DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, OMAHA DISTRICT
215 NORTH 17TH STREET
OMAHA, NEBRASKA 68102-4978

REPLY TO
ATTENTION OF
Hazardous & Toxic Waste Branch

DEC 2 1993

RECEIVED
DEC 17 1993
EMERG & REMEDIAL RESPONSE SECTION
BUR OF SOLID & HAZRD WASTE

Mr. Tom Williams (HSRW-6J)
Remedial Project Manager
U.S. EPA, Region V
77 West Jackson Boulevard
Chicago, Illinois 60604-3590

Dear Mr. Williams:

Enclosed are two copies of the Groundwater Sampling report for the Oconomowoc Superfund Site Remedial Design.

On September 15, 1993, B&V sampled the groundwater at the Oconomowoc Superfund Site to determine the concentration of hexavalent chromium. This post design sampling activity was conducted to determine the need of a chromium reduction step to the groundwater treatment train.

The analysis results indicate the total chromium levels are well below the proposed effluent limits. Hexavalent chromium levels for the first composite sample (MW-3S, MW-9S & PT-1; locations of proposed extraction wells) are below the effluent limits. The hexavalent chromium level for MW-6 exceeded the proposed limits. However, the second groundwater sample is not considered representative due to sampling difficulties and the condition of the wells (MW-5 & MW-6).

Based on these results, a treatment plant modification to include a hexavalent chromium reduction step is not justified.

If you have any questions after you review this report, please contact Mr. Greg Herring, Project Manager at (402) 221-7712.

Sincerely,

Douglas A. Plack
Acting Chief, HTW Branch
Programs & Project Management
Division

Enclosures

Groundwater Sampling
for the
Oconomowoc Remedial Design

November 16, 1993

Prepared by
B & V Waste Science and Technology Corp.
Kansas City, Missouri

for
the U. S. Army Corps of Engineers
Omaha District

under Contract No. DACW45-92-D-0009
and BVWST Project No. 40340

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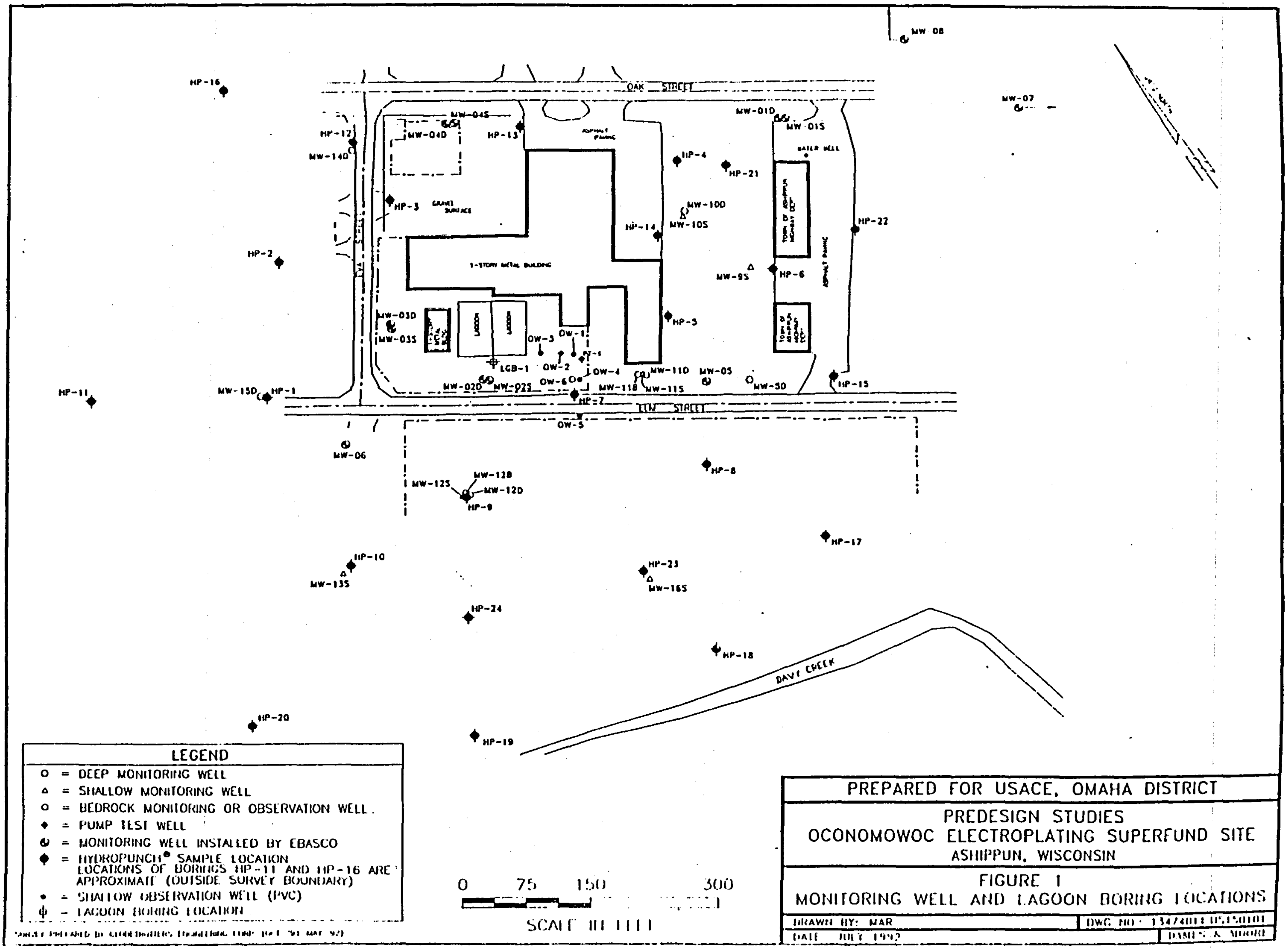
Soil Contamination Investigation

