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REMEDIATION SYSTEM EVALUATION (RSE)

ACE SERVICES SUPERFUND SITE
COLBY, KANSAS

Report of the Remediation System Evaluation
Site Visit Conducted April 24, 2007

Final Report
September 2007

NOTICE

Work described herein was performed by GeoTrans, Inc. (GeoTrans) for the U.S. Environmental Protection Agency (U.S. E.P.A). Work conducted by GeoTrans, including preparation of this report, was performed under EPA contract 68-C-02-092 to Dynamac Corporation, Ada, Oklahoma. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

EXECUTIVE SUMMARY

A Remediation System Evaluation (RSE) involves a team of expert hydrogeologists and engineers, independent of the site, conducting a third-party evaluation of site operations. It is a broad evaluation that considers the goals of the remedy, site conceptual model, above-ground and subsurface performance, and site closure strategy. The evaluation includes reviewing site documents, visiting the site for up to 1.5 days, and compiling a report that includes recommendations to improve the system. Recommendations with cost and cost savings estimates are provided in the following four categories:

- Improvements in remedy effectiveness
- Reductions in operation and maintenance costs
- Technical improvements
- Gaining site closeout

The recommendations are intended to help the site team identify opportunities for improvements. In many cases, further analysis of a recommendation, beyond that provided in this report, may be needed prior to implementation of the recommendation. Note that the recommendations are based on an independent evaluation by the RSE team, and represent the opinions of the RSE team. These recommendations do not constitute requirements for future action, but rather are provided for the consideration of all stakeholders.

The Ace Services Superfund Site is located near the east edge of the city of Colby in Thomas County, Kansas. The site is a former plating facility that was operated between 1954 and 1969 by Northwest Manufacturing Facility and between 1969 and 1989 by ACE Services. The site soils were impacted by chromium and lead compounds and ground water was impacted with hexavalent chromium as a result of these historical activities. The site contamination has been divided into two Operable Units (OUs). The OU1 remedy, which was completed in 2000, addressed existing buildings. The OU2 remedy utilizes a pump and treat (P&T) system to address ground water contamination of a sole source aquifer. The treated ground water from the P&T system is beneficially reused by the City of Colby, Kansas public water supply system. In 2006, the P&T system satisfied 51% of the demand for potable water to the City of Colby. This RSE focuses on the OU2 remedy, which is now entering the fifth year of a 10-year Long-Term Remedial Action (LTRA) before being transferred to the State of Kansas for operation and maintenance (O&M). A granular activated carbon (GAC) pre-treatment system pre-treats the treatment system influent for volatile organic compounds from an upgradient leaking underground storage tank site. This pre-treatment system is managed under the KDHE Petroleum Storage Tank Release Program, and direct review of that pre-treatment system was not included in this RSE.

In general, the RSE team found a well-operated system. The observations and recommendations contained in this report are not intended to imply a deficiency in the work of either the system designers or operators, but are offered as constructive suggestions in the best interest of the EPA, the public, and the facility. These recommendations have the benefit of being formulated based on operational data unavailable to the original designers.

Recommendations are provided in all four of the categories: effectiveness, cost reduction, technical improvement, and site closure. The recommendations for improving system effectiveness are as follows:

- The site team should revise their methods of evaluating capture. This should involve a revised potentiometric map that does not include water levels from actively pumping extraction wells. Additionally, the capture zone evaluations should consider other lines of evidence including a comparison of extraction rates to calculated ground water flow through the plume and concentration trends in downgradient monitoring wells.

- The site team should pump for six months at extraction wells where extraction has been temporarily discontinued and concentrations have risen substantially or have risen above cleanup standards. This includes EX-5I/D, which increased above cleanup standards as of the Spring 2007 sampling event. This pumping would result in an estimated cost of $43,000 for 2007 assuming a flow rate of 100 gpm maintained over 6 months. The site team will then need to decide if pumping should continue until concentrations are consistently below cleanup standards or consistently undetectable. This decision has larger implications for operation of the P&T system in general. Continuing to operate extraction wells until concentrations are undetectable as voiced during the RSE process (rather than until cleanup standards are met) could extend the duration of the remedy by several years.

Recommendations for cost reduction include the following:

- It is suggested that extraction rates be modified to reduce the cost of resin without sacrificing protectiveness. It is recommended that extraction from EX-1D and EX-2D can be discontinued since extraction from these deeper wells may be contributing to the downward migration of contaminants and concentrations at these wells have been below cleanup standards for the past four sampling events. Additionally, pumping could be discontinued at EX-4I/D since concentrations at wells and upgradient of this well are below cleanup standards. The site team reported a cost of resin at 0.164 cents per gallon of water treated. Discontinuing pumping at EX-1D and EX-2D will result in savings of approximately $156,000 annually. If the site team chooses to discontinue pumping from EX-4I/D, an additional savings of $86,000 annually could be realized.

- The RSE team suggests revising the ground water monitoring program from 71 wells sampled semi-annually (excluding residential sampling) to 56 wells sampled annually and 44 wells sampled semi-annually (also excluding residential sampling). This modification would result in annual savings of approximately $25,000.

- The total project management costs are high relative to other Fund-lead P&T systems. The RSE team believes that sufficient project management, technical support, and routine audits could be performed for approximately $108,000 per year. This would result in an annual savings of approximately $34,000. Some of the savings might be achieved by using vendor assistance and local expertise as technical resources to offset some of the involvement by the design engineer. Savings may also be realized by modifying the reporting format for the quarterly audit process.

In total, the RSE team identifies approximately $215,000 per year in potential savings. Recommendations for technical improvement and gaining site closure include the following:

- Because the remedy may achieve cleanup standards in a reasonable time frame, the site team should continue to look for ways to reuse equipment and simplify operations rather than paying for replacement of expensive automation controls and equipment.

- The site team should prepare a map to illustrate the results of previous soil investigations and excavations to help understand the potential for future leaching of soil contamination to ground water.

- An initial increase followed by a decrease in contamination at a well immediately downgradient of the source area has raised concern that soil contamination may continue to act as a potential source to ground water contamination. The increase and subsequent decrease might also be explained by a redistribution of existing ground water contamination when the P&T system began operation. The RSE team recommends continuing to operate the P&T system and monitoring for potential future concentration increases to see if soil is acting as a continuing source. However, if the site team is concerned about the soil contamination and would like to take a more proactive approach, the RSE team has provided an approach for the site team's consideration. It consists of two steps: a preliminary investigation followed by a follow-up investigation and soil flushing. The soil flushing would include improved ground water capture in the immediate source area. The estimated cost for the preliminary investigation is approximately $55,000, and the estimated cost for the follow-up investigation and remediation is approximately $400,000, including two years of operation.

A table summarizing the recommendations, including estimated costs and/or savings associated with those recommendations, is presented in Section 7.0 of this report.

PREFACE

This report was prepared as part of a project conducted by the United States Environmental Protection Agency Office of Superfund Remediation and Technology Innovation (U.S. EPA OSRTI) in support of the "Action Plan for Ground Water Remedy Optimization" (OSWER 9283.1-25, August 25, 2004). The objective of this project is to conduct Remediation System Evaluations (RSEs) at selected pump and treat (P&T) systems that are jointly funded by EPA and the associated State agency. The project contacts are as follows:

Organization	Key Contact	Contact Information
U.S. EPA Office of Superfund Remediation and Technology Innovation (OSRTI)	Charles Sands	2777 South Crystal Drive 5th Floor Mail Code 5204P Arlington, VA 22202 phone: 703-603-8857 sands.charles@epa.gov
Dynamac Corporation (Contractor to U.S. EPA)	Daniel F. Pope	Dynamac Corporation 3601 Oakridge Boulevard Ada, OK 74820 phone: 580-436-5740 fax: 580-436-6496 dpope@dynamac.com
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1.0 INTRODUCTION

1.1 PURPOSE

During fiscal years 2000 and 2001 Remediation System Evaluations (RSEs) were conducted at 20 Fund-lead pump and treat (P&T) sites (i.e., those sites with pump and treat systems funded and managed by Superfund and the States). Due to the opportunities for system optimization that arose from those RSEs, EPA OSRTI has incorporated RSEs into a larger post-construction complete strategy for Fund-lead remedies as documented in *OSWER Directive No. 9283.1-25, Action Plan for Ground Water Remedy Optimization*. OSRTI has since commissioned RSEs at additional Fund-lead sites with P&T systems. An independent EPA contractor is conducting these RSEs, and representatives from EPA OSRTI are participating as observers.

The RSE process was developed by the US Army Corps of Engineers (USACE) and is documented on the following website:

http://www.environmental.usace.army.mil/library/guide/rsechk/rsechk.html

An RSE involves a team of expert hydrogeologists and engineers, independent of the site, conducting a third-party evaluation of site operations. It is a broad evaluation that considers the goals of the remedy, site conceptual model, above-ground and subsurface performance, and site closure strategy. The evaluation includes reviewing site documents, visiting the site for up to 1.5 days, and compiling a report that includes recommendations to improve the system. Recommendations with cost and cost savings estimates are provided in the following four categories:

- Improvements in remedy effectiveness
- Reductions in operation and maintenance costs
- Technical improvements
- Gaining site closeout

The recommendations are intended to help the site team (the responsible party and the regulators) identify opportunities for improvements. In many cases, further analysis of a recommendation, beyond that provided in this report, may be needed prior to implementation of the recommendation. Note that the recommendations are based on an independent evaluation by the RSE team, and represent the opinions of the RSE team. These recommendations do not constitute requirements for future action, but rather are provided for the consideration of all site stakeholders.

The Ace Services Superfund Site (the Site) was selected by EPA OSRTI based on a recommendation from EPA Region 7. The Kansas Department of Environmental Health (KDEH) has expressed concern over a recent spike in chromium levels in the Ace Recovery Wells that may indicate leaching of source area contamination. Additionally the site team is looking for cost-reduction strategies that will allow the system to more cost-effectively maintain its designed level of protectiveness. This report provides a brief background on the site and current operations, a summary of observations made during a site visit, and recommendations regarding the remedial approach. The cost impacts of the recommendations are also discussed.

1.2 TEAM COMPOSITION

The team conducting the RSE consisted of the following individuals:

Peter Rich, Civil and Environmental Engineer, GeoTrans, Inc.
Doug Sutton, Water Resources Engineer, GeoTrans, Inc.
Erin Pettypiece, Geologist, GeoTrans, Inc.

The RSE team was also accompanied by the following observers:

Chuck Sands from EPA OSRTI
Glynis Hill from EPA OSRTI
Ashley Allen from KDHE
Leo Henning from KDHE

1.3 DOCUMENTS REVIEWED

Author	Date	Title
U.S. EPA	10/1998	Remedial Investigation Report
U.S. EPA	05/05/1999	Record of Decision
BVSPC	11/13/2000	Technical Memorandum - Pump Test Results
BVSPC	12/14/2000	Technical Memorandum - Groundwater Modeling Activities
BVSPC	07/06/2001	Technical Memorandum - Groundwater Modeling Activities
U.S. EPA	09/13/2001	Record of Decision Amendment
BVSPC	9/2003	Interim Remedial Action Report
BVSPC	10/2003	Remedial Action Report
BVSPC	9/2003	Remedial Action Report Demolition Summary
U.S. EPA	9/2003	Preliminary Close Out Report
BVSPC	2006	Long Term Response Action, Cleanup Status Reports, 1/04/2006 and 6/08/2006
BVSPC	2006	Long Term Response Action, Audit Reports, 11/29/2006, 7/28/2006, 5/24/2006, and 3/03/2006
BVSPC	3/2006	General System O&M Manual, Ground Water Treatment Plant Volume I & II
U.S. EPA	11/2006	Annual O&M / Remedy Evaluation Checklist
MILCO	8-11/2006	Quarterly O&M and Monitoring Report, Hi-Plains Coop and Granular Activated Carbon System
BVSPC	6/2007	Spring 2007 Ground Water Sampling Data

1.4 PERSONS CONTACTED

The following individuals associated with the site were present for the visit:

Rob Weber, PG, Environmental Scientist/Remedial Project Manager, EPA Region 7
Gary Felkner, Senior Geologist, Black & Veatch
Curt McCoy, Construction Manager, Black & Veatch

Ken Wyatt, Project Manager, Black & Veatch
Jim Helus, Plant Operator, City of Colby

1.5 SITE LOCATION, HISTORY, AND CHARACTERISTICS

1.5.1 LOCATION

The Ace Services Superfund Site is located in a light commercial/industrial area near the east edge of the city of Colby, Thomas County, Kansas. The site address is 500 East Fourth Street. To the north, the site is bordered by Fourth Street. A church and a hardware store are located to the east and west, respectively. Vacant land is located to the south of the site. For the purposes of this RSE report, the site refers to the Ace Services Property unless otherwise noted.

