



November 23, 2012

ACHCSA-EHS  
1131 Harbor Bay Parkway, Suite 250  
Alameda, CA. 94502-6577

Re: Groundwater Monitoring Report – October 2012  
969 San Pablo Avenue, Albany, CA. 94706  
ProTech Project # 383-OH12

**RECEIVED**

8:52 am, Dec 06, 2012

Alameda County  
Environmental Health

To Whom It May Concern:

Attached is the Professional Certification – Report for Groundwater Monitoring, Kelly-Moore Paint Company, 969 San Pablo Avenue, Albany, CA, October 2012 report that Kelly-Moore Paint Company received November 13, 2012 for groundwater monitoring for 969 San Pablo Avenue, Albany, California. This report was prepared by ProTech Consulting & Engineering to evaluate groundwater at this site as required by ACHCSA-EHS. Kelly-Moore Paint Company is aware of the content of this report. If you have questions I can be reached at my office telephone at (650)610-4314

Sincerely,

A handwritten signature in blue ink, appearing to read "Robert Stetson", with a long horizontal line extending to the right.

Robert Stetson  
Director of Risk Management

1 Attachment: Report for Groundwater Monitoring, Kelly-Moore Paint Company, 969  
San Pablo Avenue, Albany CA. – October 2012

13 November 2012

Mr. Robert Stetson  
**Kelly-Moore Paint Company**  
PO Box 3016  
San Carlos, CA 94070

**Re: Groundwater Monitoring Report – October 2012**  
**969 San Pablo Avenue, Albany, CA**  
**ProTech Project # 383-OH12**

Dear Mr. Stetson:

This Groundwater Monitoring Report (GWMR) describes and documents the events that took place during the groundwater monitoring (GWM) at the subject site during the month of October 2012. The document reports on the task requested by the Alameda County Environmental Health (ACEH) in a voicemail received in August 2012.

We will provide the Kelly-Moore Paint Company (KMPC) and the ACEH with an electronic version of this report. A certification letter (on KMPC letterhead, signed by you) is anticipated to go in front of this document transmitting the report to the agencies. Your production of this letter is required prior to submittal to ACEH.

Please review this information and let us know if you have any questions or comments.

Sincerely,  
PROTECH CONSULTING & ENGINEERING



Glen Koutz  
President

**Distribution:**

Mr. Robert Stetson  
**Kelly-Moore Paint Company**  
 PO Box 3016  
 San Carlos, CA 94070

Mark E. Detterman  
**ACEH**  
 1131 Harbor Bay Parkway, Suite 250  
 Alameda, CA 94502-6577

Project File  
 GeoTracker

**SITE INFORMATION**

Site Name:	969 San Pablo
Site Address:	969 San Pablo Avenue, Albany, CA
Owner:	Kelly-Moore Paints P.O. Box 3016, San Carlos, CA 94070
Owner's Representative:	Robert Stetson Director of Risk Management Tele: 650.592.8337x 4314 Mobile: 650.222.6023
Consultant:	ProTech Consulting & Engineering 1208 Main Street, Redwood City, CA 94063 Tele: 650.569.4020
Project Manager:	Sherwood Lovejoy, Jr. Tele: 415.381.2560 Mobile: 650.714.4200
Regulator	Mark E. Detterman Hazardous Materials Specialist ACEH 1131 Harbor Bay Parkway, Suite 250 Alameda, CA 94502-6577 Tele: 510.567.6876

**PROFESSIONAL CERTIFICATION**

REPORT FOR GROUNDWATER MONITORING  
KELLY MOORE PAINTS, 969 SAN PABLO AVENUE, ALBANY, CA  
October 2012

This report has been prepared by the staff of ProTech Consulting & Engineering (ProTech) under the supervision of our Registered Professional Engineer for this project whose stamp and signature appear below.

This report has been prepared by ProTech for the exclusive use of ProTech and Kelly-Moore Paint Company (client) and not for use by any other party. Any use by a third party of any of the information contained in this report shall be at their own risk and shall constitute a release and an agreement to defend and indemnify ProTech from and against any and all liability in connection therewith whether arising out of ProTech's negligence or otherwise.

All interpretations, conclusions, and recommendations are based solely on information gathered during this investigative stage and on no other unspecified information. This report is prepared as a tool for the client to use in determining the condition of the site. This report makes no certification, either implied or otherwise, that the site is free from pollution; it simply reports the findings of the study. Water sampling, while being less sample-specific than soil sampling, is still area-specific and if contaminants are not found in a sample it does not universally suggest that there are none of these contaminants present in that area or at the site.

The results and findings contained in this report are based on certain information from sources outside the control of ProTech. While exercising all reasonable diligence in the acceptance and use of information provided, ProTech does not warrant or guarantee the accuracy thereof. The report was developed specifically for this project (969 San Pablo, Albany, California) and should not be used for any other site.

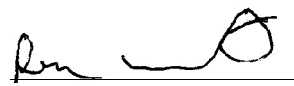
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Dr. C. Hugh Thompson, P.E.  
Civil Engineer



Sherwood Lovejoy, Jr.  
Environmental Assessor  
Consulting Hydrogeologist



Ryan Cozart  
Geologist

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**ABBREVIATIONS**

ACEH = Alameda County Environmental Health  
Aromatics = Benzene, Toluene, Ethyl-Benzene, and Xylenes (BTEX)  
FO<sub>x</sub> = Fuel Oxygenates  
GWM = Groundwater Monitoring  
GWMR = Groundwater Monitoring Report  
KMPC = Kelly Moore Paint Company  
MTBE = Methyl tert-Butyl Ether  
ND = Not Detected  
ProTech = ProTech Consulting & Engineering  
PHCs = Petroleum Hydrocarbons  
rESL = residential Environmental Screening Level  
RL = Reporting Limit  
TA = Test America, Inc.  
DRO = Diesel Range Organics (used to be TEPH-d)  
GRO = Gasoline Range Organics (used to be TPH-g)  
MORO = Motor Oil Range Organics (used to be TEPH-mo)  
TPH-ho = TPH-Hydraulic Oil Range  
VOCs = Volatile Organic Compounds

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## **1.0 - PROJECT BACKGROUND**

### **1.1 - INTRODUCTION**

ProTech Consulting & Engineering, Inc. (ProTech) was retained (August 2009) by Kelly-Moore Paint Company (KMPC) to perform Semi-annual groundwater monitoring and reporting at 969 San Pablo Avenue, Albany, California (site). ProTech has performed multiple tasks on this site, including: Phase I - Environmental Site Assessment, hydraulic lift removal, soil boring and groundwater monitor well installation, and groundwater monitoring. The last groundwater monitoring was performed in September 2011 and before that September 2010<sup>1</sup>. Three GWM reports had been forwarded to Alameda County Environmental Health (ACEH) without response until 27 April 2011. The work reported here was recently<sup>2</sup> required by the ACEH to obtain current information upon which to make site closure decisions. Beyond requesting monitoring, the ACEH requested that KMPC register information with the State GeoTracker site and update the information according to State requirements (see 27 April 2011 letter for all requirements).

The frequency of GWM was reduced to annual in 2011 when the site was monitored in September. This report documents monitoring that took place in early October of this year (2012).

### **1.2 - SITE DESCRIPTION**

The site is located in Albany, at the junction of San Pablo Avenue and Buchanan Street (Figure 1). A commercial building was converted from a vehicle maintenance operation to a retail paint store and a beauty aids store. The site consists of one building that is L-shaped and parking lots both in front and along the side of the building (Figure 2). The site is fully capped with a building slab and concrete parking, other than small planter box areas. The existing groundwater monitor wells are located along the west side (front) and on the north side (end) of the building, along San Pablo Avenue (Figure 2). The two most recent well locations (MW-5 and MW-6) were selected based upon existing well locations (MW-2 through MW-4), position of former

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<sup>1</sup> Before the September 2009 sampling, almost ten years had passed between GWM events. Monitoring was discontinued because the ACEH was not responding to the GWMRs filed by KMPC, including questions and requests for guidance.

<sup>2</sup> 07/24/09 letter: "The California State Water Resources Control Board (State Water Board) has approved Resolution No. 2009-0042 (Actions to Improve Administration of the UST Cleanup Fund and UST Cleanup Program). Resolution No. 2009-0042 states that, "Regional Water Board and LOP agencies shall reduce quarterly groundwater monitoring requirements to semiannual or less frequent monitoring at all site unless site-specific needs warrant otherwise and shall notify all responsible parties of the new requirements no later than August 1, 2009. The groundwater monitoring wells at your site have not been monitored since September 2000. In accordance with Resolution No. 2009-0042, groundwater monitoring for your site is to be conducted on a semiannual basis unless site-specific needs warrant otherwise. The semiannual monitoring is to be conducted during the first and third quarters. Please present results from the semiannual groundwater monitoring in groundwater monitoring reports no later than 60 days following the groundwater sampling event."

underground storage tank, and former land uses. The locations were approved by the ACEH prior to installation.

### 1.3 - SITE BACKGROUND

The site is a former vehicle repair facility which was operated by Firestone Tire and Rubber until the early 1990 when it was sold to Super Shops, Inc. Super Shops operated it as vehicle repair and modification shop. Firestone operated a waste oil tank on the site until they removed it in May 1990 (ERM, 1990a).

Initially, constituents of potential concern (COPC) were defined by ERM and accepted by ACEH to included: [total extractible petroleum hydrocarbons, characterized as diesel (TEPH-d)<sup>3</sup>; oil and grease (O&G); benzene, toluene, ethyl-benzene, and Xylenes (BTEX); 1,2-dichloroethane (1,2-DCA), 1,1-dichloroethane (1,1-DCA), 1,1,1-trichloroethane (1,1,1-TCA), and Tetrachloroethylene (PCE); chromium Cr), lead (Pb), and nickel (Ni)] which were found during the tank removal (ERM, 1990a).

Well MW-4, (down gradient and away from existing buildings), and to a lesser extent well MW-5 have consistently shown COPC<sup>4</sup> during the monitoring from 1998 to 2000. The other wells have either not shown COPCs (MW-2) or sporadic detections (MW-3 and MW-6) during this period. MW-1 was destroyed years ago during soil excavation activities to remediate shallow polluted soils.

### 1.4 - ACEH CONCERNS

The ACEH reviewed ProTech's reports from April 1998 and March 1999 and prepared a comment letter. In this letter, they expressed concern about:

- The concentrations of the VOCs exceeded California rESLs.
- The status of well MW-2, and
- The limits of the former waste oil tank excavation with regard to wells MW-5 and MW-6.

ACEH directed KMPC to:

- Continue quarterly groundwater monitoring, with approval to remove TPH-g, TEPH-d, BTEX, and MTBE from the analyte list;
- Locate MW-2 or its remnants prior to resurfacing of the parking lot; and
- Plot the limits of the excavation on the site plan (ACEH, 1999b).

ProTech requested in writing that the drill cuttings be used on-site as fill material due to the lack of COPC (ProTech, 1999c). ACEH agreed to allow this re-use of soil cuttings (ACEH, 1999b).

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<sup>3</sup> TEPH-d is now referred to as Diesel Range Organics (DRO).

<sup>4</sup> Only chlorinated hydrocarbons have been found in the wells, analytes related to fuel hydrocarbons were tested for in MW-3 and MW-4 in 04/21/98 and 03/29/99, and in MW-5 and MW-6 in 03/29/99. All results were ND.

The second quarter of groundwater monitoring was performed on 16 June 1999. During reconnaissance and setup for sampling the four wells (MW-3, MW-4, MW-5, and MW-6) we discovered well MW-2. It had been buried under the planter along the north end of the building. We sampled all five wells. Well MW-2 did not contain any of the compounds tested. The other four wells (MW-3, MW-4, MW-5, and MW-6) all contained 1,1-DCA, and PCE, while wells MW-5 and MW-6 contained chloroform and TCE also. Well MW-4 also contained 1,1-DCE, cis-1,2-DCE, and vinyl chloride. California rESLs continued to be exceeded in well MW-4 for 1,1-DCA, cis-1,2-DCE, PCE, TCE and vinyl chloride, and in well MW-5 for 1,1-DCA. Well MW-2 was surveyed for TOC elevation. ProTech requested verbally that SVOCs be removed from the analyte list for quarterly monitoring since they had not been detected in previous monitoring events (ProTech, 1999c).

The County reviewed the ProTech QMR, including a proposed risk management assessment to close the site, and prepared a comment letter (ACEH, 1999c). In this letter, they expressed concern that:

- “Risk Management Plan (RMP) may essentially allow for a reduced frequency in groundwater monitoring, however it would not include closure for the site” based on fact that concentrations of VOCs continue to exceed California rESLs.
- “Analysis for SVOCs may be discontinued due to Non Detect results from past sampling event. It appears that you have already taken the initiative to discontinue the analysis for SVOCs, based on the fact that this monitoring event did not include the analysis for these constituents”;
- “Future groundwater monitoring reports, and any additional reports or Workplans, shall include an attached cover letter, signed by a representative of your company (KMPC) acknowledging that the company has read the report and agrees to any recommendations or proposals”; and
- “Future groundwater monitoring reports include copies of field data sheets showing levels of turbidity, noting odors, percent recharge in wells when samples were collected, pH, temperature, etc.”

The third quarter of groundwater monitoring was performed on 15 September 1999. We sampled all five wells. Well MW-2, again, did not contain any of the compounds tested. The other four wells (MW-3, MW-4, MW-5, and MW-6) contained 1,1-DCA, PCE, and TCE, while MW-4 also contained 1,1-DCE, cis-1,2-DCE, and vinyl chloride. California rESLs continue to be exceeded in well MW-4 for 1,1-DCA, cis-1,2-DCE, PCE, and vinyl chloride, while in well MW-5 1,1-DCA is above its rESL, and in well MW-6 PCE is above its rESL (ProTech, 1999d).

The County did not prepare a response letter to the third quarter monitoring report. The ACEH has been provided information to know the depth of these wells. City and County ordinances prohibit use of shallow ground water for drinking and require well casings to be sealed below the depth of the wells.

The fourth quarter of groundwater monitoring was performed on 15 December 1999. We sampled all five wells. Well MW-2, again, did not contain any of the compounds tested. The



other four wells (MW-3, MW-4, MW-5, and MW-6) contained 1,1-DCA, PCE, and TCE, while MW-4 also contained cis-1,2-DCE. California rESLs continue to be exceeded in well MW-4 for 1,1-DCA, cis-1,2-DCE, and PCE, while in well MW-5 1,1-DCA is above its rESL, and in well MW-6 PCE is above its rESL (ProTech, 2000a).

The County did not prepare a response letter to the fourth quarter monitoring report. We contacted the County a week before the March 2000 monitoring was scheduled and learned that the County case officer had been changed for this project. During this teleconference, and several more telephone exchanges over the next week, we also negotiated the method of purging that had been requested in the fourth quarter 1999 monitoring report. The negotiated method was a slow purge effort ensuring the wells were not dewatered during the removal of one wellbore volume from each well.

No response or guidance from the ACEH reviews of four submitted reports lead to a nine-year hiatus in monitoring. With no direction provided to KMPC or technical comments provided on submitted reports, field actions were suspended by KMPC.

At the request of ACEH, sampling was resumed by KMPC and the September 2009 report presents the results of the first semi-annual groundwater monitoring for 2009 (25 September 2009). The County request for continued work included no technical or administrative justification nor did ACEH provide any guidance pertaining to the significance of starting sampling, now, in light of the lack of County direction or comments on past sampling results. The County provided no indication to KMPC of current site or regional changed conditions to justify the importance of resuming monitoring. Four wells were sampled during this GWM event (MW-2, MW-3, MW-4, and MW-5). MW-6 was not sampled because it could not be located. MW-2, again, and MW-3 did not contain any of the compounds tested. MW-4 contained 1,1-DCA, cis-1,1 DCE, PCE, and TCE above the residential Environmental Screening Levels (rESLs). MW-5 contained 1,1-DCA, cis-1,1 DCE, PCE, and TCE below the rESLs<sup>5</sup>.

Sampling resumed and the March 2010 report represents the results of the first semi-annual groundwater monitoring for 2010 (29 March 2010). The results of groundwater analysis indicated that MW-4 and MW-5 show consistent detection of potential pollutants but only MW-4 shows these levels to be above the guidelines (rESLs). MW-4 contained 1,1-DCA at 25 ug/L, c-1,2-DCE at 9.2 ug/L, PCE at 21 ug/L, and TCE at 6.7 ug/L (all above their respective rESLs). MW-5 contained 1,1-DCA at 1.3 ug/L, PCE at 1.5 ug/L. MW-2 and MW-3 were ND for all compounds analyzed and MW-6 was not found during this GWM event.

GWM continued and the September 2010 report represents the results of the second semi-annual groundwater monitoring for 2010 (28 September 2010). The results of this groundwater analysis indicate that MW-4 and MW-5 show consistent detection of potential pollutants, but only MW-4 shows levels above the rESLs. MW-4 contained 1,1-DCA at 25 ug/L, c-1,2-DCE at 8 ug/L, PCE at 20 ug/L, and TCE at 6.6 ug/L (all above their respective rESLs). MW-5 contained PCE at 2.1

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<sup>5</sup> The rESLs are set to Maximum Contaminant Level-priority (MCL-priority) and the rESLs and MCLs are the same for these compounds.

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ug/L, which is below its rESL. MW-2 and MW-3 were ND for all compounds analyzed and MW-6 was not found during this GWM event.

The GWM was reduced to annually in the ACEH letter, dated 27 April 2011. GWM continued and the September 2011 report represents the first and only groundwater monitoring for 2011 (20 September 2011). The results of this groundwater analysis indicate that MW-4 and MW-5 show consistent detection of potential pollutants, but only MW-4 shows levels above the rESLs. MW-4 contained 1,1-DCA at 27 ug/L, c-1,2-DCE at 8.8 ug/L, PCE at 21 ug/L, and TCE at 6.9 ug/L (all above their respective rESLs). MW-5 contained 1,1-DCA at 1.4, and PCE at 2.2 ug/L, which are below their respective rESL. MW-6 contained 1,1-DCA at 0.88, PCE at 3.1 ug/L, and TCE at 0.89 ug/L, which are below their respective rESL. MW-2 and MW-3 were ND for all compounds analyzed.

## 2.0 - GROUNDWATER MONITORING – OCTOBER 2012

### 2.1 - INTRODUCTION

At the request of ACEH, ProTech performed the 2012 GWM at 969 San Pablo Avenue, Albany, CA on 5 October 2012. The County approved scope-of-work for this GWM is outlined below:

1. Measure the depth-to-groundwater (DTW) and total depth (TD) in each of the groundwater monitor wells;
2. Purge each well prior to collecting a groundwater sample for analysis;
3. Analyze each of the groundwater samples for Halogenated Volatile Organic Compounds (HVOCs) by EPA Method 8260. Also, at the request<sup>6</sup> of the ACEH, each groundwater sample was analyzed for Diesel Range Organics (DRO), Motor Oil Range Organics (MORO), and Total Purgeable Hydrocarbons hydraulic oil (TPH-ho) by EPA Method 8015B. This GWM event represents the first time DRO has been analyzed since 3/29/99 and the first time MORO and TPH-ho have ever been analyzed);
4. Prepare a groundwater monitoring report that includes the results of DTW measurements, and groundwater sample analysis. The report will include:
  - Tables showing tabulated DTW, development and purge parameters, groundwater elevations, and analytical results;
  - Figures illustrating groundwater flow direction; and
  - Appendix that includes laboratory reported results and chain-of-custody (COC) forms.

The fieldwork and laboratory analysis tasks are completed. This document represents the report task of the project.

### 2.2 - ELEVATION MEASUREMENTS

DTW and TD measurements for each monitoring well were recorded by ProTech on 5 October 2012. The locations of the wells are shown on Figure 2. During this monitoring event, DTW was measured between 9.35 (MW-3) and 9.74 (MW-2) feet below the top of the monitor well casings (TOC) with the corresponding elevations being 32.14 feet above mean sea level (ft-amsl) [MW-3] and 32.11 ft-amsl [MW-5]. Groundwater level data for the site are included in Table 1.

