into a 7,500 gallon tanker trailer for transport to a processing facility. Samples would be taken at 20,000 gallon intervals to determine hexavalent chromium concentrations.

The optimum pumping rate is not yet determined. However, from soil boring logs, it appears that the soil is composed of a clay-silt mix; it is, therefore, assumed that the transmissivity would be low which requires a lower pumping rate. Assuming a pumping rate of 20 gpm, one 7,500 gallon tanker can be filled in approximately seven hours. Pumping will resume when the water table has recovered. For the purpose of this estimate, it is assumed that recovery will take two days, although this cannot be determined with accuracy until field tests are performed. Thus, three loads of groundwater will be pumped per week. At 7,500 gallons per load, the weekly removal will be 22,500 gallons. For removal of 330,000 gallons, it will take approximately 15 weeks; for 2,000,000 gallons, it will take 89 weeks. Due to the stepwise nature of the work, only one person is required on site to supervise pumping for a total of three days per week. For the purpose of this cost estimate, Chem Clear in Chicago, Illinois, was assumed to be the treatment facility. Costs for treatment are based on an assumption of $1.00/gallon; however, this will likely decrease as the chromium concentration decreases.

6.3.2 On-Site Conventional Treatment

Chemical treatment represents a proven and effective method for removing heavy metals from ground water. The process involves reducing the hexavalent chromium to its trivalent state using sodium bisulfite. The remaining trivalent chrome is precipitated out of solution at a high pH and flocculated with an inorganic coagulant such as lime or alum. The flocs then settle out in a settling/clarifying tank. The treated effluent can then be discharged via the sanitary sewer. The remaining sludge from the settled particulate can be disposed of in a secure landfill. Package units are available for treating these required volumes.

A 5 gpm sump pump will be installed approximately two to three feet below the water table in a pit left from a previously excavated chrome plating tank. The ground water will then be pumped directly to the treatment system. The system will operate 24 hours per day. Two hours of labor will be required approximately every eight hours to refill the tanks with treatment chemicals and collect the residual sludge.

Assuming treatment at a rate of 5 gpm, 24 hours/day, the 330,000 gallons will be treated in approximately 46 days. Treatment of the 2,000,000 gallons will take approximately 278 days. Once the system operates smoothly, four to six hours of labor will be necessary every 24 hour period.

Advantages of chemical treatment include its proven effectiveness in similar cases, minimal safety and health hazards, the availability of equipment, and the ease of operation. The major disadvantage is the large volume of sludge produced. In order to meet landfill disposal regulations, the sludge must contain a certain moisture content, which may require dewatering or drying. Mechanical dewatering units are available which effectively dewater sludge to meet disposal parameters. This, however, will increase costs. Filtration/dewatering systems commonly used include vacuum filtration, belt filter press, and pressure filtration.

6.3.3 On-Site Treatment Using Ion Exchange

Ion exchange treatment of contaminated water involves the exchange of an ion possessing a high ion selectivity the degree to which one ion replaces another for an ion possessing a lower selectivity. In such a treatment system, the water to be treated passes across ion exchange resins which contain the exchangeable ions. The ions removed from the water attach to the resin. The exchange reaction is reversible and is dependent upon the concentration of the contaminant involved. Exchange resins can be regenerated for reuse, which makes the treatment system economical.

The ground water is initially pumped into a storage tank to allow for continuous feed into the treatment system. This tank also functions as a settling tank to collect any suspended solids. The water then passes through a series of ion exchange columns. For uninterrupted operation, two sets of columns may be used. Regeneration of the cation requires an acid such as hydrochloric or sulfuric; anion regeneration requires a caustic base such as sodium hydroxide or sodium carbonate. After the ion exchange treatment is complete, the ground water may be discharged via the sanitary sewer. A portion of the treated effluent will be diverted to the previously-described recharge trench.

Ion exchange is an effective method for removing heavy metals from water with contaminant concentrations of 2,500 to 4,000 mg/l (ORD 1985). Higher concentrations will result in rapid depletion of the resins resulting in high regeneration costs. With lower contaminant concentrations, ion exchange is a viable treatment option. Ion exchange does not require additional water, and less sludge is generated than with conventional chemical treatment systems. For operating plating facilities, ion exchange allows recycling of the treated water, thus eliminating disposal costs. Additionally, ion exchange can be used to recover chemicals for reuse or sale. In the case of Better-Brite, the high levels of hexavalent chromium will necessitate high chemical costs for regeneration of the resins and there will be no reuse of the treated effluent nor will there be a need to recover chromium. Therefore, for the Better-Brite site, the economic benefits of ion exchange are diminished.

An ion exchange treatment system will require approximately four hours of labor each day. Tasks include chemical addition for resin regeneration cycles (approximately twice per day), collection of any sludge generated, and monitoring of the process. Total time elapsed for treatment of the ground water is equal to that for the conventional system, i.e., 46 days for 330,000 gallons, 278 days for 2,000,000 gallons. Chemical costs comprise a major portion of the daily costs at $180.00 per day. This, however, represents a very rough approximation, given the lack of available data. Chemicals are required for chrome reduction, neutralization, and for regeneration of the resins. As the concentration of chromium in the ground water decreases, so will the chemical costs.

6.3.4 On-Site Treatment Using Electrochemical System

The electrochemical process for removing heavy metals from wastewater was developed approximately 10 years ago. The method functions essentially in the reverse mode of electroplating. Instead of the chrome attaching to iron plates, the plates, the iron migrates from the plates and attaches to the chrome in the wastewater. The chrome particles become more dense and consequently settle out of solution.

The electrochemical system can be modularized. Ground water is pumped (as in the previous on-site treatment systems) into a tank containing the electrochemical cell. A direct current is applied, generating a ferrous ion which reduces the hexavalent chrome to its trivalent state. The treated effluent is discharged from the cell, leaving behind the metal hydroxides formed in the reaction. These suspended solids can then be removed in a clarifier unit. A polyelectrolyte may be added to the water prior to entering the clarifier to aid in the flocculation.

For contaminant concentrations greater than 50 mg/l, it may be more cost effective to operate the system in a batch process. As such, the ground water would first be pumped into a holding tank. It may be necessary to recirculate the effluent from the clarifier to remove excess chrome.

The solids collected can be run through a filter press, dewatered to form a filter cake, and disposed. Generally one cake is generated per shift. In order for the sludge to be considered nontoxic, it must pass the U.S. EPA's Extraction Procedure Toxicity Test (EP tox) for leachability. The test for chrome allows 5 mg/l of total chromium in the leachate. The electrochemical process has yielded EP tox results between 0.2 and 0.5 mg/l. The sludge may then be delisted and disposed in a sanitary landfill.

The complete electrochemical treatment system will cost from $300,000 to $500,000. This includes costs for feed tanks and pumps, the clarifier, polymer feed, 50 cubic feet of filter, and all instrumentation. Operating and maintenance costs include electricity and approximately one hour of labor per day. Assuming the sludge is delisted, it can be disposed at the local municipal landfill. For the purpose of this estimate, sludge production is estimated at 112 cubic feet per day.

7.0 COST ESTIMATES

7.1 Support Costs

The support costs outlined below are estimated for 10 days of site work.

Support costs include an estimate for the disposal of decon wash water at Chem Clear in Chicago, Illinois.

Personnel

Item	Days	Amount
1 Response Manager @ $58.40/hr, $71.30/hr OT (10-hr days)	10	$6,098.00
1 Field clerk @ $17.50/hr, $24.00/hr OT (10-hr days)	10	1,880.00
2 Per diems @ $66.00/day	10	1,320.00

Equipment

Item	Days	Amount
1 Passenger sedan @ $55.00/day	10	$ 550.00
1 Pick-up truck @ $62.00/day	10	620.00
1 Office trailer @ $75.00/day	10	750.00
1 Portable toilet @ $75.00/mo	10	75.00
Telephone and water		500.00
Electricity		600.00
1 Level C protection @ $62.00/day	10	620.00
Decon pad @ $38.00/day	10	380.00
HP/HW washer, 1200 psi @ $176.00/day	10	1,760.00
Mobilization and demobilization		400.00

Materials

Item	Amount
Caution tape	$ 50.00

Transportation

Item	Amount
1 Load @ $4.00/loaded mile x 250 miles	$1,000.00

Disposal

Item	Amount
1,000 gallons decon wash water @ $0.25	250.00
Subtotal for Support Costs	$16,853.00

7.2 Fence Construction

Item	Amount
1,000 L.F. of 6-foot chain-link fence with 3 strands barbed wire @ $12.00/L.F.	$12,000.00
1 Vehicle gate @ $1,500/ea	1,500.00
1 Personnel gate @ $175/ea	175.00
Prime contractor handling costs (3%)	410.25
Subtotal for Fence Construction	$14,085.25

7.3 Conduct Sampling and Compatibility Programs

Personnel

Item	Days	Amount
1 Lab technician, Level 1, @ $29.20/hr, $38.60/hr OT (10-hr days)	1	$ 310.80
1 Organic chemist, Level 2, @ $40.90/hr, $52.60/hr OT (10-hr days)	1	432.40
2 Per diems @ $66.00/day	1	132.00

Equipment

Item	Days	Amount
2 Level B protection @ $171.00/person/day	1	$ 342.00

Equipment (Continued)

Item	Days	Amount
Cascade system @ $56.00/day	1	$56.00
Photoionization detector @ $67.00/day	1	67.00
Air monitor detection pump @ $24.00/day	1	24.00

Materials

Item	Amount
60 Wide-mouth pint sample jars @ $2.86/ea	$ 171.60
50 Drum thieves @ $2.47/ea	123.50
Miscellaneous	25.00

Analytical Costs

Item	Amount
50 Soil samples analyzed for Cr^{+6} @ $32.00/ea	$1,600.00
10 Liquid samples from vats and drums analyzed for disposal parameters @ $125/sample	1,250.00
Subtotal for Sampling and Analysis	$4,534.30

7.4 Removal of Hazardous Drums and Vats

Personnel

Item	Days	Amount
2 Cleanup technicians, Level 2, @ $25.70/hr, $35.10/hr OT (10-hr work days)	2	$1,103.20
1 Equipment operator, Level 2, @ $31.00/hr, $42.10/hr OT (10-hr work days)	2	664.40

Personnel (Continued)

Item	Days	Amount
3 Per diems @ $66.00/day	2	$396.00

Equipment

Item	Days	Amount
1 Backhoe, Cat 225 @ $512.00/day	2	$1,024.00
1 Drum grappler @ $157.00/day	2	314.00
1 Acid pump with hose @ $118.00/day	2	236.00
3 Level C personnel proection @ $62.00/day	2	372.00
1 5,000-gal tanker trailer @ $276.00/day	1	276.00
1 3,500-gal vacuum trucks @ $305.00/day	1	305.00
1 Tractor, OTR @ $301.00/day	2	602.00
1 Trailer, low boy @ $218.00/day	2	436.00
Mobilization and demobilization		1,250.00

Materials

Item	Amount
2 Rolls Visqueen @ $50/roll plus 3% handling	$ 103.00
10 85-gal overpack drums @ $107.96/ea	1,079.60

Transportation

Item	Amount
1 Load liquids - 5,000-gal tanker @ $4.00/loaded mile x 250 miles	$1,000.00
1 Load liquids, 3,500-gal vac truck @ $4.00/loaded mile x 250 miles	1,000.00

Disposal

Item	Amount
4,000 gallons chrome plating liquid @ $1.00/gal	$4,000.00
2,000 gallons HCl @ $1.00/gal	2,000.00
2,000 gallons degreaser @ $3.00/gal	6,000.00
50 drums organic solvents @ $200/drum	10,000.00
Subtotal for Drum/Vat Removal	$32,161.20

7.5 Excavation and Disposal of Contaminated Soil

Personnel

Item	Days	Amount
2 Equipment operators, Level 2, @ $31.00/hr, $42.10/hr OT (10-hr work days)	4	$2,657.60
1 Cleanup technician, Level 2, @ $25.70/hr, $35.10/hr OT (10-hr work days)	4	1,103.20
3 Per diems @ $66.00/day	4	792.00

Equipment

Item	Days	Amount
1 D-6 Dozer @ $536.00/day	4	$2,144.00

Equipment (Continued)

Item	Days	Amount
1 Loader, CAT 955 @ $448.00/day	4	$1,792.00
3 Level C personnel protection @ $62.00/day	4	744.00

Materials

Item	Amount
50 rolls Visqueen @ $50/roll plus 3% handling	$2,575.00
750 cu yds of clay fill material @ $8.00/cu yd delivered	6,000.00
350 cu yds of top soil @ $5.00/cu yd delivered	1,750.00
Seeding	1,000.00

Transportation

Item	Amount
50 Loads 20 cu. yd. lined dump truck @ $4.00/loaded mile x 850 miles	$170,000.00

Disposal

Item	Amount
1,000 cu. yds. of soil @ $100/cu. yd.	$100,000.00
Subtotal for Soil Removal	$290,557.80

7.6 Groundwater Monitoring

Costs include labor, materials, and equipment required to install three ground water monitoring wells. The wells will be installed to depths of 30 feet. The ground water will be sampled and analyzed every 20,000 gallons to determine how ions treatment needs to be confined.

Item	Amount
3 2"-Ground water monitoring wells @ $40.00/ft x 30 ft plus 3% handling charge	$3,708.00

Item	Amount
Ground water sample analyzed for hexavalent chromium @ $32.00/sample	
330,000 gallons @ 17 samples	$544.00
2,000,000 gallons @ 100 samples	3,200.00

7.7 Off-Site Ground Water Treatment Costs

Personnel

Item	Weekly Cost
1 Cleanup technician, Level 2, @ $25.70/hr (8-hr day) for 3 days	$616.80

Equipment

Item	Weekly Cost
1 7,500-gallon tanker trailer @ $315.00/day @ 3 days/week	$945.00
4 Electric submersible pumps 3-inch @ $310.00/week	1,240.00
1 Level C Protection @ $62.00/day @ 3 days/week	186.00

Laboratory Costs

1 Sample for hexavalent chromium @ $32.00/sample	32.00
Subtotal weekly costs	$3,019.80

Transportation

3 Loads @ $4.00/loaded mile x 250 miles	$3,000.00

Disposal

22,500 gallons ground water @ $1.00/gallon	$22,500.00
Total Weekly Costs	$28,519.80/week
Treatment of 330,000 gallons @ 15 weeks	427,797.00
Treatment of 2,000,000 gallons @ 89 weeks	2,538,262.20

7.8 Chemical Treatment of Ground Water On Site

Personnel

Item	Daily Cost
1 Cleanup technician, Level 2, @ $25.70/hr for 6 hrs/day	$154.20

Equipment

Item	
2" Electric submersible pump @ $58.00/day	58.00

Materials

Item	
936 lb $NaSO_4$ @ $0.30/lb	280.80
450 lb Acid @ $.10/lb	45.00
375 lb Caustic @ $.26/lb	97.50
0.5 gal Polymer @ $4.00/gal	2.00
3% Handling charge	12.76

Miscellaneous

Item	Daily Cost
7,200 gal Water @ $.98/1,000 gal	$7.06
175 kwh electricity @ $.08/kwh	14.00
7,200 gal Effluent discharged @ $17.32/day	17.32
Subtotal Daily Costs	$688.64

Fixed Costs

Item	Amount
Treatment unit @ 5 gpm	$50,000.00
2 Pumps, 3/4 hp each @ $1,200/ea	2,400.00

Fixed Costs (Continued)

Item	Amount
2 Valves, control boxes, starters @ $700/ea	$1,400.00
Subtotal Fixed Costs	$53,800.00

Transportation and Disposal Costs

For 330,000 gallons of ground water treated, approximately eight tons of sludge will require disposal. For 2,000,000 gallons, approximately 45 tons will be generated. Costs herein assume transportation to and disposal at the Chem Waste Landfill in Emelle, Alabama.

