

March 27, 2013

Janice Goebel  
California Regional Water Quality Control Board  
North Coast Region  
5550 Skylane Blvd., Suite A  
Santa Rosa, California 95403

**Subject: Work Plan for In-Situ Remediation of Hexavalent Chromium in B-Zone Groundwater  
Former Remco Hydraulics Facility, Willits, California**

Dear Ms. Goebel:

Jacobson James Associates, Inc., (JJ&A) submits this *Work Plan for In-Situ Remediation of Hexavalent Chromium in B-Zone Groundwater* (Work Plan) on behalf of the Willits Environmental Remediation Trust (Willits Trust). This Work Plan proposes an Interim Remedial Action (IRA) at the Former Remco Hydraulics Facility (the Facility), located at 934 South Main Street in Willits, California (Figure 1). This IRA involves the injection of dilute calcium polysulfide and molasses solution to enhance *in-situ* reduction of hexavalent chromium in B-Zone groundwater.

This IRA will be conducted pursuant to the Waste Discharge Requirements (WDR) Order No. R1-2009-0001 (the Order), as adopted by the Regional Water Quality Control Board, North Coast Region (RWQCB) on January 29, 2009, approving the implementation of the subject IRA. The Order authorized implementation of *in-situ* reductive remediation of metals in groundwater, subject to a RWQCB-approved work plan on a project-specific basis. This Work Plan is intended to fulfill the requirement in Section B, paragraph 2, of the Order, which requires a Work Plan be prepared and submitted for RWQCB approval.

#### **SUMMARY OF PRIOR INTERIM REMEDIAL ACTIONS**

A summary of prior IRA injection events pursuant to the remediation of hexavalent chromium in the B-Zone at the Facility is presented in the *Summary Report on In-Situ Treatment of Volatile Organic Compounds (VOCs) and Hexavalent Chromium* (JJ&A and Farr Associates, May 12, 2011). Prior IRAs addressing B-Zone hexavalent chromium impacts were conducted at the Facility in 2003, 2004, 2005, and 2010 as shown on Figure 2.

The results of the groundwater sampling program indicate that the IRAs have had the desired effect of reducing concentrations of hexavalent chromium in groundwater throughout the B-Zone. The reduction in magnitude and extent of the hexavalent chromium plume over time in the B-Zone, demonstrating the efficacy of the IRA injections, is illustrated on Figure 3. Although the concentrations of hexavalent chromium reported for samples collected at extraction well EW-1B have decreased significantly, residual hexavalent chromium is still present in the immediate vicinity of this extraction well (*e.g.*, 1.9 milligrams per liter [mg/L] of hexavalent chromium was reported for the October 2012 sample from EW-1B).

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e n v i r o n m e n t a l   c o n s u l t a n t s

9 0 8 3 F o o t h i l l s B l v d . , S u i t e 3 7 0 , R o s e v i l l e , C a l i f o r n i a 9 5 7 4 7

P h . 9 1 6 . 3 6 7 . 5 1 1 1   F a x 9 1 6 . 3 6 7 . 5 1 1 0

Figure 4A depicts the concentration of hexavalent chromium detected in EW-1B from 1997 to present, illustrating the effect of the IRAs conducted in the B-Zone. This figure confirms that the three initial IRA injection events (2003, 2004, and 2005) resulted in limited reduction of hexavalent chromium at this location. The 2010 injection event, however, had a significant effect (25-fold reduction) on concentrations detected in this well. Nevertheless, subsequent analytical testing indicated that hexavalent chromium concentrations were rebounding in this well. Based on the observation of rebounding concentration in EW-1B, groundwater extraction (*i.e.*, pump-and-treat) was proposed as an IRA to address the residual impact at EW-1B. EW-1B was connected to the Groundwater Extraction and Treatment System (GWETS) at the Facility with extraction commencing in October 2011. As noted on Figure 4B, which shows the concentration of hexavalent chromium in EW-1B during the groundwater extraction, the observed concentrations declined initially; however, concentrations have since stabilized at around 1 to 2 mg/L.

### SCOPE OF WORK

The scope of work described in this Work Plan is intended to address residual hexavalent chromium in B-Zone groundwater in the vicinity of EW-1B. EW-1B is a 4-inch extraction well, screened from 26-36 feet below ground surface (ft-bgs). This extraction well and the three additional B-Zone extraction wells currently operating at the Site are shown on the January 2013 B-Zone potentiometric map (Figure 5). The boring log and well construction log for EW-1B are included in Attachment A.

EW-1B will be used as the injection location to deliver remedial solutions to the target treatment area. The idealized target area is the 20-foot diameter (*i.e.*, 10-foot radius) cylindrical volume of soil centered around EW-1B, as shown in Figure 6. The proposed injection is intended to treat one pore volume of the vertical cylinder within this 10-foot radius across the full thickness of the B-Zone (approximately 15 feet), which spans from approximately 24 to 39 ft-bgs, as indicated on the EW-1B boring log. Assuming a soil porosity of 30%, the design injection volume is 10,575 gallons.

The proposed injections will be conducted in the same manner as the previous IRA injection event that utilized the MLW-9-series well cluster for remedial injections completed in August 2012. The injection system will consist of a tank, pump, and manifold constructed from polyvinyl chloride (PVC) piping and tubing. The manifold will connect the tank and pump to the target injection well. A fitting will be attached to the injection well to reduce the casing diameter and connect to the manifold. The manifold will be fitted with pressure gauges and valves, as appropriate, to monitor and control flow. The proposed injection system schematic is shown in Figure 7.

The proposed remedial solution is consistent with that used in prior injection events, and will consist of a dilute mixture of calcium polysulfide (2% by volume) and molasses (7% by volume) mixed with potable water. Approximately 10,575 gallons of the remedial solution will be prepared according to the mixing instructions shown on Attachment B, and will be injected at relatively low pressures (less than 50 pounds per square inch [psi]) and at relatively low flow rates (approximately 5 gallons per minute [gpm]) using a progressive cavity pump.

The calcium polysulfide to be used for this IRA is manufactured as Calmet and consists of a 29% calcium polysulfide (by weight) solution. The materials safety data sheet (MSDS) for Calmet is provided in Attachment C. Prior to the injection event, groundwater extraction from the target well (EW-1B) will cease and the injection head works will be fitted to the well. Groundwater extraction from well EW-5B will also be temporarily discontinued for a three-week period beginning one week before the remedial solution injection at EW-1B. The injection event is expected to take approximately one to two days to complete, and groundwater extraction will resume at EW-1B approximately 1 month after the remedial injection has been completed.

### **MONITORING PROGRAM**

A groundwater monitoring program has been specifically designed to evaluate the performance and effectiveness of the IRA in monitoring wells located in and around the target injection area. The IRA performance monitoring well network will consist of the target well EW-1B and down-gradient monitoring wells W8B and W31B. The locations of the IRA performance monitoring wells are shown on Figure 6.

The IRA monitoring wells will be tested prior to the injection event to establish baseline water quality conditions, with samples to be collected during the semi-annual sampling event in April 2013. Water samples from EW-1B will be analyzed for the following constituents:

- Hexavalent chromium by United States Environmental Protection Agency (USEPA) Method 7199;
- Dissolved chromium by USEPA Method 6010;
- Arsenic by USEPA Method 6020; and,
- Sulfate by USEPA Method 300.

Water samples from W8B and W31B will be analyzed for the following constituents:

- Arsenic by USEPA Method 6020; and,
- Sulfate by USEPA Method 300.

Water levels will be measured in proximal B-Zone wells during the injection event to observe water-level changes and estimate the radius of injection pressure influence. Monthly field monitoring of hexavalent chromium concentrations at EW-1B will be completed using a field HACH kit in addition to measuring water quality parameters (pH, temperature, oxidation-reduction potential, and electrical conductivity). Monthly field monitoring will continue for three months following the injection event.

Quarterly sampling with laboratory analyses for the analytes listed in the bulleted lists above will continue for one year following the IRA injection event in wells EW-1B, W8B, and W31B. Quarterly monitoring and sampling of the three IRA monitoring wells will include field-measured water quality parameters, as well as the constituents indicated above for baseline testing. Additional sampling may be conducted, as needed, to verify constituent trends or to further evaluate treatment effectiveness and progress. Sampling will be conducted in conjunction with the routine groundwater monitoring and sampling events, to allow for a comprehensive assessment of groundwater conditions at the Facility.

## CONTINGENCY PLAN

The contingency plan presented in this Work Plan is consistent with requirements in Section B, paragraph 2, of the Order. If significant increasing trend(s) of arsenic and/or sulfate are observed in down-gradient wells at concentrations exceeding the baseline (pre-injection) concentrations, groundwater extraction from the target well (EW-1B) and/or other B-Zone extraction wells (e.g., EW-5B) will commence and/or be increased as necessary to control affected groundwater. Data from the IRA monitoring program described above will provide the basis for determining if and when contingency measures must be implemented.

The Willits Trust will continue to review and evaluate the data generated from the IRA monitoring program, and conduct additional sampling and analytical testing, as necessary, to conduct a thorough evaluation of the IRA effectiveness. If the analytical data indicate that additional hydraulic control is needed, the Willits Trust is prepared to increase pumping rates from the existing wells, or bring additional extraction well(s), such as EW-4B, online.