Groundwater sampling was conducted September 15, 1993 at the Oconomowoc Electroplating (OEC) Superfund site in Ashippun, Wisconsin. The groundwater sampling was conducted as a post design activity for the remedial action at the OEC site for the U.S. Army Corps of Engineers - Omaha District by B&V Waste Science and Technology Corp. under contract DACW45-92-D-0009. The groundwater was sampled to determine the concentration of hexavalent chromium present.

BVWST based the current treatment plant design on a conceptual design developed by Dames & Moore(D&M). The predesign report by Dames & Moore(D&M) included groundwater sampling that was used as the basis for their conceptual design. D&M based their conceptual design on cadmium removal because as stated in their report "the cadmium (Cd) concentration in the untreated composite water was higher than the other regulated metals, and because the proposed WPDES Davy Creek discharge limit for cadmium is the lowest of all the metals, all samples submitted for metals analysis were analyzed for cadmium.". D&M analyzed the samples for total chromium but not hexavalent chromium. BVWST noted during the treatment plant design that even though the total chromium concentration reported by D&M was less than the total chromium effluent limit, it was above the concentration for the hexavalent chromium effluent limit. Since analytical data was not available for hexavalent chromium, the potential exists for the treatment plant effluent to exceed the effluent limits because the hexavalent chromium component of the total chromium sample is unknown. The current treatment plant design does not include hexavalent chromium reduction/removal equipment.

Sampling Procedures

Several monitoring wells and one pump test well were drilled on site during the remedial investigation and during the predesign site activities, as shown on Figure 1. Groundwater from monitoring wells MW-05 and MW-06 were composited by D&M and the analytical results were used as the basis for the conceptual groundwater treatment plant design. The USACE and BVWST decided to recreate the composite sampling effort D&M preformed during the predesign study allowing use of the original results as a baseline and to provide hexavalent chromium concentrations from the same wells. It was also decided to obtain a second sample by compositing three other monitoring wells MW-3S, MW-9S and EW-4 (formerly named PT-1). These



LEGEND

- ○ = DEEP MONITORING WELL
- △ = SHALLOW MONITORING WELL
- ○ = BEDROCK MONITORING OR OBSERVATION WELL
- ◆ = PUMP TEST WELL
- ⊕ = MONITORING WELL INSTALLED BY EBASCO
- ◆ = HYDROPUNCH® SAMPLE LOCATION
  LOCATIONS OF BORINGS HP-11 AND HP-16 ARE APPROXIMATE (OUTSIDE SURVEY BOUNDARY)
- • = SHALLOW OBSERVATION WELL (PVC)
- ɸ – LAGOON BORING LOCATION