For 330,000 gallons:

1 Load @ $4.00/loaded mile x 850 miles	$3,400.00
8 Tons sludge disposed @ $100/ton	800.00
Subtotal T & D	$4,200.00

For 2,000,000 gallons:

3 Loads @ $4.00/loaded mile x 850 miles	$10,200.00
45 Tons sludge disposed @ $100/ton	4,500.00
Subtotal T & D	$14,700.00

7.9 On-Site Treatment Using Ion Exchange

Personnel

Item	Amount
1 Cleanup technician, Level 2, @ $25.70/hr for 4 hrs/day	$ 102.80

Equipment

Item	Amount
2" Electric submersible pump @ $58.00/day	$58.00

Materials

Item	Amount
Chemicals for reduction, neutralization and resin regeneration @ $25.00/1,000 gallons x 7,200 gallons/day (includes 3% handling charge)	$180.00

Miscellaneous

Item	Amount
175 kwh electricity @ $.08/kwh	$14.00
7,200 gal effluent discharged @ $17.32/day	17.32
Subtotal Daily Costs	$372.12

Fixed Costs

Item	Amount
Ion exchange system, 5 gpm flow rate, installed	$80,000.00

Transportation and Disposal Costs

For 330,000 gallons of ground water treated, approximately six tons of sludge will be generated. For 2,000,000 gallons, approximately 30 tons will be generated. Costs herein assume transportation to and disposal at the Chem Waste Landfill in Emelle, Alabama.

For 330,000 gallons:

1 Load @ $4.00/loaded mile x 850 miles	$3,400.00
6 tons sludge disposed @ $100/ton	600.00
Subtotal T&D	$4,000.00

For 2,000,000 gallons:

2 Loads @ $4.00/loaded mile x 850 miles	6,800.00
30 tons sludge disposed @ $100/ton	3,000.00
Subtotal T&D	$9,800.00

7.10 On-Site Electrochemical Treatment System

Personal	Daily Cost
Item	
1 Cleanup technician, Level 2 @ $25.70/hr for one hour	$25.70
Equipment	
Item	
2" electric submersible pump @ $58.00/day	58.00
Miscellaneous	
1,500 kwh electricity @ $.08/kwh	$120.00
Materials	
Item	
906 lbs Electrodes @ $.30/lb plus 3% handling charge	279.95
Subtotal Daily Costs	$483.65

Fixed Costs

Electrochemical treatment system, 5 gpm, installed	$400,000.00

Transportation and Disposal Costs

For 330,000 gallons, approximately 5,152 lbs of sludge will be generated in 46 days. For 2,000,000 gallons, approximately 31,136 lbs of sludge will be generated. For the purpose of this cost estimate, it is assumed that the sludge will be disposed at the Brown County Landfill, approximately five miles south of the site.

For 330,000 gallons:

1 Load @ $4.00/loaded mile x 5 miles	$20.00
2 1/2 tons disposed @ $8.50/ton	21.25
	$41.25

For 2,000,000 gallons

1 load @ $4.00/loaded mile x 5 miles	$20.00
16 tons disposed @ $8.50/ton	$136.00
	$156.00

7.12 Cost Summary

Section No.	Amount
7.1 Support Costs	$16,853.00
7.2 Fence Construction	14,085.25
7.3 Conduct Sampling and Compatibility Program	4,534.30
7.4 Removal of Hazardous Drums and Vat Materials	32,161.20
7.5 Excavation and Disposal of Contaminated Soil	290,557.80
Subtotal Removal Activities:	$358,191.55

Option 1: Off-Site Treatment

	330,000 gal (15 weeks)	2,000,000 gal (89 weeks)
Groundwater sampling costs	$ 544.00	$3,200.00
Ground water monitoring wells	3,708.00	3,708.00
Fixed equipment costs	--	--
Weekly costs x # weeks (3,019.80/wk)	45,297.00	268,762.20
Transportation costs (3,000.00/wk)	45,000.00	267,000.00
Disposal costs (22,500/wk)	337,500.00	2,002,500.00
	$432,049.00	$2,545,170.20
	($1.31/gal)	($1.27/gal)

Option 2: On-Site Chemical/Precipitation Treatment

	(46 days)	(278 days)
Ground water sampling	$ 544.00	$3,200.00
Ground water monitoring wells	3,708.00	3,708.00
Fixed equipment costs	53,800.00	53,800.00
Daily costs x # days	31,677.44	191,441.92
Transportation	3,400.00	10,200.00
Disposal	800.00	4,500.00
	$93,929.44	$266,849.92
	($0.28)	($0.13)

Option 3: On-Site Ion Exchange

	(46 days)	(278 days)
Ground water sampling	$ 544.00	$3,200.00
Ground water monitoring wells	3,708.00	3,708.00
Fixed equipment costs	80,000.00	80,000.00
Daily costs x # of days	17,117.52	103,449.36
Transportation	3,400.00	6,800.00
Disposal	600.00	3,000.00
	$105,369.52	$200,157.36
	($0.32/gal)	($0.10)

Option 4: On-Site Electrochemical Treatment

	(46 days)	(278 days)
Ground water sampling	$ 544.00	$3,200.00
Ground water monitoring wells	3,708.00	3,708.00
Fixed equipment costs	400,000.00	400,000.00
Daily costs x # days	22,247.90	134,454.70
Transportation	20.00	20.00
Disposal	21.25	136.00
	$426,541.15	$541,518.70
	($1.29/gal)	($0.27/gal)

TABLE 1
BETTER BRITE SAMPLE RESULTS
De Pere, Wisconsin
Results From the Wisconsin Department of Natural Resources
(Values are in mg/l or ppm)

Sample No.[1]	Sample Depth	Total Chromium	Hex Chromium	Cadmium	Zinc	Lead
W1	7.7 ft	0.15	0.12	--	--	--
W1A	0.6	429	280	--	--	--
W2	1.5	62	60	--	--	--
W3	2.6	320	263	--	--	--
W3[2]	--[3]	3800	--	--	--	--
W4	4.8	0.55	0.52	--	--	--
W7	1.2	0.20	0.08	--	--	--
W9[2]	--	1.6	--	--	--	--
W11[2]	--	2700	--	--	--	--
S1a	0-6 in	86	--	<1	80	24
S2a	0-6	8000	--	4	2200	100
S3a	0-6	620	--	<1	120	--
S1b	6-12	74	--	<1	52	<5
S2b	6-12	4900	--	<1	490	82
S3b	6-12	210	--	<1	60	--

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[1] W denotes samples received from ground water monitoring wells on August 10, 1979 by Soil Testing Services of Wisconsin, Inc., unless other wise indicated.
S denotes surface sediment samples received by the WDNR on September 27, 1985.

[2] Ground water sample received by the WDNR on September 7, 1985.

[3] -- = No data

TABLE 2
BETTER BRITE SAMPLE RESULTS
De Pere, Wisconsin
Samples Taken by the Technical Assistance Team
(Values are in mg/l, ug/g, or ppm)

Sample No.[1]	Matrix	Total Chromium	Hex Chromium	EP Tox Chromium	Zinc	Lead
S21[2]	Liquid	--[3]	--	--	--	--
S22	Surface Soil	510	--	--	94	16
S23	Surface Soil	250	--	--	61	14
S24	1.5 Ft Soil	33	--	--	15	4.3
S25	Sediment	48	--	--	56	20
S26	Liquid	4540	--	--	--	0.951
S04	Sediment	--	--	0.204	--	--
S05	Surface Soil	--	<10	--	--	--
S06	Surface Soil	--	<10	--	--	--
S07	Surface Soil	--	<10	--	--	--
S08	Composite Surface Soil	16100	14100	482	--	--
S09	Surface Soil	117	<10	0.067	--	--
S10	Liquid	--	5110	--	--	--

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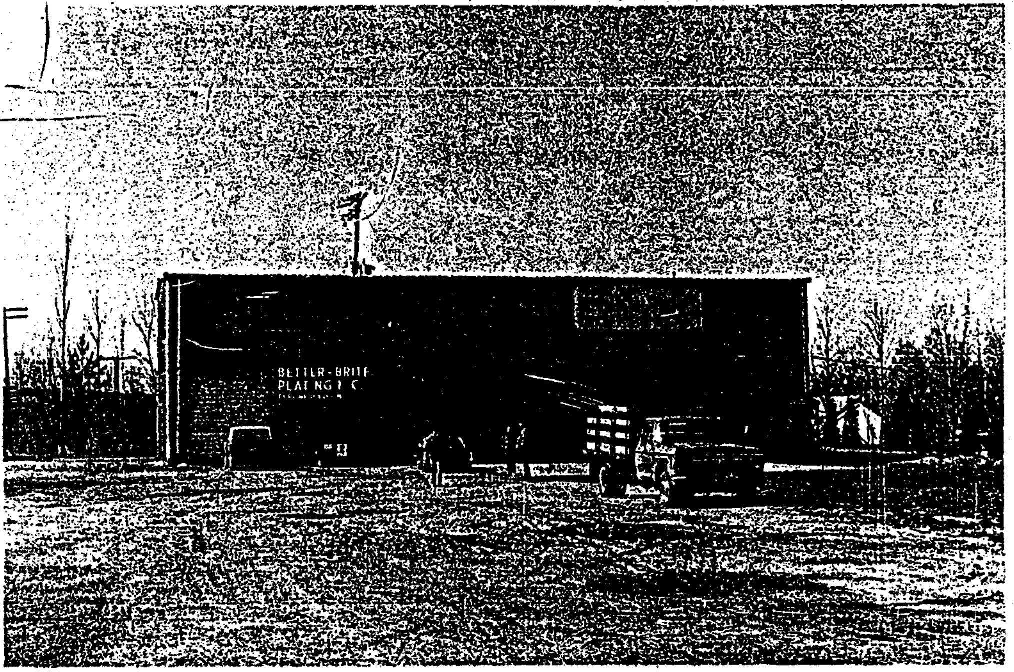
[1] Samples S21 through S26 taken on April 22, 1986. Samples S04 through S10 taken on June 23, 1986.

[2] Sample S21 leaked during shipping providing the laboratory with an insufficient volume for analysis.

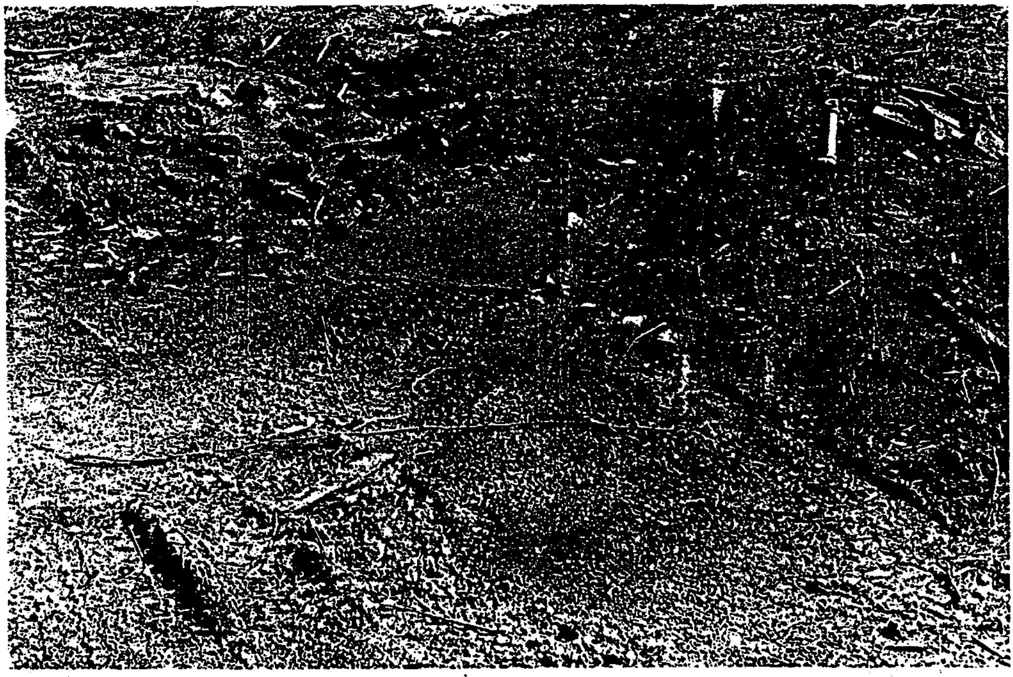
[3] -- = No Data

ATTACHMENT A

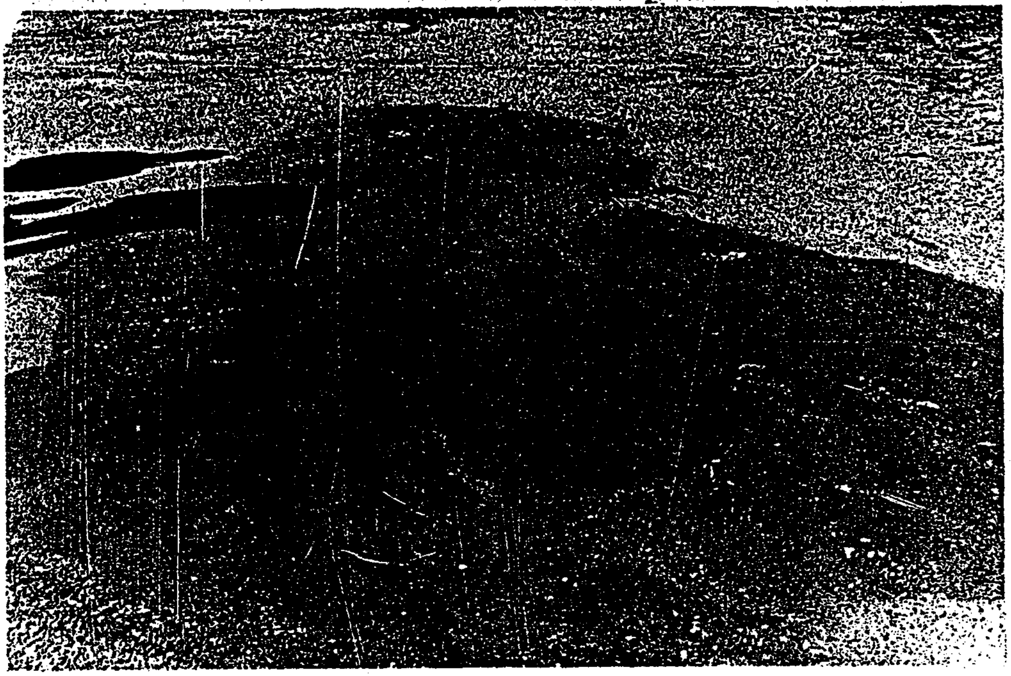
Site Photographs
Better Brite Plating
De Pere, Wisconsin



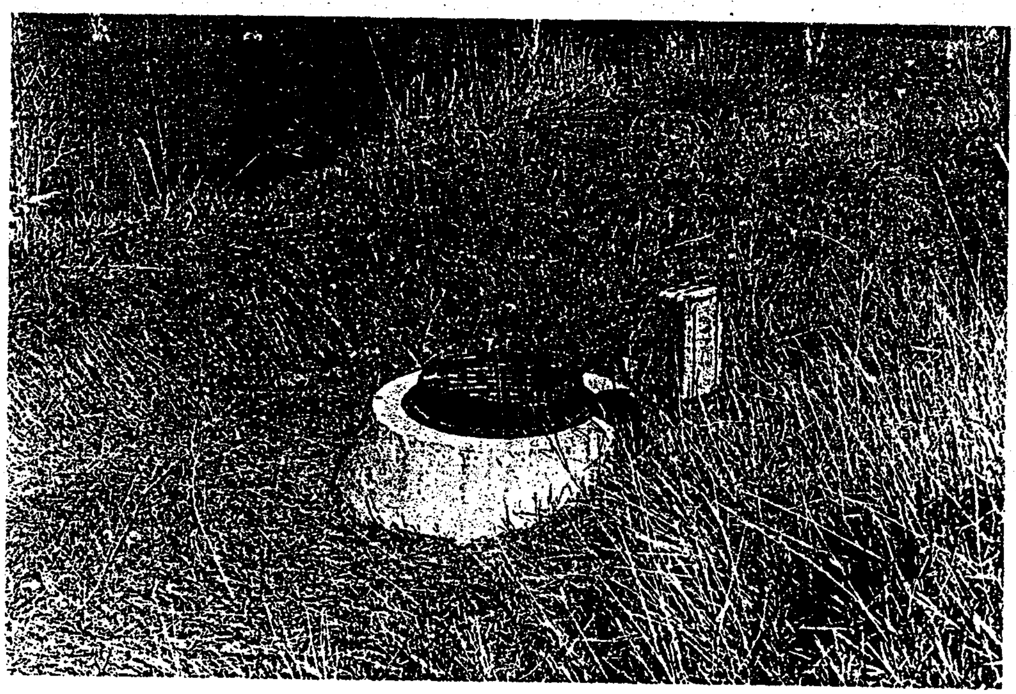
PHOTOGRAPH 1: BETTER-BRITE PLATING, De Pere, Wi.
Better-Brite Plating facility looking south from the parking lot.
(Photo by Bard, 900-1100, 4/21/86.)