## REPORTING

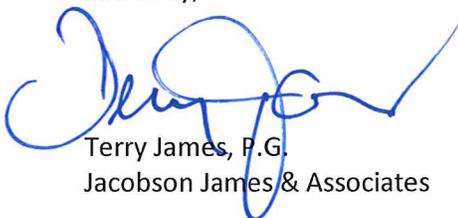
An IRA implementation report will be prepared and submitted to the RWQCB within 45 days of the completion of the injection event at the Facility. The analytical results from the IRA sampling events will be submitted to the RWQCB as part of the routine groundwater monitoring and sampling reports required under the existing Monitoring and Reporting Program.

## SUMMARY AND SCHEDULE

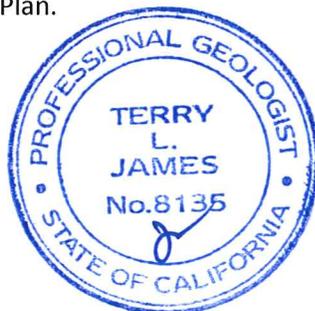
JJ&A respectfully submits this *Work Plan for In-Situ Remediation of Hexavalent Chromium in B-Zone Groundwater* on behalf of the Willits Trust. The proposed injections and monitoring program, as described herein, will allow the Willits Trust to efficiently implement the IRA, assess remedial effectiveness, and monitor byproducts of the remedial action. Assuming that the RWQCB approves this work plan within 30-days, the work will be initiated at the conclusion of the 30-day notification and comment period in May 2013.

Please feel free to call Terry James at (916) 367-5111 ext. 112, if you have any questions or would like to discuss the contents of this Work Plan.

Sincerely,



Terry James, P.G.  
Jacobson James & Associates



cc: Anne M. Farr, Ph.D., Willits Environmental Remediation Trust  
Philip C. Hunsucker, Esq., Hunsucker, Goodstein & Nelson, PC  
Adrienne Moore, City of Willits  
Earl D. James, EKI  
Stuart Block, Esq., Cox, Castle and Nicholson, LLP  
H. James Lance, Esq., City of Willits  
Dennis Reis, Esq., Briggs & Morgan, PA  
David Patrick, PepsiCo  
Electronic Document Depository

#### **LIST OF FIGURES**

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- Figure 2 Compilation of Hexavalent Chromium *In-Situ* B-Zone Injection Events
- Figure 3 Hexavalent Chromium Detected in B-Zone Monitoring Wells Over Time (2003-2012)
- Figure 4A Hexavalent Chromium Concentrations Over Time in EW-1B (1997-Present)
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- Figure 5 B-Zone Potentiometric Map (January 14, 2013)
- Figure 6 IRA Injection Area and Performance Wells
- Figure 7 Proposed Injection System Schematic

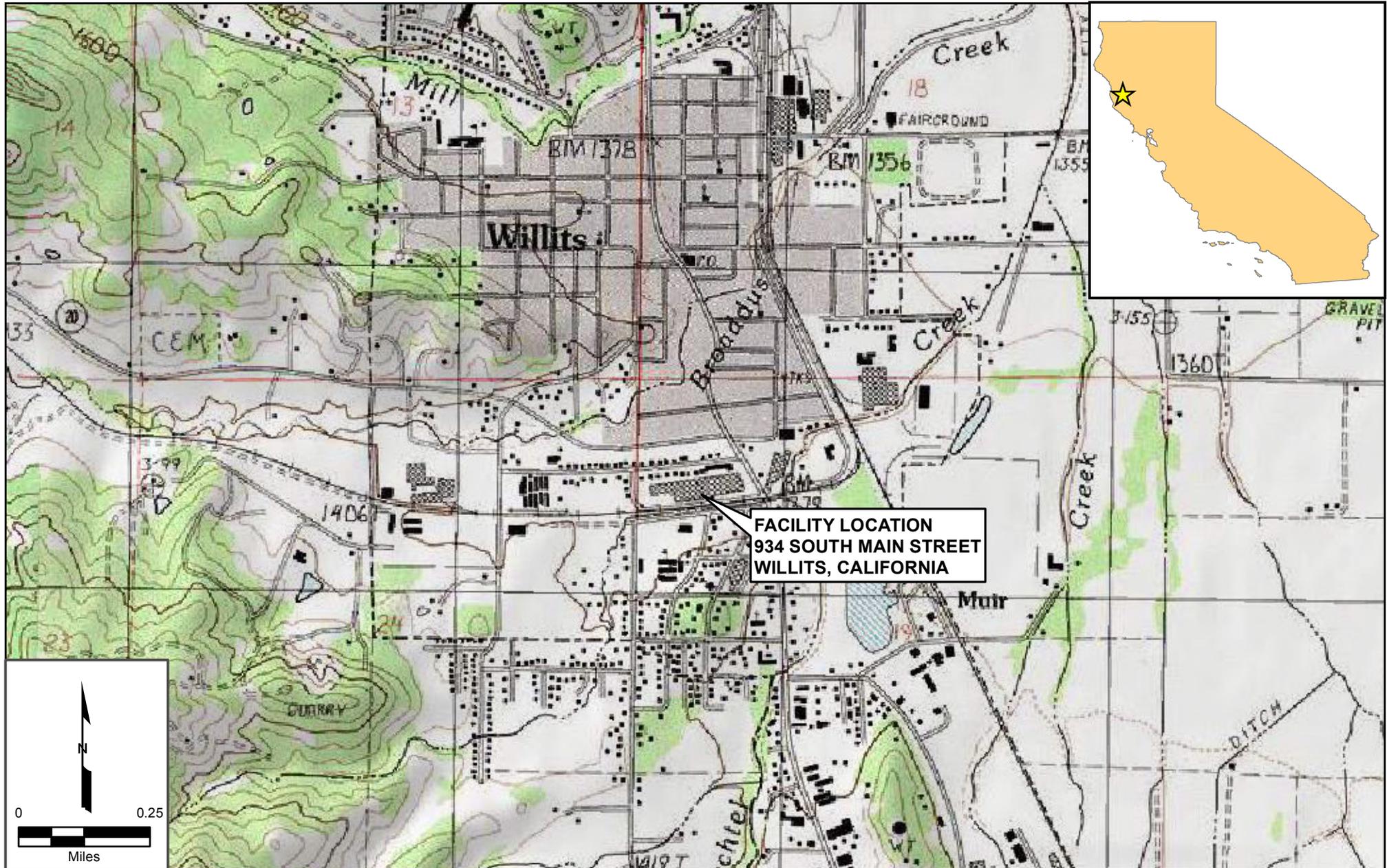
#### **LIST OF ATTACHMENTS**

- Attachment A EW-1B Boring Log and Well Construction Diagram
- Attachment B Remedial Solution Mixing Sheet
- Attachment C Calcium Polysulfide Materials Safety Data Sheet

## FIGURES

## LIST OF FIGURES

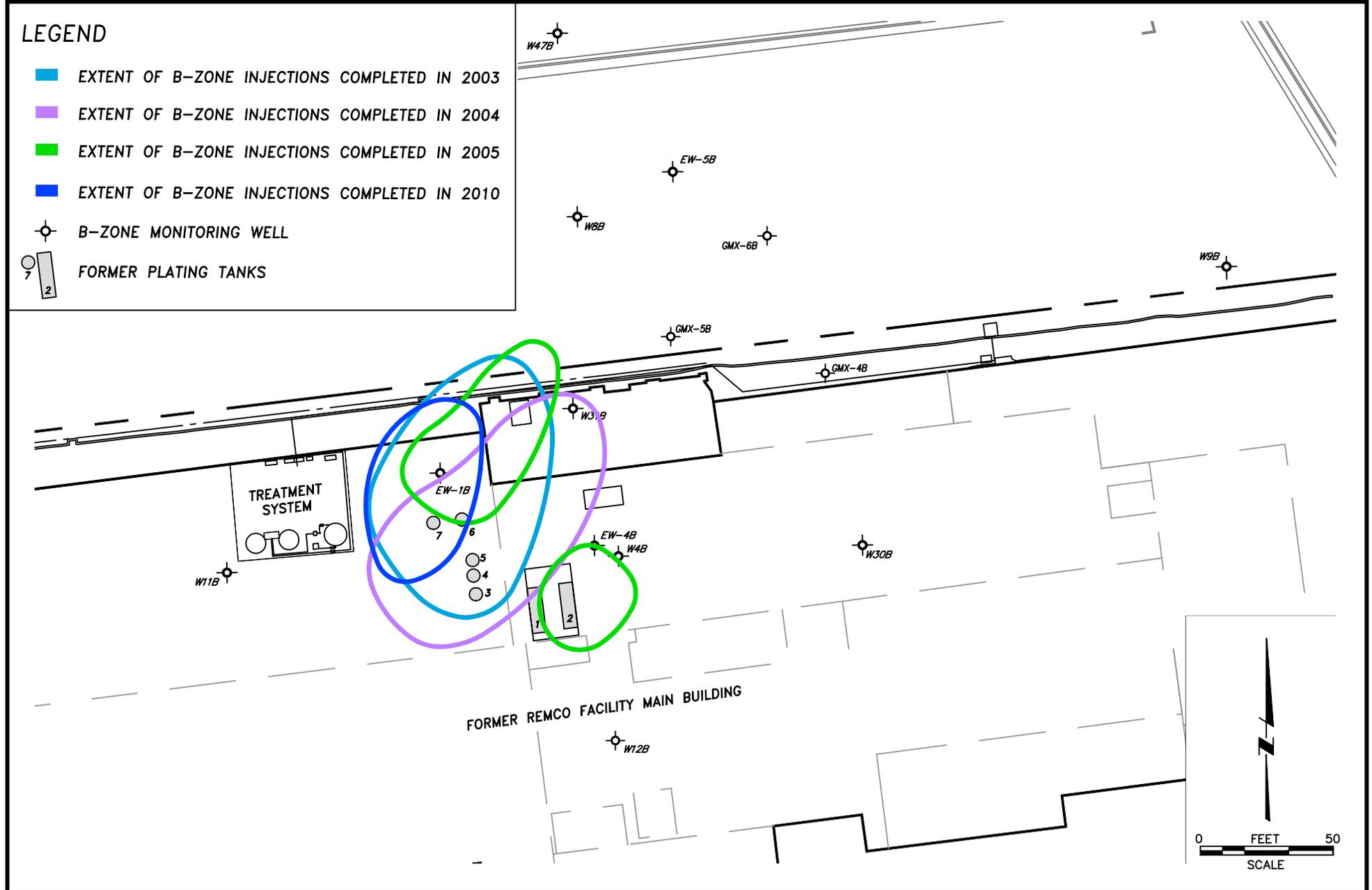
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**JACOBSON | JAMES**  
& associates, inc