SURVEY PREPARED BY [illegible] ENGINEERING CORP (OCT '91 MAY '92)

PREPARED FOR USACE, OMAHA DISTRICT

PREDESIGN STUDIES
OCONOMOWOC ELECTROPLATING SUPERFUND SITE
ASHIPPUN, WISCONSIN

FIGURE 1
MONITORING WELL AND LAGOON BORING LOCATIONS

DRAWN BY: MAR	DWG NO: 13474011 05150101
DATE JULY 1992	DAMES & MOORE

wells were selected to best represent water extracted from the future extraction wells. MW-3S is located south of extraction well EW-1; MW-9S is located east of extraction well EW-5; and, PT-1 will be converted into extraction well EW-4 as part of the treatment plant design.

Samples were collected using procedures listed in the D&M predesign report and Chemical Data Acquisition Plan with the following exceptions:

- PT-1 was bailed 1.5 well volumes.
- MW-05 was not functional due to sand infiltration through the screen and could not be sampled.
- MW-06 was bailed in excess of 3 well volumes but the water remained very turbid. MW-06 is apparently becoming non functional similar to MW-05.
- No onsite turbidity measurements were taken. To compensate all samples were filtered prior to delivery to the laboratory.
- The pH probe developed a short during the sampling effort and accurate readings could not be obtained. Samples were taken to the laboratory within four hours where laboratory personnel indicated the pH would be checked and adjusted as necessary.

Samples were composited and split as follows:

- MW-3S, MW-9S, PT-1 were composited, filtered, and split into one 500 ml sample (total chromium analysis) and one 250 ml sample (hexavalent chromium analysis).
- MW-06 was filtered and split into one 500 ml sample (total chromium analysis) and one 250 ml sample (hexavalent chromium analysis).

All chemical analysis were performed by Swanson Environmental, Inc. in Brookfield, Wisconsin.

Continuous air monitoring was conducted during sampling for health and safety purposes using an HNU Systems Inc. photoionization detector (HNU) with an 11.7 eV probe. The wellheads were monitored every 15 minutes as they were sampled. No readings above background were recorded.

The sampling equipment was decontaminated after each well was sampled. All purge water and decontamination water were poured into the on-site lagoon. All sampling derived waste including personal protective equipment and disposable sampling equipment were placed in double plastic bags and secured beneath the tarp covering the on-site soil stockpile.

Geology

Water was typically encountered at 3 to 5 feet below the ground surface. For further discussion of geology associated with the OEC site, the reader should refer to the Remedial Investigation (RI) Report (Ebasco Services Inc., 1990).

Analytical Results

The samples were analyzed by Swanson Environmental, Inc. by the EPA method and with the detection limits listed in Appendix B.

Chromium was detected in each sample. Chromium concentrations detected in each sample are presented in Appendix B.

Conclusions

The composite sample for MW-03S, MW-09S and PT-1 is considered to be a good quality sample based on the condition of the wells, clarity of the purge water, and the stabilization of temperature and conductivity readings during purging. The total chromium concentration, 2 ppb, is consistent with samples taken as part of the D&M report. The hexavalent chromium concentration reported was < 6 ppb. The laboratory quality control data presented in Appendix A supports the accuracy and precision expected. BVWST considers this sample representative of the make-up of water that will be extracted from the site when the treatment plant is operational.

The sample drawn from MW-06 was not able to be composited with MW-05 and therefore, it was impossible to recreate the D&M composite sample. In the absence of MW-05 or any other well suitable or representative in that immediate area to be sampled, we elected to have MW-06 analyzed by itself. MW-06 was not considered a good quality sample because:

- After three well volumes were purged the turbidity remained high. The well appeared to be filling with sand similar to that experienced at MW-05. The sample had high turbidity prior to filtration.
- The lock on well casing was not functional. This well sits outside the secured fence area and was not locked. Because the wellhead not was secured, contaminants may have been and/or could be introduced through the wellhead.