PHOTOGRAPH 2: BETTER-BRITE PLATING, De Pere, Wi.
Closeup view of visibly stained soil on the northeast side of the parking lot.
(Photo by Bard, 900-1100, 4/21/86.)



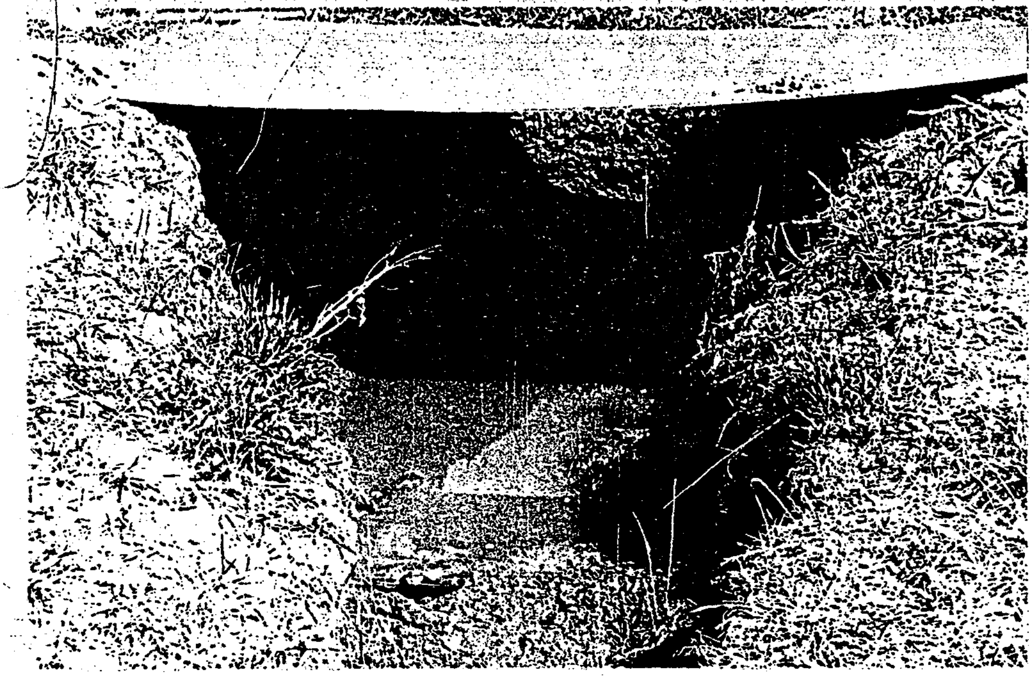
PHOTOGRAPH 3: BETTER-BRITE PLATING, De Pere, Wi.
Yellow liquid floating on puddle in the parking lot near the place where people are standing in Photo 1.
(Photo by Bard, 900-1100, 4/21/86.) JLB



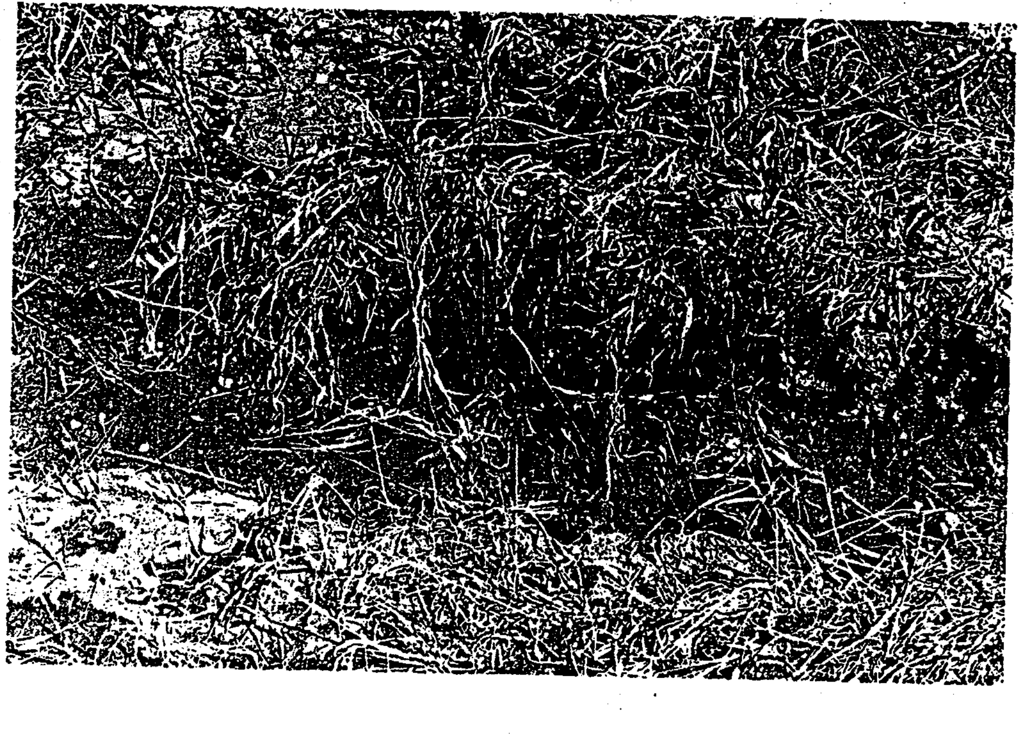
PHOTOGRAPH 4: BETTER-BRITE PLATING, De Pere, Wi.
Sump located on the west side of the property (looking to the right in Photo 1).
(Photo by Bard, 900-1100, 4/21/86). JLB

PHOTOGRAPH 5: BETTER-BRITE PLATING, De Pere, Wi.
Snow fence surrounding surface water holding pond on the west side of the property. Sump shown in Photo 4 is out of the picture on the left side. Trench leading to the building bisects the shadow of the building.
(Photo by Bard, 900-1100, 4/21/86.) JB

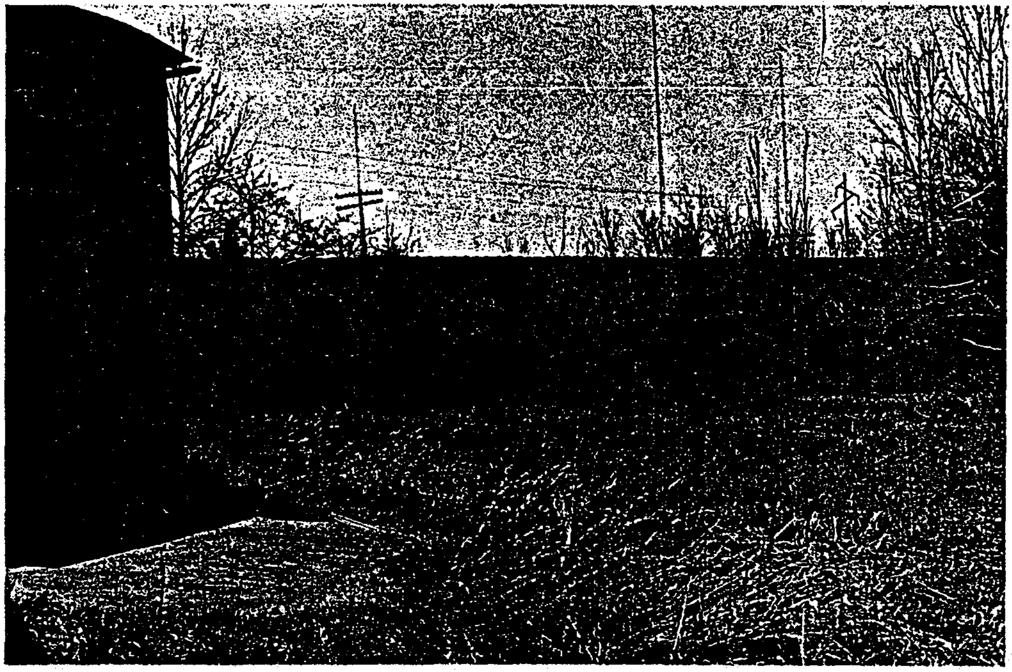
PHOTOGRAPH 6: BETTER-BRITE PLATING, De Pere, Wi.
Nearly dry holding pond shown in Photo 5. Note the proximity of residences to the storage pond. Photo is taken looking west.
(Photo by Bard, 900-1100, 4/21/86.) JB



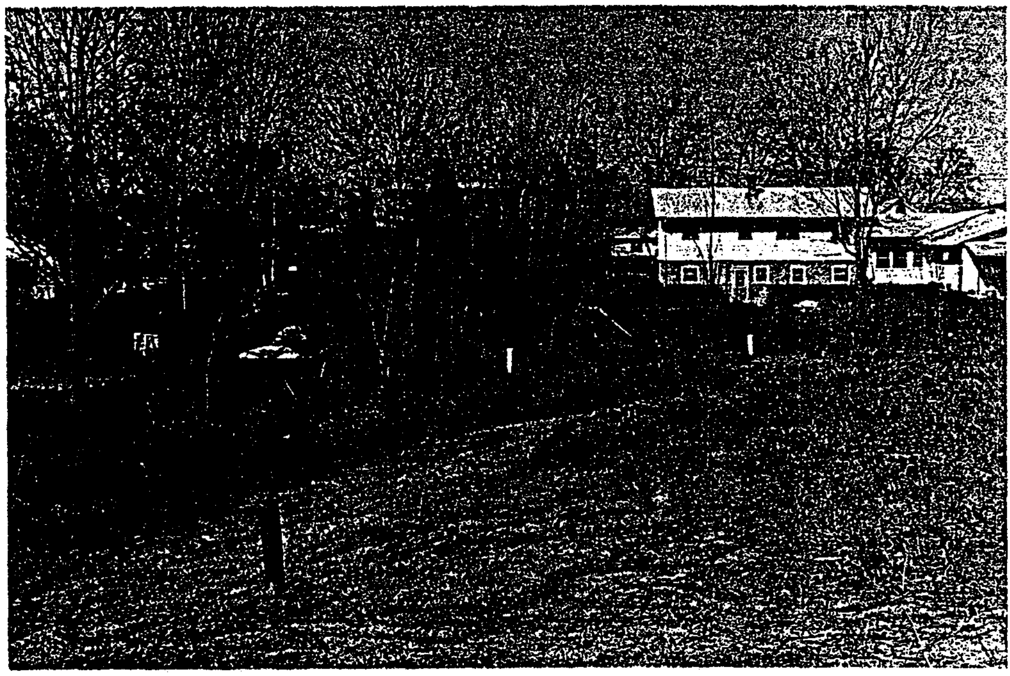
PHOTOGRAPH 7: BETTER-BRITE PLATING, De Pere, Wi.
Location of sediment sample, north of the holding pond.
(Photo by Bard, 900-1100, 4/21/86.)



PHOTOGRAPH 8: BETTER-BRITE PLATING, De Pere, Wi.
Location of auger retrieved sediment sample in the trench shown in Photo 5.
(Photo by Bard, 900-1100, 4/21/86.)



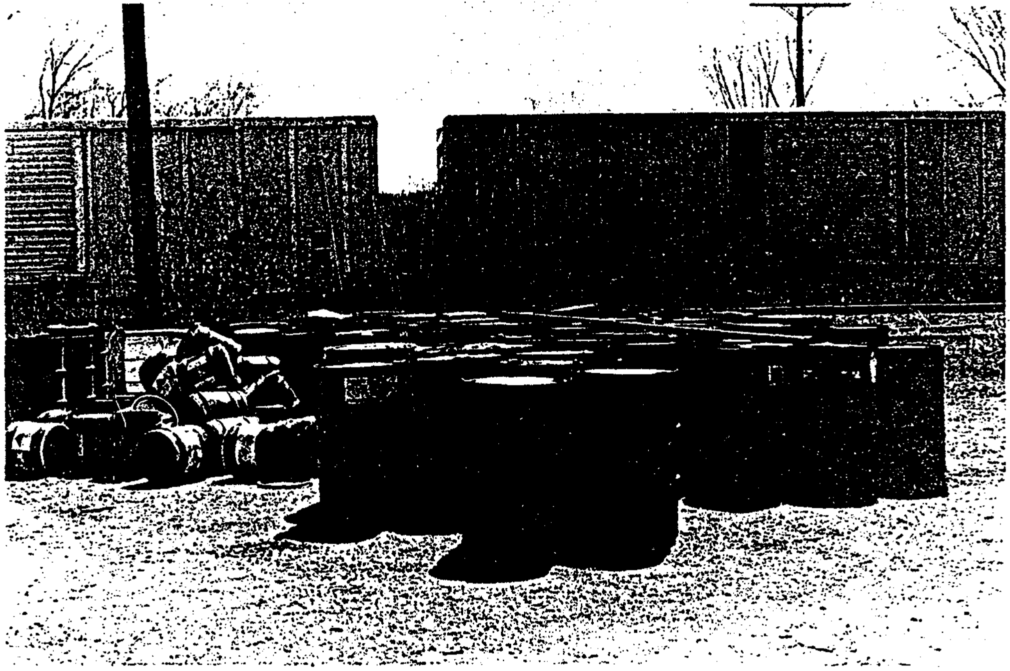
PHOTOGRAPH 9: BETTER-BRITE PLATING, De Pere, Wi. Westside entrance to the building looking south from near the location of the auger sample shown in Photo 8.
(Photo by Bard, 900-1100, 4/21/86.)