LOCATION FORMER REMCO HYDRAULICS, INC. WILLITS, CALIFORNIA		
DRAWN BY DPG	APPR. BY TJ	DATE 11/20/12

FIGURE 1  
**FACILITY LOCATION MAP**



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 & associates, inc

WILLITS ENVIRONMENTAL REMEDIATION TRUST  
 FORMER REMCO HYDRAULICS, INC  
 WILLITS, CALIFORNIA

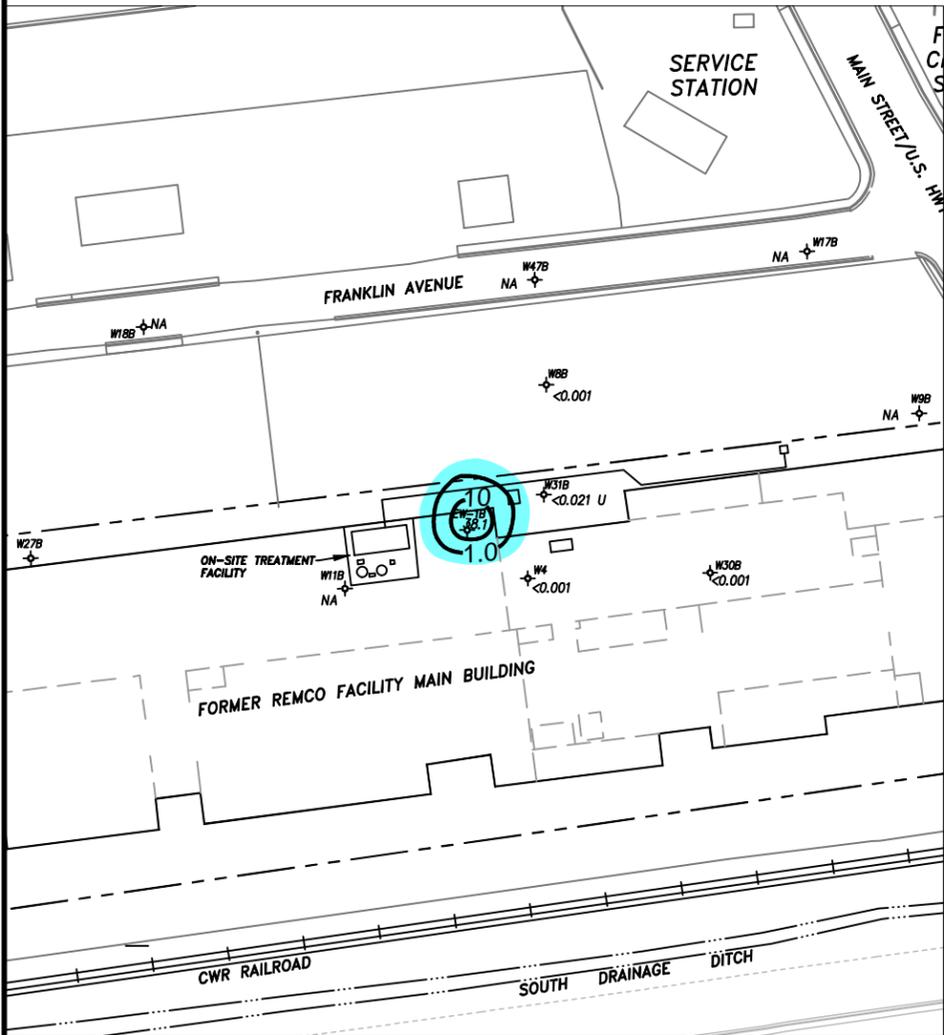
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**FIGURE 2**  
**COMPILATION OF HEXAVALENT CHROMIUM IN-SITU B-ZONE INJECTION EVENTS**

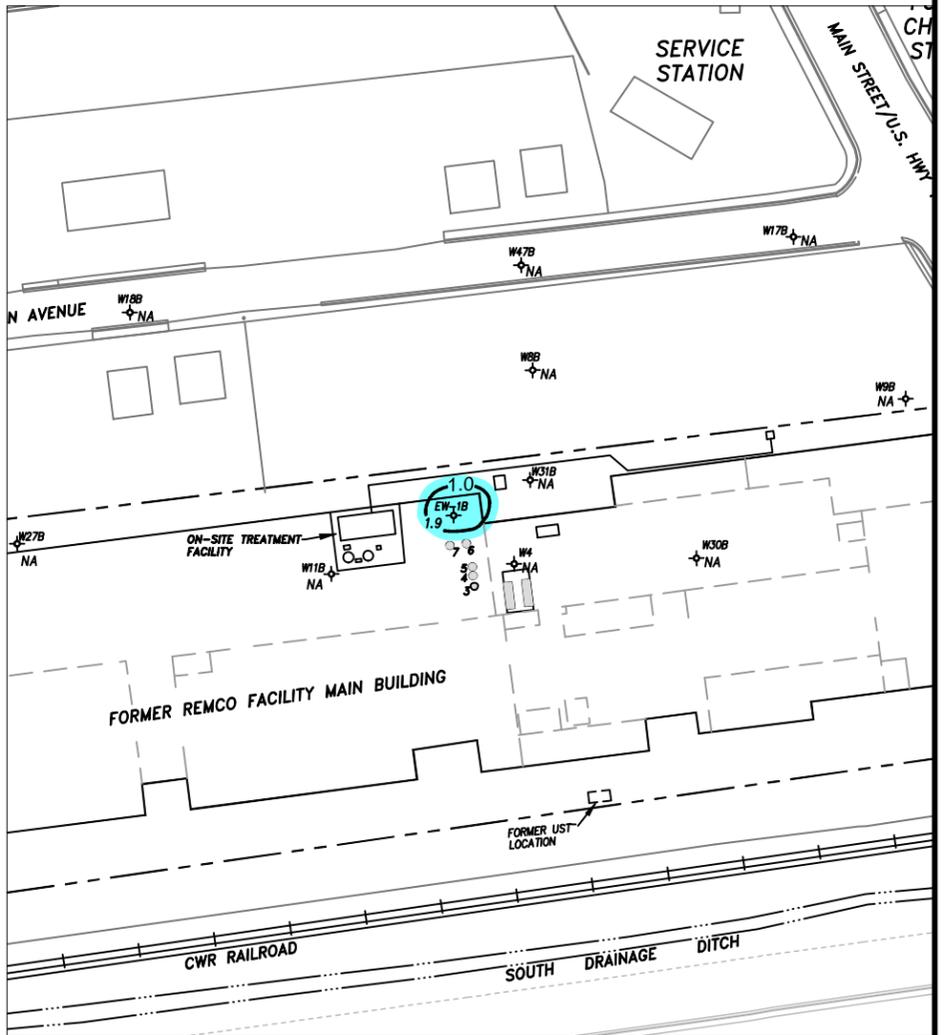


Hexavalent Chromium Detected in B-Zone Monitoring Wells - October 2003

Hexavalent Chromium Detected in B-Zone Monitoring Wells - October 2004



Hexavalent Chromium Detected in B-Zone Monitoring Wells - April 2006



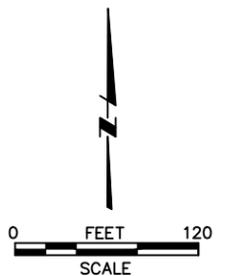
Hexavalent Chromium Detected in B-Zone Monitoring Wells - October 2012