Site characterization and remediation has been divided into two operable units (OUs): OU1 addressed buildings associated with historic facility operations and OU2 addresses contaminated ground water. The OU1 remedy consisted of the removal and disposal of hazardous wastes from the interior of the buildings. The OU1 remedy was completed in February 2000 (seven years prior to the RSE). The OU2 remedy consists of the extraction of contaminated ground water from a sole source aquifer, ground water treatment using ion exchange resins, and discharge of treated ground water to the Prairie Dog Creek Tributary or to the City of Colby drinking water supply. To date, the treated ground water from the P&T system has beneficially reused by the City of Colby, Kansas public water supply system, satisfying 51% of the demand for potable water to the City of Colby in 2006. During the demolition and excavation of the Ace Services facility, chromium contaminated soil was discovered. The contaminated soil was excavated to 15 feet then backfilled with clean fill. This RSE focuses on the OU2 ground water remedy, but considers residual soil contamination that could potentially serve as a continuing source of ground water contamination. A granular activated carbon (GAC) pre-treatment system pre-treats the Ace Services treatment system influent for volatile organic compounds from the upgradient Hi-Plains Co-Op leaking underground storage tank site. Although this pre-treatment system is managed under the KDHE Petroleum Storage Tank Release Program, the Ace Services system operators monitor the GAC system through sample log sheets and by observing electronic critical flow and pressure data from the GAC system. Direct review of Hi-Plains Co-Op pre-treatment system is not included in this RSE.

1.5.2 HISTORICAL PERSPECTIVE

The Ace Services property was operated as a plating facility between 1954 and 1989. Northwest Manufacturing Facility operated the facility from 1954 to 1969 when Ace Services took over the operations. Ace Services terminated operations at the site in 1989 after losing corporate status due to failure to pay taxes and fees. During operation, parts were transferred to and from plating vats. Contaminants reportedly entered the environment from the plating vats, spills that occurred during the transfer of parts, and as a result of a faulty waste water treatment plant.

- The site was added to the National Priorities List in September 1995.
- The Remedial Investigation and Risk Assessment occurred in October 1998.
- The Record of Decision for both OU1 and OU2 was issued in May 1999.
- The OU1 Remedial Design was completed in December 1999.

- The OU1 Remedial Action was completed in February 2000.
- The Record of Decision was amended in September 2001.
- The OU2 Remedial Design was completed in 2002.
- The construction of the OU2 P&T system was completed August 12, 2003.
- The OU2 remedy operated for several months beginning in August 2003 before it was temporarily shut down in October 2003, due to VOC contamination detected in site monitoring and extraction wells from an upgradient source.
- Long-Term Remedial Action (LTRA) officially began in September 2003.
- The responsible party for the upgradient VOC contamination installed a GAC treatment unit and began operation of that unit in August 2004 to treat the extracted water prior to treatment by the Ace Services treatment plant. The Ace Services treatment plant resumed operation on August 24, 2004.

1.5.3 POTENTIAL SOURCES

The contaminants were reportedly released as a result of poor maintenance during chromium electroplating operations, waste water discharge to the surface, and a faulty waste water treatment facility. The source of chromium was the chromic acid solution used in the plating vats. Removal actions were preformed between 1981 and 1994 to remove contaminated sludge, building debris, soils and remaining wastes. During the construction phase of OU2 in 2002 additional contaminated soils were discovered beneath the Ace Services facility. Contaminated soils were excavated to a depth of 15 feet. Contaminated soils remained in one area but were deemed not a threat to human health because they would be covered with clean backfill and the treatment system. Primary site-related compounds of concern are as follows:

- Hexavalent Chromium
- Total Chromium

Volatile organic compounds (VOCs) attributed to other contaminated sites (the High Plains Co-Op Site upgradient of the Ace Services Site) are also present in ground water underlying the Site. The High Plains Co-Op Site is located across Fourth Street near the intersection of Nashville and Fifth Street, and the ground water remedy at that site includes an air sparge system. Contaminants associated with the High Plains Co-Op Site include 1,2-dichloroethane (1,2-DCA). The High Plains Co-Op Site has installed a GAC unit east of the Site that pre-treats extracted water to remove VOCs prior to entering the Ace Services site treatment plant.

1.5.4 HYDROGEOLOGIC SETTING

The Site is underlain by fill in some areas that is associated with excavation and demolition events associated with OU2 construction activities. Typically, the fill is approximately 2 to 3 feet thick, but in some areas it is approximately 15 feet deep.

Underlying the site are unconsolidated deposits of quaternary age. These deposits consist of gravel, sand, silt, and clay. These deposits are overlain by deposits of loess in some areas, which are wind blown silt deposits. The quaternary age deposits are underlain by unconsolidated sediments which are Miocene in age and are referred to as the Ogallala Formation. The unit is highly stratified and consists of sand, gravelly sand, silt, and clay. This unit also contains thin interbedded caliche layers. Bedrock from the Cretaceous Pierre Shale Formation underlies the unconsolidated formation. The site team has divided the unconsolidated formation into three zones: the shallow, intermediate, and deep zones.

The shallow zone begins at 105 feet below ground surface (bgs) and is generally sand with gravel and clay. It is approximately 40 feet thick. The intermediate monitoring and extraction wells at the site screen regional ground water in the intermediate zone approximately 145 to 190 feet bgs. These sediments consist of gravelly sand with thin clay lenses. At approximately 190 feet, there is a semi-confining layer of clay and silty clay. This unit is approximately 17 feet thick. Underlying the semi-confining unit is the deep zone, which consists of gravelly sand with thin clay lenses. The gravely sand is approximately 23 feet in thickness. Bedrock is encountered at approximately 230 feet bgs. Site maps with well locations for the shallow, intermediate, and deep zones are provided on Figures 1-1, 1-2, and 1-3.

The depth to the regional water table is approximately 90 feet bgs, but this depth has been increasing as a result of decreasing water elevation in the Ogallala Formation. Locally, flow in the intermediate and deep zones is to the east-southeast. The hydraulic gradient is approximately 0.0022 to 0.0032 feet per foot. Hydraulic conductivity has been calculated to range from 53.1 feet per day to 71.7 feet per day in the intermediate zone and 10.4 feet per day to 153.4 feet per day in the deep zone based on pump tests conducted during the pre-design phase.

1.5.5 POTENTIAL RECEPTORS

The potential receptors for the site are residential wells located downgradient of the site. The city has made city water hook up available to affected residents. Most residents have hooked up to city water but have not abandoned their wells, making those residents potential receptors. Two residents have refused to pay for city water and therefore still use their private wells as a drinking water source. All downgradient residential wells are sampled semi-annually and residents receive a report summarizing the sample results.

1.5.6 DESCRIPTION OF GROUND WATER PLUME

The site team tracks concentrations of hexavalent chromium. Concentrations are highest in the area immediately downgradient of the original soil source area. The April 2003 baseline sampling event provides information regarding contaminant transport in ground water after the soil contamination had been removed during the demolition and excavation of existing site buildings but before the P&T system began operation. In the shallow zone, the April 2003 results indicated that ground water with concentrations above cleanup standards for chromium compounds had migrated approximately 1.4 miles east of the former facility (e.g., east of the current treatment plant). Chromium concentrations above cleanup standards were detected in MW-8S, MW-9S, MW-11S, MW-13S, MW-14S, MW-15S, OB-1S, and OB-2S.

In the intermediate zone, April 2003 sampling suggested that contaminant migration was more extensive. Chromium concentrations above cleanup standards were detected in MW-2I, MW-8I, MW-9I, MW-11I , MW-12I, MW-13I, MW-14I, OB-1I, and OB-2I.

In the deep zone, April 2003 sampling suggests that contaminant migration was even more extensive. Chromium concentrations above cleanup standards were detected in MW-2D, MW-6D, MW-9D, MW-11D, MW-13D, MW-15D, MW-18D, OB-1D, and OB-2D.

With respect to vertical plume delineation the bedrock is considered the confining unit and it is located at 230 feet bgs. No sampling of the bedrock has been conducted at the site.

2.0 SYSTEM DESCRIPTION

2.1 SYSTEM OVERVIEW

The P&T system has an Operational and Functional date of September 2003 and consists of an extraction system, a treatment plant, and discharge to the City of Colby drinking water supply or to the Prairie Dog Creek Tributary. The system is designed to contain site-related contamination and remove contaminant mass. A GAC treatment unit was also installed offsite for pretreatment of VOCs associated with the Hi-Plains Co-op Leaking Underground Storage Tanks Site. The GAC is maintained by that group.

2.2 EXTRACTION SYSTEM

The extraction system includes 13 extraction wells, which are listed in the table below. There are four shallow extraction wells, but none of those wells are currently operating. Due to low water levels, EX-2S is not operating. EX-4S and EX-5S were turned off in October 2005 due to reduced contaminant concentrations, and EX-3S was turned off in January 2007 due to reduced chromium concentrations. There are five intermediate extraction wells. In October 2005, EX-5-I/D was turned off because the detected chromium concentration was below the Maximum Contaminant Level (MCL) of 100 ug/L. There are three deep extraction wells. EX-3D was shut down in January 2007 because the detected chromium concentration was below the MCL. Additionally there is a public water supply well (PSW-8), which has been converted into an extraction well that is currently operating. Each well head is enclosed in a small heated and ventilated well house building and is piped to the treatment plant through a common HDPE header pipe. Flow from each well is controlled by actuated valves that are in turn controlled from a programmable logic controller at the treatment plant. Isolation valves are included to allow the wells to be taken off line. The following table summarizes the October 2006 extraction rates and contaminant concentrations for each of those wells based on sampling data. The site team reports a total chromium mass of 1,052 kg removed from the site between June 2003 and October 2006.

Extraction Well	Flow Rate October 2006 (gpm)	Hexavalent Concentration October 2006 (ug/L)
EX-1-I	70	500
EX-1-D	70	< 10
EX-2-S	**0**	--
EX-2-I	100	80
EX-2-D	100	21.6
EX-3-S	**0**	12.2
EX-3-I	50	72
EX-3-D	**0**	12.3
EX-4-S	**0**	< 10
EX-4-I/D	100	36.5
EX-5-S	**0**	< 10
EX-5-I/D	**0**	67.5
PSW-8	125	190
Total	**615**	

2.3 TREATMENT SYSTEM

The treatment system consists of the following treatment components:

- One 250,000-gallon influent water storage tank
- Two lines of bag filters each consisting of four 5 micron bag filters
- Two ion exchange process trains, each consisting of three 600 cubic foot ion exchange beds arranged in a lead/lag/spare configuration
- One 250,000-gallon effluent water storage tank
- Chlorination system
- 600 cubic foot resin transfer vessel
- Associated gauges, meters, mixers, pumps, and controls

The system was designed for a capacity of 1,000 gpm with redundant features to prevent downtime.

2.4 MONITORING PROGRAM

Ground Water Monitoring

A semi-annual ground water monitoring program that includes sampling all wells has been established for the site. The most recent sampling event occurred in October 2006 and consisted of sampling 48 monitoring wells, six observation wells, nine residential wells, two Hi-Plain Co-op monitoring wells, the Ace Recovery Well (at three intervals), 12 extraction wells (three not operating), and PWS-8 (the former public water supply well) for total chromium and field parameters including temperature, specific conductivity, pH, turbidity, dissolved oxygen, and oxidation-reduction potential. Monitoring wells were sampled using a conventional purge (three volumes or more) and sample method and extraction wells were sampled through a sample port. Laboratory analyses are provided by the Region 7 Laboratory at no cost to the site. Ground water elevations were measured in all monitoring wells, including all extraction wells. The results of the event were summarized in a concise report that provided potentiometric surface maps for the intermediate and deep zones and contaminant concentration maps for total chromium. Another sampling event took place in April 2007 at the time of the RSE site visit.