The laboratory results for the samples indicate an inconsistency for MW-06. The hexavalent chromium concentration 18 ppb exceeded that of the total chromium concentration 3 ppb. This situation was brought to the attention of the laboratory and since the samples were still within the 30 day holding time, the total chromium analysis was run again. The total chromium results, 3 ppb, were the same as the first run. A re-run of the hexavalent chromium samples was not possible due to its 24 hour holding time. The laboratory checked the quality control data and found the standard recoveries were within a 10% range which is acceptable. The quality control accuracy and precision data and letter of explanation is presented in Appendix A.

The BVWST "Final Design Analysis Volume 1" indicates the following effluent limits must be achieved:

Total Chromium (weekly average)	120 μg/L
Hexavalent Chromium (weekly average)	9.7 μg/L

The analysis results indicate the chromium levels are well below the effluent limits for total chromium. Hexavalent chromium levels for the first composite sample are below effluent limits. The hexavalent chromium level for MW-06 exceeded proposed limits. However, the quality of the sample was questionable and the analysis results for MW-06 should not be considered in evaluating the alternatives and making a recommendation.

Recommendations

On the basis of the above discussion of the sampling activities/observations and laboratory results, the following is recommended:

- Rehabilitate wells MW-05 and MW-06 or install two new monitoring wells. These wells will be needed during the operational period. Both wells were proposed for periodic sampling during the one year operations period.
- Sample rehabilitated wells MW-05 and MW-06 or other appropriate wells to reinforce the findings on the composite sample analysis of MW-3S, MW-9S, and PT-1.

BVWST cannot recommend addition of a hexavalent chromium reduction/removal step to the current treatment plant design based on one hexavalent chromium sample that has a reasonable probability of being in error. The composite sample (MW-3S,MW-9S,PT-1) was well within the effluent discharge limits and is considered a good quality sample. A treatment plant design revision to include a hexavalent chromium reduction process is not justified at this time.

If future sampling establishes elevated hexavalent chromium levels, a chromium reduction process could be retrofit into the current design with modest effort by converting a portion of the drive thru in the treatment building into a process area. The details of the process could be evaluated further when the need for hexavalent chromium reduction/removal process is determined. A preliminary discussion of treatment options is presented in paragraph Potential Treatment System Modifications.

Potential Treatment System Modifications

Two treatment sequences are typically employed to reduce and remove chromium as shown in Figure 2. Either of the two sequences shown could be integrated into the current treatment system. Figure 3 shows schematically where the additional treatment equipment would be installed. Both treatment sequences shown would be adequate to reduce the chromium to the extent required. Capital cost and O&M costs are significantly different for the two sequences and favor use of the insoluble sulfide chromium reduction system.

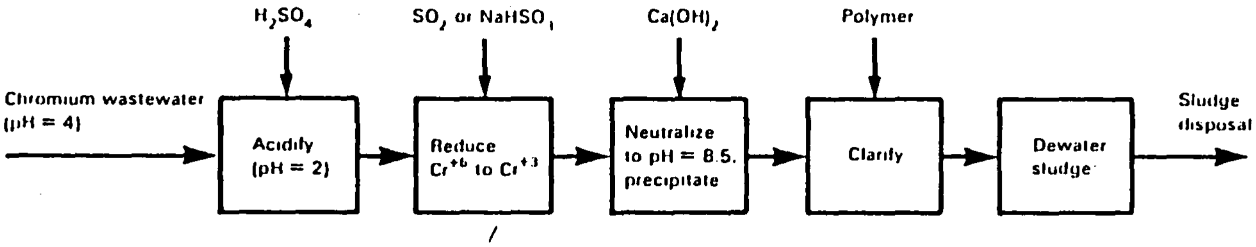
Treatment sequence (a) is the traditional chemical chromium reduction system which requires additional chemical feeds beyond what is currently used in the groundwater treatment scheme. This sequence also requires a pH of 2 prior to reduction which will increase the use of sodium hydroxide for neutralization and precipitation after reduction because downstream processes require pH 8.5.