**LEGEND**

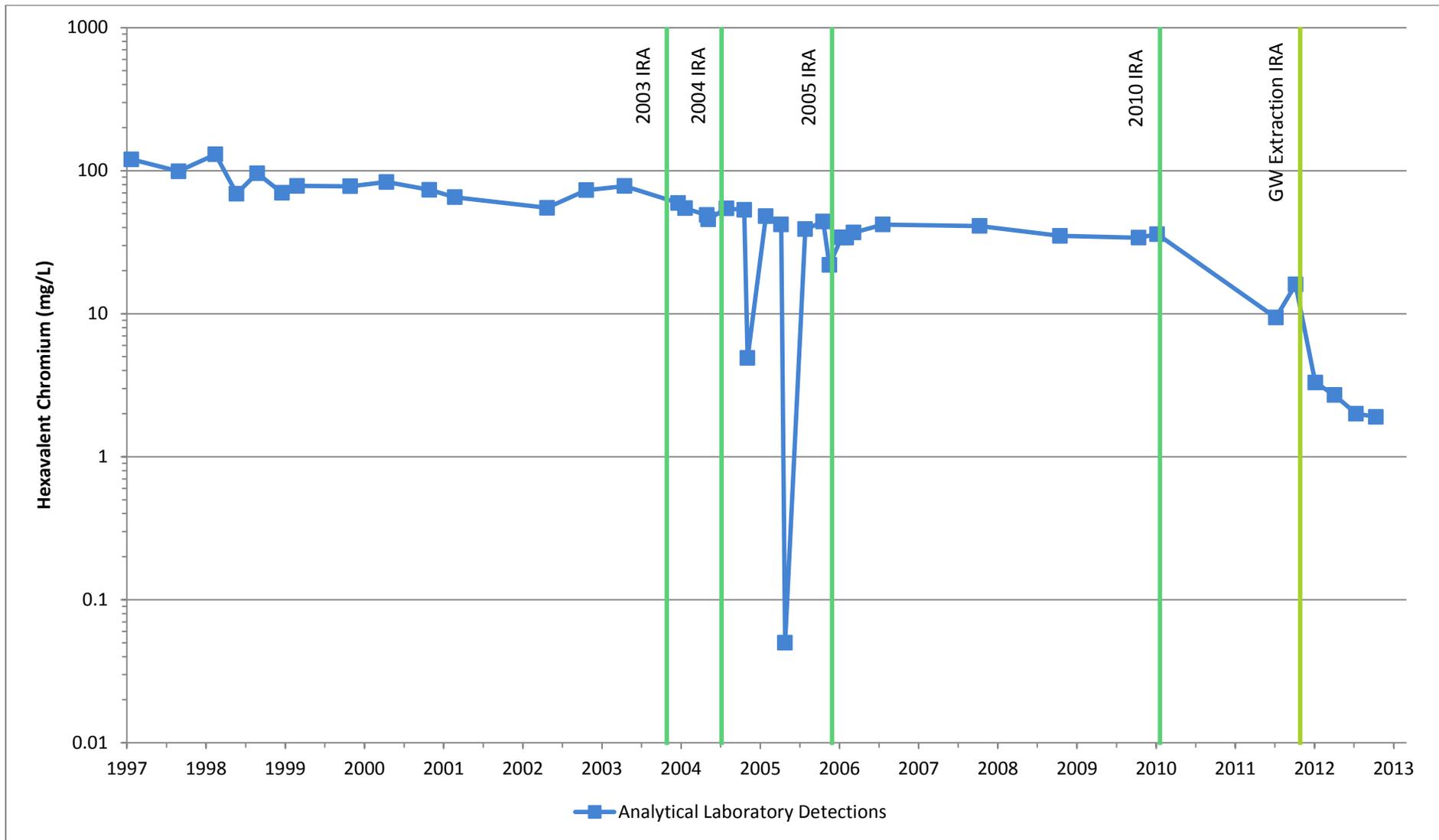
- PROPERTY BOUNDARY
- HEXAVALENT CHROMIUM CONTOUR (MILLIGRAMS/LITER)

ESTIMATED AREA EXCEEDING MCL FOR DISSOLVED CHROMIUM OF 0.050 mg/L

NOTES:  
 FIGURES AND/OR DATA ARE PROVIDED IN HISTORICAL ROUTINE GROUNDWATER MONITORING AND SAMPLING REPORTS PREPARED FOR THE FORMER REMCO FACILITY.

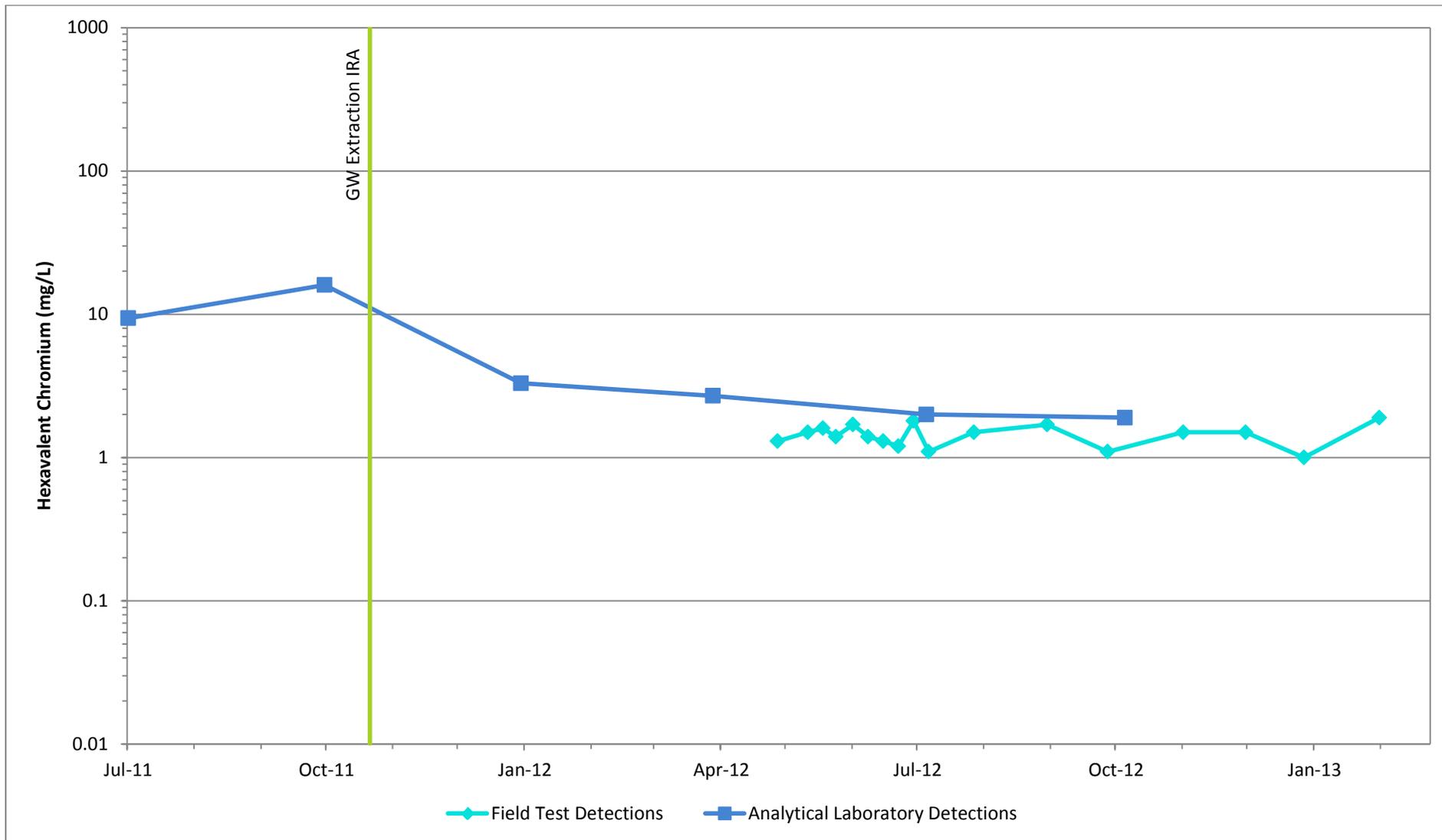


**FIGURE 4A**  
**HEXAVALENT CHROMIUM CONCENTRATIONS OVER TIME IN EW-1B (1997-Present)**  
**Work Plan for In-Situ Remediation of Hexavalent Chromium in B-Zone Groundwater**  
**Former Remco Hydraulics Facility**  
**Willits, California**



Notes:  
 GW = groundwater  
 IRA = Interim Remedial Action  
 mg/L = milligrams per liter

**FIGURE 4B**  
**HEXAVALENT CHROMIUM CONCENTRATIONS OVER TIME IN EW-1B (2011-Present)**  
**Work Plan for In-Situ Remediation of Hexavalent Chromium in B-Zone Groundwater**  
**Former Remco Hydraulics Facility**  
**Willits, California**