Process Monitoring

Process monitoring is conducted twice daily (morning and afternoon) at three locations: plant influent, plant effluent, and the effluent to the city. In the morning, an additional seven samples are collected: downstream of the influent tank, downstream of bag filter BF-1, downstream of bag filter BF-2, downstream of ion exchange train A lead vessel, downstream of ion exchange train A lag vessel, downstream of ion exchange train B lead vessel, and downstream of ion exchange train B lag vessel. All samples are analyzed for hexavalent chromium and pH. In addition, influent and effluent samples are analyzed for total chromium. The daily analysis of the samples is performed at the GWTP with a Hach kit. Once a week, the morning samples are split and sent to an independent laboratory contracted through an EPA cooperative agreement with the City of Colby, Kansas.

3.0 SYSTEM OBJECTIVES, PERFORMANCE, AND CLOSURE CRITERIA

3.1 CURRENT SYSTEM OBJECTIVES AND CLOSURE CRITERIA

The ROD stated the following language regarding the goals for the ground water remedy.

- Prevent ingestion, inhalation, or direct contact with ground water having chromium concentration in excess of current regulatory drinking water standards.

- Prevent further migration of chromium to prevent further degradation of natural resources.

The cleanup criteria established by the ROD for site-related contaminants are summarized in the following table.

Contaminant of Concern	Cleanup Criteria (ug/L)
Chromium, Total	100

3.2 TREATMENT PLANT OPERATION STANDARDS

Treated ground water is discharged to the Prairie Dog Tributary or to the City of Colby drinking water supply. Discharge to the City of Colby drinking water supply is coordinated with the City of Colby. Selected discharge criteria are provided in the following table.

Constituent	Discharge Criteria (ug/L)
Chromium, Hexavalent	17
Chromium, Total	100

The effluent treatment plant routinely has undetectable levels of chromium, with the detection limit below the discharge criteria.

4.0 FINDINGS AND OBSERVATIONS FROM THE RSE SITE VISIT

4.1 FINDINGS

The observations provided below are not intended to imply a deficiency in the work of the system designers, system operators, or site managers but are offered as constructive suggestions in the best interest of the EPA and the public. These observations have the benefit of being formulated based upon operational data unavailable to the original designers. Furthermore, it is likely that site conditions and general knowledge of ground water remediation have changed over time.

4.2 SUBSURFACE PERFORMANCE AND RESPONSE

4.2.1 WATER LEVELS

Water levels collected from 58 monitoring wells along the plume confirm regional ground water flow to the east-southeast and show influence from ground water extraction. Potentiometric surface maps prepared by the site team and incorporated into the Cleanup Status Reports, however, include water levels from active pumping wells, which tend to overestimate the influence of pumping. A more accurate representation of the influence of pumping is to prepare the potentiometric surface map without water levels from operating extraction wells and rely on water levels from monitoring wells that are near operating extraction wells. Fortunately, at this site, most of the extraction wells have nearby monitoring wells.

Water levels from monitoring wells indicate a downward vertical gradient that has been intensified by higher extraction rates from deeper wells than from shallow wells. This is evident by reviewing water levels from the October 2006 sampling event at the MW-1 and MW-2 clusters. MW-1 is located upgradient of the site and is approximately 500 feet up/sidegradient from the nearest extraction well. Based on this event, the downward gradient at the MW-1 cluster is 0.0016 feet per foot (a difference in water levels of 0.15 feet over 95 feet). The MW-2 cluster is located near the EX-1 cluster where pumping occurs from the intermediate and deep extraction wells. The downward vertical gradient at this location is 0.037, which is more than a factor of 20 higher than in non-pumping locations. This high gradient indicates that extraction from intermediate and deep wells pulls water from the shallow zone and contributes to capture of shallow ground water contamination. It also, however, increases the vertical gradient, which likely draws contamination into the deep zone and perpetuates pumping from deep extraction wells.

4.2.2 CAPTURE ZONES

Four different lines of evidence are typically appropriate for evaluating capture at a site like this:

- A comparison of ground water flowing through the contaminated area with the amount of ground water being extracted
- Evaluation of potentiometric surface maps
- Evaluation of trends in contaminant concentrations
- Ground water modeling with particle tracking

The following equation is useful for evaluating the first line of evidence.

$$Q \geq W \times C \times B \times K \times i \times f$$

Q – Extraction rate
W – Width of capture zone
B – Saturated thickness
K – Hydraulic conductivity
i – Hydraulic gradient
f – Safety factor of 2 to account for heterogeneity and other factors
C – Conversion factor – 0.00518 gpm/ft^3/day

Typically, for adequate capture, the extraction rate (left-hand side of the equation) is two or more times higher than the amount of water flowing through the contaminated zone. The right-hand side of the equation represents this flow rate and the factor of safety (*f*). The following table summarizes the input data for this equation and indicates if capture appears to be adequate based on this line of evidence. The analysis is done for current site conditions. Therefore, a relatively narrow plume is considered as is extraction from EX-1, PSW-8, and EX-2.

Zone	Actual Q[1] (gpm)	Width[2] (feet)	Hydraulic Gradient[3] (feet/foot)	Saturated Thickness[4] (feet)	Hydraulic Conductivity[3] (feet/day)	Right-Hand Side of Equation (gpm)
Shallow	25	400	0.0032	35	37	17
Intermediate	245	400	0.0032	65	62	53
Deep	195	400	0.0032	25	43	14

[1] *Extraction from PSW-8 is apportioned as follows 20% shallow, 60% intermediate, and 20% deep.*
[2] *Conservative based on contaminant contours presented by site contractor, which are interpreted based on relatively sparse data for delineating the plume width.*
[3] *As reported in modeling report prepared by site contractor*
[4] *Interpreted from cross-section in Cleanup Status Report*

Capture appears to be adequate in each of the three intervals based on this simple calculation because the actual pumping rate (Q) is greater than the right hand side of the equation. It is noted, however, that such simple calculations require simplifying assumptions such as homogeneous, isotropic, confined aquifer with infinite extent, uniform aquifer thickness, fully penetrating wells, uniform regional horizontal hydraulic gradient, steady-state flow, negligible vertical gradient, no net recharge, and no other water sources introduced to aquifer due to extraction. Most of the assumptions are not satisfied at this site. However, based on the much greater calculated capture widths compared to the actual plume widths, especially in the intermediate and deep zones, it appears that the analysis is conservative and error associated with the assumptions would likely not change the conclusions from this line of evidence.

The use of water levels from operating extraction wells biases the potentiometric surface maps in favor of capture. Therefore, the potentiometric surface maps from the existing Cleanup Status Reports are not reliable for evaluating plume capture. The potentiometric surface maps could be prepared without the use of water levels from operating extraction wells, and then used for evaluating capture along with the other lines of evidence presented here.

Using concentration trends at monitoring wells downgradient of extraction wells can provide evidence of capture; however, the analysis will take several rounds of monitoring data to obtain useful results. The peak in chromium contamination, which was in the ARW well in April 2005, can be used in conjunction with concentrations measured in subsequent events at downgradient wells over the next several monitoring events. The flow parameters used above and an effective porosity of 0.25 suggest that contaminant transport velocities are approximately 0.5 feet per day for the shallow and deep zones and approximately 1 foot per day for the intermediate zone. PSW-8 and the MW-8 cluster are located approximately 1,000 feet downgradient of the ARW well. If capture provided by EX-1 is adequate, then concentrations at PSW-8 should decrease and the concentrations at MW-8 should remain low or undetectable. If capture provided by EX-1 is not adequate, the concentrations at PSW-8 and MW-8 will likely increase within approximately 3 to 6 years (e.g., between 2008 and 2011) assuming the parameters above are accurate. It should be noted that pumping downgradient of EX-1, such as extraction from PSW-8, might actually compromise capture provided by EX-1.

Numerical modeling is beyond the scope of this RSE, but the numerical modeling conducted by the site team during design appears adequate. It was calibrated based on pumping and non-pumping conditions, simulated and observed heads compared relatively well, and a sensitivity analysis was performed. Current pumping rates from EX-1, PSW-8, and EX-2 appear to be comparable to or exceed what was simulated with the modeling.

Based on the above analysis, capture of the existing plume by EX-1, PSW-8, and EX-2 appears to be adequate at this site. However, this evaluation is heavily dependent on pump test data that was difficult to interpret. Additional review of revised potentiometric surface maps and continued monitoring of concentration trends at PSW-8 and the MW-8 cluster should provide further evidence of capture.

4.2.3 CONTAMINANT LEVELS

Based on the October 2006 sampling event, the area of the plume has substantially decreased since pumping began approximately 3.5 years prior to the event. This suggests that upgradient extraction is preventing contamination from migrating to downgradient locations and that downgradient extraction has effectively removed contamination. If the EX-1 cluster effectively captures the increase and subsequent decrease in concentrations noticed at the ARW cluster, the plume will maintain its substantially reduced size. Concentrations at the deep extraction wells have also substantially decreased. ARW-D is the only deep sampling location with chromium contamination above the cleanup criteria (given that the concentration reported for MW-4D on the 2006 Quarterly Clean Status Report Number 7, Figure 2-3 is an error based on historic sampling and the results of the Spring 2007 sampling event). The relatively low concentrations in the deep aquifer suggest that deep extraction has effectively remediated the deeper aquifer and that any sustained deep pumping may only serve to pull additional contamination deeper.

Contaminant concentrations in the ARW sampling locations indicated an increase during the first two years of pumping (April 2003 to April 2005) followed by a consistent decrease since April 2005. The increase and subsequent decrease raises questions as to the cause of this concentration trend. Reasonable suggestions are that it 1) represents movement of contaminants under a new pumping regime (i.e., the start-up of the P&T system) or 2) represents contaminant mass that leached from the soil to the ground water. The horizontal transport time between the source area and the ARW sampling locations is on the order of one to two years. Additional time would be needed for vertical migration to the ARW-I and ARW-D locations, especially given the low-permeability units that separate the shallow, intermediate, and deep zones. Therefore, if the latter explanation is used, the contamination likely leached from the soil around the time of soil removal and the treatment plant construction.

4.3 COMPONENT PERFORMANCE

4.3.1 EXTRACTION SYSTEM

The extraction wells are equipped with a high capacity stainless steel submersible centrifugal pumps. The water is pumped through a buried HDPE collection piping system to the Hi-Plains Co-Op GAC pre-treatment unit, which operates on the water pressure provided by the extraction pumps. Water pre-treated by the GAC system is then pumped to an influent holding tank at the treatment plant. The extraction well pumps are intended to run continuously, however, a pressure transmitting type level sensor is mounted inside the well casing to turn off the motor if water levels fall below the low level set point and to turn on the motor when the high level set point is reached. If an extraction well experiences cycling due to fluctuating water levels the average flow rate may be decreased. The flow rate for each well is controlled automatically to a specified set point by the PLC through an actuated valve and flow meter located at each well. Fiber optic wiring (rather than copper wiring) connects the actuated valves and flow meters to the PLC to reduce potential equipment damage from lightning strikes. The extraction wells also have a butterfly valve which isolates the extraction well piping for maintenance and two tee and ball valve combinations which are used as a sampling port. The extraction well piping, valves, and controls are housed in a heated and ventilated well house above each well.

4.3.2 EQUALIZATION TANKS

Prior to entering the equalization tank, ground water is pumped through the off-site GAC system to remove VOCs associated with the upgradient Hi-Plains Co-Op leaking underground storage tank site. The effluent from the GAC system is pumped to the 250,000-gallon equalization tank located at the treatment plant, which also receives flow from the process sump and the recycle line. Water from the influent tank enters the ground water treatment plant.