The groundwater elevation measurements recorded for this monitoring event were used to construct an inferred groundwater flow direction map with gradient included as Figure 3<sup>7</sup>. Figure 4 represents an interpretation of the potential groundwater elevation contour map. According to

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<sup>6</sup> The County upon which to base this request provided no technical or administrative information on area water quality change to KMPC.

<sup>7</sup> For a lot this small and wells so shallow, determining the actual ground water velocity and direction of this shallow system is of questionable feasibility plus the precision and accuracy is not well defined.

the EPA On-line Tools for Site Assessment Calculation<sup>8</sup>, the average hydraulic gradient for this site is 0.01122 and the flow direction was 149.7° of north.

### 2.3 - GROUNDWATER WELL PURGING & SAMPLING

We calculated the total wellbore water volume using the DTW and TD measurements to determine the volume of groundwater removal from each well<sup>9</sup>. Usually, at least three wellbore volumes are removed, unless the wells are low-flow wells<sup>10</sup> or other arrangements have been made with the agency<sup>11</sup>. These calculations are shown in Table 2.

ProTech purged the wells using a 2-stage purge/sampling pump. We dedicated the down-hole tubing to each well and do not handle or clean this tubing between events so it does not need cleaning, thus preventing cross-contamination. We cleaned the purge/sampling pump, using a triple-rinse setup<sup>12</sup>, between wells<sup>13</sup>. This system has been proven to produce ND results when there are no pollutants and this method is approved by ACEH. ProTech purged one well bore volume at a low rate to attempt to ensure that wells did not dewater. Monitor wells (MW-3 and MW-4) dewatered during this monitoring event even after these low-flow efforts. Once purged, ProTech sampled groundwater in the appropriate sample containers (3 - 40-ml VOA vials and 2 - Amber liters). We sealed the containers, checked for bubbles, labeled, and placed them on ice pending transport to the laboratory. The purge volume and parameters are in Tables 2 and 3, respectively. ACEH has been advised of the potential for the well purging actions to dewater the wells plus the undefined changes made to the sampled shallow groundwater.

#### 2.3.1 – MW-2

We removed approximately 3.5 gallons (~1.11 wellbore volumes) from this well during purging. The well did dewater at end of purging and was allowed to recharge before sampling. The water was silty at start and cleared up by the time samples were collected. ACEH has been advised of the potential for the well purging actions to dewater the wells plus the undefined changes made

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<sup>8</sup> <http://www.epa.gov/athens/learn2model/part-two/onsite/index.html>.

<sup>9</sup> We determine the volume of groundwater that needs removal from each well by finding the water column height (WCH) using [DTW-TD=WCH], then determine the cubic feet (ft<sup>3</sup>) using [WCH\* $\pi$ \*r<sup>2</sup>], and then convert ft<sup>3</sup> to gallons using [ft<sup>3</sup> \* 7.48].

<sup>10</sup> Low-Flow wells are dewatered and then allowed to recover 80% of their static level before sampling.

<sup>11</sup> The ACEH has approved removing one wellbore volume prior to sampling and that the flow rate be sufficiently low so as not to dewater wells.

<sup>12</sup> A triple-rinse setup is three buckets, the first with water and TSP, the second with water, and the third with DI water. The pump is soaked and scrubbed with a scrub brush in the first bucket to remove contaminants. We rinse the pump vigorously in the second bucket, and again in the third bucket. TCG rinses the buckets and refills them after each decontamination event.

<sup>13</sup> During purging, we measure the parameters: pH, conductivity, and temperature, while we observe clarity or turbidity of water. We monitor parameters a few gallons after commencement of pumping, at the mid-point, and at the end-point of pumping.

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to the sampled shallow groundwater. The purge water was placed in a 55-gallon drum on-site and there were no bubbles in the unpreserved VOA vials and Amber liter bottles<sup>14</sup>.

### 2.3.2 – MW-3

We removed approximately 3.5 gallons (~1.08 wellbore volumes) from this well during purging. The well dewatered at 2.5 gallons. ACEH has been advised of the potential for the well purging actions to dewater the wells plus the undefined changes made to the sampled shallow groundwater. The pump was turned off at dewatering, turned back on to remove an additional gallon, after recharging, prior to sampling. The water was clear at the start and clear samples were collected. The purge water was placed in a 55-gallon drum on-site and there were no bubbles in the unpreserved VOA vials and Amber liters.

### 2.3.3 – MW-4

We removed approximately 3.5 gallons (~1.01 wellbore volumes) from this well during purging. The well dewatered at 3 gallons. ACEH has been advised of the potential for the well purging actions to dewater the wells plus the undefined changes made to the sampled shallow groundwater. The pump was turned off at dewatering, turned back on to remove an additional ½ gallon, after recharging, prior to sampling. The water was cloudy at start and did not clear up. Cloudy samples were collected. The purge water was placed in a 55-gallon drum on-site and there were no bubbles in the unpreserved VOA vials and Amber liters.

### 2.3.4 – MW-5

We removed approximately 7 gallons (~1.02 wellbore volumes) from this well during purging. The well did not dewater. The pump was turned on and left running the entire time. Water was clear at start and clear samples were collected. The purge water was placed in a 55-gallon drum on-site and there were no bubbles in the unpreserved VOA vials and Amber liters.

### 2.3.5 – MW-6

Well MW-6 was sampled during this event for the second time since 3/16/2000 and the first time was 9/20/2011. We removed approximately 7 gallons (~0.98 wellbore volumes) from this well during purging. The well did not dewater. Water was silty at start and cleared up after one minute. Clear samples were collected. The purge water was placed in a 55-gallon drum on-site and there were no bubbles in the unpreserved VOA vials and Amber liters.

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<sup>14</sup> Unpreserved VOA vials and Amber liters were used due to bubble formation in the preserved sampling containers.

## 2.4 - ANALYTICAL RESULTS<sup>15</sup>

We delivered, under COC protocols, to Test America's (TA) Pleasanton laboratory for analysis. TA analyzed the groundwater samples for: HVOCs by EPA 8260, and DRO, MORO, and TPH-ho by EPA method 8015B. This GWM event represents the first time DRO (previously designated as TPH-Diesel) has been analyzed since 3/29/00 and the first time MORO (previously designated as TPEH-mo) and TPH-ho have ever been analyzed. The results are discussed below, tabulated in Table 1, and illustrated in Figures 5 through 13. The Laboratory Results and COC form are included in Appendix 1.

### 2.4.1 – MW-2

The results of analysis indicate that:

- DRO was detected at 51 ug/L with an RL of 50 ug/L, which is below its rESL,
- MORO was detected at 110 ug/L with an RL of 100 ug/L, which is above its rESL,
- All other compounds tested were below their RLs.

### 2.4.2 – MW-3

The results of analysis indicate that:

- DRO was detected at 110 ug/L with an RL of 50 ug/L, which is above its rESL,
- MORO was detected at 320 ug/L with an RL of 99 ug/L, which is above its rESL,
- All other compounds tested were below their RLs.

### 2.4.3 – MW-4

The results of analysis indicate that:

- 1,1-DCE was detected at 0.70 ug/L with an RL of 0.50 ug/L, which is below its rESL,
- 1,1-DCA was detected at 35 ug/L with an RL of 0.50 ug/L, which is above its rESL,
- cis-1,2-DCE was detected at 9.5 ug/L with an RL of 0.50 ug/L, which is above its rESL,
- TCE was detected at 6.8 ug/L with an RL of 0.50 ug/L, which is above its rESL, and
- PCE was detected at 21 ug/L with an RL of 0.50 ug/L, which is above its rESL.
- All other compounds tested were below their RLs.

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<sup>15</sup> In reviewing these data, the County may wish to consider that sampling this very shallow ground water in an old urban area (where the shallow soils have been repeatedly disturbed or imported) would be unlikely to represent the quality of any beneficially useful groundwater. Other sites in the Bay Area have been granted closure with pollutants at higher concentrations than at this site.

#### 2.4.4 – MW-5

The results of analysis indicate that:

- 1,1-DCA was detected at 1.8 ug/L with an RL of 0.50 ug/L, which is below its rESL,
- PCE was detected at 3.5 ug/L with an RL of 0.50 ug/L, which is below its rESL, and
- DRO was detected at 70 ug/L with an RL of 50 ug/L, which is below its rESL,
- All other compounds tested were below their RLs.

#### 2.4.5 – MW-6

The results of analysis indicate that:

- 1,1-DCA was detected at 1.0 ug/L with an RL of 0.50 ug/L, which is below its rESL,
- TCE was detected at 1.0 ug/L with an RL of 0.50 ug/L, which is below its rESL, and
- PCE was detected at 3.7 ug/L with an RL of 0.50 ug/L, which is below its rESL.
- All other compounds tested were below their RLs.

### 2.5 – ENVIRONMENTAL SCREENING LEVELS COMPARISON

Below is a table showing the detected results, by well, and the residential Environmental Screening Levels [rESLs] (MCL-priority) for those compounds<sup>16</sup>. The rESLs (MCL-priority) are regulatory limits for drinking water and from common practice they have become similar to “default cleanup standards for groundwater”. When a constituent is detected in more than one analysis, then the highest result is used for comparison.

COMPARISON OF RESULTS TO RESIDENTIAL ENVIRONMENTAL SCREENING LEVELS [rESLs] (MCL-PRIORITY)						
Constituent	MW-2	MW-3	MW-4	MW-5	MW-6	rESL <sup>1</sup>
1,1-DCA	ND	ND	<b>35</b>	<b>1.8</b>	<b>1.0</b>	5
1,1-DCE	ND	ND	<b>0.7</b>	ND	ND	6
cis-1,2-DCE	ND	ND	<b>9.5</b>	ND	ND	6
PCE	ND	ND	<b>21</b>	<b>3.5</b>	<b>3.7</b>	5
TCE	ND	ND	<b>6.8</b>	ND	<b>1.0</b>	5
VC	ND	ND	ND	ND	ND	0.5
DRO	<b>51</b>	<b>110</b>	ND	<b>70</b>	ND	100
MORO	<b>110</b>	<b>320</b>	ND	ND	ND	100
TPH-ho	ND	ND	ND	ND	ND	100

**Notes:**  
<sup>1</sup> = MCL-priority  
 Results in ug/L, rESLs in ug/L  
**Bold = Detected**  
**Bold Italics = ≥ rESL**  
 Citation: *Screening For Environmental Concerns at Sites With Contaminated Soil and Groundwater* (November 2007), San Francisco Bay Regional Water Quality Control Board, California EPA, <http://www.waterboards.ca.gov/sanfranciscobay/esl.htm> (updated: May 2008).

<sup>16</sup> These limits can be found in the Environmental Screening Levels, using the rESL-priority levels for groundwater. *Screening For Environmental Concerns at Sites with Contaminated Soil and Groundwater* (November 2007), San Francisco Bay Regional Water Quality Control Board, California EPA.

As illustrated in the above table, MORO exceeded its rESL and DRO was detected below its rESL in MW-2. MORO and DRO exceeded their rESLs in MW-3. 1,1-DCA, cis-1,2-DCE, TCE, and PCE all exceeded their rESLs and 1,1-DCE was detected below its rESL in MW-4. MW-5 had detections of 1,1-DCA, PCE, and DRO, while MW-6 had detections of 1,1-DCA, PCE, and TCE, but all are below their rESLs.

The following Table shows the detected result, the corresponding rESL, and the multiple of the rESL. In urban areas there is a disparity of VOCs, based on numerous issues.<sup>17</sup>

<b>Analytical Results Multiple Over (Under) rESLs</b>				
<b>Well #</b>	<b>Constituent</b>	<b>Analytical Result</b>	<b>rESL*</b>	<b>X rESL</b>
MW-2	MORO	110	100	1.0
MW-3	DRO	110	100	1.0
MW-3	MORO	320	100	3.2
MW-4	1,1-DCA	35	5	6
MW-4	cis-1,2-DCE	9.5	6	1.58
MW-4	PCE	21	5	4.2
MW-4	TCE	6.8	5	1.36

Notes:  
 \* = rESL (MCL-Priority)  
 X rESL = Analytical Result multiple of rESL

<sup>17</sup> Breton W. Bruce, Peter B. McMahon, Shallow ground-water quality beneath a major urban center: Denver, Colorado, USA, Journal of Hydrology, Volume 186, Issues 1-4, 15 November 1996, Pages 129-151, ISSN 0022-1694, DOI: 10.1016/S0022-1694 (96) 03031-4. (<http://www.sciencedirect.com/science/article/B6V6C-3VWNHTW-7/2/92dbeac9f091db245bbd4c18e4f0258f>)



### **3.0 – OBSERVATIONS, CONCLUSIONS, AND RECOMMENDATIONS**

#### **3.1 - OBSERVATIONS**

ACEH has been advised of the potential for the well purging actions to dewater the wells plus the undefined changes made to the sampled shallow groundwater. The chemical results from all the wells except MW-5, and MW-6 cannot be representative of formation groundwater without significant disturbance. Sampling potential silt carried chemicals, violent well water mixing and well water aeration all contribute to the difficulties of interpreting the sampling results.

Ignoring the above cautions, the following observations about chemical impact were made:

- The results of groundwater analysis indicate that MW-4 contained 1,1-DCA at 35 ug/L, c-1,2-DCE at 9.5 ug/L, PCE at 21 ug/L, and TCE at 6.8 ug/L (all above their respective rESLs) and 1,1 DCE at 0.7 ug/L below its respective rESL.
- MW-5 contained PCE at 3.5 ug/L, 1,1-DCA at 1.8 ug/L, and DRO at 70 ug/L, which are all below their respective rESLs.
- MW-2 contained DRO at 51 ug/L, which is below its respective rESL and MORO at 110 ug/L, which is above its respective rESL.
- MW-3 contained DRO at 110 ug/L and MORO at 320 ug/L, which are both above their respective rESLs.
- MW-6 was sampled for the second time since 3/16/2000 (first time since 9/20/2011) during this GWM event. MW-6 contained 1,1 DCA at 1.0 ug/L, PCE at 3.7 ug/L, and TCE at 1.0 ug/L, which are below their respective rESLs.<sup>18</sup>

Table 2 shows calculations and observations of ProTech's well purging practice. The parameters of pH, conductivity, and temperature were measured during purging (Table 3) and indicate that, there is some stabilization before sampling. The samples were consistent with the Chain-of-Custody (COC). There were no bubbles were reported in the TA checklist.

The on-site inferred (estimated) groundwater flow direction and gradient, according to EPA On-line Tools for Site Assessment Calculation, is towards the southwest (149.7° of north), with an average hydraulic gradient of 0.01122 (Table 4).

#### **3.2 - CONCLUSIONS**

From the above observations, and our history with the site, we formed the following conclusions (not withstanding the observations of unknown constituent concentration effects of sampling dewatered wells):

1. Figures 5 through 8 show the historic concentrations of PCE, TCE, c1,2-DCE, and 1,1-DCA. All of these constituents, except PCE are trending downward (near or at their lows in the most recent sampling) from all

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<sup>18</sup> The County may wish to consider the facts that the up-gradient wells closer to the former sources do not support positive findings, while the down-gradient wells closer to buried utilities and adjacent property appear to be maintaining higher levels of COPCs. It is common for sewers to leak VOCs and groundwater VOCs can be found in the presence of Nitrate, Nitrite, and fecal coliform.

- the data collected since 1998<sup>19</sup>,
2. Figures 9 through 11 illustrate the isoconcentration contours of PCE, TCE, c1,2-DCE, and 1,1-DCA, while Figures 12 and 13 illustrate the isoconcentration contours of DRO and MORO.
  3. The HVOCs seem to be in excess of ESLs in only MW-4, while DRO is in excess of ESL in MW-2 and MW-3, and MORO is in excess of ESL in MW-3.
  4. There continues to be no threat to public health from direct exposure (area paved), inhalation (no odors – lots of air movement), or from drinking water, as shallow groundwater (<50 fbg) is not allowed for consumptive use and is too shallow due to normally prohibited pumping of shallow ground water due to potential water borne disease transport. In addition the area has been and continues to be supplied by municipal water service that draws water from out of this vicinity,
  5. Limited Beneficial Uses and non-degradation policies of the State, may be considered in light of this site's long history and natural attenuation and degradation of constituents, that has already been accepted by California Regulatory Agencies at other sites and has been recommended by Senate Bill 1764 Advisory Committee Recommendations Report.<sup>20</sup>,

### 3.3 - RECOMMENDATIONS

Based on the above observations and conclusions, we recommend:

1. The County needs to recognize the high uncertainty associated with using these data as an indication of groundwater pollution affecting beneficial uses of waters of the State of California.
2. Completion of the Site Conceptual Model with an overall recommendation at the end of that task.

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<sup>19</sup> There was an unusual occurrence between November 1999 and March 2000, MW-2 and MW-3 dropped 3+ feet, while MW-6 dropped 1.5 feet, MW-5 dropped 0.5 feet and MW-4 dropped only 0.15 feet.

<sup>20</sup> Section 8 – Beneficial Use Designations and Water Quality Objectives, pp. 12.