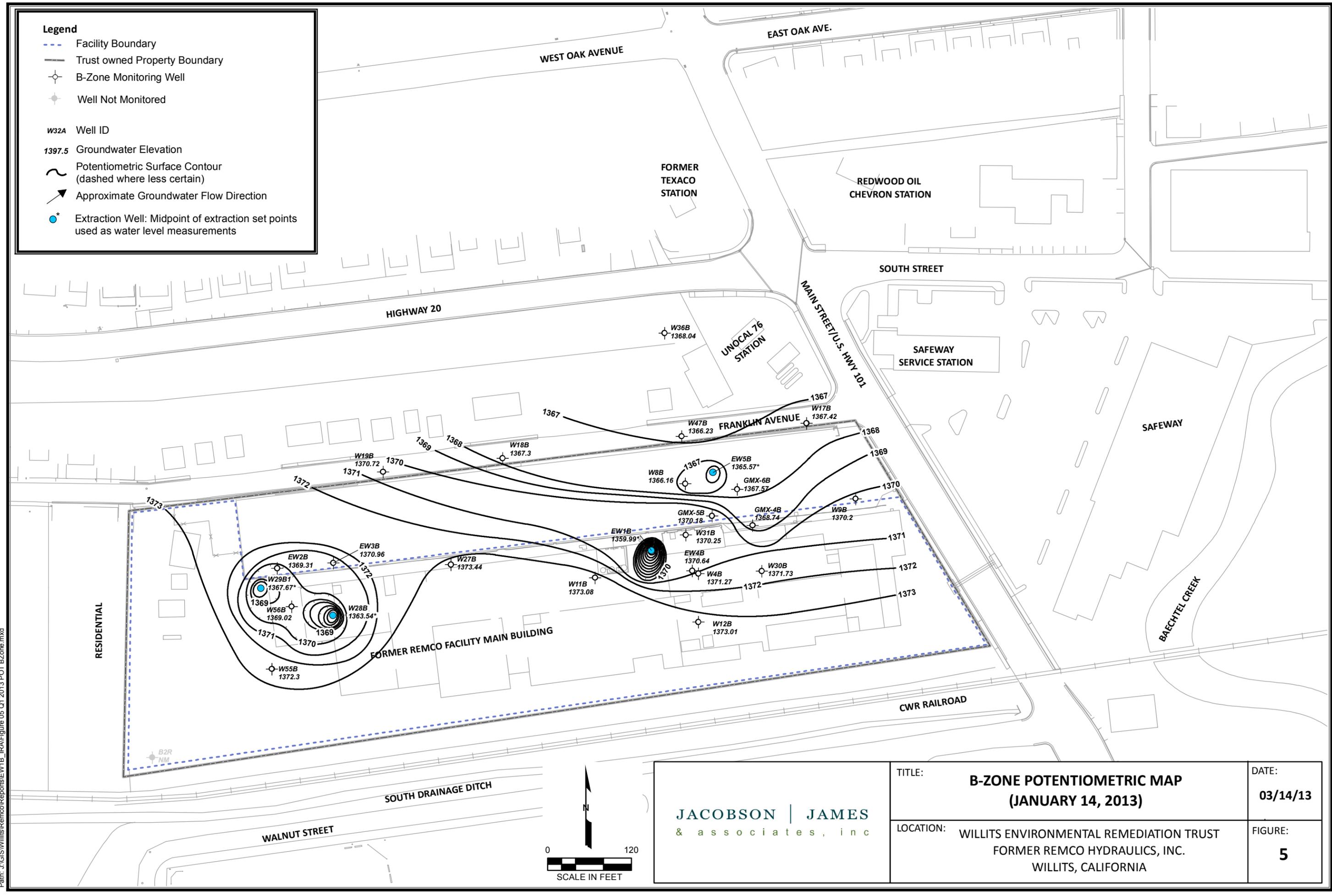


Notes:

GW = groundwater  
 IRA = Interim Remedial Action  
 mg/L = milligrams per liter

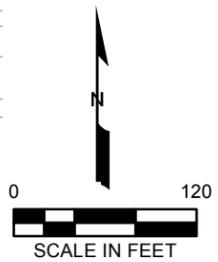
**Legend**

-  Facility Boundary
-  Trust owned Property Boundary
-  B-Zone Monitoring Well
-  Well Not Monitored
  
- w32A** Well ID
- 1397.5** Groundwater Elevation
-  Potentiometric Surface Contour (dashed where less certain)
-  Approximate Groundwater Flow Direction
-  Extraction Well: Midpoint of extraction set points used as water level measurements



Path: J:\GIS\WillitsRemco\Reports\EW1B\_IRA\Figure 05 01 2013 POT BZone.mxd

	TITLE: <b>B-ZONE POTENTIOMETRIC MAP (JANUARY 14, 2013)</b>	DATE: <b>03/14/13</b>
	LOCATION: WILLITS ENVIRONMENTAL REMEDIATION TRUST FORMER REMCO HYDRAULICS, INC. WILLITS, CALIFORNIA	FIGURE: <b>5</b>

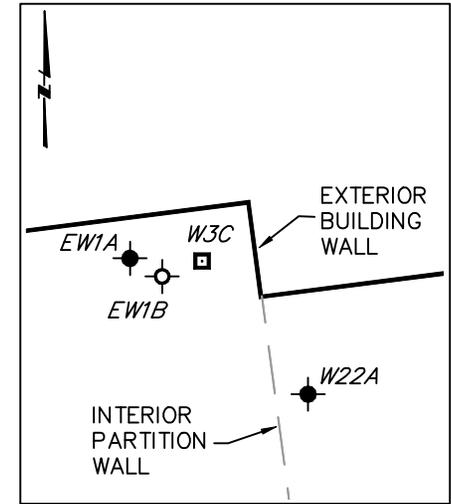
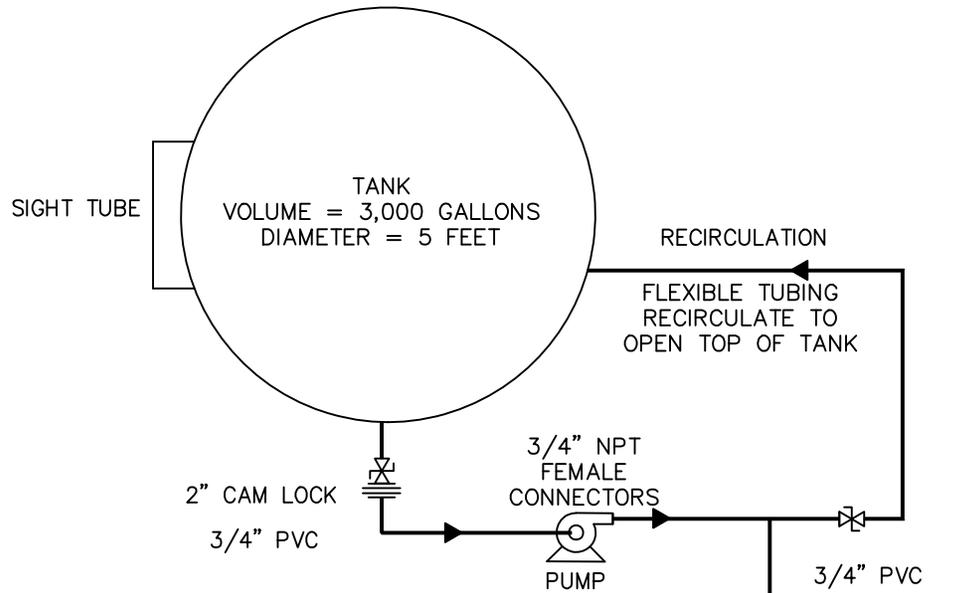
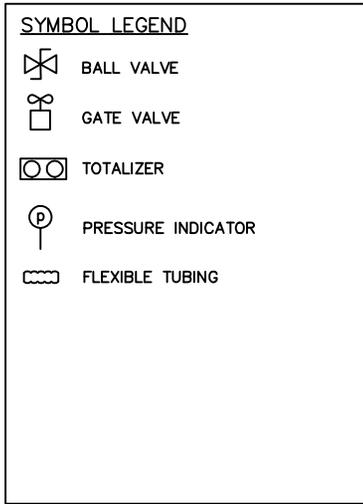




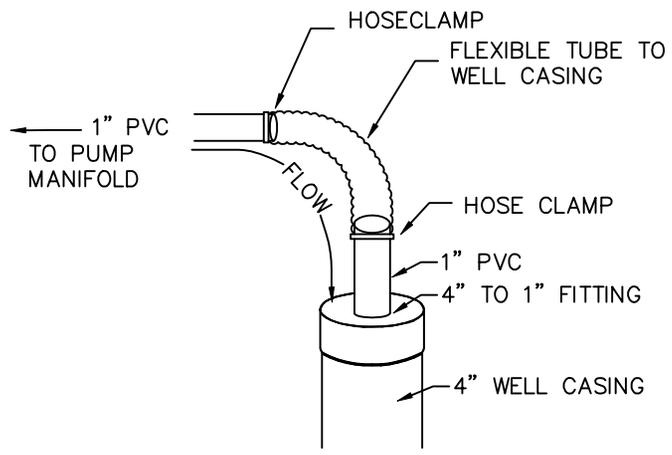
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WILLITS ENVIROMENTAL REMEDIATION TRUST FORMER REMCO HYDRAULICS FACILITY WILLITS, CALIFORNIA			
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FIGURE 6  
**IRA INJECTION AREA & PERFORMANCE WELLS**