The effluent equalization tank accumulates water after it has been run through either ion exchange train, but prior to entering the chlorination system. Water from the effluent tank is either sent to the chlorination system and then to the city of Colby water supply, or is discharged directly to the Prairie Dog Creek tributary.

Each equalization tank contains a low level sensor which triggers an alarm when the tank is at 12% capacity. When the tanks are at 8% capacity a low-low level sensor shuts down the pumps removing water from the tank. After a low-low alarm has been triggered a low-maintain level control automatically restarts the pumps when the tank reaches 33% capacity. Each tank also contains a high level sensor which triggers an alarm when the tank is at 85% capacity. When the tanks are at 90% capacity a high-high level sensor shuts down pumps pumping water to the tank. When a tank returns to 67% capacity after a high-high level alarm a high-maintain level control automatically restarts the pumps.

4.3.3 BAG FILTERS

Bag filters are provided in two trains each containing four parallel bag filters. The bag filter housings contain a 5 micron bag. The bag filters are located in between the raw water pumps and the ion exchange vessels. Bag filter change outs are infrequent, typically on the order of every two months. Only three bag filters in each train are needed to operate the system, and valves are in place to allow the system to operate continuously while one of the four bags in each train is replaced. The bag filters have been effective at removing carbon fines that enter the process stream from the GAC pre-treatment unit.

4.3.4 Ion Exchange

The ion exchange vessels are grouped into two trains each containing three vessels: a lead vessel, a lag vessel, and a standby vessel. As the process water passes though both the vessels the hexavalent chromium is exchanged for chloride. When chromium break though begins to occur, the lag vessel is moved into the lead position and the standby unit is moved into the lag position. Each vessel is capable of being isolated and assigned to any position in the process train. This rotation of resin allows the spent resin to be replaced without shutting down the system. Resin is delivered to the site in a 600 cubic foot tanker which is able to park in the building. The virgin resin is sluiced into a resin transfer vessel to be held while the spent resin is removed. The virgin resin is then sluiced into the empty vessel, which becomes the standby vessel. Spent resin is removed from the site and disposed of at an offsite facility.

4.3.5 Chlorination System

The chlorination system is housed in a Chlorination Shelter located outside the ground water treatment building between the influent and effluent tanks. Water enters the chlorination system from the effluent equalization tank. Chlorine is stored in pressurized cylinders with regulators which control the amount of chlorine being added. Disinfected water is discharged from the chlorination system into the city water distribution system.

4.4 Components Or Processes That Account For Majority of Annual Costs

Annual O&M costs are approximately $1,050,000 per year as summarized below.

Item Description	Estimated Annual Cost
Labor: BVSPC oversight and project management	$142,000
Labor: System operation	$50,000
Ground water sampling and reporting (labor and analytical)	$110,000
Utilities: Electricity	$120,000
Non-electric utilities and other services	$60,000
Non-utility consumables, disposal, and small repairs	$540,000
Treatment plant analytical costs	$28,000
Total Estimated Annual Cost	**$1,050,000**

4.4.1 Utilities

Utilities costs are divided between electricity and non-electricity services. The electricity cost from the utility is estimated by the site contractor as $120,000 per year.

Non-electric utilities and other services include potable water, garbage collection, cell phones, telephone, portable toilets, cable internet service, repairs, and shipping. The cost estimate for these non-electric utilities is approximately $60,000 per year.

4.4.2 Non-Utility Consumables and Disposal Costs

The consumables category includes chemicals and resin. Chemical usage is negligible relative to resin usage; therefore these costs represent resin usage. The main system cost, over half, is due to resin usage, which is directly related to system flow rates. Recent resin usage has been about 40 million gallons per resin vessel. Resin usage, for FY2007, at the current 615 gpm flow rate, is projected at four changeouts of two 600 cubic foot vessels (one in each train) at a cost of $135,000 per changeout or $540,000 annually, which represents a decrease from the $798,000 budgeted in previous years.

4.4.3 LABOR

There are three general areas involving labor: contractor project management, operator labor, and ground water sampling. The contractor project management is approximately $142,000 per year. The operator labor is approximately $50,000 per year. The ground water sampling labor (and associated equipment and analytical) is approximately $110,000 per year.

4.4.4 CHEMICAL ANALYSIS

The chemical analysis costs represent costs for analyzing treatment plant compliance samples. Chemical analysis for the ground water sampling is provided by the Region 7 Laboratory at no cost to the site budget.

4.5 RECURRING PROBLEMS OR ISSUES

The site team reported recurring problems power outages occurring in two of the extraction wells. Due to their distance from the treatment plant the power for these wells is supplied by a different provider.

4.6 REGULATORY COMPLIANCE

The treatment plant has routinely met discharge standards since operations began in October 2003.

4.7 TREATMENT PROCESS EXCURSIONS AND UPSETS, ACCIDENTAL CONTAMINANT/REAGENT RELEASES

There have been no reported major upsets or accidents since the plant began operations in October 2003.

4.8 SAFETY RECORD

The site team reports no health and safety reportable incidents for the treatment plant. The site team had no unaddressed concerns for potential safety issues.

5.0 EFFECTIVENESS OF THE SYSTEM TO PROTECT HUMAN HEALTH AND THE ENVIRONMENT

5.1 GROUND WATER

The ground water potential points of exposure are residential wells located approximately 1.5 miles from the site. Data to date suggest that the contamination in this area has been remediated and is no longer present. All residential wells have reported levels of chromium concentrations below the MCL since April 2003. In addition, the treatment plant routinely discharges water with undetectable chromium concentrations and adequate chlorine residual to the city water supply. As a result, the RSE team believes that the current remedy is likely protective of human health with respect to preventing contamination of the residential wells.

5.2 SURFACE WATER

The contaminated ground water is captured or attenuates prior to discharging to surface water, and the effluent from the treatment plant consistently meets the discharge criteria. As a result, the RSE team believes that the current remedy is likely protective of human health and the environment with respect to surface water.

5.3 AIR

Chromium and lead dust were addressed as part of OU1. Hexavalent chromium has been identified as a threat to human health through inhalation when associated with plating operations. The OU1 remedy has reportedly covered remaining chromium contamination in the soil, and the RSE team did not further evaluate the OU1 remedy as part of the RSE.

5.4 SOIL

In 1992, contaminated soils were identified in the lagoon soils east of the Ace Services facility and beneath the troughs within the facility. In 1994, as part of a remediation effort conducted by the USEPA, contaminated soils, concrete, and structures were removed from the site. Cleanup goals for soils were 1,500 mg/kg total chrome and 500 mg/kg total lead. Contaminated soil was left in place due to limitations of the excavation equipment. Samples of the soils left in these location indicated chrome concentrations of 1,900 mg/kg to 2,400 mg/kg. The bottom of the excavation was covered with sodium metabisulfite and backfilled with clean soil and topped with concrete. Approximately 500 tons of soil was excavated from the lagoon and verification samples indicated that lagoon soils no longer exceeded the action levels. During OU1 demolition and construction activities chromium contaminated soils were encountered beneath the Ace Services building slab. Soil was excavated to a depth of up to 15 feet in some locations. Remaining contamination was backfilled over with clean fill and deemed not a threat to human health because the ground water treatment plant would serve as a cap.

5.5 WETLANDS AND SEDIMENTS

Wetlands and sediments are not potential receptors of the ground water contamination of this site.

6.0 RECOMMENDATIONS

Cost estimates provided herein have levels of certainty comparable to those done for CERCLA Feasibility Studies (-30%/+50%), and these cost estimates have been prepared in a manner consistent with EPA 540-R-00-002, *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study*, July, 2000.

6.1 RECOMMENDATIONS TO IMPROVE EFFECTIVENESS

6.1.1 MODIFY METHODS OF EVALUATING CAPTURE ZONE

Four different lines of evidence are typically appropriate for evaluating capture at a site like this:

- A comparison of ground water flowing through the contaminated area with the amount of ground water being extracted
- Evaluation of potentiometric surface maps
- Evaluation of trends in contaminant concentrations
- Ground water modeling with particle tracking

As demonstrated in Section 4.2.2, the first line of evidence suggests that capture of the current plume is adequate. The second line of evidence, however, is inconclusive because the site team currently prepares potentiometric surface maps using water levels from active extraction wells, which biases the potentiometric surface map in favor of capture. The third line of evidence will take additional time as the site team continues to monitor decreasing concentrations in downgradient monitoring wells. The fourth line of evidence is numerical modeling. The design extraction rates determined by the modeling are consistent with the ground water extraction rates that are evaluated as part of the first line of evidence.

The RSE team recommends that the site team prepare future potentiometric surface maps without using water levels from operating extraction wells. There are monitoring wells near some of the extraction wells that will be more representative of the influence that extraction has on water levels in the aquifer. Although this potentiometric surface map may be more difficult to prepare, it will likely still demonstrate capture and will be a more reliable indicator of capture than the current potentiometric surface maps.

The RSE team also recommends continuing to monitor PSW-8 and the MW-8 cluster and evaluate concentration trends. PSW-8 and the MW-8 cluster are located approximately 1,000 feet downgradient of the ARW well. If capture provided by EX-1 is adequate, then concentrations at PSW-8 should continue to decrease and MW-8 should remain low/undetectable. If capture provided by EX-1 is not adequate, the 2003 to 2005 increases at the ARW well will lead to concentration increases at PSW-8 and MW-8 within approximately 3 to 6 years (e.g., between 2008 and 2011).

This evaluation of capture should require the same level of effort as the current data analysis and presentation and should therefore not increase annual costs.

6.1.2 RE-START PUMPING AT EXTRACTION WELLS WHERE CONCENTRATIONS HAVE INCREASED ABOVE STANDARDS

Due to the high cost of water treatment, the site team experiments with discontinuing pumping from extraction wells where concentrations have decreased below standards. The RSE team agrees with this approach and suggests discontinuing pumping from additional extraction wells (see Recommendation 6.2.1). If the concentrations increase above standards in an extraction well where pumping was recently discontinued, then the site team should consider restarting pumping from that extraction well (e.g., EX-5I/D based on the Spring 2007 sampling data). Extraction should likely continue for the 6-month period until the next sampling results are available and reevaluated at that time. The cost of treating the water from EX-5I/D for a six month period is approximately $43,000 based on an extraction rate of 100 gpm and a resin usage cost of 0.164 cents per gallon treated.

The site team will then need to decide if pumping should continue until concentrations are consistently below cleanup standards or consistently undetectable. This decision represents a larger issue. The site team will need to determine if P&T operation in general will continue until cleanup standards are uniformly met or until concentrations are undetectable. The decision for operating the system until concentrations are undetectable could extend the life of the remedy by several years.

6.2 RECOMMENDATIONS TO REDUCE COSTS

6.2.1 REVISE EXTRACTION WELL PUMPING

The review of the water levels in Section 4.2.1 suggests that in the absence of pumping, the vertical hydraulic gradient is similar in magnitude to the horizontal hydraulic gradient (0.0016 feet per foot for the vertical gradient compared to 0.0022 to 0.0032 feet per foot for the horizontal gradient). In addition, it is commonly assumed that the horizontal hydraulic conductivity is an order of magnitude higher than the vertical hydraulic conductivity due to layering of sediments and possible lenses of lower permeability material. As a result, under non-pumping conditions, it would take approximately 1,000 feet of horizontal distance for contamination to migrate from the water table to the bottom of the aquifer, which is 100 feet deeper. However, contamination has been present in the MW-2D and ARW-D sampling locations. This is likely the result of regional pumping, and more specifically historic pumping from PSW-8 and remediation pumping from ARW-D. Although these wells extract water from multiple intervals, extraction rates from the lower intervals may be higher than extraction rates in the shallower intervals, which would increase downward ground water flow and downward contaminant transport. Continued pumping from PSW-8 and other deeper wells will only perpetuate this accelerated downward contaminant transport.