For treatment sequence (a) the following equipment must be added to the currently designed alkaline chlorination system:

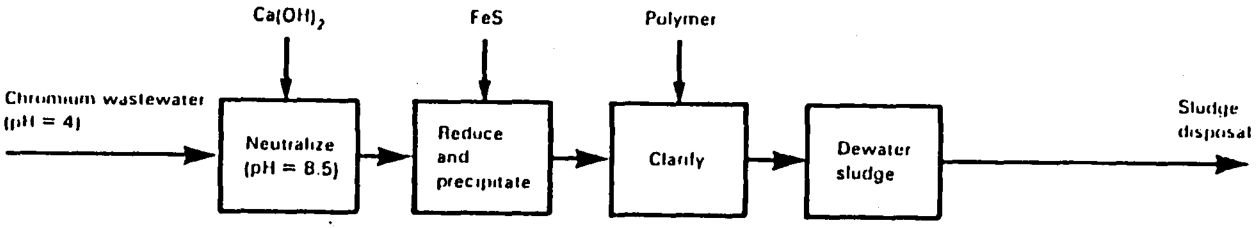
- Sulfuric acid feed system.
- Sodium bisulfite feed system.
- Initial pH adjustment tank with mixer.
- Chromium reduction tank with mixer.
- Transfer pumps.

The neutralization step shown in Figure 2 would be performed as part of the first stage of the present alkaline chlorination system so additional equipment will not be required for this step. A clarifier would have to be added prior to the metals removal system (as shown in Figure 3) if total chromium removal is required. Based on chromium levels reported in previous reports and the findings in this report, the total chromium levels are below the discharge limit. Therefore, reduction of the hexavalent chromium may be required but removal of total chromium is not required. Some trivalent chromium is likely to be removed in the currently designed metals