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#### **4.0 - REFERENCES**

- Breton W. Bruce, Peter B. McMahon, Shallow ground-water quality beneath a major urban center: Denver, Colorado, USA, Journal of Hydrology, Volume 186, Issues 1-4, 15 November 1996, Pages 129-151, ISSN 0022-1694, DOI: 10.1016/S0022-1694 (96) 03031-4. (<http://www.sciencedirect.com/science/article/B6V6C-3VWNHTW-7/2/92dbeac9f091db245bbd4c18e4f0258f>)
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**TABLES**

**Table 1 - Groundwater Elevation Measurement and Analytical Results**  
 Kelly-Moore Paint Company  
 969 San Pablo Avenue, Albany, CA  
 ProTech Project #383-12

WELL #	DATE	TOC	DTW	GW-ELEV	Δ-Elev	Chlfrm	1,1-DCA	1,1-DCE	c1,2-DCE	PCE	TCE	VC	GRO	DRO	MORO	TEPH-ho	
MW-2	06/16/99	42.14	8.36	33.78		ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	
	09/15/99	42.14	9.25	32.89	0.89	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	
	12/15/99	42.14	8.36	33.78	-0.89	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	
	03/16/00	42.14	5.18	36.96	-3.18	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	
	09/25/09	42.14	8.35	33.79	3.17	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	
	03/29/10	42.14	5.49	36.65	2.86	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	
	09/28/10	42.14	9.64	32.5	-4.15	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	
	09/20/11	42.14	9.22	32.92	0.42	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	
	10/05/12	42.14	9.74	32.4	-0.52	ND	ND	ND	ND	ND	ND	ND	NA		51	110	ND
	MW-3	04/21/98	41.49	7.33	34.16		ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA
03/29/99		41.49	5.6	35.89	-1.73	ND	1.2	ND	ND		1.7	1.6	ND	ND	NA	NA	
06/16/99		41.49	7.95	33.54	2.35	ND	1.3	ND	ND		1.7	2.3	ND	NA	NA	NA	
09/15/99		41.49	8.73	32.76	0.78	ND	1.4	ND	ND		1.6	1.9	ND	NA	NA	NA	
12/15/99		41.49	8.36	33.13	-0.37	ND	0.97	ND	ND		1	0.98	ND	NA	NA	NA	
03/16/00		41.49	5.05	36.44	-3.31	ND	1.2	ND	ND		1.6	2	ND	NA	NA	NA	
09/25/09		41.49	8.8	32.69	3.75	ND	ND	ND	ND		ND	ND	NA	NA	NA	NA	
03/29/10		41.49	7.14	34.35	1.66	ND	ND	ND	ND		ND	ND	NA	NA	NA	NA	
09/28/10		41.49	9.3	32.19	-2.16	ND	ND	ND	ND		ND	ND	NA	NA	NA	NA	
09/20/11		41.49	8.85	32.64	0.45	ND	ND	ND	ND		ND	ND	NA	NA	NA	NA	
10/05/12	41.49	9.35	32.14	-0.5	ND	ND	ND	ND		ND	ND	NA		110	320	ND	
MW-4	04/21/98	41.15	7.52	33.63		ND	34	ND		5.3	3.6	ND	ND	ND	NA	NA	
	03/29/99	41.15	7.5	33.65	-0.02	ND	84	1.5		25	18	6.5	3.1	ND	ND	NA	
	06/16/99	41.15	8.73	32.42	1.23	ND	76	1.3		23	20	6.4	2.4	NA	NA	NA	
	09/15/99	41.15	9.18	31.97	0.45	ND	61	0.74		18	16	4.4	0.91	NA	NA	NA	
	12/15/99	41.15	8.95	32.2	-0.23	ND	37	ND		11	5.7	2.5	ND	NA	NA	NA	
	03/16/00	41.15	8.8	32.35	-0.15	ND	58	0.84		18	10	44	1.2	NA	NA	NA	
	09/25/09	41.15	9.3	31.85	0.5	ND	33	ND		12	15	6.7	ND	NA	NA	NA	
	03/29/10	41.15	7.6	33.55	1.7	ND	25	ND		9.2	21	6.7	ND	NA	NA	NA	
	09/28/10	41.15	9.35	31.8	-1.75	ND	25	ND		8	20	6.6	ND	NA	NA	NA	
	09/20/11	41.15	8.87	32.28	0.48	ND	27	ND		8.8	21	6.9	ND	NA	NA	NA	
10/05/12	41.15	9.38	31.77	-0.51	ND	35	0.7		9.5	21	6.8	ND	NA	ND	ND		
MW-5	03/29/99	41.71	8.14	33.57		0.97	5.3	ND	ND		1.6	1.6	ND	ND	NA	NA	
	06/16/99	41.71	8.91	32.8	0.77	0.63	4.8	ND	ND		1.5	1.8	ND	NA	NA	NA	
	09/15/99	41.71	9.2	32.51	0.29	ND	6.4	ND	ND		1.8	1.8	ND	NA	NA	NA	
	12/15/99	41.71	8.86	32.85	-0.34	ND	6.7	ND	ND		1.5	1.4	ND	NA	NA	NA	
	03/16/00	41.71	8.3	33.41	-0.56	0.61	5.3	ND	ND		1.3	1.1	ND	NA	NA	NA	
	09/25/09	41.71	9.89	31.82	1.59	ND	4.8	ND	0.76		2.7	0.88	ND	NA	NA	NA	
	03/29/10	41.71	8.33	33.38	1.56	ND	1.3	ND	ND		1.5	ND	ND	NA	NA	NA	
	09/28/10	41.71	9.79	31.92	-1.46	ND	2.1	ND	ND		ND	ND	ND	NA	NA	NA	
	09/20/11	41.71	9.71	32	0.08	ND	1.4	ND	ND		2.2	ND	ND	NA	NA	NA	
	10/05/12	41.71	9.6	32.11	0.11	ND	1.8	ND	ND		3.5	ND	ND	NA	70	ND	
MW-6	03/29/99	42.04	7.74	34.3		0.78	1.4	ND	ND		6.8	0.8	ND	ND	NA	NA	
	06/16/99	42.04	9.25	32.79	1.51	ND	1.4	ND	ND		5.3	0.8	ND	NA	NA	NA	
	09/15/99	42.04	9.71	32.33	0.46	ND	1.8	ND	ND		6.2	0.87	ND	NA	NA	NA	
	12/15/99	42.04	9	33.04	-0.71	ND	1.2	ND	ND		4.8	0.56	ND	NA	NA	NA	
	03/16/00	42.04	7.38	34.66	-1.62	ND	1.3	ND	ND		5.6	0.74	ND	NA	NA	NA	
	09/25/09	42.04	NM			NA	NA	NA	NA		NA	NA	NA	NA	NA	NA	
	03/29/10	42.04	NM			NA	NA	NA	NA		NA	NA	NA	NA	NA	NA	
	09/28/10	42.04	NM			NA	NA	NA	NA		NA	NA	NA	NA	NA	NA	
	09/20/11	42.04	9.12	32.92		ND	0.88	ND	ND		3.1	0.89	ND	NA	NA	NA	
	10/05/12	42.04	9.7	32.34	-0.58	ND	1	ND	ND		3.7	1	ND	NA	ND	ND	

**Table 1 - Groundwater Elevation Measurement and Analytical Results**  
**Kelly-Moore Paint Company**  
**969 San Pablo Avenue, Albany, CA**  
**ProTech Project #383-12**

WELL #	DATE	TOC	DTW	GW-ELEV	Δ-Elev	Chlfrm	1,1-DCA	1,1-DCE	c1,2-DCE	PCE	TCE	VC	GRO	DRO	MORO	TEPH-ho
Notes:	TOC = top of casing elevation (ft above mean sea level - [ft-amsl]) DTW = depth to water (ft below TOC) GW-ELEV = groundwater elevation (ft-amsl) D-Elev = change in elevation (ft) from one GWM to the next All results reported in parts-per-billion (ppb) MCL = maximum contaminant level (EPA and California cited) Chlfrm = Chloroform (RL-0.5 ppb) (MCL-80 ppb) 1,1-DCA = 1,1-dichloroethane (RL-0.5 ppb) (MCL-5 ppb [California]) 1,1-DCE = 1,1-dichloroethene (RL-0.5 ppb) (MCL-7 ppb [EPA] 6 ppb [California]) c1,2-DCE = cis 1,2-dichloroethene (RL-0.5 ppb) (MCL-70 ppb [EPA] 6 ppb [California]) PCE = tetrachloroethene (RL-0.5 ppb) (MCL-5 ppb [EPA & California]) TCE = trichloroethene (RL-0.5 ppb) (MCL-5 ppb [EPA & California]) VC = vinyl chloride (RL-0.5 ppb) (MCL-2 ppb [EPA] 0.5 ppb [California]) NA = not analyzed for NM = not measured ND = not detected above method detection limit Bold = greater than California MCL												GRO= gasoline Range Organics DRO = Diesel Range Organics MORO = Motor Oil Range Organics TEPH-ho = Hydraulic Oil			

**Table 2 - Wellbore Volume Calculations**

Kelly-Moore Paint company  
 969 San Pablo Avenue, Albany, CA  
 ProTech Project #383-12

**Sampling Date:** 10/05/12

Well #	DTW	TD	DH	Well R	Well R <sup>2</sup>	WV (ft <sup>3</sup> )	WV (gal)	VR (g)	TWV
MW-2	9.74	14.58	4.84	0.17	0.03	0.42	3.16	3.50	1.11
MW-3	9.35	14.3	4.95	0.17	0.03	0.43	3.23	3.50	1.08
MW-4	9.38	14.69	5.31	0.17	0.03	0.46	3.46	3.50	1.01
MW-5	9.60	20.1	10.50	0.17	0.03	0.92	6.85	7.00	1.02
MW-6	9.70	19.85	10.15	0.17	0.03	0.96	7.15	7.00	0.98

**Notes:**  
 Wellbore volume formula used -  $\pi R^2 H$ ; where H is DH  
 DTW = depth-to water (ft below grade)  
 TD = total depth of well  
 $\Delta H$  = water column thickness (ft)  
 Well R = well radius (ft)  
 Well R<sup>2</sup> = well radius squared (ft<sup>2</sup>)  
 WV (ft<sup>3</sup>) = wellbore volume (ft<sup>3</sup>)  
 WV (gal) = wellbore volume (gallons); where 1 ft<sup>3</sup> = 7.48 gallons  
 VR (gal) = volume removed during purging (gallons)  
 TWV = total wellbore volumes removed during purging



**Table 3 - Parameter Testing Results**

Kelly-Moore Paint company  
 969 San Pablo Avenue, Albany, CA  
 ProTech Project #383-12

**Sampling Date:** 10/5/12

Well #	Interval(1)	~Gals	Parameters			Notes
			pH	Cond	Temp	
MW-2	Start	1.00	8.50	428	64.80	Silty at start cleared up by the end
	End	3.50	8.20	400	63.90	clear samples dewatered at end
MW-3	Start	1.00	7.40	622	67.30	Clear at start dewater at 2.5 gal.
	End	2.50	7.20	560	68.90	clear samples
MW-4	Start	1.00	6.50	703	66.70	Cloudy, no clear up, Dewatered
	End	3.50	6.40	686	67.80	at 3 gals, Cloudy samples
MW-5	Start	1.00	7.30	705	66.20	Clear at start
	Middle	7.00	6.70	662	67.60	
	End	7.00	6.60	627	68.00	clear samples
MW-6	Start	1.00	7.70	899	64.40	Silty at start
	Middle	5.00	8.20	815	65.10	Cleared up in 1 minute
	End	7.00	7.20	870	64.90	Clear samples

**Notes:**  
 ~Gals = approximate gallons removed at time of measurement  
 pH in standard units  
 Cond = Conductivity (µmho/cm)  
 Temp = temperature (° F)  
 (1) = wells dewatered during pumping, were then allowed to recover for sampling



# EPA On-line Tools for Site Assessment Calculation

## Hydraulic Gradient -- Magnitude and Direction

**Gradient Calculation** from fitting a plane to as many as thirty points

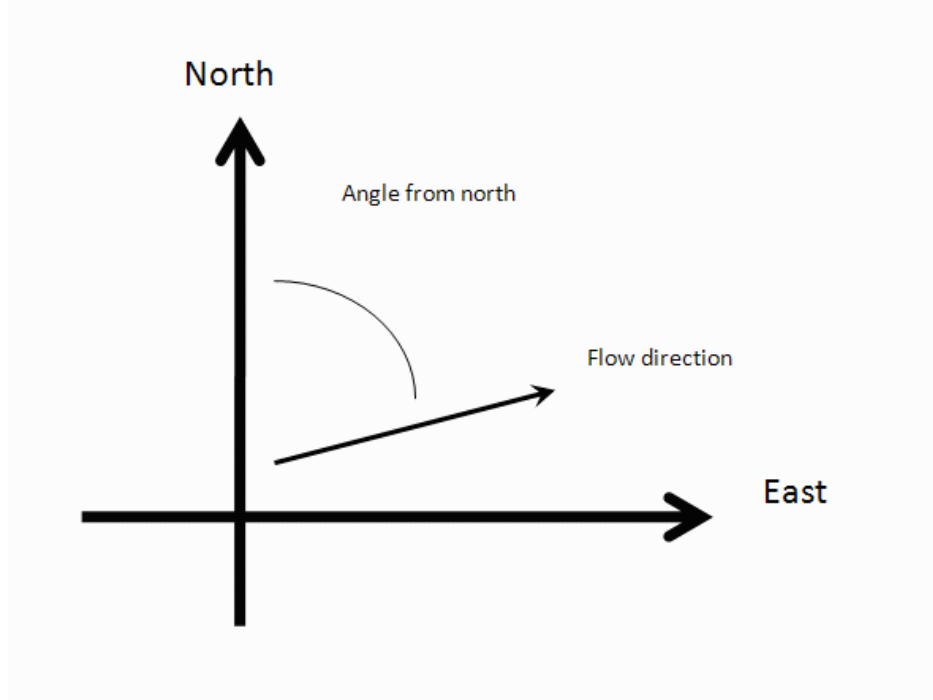
$$\begin{aligned}
 a x_1 + b y_1 + c &= h_1 \\
 a x_2 + b y_2 + c &= h_2 \\
 a x_3 + b y_3 + c &= h_3 \\
 &\dots \\
 a x_{30} + b y_{30} + c &= h_{30}
 \end{aligned}$$

where  $(x_i, y_i)$  are the coordinates of the well and  $h_i$  is the head

$i = 1, 2, 3, \dots, 30$

The coefficients  $a$ ,  $b$ , and  $c$  are calculated by a least-squares fitting of the the data to a plane

The gradient is calculated from the square root of  $(a^2 + b^2)$  and the angle from the arctangent of  $a/b$  or  $b/a$  depending on the quadrant



### Inputs

Site Name

Date

Calculation basis

Coordinates

I.D.

1)	MW-2	-20	57	32.4
2)	MW-3	-32	11.5	32.14
3)	MW-4	-1	3.5	31.77
4)	MW-5	11	33	32.11
5)	MW-6	-12	44	32.34
6)				
7)				
8)				

9)				
10)				
11)				
12)				
13)				
14)				
15)				
16)				
17)				
18)				
19)				
20)				
21)				
22)				
23)				
24)				
25)				
26)				
27)				
28)				
29)				
30)				

**Results**

Number of Points Used in Calculation	5
Max. Difference Between Head Values	0.1920
Gradient Magnitude (i)	0.01122
Flow direction as degrees from North (positive y axis)	149.7
Coefficient of Determination (R <sup>2</sup> )	0.934

WCMS

Last updated on January 5, 2012

**FIGURES**



Site 12.73 mi



Site 3144 ft



Site 810 ft

**ProTech Consulting & Engineering**  
 1208 Main Street, Redwood City, CA 94063  
 Tele: 650.569.4020 / Fax: 650.569.4023

Job No.	<b>383-OH12</b>
Date	<b>22 October 2012</b>
Drawn by	<b>RC</b>
Rev	<b>WL</b>
Apprvd	<b>WL</b>

**Site Location**  
 Kelly-Moore Paint Company  
 696 San Pablo Avenue, Albany, CA  
 for: W.E. Berry  
 P.O. Box 3016, San Carlos, CA 94070

Project



Figure

**1**



**Key**  
 ☆ Monitoring Well  
 41.19 = Top of Casing Elevation  
 ft amsl = feet above mean sea level

**ProTech**

1208 Main Street, Redwood City, CA 94063  
 Tel: 650.569.4020 / Fax: 650.569.4023

**TOC Elevations (ft)**

696 San Pablo Avenue, Albany, CA  
 for  
 Kelly-Moore Paint Company  
 P.O. Box 3016, San Carlos, CA 94070

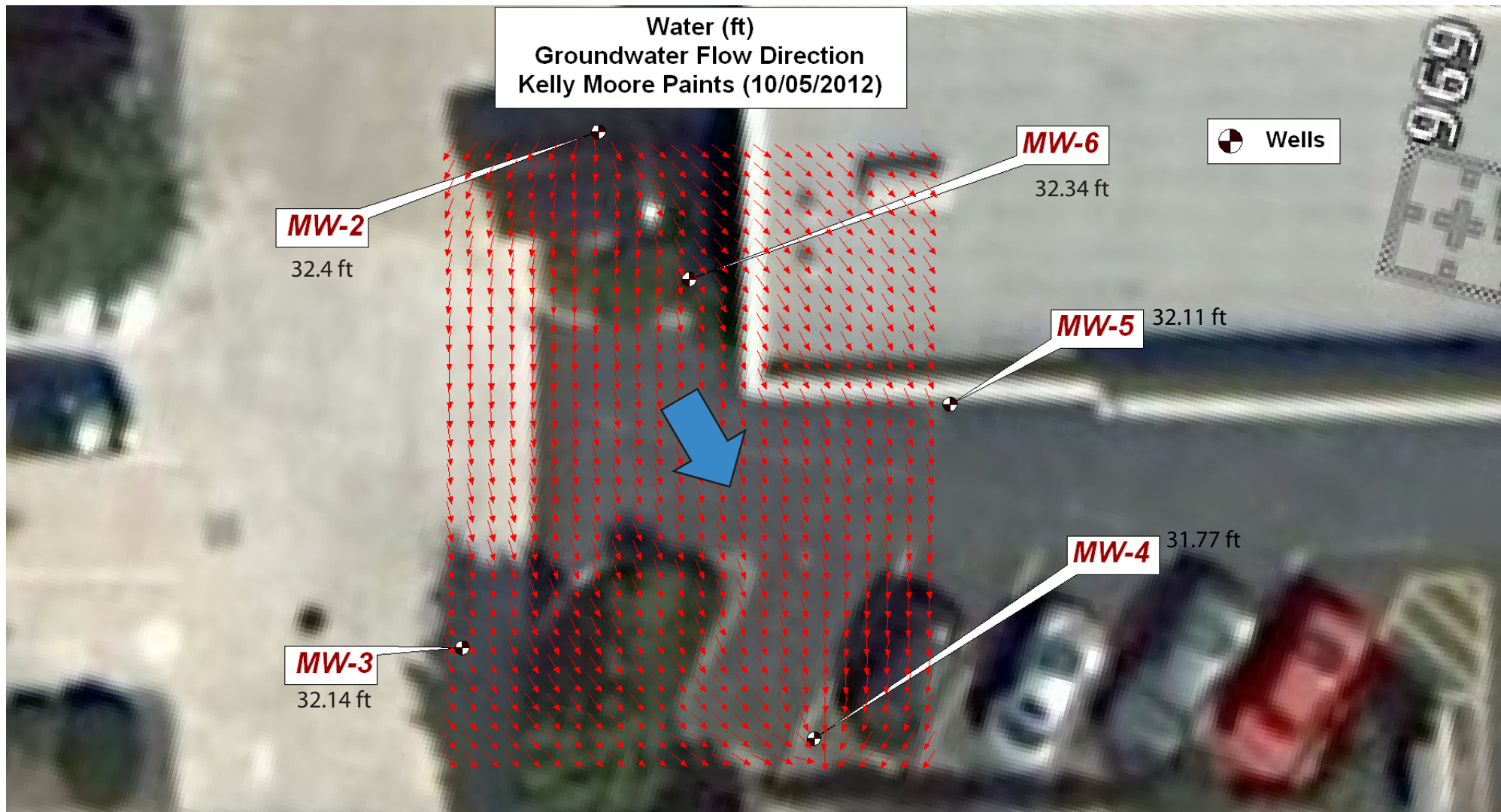
Project



Figure

**2**

Job No. 383-OH12	Date 22 Oct 2012	Drawn by WL	Rev. WL	Apprvd. WL
------------------	------------------	-------------	---------	------------



↙ Calculated flow direction 149.7 degrees (from EPA north ↑) as per EPA Site Assessment Calculation.

Calculated average gradient as per EPA Site Assessment Calculation = 0.01122.