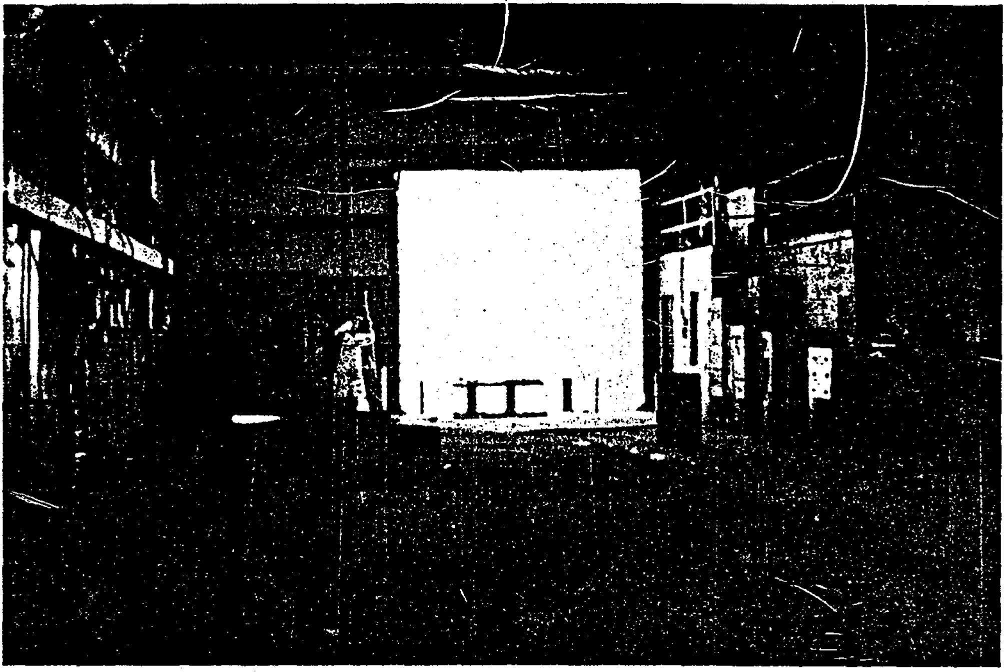
PHOTOGRAPH 10: BETTER-BRITE PLATING, De Pere, Wi. Looking west along the south boundary of the property. Note the berm to contain the surface waters on the Better-Brite property.
(Photo by Bard, 900-1100, 4/21/86.)

PHOTOGRAPH 11: BETTER-BRITE PLATING, De Pere, Wi. Panorama of the west boundary of the property. Soil depth on the Better-Brite grounds was reportedly built up with contaminated soils from neighboring lots. The retaining pond shown in Photos 5 and 6 is out of the picture to the right side. (Photos by Bard, 900-1100, 4/21/86.)

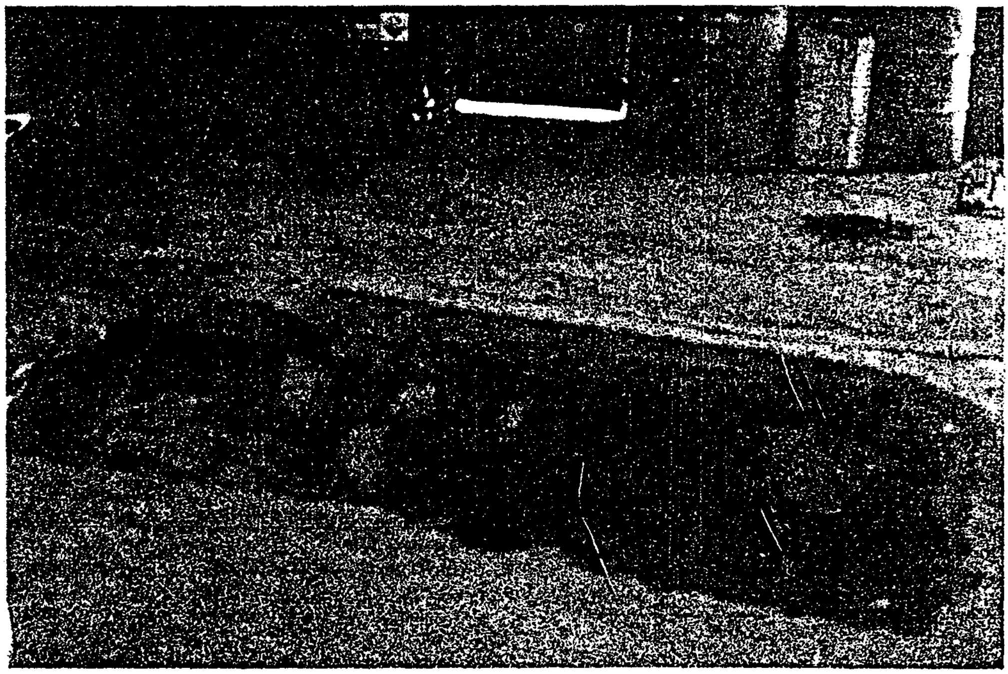
PHOTOGRAPH 12: BETTER-BRITE PLATING, De Pere, Wi.
Drums stored along the southside of the building.
(Photo by Bard, 900-1100, 4/21/86.) JSB



PHOTOGRAPH 13: BETTER-BRITE PLATING, De Pere, Wi.
Drums and buckets found on the east side of the property. Most of the approximately 84 55-gallon drums and 32 5-gallon buckets in this pile are empty.
(Photo by Bard, 900-1100, 4/21/86.) JSB



PHOTOGRAPH 14: BETTER-BRITE PLATING, De Pere, Wi.
Row of four plating vats looking west out the entrance shown in Photo 9. TAT member Scoville is sampling a vat that has filled with liquid to within 6 feet of the surface.
(Photo by Bard, 900-1100, 4/21/86.)



PHOTOGRAPH 15: BETTER-BRITE PLATING, De Pere, Wi.
Pit where an underground tank has been removed. Pit is west of the vat TAT member Scoville is sampling in Photo 14.
(Photo by Bard, 900-1100, 4/21/86.)

ATTACHMENT B

Summons Notification and Supporting Documents
Better Brite Plating
De Pere, Wisconsin

79-036

1030

STATE OF WISCONSIN CIRCUIT COURT BROWN COUNTY

STATE OF WISCONSIN,

Plaintiff,

vs.

BETTER-BRITE PLATING, INC.,
Everett Hintz, President,

Defendant.

AUTHENTICATED COPY
FILED
FEB 27 1980
CLERK OF COURTS
BROWN COUNTY, WISC.

SUMMONS

80CV586

THE STATE OF WISCONSIN, to Said Defendant(s):

YOU ARE HEREBY SUMMONED and required to serve upon Bronson C. La Follette, Attorney General, and Nancy L. Arnold, Assistant Attorney General, plaintiff's attorneys, whose address is 114 East, State Capitol, Madison, Wisconsin 53702, an answer to the complaint which is herewith served upon you within 20 days after service of this summons upon you, exclusive of the day of service, and in case of your failure so to do judgment will be rendered against you according to the demand of the complaint.

BRONSON C. LA FOLLETTE
Attorney General

NANCY L. ARNOLD
Assistant Attorney General

Department of Justice
114 East, State Capitol
Madison, Wisconsin 53702
(608) 266-8101

STATE OF WISCONSIN CIRCUIT COURT BROWN COUNTY

STATE OF WISCONSIN,

Plaintiff,

vs.

BETTER-BRITE PLATING, INC.,
Everett Hintz, President,

Defendant.

COMPLAINT

NOW COMES the plaintiff, State of Wisconsin, by Bronson C. La Follette, Attorney General, and Nancy L. Arnold, Assistant Attorney General, its attorneys, at the request of the Department of Natural Resources, and for claims for relief against the defendant, alleges and shows to the court as follows:

1. That the plaintiff is a sovereign state having its principal place of business at the State Capitol, Madison, Dane County, Wisconsin, 53702.

2. That the defendant is, and at all times material hereto was, a corporation owning and operating a chrome and zinc plating facility, in the City of DePere, Wisconsin. Its principal place of business is 315 South 6th Street, DePere, Wisconsin 54115, which is the location of its "old" building. Its "new" building is located at 519 Lande Street, DePere, Wisconsin.

FIRST CLAIM FOR RELIEF

3. That on or about December 19, 1978, defendant dumped yellow liquid, containing 1000 mg/liter total chrome and 1.0

mg/liter hexavalent chrome, on the ground adjacent to the loading dock door of its new building.

4. That on or about January 10 and 11, 1979, defendant again dumped chrome-contaminated liquid (as described in paragraph 3) outside the loading dock door of its new building.

5. That on or about May 21, 1979, defendant again dumped chrome-contaminated liquid (as described in paragraph 3) outside the loading dock door of its new building.

6. That on or about June 7, 1979, defendant again dumped chrome-contaminated liquid (described in paragraph 3) outside the loading dock door of its new building.

7. That on or about June 19 and 21, 1979, defendant again dumped chrome-contaminated liquid (described in paragraph 3) outside the loading dock door of its new building.

8. That on or about June 27, 1979, defendant again dumped chrome-contaminated liquid (described in paragraph 3) outside its new building.

9. That on or about July 23, 1979, defendant again dumped chrome-contaminated liquid (described in paragraph 3) out of the loading dock door of its new building.

10. That on or about July 30, 1979, defendant again dumped chrome-contaminated liquid (as described in paragraph 3) on the south side of its new building.

11. That on or about July 31, 1979, defendant again dumped chrome-contaminated liquid (described in paragraph 3) outside the loading dock of its new building.

12. That defendant's dumping of the yellow chrome-contaminated liquid as described in paragraphs 3 through 11 constituted "discharges" within the meaning of sec. 144.76(1)(a), Stats.

13. That the yellow chrome-contaminated liquid which defendant dumped as described in paragraphs 3 through 11, constitutes a "hazardous substance" within the meaning of secs. 144.76(1)(b) and 144.43(2), Stats.

14. That each dumping of the chrome-contaminated liquid in paragraphs 3 through 11 constituted a hazardous substance spill, within the meaning of sec. 144.76, Stats.

15. That sec. 144.76(2), Stats., requires that persons possessing a hazardous substance notify the DNR immediately of a discharge of such substance; that sec. 144.76(3), Stats., requires persons discharging a hazardous substance to take the actions necessary to restore the environment and to minimize the harmful effects of any discharge on the air, lands, waters of the state; that sec. 144.76(4), Stats., requires persons to take preventive measures to control repeated discharges of hazardous substances.

16. That the defendant, in each instance described in paragraphs 3 through 11, failed to notify the DNR of its spilling of hazardous substance, in violation of sec. 144.76(2), Stats.

17. That, as a result of defendant's dumping of yellow chrome-bearing liquid outside its new building (as alleged in paragraphs 3 through 11) the soil and groundwater on

defendant's property adjacent to its new building and on neighboring adjacent properties have become contaminated with chromium and hexavalent chromium.

18. That the defendant has failed to take the actions necessary to restore said soil and groundwater and to minimize the harmful effects of its discharge; that it has failed to submit to the DNR a plan for restoration of contaminated soil and groundwater on its own and adjacent neighboring properties as required, all in violation of sec. 144.76(3), Stats.

19. That defendant has failed to take preventive measures to control repeated discharges of hazardous substances, in violation of sec. 144.76(4), Stats.

20. That, as plaintiff is informed and believes, the defendant will continue to violate secs. 144.76(2), (3) and (4), Stats., unless injunctive and other appropriate relief is granted.

SECOND CLAIM FOR RELIEF

As and for a second claim for relief against said defendant, plaintiff alleges and shows to the court as follows:

21. Alleges and re-alleges paragraphs 3 through 18 above.

22. That the defendant is "disposing" (or has disposed) of hazardous waste within the meaning of sec. 144.61(3), Stats.

23. That the defendant, by its repeated actions of dumping chromium liquid, has established and is maintaining a

site for the disposal of hazardous waste without a license, in violation of secs. 144.44(1) and (4), Stats.

24. That, as plaintiff is informed and believes, the defendant will continue to violate secs. 144.44(1) and (4), Stats., unless injunctive and other appropriate relief is granted.

THIRD CLAIM FOR RELIEF

As and for a third claim for relief against said defendant, plaintiff alleges and shows to the court as follows:

25. Alleges and re-alleges paragraphs 3 through 18 of this complaint.

26. That the defendant has dumped chrome-contaminated liquid wastes for a sufficient duration and in a sufficient quantity so as to contaminate and pollute the soil and groundwater and that the acts of defendant are deleterious and injurious to the health, safety, and well-being of citizens of this state, and are deleterious and injurious to property, both personal and real, owned by persons other than defendant, and the acts of the defendant prevent citizens from reasonably enjoying the normal benefits of living in communities of this state, and from the full use and enjoyment of their property, both personal and real.

27. That the acts of defendant constitute a public nuisance, which, as plaintiff is informed and believes, defendant will not abate unless injunctive relief is granted.

WHEREFORE, the plaintiff demands judgment:

a. For a mandatory injunction requiring the defendant:

(1) to cease immediately all dumping of chrome-contaminated liquid outside its new facility.

(2) to take all measures necessary to prevent future discharges of chrome-contaminated materials.

(3) to take all actions necessary to restore the soil and groundwater it has contaminated on its own and adjacent properties including submission of a comprehensive plan for restoration, and to otherwise minimize the harmful effects of the discharges described herein, according to a schedule determined by the court.

(4) to notify the DNR immediately of any new hazardous substance spill, as required by sec. 144.76(2), Stats.

b. Ordering the defendant to pay a sum pursuant to sec. 144.99, Stats., of not less than $10 nor more than $5,000 for each day of violation of secs. 144.76(2), (3) and (4), Stats., as set forth in the first claim for relief above, continuing until such time as compliance is achieved.

c. Ordering the defendant to pay a sum pursuant to sec. 144.99, Stats., of not less than $10 nor more than $5,000 for each day of violation of secs. 144.44(1) and (4), Stats., as set forth in the second claim for relief above, continuing until such time as compliance is achieved.

d. For such other relief as the court deems proper.

Dated this 26th day of February, 1980.

BRONSON C. LA FOLLETTE
Attorney General

Nancy L. Arnold
NANCY L. ARNOLD
Assistant Attorney General

Attorneys for Plaintiff,
State of Wisconsin

Department of Justice
114 East, State Capitol
Madison, Wisconsin 53702
(608) 266-8101

If you have any questions, please contact Doug Coenen at (608) 266-7017 or Doug Rossberg at (414) 497-4047.

Sincerely,
Bureau of Solid Waste Management

Douglas W. Coenen, Engineer
Hazardous Waste Management Section

David Stensby

David Stensby, Chemist
Hazardous Waste Management Section

John W. Thorsen

John W. Thorsen, P.E., Chief
Hazardous Waste Management Section

DC:jb
cc: D. Rossberg-LMD
Mary Ann Sumi - Dept. of Justice
Bernard Berk - Attorney

79-036

The State of Wisconsin
Department of Justice
Madison
53702

Maryann Sumi
Assistant Attorney General
(608) 266-0770

Bronson C. La Follette
Attorney General

David J. Hanson
Deputy Attorney General

Better-Brite

October 16, 1980

REC'D DNR
OCT 17 1980
GREEN BAY

Honorable Richard G. Greenwood
Circuit Judge
Brown County Courthouse
Green Bay, Wisconsin 54301

Re: State of Wisconsin v. Better-Brite Plating, Inc., Case No. 80-CV-586

Dear Judge Greenwood:

Enclosed please find the State's Notice and Motion for Temporary Injunction and a supporting Affidavit. As indicated, we are set for hearing at 10:00 a.m. on Thursday, October 23, 1980. We expect to have two or, at most, three witnesses testify on the department's behalf. I telephoned Mr. Berk On October 14 to inform him of the hearing and also to notify him that the pretrial set for October 17 is cancelled, and he is being served with copies of the pleadings submitted herewith.

Respectfully,

Maryann Sumi
Assistant Attorney General

MS:mmi
Enclosures

cc: Mr. Bernard Berk

bcc: Doug Rossberg

STATE OF WISCONSIN CIRCUIT COURT BROWN COUNTY

STATE OF WISCONSIN,

Plaintiff,

vs.

Case No. 80-CV-586

BETTER-BRITE PLATING, INC.,
a Wisconsin corporation,

Defendant.