WELL LOCATION DETAIL  
NOT TO SCALE



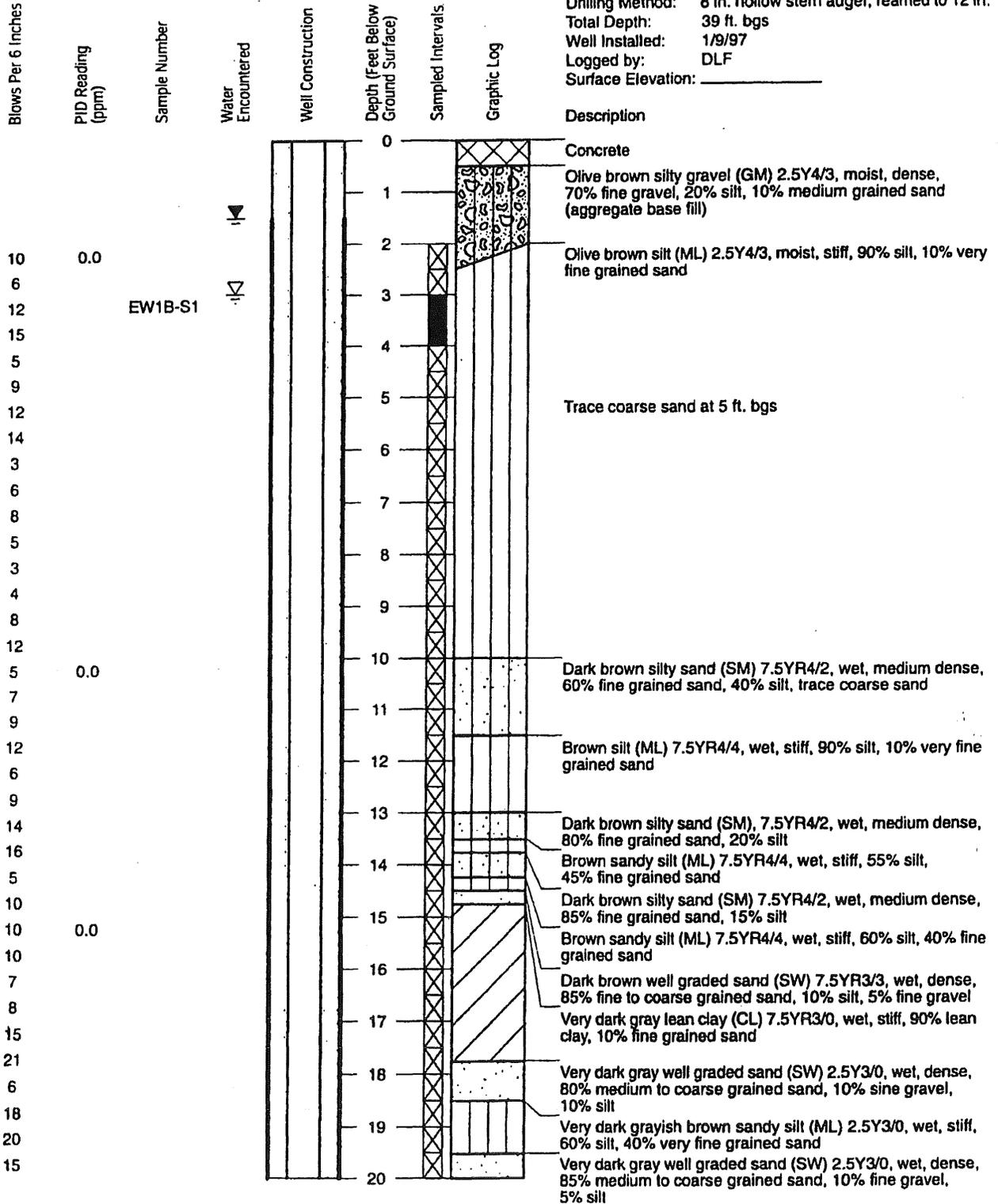
VERTICAL CONNECTION DETAIL

NOT TO SCALE

<p><b>JACOBSON   JAMES</b> &amp; associates, inc</p>	<p>WILLITS ENVIROMENTAL REMEDIATION TRUST FORMER REMCO HYDRAULICS FACILITY WILLITS, CALIFORNIA</p>		<p>FIGURE 7 <b>PROPOSED INJECTION SYSTEM SCHEMATIC</b></p>	
	PROJECT NO.	DATE	DRAWN BY	APPROVED BY
	01.WIL.2013	03/15/13	DPG	TJ

**ATTACHMENT A**  
**EW-1B BORING LOG AND WELL CONSTRUCTION DIAGRAM**

**Well EW-1B**  
 Date Drilled: 1/6,9/97  
 Drilled By: All Terrain Drilling  
 Drilling Method: 8 in. hollow stem auger, reamed to 12 in.  
 Total Depth: 39 ft. bgs  
 Well Installed: 1/9/97  
 Logged by: DLF  
 Surface Elevation: \_\_\_\_\_



**Henshaw Associates**  
 Environmental Engineering Services

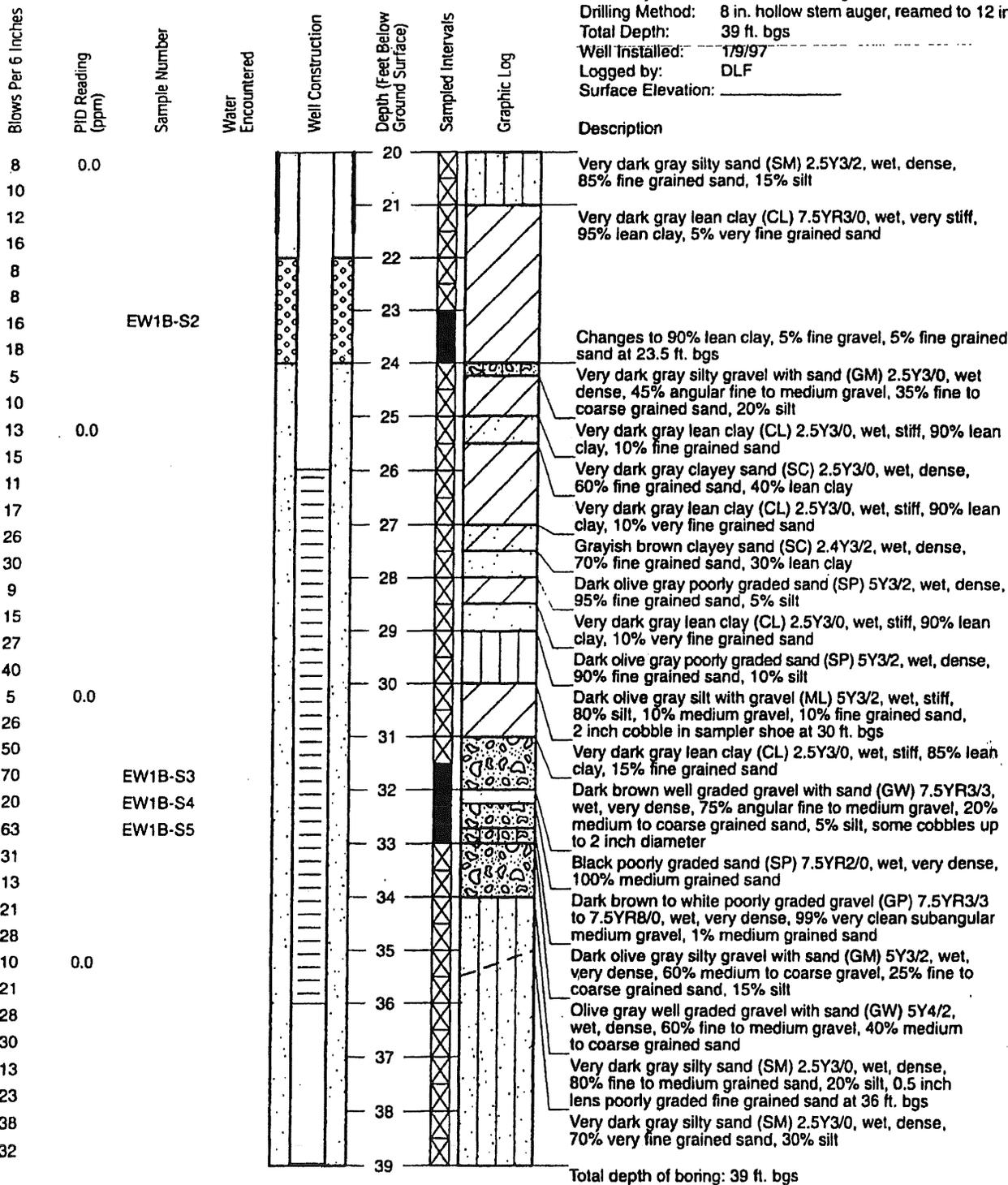
**Boring Log**  
 B-Zone Well EW-1B  
 Remco Hydraulics  
 Willits, California

FIGURE

DRAWN DLF	JOB NUMBER 101.C.01	APPROVED	DATE 1/97	REVISED DATE
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**Well EW-1B**

Date Drilled: 1/6/97  
 Drilled By: All Terrain Drilling  
 Drilling Method: 8 in. hollow stem auger, reamed to 12 in.  
 Total Depth: 39 ft. bgs  
 Well Installed: 1/9/97  
 Logged by: DLF  
 Surface Elevation: \_\_\_\_\_