Contours drawn by Enviroinsite

## ProTech Consulting & Engineering

1208 Main Street, Redwood City, CA 94063  
 Tele: 650.569.4020 / Fax: 650.569.4023

Job No.	383-OH12
Date	22 October 2012
Drawn by	RC
Rev	SL
Apprvd	SL

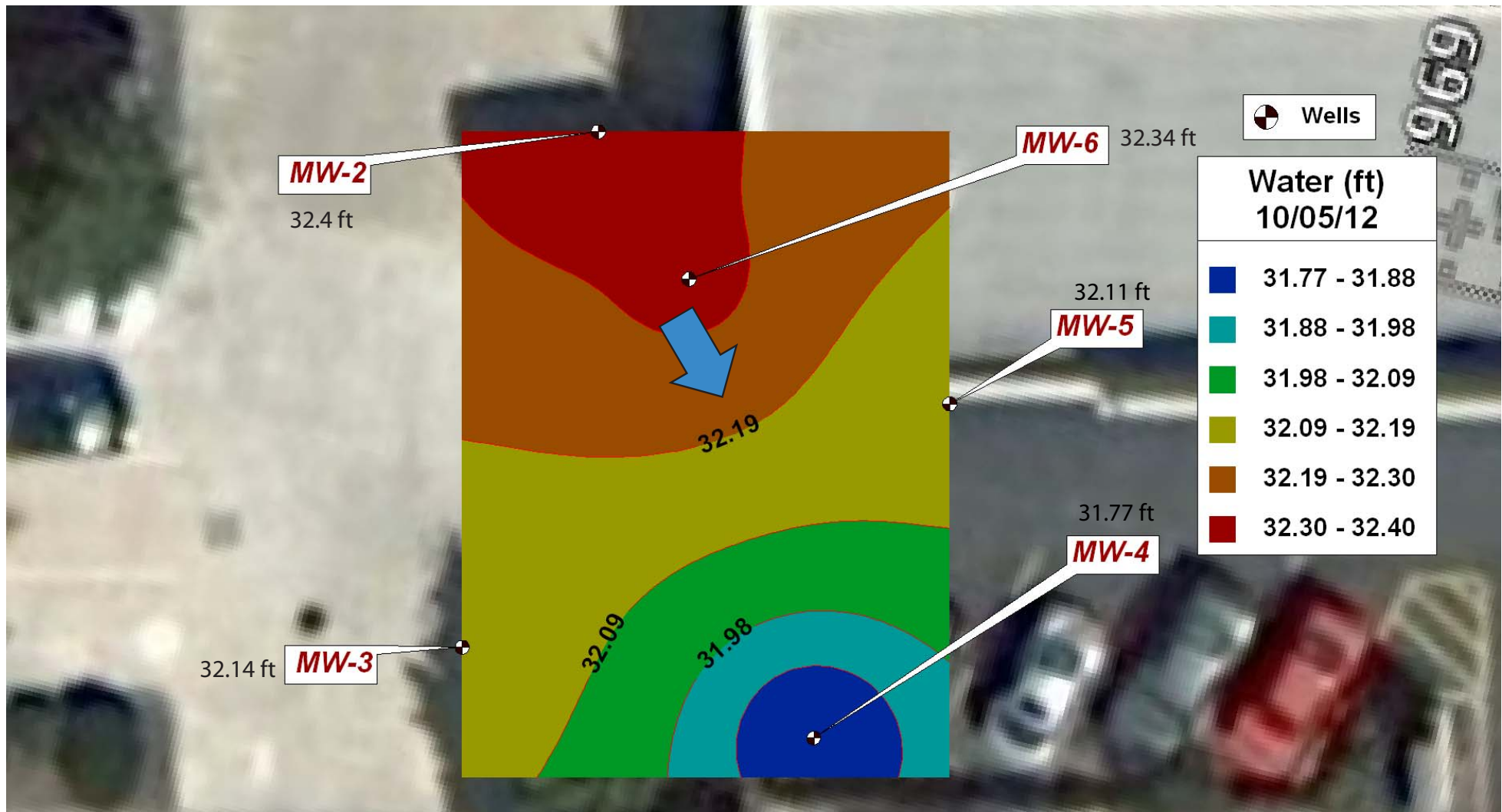
**Groundwater Flow Direction**  
 Kelly-Moore Paint Company (10/5/2012)  
 696 San Pablo Avenue, Albany, CA  
 for: W.E. Berry  
 P.O. Box 3016, San Carlos, CA 94070

Project



Figure

**3**



↙ Calculated flow direction 149.7 degrees (from EPA north ↑) as per EPA Site Assessment Calculation.

Calculated average gradient as per EPA Site Assessment Calculation = 0.01122.

Contours drawn by Enviroinsite

**ProTech Consulting & Engineering**  
 1208 Main Street, Redwood City, CA 94063  
 Tele: 650.569.4020 / Fax: 650.569.4023

Job No.	383-OH12
Date	22 October 2012
Drawn by	RC
Rev	SL
Apprvd	SL

**Groundwater Elevation Contour**  
 Kelly-Moore Paint Company (10/05/2012)  
 696 San Pablo Avenue, Albany, CA  
 for: W.E. Berry  
 P.O. Box 3016, San Carlos, CA 94070

Project

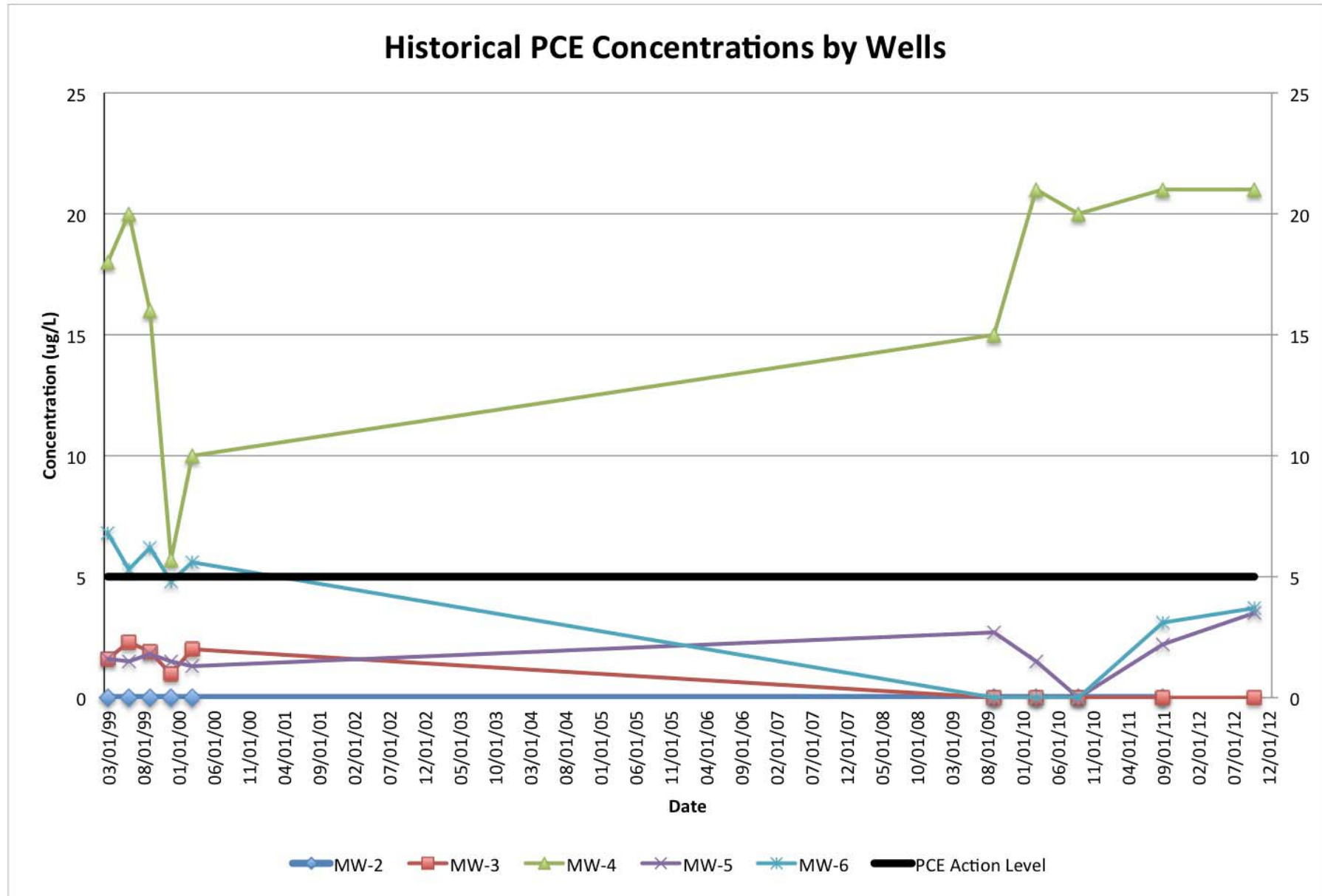


Figure

4



## Historical PCE Concentrations by Wells



**ProTech Consulting & Engineering**  
 1208 Main Street, Redwood City, CA 94063  
 Tele: 650.569.4020 / Fax: 650.569.4023

Job No. **383-OH12**  
 Date **22 October 2012**  
 Drawn by **RC**  
 Rev **SL**    Apprvd **SL**

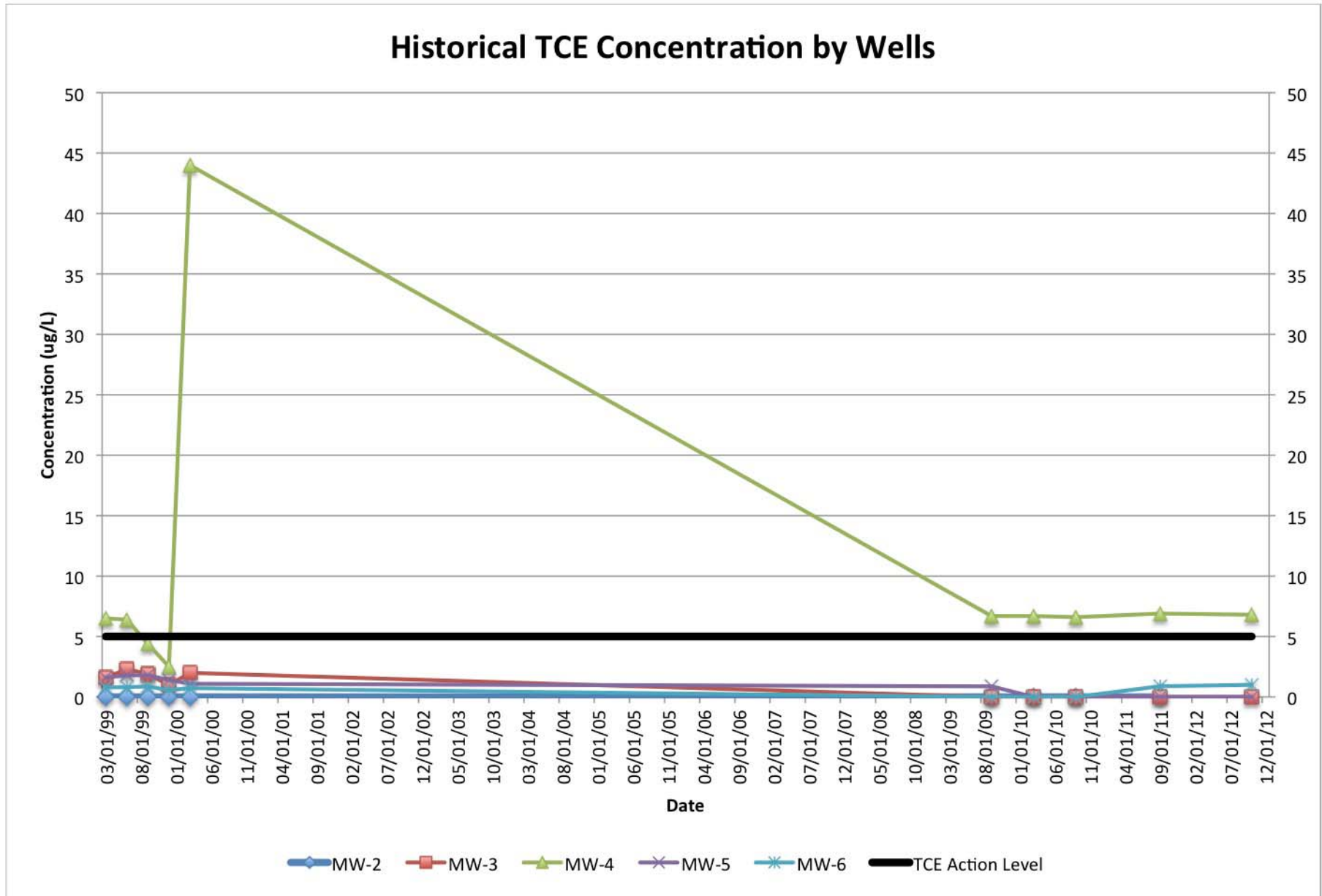
**Historical PCE Concentrations**  
 Kelly-Moore Paint Company  
 696 San Pablo Avenue, Albany, CA  
 for: W.E. Berry  
 P.O. Box 3016, San Carlos, CA 94070

Project

Figure

**5**

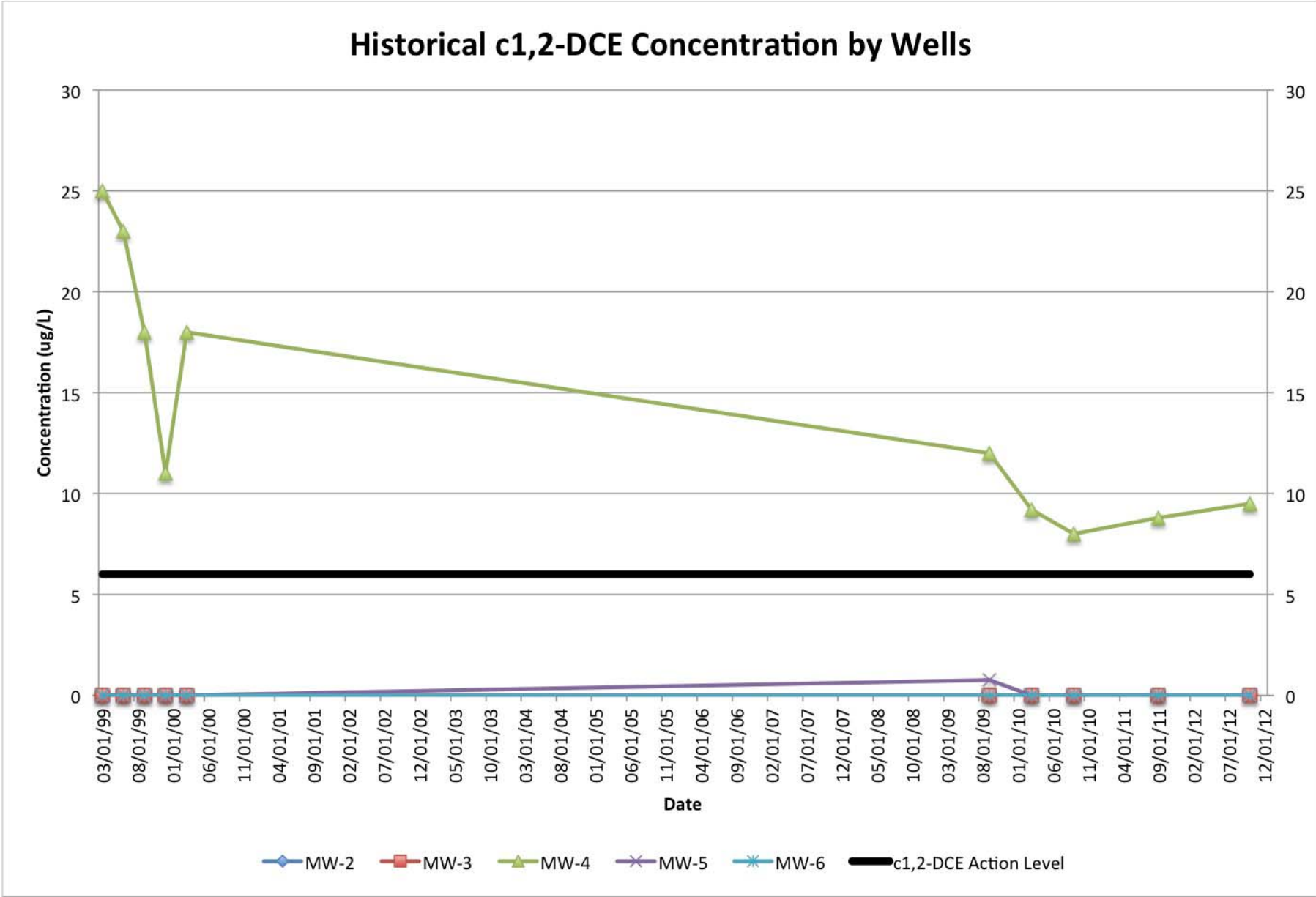
### Historical TCE Concentration by Wells



Job No.	<b>383-OH12</b>
Date	<b>22 October 2012</b>
Drawn by	<b>RC</b>
Rev	<b>SL</b>
Apprvd	<b>SL</b>

<b>Historical TCE Concentrations</b>	Project
Kelly-Moore Paint Company	
696 San Pablo Avenue, Albany, CA	
for: W.E. Berry	
P.O. Box 3016, San Carlos, CA 94070	

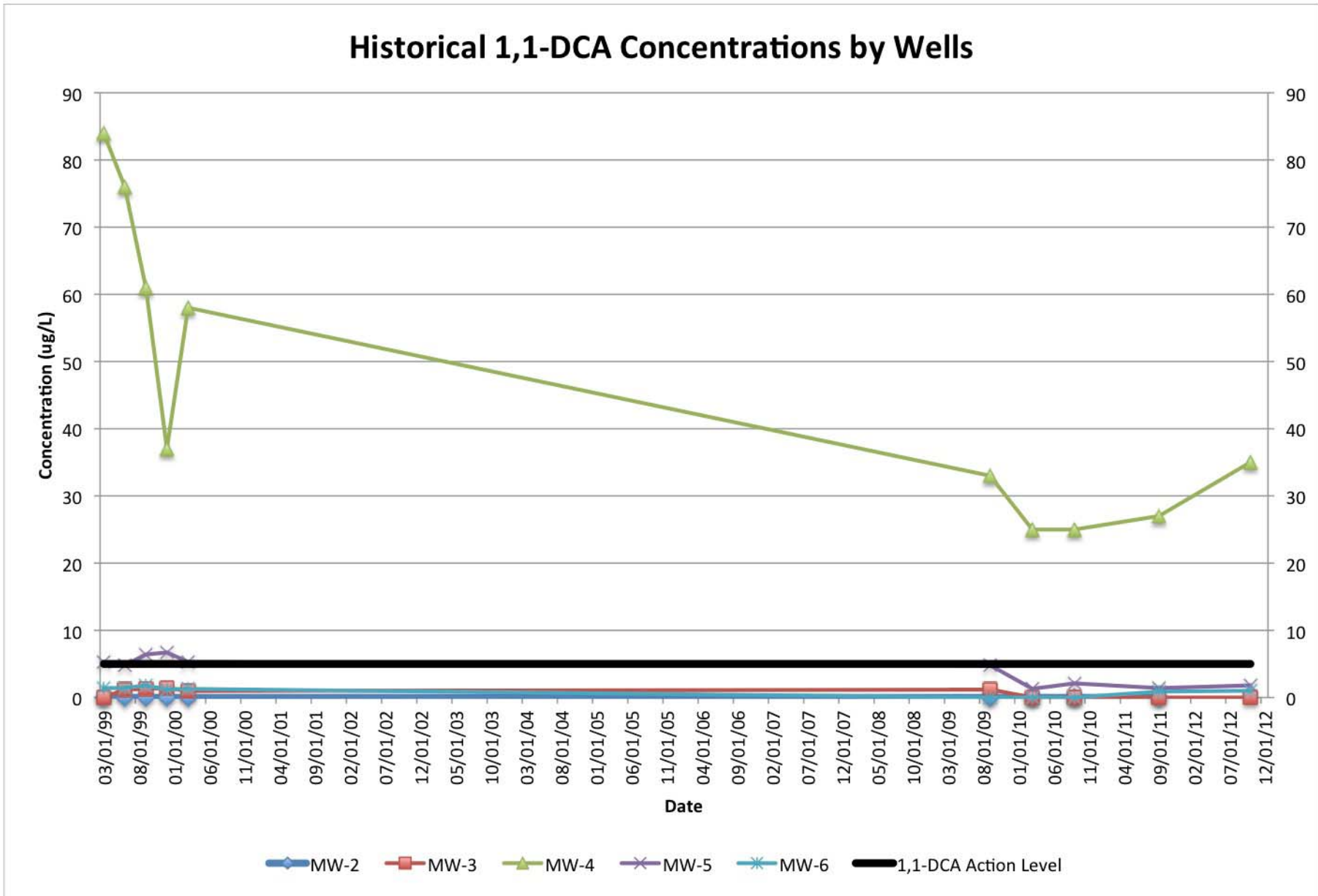
### Historical c1,2-DCE Concentration by Wells



Job No.	<b>383-OH12</b>
Date	<b>22 October 2012</b>
Drawn by	<b>RC</b>
Rev	<b>SL</b>
Apprvd	<b>SL</b>

**Historical c1,2-DCE Concentrations** Project  
 Kelly-Moore Paint Company  
 696 San Pablo Avenue, Albany, CA  
 for: W.E. Berry  
 P.O. Box 3016, San Carlos, CA 94070