Given that contaminant concentrations are generally below cleanup levels in the deep aquifer, with the exception of the ARW-D sampling location and PSW-8 (depending on the PSW-8 interval that provides the majority of the contamination), it is suggested that extraction from EX-1D and EX-2D be discontinued. Discontinuing extraction from EX-4I/D (100 gpm) could also be considered given that the contaminant concentration in this well has been below cleanup standards for four consecutive semi-annual sampling events. The site team may be prefer, however, to continue pumping at this well until contaminant concentrations are undetectable for several consecutive sampling events. Monitoring can continue at these and other downgradient wells, and pumping can be restarted at select deep wells if concentrations increase over two consecutive sampling events. Although PSW-8 may have historically been responsible for pulling contamination downward, the advantages of pumping from PSW-8 until cleanup standards are met would likely outweigh the disadvantages.

Eliminating extraction from EX-1D and EX-2D will decrease the overall system extraction rate by 170 gpm (70 gpm for EX-1D and 100 gpm for EX-2D). These modifications will decrease the system extraction rate from 615 gpm to 445 gpm (or 715 gpm to 545 gpm if EX-5I/D is restarted). Cleanup Status Report Number Seven gives the cost of resin as 0.164 cents per gallon of water treated. At 445 gpm, we estimate an annual resin cost of approximately $384,000 per year. This is an annual savings of approximately $156,000 per year for resin. There would be other minor cost savings associated with decreased electrical usage. When pumping from EX-4I/D is discontinued, resin costs should decrease by another $86,000 per year.

When pumping from both EX-4I/D and EX-5I/D is discontinued, the total system pumping rate will allow the plant to operate one resin train at a time. This will result in a reduction of analytical costs, decrease operator labor, and allow easier scheduling of maintenance and resin change outs.

6.2.2 SUGGESTIONS FOR GROUND WATER MONITORING

The sampling protocol and costs are reasonable given the construction of the monitoring wells and area of the monitoring network relative to the appropriate sampling teams. However, with the decrease in plume extent and concentration, sampling at many monitoring wells could be suspended and sampling from some other locations could be reduced to annual. Sampling at the MW-1, MW-6, MW-16, OB-1, OB-2 and HPMW-6 locations at all depths (16 locations total) could be suspended until confirmation sampling is needed to reach site closure or reduced in frequency to occur along with each Five Year Review. These wells are redundant with other existing wells. In addition, the following monitoring wells have routinely had low or undetectable chromium concentrations and appear to be consistently side gradient of the plume.

- HPMW-9S, MW-4S, MW-5S, MW-7S
- MW-4I, MW-5I, MW-7I, MW-17I, MW-18I
- MW-4D, MW-17D,MW-18D

Based on the above suggestions, the revised ground water monitoring program would be as follows

Annual Sampling			**Semi-Annual Sampling***			
12 Locations			**44 Locations**			
HPMW-9S	MW-4I	MW-4D	MW-2S	MW-2I	MW-2D	EX-2S
MW-4S	MW-5I	MW-17D	MW-8S	MW-8I	MW-3D	EX-3S
MW-5S	MW-7I	MW-18D	MW-9S	MW-9I	MW-5D	EX-4S
MW-7S	MW-17I		MW-11S	MW-11I	MW-7D	EX-5S
	MW-18I		MW-12S	MW-12I	MW-8D	EX-1I
			MW-13S	MW-13I	MW-9D	EX-2I
			MW-14S	MW-14I	MW-11D	EX-3I
			MW-15S	MW-15I	MW-12D	EX-4I/D
			MW-17S	ARW-I	MW-13D	EX-5I/D
			MW-18S		MW-15D	EX-1D
			ARW-S		ARW-D	EX-2D
						EX-3D
						PWS-8

** Sampling at residential wells would also continue on a semi-annual basis*

The above sampling program results in one event with 56 sampling locations and another event with 44 sampling locations in addition to the residential well sampling. This compares to the current program that includes two events, each with over 70 non-residential sampling locations. This RSE team estimates that these reductions should yield approximately $25,000 in savings. This estimate is based on reducing the number of "man/crew-days" from 12 to nine for one event and from 12 to seven for the other event and assuming a man/crew day costs approximately $3,200 for the site contractor, per diem, equipment, and subcontractor.

6.2.3 REDUCTIONS IN PROJECT MANAGEMENT CONSISTENT WITH STEADY STATE SYSTEM OPERATION

The total contractor project management and technical support costs at $142,000 per year for this site are higher than the typical Fund-lead P&T site, but additional attention is merited given that the system provides potable water to the city. Labor rates and level of effort were not provided by the site team for this cost category, but the following table provides the RSE team's estimate for level of effort per quarter and typical unit rates to accomplish the project management and technical support scope of work that the site team presented.

Item per Quarter	Units	# of Units	Unit Cost	Cost per Quarter
project management (senior)	hrs	12	$150	$1,800
project management (support)	hrs	52	$75	$3,900
on-demand engineering support	hrs	52	$150	$7,800
quarterly audit with memo	hrs	50	$150	$7,500
travel costs to site (excluding labor)	visit	2	$500	$1,000
meeting	job	0.5	$4,000	$2,000
non-routine support budget	hrs	20	$150	$3,000
				$27,000

Note: 0.5 meetings per quarter represents an average of two meetings per year. Cost assumes two staff for one full day meeting near office plus a half day of preparation.

Applying this average quarterly cost over the course of the year would yield $108,000, representing a $34,000 difference between the RSE team's cost estimate and the project team's costs. As technical issues arise, the site team might be able to more cost-effectively address items by using its vendors (or even competing vendors) as technical resources. For issues related to some specific system components, the site team might also identify local resources that could provide support and help reduce the level of effort by the senior site engineer. It is noted that these resources would not completely replace the role of the senior engineer but could help reduce the time commitment and cost of the senior engineer when addressing some technical issues. In addition, given that system O&M is becoming more routine, an effective audit of the system by the engineer who designed it, has provided technical support for several years, and is also responsible for ongoing management could be done for less, especially if less formal reporting is used. It may be more appropriate to use less formal memos to document the findings for each audit and then summarize the audit findings and resolved issues in a report on an annual basis. Therefore, a cost of approximately $108,000 may be more appropriate for project management technical assistance at this site.

6.3 RECOMMENDATIONS FOR TECHNICAL IMPROVEMENT

6.3.1 CONTINUE RE-USING ON-SITE EQUIPMENT RATHER THAN PURCHASE NEW EQUIPMENT

The remedy will likely achieve its goals in a timely manner. As such, new equipment should not be purchased if a viable substitute is already available at the site. Primary examples include the controls, valves, and pumps associated with each extraction well. As extraction wells are shut down, these parts can be used to replace similar parts from other extraction wells when they fail as has been the practice of the site team.

6.3.2 PREPARE MAP ILLUSTRATING RESULTS OF SOIL EXCAVATIONS

Based on discussions during the site visit, it appears that a comprehensive map of the soil investigations and excavations have not been prepared. Such a map would be helpful, especially given the stated concern of potential for remaining soil contamination to leach to ground water. It may also be helpful if the activities described in Recommendation 6.4.1 are implemented. Preparation of this map will required review previous records and analytical results for both chromium and lead. The RSE team estimates that the map could be produced for $7,500.

6.4 CONSIDERATIONS FOR GAINING SITE CLOSE OUT

6.4.1 POSSIBLE APPROACH TO EVALUATING AND ADDRESSING REMAINING SOIL CONTAMINATION THAT MAY SERVE AS A CONTINUING SOURCE OF GROUND WATER CONTAMINATION

The cause of the initial increase and then decrease in the ARW sampling locations is not certain. Reasonable suggestions are that it 1) represents the redistribution of existing ground water contamination under a new pumping regime (i.e., the start-up of the P&T system) or 2) represents contaminant mass that leached from the soil to the ground water and then migrated to the ARW location. If the first case is true, then concentrations will likely decrease over time, and MCLs will likely be achieved in a timely manner (e.g., five to 10 years). However, if the second case is true and soil contamination remains in sufficient magnitude, then contamination will continue to leach from the soil, causing continued ground water contamination and delaying the achievement of MCLs. Higher than average rainfall over time or future construction at the site might mobilize this contamination.

Continued decreases in the ARW sampling locations since April 2005 suggest that residual soil contamination is not contributing significantly to ground water contamination, and it is noted that 2003, 2004, 2005, and 2006 were either near normal or above normal for precipitation in Kansas according to the National Climatic Data Center. These relatively short term data are not conclusive, but given the trend, the RSE team would suggest revised pumping as per Recommendation 6.2.1 and continued monitoring of the ARW locations unless or until concentrations in the ARW locations increase again. If concentrations continue with the current trend, then aquifer restoration will likely be timely. If concentrations increase, then it suggests that soil is continuing to contribute to ground water contamination.

It is recognized that at the end of LTRA in 2013 that the State will inherit this site and that the State would like some assurance that soil will not cause continuing ground water contamination and prolong the remedy. If the site team agrees that it is worth further investigation and potential remediation of the soil, the RSE team agrees that soil flushing with some of the treated water would be the most appropriate remedy. However, the RSE team strongly suggests that capture in the immediate area of the soil flushing be improved, if flushing is implemented. Currently, flushed contamination (if any) would need to migrate over 1,000 feet downgradient and over 40 feet down to be extracted by EX-1I. This migration would take approximately 3 years or more and require a higher extraction rate than more localized capture. A cost effective approach to this initial investigation of the soil and improving localized capture would be to install a shallow extraction well in the middle of what is expected to be the most contaminated area. It was suggested to the RSE team that this area was beneath the northeast corner of the treatment plant. During well installation, soil samples could be collected every 5 feet to determine the vertical profile of chromium and lead soil contamination in this one area, and a ground water sample could be collected from the new well. The well should be constructed in the shallow zone but should likely include a "sump" below the screen to allow the pump to continue operating at relatively low water levels in the well. If substantial contamination is observed throughout the profile, and the site team is collectively concerned about future leaching of this contamination, then modeling with software such as CHEMFLO or VLEACH could be conducted to help determine if flushing is appropriate.

If the site team determines that flushing is appropriate, capital costs would likely be relatively substantial. Additional vertical profiling would likely be merited so that the soil flushing remedy would address the whole extent of the problem rather than one focused area. The RSE team estimates that five additional profiling locations might be appropriate in areas of expected high soil contamination. Permanent monitoring wells would be installed in each of these locations to assist with monitoring the flushing. In addition, injection points would also be installed for the flushing. The injection points should be sufficiently deep to avoid compromising the integrity of the treatment plant foundation, and the plan should be reviewed by a qualified geotechnical engineer. The estimated extraction rate from the new, shallow extraction well would be approximately 25 gpm, and the reinjection rate should be about half of this (e.g., less than 12.5 gpm). The number and spacing of the reinjection wells would depend on the depth of the contamination to be flushed and characteristics of the subsurface. For the purposes of this exercise, the RSE team would assume 10 injection points to a depth of 25 feet each. The extracted water from the new well would likely need to be piped to the GAC treatment facility before being treated at the treatment plant.

The RSE team estimates that the initial vertical profiling from one location, well construction (no pump or controls at the investigation stage), associated ground water sampling, and soil leaching modeling would cost approximately $55,000, including work plans and contractor oversight. If the site team decides to move ahead with additional profiling and soil flushing according to the above scope of work, the RSE team estimates that additional capital costs would be on the order of $300,000. Operating the soil flushing remedy for two years may add an additional $100,000 (i.e., $50,000 per year) for increased resin usage, technical support, monitoring, and reporting. The RSE team will defer to the site team to determine if it is appropriate to make this capital investment or to continue operating the P&T system and monitoring for potential increases at the ARW well.

7.0 SUMMARY

The observations and recommendations contained in this report are not intended to imply a deficiency in the work of either the system designers or operators, but are offered as constructive suggestions in the best interest of the EPA and the public. These recommendations have the benefit of being formulated based upon operational data unavailable to the original designers.

Recommendations are provided in all four categories: effectiveness, cost reduction, technical improvement, and gaining site closure. The effectiveness recommendations include modifying the capture zone analysis and to resume pumping in extraction wells where concentrations have increased above cleanup standards. The recommendations for cost reduction offer potential cost savings of over $302,000 per year. Recommendations include changes to ground water extraction well pumping rates, which will decrease resin usage. The recommendations also include suggested changes to the ground water monitoring program and a reevaluation of project management costs and reporting frequency. The recommendations for technical improvement include continuing to reuse parts from on-site rather than purchasing new parts and preparing a map to summarize the previous soil excavations. The site closure recommendation provides considerations for soil investigation and soil flushing if the site team determines that this is appropriate given the eventual transfer of the site from EPA to the State.