(a) Traditional Chromium Reduction



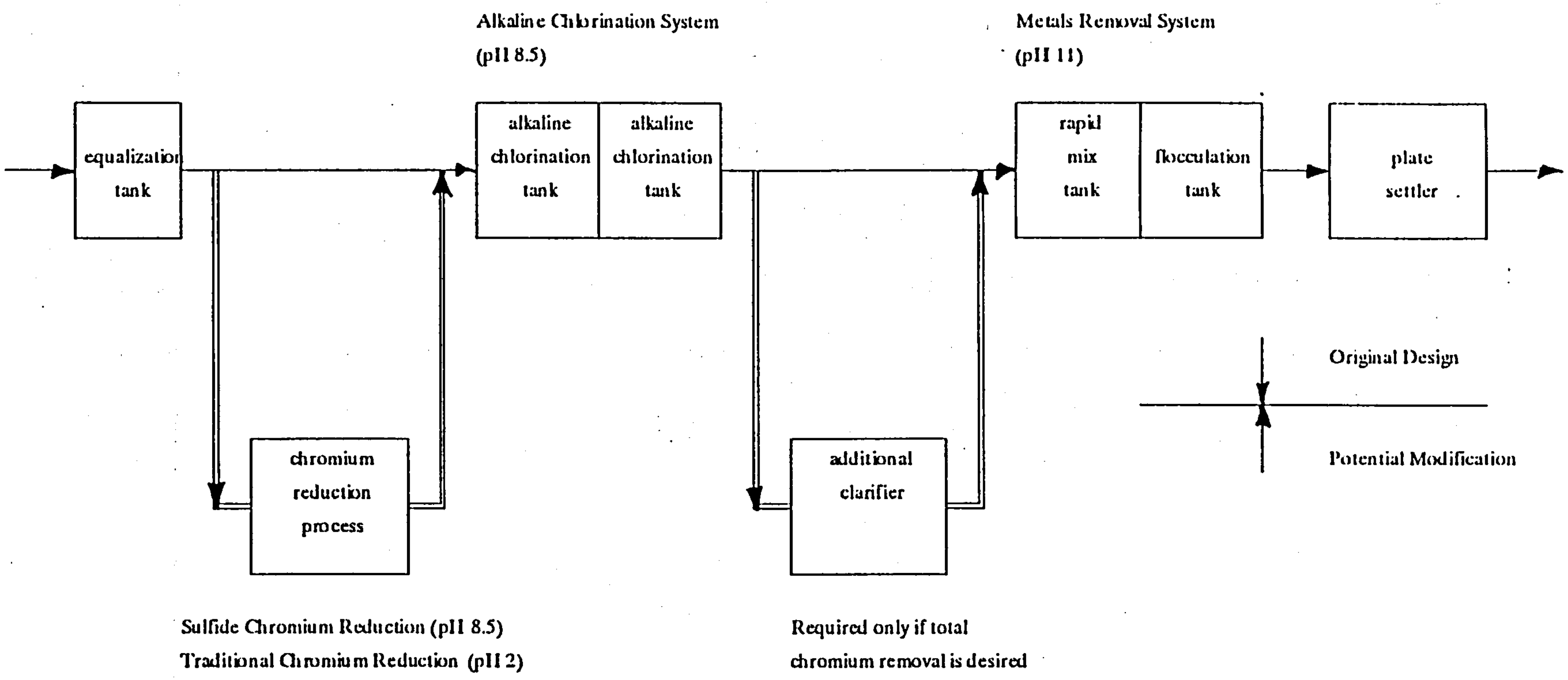
(b) Sulfide Chromium Reduction



CHROMIUM REDUCTION TREATMENT SEQUENCES

FIGURE 2

Reference: EPA 625/8-80-003



GROUNDWATER TREATMENT SYSTEM

FIGURE 3

removal system even though the solubility at pH of 11 is much higher than it is at pH of 8.5.

Treatment sequence (b) is an insoluble sulfide chromium reduction system which requires one chemical feed in addition to ones currently used in the groundwater treatment system. This sequence requires pH adjustment to 8.5 prior to reduction. Because this is the same pH as is required in the alkaline chlorination step there will be no significant increase in sodium hydroxide usage by adding the step. The insoluble sulfide sequence will require the following equipment to be added prior to the currently designed alkaline chlorination system:

- Iron sulfide feed system.
- Initial pH adjustment tank with mixer.
- Chromium reduction tank with mixer.
- Transfer pumps.

Iron sulfide cannot be added directly to the first or second stage alkaline chlorination tanks because of concern that the sodium hypochlorite will inhibit the chromium reduction by oxidizing the iron. Processes downstream of the alkaline chlorination system would be unaffected except if it is determined chromium removal is also required.

Figure 3 shows schematically where the hexavalent chromium reduction equipment would be added to the existing treatment scheme.

References

Dames & Moore, 1992, "Predesign Engineering Report", prepared for U.S. Army Corps of Engineers, Omaha District under Contract No. DACW45-91-R-0015.

B&V Waste Science and Technology Corp., 1993, "Final Design Analysis", prepared for U.S. Army Corps of Engineers, Omaha District under Contract No. DACW45-92-D-0009.

Ebasco Services Incorporated, 1990, "Final Remedial Investigation Report", prepared for U.S. Environmental Protection Agency under REM III Contract No. 68-01-7250.

U.S. Environmental Protection Agency. Control and Treatment Technology for the Metal Finishing Industry-Sulfide Precipitation. EPA 625/8-80-003. April 1980.

APPENDIX A

LABORATORY QUALITY CONTROL REPORT

SWANSON ENVIRONMENTAL INC.

October 20. 1993

Mr. Mike Boehler
Black & Vetch Waste Science Technology Corp.
4717 Grand Avenue
Suite 500
Kansas City, MO 64112

Dear Mr. Boehler:

Attached is the Quality Control data pertinent to the analyses of your Project #40340.447 Oconomowoc groundwater samples collected on September 15, 1993 and received by Swanson Environmental 's Laboratory (SEI) on September 15, 1993. The samples were analyzed following EPA Methods 218.4 for hexavalent chromium (Cr+6) and EPA Method 218.2 for total chromium (T-Cr).

Quality Control samples are included in each analytical sequence containing your samples. Check standards, method blanks, the sample, the sample's replicate and matrix spikes are routinely analyzed for each group of 10 or less analyses.

The values of all Quality Control samples are within SEI historical control limits and/or regulatory and method specific control limits, unless flagged with an explanation given below. Whenever the Quality Control acceptable criteria is not satisfied, corrective action procedures are initiated, the situation corrected and the samples reanalyzed.

The values obtained for the composite MW03S, MW09S and PT-1 were:

<0.006 mg/L for Cr+6
0.002 mg/L for T-Cr.

The values obtained for MW06 were:

0.018 mg/L for Cr+6
0.003 mg/L for T-Cr.