## Historical 1,1-DCA Concentrations by Wells

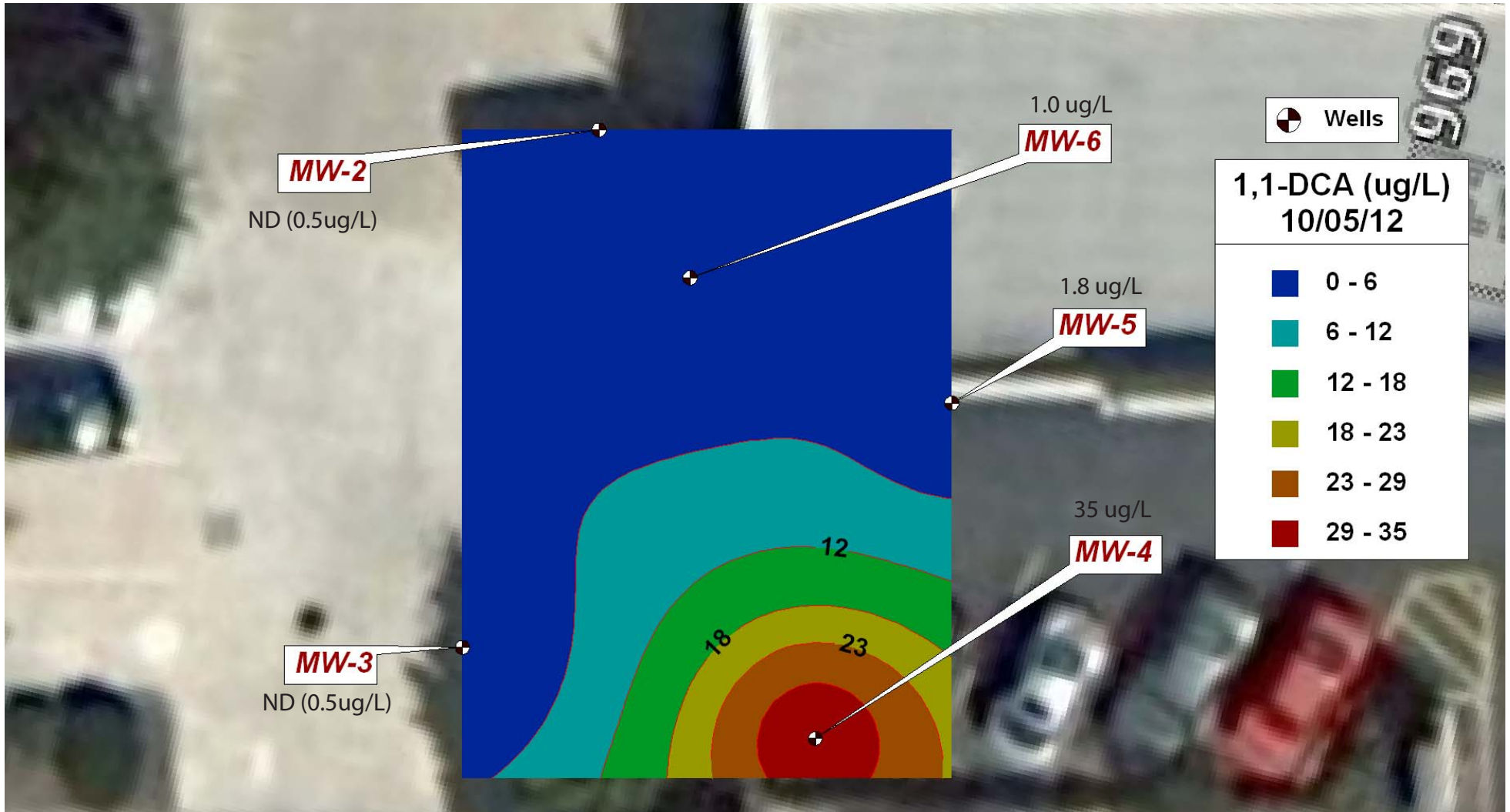


**ProTech Consulting & Engineering**  
 1208 Main Street, Redwood City, CA 94063  
 Tele: 650.569.4020 / Fax: 650.569.4023

Job No.	<b>383-OH12</b>
Date	<b>22 October 2012</b>
Drawn by	<b>RC</b>
Rev	<b>SL</b>
Apprvd	<b>SL</b>

**Historical 1,1-DCA Concentrations** Project  
 Kelly-Moore Paint Company  
 696 San Pablo Avenue, Albany, CA  
 for: W.E. Berry  
 P.O. Box 3016, San Carlos, CA 94070

Figure  
8



Contours drawn by Enviroinsite

**ProTech Consulting & Engineering**  
 1208 Main Street, Redwood City, CA 94063  
 Tele: 650.569.4020 / Fax: 650.569.4023

Job No.	383-OH12
Date	23 October 2012
Drawn by	RC
Rev	SL
Apprvd	SL

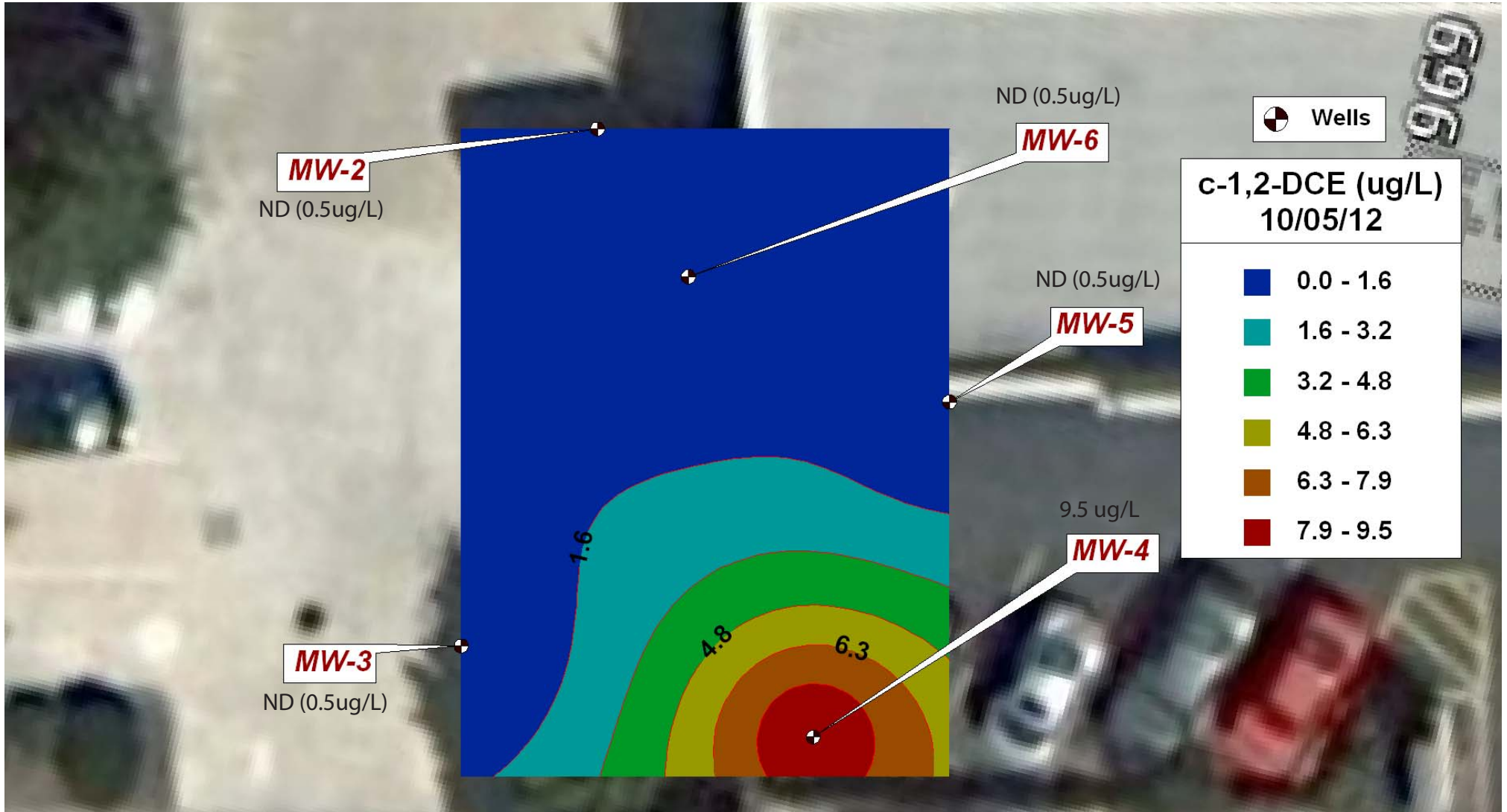
**Site Location w/1,1-DCA (ug/L) Results and Contours (10/05/2012)**  
 Kelly-Moore Paint Company  
 696 San Pablo Avenue, Albany, CA  
 for: W.E. Berry  
 P.O. Box 3016, San Carlos, CA 94070

Project



Figure

9



Contours drawn by Enviroinsite

**ProTech Consulting & Engineering**  
 1208 Main Street, Redwood City, CA 94063  
 Tele: 650.569.4020 / Fax: 650.569.4023

Job No.	383-OH12
Date	23 October 2012
Drawn by	RC
Rev	SL
Apprvd	SL

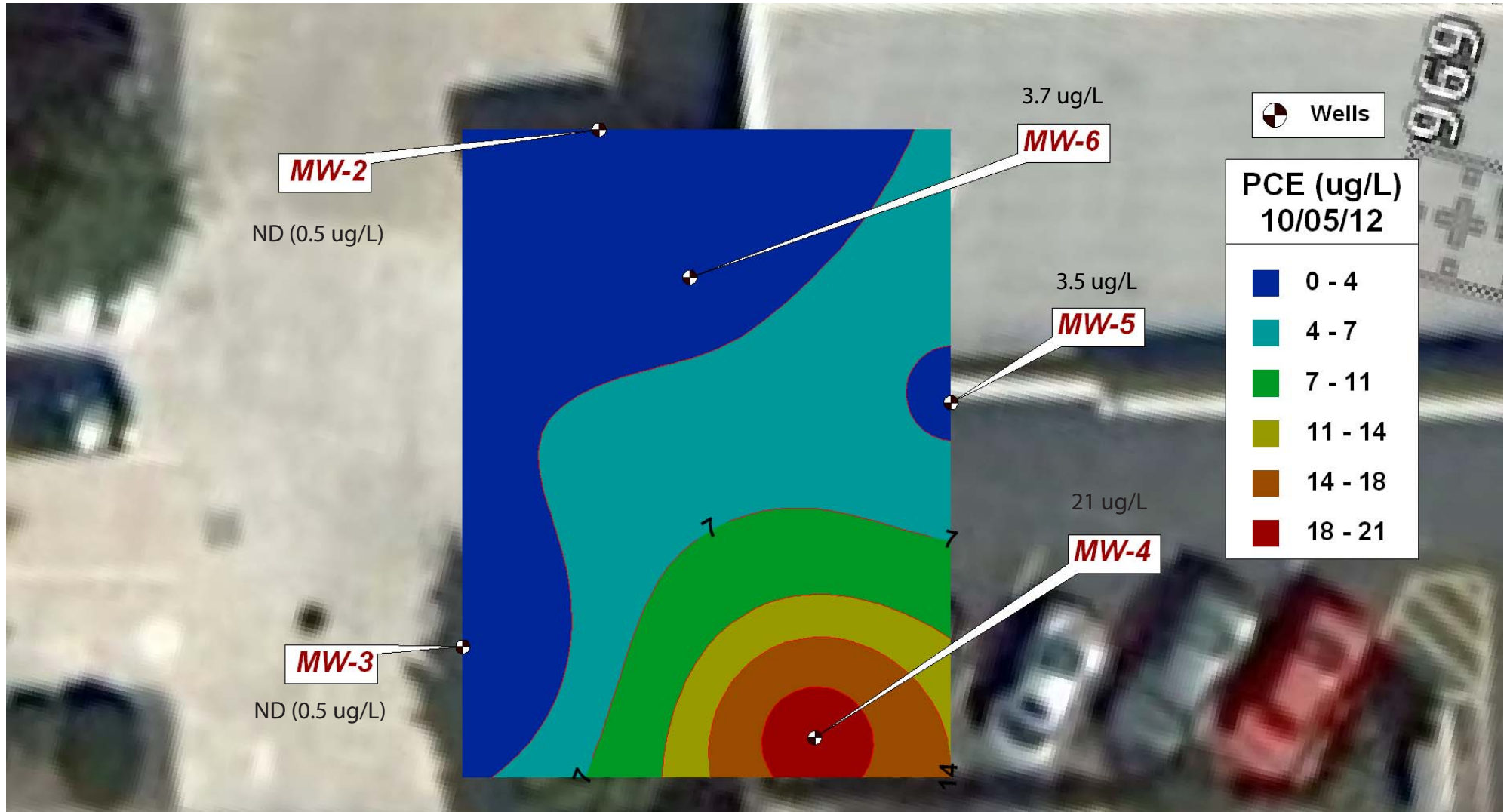
**Site Location w/cis-1,2 -DCE (ug/L)  
 Results and Contours (10/05/2012)**  
 Kelly-Moore Paint Company  
 696 San Pablo Avenue, Albany, CA  
 for: W.E. Berry  
 P.O. Box 3016, San Carlos, CA 94070

Project



Figure

**10**



Contours drawn by Enviroinsite

**ProTech Consulting & Engineering**  
 1208 Main Street, Redwood City, CA 94063  
 Tele: 650.569.4020 / Fax: 650.569.4023

Job No.	383-OH12
Date	23 October 2012
Drawn by	RC
Rev	SL
Apprvd	SL

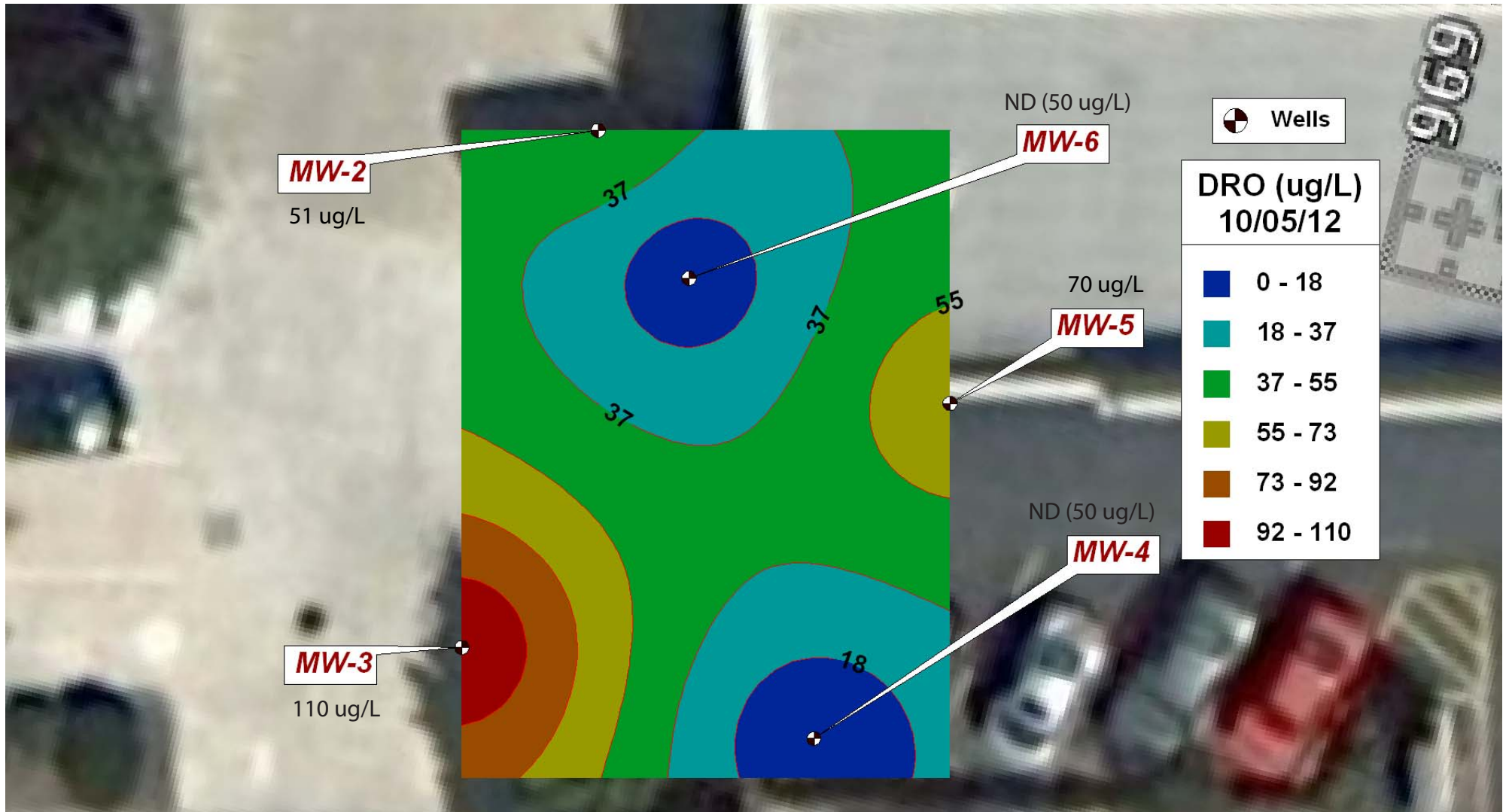
**Site Location w/PCE (ug/L)  
Results and Contours (10/05/2012)**  
 Kelly-Moore Paint Company  
 696 San Pablo Avenue, Albany, CA  
 for: W.E. Berry  
 P.O. Box 3016, San Carlos, CA 94070

Project



Figure

**11**



Contours drawn by Envirosite

**ProTech Consulting & Engineering**  
 1208 Main Street, Redwood City, CA 94063  
 Tele: 650.569.4020 / Fax: 650.569.4023

Job No.		383-OH12	
Date		23 October 2012	
Drawn by		RC	
Rev	SL	Apprvd	SL

**Site Location w/DRO (ug/L)  
 Results and Contours (10/05/2012)**  
 Kelly-Moore Paint Company  
 696 San Pablo Avenue, Albany, CA  
 for: W.E. Berry  
 P.O. Box 3016, San Carlos, CA 94070