Table 7-1 summarizes the costs and cost savings associated with each recommendation. Capital costs, the change in annual costs, and the change in life-cycle costs are presented for each recommendation.

Table 7-1. Cost Summary Table

Recommendation	Reason	Additional Capital Costs ($)	Estimated Change in Annual Costs ($/yr)	Estimated Change in Life-Cycle Costs $*	Estimated Change in Life-Cycle Costs (net present value) $**
6.1.1 Modify Methods of Evaluating Capture Zone	Effectiveness	$0	$0	$0	$0
6.1.2 Re-Start Pumping at Extraction Wells where Concentrations Have Increased above Standards	Effectiveness	$0	$43,000	$0	$0
6.2.1 Evaluate Extraction Pumping	Cost Reduction	$0	($156,000)	($780,000)	($710,000)
6.2.2 Suggestions for Ground Water Monitoring	Cost Reduction	$0	($25,000)	($125,000)	($114,000)
6.2.3 Reductions in Project Management Costs	Cost Reduction	$0	($34,000)	($170,000)	($156,000)
6.3.1 Continue Re-Using On-Site Equipment Rather than Purchase New Equipment	Technical Improvement	Not Estimated	Not Estimated	Not Estimated	Not Estimated
6.3.2 Prepared Map Illustrating Results of Soil Excavations	Technical Improvement	$7,500	$0	$7,500	$7,500
6.4 Consideration for Gaining Site Closure	Gaining Site Closure	$55,000 To $400,000	$0	$55,000 To $400,000	$55,000 To $400,000

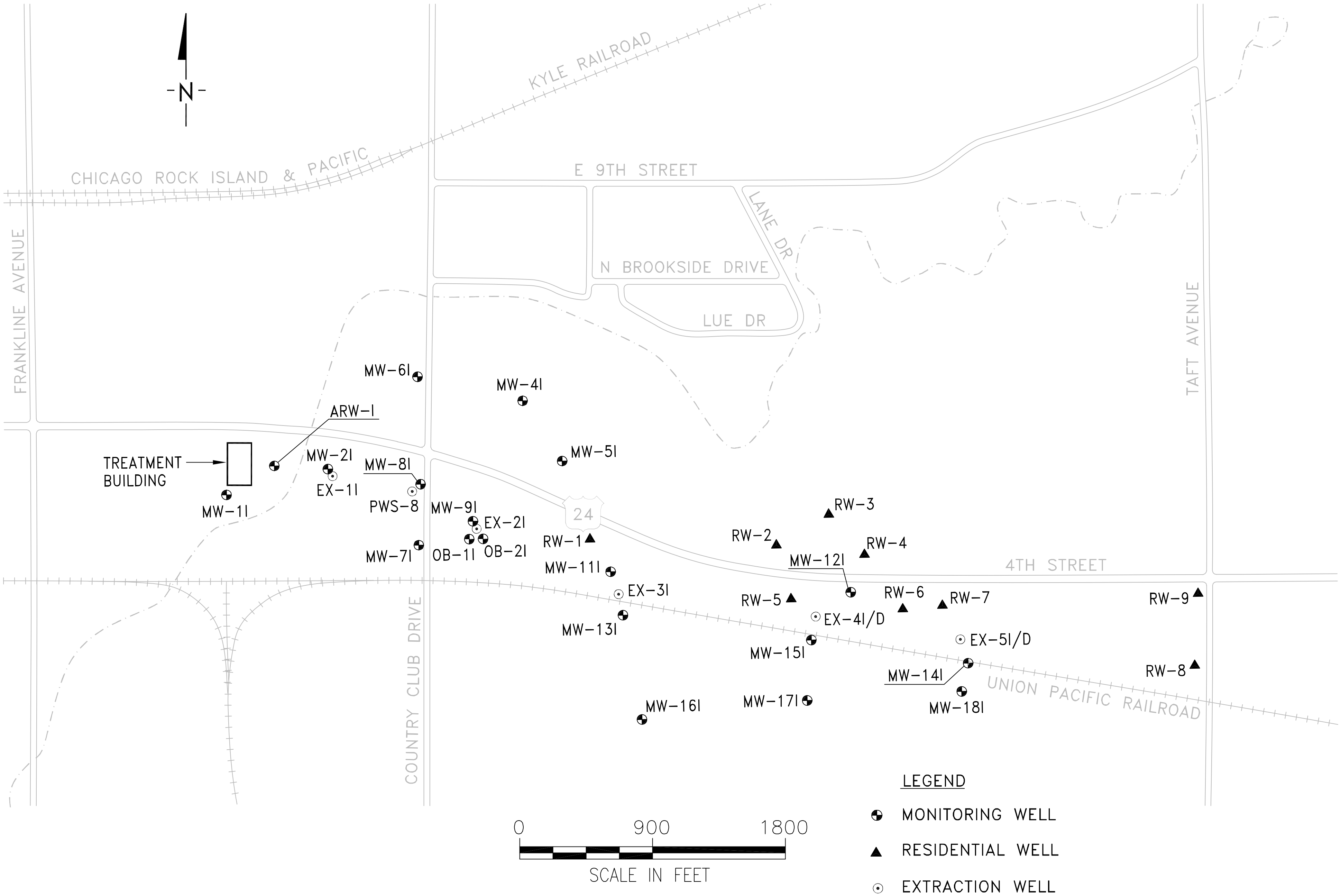
Costs in parentheses imply cost reductions
* assumes 5 years of operation with a discount rate of 0% (i.e., no discounting)
** assumes 5 years of operation with a discount rate of 5% and no discounting in the first year

FIGURES

APPENDIX
REPORT COMMENTS AND RESPONSES

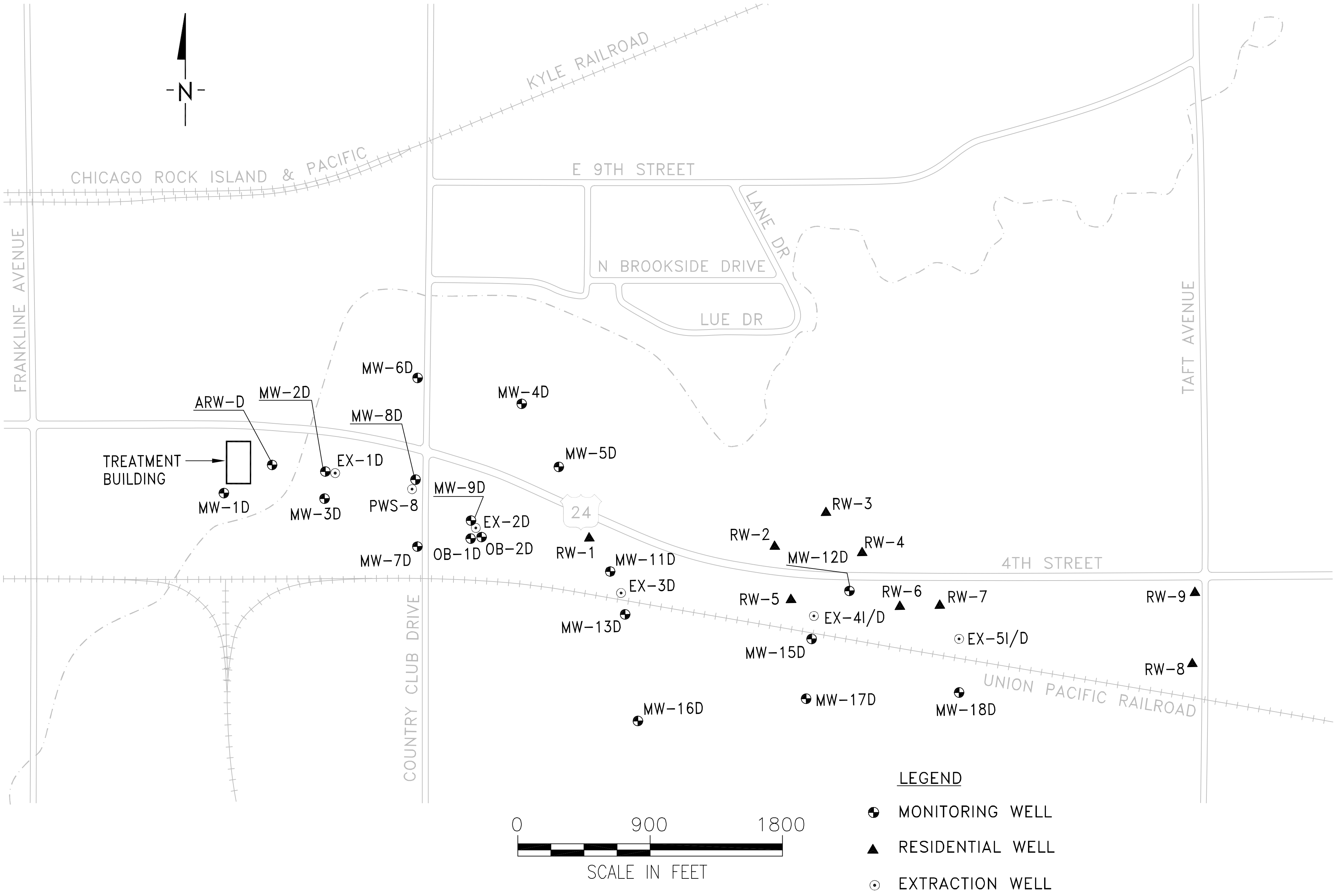
- EPA Region 7 Comments to Draft RSE Report, July 25, 2007
- KDPH Comments to Draft RSE Report, June 25, 2007
- RSE Team Response to Comments, August 31, 2007
- EPA Region 7 Email Response, September 10, 2007

FIGURE 1-2. LOCATION OF INTERMEDAITE MONITORING WELLS.



(Note: Reproduced from Long Term Response Action Cleanup Status Report Number 7, Black & Veatch, 2006.)

FIGURE 1-3. LOCATION OF DEEP MONITORING WELLS.



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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VII
901 NORTH 5TH STREET
KANSAS CITY, KANSAS 66101

JUL 2 5 2007

MEMORANDUM

TO: Charles Sands, EPA Headquarters, OSWER/OSRTI

THRU: Glenn Curtis, Branch Chief, EPA Region 7, SUPR/IANE

FROM: Robert Weber, Remedial Project Manager, EPA Region 7, SUPR/IANE

SUBJECT: Draft Remediation System Evaluation,
Ace Services Superfund Site, Colby, Kansas

The U.S. Environmental Protection Agency (EPA), Region 7 received a copy of the above-referenced document via e-mail on June 15, 2007, from GeoTrans, Inc., EPA Headquarters contractor. EPA Region 7 appreciates the opportunity to participate in this remedy optimization study and looks forward to the final document incorporating the comments provided below. Additionally, a comment provided via e-mail by Glynis Hill of EPA Headquarters is attached to this memorandum.

General Comments

For background and clarification, it should be noted that the aquifer being remediated for dissolved chromium contamination by the Ace Services Groundwater Treatment System under EPA Long-Term Remedial Action is a sole source aquifer that supplies drinking water to the region. Treated groundwater from the Ace Services remediation system is beneficially reused by the city of Colby, Kansas public water supply system. In 2006, the groundwater treatment system satisfied 51 percent of the demand for potable water to the city of Colby.

For further background and clarification, a nearby leaking petroleum underground storage tank site, the Hi-Plains Co-Op, impacts the Ace Services site with petroleum compounds including 1,2-dichloroethane. Groundwater extracted by the Ace Services system is pumped east to a Kansas Department of Health and Environment (KDHE) Petroleum Storage Tank Release Trust Fund site, Granular Activated Carbon (GAC) treatment system. The GAC system is a petroleum-compounds pretreatment system that operates on the water pressure provided by the Ace Services system. Treated water from the GAC system is then pumped west to the Ace Services system for chromium treatment. The Ace Services system operators monitor the GAC system through sample log sheets and by observing electronic critical flow and pressure data for the GAC system. Effects from the GAC system on the Ace Services system have been noted in additional pumping head pressure and additional loading of carbon fines in bag filters.