Due to the fact that the Cr+6 is higher than the T-Cr in the MW06 sample, SEI investigated the situation. These are the findings. The holding times specified by the method were met. For the MW06 sample, the T-Cr was reanalyzed by GFAA on 10-19-93 and the value obtained was 0.003 mg/L. The quality control standard recoveries were within a 10% range of 100%. The quality control data enclosed is acceptable. During the investigation, SEI found in the method these items which could have interfered with the analysis, thereby causing Cr+6 to be higher than T-Cr .

3150 N. Brookfield Road, Brookfield, Wisconsin 53045
Telephone (414) 783-6111 Fax (414) 783-5752

a. Contamination from reagent grade salts or glassware. The analysis of SEI's method blanks had results which were below detection limit eliminating this as a potential cause.

b. Oxidation of Cr−3 to Cr−6 can occur in an alkaline medium in the presence of iron (Fe−3) and oxidized Mn. This may have been the cause. For accuracy, pH should be taken in the field.

c. The other possible interferents given in the method explain why Cr+6 would be lower than expected. These are reduction of Cr+6 to Cr+3 and overloading of the ion chromatography column.

The Practical Quantiation Limit (PQL) of each analyte represents the lowest concentration that can be reliably measured within specific limits of precision and accuracy during routine operating conditions. This limit is elevated by a dilution factor whenever matrix interference or high analyte concentration is encountered during sample analysis.

Thank you for choosing SEI for your analytical needs. If you have any questions concerning this report or we may assist you in any way, please give us a call.

Sincerely,

Debra M Patterson

Debra M. Patterson
QA/Administrative Assitant

enclosure: 7255

Report Date: October 20, 1993
Client: Black & Vetch Waste Science
Project: 40340.447 Oconomowoc

Matrix: Groundwater
Lab ID =: WL7255-1 and 7255-2
Date Collected: 9-15-93

QUALITY CONTROL ACCURACY AND PRECISION DATA

Analyte	Sample ID	Conc. ppm	QC/Spk % Recovery	Sample Result	Sample Replicate	RPD	Control Limits	Analysis Date
Cr+6	Standard	0.50	96				90-110	9-16-93
Cr+6	7273-1	0.50	97				85-115	9-16-93
Cr+6	Method Blk	<0.006						9-16-93
T-Cr	7416-2			0.015	0.015	0		9-29-93
T-Cr	7330-1			<0.002	<0.002			9-29-93
T-Cr	Method Blk	<0.002						9-29-93
T-Cr	7255-2	0.010	90				67-143	10-19-93
T-Cr	7746-3	0.020	95				67-143	10-19-93
T-Cr	7532-1			<0.002	<0.002			10-19-93
T-Cr	7746-3			0.003	0.003	0		10-19-93
T-Cr	Method Blk	<0.002						10-19-93

APPENDIX B

ANALYTICAL REPORT

SWANSON ENVIRONMENTAL INC.

3150 North Brookfield Road
Brookfield, Wisconsin 53045
telephone (414) 783-6111
FAX (414) 783-5752

WDNR Certification #268181760

ANALYTICAL REPORT

REPORT NUMBER: 34179

Black & Vetch Waste Science Technology Corp.
4717 Grand Avenue, Suite 500
P.O. Box 30240
Kansas City, MO 64112
Attn: Mr. Mike Boehler
Project #40340.447

DATE: October 5, 1993
PURCHASE ORDER:
SEI NO: WL7255
DATE COLLECTED: 09/15/93
DATE RECEIVED: 09/15/93

Matrix: Groundwater
Source: Oconomowoc

Units: mg/l (ppm)

	SEI ID	7255-1	7255-2
		Composite	
		MW03S	
Analyte	Sample ID	MW09S, PT-1	MW06
Chromium		0.002	0.003
Hexavalent Chromium		<0.006	0.018

Gary E. Barry
Gary E. Barry
Projects Coordinator

BLACK & VEATCH WASTE SCIENCE & TECHNOLOGY CORPORATION
OCONOMOWOC ELECTROPLATING SITE
ASHIPPUN, WISCONSIN

MATRIX	PARAMETER	EPA METHOD	DETECTION LIMIT
GW	Total Chromium	3020/7191	5 ppb
GW	Hexavalent Chromium	218.4	6 ppb

ANALYTICAL FEES

2 GW	Total Chromium	$32.00/sample
2 GW	Hexavalent Chromium	$25.00/sample