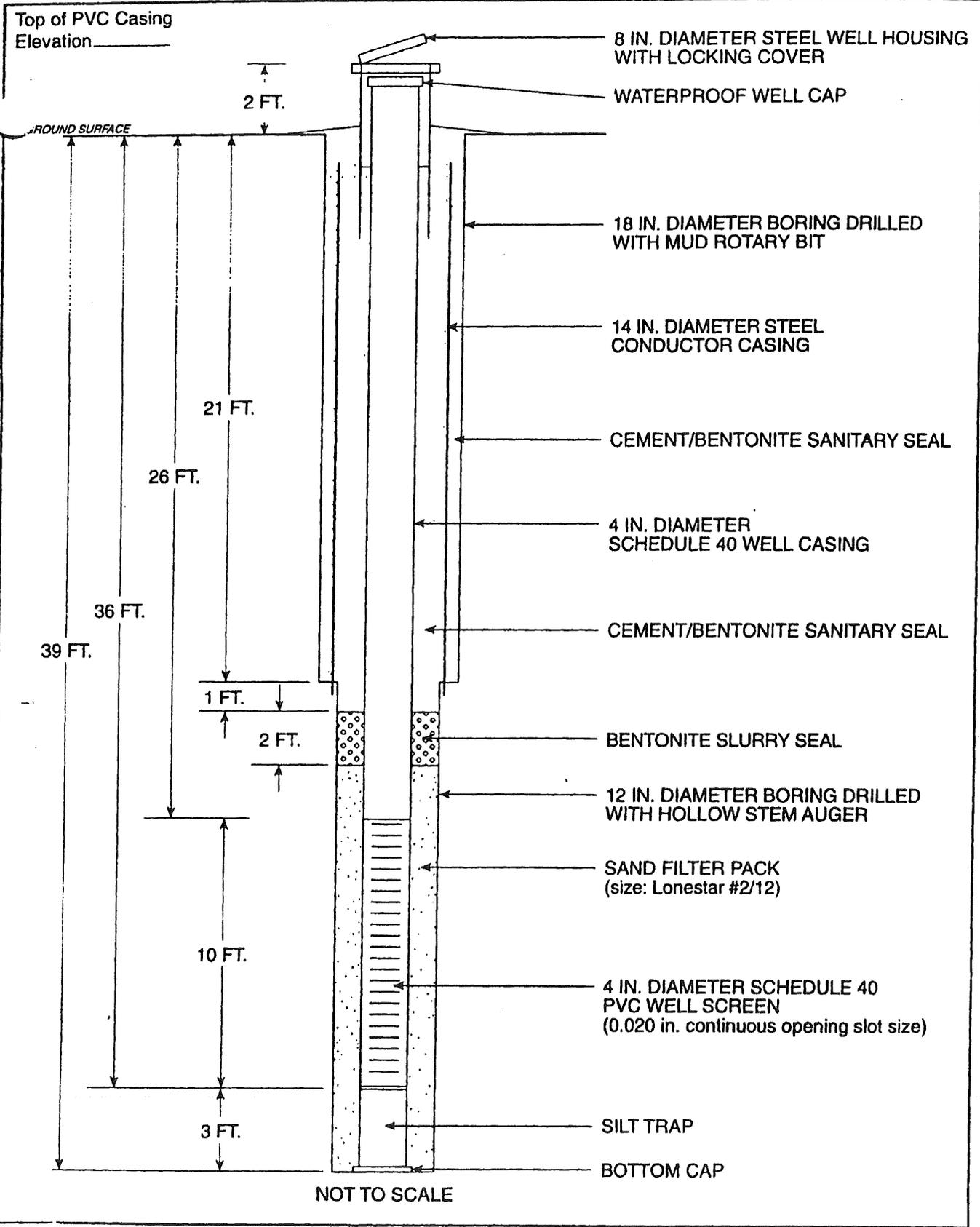


**Henshaw Associates**  
 Environmental Engineering Services

**Boring Log**  
 B-Zone Well EW-1B  
 Remco Hydraulics  
 Willits, California

FIGURE

DRAWN DLF	JOB NUMBER 101.C.01	APPROVED	DATE 1/97	REVISED DATE
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**Flintshaw Associates**  
 Environmental Engineering Services

Well Construction Diagram  
 B-Zone Well EW-1B  
 Remco Hydraulics  
 Willits, California

FIGURE

DRAWN LF	JOB NUMBER 101.C.01	APPROVED	DATE 1/97	REVISED DATE
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**ATTACHMENT B**  
**REMEDIAL SOLUTION MIXING SHEET**

**ATTACHMENT B**  
**REMEDIAL SOLUTION MIXING SHEET**  
**Work Plan for In-Situ Remediation of Hexavalent Chromium in B-Zone Groundwater**  
**Former Remco Hydraulics Facility**  
**Willits, California**

Care is to be taken in ensuring each batch is mixed properly. Remedial solutions will be mixed as needed. It is important to document the type and volume of remedial solution injected using provided field forms. In addition to volumes and location, both break-through and operating pressures, time of pumping, and short circuiting or surfacing are to be noted. Recipes are provided in 2,644-gallon batches; four batches will be made to achieve the total injection volume of 10,575 gallons.

**Calcium Polysulfide (CaSx)/Molasses remedial solution recipe:**

	<b>2,644 Gallons: CaSx (2% by volume) + Molasses (7% by volume)</b>
1	183 gallons Calcium Polysulfide as a 29% solution by weight
2	740 gallons molasses solution (diluted 4:1; 25% by volume)
3	1,721 gallons of potable water

**NOTES**

CaSx (also known as lime sulfur; trade names Calmet or Cascade) should be batched with the molasses/water solution on a daily basis. Care should be taken to ensure that batches are mixed in a volume that can be used that day. CaSx may precipitate crystals with extended contact with air; to prevent this, a thin layer of vegetable oil will be laid on top of this product once container is opened, as needed, to minimize oxidation of product. The CaSx and molasses-water solution will be mixed with potable water to create the final remedial solution. This final solution must be well-mixed to ensure proper distribution.

**MATERIAL HANDLING/CONTAINERS**

All raw ingredients are to be stored in a secured raw-material storage area prior to use. Mixing areas and lines must be double contained to ensure no releases. All pressurized lines must be secured and "choked." Spills must be cleaned up immediately and waste must be containerized in drums. All vessels are to be properly labeled.

**ATTACHMENT C**  
**CALCIUM POLYSULFIDE MATERIALS SAFETY DATA SHEET**



## Material Safety Data Sheet

### Calcium polysulfide solution

MSDS Number 6100 (Revised: 4/29/02)

6 Pages

<b>Section</b>	<b>1:</b>	<b>CHEMICAL PRODUCT and COMPANY IDENTIFICATION</b>
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- 1.1 Product Name** ..... **Calcium polysulfide solution**  
Chemical Family ..... Inorganic salt solution  
Synonyms ..... Calcium polysulfide, CaPS, calcium sulfide, lime sulphur  
Formula .....  $CaS_x$
- 1.2 Manufacturer** ..... Tessenderlo Kerley Inc.  
2255 N. 44<sup>th</sup> Street, Suite 300  
Phoenix, Arizona 85008-3279  
Information ..... (602) 889-8300
- 1.3 Emergency Contact** ..... (800) 877-1737 (Tessenderlo Kerley)  
**(800) 424-9300 (CHEMTREC)**

<b>Section</b>	<b>2:</b>	<b>COMPOSITION, INFORMATION ON INGREDIENTS</b>
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- 2.1 Chemical Ingredients (% by wt.)**
- |                     |                 |     |
|---------------------|-----------------|-----|
| Calcium polysulfide | CAS #:1344-81-6 | 29% |
| Water               | CAS #:7732-18-5 | 71% |

(See Section 8 for exposure guidelines)

<b>Section</b>	<b>3:</b>	<b>HAZARDS IDENTIFICATION</b>
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**NFPA:**      **Health - 3**      **Flammability - 0**      **Reactivity - 1**

#### EMERGENCY OVERVIEW

**Warning:**

Avoid inhalation of product fumes (hydrogen sulfide) near openings on storage container. Release of the product to the environment may cause the evolution of highly toxic hydrogen sulfide vapors. Product solution is very alkaline and corrosive to the skin. Eye contact will cause severe eye irritation and possible corneal damage. Ingestion will result in corrosion of tissues and the release of hydrogen sulfide in the gastrointestinal tract.

<b>Section</b>	<b>3:</b>	<b>HAZARDS IDENTIFICATION (Cont.)</b>
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**3.1 POTENTIAL HEALTH EFFECTS**

**EYE:** Contact with the eyes by product mist or solution will cause irritation and a burning sensation. Eye contact may result in severe corneal injury.

**SKIN CONTACT:** Contact with product mist or solution will cause skin irritation and may result in corrosion of the skin.

**SKIN ABSORPTION:** Absorption is unlikely to occur.

**INGESTION:** Ingestion of product solution will cause irritation and corrosion of the gastrointestinal tract to include nausea, vomiting and diarrhea. Contact with stomach acid will cause highly toxic hydrogen sulfide to evolve.

**INHALATION:** Inhalation of product vapors (hydrogen sulfide) may cause dizziness and unconsciousness possibly resulting in serious falls from elevated positions..

**CHRONIC EFFECTS/CARCINOGENICITY:** Not listed as a carcinogen by NTP, IARC or OSHA.

<b>Section</b>	<b>4:</b>	<b>FIRST AID MEASURES</b>
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**4.1 EYES:** Immediately flush with large quantities of water for 15 minutes. Hold eyelids apart during irrigation to insure thorough flushing of the entire area of the eye and lids. Obtain immediate medical attention.

**4.2 SKIN:** Immediately flush with large quantities of water. Remove contaminated clothing under a safety shower. Obtain immediate medical attention.

**4.3 INGESTION:** DO NOT INDUCE VOMITING. If victim is conscious, immediately give large quantities of water. If vomiting does occur, continue to give fluids. Obtain immediate medical attention.