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4. Page 17, Section 6.1.1. Water levels measured in active pumping wells will be corrected for well efficiency to allow use in constructing groundwater contours of the site. It is agreed that calculated water flow, evaluation of contaminant trends, and groundwater modeling results indicate adequate capture of the plume. In addition, to well PSW-8 and well cluster MW-8, the site team has been, and will continue to monitor and evaluate concentrations in all wells and make system adjustments to optimize remedial action efforts. This has been evident in recent and historical adjustments to the system.

5. Page 18, Section 6.1.2. Extraction well EX-5-I/D will be returned to service at 100 gallons per minute given that the recent sample data, collected in April 2007, collected at the time the RSE field visit was being conducted (April 2007), indicates rebound of hexavalent chromium in Well EX-5-I/D to a concentration above the cleanup goal.

6. Page 18, Section 6.2.1.

    a) Pumping should be discontinued, for the time being, at wells EX-1-D and EX-2-D. However, pumping should continue at well EX-4-I/D to continue plume capture from the intermediate zone in the area of the well. Contaminants are still being detected in the intermediate zone in this area. Although detected concentrations of hexavalent chromium are below the cleanup goal, it is unlikely that the monitoring wells are located in the area that is the most contaminated.

    b) By including flow from wells EX-4-I/D and EX-5-I/D, the total influent would be 545 gallons per minute which exceeds the maximum influent rate for one treatment train. Future consideration for operating one treatment train will be given as the total influent rate allows.

7. Page 19, Section 6.2.2. A more appropriate approach to developing an optimized monitoring plan will be to use a statistical software program in conjunction with best-professional-judgment at the site. The use of Monitoring and Remediation Optimization System (MAROS) will be beneficial in evaluating future monitoring locations. Further information on the MAROS software can be found at www.clu-in.org. Results of the monitoring optimization evaluation are presented in a technical memorandum dated June 29, 2007 attached to this letter.

8. Page 20, Section 6.2.3.

a) It is stated that the total contractor project management and support costs for this site are higher than the typical fund-lead pump and treat site. It was recognized in the draft RSE that this system supplies potable water. How many of the other pump-and-treat systems used for comparison offered a potable water supply component where almost 100 percent of the treated water was supplied to a municipality in the quantities that the Ace Service treatment system provides? Were their costs similar in scope based on the type and concentrations of contaminants and quantities of water treated? Were these systems located in rural areas or highly populated metropolitan areas?

b) It is stated that to reduce the project management costs, as technical issues arise, vendors should be worked with more closely and local expertise should be relied on instead of a "high-level" design engineer. These specific suggestions present some concern. Vendors may not necessarily have the best interest of the site in mind when providing suggestions for replacement or repair of components. Local expertise is limited in the rural area of western Kansas given that very few pump-and-treat systems are operated in the immediate area. The term "high-level" for design engineer may not be an appropriate term. EPA's contractors perform quality work at negotiated prices under the oversight of EPA personnel.

In 2005, the system experienced poor resin quality from a vendor which allowed a pH shift and resulted in "fizzing water" at the taps of potable water recipients. Much effort went into review and diagnosis of the issue. The vendors of the resin did not notify the site team of the change in the resin's source until after the problems occurred and then attempted to place the failure of the resin on the system and operators. The design engineer diagnosed the problem immediately (poor quality resin) and provided valuable assistance in rectifying the problem. This is one site-specific example where relying solely on vendors for technical trouble shooting may not be in the best interest of a system that provides potable water to the public.

Region 7 will continue to use the level of project management necessary to ensure that the treatment system is well-operated and managed both efficiently and cost-effectively. However, relying on vendors and local expertise does not appear to be an option at this time.

c) The level of detail in the audit reports is appropriate for the site. At this time, no change is planned in the reporting formats. However, consideration will be made whether or not to consolidate the LTRA Cleanup status report and audit reports into an annual document with periodic technical memorandums reporting audit and sampling results. The audit period was recently changed from quarterly to semi-annually. However, if significant LTRA treatment system concerns are presented in the next or subsequent audit periods, the frequency of audits and status reports may be increased.

9. Page 20, Section 6.3.1. The practice of salvaging unused on-site equipment when maintaining operating equipment has always been implemented - especially concerning extraction wells. Where extraction wells have been shut down, parts have been used from the inactive wells to repair the remaining active wells.

10. Page 20, Section 6.3.2. A site map showing soil concentrations and excavation locations to assist in the evaluation of groundwater treatment system performance will be prepared.

11. Page 21, Section 6.4.1. It is stated that "Continued decrease in the ARW sampling locations since April 2005 suggest that residual soil contamination is not contributing significantly to groundwater contamination, and it is noted that 2003, 2004, 2005, and 2006 were either near normal or above normal for precipitation in Kansas according to the National Climatic Data Center. These relatively short term data are not conclusive, but given the trend, the RSE would suggest revised pumping as per Recommendation 6.2.1 and continued monitoring of ARW locations unless or until concentrations in the ARW increase again. If concentrations continue with the current trend, then aquifer restoration will likely be timely. If concentrations increase, then it suggests that soil in continuing to contribute to groundwater contamination."

    Based on EPA Region 7 knowledge of the site and RSE Recommendation 6.3.2 and 6.4.1, the following approach will be considered. The timing of this approach will depend on site-specific data and available funding for any additional activities.

    Phase 1

    a) Prepare a map to show existing soil concentrations and excavation locations in relation to existing site structures per RSE Recommendation 6.3.2.

    b) Monitor groundwater data to determine if increasing or decreasing trends are occurring - especially in relation to the ARW wells.

    c) Proceed to Phase 2 if it is determined that additional characterization is required based on the soil concentrations map and ongoing groundwater data collection.

    Phase 2

    a) Collect additional soil data to determine the remaining nature and extent of soil contamination, if any. Vertical profiling (samples every five feet) from one location with installation of a single well (no pump or controls at the investigation stage), associated groundwater sampling, and soil leaching modeling will be conducted.

    b) Evaluate the data to determine if a soil source remains and if it will adversely affect groundwater in the future.

    c) If it is determined that a soil source either does not remain or will not adversely affect groundwater in the future, no additional activities will be necessary. However, if it is determined that a soil source remains and that it will adversely affect groundwater, additional investigation and remediation as generally outlined in Phase 3 may be considered.

Phase 3

a) Conduct additional vertical profiling to further define the extent of the soil source area. Approximately 5 soil borings converted to permanent monitoring wells may be installed.

b) Install a treated-water soil-flushing infiltration gallery (approximately 10 injection points to an approximate depth of 25 feet below ground surface) with a potential design capacity of up to 12.5 gallons per minute.

c) Modify the existing treatment system to facilitate treated water injection, a single shallow extraction well (approximately 25 gallons per minute), and additional water transmission piping leading to the KDHE GAC facility and associated manual and electronic controls.

d) Operation and maintain the soil flushing and extraction component for approximately two years in conjunction with existing LTRA activities.

12. In summary, the Ace Services LTRA groundwater treatment system, as it currently operates without any additional modifications, is protective of human health and the environment. Groundwater hexavalent chromium concentrations are declining. The overall mass of hexavalent chromium in groundwater from the site continues to reduce. The system has removed over one ton of chromium from the aquifer and provides 51 percent of the annual demand for water to the city of Colby public water supply system.

Of the $302,000 identified in cost savings in the draft RSE, $243,000 is for resin annually. The site team continues its ongoing system optimization and prior to the RSE reduced pumping to effectively eliminate one resin change out per year. The remaining costs savings in the draft RSE are identified as project management ($34,000 annually), and reduced sampling ($25,000 annually). Project management savings will be realized to the extent possible as the system continues its successful performance. However, utilizing vendors and local support as mentioned earlier, does not appear to be an appropriate option at this time. A technical memorandum is attached that outlines the planned reduced sampling protocol through April 2009.

In the absence of any additional site work, the Ace Services LTRA is currently on track to meet the remedial action objectives (RAOs) for the site within an approximate 10-year time period. In 2013 at the end of the LTRA period and if RAOs are not met, the State of Kansas will acquire the system for continued operation and maintenance. Concerns from KDHE regarding acquisition of the site after the 10-year LTRA period have renewed interest in the potential soil source materials remaining onsite.

cc: Glynis Hill, EPA Headquarters, OSWER/OSRTI
Daniel Pope, Dynamac
Douglas Sutton, GeoTrans
Ashley Allen, KDHE/BER
Gary Felkner, BVSPC

KANSAS

DEPARTMENT OF HEALTH
AND ENVIRONMENT
Division of Environment

Kathleen Sebelius, Governor
Roderick L. Bremby, Secretary

www.kdheks.gov

June 25, 2007

RECEIVED
JUN 2 C 2007
SUPERFUND DIVISION

Mr. Rob Weber
EPA Region 7
SUPR/IANE
901 North 5th Street
Kansas City, Kansas 66101

SUBJECT: Draft Remedial System Evaluation, Ace Services Superfund Site, Colby, Kansas, dated June 15, 2007

Dear Mr. Weber:

The Kansas Department of Health and Environment/Bureau of Environmental Remediation (KDHE/BER) has reviewed the subject document prepared by GeoTrans, Inc. for the U.S. Environmental Protection Agency (EPA), received via e-mail on June 15, 2007. Based on our review of the document, we have not generated any comments. KDHE/BER looks forward to working EPA on implementing the recommendations provided in the document.

If you have any questions, please call me at (785) 291-3089.

Sincerely,

Ashley Allen, LG
Professional Geologist
Superfund Unit/Assessment and Restoration Section

cc: Fred Molloy → Leo Henning → C6 097 00001-1 (Ace Services)
Bill Heimann, KDHE/NWDO

BUREAU OF ENVIRONMENTAL REMEDIATION
CURTIS STATE OFFICE BUILDING, 1000 SW JACKSON ST., STE. 410, TOPEKA, KS 66612-1367
Voice 785-291-3089 Fax 785-296-4823 E-Mail: aallen@kdhe.state.ks.us

MEMORANDUM

TO: Chuck Sands, EPA OSRTI
Glynnis Hill, EPA OSRTI
Robert Weber, EPA Region 7

FROM: Doug Sutton, GeoTrans, Inc. (RSE team coordinator)

SUBJECT: Response to Comments on the Draft Remediation System Evaluation, Ace Services Superfund Site, Colby, Kansas

DATE: August 31, 2007

The Remediation System Evaluation (RSE) team has reviewed comments provided by the EPA Office of Superfund Remediation and Technology Innovation (OSRTI) and EPA Region 7. The Kansas Department of Health and Environment (KDHE) forwarded a letter acknowledging the draft report and generally supporting the report content. KDHE did not provide any specific comments.

We appreciate the communication provided by the reviewers. We have provided responses to each of the comments provided and have revised the RSE report accordingly.

Comments Provided by EPA OSRTI

1. Please address the in the RSE report the lead soil contamination that was discussed during the RSE site visit.

   Response: Recommendations 6.3.2 and 6.4.1 of the RSE report were intended to address both lead and chromium soil contamination. Given that the site has been covered and direct exposure pathways have been eliminated or can be controlled by institutional controls at the property, the remaining concern regarding soil contamination is the potential for it to act as a continuing source of ground water contamination. As indicated by the ground water data, chromium is the predominant concern regarding leaching from soil to ground water. Nevertheless, Recommendation 6.3.2 has been updated to include mapping of both chromium and lead, and Recommendation 6.4.1 has been updated to include sampling of both chromium and lead.

Comments Provided by EPA Region 7

EPA Region 7 comments were provided in hard copy format and are included as an attachment to this response to comments memorandum. A response to each comment is provided below. The number of the response corresponds to the comment number in the attachment.

Response to General Comment: The information contained in the general comment has been added to the introduction section and component performance section of the RSE report and has been summarized in the executive summary of the RSE report.

1. As requested, the executive summary has been modified to reflect other modifications to the report that have been made in response to the other comments.