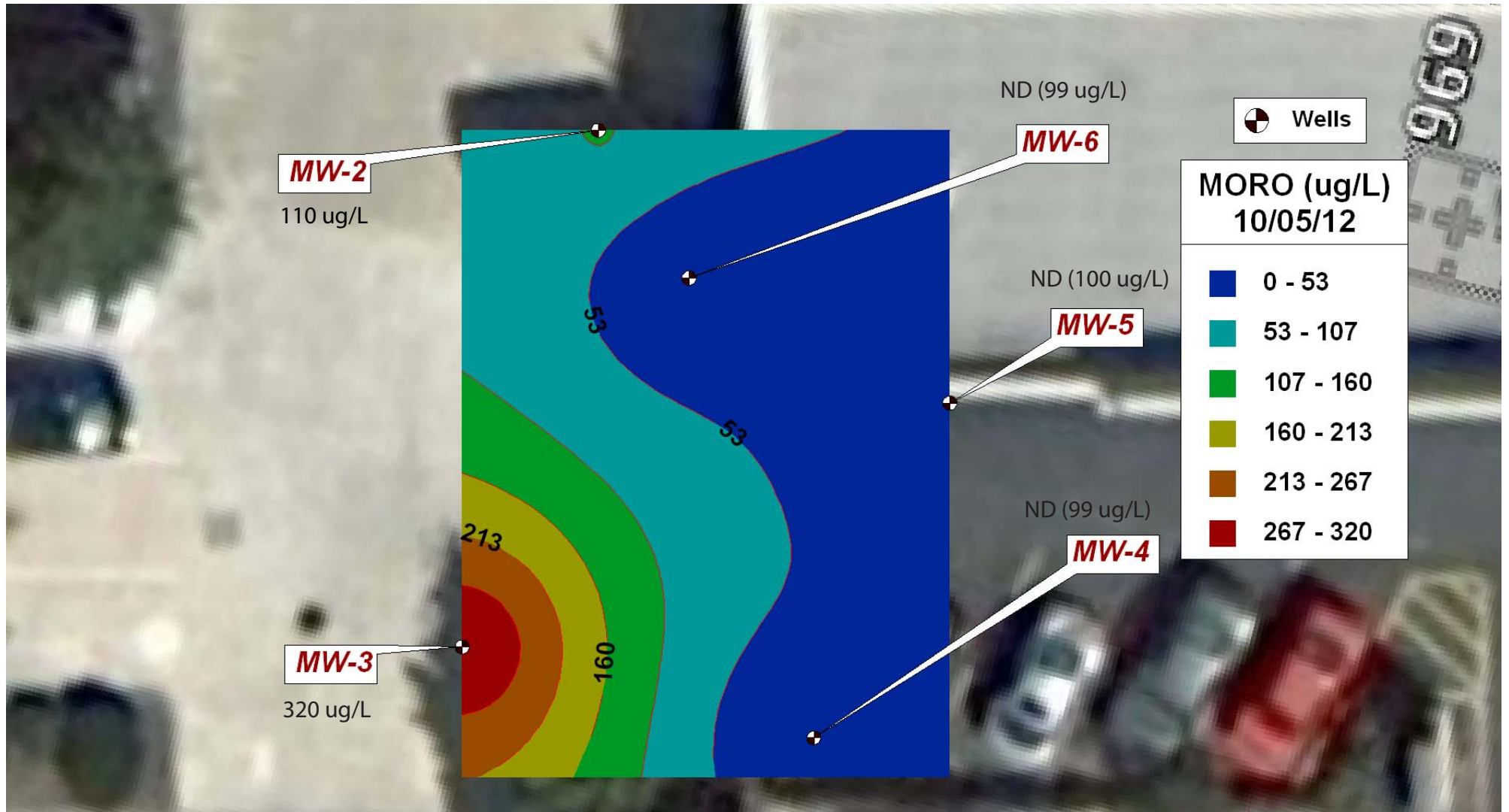
Project



Figure

**12**





Contours drawn by Envirosite

**ProTech Consulting & Engineering**  
 1208 Main Street, Redwood City, CA 94063  
 Tele: 650.569.4020 / Fax: 650.569.4023

Job No.	383-OH12
Date	23 October 2012
Drawn by	RC
Rev	SL
Apprvd	SL

**Site Location w/MORO (ug/L)  
 Results and Contours (10/05/2012)**  
 Kelly-Moore Paint Company  
 696 San Pablo Avenue, Albany, CA  
 for: W.E. Berry  
 P.O. Box 3016, San Carlos, CA 94070

Project



Figure

**13**

**APPENDIX 1 – LABORATORY REPORTS AND COC FORMS**

# TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING


## ANALYTICAL REPORT

TestAmerica Laboratories, Inc.  
TestAmerica Pleasanton  
1220 Quarry Lane  
Pleasanton, CA 94566  
Tel: (925)484-1919

TestAmerica Job ID: 720-45070-1  
Client Project/Site: Kelly Moore

For:  
ProTech Consulting and Engineering  
1208 Main Street  
Redwood City, California 94063

Attn: Mr. Woody Lovejoy



Authorized for release by:  
10/18/2012 6:30:34 PM

Onieka Howard  
Project Manager I  
[onieka.howard@testamericainc.com](mailto:onieka.howard@testamericainc.com)

### LINKS

Review your project  
results through  
**TotalAccess**

Have a Question?



Visit us at:  
[www.testamericainc.com](http://www.testamericainc.com)

*This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.*

*Results relate only to the items tested and the sample(s) as received by the laboratory.*

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## Definitions/Glossary

Client: ProTech Consulting and Engineering  
Project/Site: Kelly Moore

TestAmerica Job ID: 720-45070-1

### Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
☼	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CNF	Contains no Free Liquid
DL, RA, RE, IN	Indicates a Dilution, Reanalysis, Re-extraction, or additional Initial metals/anion analysis of the sample
EDL	Estimated Detection Limit
EPA	United States Environmental Protection Agency
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RL	Reporting Limit
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

# Case Narrative

Client: ProTech Consulting and Engineering  
Project/Site: Kelly Moore

TestAmerica Job ID: 720-45070-1

---

**Job ID: 720-45070-1**

---

**Laboratory: TestAmerica Pleasanton**

---

**Narrative**

**Job Narrative**  
**720-45070-1**

**Comments**

No additional comments.

**Receipt**

The samples were received on 10/5/2012 1:15 PM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 4.9° C.

Except:

Sample times were not provided on the COC.

**GC/MS VOA**

Method(s) 8260B: The following sample 45070-1,2,3,4 and 5 submitted for volatiles analysis was received with insufficient preservation (pH >2).

No other analytical or quality issues were noted.

**GC Semi VOA**

No analytical or quality issues were noted.

**Organic Prep**

No analytical or quality issues were noted.



# Detection Summary

Client: ProTech Consulting and Engineering  
 Project/Site: Kelly Moore

TestAmerica Job ID: 720-45070-1

## Client Sample ID: MW-2

## Lab Sample ID: 720-45070-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Diesel Range Organics [C10-C28]	51		50		ug/L	1		8015B	Silica Gel Cleanup
Motor Oil Range Organics [C24-C36]	110		100		ug/L	1		8015B	Silica Gel Cleanup

## Client Sample ID: MW-3

## Lab Sample ID: 720-45070-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Diesel Range Organics [C10-C28]	110		50		ug/L	1		8015B	Silica Gel Cleanup
Motor Oil Range Organics [C24-C36]	320		99		ug/L	1		8015B	Silica Gel Cleanup

## Client Sample ID: MW-4

## Lab Sample ID: 720-45070-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
1,1-Dichloroethene	0.70		0.50		ug/L	1		8260B	Total/NA
1,1-Dichloroethane	35		0.50		ug/L	1		8260B	Total/NA
cis-1,2-Dichloroethene	9.5		0.50		ug/L	1		8260B	Total/NA
Trichloroethene	6.8		0.50		ug/L	1		8260B	Total/NA
Tetrachloroethene	21		0.50		ug/L	1		8260B	Total/NA

## Client Sample ID: MW-5

## Lab Sample ID: 720-45070-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
1,1-Dichloroethane	1.8		0.50		ug/L	1		8260B	Total/NA
Tetrachloroethene	3.5		0.50		ug/L	1		8260B	Total/NA
Diesel Range Organics [C10-C28]	70		50		ug/L	1		8015B	Silica Gel Cleanup

## Client Sample ID: MW-6

## Lab Sample ID: 720-45070-5

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
1,1-Dichloroethane	1.0		0.50		ug/L	1		8260B	Total/NA
Trichloroethene	1.0		0.50		ug/L	1		8260B	Total/NA
Tetrachloroethene	3.7		0.50		ug/L	1		8260B	Total/NA

# Client Sample Results

Client: ProTech Consulting and Engineering  
Project/Site: Kelly Moore

TestAmerica Job ID: 720-45070-1

**Client Sample ID: MW-2**  
**Date Collected: 10/05/12 00:00**  
**Date Received: 10/05/12 13:15**

**Lab Sample ID: 720-45070-1**  
**Matrix: Water**

### Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1-Dichloroethene	ND		0.50		ug/L			10/09/12 16:28	1
1,1-Dichloroethane	ND		0.50		ug/L			10/09/12 16:28	1
Dichlorodifluoromethane	ND		0.50		ug/L			10/09/12 16:28	1
Vinyl chloride	ND		0.50		ug/L			10/09/12 16:28	1
Chloroethane	ND		1.0		ug/L			10/09/12 16:28	1
Trichlorofluoromethane	ND		1.0		ug/L			10/09/12 16:28	1
Methylene Chloride	ND		5.0		ug/L			10/09/12 16:28	1
trans-1,2-Dichloroethene	ND		0.50		ug/L			10/09/12 16:28	1
cis-1,2-Dichloroethene	ND		0.50		ug/L			10/09/12 16:28	1
Chloroform	ND		1.0		ug/L			10/09/12 16:28	1
1,1,1-Trichloroethane	ND		0.50		ug/L			10/09/12 16:28	1
Carbon tetrachloride	ND		0.50		ug/L			10/09/12 16:28	1
1,2-Dichloroethane	ND		0.50		ug/L			10/09/12 16:28	1
Trichloroethene	ND		0.50		ug/L			10/09/12 16:28	1
1,2-Dichloropropane	ND		0.50		ug/L			10/09/12 16:28	1
Dichlorobromomethane	ND		0.50		ug/L			10/09/12 16:28	1
trans-1,3-Dichloropropene	ND		0.50		ug/L			10/09/12 16:28	1
cis-1,3-Dichloropropene	ND		0.50		ug/L			10/09/12 16:28	1
1,1,2-Trichloroethane	ND		0.50		ug/L			10/09/12 16:28	1
Tetrachloroethene	ND		0.50		ug/L			10/09/12 16:28	1
Chlorodibromomethane	ND		0.50		ug/L			10/09/12 16:28	1
Chlorobenzene	ND		0.50		ug/L			10/09/12 16:28	1
Bromoform	ND		1.0		ug/L			10/09/12 16:28	1
1,1,2,2-Tetrachloroethane	ND		0.50		ug/L			10/09/12 16:28	1
1,3-Dichlorobenzene	ND		0.50		ug/L			10/09/12 16:28	1
1,4-Dichlorobenzene	ND		0.50		ug/L			10/09/12 16:28	1
1,2-Dichlorobenzene	ND		0.50		ug/L			10/09/12 16:28	1
Chloromethane	ND		1.0		ug/L			10/09/12 16:28	1
Bromomethane	ND		1.0		ug/L			10/09/12 16:28	1
1,1,2-Trichloro-1,2,2-trifluoroethane	ND		0.50		ug/L			10/09/12 16:28	1
EDB	ND		0.50		ug/L			10/09/12 16:28	1
1,2,4-Trichlorobenzene	ND		1.0		ug/L			10/09/12 16:28	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Toluene-d8 (Surr)	96		70 - 130		10/09/12 16:28	1
4-Bromofluorobenzene	92		67 - 130		10/09/12 16:28	1
1,2-Dichloroethane-d4 (Surr)	117		75 - 138		10/09/12 16:28	1

### Method: 8015B - Diesel Range Organics (DRO) (GC) - Silica Gel Cleanup

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
<b>Diesel Range Organics [C10-C28]</b>	<b>51</b>		50		ug/L		10/11/12 08:30	10/18/12 12:59	1
<b>Motor Oil Range Organics [C24-C36]</b>	<b>110</b>		100		ug/L		10/11/12 08:30	10/18/12 12:59	1
TPH-Hydraulic Oil Range (C19-C36)	ND		500		ug/L		10/11/12 08:30	10/18/12 12:59	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Capric Acid (Surr)	0.0004		0 - 5	10/11/12 08:30	10/18/12 12:59	1
p-Terphenyl	89		31 - 150	10/11/12 08:30	10/18/12 12:59	1



# Client Sample Results

Client: ProTech Consulting and Engineering  
Project/Site: Kelly Moore

TestAmerica Job ID: 720-45070-1

**Client Sample ID: MW-3**  
**Date Collected: 10/05/12 00:00**  
**Date Received: 10/05/12 13:15**

**Lab Sample ID: 720-45070-2**  
**Matrix: Water**

### Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1-Dichloroethene	ND		0.50		ug/L			10/09/12 16:58	1
1,1-Dichloroethane	ND		0.50		ug/L			10/09/12 16:58	1
Dichlorodifluoromethane	ND		0.50		ug/L			10/09/12 16:58	1
Vinyl chloride	ND		0.50		ug/L			10/09/12 16:58	1
Chloroethane	ND		1.0		ug/L			10/09/12 16:58	1
Trichlorofluoromethane	ND		1.0		ug/L			10/09/12 16:58	1
Methylene Chloride	ND		5.0		ug/L			10/09/12 16:58	1
trans-1,2-Dichloroethene	ND		0.50		ug/L			10/09/12 16:58	1
cis-1,2-Dichloroethene	ND		0.50		ug/L			10/09/12 16:58	1
Chloroform	ND		1.0		ug/L			10/09/12 16:58	1
1,1,1-Trichloroethane	ND		0.50		ug/L			10/09/12 16:58	1
Carbon tetrachloride	ND		0.50		ug/L			10/09/12 16:58	1
1,2-Dichloroethane	ND		0.50		ug/L			10/09/12 16:58	1
Trichloroethene	ND		0.50		ug/L			10/09/12 16:58	1
1,2-Dichloropropane	ND		0.50		ug/L			10/09/12 16:58	1
Dichlorobromomethane	ND		0.50		ug/L			10/09/12 16:58	1
trans-1,3-Dichloropropene	ND		0.50		ug/L			10/09/12 16:58	1
cis-1,3-Dichloropropene	ND		0.50		ug/L			10/09/12 16:58	1
1,1,2-Trichloroethane	ND		0.50		ug/L			10/09/12 16:58	1
Tetrachloroethene	ND		0.50		ug/L			10/09/12 16:58	1
Chlorodibromomethane	ND		0.50		ug/L			10/09/12 16:58	1
Chlorobenzene	ND		0.50		ug/L			10/09/12 16:58	1
Bromoform	ND		1.0		ug/L			10/09/12 16:58	1
1,1,2,2-Tetrachloroethane	ND		0.50		ug/L			10/09/12 16:58	1
1,3-Dichlorobenzene	ND		0.50		ug/L			10/09/12 16:58	1
1,4-Dichlorobenzene	ND		0.50		ug/L			10/09/12 16:58	1
1,2-Dichlorobenzene	ND		0.50		ug/L			10/09/12 16:58	1
Chloromethane	ND		1.0		ug/L			10/09/12 16:58	1
Bromomethane	ND		1.0		ug/L			10/09/12 16:58	1
1,1,2-Trichloro-1,2,2-trifluoroethane	ND		0.50		ug/L			10/09/12 16:58	1
EDB	ND		0.50		ug/L			10/09/12 16:58	1
1,2,4-Trichlorobenzene	ND		1.0		ug/L			10/09/12 16:58	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Toluene-d8 (Surr)	96		70 - 130		10/09/12 16:58	1
4-Bromofluorobenzene	92		67 - 130		10/09/12 16:58	1
1,2-Dichloroethane-d4 (Surr)	118		75 - 138		10/09/12 16:58	1

### Method: 8015B - Diesel Range Organics (DRO) (GC) - Silica Gel Cleanup

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
<b>Diesel Range Organics [C10-C28]</b>	<b>110</b>		50		ug/L		10/11/12 08:30	10/18/12 14:37	1
<b>Motor Oil Range Organics [C24-C36]</b>	<b>320</b>		99		ug/L		10/11/12 08:30	10/18/12 14:37	1
TPH-Hydraulic Oil Range (C19-C36)	ND		500		ug/L		10/11/12 08:30	10/18/12 14:37	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Capric Acid (Surr)	0.002		0 - 5	10/11/12 08:30	10/18/12 14:37	1
p-Terphenyl	43		31 - 150	10/11/12 08:30	10/18/12 14:37	1

# Client Sample Results

Client: ProTech Consulting and Engineering  
Project/Site: Kelly Moore

TestAmerica Job ID: 720-45070-1

**Client Sample ID: MW-4**  
**Date Collected: 10/05/12 00:00**  
**Date Received: 10/05/12 13:15**

**Lab Sample ID: 720-45070-3**  
**Matrix: Water**

## Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
<b>1,1-Dichloroethene</b>	<b>0.70</b>		0.50		ug/L			10/09/12 17:27	1
<b>1,1-Dichloroethane</b>	<b>35</b>		0.50		ug/L			10/09/12 17:27	1
Dichlorodifluoromethane	ND		0.50		ug/L			10/09/12 17:27	1
Vinyl chloride	ND		0.50		ug/L			10/09/12 17:27	1
Chloroethane	ND		1.0		ug/L			10/09/12 17:27	1
Trichlorofluoromethane	ND		1.0		ug/L			10/09/12 17:27	1
Methylene Chloride	ND		5.0		ug/L			10/09/12 17:27	1
trans-1,2-Dichloroethene	ND		0.50		ug/L			10/09/12 17:27	1
<b>cis-1,2-Dichloroethene</b>	<b>9.5</b>		0.50		ug/L			10/09/12 17:27	1
Chloroform	ND		1.0		ug/L			10/09/12 17:27	1
1,1,1-Trichloroethane	ND		0.50		ug/L			10/09/12 17:27	1
Carbon tetrachloride	ND		0.50		ug/L			10/09/12 17:27	1
1,2-Dichloroethane	ND		0.50		ug/L			10/09/12 17:27	1
<b>Trichloroethene</b>	<b>6.8</b>		0.50		ug/L			10/09/12 17:27	1
1,2-Dichloropropane	ND		0.50		ug/L			10/09/12 17:27	1
Dichlorobromomethane	ND		0.50		ug/L			10/09/12 17:27	1
trans-1,3-Dichloropropene	ND		0.50		ug/L			10/09/12 17:27	1
cis-1,3-Dichloropropene	ND		0.50		ug/L			10/09/12 17:27	1
1,1,2-Trichloroethane	ND		0.50		ug/L			10/09/12 17:27	1
<b>Tetrachloroethene</b>	<b>21</b>		0.50		ug/L			10/09/12 17:27	1
Chlorodibromomethane	ND		0.50		ug/L			10/09/12 17:27	1
Chlorobenzene	ND		0.50		ug/L			10/09/12 17:27	1
Bromoform	ND		1.0		ug/L			10/09/12 17:27	1
1,1,2,2-Tetrachloroethane	ND		0.50		ug/L			10/09/12 17:27	1
1,3-Dichlorobenzene	ND		0.50		ug/L			10/09/12 17:27	1
1,4-Dichlorobenzene	ND		0.50		ug/L			10/09/12 17:27	1
1,2-Dichlorobenzene	ND		0.50		ug/L			10/09/12 17:27	1
Chloromethane	ND		1.0		ug/L			10/09/12 17:27	1
Bromomethane	ND		1.0		ug/L			10/09/12 17:27	1
1,1,2-Trichloro-1,2,2-trifluoroethane	ND		0.50		ug/L			10/09/12 17:27	1
EDB	ND		0.50		ug/L			10/09/12 17:27	1
1,2,4-Trichlorobenzene	ND		1.0		ug/L			10/09/12 17:27	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
<i>Toluene-d8 (Surr)</i>	96		70 - 130		10/09/12 17:27	1
<i>4-Bromofluorobenzene</i>	100		67 - 130		10/09/12 17:27	1
<i>1,2-Dichloroethane-d4 (Surr)</i>	119		75 - 138		10/09/12 17:27	1

## Method: 8015B - Diesel Range Organics (DRO) (GC) - Silica Gel Cleanup

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics [C10-C28]	ND		50		ug/L		10/11/12 08:30	10/18/12 13:23	1
Motor Oil Range Organics [C24-C36]	ND		99		ug/L		10/11/12 08:30	10/18/12 13:23	1
TPH-Hydraulic Oil Range (C19-C36)	ND		500		ug/L		10/11/12 08:30	10/18/12 13:23	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
<i>Capric Acid (Surr)</i>	0.007		0 - 5	10/11/12 08:30	10/18/12 13:23	1
<i>p-Terphenyl</i>	85		31 - 150	10/11/12 08:30	10/18/12 13:23	1