**4.4 INHALATION:** Remove victim from contaminated atmosphere. If breathing is labored, administer oxygen. If breathing has ceased, clear airway and start mouth to mouth resuscitation. If heart has stopped beating, external heart massage should be applied. Obtain immediate medical attention.

<b>Section</b>	<b>5:</b>	<b>FIRE FIGHTING MEASURES</b>
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**5.1 FLAMMABLE PROPERTIES**

**FLASH POINT:** Not flammable (See Section 5.4)

**METHOD USED:** NA

**5.2 FLAMMABLE LIMITS**      **H<sub>2</sub>S**      **LFL:** 4%      **UFL:** 44%

**5.3 EXTINGUISHING MEDIA:** Water spray or foam or as appropriate for combustibles involved in fire.

<b>Section</b>	<b>5:</b>	<b>FIRE FIGHTING MEASURES (Cont.)</b>
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**5.4 FIRE & EXPLOSIVE HAZARDS:** When heated or diluted, hydrogen sulfide vapors will evolve. This gas may form explosive mixtures with air. (See Section 5.2) Keep containers/storage vessels in fire area cooled with water spray.

**5.5 FIRE FIGHTING EQUIPMENT:** Because of the possible presence of toxic gases and the corrosive nature of the product, wear self-contained breathing apparatus, positive pressure, (MSHA/NIOSH approved or equivalent) and full protective gear.

<b>Section</b>	<b>6:</b>	<b>ACCIDENTAL RELEASE MEASURES</b>
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**6.1 Small releases:** Confine and absorb small releases on sand, earth or other inert absorbent. Released material may contain residual sulfides. Spray with weak (~5%) hydrogen peroxide to oxidize sulfides.

**6.2 Large releases:** Confine area to qualified personnel. Wear proper protective equipment. Shut off release if safe to do so. Dike spill area to prevent runoff into sewers, drains (possible toxic or explosive mixtures) or surface waterways (potential aquatic toxicity). Spray product vapors with fine water spray or mist. Recover as much of the solution as possible. Treat remaining material as a small release (above).

<b>Section</b>	<b>7:</b>	<b>HANDLING and STORAGE</b>
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**7.1 Handling:** Handle in enclosed containers to avoid breathing product. Avoid contact with skin and eyes. Dilute only in enclosed containers. Use in a well ventilated area. Wash thoroughly after handling.

**7.2 Storage:** Store in well ventilated areas in enclosed containers. Do not store combustibles in the area of storage vessels. Keep away from any sources of heat or flame. Store tote, drums and small containers out of direct sunlight at moderate temperatures [ $<90^{\circ}\text{F}$  ( $32^{\circ}\text{C}$ )]. (See Section 10.4 for materials of construction)

<b>Section</b>	<b>8:</b>	<b>EXPOSURE CONTROLS, PERSONAL PROTECTION</b>
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**8.1 RESPIRATORY PROTECTION:** Wear self-contained breathing apparatus, positive pressure, MSHA/NIOSH (approved or equivalent).

**8.2 SKIN PROTECTION:** Gloves, boots, and chemical suit should be worn to prevent liquid contact. Wash contaminated clothing prior to reuse. Contaminated shoes cannot be cleaned and should be discarded

**8.3 EYE PROTECTION:** Chemical goggles and a full face shield.

**8.4 EXPOSURE GUIDELINES:**

	OSHA		ACGIH	
	TWA	STEL	TLV	STEL
Hydrogen sulfide	20 ppm (ceiling)		10 ppm (ceiling)	

**8.5 ENGINEERING CONTROLS:** Use adequate exhaust ventilation to prevent inhalation of product vapors. Maintain eyewash/safety shower in areas where chemical is handled.

**Section 9: PHYSICAL and CHEMICAL PROPERTIES**

<b>9.1 APPEARANCE:</b>	Deep-red-orangish brown liquid
<b>9.2 ODOR:</b>	Strong order of rotten eggs
<b>9.3 BOILING POINT:</b>	Not determined
<b>9.4 VAPOR PRESSURE:</b>	Not determined (Believed to be minimal)
<b>9.5 VAPOR DENSITY:</b>	Not determined
<b>9.6 SOLUBILITY IN WATER:</b>	Dissolves with precipitation of elemental sulfur.
<b>9.7 SPECIFIC GRAVITY:</b>	1.27 (10.6 lbs/gal)
<b>9.8 FREEZING POINT:</b>	Not determined
<b>9.9 pH:</b>	11.0 - 11.9
<b>9.10 VOLATILE:</b>	Not applicable

**Section 10: STABILITY and REACTIVITY**

**10.1 STABILITY:** This is a stable material

**10.2 HAZARDOUS POLYMERIZATION:** Will not occur.

**10.3 HAZARDOUS DECOMPOSITION PRODUCTS:** Heating this product will evolve hydrogen sulfide vapors. Continued heating will also cause oxides of sulfur to be released.

**10.4 INCOMPATIBILITY:** Strong oxidizers such as nitrates, nitrites or chlorates can cause explosive mixtures if heated to dryness. Acids, acidic materials or dilution with water will cause the release of hydrogen sulfide, a highly toxic gas.

**Section 11: TOXICOLOGICAL INFORMATION**

**11.1 ORAL:** Data not available

**11.2 DERMAL:** Data not available

**11.3 INHALATION:** Data not available

**11.4 CHRONIC/CARCINOGENICITY:** No evidence available

**11.5 TERATOLOGY:** Data not available

**11.6 REPRODUCTION:** Data not available

**11.7 MUTAGENICITY:** Data not available

**Section 12: ECOLOGICAL INFORMATION**

No data available.

<b>Section</b>	<b>13:</b>	<b>DISPOSAL CONSIDERATIONS</b>
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If released to the environment for other than its intended purpose, this product should be checked to see it meets the criteria of a D002, Corrosive waste. In addition the product contains some reactive sulfides but not a sufficient quantity to meet the definition of a D003, Reactive waste.

<b>Section</b>	<b>14:</b>	<b>TRANSPORT INFORMATION</b>
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- 14.1 DOT Shipping Name: Corrosive liquid, toxic, n.o.s.
- 14.2 DOT Hazard Class: 8
- 14.3 UN/NA Number: 2922
- 14.4 Packing Group: II
- 14.5 DOT Placard: Corrosive
- 14.6 DOT Label(s): Corrosive
- 14.7 IMO Shipping Name: Corrosive liquid, toxic, n.o.s.
- 14.8 RQ (Reportable Quantity): Not applicable
- 14.9 RR STCC Number:

<b>Section</b>	<b>15:</b>	<b>REGULATORY INFORMATION</b>
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- 15.1 OSHA: This product is listed as a hazardous material under criteria of the Federal OSHA Hazard Communication Standard, 29 CFR 1910.1200.
- 15.2 SARA TITLE III:
- |    |   |                       |
|----|---|-----------------------|
| a. | EHS (Extremely Hazardous Substance) List:     | No                    |
| b. | Section 311/312, (Tier I,II) Categories:      | Immediate (acute) Yes |
|    | Fire  | No                    |
|    | Sudden release                                | No                    |
|    | Reactivity                                    | Yes                   |
|    | Delayed (chronic)                             | No                    |
| c. | Section 313 (Toxic Release Reporting-Form R): | No                    |
- |  |                      |                   |                      |
|--|----------------------|-------------------|----------------------|
|  | <u>Chemical Name</u> | <u>CAS Number</u> | <u>Concentration</u> |
|--|----------------------|-------------------|----------------------|
- 15.2 SARA TITLE III: (Cont.)
- |    |                                    |    |
|----|------------------------------------|----|
| d. | TPQ (Threshold Planning Quantity): | No |
|----|------------------------------------|----|
- 15.3 CERCLA/SUPERFUND: RQ (Reportable Quantity) No

<b>Section</b>	<b>15: REGULATORY INFORMATION (Cont.)</b>
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<b>15.4 TSCA</b> (Toxic Substance Control Act) Inventory List:	Yes	
<b>15.5 RCRA</b> (Resource Conservation and Recovery Act) Status:		Possible D002 (See Section 13)
<b>15.6 WHMIS</b> (Canada) Hazard Classification:		E, D2B
<b>15.7 DOT</b> Hazardous Material: (See Section 14)	Yes	
<b>15.8 CAA</b> Hazardous Air Pollutant (HAP)		No

<b>Section</b>	<b>16: OTHER INFORMATION</b>
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**REVISIONS:** The entire MSDS was reformatted to comply to ANSI Standard Z400.1-1993, by Technical Services-Tessenderlo Kerley, Inc.

Address updated, 4/30/99

Section 8.3, Eye Protection revised and logo revised, 4/29/02

<p>THE INFORMATION PUBLISHED IN THIS MATERIAL SAFETY DATA SHEET HAS BEEN COMPILED FROM OUR EXPERIENCE AND OSHA, ANSI, NFPA, DOT, ERG, AND CHRIS. IT IS THE USER'S RESPONSIBILITY TO DETERMINE THE SUITABILITY OF THIS INFORMATION FOR THE ADOPTION OF NECESSARY SAFETY PRECAUTIONS. WE RESERVE THE RIGHT TO REVISE MATERIAL SAFETY DATA SHEETS PERIODICALLY AS NEW INFORMATION BECOMES AVAILABLE.</p>
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