2. The report has been modified accordingly.

3. No response required.

4. No response required.

5. Restarting EX-5I/D is consistent with Recommendation 6.1.2. It has been general practice for the RSE reports to reflect site activities at the time of the RSE site visit. Therefore, the RSE report has not been modified. Restarting of the EX-5I/D can be positively reflected in the annual RSE follow-up process to document that the RSE Recommendation has been implemented.

6a. The preference to operate EX-4I/D until concentrations are "non-detect" for several quarters is acknowledged. However, we note that this appears to be a different practice than was applied at EX-5I/D, where pumping was discontinued despite detectable chromium concentrations. The report has been modified to reflect a preference to continue operating EX-4I/D until concentrations are undetectable. However, the RSE team notes that the site team will need to decide what standard they are working towards? If pumping at EX-4I/D will continue until concentrations are undetectable, does this imply that the site team will continue operating the P&T system in general until concentrations are uniformly undetectable? If the site team works toward undetectable concentrations, the life of the remedy may be extended by several years despite meeting the goals stated in the Record of Decision.

6b. The text has been modified to be consistent with our response to comment 6a.

7. The MAROS analysis provided relatively similar results in terms of the number of samples collected during semi-annual and annual sampling events. Excluding residential well sampling, the RSE report suggests that 44 wells be sampled semi-annually, and an additional 12 wells be sampled annually. Twelve wells are selected for less frequent sampling. Excluding residential well sampling, the MAROS analysis suggests 20 wells be sampled semi-annually and an additional 38 wells be sampled annually. Fourteen wells were selected for less frequent sampling. The RSE recommendation for semi-annual sampling includes the same

20 wells as the MAROS semi-annual sampling but includes an additional 18 wells that the MAROS recommendation suggests for annual or less frequent monitoring. There are at least two examples of where the RSE team would choose semi-annual sampling where the MAROS analysis suggested annual sampling. MAROS suggested MW-18S and MW-15S for annual sampling, and the RSE team suggested continuing semi-annual sampling at these two locations. MW-18S is located on the downgradient plume fringe and has concentrations that border detectable and undetectable values. This well could serve as a valuable downgradient performance monitoring well to evaluate capture, especially if the site team is considering temporarily discontinuing pumping at some extraction wells. MAROS does not have the capacity to determine the value of such downgradient performance monitoring wells or the potential changes that may occur with changes in pumping rates. MW-15S is one of the few wells with recent concentrations above cleanup standards, and given the expected relatively short timeframe for this remedy, the site may prefer more frequent updates (semi-annual rather than annual) regarding concentrations in this well to document its status with respect to cleanup. The RSE team will maintain its recommended sampling program, which appears more conservative than the MAROS recommended sampling program. The MAROS evaluation and the site team's ultimate decision on a revised monitoring program can be positively noted during the annual RSE follow-up process. We note that one well (MW-16D) was erroneously included in our table for semi-annual sampling. This has been removed, reducing the number of semi-annual samples from 45 (as stated in the draft report) to 44 as stated above.

8a. To date, none of the other P&T systems that have been reviewed by the RSE team provide potable water to municipalities at a magnitude of that at the Ace Services site, but the other P&T systems have varied substantially in terms of contaminants treated, volume treated, and location. In our experience, the factors that generally lead to increased project management are complicated treatment processes that involve many vendors and subcontractors to maintain operations, poorly designed systems that require substantial modifications or attention during operation, old systems (10+ years old) that require substantial repairs, systems where there are frequent meetings to address community or political concerns, and systems that are being managed alongside several other site activities. The Ace Services site is unique. The system is relatively new and appears well designed such that day to day operations are generally straightforward. The flow rate treated is relatively high, but the treatment train is relatively simple. The community appears very supportive of the remedy and the water it provides. There are very few other activities at the site other than P&T operation and routine ground water monitoring. All of these factors would generally lead to lower than average project management and engineering support costs. One factor that contributes to increased project management costs is the distance of the site from the site contractor's office, which increases time and cost for engineering audits and site meetings. We included what we believe is a reasonable scope/cost for project management and technical support for this site based on what we learned during the document review and site visit. Additional services/items that are provided but not included in this scope would contribute to higher costs.

8b. The report text was not intended to suggest that vendors and local expertise should be “solely” relied on. Rather, it was intended to suggest that they can be valuable resources that can provide use information and analysis as part of the product they sell. Involvement by the site engineer is still needed to request the correct analysis and ensure that the interests of EPA and the public are represented. The example provided in the comment is noted. The RSE report has been modified to more clearly state this intent. The RSE team encourages the site team to use vendors as valuable sources of information, and supports the Region’s objection to relying solely on them.

8c. The comment is noted. The RSE team stands by its suggestion that the report format can be simplified, but understands the site team’s preference to maintain the current format. The RSE report has not been modified with respect to this comment. The Region’s decision on how to address this recommendation can be positively noted during the annual RSE follow-up process.

9. The RSE report has been modified to include “as has been the practice at the site.”

10. No response required.

11. The process suggested in the comment is consistent with the RSE recommendation and no modifications will be made to the report.

12. Please refer to the above responses.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VII
901 NORTH 5TH STREET
KANSAS CITY, KANSAS 66101

JUL 25 2007

MEMORANDUM

TO: Charles Sands, EPA Headquarters, OSWER/OSRTI

THRU: Glenn Curtis, Branch Chief, EPA Region 7, SUPR/IANE

FROM: Robert Weber, Remedial Project Manager, EPA Region 7, SUPR/IANE

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Region 7 will continue to use the level of project management necessary to ensure that the treatment system is well-operated and managed both efficiently and cost-effectively. However, relying on vendors and local expertise does not appear to be an option at this time.

c) The level of detail in the audit reports is appropriate for the site. At this time, no change is planned in the reporting formats. However, consideration will be made whether or not to consolidate the LTRA Cleanup status report and audit reports into an annual document with periodic technical memorandums reporting audit and sampling results. The audit period was recently changed from quarterly to semi-annually. However, if significant LTRA treatment system concerns are presented in the next or subsequent audit periods, the frequency of audits and status reports may be increased.

9. Page 20, Section 6.3.1. The practice of salvaging unused on-site equipment when maintaining operating equipment has always been implemented - especially concerning extraction wells. Where extraction wells have been shut down, parts have been used from the inactive wells to repair the remaining active wells.

10. Page 20, Section 6.3.2. A site map showing soil concentrations and excavation locations to assist in the evaluation of groundwater treatment system performance will be prepared.

11. Page 21, Section 6.4.1. It is stated that "Continued decrease in the ARW sampling locations since April 2005 suggest that residual soil contamination is not contributing significantly to groundwater contamination, and it is noted that 2003, 2004, 2005, and 2006 were either near normal or above normal for precipitation in Kansas according to the National Climatic Data Center. These relatively short term data are not conclusive, but given the trend, the RSE would suggest revised pumping as per Recommendation 6.2.1 and continued monitoring of ARW locations unless or until concentrations in the ARW increase again. If concentrations continue with the current trend, then aquifer restoration will likely be timely. If concentrations increase, then it suggests that soil in continuing to contribute to groundwater contamination."

    Based on EPA Region 7 knowledge of the site and RSE Recommendation 6.3.2 and 6.4.1, the following approach will be considered. The timing of this approach will depend on site-specific data and available funding for any additional activities.

    <u>Phase 1</u>

    a) Prepare a map to show existing soil concentrations and excavation locations in relation to existing site structures per RSE Recommendation 6.3.2.

    b) Monitor groundwater data to determine if increasing or decreasing trends are occurring - especially in relation to the ARW wells.

    c) Proceed to Phase 2 if it is determined that additional characterization is required based on the soil concentrations map and ongoing groundwater data collection.

    <u>Phase 2</u>

    a) Collect additional soil data to determine the remaining nature and extent of soil contamination, if any. Vertical profiling (samples every five feet) from one location with installation of a single well (no pump or controls at the investigation stage), associated groundwater sampling, and soil leaching modeling will be conducted.

    b) Evaluate the data to determine if a soil source remains and if it will adversely affect groundwater in the future.

    c) If it is determined that a soil source either does not remain or will not adversely affect groundwater in the future, no additional activities will be necessary. However, if it is determined that a soil source remains and that it will adversely affect groundwater, additional investigation and remediation as generally outlined in Phase 3 may be considered.

Phase 3

a) Conduct additional vertical profiling to further define the extent of the soil source area. Approximately 5 soil borings converted to permanent monitoring wells may be installed.

b) Install a treated-water soil-flushing infiltration gallery (approximately 10 injection points to an approximate depth of 25 feet below ground surface) with a potential design capacity of up to 12.5 gallons per minute.

c) Modify the existing treatment system to facilitate treated water injection, a single shallow extraction well (approximately 25 gallons per minute), and additional water transmission piping leading to the KDHE GAC facility and associated manual and electronic controls.

d) Operation and maintain the soil flushing and extraction component for approximately two years in conjunction with existing LTRA activities.

12. In summary, the Ace Services LTRA groundwater treatment system, as it currently operates without any additional modifications, is protective of human health and the environment. Groundwater hexavalent chromium concentrations are declining. The overall mass of hexavalent chromium in groundwater from the site continues to reduce. The system has removed over one ton of chromium from the aquifer and provides 51 percent of the annual demand for water to the city of Colby public water supply system.

Of the $302,000 identified in cost savings in the draft RSE, $243,000 is for resin annually. The site team continues its ongoing system optimization and prior to the RSE reduced pumping to effectively eliminate one resin change out per year. The remaining costs savings in the draft RSE are identified as project management ($34,000 annually), and reduced sampling ($25,000 annually). Project management savings will be realized to the extent possible as the system continues its successful performance. However, utilizing vendors and local support as mentioned earlier, does not appear to be an appropriate option at this time. A technical memorandum is attached that outlines the planned reduced sampling protocol through April 2009.

In the absence of any additional site work, the Ace Services LTRA is currently on track to meet the remedial action objectives (RAOs) for the site within an approximate 10-year time period. In 2013 at the end of the LTRA period and if RAOs are not met, the State of Kansas will acquire the system for continued operation and maintenance. Concerns from KDHE regarding acquisition of the site after the 10-year LTRA period have renewed interest in the potential soil source materials remaining onsite.

cc: Glynis Hill, EPA Headquarters, OSWER/OSRTI
Daniel Pope, Dynamac
Douglas Sutton, GeoTrans
Ashley Allen, KDHE/BER
Gary Felkner, BVSPC

From: "Pope, Dan" <DPope@dynamac.com>
To: Doug Sutton
Date: Monday - September 10, 2007
Subject: FW: Revised Ace Services RSE and Response To Comments

FYI.............

From: Weber.Robert@epamail.epa.gov [mailto:Weber.Robert@epamail.epa.gov]

Sent: Monday, September 10, 2007 12:13 PM
To: Pope, Dan
Cc: sands.charles@epa.gov; Hovis.Jennifer@epamail.epa.gov; Hill.Glynis@epamail.epa.gov; aallen@kdhe.state.ks.us
Subject: Re: Revised Ace Services RSE and Response To Comments

Dan,

Regarding comment nos. 6A and 6B, I'm not sure how the interpretation was drawn of a preference by the site team for a "non-detect" cleanup goal from the original comment provided by EPA Region 7 (comment no. 6A). We do not have a preference for a "non-detect" cleanup goal. The original comment provided by EPA Region 7 discusses continued pumping of well EX-4-I/D to continue capture of the chromium plume in support of attaining the cleanup goal of 100 ug/L chromium. The nearest monitoring well to well EX-4-I/D (MW-15-S) was only recently found at concentrations below the cleanup goal of 100 ug/L chromium during the last sample round (April 2007). We would prefer to see a consistent downward trend in chromium in the area before relaxing hydraulic control in that area.

Regarding comment no. 7, the RSE team makes valid points for including wells MW-18-S and MW-15-S to the list for semi-annual sampling. We agree that these two wells should be added to the semi-annual sampling list. We believe the remaining schedule developed using the MAROS software is valid and requires no other revision at this time.

Thanks,
Rob Weber

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