# Client Sample Results

Client: ProTech Consulting and Engineering  
Project/Site: Kelly Moore

TestAmerica Job ID: 720-45070-1

**Client Sample ID: MW-5**  
**Date Collected: 10/05/12 00:00**  
**Date Received: 10/05/12 13:15**

**Lab Sample ID: 720-45070-4**  
**Matrix: Water**

## Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1-Dichloroethene	ND		0.50		ug/L			10/09/12 17:56	1
<b>1,1-Dichloroethane</b>	<b>1.8</b>		0.50		ug/L			10/09/12 17:56	1
Dichlorodifluoromethane	ND		0.50		ug/L			10/09/12 17:56	1
Vinyl chloride	ND		0.50		ug/L			10/09/12 17:56	1
Chloroethane	ND		1.0		ug/L			10/09/12 17:56	1
Trichlorofluoromethane	ND		1.0		ug/L			10/09/12 17:56	1
Methylene Chloride	ND		5.0		ug/L			10/09/12 17:56	1
trans-1,2-Dichloroethene	ND		0.50		ug/L			10/09/12 17:56	1
cis-1,2-Dichloroethene	ND		0.50		ug/L			10/09/12 17:56	1
Chloroform	ND		1.0		ug/L			10/09/12 17:56	1
1,1,1-Trichloroethane	ND		0.50		ug/L			10/09/12 17:56	1
Carbon tetrachloride	ND		0.50		ug/L			10/09/12 17:56	1
1,2-Dichloroethane	ND		0.50		ug/L			10/09/12 17:56	1
Trichloroethene	ND		0.50		ug/L			10/09/12 17:56	1
1,2-Dichloropropane	ND		0.50		ug/L			10/09/12 17:56	1
Dichlorobromomethane	ND		0.50		ug/L			10/09/12 17:56	1
trans-1,3-Dichloropropene	ND		0.50		ug/L			10/09/12 17:56	1
cis-1,3-Dichloropropene	ND		0.50		ug/L			10/09/12 17:56	1
1,1,2-Trichloroethane	ND		0.50		ug/L			10/09/12 17:56	1
<b>Tetrachloroethene</b>	<b>3.5</b>		0.50		ug/L			10/09/12 17:56	1
Chlorodibromomethane	ND		0.50		ug/L			10/09/12 17:56	1
Chlorobenzene	ND		0.50		ug/L			10/09/12 17:56	1
Bromoform	ND		1.0		ug/L			10/09/12 17:56	1
1,1,2,2-Tetrachloroethane	ND		0.50		ug/L			10/09/12 17:56	1
1,3-Dichlorobenzene	ND		0.50		ug/L			10/09/12 17:56	1
1,4-Dichlorobenzene	ND		0.50		ug/L			10/09/12 17:56	1
1,2-Dichlorobenzene	ND		0.50		ug/L			10/09/12 17:56	1
Chloromethane	ND		1.0		ug/L			10/09/12 17:56	1
Bromomethane	ND		1.0		ug/L			10/09/12 17:56	1
1,1,2-Trichloro-1,2,2-trifluoroethane	ND		0.50		ug/L			10/09/12 17:56	1
EDB	ND		0.50		ug/L			10/09/12 17:56	1
1,2,4-Trichlorobenzene	ND		1.0		ug/L			10/09/12 17:56	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Toluene-d8 (Surr)	94		70 - 130		10/09/12 17:56	1
4-Bromofluorobenzene	91		67 - 130		10/09/12 17:56	1
1,2-Dichloroethane-d4 (Surr)	119		75 - 138		10/09/12 17:56	1

## Method: 8015B - Diesel Range Organics (DRO) (GC) - Silica Gel Cleanup

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
<b>Diesel Range Organics [C10-C28]</b>	<b>70</b>		50		ug/L		10/11/12 08:30	10/18/12 13:48	1
Motor Oil Range Organics [C24-C36]	ND		100		ug/L		10/11/12 08:30	10/18/12 13:48	1
TPH-Hydraulic Oil Range (C19-C36)	ND		500		ug/L		10/11/12 08:30	10/18/12 13:48	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Capric Acid (Surr)	0.3		0 - 5	10/11/12 08:30	10/18/12 13:48	1
p-Terphenyl	89		31 - 150	10/11/12 08:30	10/18/12 13:48	1

# Client Sample Results

Client: ProTech Consulting and Engineering  
Project/Site: Kelly Moore

TestAmerica Job ID: 720-45070-1

**Client Sample ID: MW-6**  
**Date Collected: 10/05/12 00:00**  
**Date Received: 10/05/12 13:15**

**Lab Sample ID: 720-45070-5**  
**Matrix: Water**

### Method: 8260B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1-Dichloroethene	ND		0.50		ug/L			10/09/12 18:26	1
<b>1,1-Dichloroethane</b>	<b>1.0</b>		0.50		ug/L			10/09/12 18:26	1
Dichlorodifluoromethane	ND		0.50		ug/L			10/09/12 18:26	1
Vinyl chloride	ND		0.50		ug/L			10/09/12 18:26	1
Chloroethane	ND		1.0		ug/L			10/09/12 18:26	1
Trichlorofluoromethane	ND		1.0		ug/L			10/09/12 18:26	1
Methylene Chloride	ND		5.0		ug/L			10/09/12 18:26	1
trans-1,2-Dichloroethene	ND		0.50		ug/L			10/09/12 18:26	1
cis-1,2-Dichloroethene	ND		0.50		ug/L			10/09/12 18:26	1
Chloroform	ND		1.0		ug/L			10/09/12 18:26	1
1,1,1-Trichloroethane	ND		0.50		ug/L			10/09/12 18:26	1
Carbon tetrachloride	ND		0.50		ug/L			10/09/12 18:26	1
1,2-Dichloroethane	ND		0.50		ug/L			10/09/12 18:26	1
<b>Trichloroethene</b>	<b>1.0</b>		0.50		ug/L			10/09/12 18:26	1
1,2-Dichloropropane	ND		0.50		ug/L			10/09/12 18:26	1
Dichlorobromomethane	ND		0.50		ug/L			10/09/12 18:26	1
trans-1,3-Dichloropropene	ND		0.50		ug/L			10/09/12 18:26	1
cis-1,3-Dichloropropene	ND		0.50		ug/L			10/09/12 18:26	1
1,1,2-Trichloroethane	ND		0.50		ug/L			10/09/12 18:26	1
<b>Tetrachloroethene</b>	<b>3.7</b>		0.50		ug/L			10/09/12 18:26	1
Chlorodibromomethane	ND		0.50		ug/L			10/09/12 18:26	1
Chlorobenzene	ND		0.50		ug/L			10/09/12 18:26	1
Bromoform	ND		1.0		ug/L			10/09/12 18:26	1
1,1,2,2-Tetrachloroethane	ND		0.50		ug/L			10/09/12 18:26	1
1,3-Dichlorobenzene	ND		0.50		ug/L			10/09/12 18:26	1
1,4-Dichlorobenzene	ND		0.50		ug/L			10/09/12 18:26	1
1,2-Dichlorobenzene	ND		0.50		ug/L			10/09/12 18:26	1
Chloromethane	ND		1.0		ug/L			10/09/12 18:26	1
Bromomethane	ND		1.0		ug/L			10/09/12 18:26	1
1,1,2-Trichloro-1,2,2-trifluoroethane	ND		0.50		ug/L			10/09/12 18:26	1
EDB	ND		0.50		ug/L			10/09/12 18:26	1
1,2,4-Trichlorobenzene	ND		1.0		ug/L			10/09/12 18:26	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
<i>Toluene-d8 (Surr)</i>	95		70 - 130		10/09/12 18:26	1
<i>4-Bromofluorobenzene</i>	99		67 - 130		10/09/12 18:26	1
<i>1,2-Dichloroethane-d4 (Surr)</i>	120		75 - 138		10/09/12 18:26	1

### Method: 8015B - Diesel Range Organics (DRO) (GC) - Silica Gel Cleanup

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics [C10-C28]	ND		50		ug/L		10/11/12 08:30	10/18/12 14:12	1
Motor Oil Range Organics [C24-C36]	ND		99		ug/L		10/11/12 08:30	10/18/12 14:12	1
TPH-Hydraulic Oil Range (C19-C36)	ND		500		ug/L		10/11/12 08:30	10/18/12 14:12	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
<i>Capric Acid (Surr)</i>	0.002		0 - 5	10/11/12 08:30	10/18/12 14:12	1
<i>p-Terphenyl</i>	83		31 - 150	10/11/12 08:30	10/18/12 14:12	1

# QC Sample Results

Client: ProTech Consulting and Engineering  
Project/Site: Kelly Moore

TestAmerica Job ID: 720-45070-1

## Method: 8260B - Volatile Organic Compounds (GC/MS)

**Lab Sample ID: MB 720-122597/4**

**Matrix: Water**

**Analysis Batch: 122597**

**Client Sample ID: Method Blank**

**Prep Type: Total/NA**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1-Dichloroethene	ND		0.50		ug/L			10/09/12 09:37	1
1,1-Dichloroethane	ND		0.50		ug/L			10/09/12 09:37	1
Dichlorodifluoromethane	ND		0.50		ug/L			10/09/12 09:37	1
Vinyl chloride	ND		0.50		ug/L			10/09/12 09:37	1
Chloroethane	ND		1.0		ug/L			10/09/12 09:37	1
Trichlorofluoromethane	ND		1.0		ug/L			10/09/12 09:37	1
Methylene Chloride	ND		5.0		ug/L			10/09/12 09:37	1
trans-1,2-Dichloroethene	ND		0.50		ug/L			10/09/12 09:37	1
cis-1,2-Dichloroethene	ND		0.50		ug/L			10/09/12 09:37	1
Chloroform	ND		1.0		ug/L			10/09/12 09:37	1
1,1,1-Trichloroethane	ND		0.50		ug/L			10/09/12 09:37	1
Carbon tetrachloride	ND		0.50		ug/L			10/09/12 09:37	1
1,2-Dichloroethane	ND		0.50		ug/L			10/09/12 09:37	1
Trichloroethene	ND		0.50		ug/L			10/09/12 09:37	1
1,2-Dichloropropane	ND		0.50		ug/L			10/09/12 09:37	1
Dichlorobromomethane	ND		0.50		ug/L			10/09/12 09:37	1
trans-1,3-Dichloropropene	ND		0.50		ug/L			10/09/12 09:37	1
cis-1,3-Dichloropropene	ND		0.50		ug/L			10/09/12 09:37	1
1,1,2-Trichloroethane	ND		0.50		ug/L			10/09/12 09:37	1
Tetrachloroethene	ND		0.50		ug/L			10/09/12 09:37	1
Chlorodibromomethane	ND		0.50		ug/L			10/09/12 09:37	1
Chlorobenzene	ND		0.50		ug/L			10/09/12 09:37	1
Bromoform	ND		1.0		ug/L			10/09/12 09:37	1
1,1,2,2-Tetrachloroethane	ND		0.50		ug/L			10/09/12 09:37	1
1,3-Dichlorobenzene	ND		0.50		ug/L			10/09/12 09:37	1
1,4-Dichlorobenzene	ND		0.50		ug/L			10/09/12 09:37	1
1,2-Dichlorobenzene	ND		0.50		ug/L			10/09/12 09:37	1
Chloromethane	ND		1.0		ug/L			10/09/12 09:37	1
Bromomethane	ND		1.0		ug/L			10/09/12 09:37	1
1,1,2-Trichloro-1,2,2-trifluoroethane	ND		0.50		ug/L			10/09/12 09:37	1
EDB	ND		0.50		ug/L			10/09/12 09:37	1
1,2,4-Trichlorobenzene	ND		1.0		ug/L			10/09/12 09:37	1

Surrogate	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
Toluene-d8 (Surr)	97		70 - 130		10/09/12 09:37	1
4-Bromofluorobenzene	96		67 - 130		10/09/12 09:37	1
1,2-Dichloroethane-d4 (Surr)	106		75 - 138		10/09/12 09:37	1

**Lab Sample ID: LCS 720-122597/5**

**Matrix: Water**

**Analysis Batch: 122597**

**Client Sample ID: Lab Control Sample**

**Prep Type: Total/NA**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
1,1-Dichloroethene	25.0	26.1		ug/L		104	64 - 128
1,1-Dichloroethane	25.0	25.3		ug/L		101	70 - 130
Dichlorodifluoromethane	25.0	16.7		ug/L		67	34 - 132
Vinyl chloride	25.0	23.6		ug/L		94	54 - 135
Chloroethane	25.0	28.8		ug/L		115	62 - 138
Trichlorofluoromethane	25.0	26.9		ug/L		107	66 - 132

# QC Sample Results

Client: ProTech Consulting and Engineering  
Project/Site: Kelly Moore

TestAmerica Job ID: 720-45070-1

## Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: LCS 720-122597/5

Matrix: Water

Analysis Batch: 122597

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Methylene Chloride	25.0	23.7		ug/L		95	70 - 147
trans-1,2-Dichloroethene	25.0	26.0		ug/L		104	68 - 130
cis-1,2-Dichloroethene	25.0	25.8		ug/L		103	70 - 130
Chloroform	25.0	25.1		ug/L		100	70 - 130
1,1,1-Trichloroethane	25.0	27.6		ug/L		111	70 - 130
Carbon tetrachloride	25.0	28.2		ug/L		113	70 - 146
1,2-Dichloroethane	25.0	25.7		ug/L		103	61 - 132
Trichloroethene	25.0	25.7		ug/L		103	70 - 130
1,2-Dichloropropane	25.0	25.1		ug/L		101	70 - 130
Dichlorobromomethane	25.0	28.1		ug/L		112	70 - 130
trans-1,3-Dichloropropene	25.0	27.4		ug/L		110	70 - 140
cis-1,3-Dichloropropene	25.0	27.4		ug/L		110	70 - 130
1,1,2-Trichloroethane	25.0	26.1		ug/L		104	70 - 130
Tetrachloroethene	25.0	26.0		ug/L		104	70 - 130
Chlorodibromomethane	25.0	28.0		ug/L		112	70 - 145
Chlorobenzene	25.0	25.1		ug/L		100	70 - 130
Bromoform	25.0	26.4		ug/L		106	68 - 136
1,1,2,2-Tetrachloroethane	25.0	26.8		ug/L		107	70 - 130
1,3-Dichlorobenzene	25.0	25.4		ug/L		102	70 - 130
1,4-Dichlorobenzene	25.0	25.3		ug/L		101	70 - 130
1,2-Dichlorobenzene	25.0	24.8		ug/L		99	70 - 130
Chloromethane	25.0	21.7		ug/L		87	52 - 175
Bromomethane	25.0	28.0		ug/L		112	43 - 151
1,1,2-Trichloro-1,2,2-trifluoroethane	25.0	28.5		ug/L		114	42 - 162
EDB	25.0	25.3		ug/L		101	70 - 130
1,2,4-Trichlorobenzene	25.0	23.2		ug/L		93	70 - 130

Surrogate	LCS %Recovery	LCS Qualifier	Limits
Toluene-d8 (Surr)	104		70 - 130
4-Bromofluorobenzene	96		67 - 130
1,2-Dichloroethane-d4 (Surr)	103		75 - 138

Lab Sample ID: LCSD 720-122597/6

Matrix: Water

Analysis Batch: 122597

Client Sample ID: Lab Control Sample Dup

Prep Type: Total/NA

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	Limit
1,1-Dichloroethene	25.0	25.5		ug/L		102	64 - 128	2	20
1,1-Dichloroethane	25.0	24.8		ug/L		99	70 - 130	2	20
Dichlorodifluoromethane	25.0	15.5		ug/L		62	34 - 132	7	20
Vinyl chloride	25.0	23.7		ug/L		95	54 - 135	1	20
Chloroethane	25.0	27.9		ug/L		112	62 - 138	3	20
Trichlorofluoromethane	25.0	26.8		ug/L		107	66 - 132	0	20
Methylene Chloride	25.0	23.3		ug/L		93	70 - 147	2	20
trans-1,2-Dichloroethene	25.0	25.5		ug/L		102	68 - 130	2	20
cis-1,2-Dichloroethene	25.0	25.4		ug/L		102	70 - 130	2	20
Chloroform	25.0	24.5		ug/L		98	70 - 130	2	20
1,1,1-Trichloroethane	25.0	26.8		ug/L		107	70 - 130	3	20
Carbon tetrachloride	25.0	27.4		ug/L		109	70 - 146	3	20

# QC Sample Results

Client: ProTech Consulting and Engineering  
Project/Site: Kelly Moore

TestAmerica Job ID: 720-45070-1

## Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: LCSD 720-122597/6

Matrix: Water

Analysis Batch: 122597

Client Sample ID: Lab Control Sample Dup

Prep Type: Total/NA

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits		RPD	Limit
							RPD	Limit		
1,2-Dichloroethane	25.0	24.6		ug/L		98	61 - 132	4	20	
Trichloroethene	25.0	25.7		ug/L		103	70 - 130	0	20	
1,2-Dichloropropane	25.0	24.8		ug/L		99	70 - 130	1	20	
Dichlorobromomethane	25.0	27.4		ug/L		110	70 - 130	2	20	
trans-1,3-Dichloropropene	25.0	27.0		ug/L		108	70 - 140	2	20	
cis-1,3-Dichloropropene	25.0	27.0		ug/L		108	70 - 130	2	20	
1,1,2-Trichloroethane	25.0	25.4		ug/L		102	70 - 130	3	20	
Tetrachloroethene	25.0	25.8		ug/L		103	70 - 130	1	20	
Chlorodibromomethane	25.0	27.3		ug/L		109	70 - 145	2	20	
Chlorobenzene	25.0	24.8		ug/L		99	70 - 130	1	20	
Bromoform	25.0	26.9		ug/L		108	68 - 136	2	20	
1,1,1,2-Tetrachloroethane	25.0	22.0		ug/L		88	70 - 130	20	20	
1,3-Dichlorobenzene	25.0	25.0		ug/L		100	70 - 130	2	20	
1,4-Dichlorobenzene	25.0	24.9		ug/L		100	70 - 130	2	20	
1,2-Dichlorobenzene	25.0	24.5		ug/L		98	70 - 130	1	20	
Chloromethane	25.0	23.2		ug/L		93	52 - 175	7	20	
Bromomethane	25.0	27.2		ug/L		109	43 - 151	3	20	
1,1,2-Trichloro-1,2,2-trifluoroethane	25.0	27.8		ug/L		111	42 - 162	2	20	
EDB	25.0	24.5		ug/L		98	70 - 130	3	20	
1,2,4-Trichlorobenzene	25.0	23.3		ug/L		93	70 - 130	0	20	

Surrogate	LCSD LCSD		Limits
	%Recovery	Qualifier	
Toluene-d8 (Surr)	104		70 - 130
4-Bromofluorobenzene	103		67 - 130
1,2-Dichloroethane-d4 (Surr)	100		75 - 138

## Method: 8015B - Diesel Range Organics (DRO) (GC)

Lab Sample ID: MB 720-122818/1-A

Matrix: Water

Analysis Batch: 123381

Client Sample ID: Method Blank

Prep Type: Silica Gel Cleanup

Prep Batch: 122818

Analyte	MB MB		RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
	Result	Qualifier							
Diesel Range Organics [C10-C28]	ND		50		ug/L		10/11/12 08:30	10/18/12 11:45	1
Motor Oil Range Organics [C24-C36]	ND		99		ug/L		10/11/12 08:30	10/18/12 11:45	1
TPH-Hydraulic Oil Range (C19-C36)	ND		500		ug/L		10/11/12 08:30	10/18/12 11:45	1

Surrogate	MB MB		Limits	Prepared	Analyzed	Dil Fac
	%Recovery	Qualifier				
Capric Acid (Surr)	0.001		0 - 5	10/11/12 08:30	10/18/12 11:45	1
p-Terphenyl	88		31 - 150	10/11/12 08:30	10/18/12 11:45	1

Lab Sample ID: LCS 720-122818/2-A

Matrix: Water

Analysis Batch: 123381

Client Sample ID: Lab Control Sample

Prep Type: Silica Gel Cleanup

Prep Batch: 122818

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits	
							Limit	RPD
Diesel Range Organics [C10-C28]	2500	2010		ug/L		80	32 - 119	