NOTICE AND MOTION FOR TEMPORARY INJUNCTION

TO: Bernard Berk
Berk, Berk & Hoida, S.C.
403 S. Jefferson Street
Post Office Box 1063
Green Bay, Wisconsin 54305

PLEASE TAKE NOTICE that plaintiff State of Wisconsin will move the Brown County Circuit Court, Branch 1, the Honorable Richard G. Greenwood, Circuit Judge, presiding, on October 23, 1980, at 10:00 a.m. at the Brown County Courthouse, Green Bay, Wisconsin, for a mandatory injunction requiring defendant Better-Brite Plating, Inc., to halt the environmental degradation and continuing chromium contamination of groundwater resulting from defendant's refusal to restore soil and groundwater it has contaminated on its own and adjacent properties.

Dated this ____ day of October, 1980.

BRONSON C. LA FOLLETTE
Attorney General

MARYANN SUMI
Assistant Attorney General

Attorneys for Plaintiff,
State of Wisconsin

Department of Justice
114 East, State Capitol
Madison, Wisconsin 53702
(608) 266-0770

STATE OF WISCONSIN CIRCUIT COURT BROWN COUNTY

STATE OF WISCONSIN,

Plaintiff,

vs. Case No. 80-CV-586

BETTER-BRITE PLATING, INC.,
a Wisconsin corporation,

Defendant.

AFFIDAVIT

STATE OF WISCONSIN)
) SS:
COUNTY OF DANE)

Douglas W. Coenen, being first duly sworn, on oath deposes and says:

1. I am an environmental engineer presently employed by the State of Wisconsin - Department of Natural Resources in the Hazardous Waste Section of the Bureau of Solid Waste Management. My primary duty as an environmental engineer is to investigate options for the disposal of hazardous waste, including soils studies, waste characterization, and the study of groundwater and the movement of contaminants in groundwater.

2. I act as a Department of Natural Resources technical liaison to the Department of Justice in this lawsuit, which concerns Better Brite's illegal dumping of chromium wastes on

its property located in the City of DePere, Brown County, Wisconsin. In this capacity, I have participated in the evaluation of Better Brite's plans for the restoration of contaminated soil and groundwater on its own and adjacent properties. I have also participated in ongoing negotiations between the Department of Justice, the Department of Natural Resources, Better-Brite and its consultants concerning Better-Brite's restoration plan.

3. On April 15, 1980, Better-Brite submitted to the Department of Natural Resources a "Remedial Action Plan for Chromium Contamination" which proposed a groundwater extraction system consisting of a drainage trench to be dug below the static groundwater level which would collect contaminated groundwater both on- and off-site. Collected groundwater would then be stored and evaluated prior to discharge.

4. On May 16, 1980, the DNR Hazardous Waste Management Section responded in writing to the Remedial Action Plan, raising numerous questions about the adequacy of the plan to substantially eliminate the chromium contamination. Following a meeting between the Department and Better-Brite on July 16, 1980, the Department of Natural Resources requested further information from Better-Brite. Following receipt of the information and further discussions, the Department of Natural Resources approved the proposed plan and required its implementation by September 30, 1980, with the modification, among others, that the drainage trench must be dug to a depth

of 25 feet instead of 8-12 feet as proposed. A copy of the letter requiring implementation of the remedial action plan with modifications is attached hereto as Exhibit A.

5. The deepening of the drainage trench to 25 feet is necessary because recent tests show that chromium contamination in the groundwater has migrated downward to a depth of about 27 feet.

6. I am informed and believe that on or about October 1, 1980, DNR District Solid Waste Coordinator Doug Rossberg granted Better-Brite an oral extension of time to implement the Remedial Action Plan to not later than October 13, 1980, because of additional department groundwater testing.

On Monday, October 13, 1980, I visited the Better-Brite property in DePere to monitor the progress of the Remedial Action Plan. I observed absolutely no activity or excavation on the site.

8. In my professional opinion, immediate implementation of the Remedial Action Plan by Better-Brite is essential to halt further groundwater degradation by means of chromium contamination.

DOUGLAS W. COENEN

Subscribed and sworn to before me
this 16th day of October, 1980.

NOTARY PUBLIC, STATE OF WISCONSIN
My Commission expires 10/11/81.

ATTACHMENT C

WDNR Sample Results
Better Brite Plating
De Pere, Wisconsin

77-[illegible]

SOIL TESTING SERVICES
OF WISCONSIN, INC.
540 LAMBEAU ST. GREEN BAY, WIS. 54303

September 5, 1979

Better Brite, Inc.
315 South 6th Street
De Pere, Wisconsin 54115

Attention: Mr. Everett Hintz

STS Job 9879

RE: Preliminary test results regarding chromium contamination at Better Brite, Inc. facility in De Pere, Wisconsin.

Gentlemen:

A preliminary subsurface exploration to evaluate the chromium contamination at the above referenced facility has been completed. The attached report contains the following items.

Soil Boring Location Diagram

Topography Map

Soil Boring Logs (W-1, W-1A, W-2, W-3, W-4 and W-7)

Perched Ground Water Table Contour Map

Ground Water Level Summary (8-10-79 and 8-28-79)

Schematic Diagram of Observation Well Installations and Chromium Contamination

Geologic Cross-Section (depicts probable zone of chromium contamination)

Six copies of this report have been sent to the above address. We suggest that four copies be delivered to the Department of Natural Resources, Lake Michigan District Office, P. O. Box 3000, Green Bay, Wisconsin, 54306, Attention: Mr. Doug Rossberg

AFFILIATE OF SOIL TESTING SERVICES, INC

GREEN BAY PHONE (414) 494-9656
WAUSAU, WISCONSIN : 715—845-8386
MARQUETTE, MICHIGAN : 906—225-1417
MILWAUKEE, WISCONSIN : 414—354-1100
SUPERIOR, WISCONSIN : 715—392-9006
OSHKOSH, WISCONSIN : 414—235-0270

WILLIAM M. PEPPICH, P.E.
JOHN P. GNAEDINGER, P.E.
BRUCE M. THORSON, P.E.
CLYDE N. BAKER, P.E.
MERLE E. BRANDER, P.E.
PHILLIP C. BEST

DOUGLAS J. HERMANN, P.E.
JAMES J. BOTZ, P.E.
JAMES A. SENGER
JON D. MUELLER
THOMAS W. WOLF
JACK J. AMAR, P.E.

Briefly, the probable zone of chromium contamination is located west-southwest from the plating building and likely extends to a surface water drainage ditch where surface water drains to the north. The soil analysis indicates the probable depth of contamination to be 6.5, 8.0, 9.0 at borings 1, 2 and 3, respectively. The deeper zone of contamination in Boring 3 is attributed to uncontrolled fill which has been backfilled into this area and provides a more permeable path for contamination migration. Borings 4 and 7 did not encounter significant levels of contamination and probably represent a natural background concentration in the soil. An aggressive digestion using 4.0 M hydrofluoric acid digestion was used for the soil analysis.

Water analysis at Wells 1A, 2 and 3 also encountered total chromium contamination ranging from 62 to 429 mg/l with 60 to 280 mg/l hexavalent chromium. This sampling was performed on August 28, 1979. Water samples from Wells W-1, W-4 and W-7 did not contain discernable amounts of chromium. The absence of chromium in Well W-1 corroborates the soil analysis. In conjunction with water sampling, a surface water sample was collected in the ditch near the storm sewer drain located west-northwest of the plating building. The total chromium and hexavalent chromium concentrations in this sample were respectivaly 1511 and 1440 mg/l.

The probable zone of contamination is shown on the attached geologic cross-section. This information indicates that a rather confined area in the upper soil horizon has been contaminated. We suggest that further study evaluate off-site property in the area to delineate probable areas of contamination. This work may be accomplished by performing relatively shallow borings extending to 8 to 10 feet. A 4 M hydrofluoric acid digestion should be performed on soil samples recovered from these borings and compared to the results in this report. We suggest that the additional exploration and testing be performed as soon as possible to minimize migration of the contaminants.

We have appreciated the opportunity to provide testing and engineering services for you. If you have any questions with regard to the enclosed, please contact us at your convenience.

Yours very truly,

SOIL TESTING SERVICES OF WISCONSIN, INC.

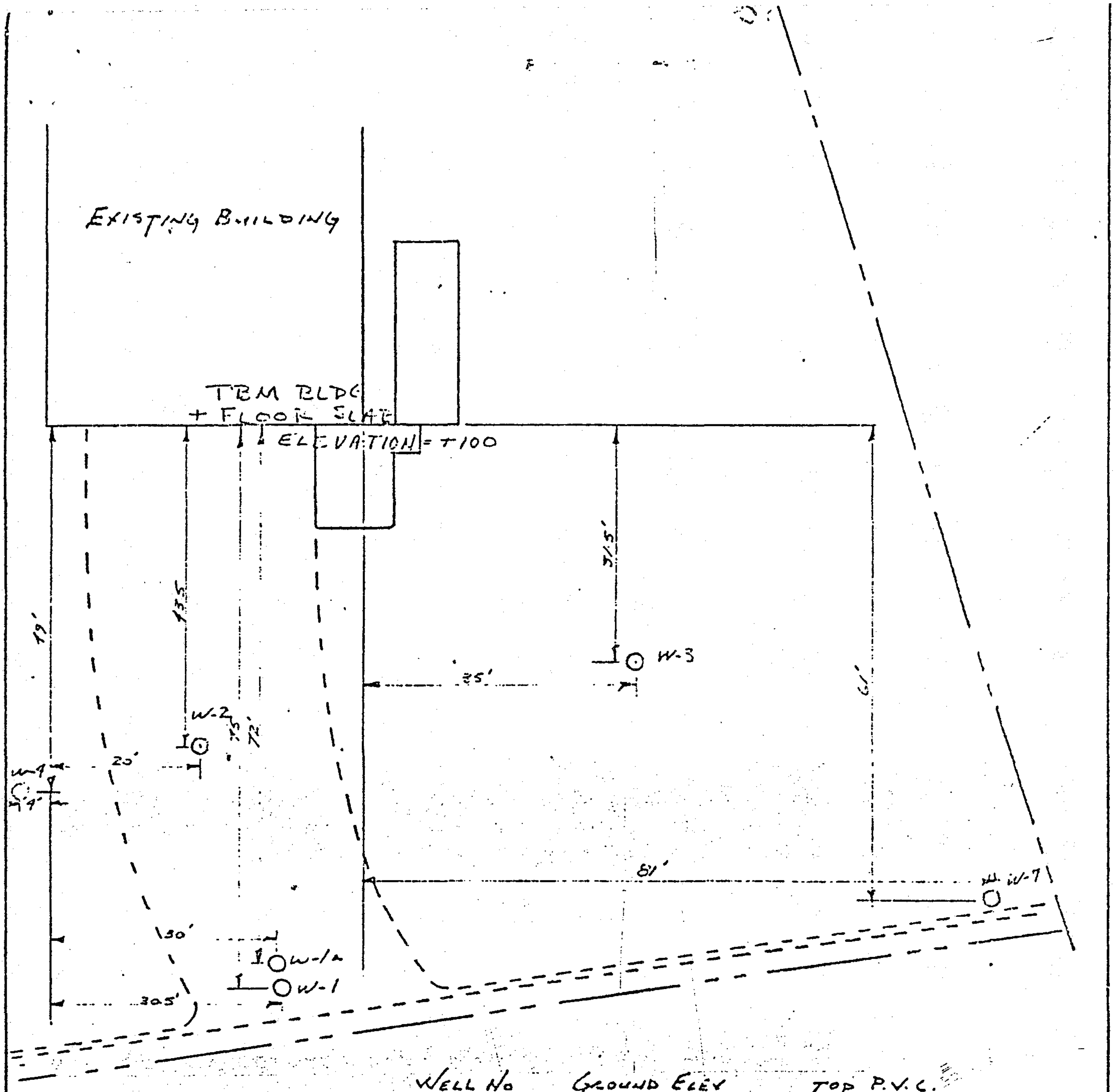
Douglas J. Her

Douglas J. Hermann, P. E.
Project Engineer

William M. Perpich, P. E.
President

DJH/cs

Encl: Soil Boring Location Diagram
Topography Map
Soil Boring Logs (W-1 through W-7)
Ground Water Level Summary
Perched Ground Water Table Contour Map
Geologic Cross-Section
Schematic Diagram of Observation Well and Chromium Contamination

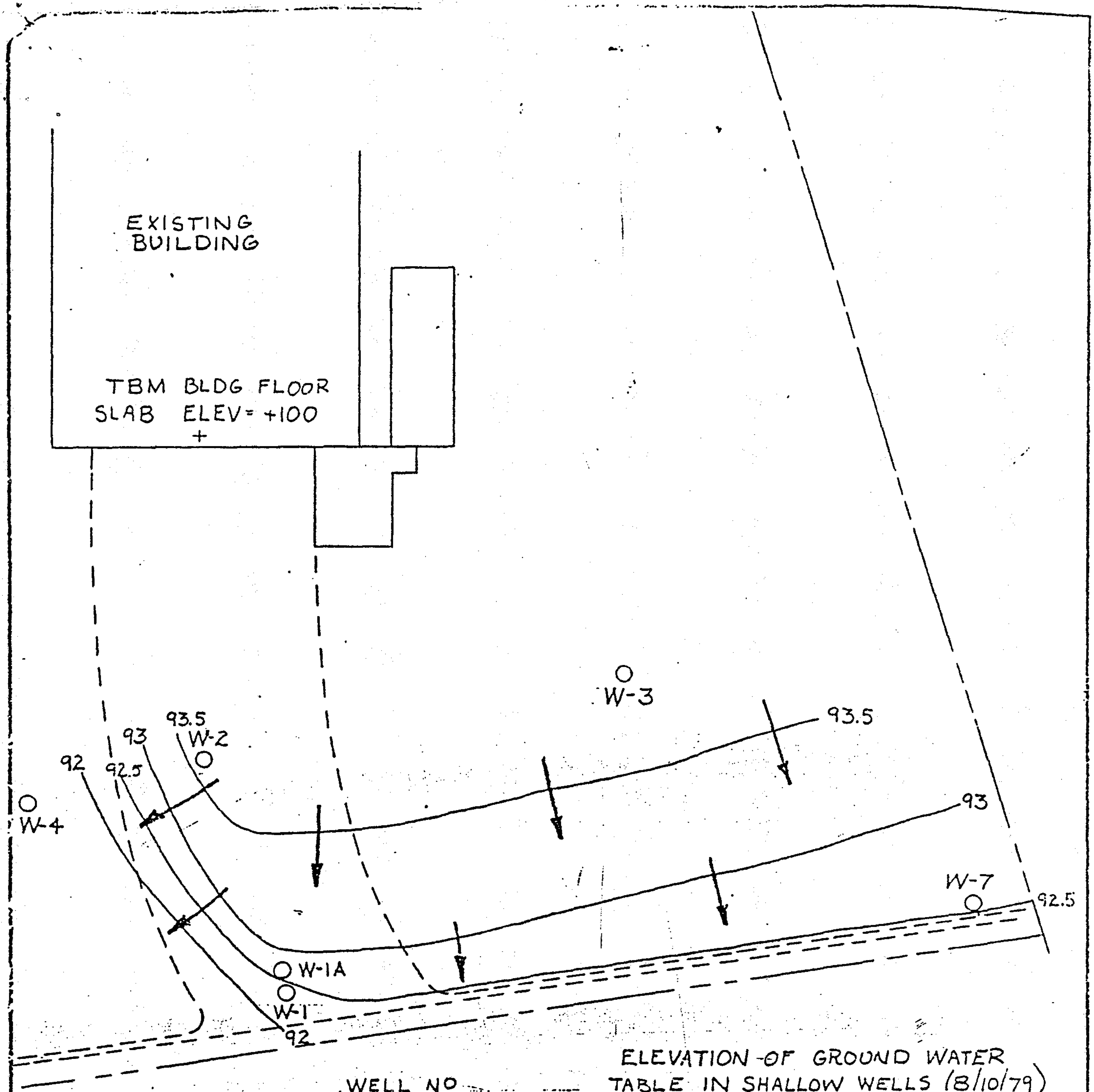


WELL NO	GROUND ELEV	TOP P.V.C.
W-1	93.17	95.25
W-1A	93.47	95.64
W-2	95.30	97.16
W-3	96.52	98.60
W-4	95.48	97.73
W-7	93.79	95.85

BETTER BRITE PLATING
SOIL BORING LOCATION DIAGRAM
DEPERE, WISC.

SOIL TESTING SERVICES
OF WISCONSIN, INC.
540 LAMBEAU ST. GREEN BAY, WISCONSIN 54303

[illegible] | 1" = 20' | [illegible] | [illegible]

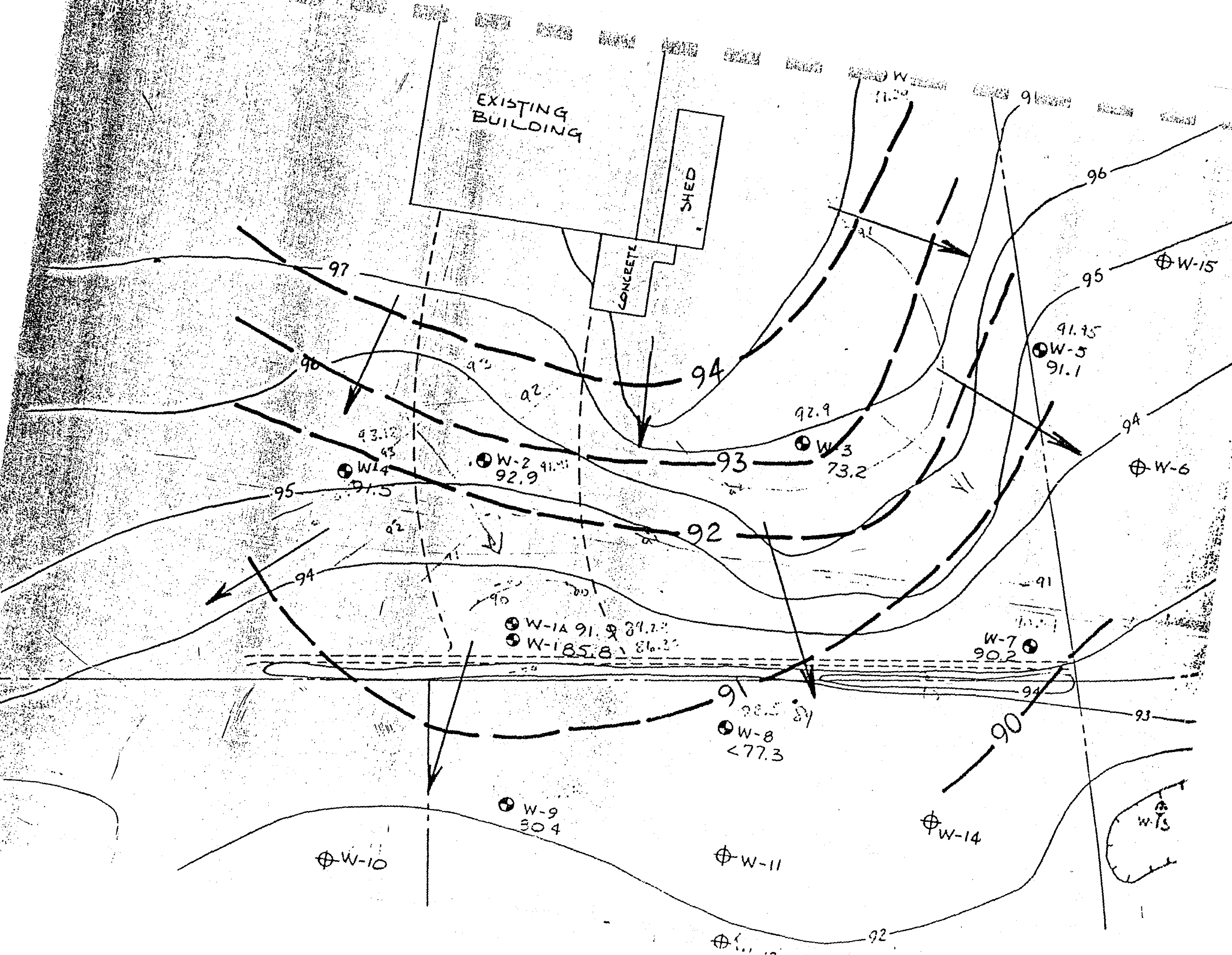


WELL NO	ELEVATION OF GROUND WATER TABLE IN SHALLOW WELLS (8/10/79)
W-1	DEEP WELL @ 85.5
W-1A	92.9
W-2	93.8
W-3	93.9
W-4	< 90.7
W-7	92.7

BETTER BRITE PLATING
PERCHED GROUND WATER TABLE CONTOUR
DE PERE, WISC.

SOIL TESTING SERVICES
OF WISCONSIN, INC.
540 LAMBEAU ST. GREEN BAY, WISCONSIN 54303

PSS | 1"=20' | 8-20-79 | 4879


EXISTING BUILDING
SHED
CONCRETE
W-1A 91.9 89.2
W-1B 85.8 86.2
W-2 92.9
W-3 73.2
92.9
W-4 91.5
93.12
W-5 91.1
91.45
W-6
W-7 90.2
W-8 <77.3
W-9 80.4
W-10
W-11
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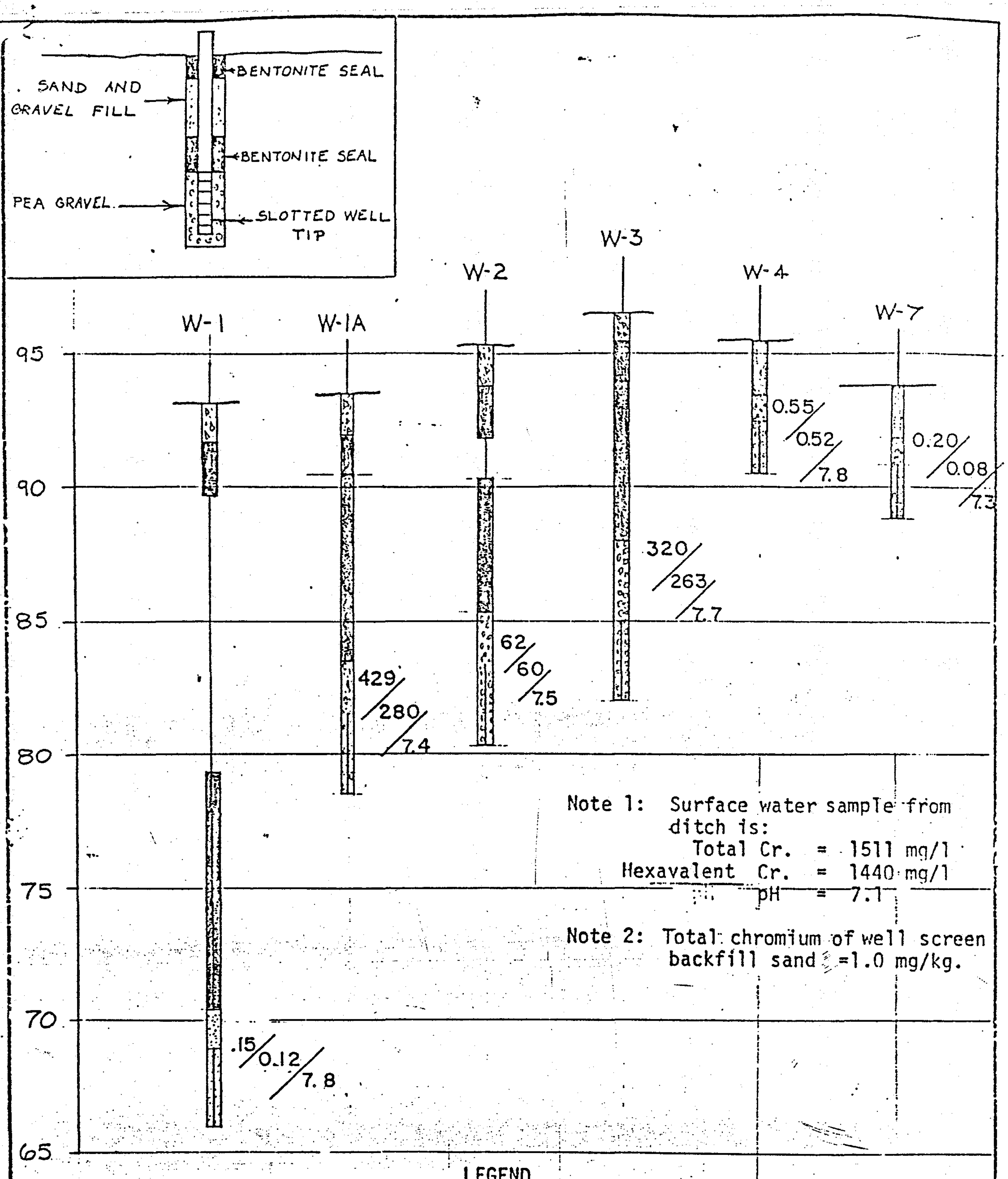


Note 1: Surface water sample from ditch is:
Total Cr. = 1511 mg/l
Hexavalent Cr. = 1440 mg/l
pH = 7.1

Note 2: Total chromium of well screen backfill sand =1.0 mg/kg.

LEGEND

Total Chromium in mg/l / Hexavalent chromium in mg/l / pH

SCHEMATIC DIAGRAM
OBSERVATION WELL INSTALLATION
AND CHROMIUM CONCENTRATION

SOIL TESTING SERVICES
OF WISCONSIN, INC.
540 LAMBEAU ST. GREEN BAY, WISCONSIN 54303

TSS	8-20-79	1859

DATE OF READING: 8-10-79 JOB No. 9879

WELL No.	GROUND SURFACE ELEV.	TOP OF PVC ELEV.	DEPTH TO WATER	ELEV. OF WATER IN WELL
W-1	93.2	95.25	9.8	85.5
W-1A	93.5	95.64	2.7	92.9
W-2	95.3	97.16	3.4	93.8
W-3	96.5	98.60	4.7	93.9
W-4	95.5	97.73	Dry @ 7.0	90.7
W-7	93.8	95.85	3.3	92.6

Ground Water Level Summary
Better Brite Plating Company
De Pere, Wisconsin

SOIL TESTING SERVICES OF WISCONSIN, INC.
540 LAMBEAU ST. GREEN BAY, WISCONSIN 54303

DJH | 8-10-79 | 9879

LOG OF BORING NO. W-1

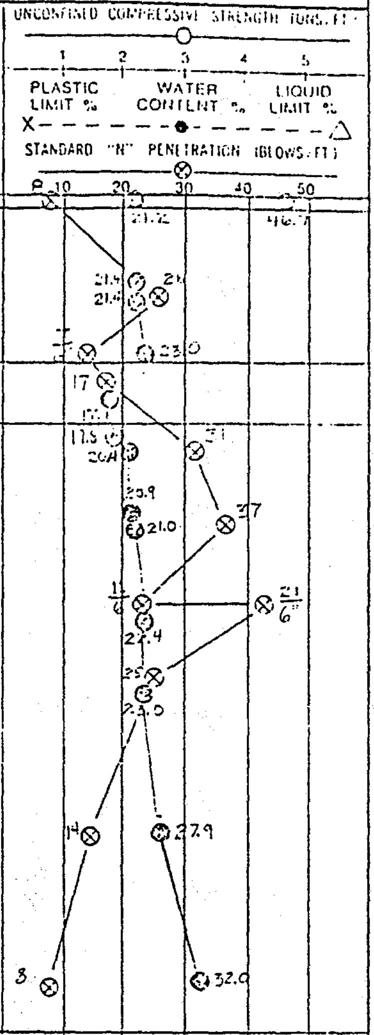
OWNER Better Brite Plating Company

ARCHITECT-ENGINEER

SITE Lande Street, De Pere, Wisconsin

PROJECT NAME Chromium Spill

DEPTH ELEVATION	SAMPLE NO.	TYPE SAMPLE	SAMPLE DIST.	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT. 3
☒					SURFACE ELEVATION 93.2	
	1	SS			Brown silty clayey topsoil (OL) moist-stiff	
	2	SS			Reddish brown silty clay (CL) trace sand-trace to a little gravel-moist- very stiff to hard.	
	3	SS				
	3A	SS			Grayish brown silty sandy clay (CL) some fine to medium sand-wet-stiff	
	4	SS			Reddish brown silty clay (CL) trace to a little fine sand-trace fine gravel-one inch clayey sand (SC) seam at 8.0 feet-moist--decreasing strength from hard to stiff with depth	
10	5	SS				
	6	SS				
15	7	SS				
20	8	SS				
25	9	SS				
27.3						
30						



End of Boring
Boring terminated on boulder or bedrock. Auger refusal at 27.3 feet
Boring advanced to 27.3 feet by solid stem auger
1 1/4 inch PVC observation well installed at 27.3 feet with protector pipe and lock; Top PVC Elevation = 95.25

TOTAL CHROMIUM CONCENTRATION (mg/kg)

Sample	Top	Bottom	Average
S-1	140	31	86
S-2	21	25	23
S-3	22	18	20
S-4	7.2	6.5	6.9
S-5	5.0	6.1	5.6
S-6	-	-	4.8
S-7	-	-	4.9
S-8	-	-	4.7
S-9	-	-	4.6

NOTE: Soil chemistry results by Foth & Van Dyke & Associates

WATER LEVEL OBSERVATIONS		
W.L.	10' WD	
W.L.	B.C.R.	A.C.R.
W.L.	22' AB	

SOIL TESTING SERVICES
OF WIS., INC.
540 LAMBEAU STREET
GREEN BAY, WIS. 54303

BORING STARTED		8-2-79	
BORING COMPLETED		8-2-79	
RIG	Bomb	FOREMAN	TT
DRAWN	PS	APPROVED	DJH
JOB #	9879	SHEET	

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BBS 10/7

LOG OF BORING NO. W-1A

NER Better Brite Plating Company

SITE Lande Street, De Pere, Wisconsin

ARCHITECT-ENGINEER

PROJECT NAME Chromium Spill

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.² —○— 1 2 3 4 5

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % △

STANDARD "N" PENETRATION (BLOWS/FT.) —⊗— 10 20 30 40 50

DEPTH ELEVATION	SAMPLE NO.	TYPE SAMPLE	SAMPLE DIST.	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT. 3
☒					SURFACE ELEVATION 93.5	
5						
		PA			Auger only - No Sampling	
10						
15						
					End of Boring Boring terminated in Reddish brown silty clay Boring advanced to 15.0 feet by solid stem auger 1 1/4 inch PVC observation well installed at 15.0 feet with protector pipe and lock; Top PVC Elevation = 95.64	

WATER LEVEL OBSERVATIONS		
W.L.	Dry WD	
W.L.	B.C.R.	A.C.R.
W.L.	Dry AB	

SOIL TESTING SERVICES
OF WIS., INC.
540 LAMBEAU STREET
GREEN BAY, WIS. 54303

BORING STARTED		8-2-79	
BORING COMPLETED		8-2-79	
RIG	Romb	FOREMAN	TT
DRAWN	PS	APPROVED	DJH
JOB #	9879	SHEET	

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

LOG OF BORING NO. W-2

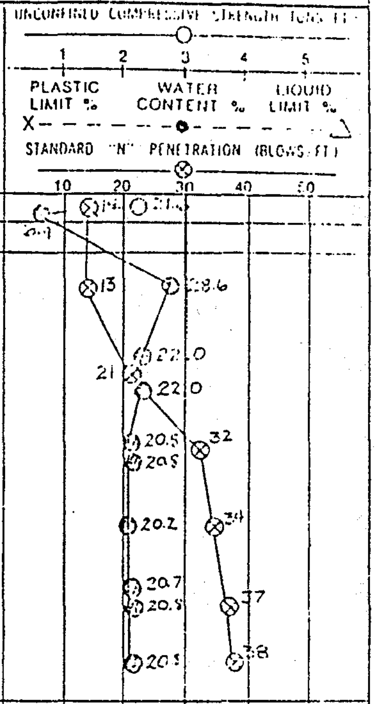
OWNER Better Brite Plating Company

ARCHITECT-ENGINEER

SITE Lande Street, De Pere, Wisconsin

PROJECT NAME Chromium Spill

DEPTH ELEVATION	SAMPLE NO.	TYPE SAMPLE	SAMPLE DIST.	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT. 3
☒					SURFACE ELEVATION 95.3	
	1	SS			Brown slightly silty fine sand (SP-SM) trace to a little gravel-moist-(Fill)	
					Black silty sandy topsoil (OL)-moist-medium dense	
	2	SS			Reddish brown silty clay (CL) trace gravel-trace fine to medium sand-moist-very stiff to stiff with decreasing strength with depth	
5	3	SS				
	4	SS				
10	5	SS				
	6	SS				
15						
16.5	7	SS				



End of Boring

Boring terminated in silty clay

Boring advanced to 16.5 feet by solid stem auger

1 1/4 inch PVC observation well installed at 15.0 feet with protector pipe and lock; Top PVC Elevation = 97.16

TOTAL CHROMIUM CONCENTRATION (mg/kg)

Sample	Top	Bottom	Average
S-1	3.7	11	7.3
S-2	-	-	30
S-3	31	32	32
S-4	11	9	10
S-5	-	-	5.0
S-6	5.5	5.0	5.2
S-7	-	-	5.0

WATER LEVEL OBSERVATIONS

W.L. 7.5-9.0 WS While Sampling

W.L. B.C.R. A.C.R.

W.L. 14.4 AB After Boring

SOIL TESTING SERVICES
OF WIS., INC.
540 LAMBEAU STREET
GREEN BAY, WIS. 54303

BORING STARTED		8-2-79	
BORING COMPLETED		8-2-79	
RIG	Bomb	FOREMAN	TT
DRAWN	PS	APPROVED	DJH
JOB #	9879	SHEET	

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

LOG OF BORING NO. W-3

OWNER. Better Brite Plating Company

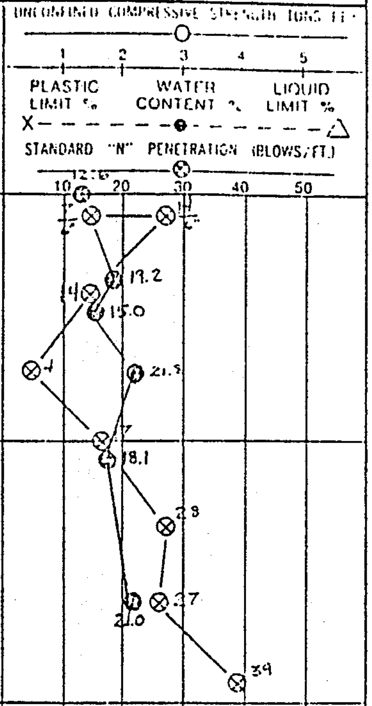
ARCHITECT-ENGINEER

SITE Lande Street, De Pere, Wisconsin

PROJECT NAME Chromium Spill

SURFACE ELEVATION 96.5

DEPTH ELEVATION	SAMPLE NO.	TYPE SAMPLE	SAMPLE DIST.	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT. 3
	1	SS			Dark brown silty sandy topsoil (OL) trace to a little clay chunks-trace roots-moist-(Fill)	
	2	SS				
5	3	SS				
	4	SS			Reddish brown silty clay (CL) a little to some sand at 8 feet with a trace of sand below 8 feet-trace fine gravel-wet at 8 feet-moist below 8 feet-hard	
10	5	SS		LS		
	6	SS				
16						
16.5	7	SS				



End of Boring
Boring terminated in silty clay
Boring advanced to 16.5 feet by solid stem auger
1 1/4 inch PVC observation well installed at 14.5 feet with protector pipe and lock; Top PVC Elevation = 98.60

TOTAL CHROMIUM CONCENTRATION (mg/kg)

Sample	Top	Bottom	Average
S-1	-	-	27
S-2	2.0	2.0	2.0
S-3	-	-	4.0
S-4	-	-	31
S-5	lost sample during drilling		
S-6	-	-	5.0

WATER LEVEL OBSERVATIONS		
W.L.	5-6.5 WS	
W.L.	B.C.R.	A.C.R.
W.L.	3.3 AB	

SOIL TESTING SERVICES
OF WIS., INC.
540 LAMBEAU STREET
GREEN BAY, WIS. 54303

BORING STARTED		8-2-79	
BORING COMPLETED		8-2-79	
RIG	Bomb	FOREMAN	TT
DRAWN	PS	APPROVED	DJH
JOB #	9879	SHEET	

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

BBS 1075

LOG OF BORING NO. W-4

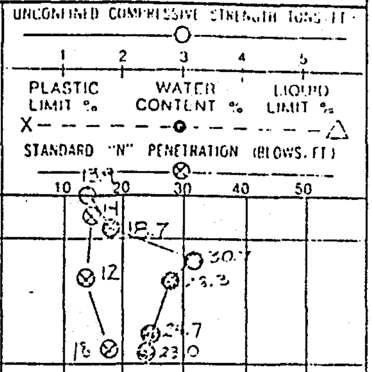
OWNER Better Brite Plating Company

ARCHITECT-ENGINEER

SITE Lande Street, De Pere, Wisconsin

PROJECT NAME Chromium Spill

DEPTH ELEVATION	SAMPLE NO.	TYPE SAMPLE	SAMPLE DIST.	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT. 3
☒					SURFACE ELEVATION 93.8	
	1	SS			Dark brown silty sandy topsoil (OL)-trace gravel-trace roots-moist	
	2	SS			Reddish brown silty clay (CL) trace sand-trace gravel-moist-very stiff to hard	
5 5.5	3	SS				



End of Boring
Boring terminated in silty clay
Boring advanced to 5.5 feet by solid stem auger
1 1/4 inch PVC observation well installed at 5.0 feet with protector pipe and lock; Top PVC Elevation = 95.85

TOTAL CHROMIUM CONCENTRATION (mg/kg)

Sample	Top	Bottom	Average
S-1	3.2	3.3	3.2
S-2	5.3	6.0	5.6
S-3	5.0	4.8	4.9

WATER LEVEL OBSERVATIONS		
W.L.	Dry WD	
W.L.	B.C.R.	A.C.R.
W.L.	Dry AB	

SOIL TESTING SERVICES
OF WIS., INC.
540 LAMBEAU STREET
GREEN BAY, WIS. 54303

BORING STARTED		8-3-79	
BORING COMPLETED		8-3-79	
RIG	Bomb	FOREMAN	FT
DRAWN	PS	APPROVED	DJH
JOB #	9879	SHEET	

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

DBS 107

LOG OF BORING NO.

OWNER Better Brite Plating Company	ARCHITECT-ENGINEER
SITE Lande Street, De Pere, Wisconsin	PROJECT NAME Chromium Spill

DEPTH ELEVATION	SAMPLE NO.	TYPE SAMPLE	SAMPLE DIST.	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT. 3	STANDARD "N" PENETRATION (BLOWS/FT.)	WATER CONTENT %
					SURFACE ELEVATION 93.8			
	1	SS			Dark brown silty sandy topsoil (OL) moist-loose		12	[illegible]
4	2	SS			Grayish brown silty clay (CL) trace to a little sand-trace gravel-stiff		8	26.3 17.0
5 .5	3	SS			Grayish brown clayey sand (SC) trace to a little silt-trace gravel-moist-loose		8	17.0
9								

UNCONFINED COMPRESSIVE STRENGTH TONS/FT.² 1 2 3 4 5

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % △

STANDARD "N" PENETRATION (BLOWS/FT.) 10 20 30 40 50

End of Boring
Boring terminated in clayey sand
Boring advanced to 5.5 by solid stem auger
1 1/4" PVC observation well installed at 5.0 feet with protector pipe and lock; Top PVC Elevation = 95.85

TOTAL CHROMIUM CONCENTRATION (mg/kg)

Sample	Top	Bottom	Average
S-1	3.3	3.9	3.6
S-2	4.8	3.7	4.2
S-3	-	-	3.9

WATER LEVEL OBSERVATIONS	
W.L.	4-5.5 WS
B.C.R.	A.C.R.
Dry AB	

SOIL TESTING SERVICES
OF WIS., INC.
540 LAMBEAU STREET
GREEN BAY, WIS. 54303

BORING STARTED			8-3-79
BORING COMPLETED			8-3-79
RIG	Bomb	FOREMAN	TT
DRAWN	PS	APPROVED	DJH
JOB #	9879	SHEET	

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

(AD-75)

CORRESPONDENCE/MEMORANDUM

STATE OF WISCONSIN

Date: December 23, 1985

File Ref: 3300

To: → James Reyburn

From: George J. Kraft

Subject: Better-Brite monitoring program

This memo contains the plan you requested for exploration at the Better-Brite chrome plating facility. Because so much of the existing data is old and because there are so many unknowns, the plan I designed essentially starts from scratch. You may consider it to be somewhat lengthy and, if so, it can be cut back or staged. However, if the problem is to be adequately defined and unknowns answered, I believe such a lengthy plan is needed.

Exploration Needs and Tasks

The plan assumes the following need to be determined: (1) contamination sources, (2) contamination extent, (3) groundwater flow direction, (4) groundwater collection system efficacy, and (5) the extent of surface contamination from airborne fallout. I will address these needs and how to meet them one-by-one.

Determine contamination sources

Several potential and actual sources of contamination exist. These are the cyclone unit, the old spill, floor drain leakage, underground tank leakage, dumping in the southeast corner and other parts of the property, spillage in various storage areas (particularly along the south portion of the building), and potential leakage from leaking sanitary sewer connections. I suggest the following approach be used.

1. Cyclone unit. A single soil boring should be installed to 25 feet with soil samples being taken at 2.5 foot intervals and analyzed for chromium, lead and zinc. (This boring and all others installed on the property should be backfilled with a neat cement or bentonite slurry.)

2. Old spill. The original spill that caused the concerns with Better-Brite has more or less been adequately defined. It is probably only necessary to replace existing monitoring wells that are no longer functional to monitor this source.

3. Floor drains. An inspection should be made on the floor drains in the inside of the plant. They should be checked for cracking and other deterioration. If found, one to three borings should be placed and soil samples analyzed as in (1), above.

4. Underground tanks. The underground plating tanks should be inspected and tested to ensure that they were not leaking during the life of the plating operation. A finding that one or more of the plating tanks were leaking may necessitate the installation of one to three more

borings outside the plating building and adjacent to the tanks to define the contamination at these sources.

5. Miscellaneous dumping. Rumors abound of dumping on the Better-Brite property near the plating building, particularly in the southeast corner of the property. A boring with soil sampling and analysis should be performed in this part of the property. The boring should be converted to a monitoring well. Other portions of the property to the east and north should be inspected for evidence of dumping. If such evidence is found, surficial soils should be sampled and analyzed. If these soils are found to be contaminated, a deeper boring may be required.

6. Spillage around storage areas. Better-Brite maintained several outdoor storage areas for raw and/or waste products. Leakage at these sites is a strong possibility. I suggest that inspection for signs of spillage be performed, followed by surface sampling and deep sampling, if warranted.

7. Leakage from sanitary sewer. There is a possibility that the strongly acidic and oxidizing plating solutions have corroded the sanitary sewer lateral outside the Better-Brite building. I suggest that the sewer line be excavated using a backhoe to see if leakage from the laterial is an additional contamination source.

Contamination extent / groundwater flow

There are a number of holes in existing data regarding groundwater flow and contamination extent, including the following: groundwater flow north and east of the plating building, flow and possible contaminant movement around the collection system (east of R-3), and the presence of groundwater divides at the facility. A related problem is that wells -1, -1A, -4, and -8 are nonfunctional because of kinking or a lack of water. To remedy the situation, I suggest placement of wells to the northeast, northwest, west of the building (W -21, -22, and -23) and north of R-4 (W-29). In addition, wells -1, and -1A should be replaced with new wells of identical construction, and wells -4 and -8 should be replaced with a deeper wells.

Efficacy of groundwater collection system

There has been a question as to whether the collection system is truly capturing all the contaminants at the site. Contaminants (other than airborne) could circumvent the system in three ways: pass around the system's southeast side, pass around the system's northwest side or pass under the system. Installation of previously described wells will detect any bypassing around the sides of the system. To determine the possibility that contaminants are moving beneath the system, I suggest replacing the now unusable well-8 with a piezometer constructed beneath the cut-off trench base elevation and constructing a new piezometer with similar construction outside the trench near W-16.

Extent of contamination from airborne fallout

I suggest that contamination due to airborne fall-out be analyzed by taking samples at 50, 100, and 150 foot intervals from the cyclone unit at the eight compass points, but not in areas where contaminated soils have been stockpiled or are known to be present. Approximately fourteen samples would be required.

Summary of Investigation

Inspection

1. Floor drain integrity.
2. Underground plating tank integrity (may require special testing methods).
3. Facility grounds for staining indicating leakage from storage and dumping.

Surficial Soil Sampling

4. Estimated 20 surface soil samples where inspection has detected surface spills.
5. Estimated 14 surface soil samples to evaluate effects of airborne fallout.

Soil boring program

6. Estimated 2-8 soil borings to 20 feet, sampling at 2½ foot intervals, analysis for total chrome and perhaps water extractable chrome and total zinc and lead. A maximum of 72 samples would be collected. A protocol for analyzing samples would reduce the number of analyses significantly.

Monitoring Well Program

The following monitoring wells are proposed:

Well No.	Construction	Reason
7. W-21	Screened 0-10' below water table	Define flow to southeast part of property, analyze groundwater in an area of alleged dumping.
8. W-22	Screened 0-10' below water table	Define flow on northeast portion of property, analyze groundwater for contaminants from unrecorded spills.
9. W-23	Screened 0-10' below water table	Define flow on eastern portion of site, analyze groundwater for contaminants from undocumented spills.
10. W-24	Screened 0-10' below water table	Replace a currently unusable well needed to define outer zone of contaminant plume.
11. W-25	Same construction as W-1	Replacement for unusable existing well.
12. W-26	Same construction as W-1	Replacement for unusable existing well.

13. W-27	Screened 5 to 10' below depth of cut-off trench	Replacement for unusable well; ensure efficacy of collection system.
14. W-28	Same as above	Ensure efficacy of collection system and that contaminants have not reached the bedrock surface.
15. W-29	Screened 0-10' below water table	Ensure efficacy of collection system.

Samples should be taken initially and then quarterly for one year from each of these wells.

Backhoe Investigation

16. A backhoe pit to the depth of the sewer lateral to determine if chromium contamination may have emanated from lateral deterioration.

Alternatives

The plan I've described would provide the information we seek or at least tell us that a problem warrants further investigation. Because of the plan's length, there will undoubtedly be some interest in cutting it back. We must recognize that each time an item is eliminated, we trade-off a gain in knowledge about the site or make on assumption based on some existing evidence. I'm summarizing below the trade-offs for eliminating each proposed component.

	Item	Trade-Off or Assumption
1.	Floor drain inspection.	Not knowing whether a vast amount of soil under the building is contaminated. Ultimately affects clean-up plan.
2.	Underground tank inspection.	Same as above
3.	Facility grounds inspection.	Not knowing locations of other contaminant sources on the property.
4.	Soil sampling around suspected spills.	Not knowing whether suspected spill is a contaminant source.
5.	Surface soil sampling for airborne fallout.	Assuming fallout is not present or not a health issue (no problems with gardens, etc.)
6.	Soil borings.	Not knowing whether suspected points of leakage or dumping are serious sources of contaminants.

7.	Well-21	Ignoring reports of dumping in this area; assuming groundwater does not flow in this direction and carry contaminants with it.
8.	Well-22	Assuming there are no undocumented spills in this locale and that groundwater does not flow in this direction
9.	Well-23	Same as above.

NOTE: Wells 22 and 23 might be consolidated rather than eliminating one or the other. I don't recommend it.

10.	Well-24	Not having a well to measure groundwater flow and the edge of the original spill.
11.	Well-25	Not being able to measure groundwater conditions at the supposed plume edge.
12.	Well-26	Not having a well to ensure contaminants are not approaching the rock aquifer.
13.	Well-27	Assuming W-26 adequately detects contaminants that would move under the cut-off trench.
14.	Well-28	Assuming contaminants will not reach bedrock and will not flow beneath the cut-off trench.
15.	Well-29	Assuming contaminants will not flow around collection system.
16.	Backhoe investigation	Assuming chromium waste did not deterioriate the sewer lateral.

Conclusion

The plan I described should be sufficient to detect and quantify the problems at Better-Brite. The plan can be scaled down, but with trade-offs in terms of unknowns and assumptions.

GJK:cks

cc: Solid Waste - SW/3
Groundwater Section - WRM/2

Better-Brite 10 Jan 83 Sampling

Before Bailing

Well No.	6 Jan 83 Depth to H_2O ②	6 Jan 83 Total Depth	6 Jan 83 H_2O Elevation	10 Jan 83 Approx depth to
1	8.90	29.45	86.35	9
1A	6.35	16.83	89.29	6.1
2	5.25	16.60	91.91	5.4
3	5.69①	–	92.9	6.5
4	4.55	6.85	93.18	5.1
5	4.56	16.53	91.95	5.
6	5.75	14.03	88.64	8
7	5.11	6.85	90.74	5.4
8	6.19	17.15	88.50	6
16	8.50	–	91.29	8

1. Couldn't tell depth for sure due to very high contamination levels interfering with tape.

2. All measurements from top of PVC

3. Depths on this date estimated from electric tape only; no measure tape used.

BETTER-BRITE
January 10, 1983 Sampling

Sample Site	Water Elevation (January 6, 1983)	Cr^{+6}	Cr (Total)
W-1	86.35 ft.	.260 mg/l	.120 mg/l
W-1A	89.29	500	500
W-2	91.91	110	120
W-3	92.90	2900	3200
W-4	93.18	---	.004
W-5	91.95	3.9	4.3
W-7	90.74	1.1	1.5
W-8	88.50	.020	.003
W-9	88.64	.024	.012
W-16	91.29	3000	3000
R-1	---	2100	2200
R-2	---	2000	2000
R-3	---	320	320
Pit	---	1100	1100

Foth & Van Dyke
engineers/architects

2737 S. RIDGE ROAD · P.O. BOX 3000 · GREEN BAY, WI 54303-1200
OTHER OFFICES · ISHPEMING MI · MILWAUKEE, WI

No. 31592

LABORATORY CHEMICAL ANALYSES

Name Better Brite Plating Co.
Submitted By Everett Hintz
Date Received 4/4/83
Project No. Grab
Sample Type IT8200-LAB-02
Project Supervisor C.J. Larscheid

Client
Address
315 S. Sixth St.
De Pere, WI 54115

SAMPLE	DATE COLLECTED	PARAMETERS					
		Hexavalent Chromium	Total Chromium				
W1-A	3/31/83	590	600				
W2	3/31/83	105	120				
W3	3/31/83	3800	3900				
W5	3/31/83	6.5	7.0				
W16	3/31/83	3500	3600				
R1	3/31/83	2000	2100				
R2	3/31/83	1200	1300				
Pond	3/31/83	2.9	3.0				
Pit	3/31/83	480	500				

Specific conductance reported as micro-mhos./cm.
pH reported as standard units.
All other results reported as mg/l except where noted.

COMMENTS:

Signed Charles J. Larscheid

2737 S. RIDGE ROAD · P.O. BOX 3000 · GREEN BAY, WI 54303-1200
OTHER OFFICES ISHPEMING, MI · MILWAUKEE, WI

No. 31940

LABORATORY CHEMICAL ANALYSES

Name Better Brite Plating
Submitted By Everett Hinz
Date Received 7/7/83
Project No. IT8200-LAB-02
Sample Type Grab
Project Supervisor C.J. Larscheid

Client
Address
315 S. Sixth St.
De Pere, WI 54115

SAMPLE	DATE COLLECTED	PARAMETERS					
		Total Chromium	Hexavalent Chromium				
#1A	7/8/83	1400	1400				
#2	7/8/83	190	150				
#3	7/8/83	4900	4600				
5	7/8/83	2.9	2.0				
16	7/8/83	4700	2500				
R2	7/8/83	3500	3400				
R1	7/8/83	3600	3400				
Well	7/8/83	1900	1600				
Pit	7/8/83	0.1	0.06				

Specific conductance reported as micro-mhos./cm.
pH reported as standard units.
All other results reported as mg/l except where noted.

COMMENTS:

Signed Charles J. Larscheid

FORM #139L

engineers/architects
2737 S RIDGE ROAD
P O BOX 3000
GREEN BAY WI
54303 1200
414 497 2600

No. 32299

LABORATORY CHEMICAL ANALYSES

Name Better Brite Plating
Submitted By Everett Hintz
Date Received 10/6/83
Project No. IT8200-LAB-02
Sample Type Grab
Project Supervisor C.J. Larscheid

Client
Address 315 S. Sixth St.
De Pere, WI 54115

		PARAMETERS					
SAMPLE	DATE COLLECTED	Total Chromium	Hexavalent Chromium	SAMPLE		Total Chromium	Hexaval Chromiu
#1A	10/5/83	145	134				
#2	10/5/83	135	122				
#3	10/5/83	3500	3500				
#5	10/5/83	1.95	1.92				
#16	10/5/83	4500	4480				
#R2	10/5/83	3280	3250				
#R1	10/5/83	3050	2880				
Pond	10/5/83	<0.10	0.02				
Pit	10/5/83	1200	830				

Specific conductance reported as micro-mhos./cm.
pH reported as standard units.
All other results reported as mg/l except where noted.

COMMENTS:

Signed Charles J. Larscheid

FORM #13

2737 S. RIDGE ROAD
P. O. BOX 3000
GREEN BAY, WI
54303-1200
414/497-2500

No. 32608

LABORATORY CHEMICAL ANALYSES

Name Better Brite Plating

Submitted By Everett Hintz

Date Received 1/11/84

Project No. IT8200-LAB-02

Sample Type Grab

Project Supervisor C.J. Larscheid

Client

Address 315 S. Sixth St.
De Pere, WI 54115

SAMPLE	DATE COLLECTED	PARAMETERS					
		Total Chromium	Hexavalent Chromium				
A	1/10/84	220	218				
-2	1/10/84	26	26				
3	1/10/84	3700	3600				
5	1/10/84	5	5				
-16	1/10/84	3600	3480				
-1	1/10/84	2100	1840				
-2	1/10/84	2700	2600				
R-3	1/10/84	90	80				
Pit	1/10/84	1000	1000				

Specific conductance reported as micro-mhos./cm.
pH reported as standard units.
All other results reported as mg/1 except where noted.

COMMENTS:

Signed Charles J. Larscheid

FORM #139L

Foth & Van Dyke
engineers/architects
2737 S RIDGE ROAD
P O BOX 3000
GREEN BAY, WI
54303 1200
414 497 2500

No. 32829

LABORATORY CHEMICAL ANALYSES

Name Better Brite Plating
Submitted By Everett Hintz
Date Received 4/10/84
Project No. IT8200-LAB-02
Sample Type Grab
Project Supervisor C.J. Larscheid

Client
Address

1 of 2

			PARAMETERS				
SAMPLE	DATE COLLECTED	Total Chromium	Hexavalent Chromium				
A	4/9/84	700	700				
2	4/9/84	150	150				
3	4/9/84	3900	3800				
5	4/9/84	2.0	2.0				
16	4/9/84	2400	2400				
1	4/9/84	3100	3000				
2	4/9/84	3800	3800				
	4/9/84	800	720				
d	4/9/84	$<$0.1	$<$0.1				

Specific conductance reported as micro-mhos./cm.
pH reported as standard units.
All other results reported as mg/l except where noted.

COMMENTS:

Signed Charles J. Larscheid

FORM #139L

Better-Brite
Monitoring

July '84

Foth & Van Dyke
engineers/architects
2737 S. RIDGE ROAD
P O BOX 3000
GREEN BAY, WI
54303-1200
414/497-2500

No. 33158

George Kratz
LWD

LABORATORY CHEMICAL ANALYSES

Name Better Brite Plating
Submitted By Everett Hintz
Date Received 7/10/84
Project No. IT8200-LAB-02
Sample Type Grab
Project Supervisor C.J. Larscheid

Client
Address 519 Lande St.
De Pere Wis.
54115

REC'D DNR
AUG 27 1984
GREEN BAY

SAMPLE	DATE COLLECTED	PARAMETERS					
		Total Chromium		Hexavalent Chromium			
R-1	7/10	2000		1800			
R-2	7/10	3500		3500			
R-3	7/10	1000		940			
W-5	7/10	1.5		1.5			
1A	7/10	0.6		0.1	Questionable Conc well?		
W2	7/10	120		120			
W-3	7/10	4400		4200			
W-6	7/10	2500		2400			
Pit	7/10	900		880			

Specific conductance reported as micro-mhos./cm.
pH reported as standard units.
All other results reported as mg/l except where noted.

COMMENTS:

Signed Charles J Larscheid

FORM

Foth & Van Dyke
Engineers/Architects

2737 S. Ridge Road
P. O. Box 19012
Green Bay, Wisconsin 54307-9012
414/497-2500

No. 33926

LABORATORY CHEMICAL ANALYSES

Name Better-Brite Plating, Inc.
Submitted By E. Hintz
Date Received 1/18/85
Project No.
Sample Type Grab
Project Supervisor D. Loritz

Client Better-Brite Plating, Inc.
Address 519 Lande St.
De Pere, WI 54115
Attn: Everett Hintz

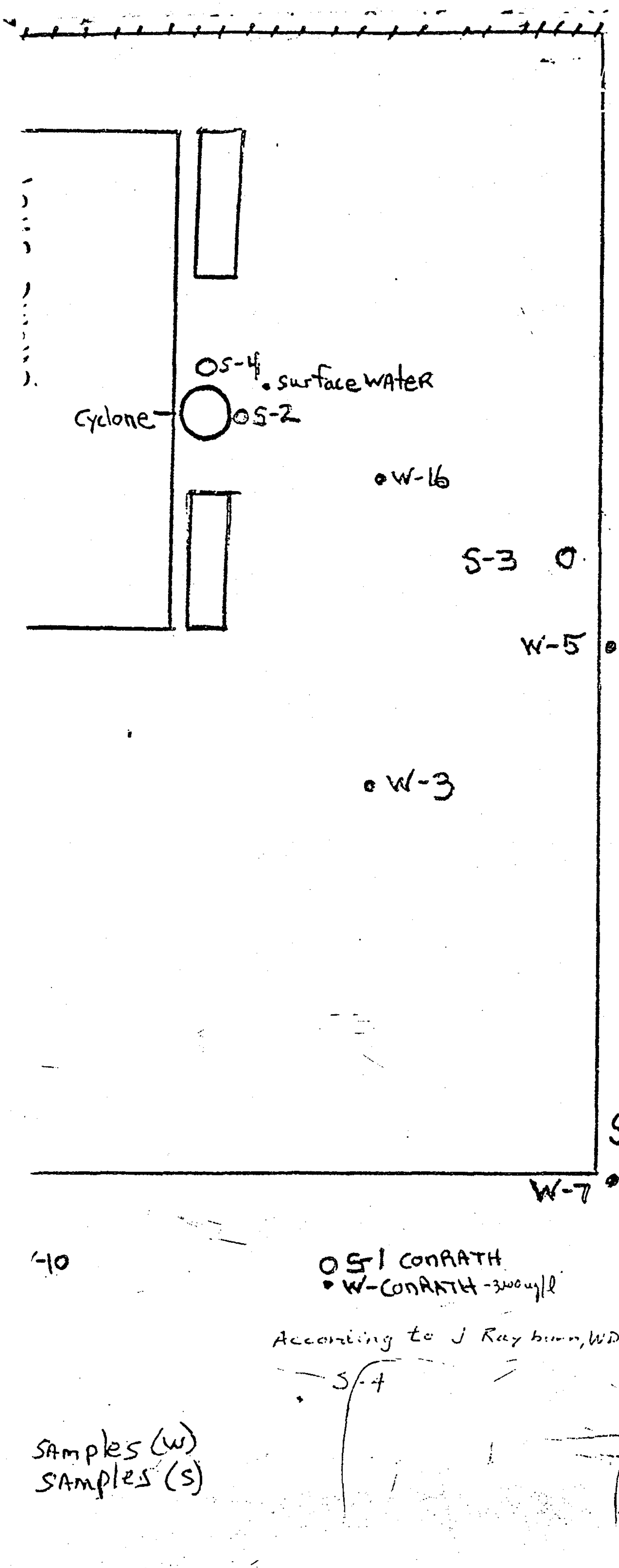
SAMPLE	DATE COLLECTED	PARAMETERS					
		Total Chromium	Hexavalent Chromium				
Pit	1/18/85	500	500				
R1	1/18/85	2,400	2,300				
R2	1/18/85	2,700	2,500				
R3	1/18/85	900	840				
W2	1/18/85	110	90				
W3	1/18/85	3,500	3,500				
W5	1/18/85	5.2	5.2				
W16	1/18/85	2,000	2,000				
1A	1/18/85	0.65	0.5				

Specific conductance reported as micro-mhos./cm.
pH reported as standard units.
All other results reported as mg/1 except where noted.

COMMENTS:

Signed

FORM #139L



WATER

W-3	Cr	3,800,000 (ug/l) ppb
	Cd	<20
	Zn	350
	Pb	<100
W-5	Cr	1600 ug/l
	Cd	<20
	Zn	20
	Pb	<100
W-7	Cr	<100 ug/l
	Cd	<20
	Zn	30
	Pb	<100
W-10	Cr	<100 ug/l
	Cd	<20
	Zn	<20
	Pb	< 100
W-16	Cr	2 700 000 ug/l
	Cd	<20
	Zn	110
	Pb	<100
W-16 DUP	Cr	2 600 000 ug/l
	Cd	<20
	Zn	110
	Pb	<100
Surface WATER	Cr	51 000 ug/l
	Cd	<20
	Zn	110
	Pb	<100

Soil

	S-1A (0-6") CONRATH	S-1B (6-12")
Cr	86 PPM (mg/kg)	74 PPM (mg/
Cd	<1	<1
Zn	80	52
Pb	24	<5

According to J Rayburn, WDNR

	S-2A		S-2B
Cr	8000 PPM	Cr	4900 PPM
Cd	4	Cd	<1
Zn	2200	Zn	490
Pb	100	Pb	82

	S-3A		S-3B
Cr	620 PPM	Cr	210 PPM
Cd	<1	Cd	<1
Zn	120	Zn	60

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