# QC Sample Results

Client: ProTech Consulting and Engineering  
 Project/Site: Kelly Moore

TestAmerica Job ID: 720-45070-1

## Method: 8015B - Diesel Range Organics (DRO) (GC) (Continued)

**Lab Sample ID: LCS 720-122818/2-A**

**Matrix: Water**

**Analysis Batch: 123381**

**Client Sample ID: Lab Control Sample**

**Prep Type: Silica Gel Cleanup**

**Prep Batch: 122818**

<i>Surrogate</i>	<i>%Recovery</i>	<i>LCS Qualifier</i>	<i>Limits</i>
<i>p-Terphenyl</i>	99		31 - 150

**Lab Sample ID: LCSD 720-122818/3-A**

**Matrix: Water**

**Analysis Batch: 123381**

**Client Sample ID: Lab Control Sample Dup**

**Prep Type: Silica Gel Cleanup**

**Prep Batch: 122818**

<i>Analyte</i>	<i>Spike Added</i>	<i>LCSD Result</i>	<i>LCSD Qualifier</i>	<i>Unit</i>	<i>D</i>	<i>%Rec</i>	<i>%Rec. Limits</i>	<i>RPD</i>	<i>RPD Limit</i>
Diesel Range Organics [C10-C28]	2500	1480		ug/L		59	32 - 119	31	35

<i>Surrogate</i>	<i>%Recovery</i>	<i>LCSD Qualifier</i>	<i>Limits</i>
<i>p-Terphenyl</i>	95		31 - 150

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# QC Association Summary

Client: ProTech Consulting and Engineering  
 Project/Site: Kelly Moore

TestAmerica Job ID: 720-45070-1

## GC/MS VOA

### Analysis Batch: 122597

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
720-45070-1	MW-2	Total/NA	Water	8260B	
720-45070-2	MW-3	Total/NA	Water	8260B	
720-45070-3	MW-4	Total/NA	Water	8260B	
720-45070-4	MW-5	Total/NA	Water	8260B	
720-45070-5	MW-6	Total/NA	Water	8260B	
LCS 720-122597/5	Lab Control Sample	Total/NA	Water	8260B	
LCSD 720-122597/6	Lab Control Sample Dup	Total/NA	Water	8260B	
MB 720-122597/4	Method Blank	Total/NA	Water	8260B	

## GC Semi VOA

### Prep Batch: 122818

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
720-45070-1	MW-2	Silica Gel Cleanup	Water	3510C SGC	
720-45070-2	MW-3	Silica Gel Cleanup	Water	3510C SGC	
720-45070-3	MW-4	Silica Gel Cleanup	Water	3510C SGC	
720-45070-4	MW-5	Silica Gel Cleanup	Water	3510C SGC	
720-45070-5	MW-6	Silica Gel Cleanup	Water	3510C SGC	
LCS 720-122818/2-A	Lab Control Sample	Silica Gel Cleanup	Water	3510C SGC	
LCSD 720-122818/3-A	Lab Control Sample Dup	Silica Gel Cleanup	Water	3510C SGC	
MB 720-122818/1-A	Method Blank	Silica Gel Cleanup	Water	3510C SGC	

### Analysis Batch: 123381

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
720-45070-1	MW-2	Silica Gel Cleanup	Water	8015B	122818
720-45070-2	MW-3	Silica Gel Cleanup	Water	8015B	122818
720-45070-3	MW-4	Silica Gel Cleanup	Water	8015B	122818
720-45070-4	MW-5	Silica Gel Cleanup	Water	8015B	122818
720-45070-5	MW-6	Silica Gel Cleanup	Water	8015B	122818
LCS 720-122818/2-A	Lab Control Sample	Silica Gel Cleanup	Water	8015B	122818
LCSD 720-122818/3-A	Lab Control Sample Dup	Silica Gel Cleanup	Water	8015B	122818
MB 720-122818/1-A	Method Blank	Silica Gel Cleanup	Water	8015B	122818

# Lab Chronicle

Client: ProTech Consulting and Engineering  
Project/Site: Kelly Moore

TestAmerica Job ID: 720-45070-1

## Client Sample ID: MW-2

Date Collected: 10/05/12 00:00

Date Received: 10/05/12 13:15

## Lab Sample ID: 720-45070-1

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	122597	10/09/12 16:28	AC	TAL SF
Silica Gel Cleanup	Prep	3510C SGC			122818	10/11/12 08:30	AM	TAL SF
Silica Gel Cleanup	Analysis	8015B		1	123381	10/18/12 12:59	BA	TAL SF

## Client Sample ID: MW-3

Date Collected: 10/05/12 00:00

Date Received: 10/05/12 13:15

## Lab Sample ID: 720-45070-2

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	122597	10/09/12 16:58	AC	TAL SF
Silica Gel Cleanup	Prep	3510C SGC			122818	10/11/12 08:30	AM	TAL SF
Silica Gel Cleanup	Analysis	8015B		1	123381	10/18/12 14:37	BA	TAL SF

## Client Sample ID: MW-4

Date Collected: 10/05/12 00:00

Date Received: 10/05/12 13:15

## Lab Sample ID: 720-45070-3

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	122597	10/09/12 17:27	AC	TAL SF
Silica Gel Cleanup	Prep	3510C SGC			122818	10/11/12 08:30	AM	TAL SF
Silica Gel Cleanup	Analysis	8015B		1	123381	10/18/12 13:23	BA	TAL SF

## Client Sample ID: MW-5

Date Collected: 10/05/12 00:00

Date Received: 10/05/12 13:15

## Lab Sample ID: 720-45070-4

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	122597	10/09/12 17:56	AC	TAL SF
Silica Gel Cleanup	Prep	3510C SGC			122818	10/11/12 08:30	AM	TAL SF
Silica Gel Cleanup	Analysis	8015B		1	123381	10/18/12 13:48	BA	TAL SF

## Client Sample ID: MW-6

Date Collected: 10/05/12 00:00

Date Received: 10/05/12 13:15

## Lab Sample ID: 720-45070-5

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B		1	122597	10/09/12 18:26	AC	TAL SF
Silica Gel Cleanup	Prep	3510C SGC			122818	10/11/12 08:30	AM	TAL SF
Silica Gel Cleanup	Analysis	8015B		1	123381	10/18/12 14:12	BA	TAL SF

### Laboratory References:

TAL SF = TestAmerica Pleasanton, 1220 Quarry Lane, Pleasanton, CA 94566, TEL (925)484-1919

# Certification Summary

Client: ProTech Consulting and Engineering  
Project/Site: Kelly Moore

TestAmerica Job ID: 720-45070-1

## Laboratory: TestAmerica Pleasanton

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
California	State Program	9	2496	01-31-14

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# Method Summary

Client: ProTech Consulting and Engineering  
Project/Site: Kelly Moore

TestAmerica Job ID: 720-45070-1

Method	Method Description	Protocol	Laboratory
8260B	Volatile Organic Compounds (GC/MS)	SW846	TAL SF
8015B	Diesel Range Organics (DRO) (GC)	SW846	TAL SF

**Protocol References:**

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

**Laboratory References:**

TAL SF = TestAmerica Pleasanton, 1220 Quarry Lane, Pleasanton, CA 94566, TEL (925)484-1919



# Sample Summary

Client: ProTech Consulting and Engineering  
Project/Site: Kelly Moore

TestAmerica Job ID: 720-45070-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
720-45070-1	MW-2	Water	10/05/12 00:00	10/05/12 13:15
720-45070-2	MW-3	Water	10/05/12 00:00	10/05/12 13:15
720-45070-3	MW-4	Water	10/05/12 00:00	10/05/12 13:15
720-45070-4	MW-5	Water	10/05/12 00:00	10/05/12 13:15
720-45070-5	MW-6	Water	10/05/12 00:00	10/05/12 13:15

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**720.45070**

Report To					Analysis Request																	
Attn: <u>Woody Lovejoy</u>																						
Company: <u>ProTech</u>																						
Address: <u>1205 Main St</u>																						
Phone: <u>(650) 569-4020</u> Email: <u>ProTech@Teg-International.com</u>																						
Bill To: <u>ProTech</u>			Sampled By: <u>Ryan Cozart</u>																			
Attn: <u>Woody Lovejoy</u>			Phone: <u>415-382-2520</u>																			
Sample ID	Date	Time	Mat. #	Preserv.	TPH EPA - <input type="checkbox"/> 8260B <input type="checkbox"/> Gas w/ <input type="checkbox"/> BTEX <input type="checkbox"/> MTBE	TEPH EPA 8015M* <input checked="" type="checkbox"/> Silica Gel <input checked="" type="checkbox"/> Diesel <input checked="" type="checkbox"/> Motor Oil <input checked="" type="checkbox"/> Other <input checked="" type="checkbox"/> <u>H<sub>2</sub>S</u>	EPA 8260B: <input type="checkbox"/> Gas <input type="checkbox"/> BTEX <input type="checkbox"/> 5 Oxygenates <input type="checkbox"/> DCA, EDB <input type="checkbox"/> Ethanol	(HVOCS) EPA 8021 by 8260B	Volatile Organics GC/MS (VOCs) <input type="checkbox"/> EPA 8260B <input type="checkbox"/> 624	Semivolatiles GC/MS <input type="checkbox"/> EPA 8270 <input type="checkbox"/> 625	Oil and Grease <input type="checkbox"/> Petroleum (EPA 1664) <input type="checkbox"/> Total	Pesticides <input type="checkbox"/> EPA 8081 <input type="checkbox"/> 608 <input type="checkbox"/> PCBs <input type="checkbox"/> EPA 8082 <input type="checkbox"/> 608	PNAs by <input type="checkbox"/> 8270 <input type="checkbox"/> 8310	CAM17 Metals (EPA 60107/4707471)	Metals: <input type="checkbox"/> Lead <input type="checkbox"/> LUFT <input type="checkbox"/> ORCRA <input type="checkbox"/> Other: _____	Low Level Metals by EPA 200.8/6020 (ICP-MS): _____	W.E.T (STLC) <input type="checkbox"/> TCLP	Hex. Chrom. (Specify Method) <input type="checkbox"/> pH (24h hold time for H <sub>2</sub> O)	Spec. Cond. <input type="checkbox"/> Alkalinity <input type="checkbox"/> TSS <input type="checkbox"/> TDS	Anions: <input type="checkbox"/> Cl <input type="checkbox"/> SO <sub>4</sub> <input type="checkbox"/> NO <sub>3</sub> <input type="checkbox"/> F <input type="checkbox"/> Br <input type="checkbox"/> NO <sub>2</sub> <input type="checkbox"/> PO <sub>4</sub>	Number of Containers	
<u>mw-2</u>	<u>10/5/12</u>		<u>2</u>	<u>1</u>		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>														<u>5</u>
<u>mw-3</u>			<u>2</u>	<u>1</u>		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>														<u>5</u>
<u>mw-4</u>			<u>2</u>	<u>1</u>		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>														<u>5</u>
<u>mw-5</u>			<u>2</u>	<u>1</u>		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>														<u>5</u>
<u>mw-6</u>			<u>2</u>	<u>1</u>		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>														<u>5</u>

Project Info		Sample Receipt	
Project Name: <u>Kelly Moore</u>	# of Containers: <u>30</u>		
Project#: <u>120107</u>	Head Space:		
PO#:	Temp: <u>4.90</u>		
Credit Card#:	Conforms to record:		

1) Relinquished by:

[Signature] 1315  
 Signature Time

Woody Lovejoy 10/5/12  
 Printed Name Date

Company \_\_\_\_\_

2) Relinquished by:

Signature \_\_\_\_\_ Time \_\_\_\_\_

Printed Name \_\_\_\_\_ Date \_\_\_\_\_

Company \_\_\_\_\_

3) Relinquished by:

Signature \_\_\_\_\_ Time \_\_\_\_\_

Printed Name \_\_\_\_\_ Date \_\_\_\_\_

Company \_\_\_\_\_

TAT	<u>5</u> Day	3 Day	2 Day	1 Day	Other:
Report: <input type="checkbox"/> Routine <input type="checkbox"/> Level 3 <input type="checkbox"/> Level 4 <input type="checkbox"/> EDD <input type="checkbox"/> State Tank Fund EDF					
Special Instructions / Comments: <input type="checkbox"/> Global ID _____					

1) Received by:

[Signature] 1315  
 Signature Time

Mullen 10-5-12  
 Printed Name Date

[Signature]  
 Company

2) Received by:

Signature \_\_\_\_\_ Time \_\_\_\_\_

Printed Name \_\_\_\_\_ Date \_\_\_\_\_

Company \_\_\_\_\_

3) Received by:

Signature \_\_\_\_\_ Time \_\_\_\_\_

Printed Name \_\_\_\_\_ Date \_\_\_\_\_

Company \_\_\_\_\_

## Login Sample Receipt Checklist

Client: ProTech Consulting and Engineering

Job Number: 720-45070-1

**Login Number: 45070**

**List Source: TestAmerica Pleasanton**

**List Number: 1**

**Creator: Apostol, Anita**

Question	Answer	Comment
Radioactivity wasn't checked or is <=/ background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	False	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

**APPENDIX 2 – HISTORICAL MONITORING**



Four groundwater monitor wells (MW-1, MW-2, MW-3, and MW-4) were installed to monitor groundwater conditions. The soil samples from the boring for MW-1 contained TEPH-d in the three samples collected between 5.5 ft and 10.5 ft below grade (fbg). The 10.5 fbg sample also contained Benzene, Xylenes, 1,1-DCA, 1,2-DCA, 1,1,1-TCA, and PCE. The soil sample collected 16 fbg in the boring for MW-2 contained Ethyl-Benzene and Xylenes. Soil samples from the other two soil borings for monitor wells MW-3 and MW-4 were below method detection limits (MDLs) for the compounds tested. The groundwater sample from monitor well MW-1 contained Benzene, 1,1-DCA, 1,1,1-TCA, Trichloroethylene (TCE), and PCE, while the groundwater samples from MW-2 and MW-3 were below method detection limits (MDLs) for all compounds tested. The groundwater sample from monitor well MW-4 contained TCE (ERM, 1990a). ERM reported an apparent mounding of groundwater near the former tankpit. They attributed this mounding to infiltration of surface water through the tankpit backfill.

Based on the results of soil sampling and groundwater results, Firestone decided to remove additional soil from the excavation in an attempt to remove the source of contamination. During this removal, monitor well MW-1 was destroyed. Results of confirmatory soil sampling indicated that TEPH-d was only detected in one of the sidewall samples (CS-3) at eight fbg at 3.8 ppm (ERM, 1990b).

Recommendations were made to perform quarterly groundwater monitoring for one year and then to re-evaluate the site conditions (ERM, 1990b). According to County personnel (Susan Hugo)<sup>21</sup> this work was never done.

ProTech performed a Phase I - Environmental Site Assessment (Phase I) in April 1998 on the property for K/M prior to their purchase of the property. During this task, ProTech located two of the three remaining groundwater monitor wells (MW-3 and MW-4), while well MW-2 was not evident during site reconnaissance activities. ProTech also identified five hydraulic lifts (Figure 2) that were present in the garage portion of the building (ProTech, 1998a).

After review of the Phase I report, K/M instructed ProTech to develop and sample the two-groundwater monitor wells (MW-3 and MW-4). In April 1998, ProTech developed the two groundwater monitor wells and collected groundwater samples for analysis for total petroleum hydrocarbons, characterized as gasoline (TPH-g), TEPH-d, TEPH, characterized as kerosene (TEPH-k), TEPH, characterized as motor oil (TEPH-mo), BTEX, O&G, and volatile organic compounds (VOCs). Results of the groundwater analyses (Figure 3) indicated that monitor well MW-3 was below MDLs for the compounds tested for, while monitor well MW-4 contained 1,1-DCA, cis-1,2-Dichloroethylene (cis-1,2-DCE), and PCE (ProTech, 1998b) at levels of interest. With the Phase I report and these groundwater results in-hand, K/M purchased the property.

In September 1998, K/M began removal of the five hydraulic lifts. ProTech witnessed the removal of all five lifts and collected soil samples from three of the pits (Pit #s 1, 4, and 5) where the rams were compromised and/or soil staining was evident. The soil samples were collected after soil was excavated to a point where contamination was no longer evident. The analyses,

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<sup>21</sup> Personal communication with Susan Hugo, June 1998.

which were specified by ACHA, were for total extractable petroleum hydrocarbons, characterized as hydraulic oil (TEPH-ho), VOCs, and LUFT Manual metals. Results from two of the pits (Pit #s 4, and 5) were below the MDLs of the analyses or present below regulated concentrations. Results from the third pit (Pit #1) indicated that TEPH-ho was detected at 500 ppm. Additional soil was excavated from this pit (approximately 3 ft below the groundwater table) and a second soil sample was collected for analysis. Results (Figure 2) indicated that TEPH-ho was still present at 1,400 ppm (ProTech, 1998c).

Results of soil samples were collected from “likely dirty” stockpiled soil indicated that petroleum hydrocarbons (TEPH-ho) required regulated disposal. This stockpiled soil was disposed of as a Class II - designated waste at Forward Landfill (ProTech, 1998c).

ACHCSA-EHS agreed that the “likely clean” soil, which came from the upper 3 feet of material in each pit and exhibited no evidence of contamination, could be re-used on-site as backfill above the water table. They further agreed that further assessment of the site would be through groundwater monitoring and the installation of two additional groundwater monitor wells (ACHCSA-EHS, 1999).

ProTech prepared a Workplan for the installation of the two additional groundwater monitor wells that the County requested plus a survey for top-of-casing (TOC) elevations of the new and existing wells (ProTech, 1999a).

Two groundwater monitor wells (MW-5 and MW-6) were installed March 1999. Soil samples were collected from the two soil borings for analysis for petroleum products, aromatic hydrocarbons, the fuel additive: methyl tert-butyl ether (MTBE), volatile organic compounds (VOCs), and semi-volatile organic compounds (SVOCs). The results indicated that only the soil samples from the boring for well MW-6 contained any compounds analyzed for above their method detection limits (MDLs). The only compound found was TEPH-d at 1.9 ppm (8 fbg) and 3.8 ppm (18 fbg). The two new wells (MW-5 and MW-6) were developed and purged, and the existing two wells (MW-3 and MW-4) were purged prior to collecting groundwater samples. The results of groundwater sampling indicate that none of the wells contains measurable petroleum hydrocarbons (TPH-g or TEPH-d), aromatic hydrocarbons (BTEX), MTBE, or SVOCs. All four wells contained 1,1-DCA, and PCE, while wells MW-5 and MW-6 also contained chloroform, and TCE, and well MW-4 also contained 1,1-DCE, cis-1,2-DCE, and vinyl chloride.<sup>22</sup> California maximum contaminant levels (rESLs) have been exceeded for 1,1-DCA, cis-1,2-DCE, PCE, and vinyl chloride. The four monitor wells (MW3 through MW-6) were surveyed TOC elevations. Monitor well MW-2 was not located during this field effort. ProTech recommended that the TPH-g, TEPH-d, BTEX, and MTBE, be removed from the analyte list for quarterly monitoring (ProTech, 1999b).

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<sup>22</sup> 1,1-DCA was improperly reported as 1,2-DCA in the April 1999 well installation report. All data tables have been corrected for this report. 1,2-DCA has not been detected by ProTech in its three sampling efforts, while 1,1-DCA has.

***APPENDIX 3 – STANDARD OPERATING PROCEDURES***

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## SOP-4 - GROUNDWATER DEVELOPMENT PURGING AND SAMPLING

### Well Development

Prior to water sampling, 72 hrs after well development, each well is purged by evacuating a minimum of three well-casing volumes of groundwater or until the one or more of parameters: temperature, conductivity, and pH of the discharge water stabilize. If a well is purged dry before three casing volumes have been removed, the sample will be taken after the well has recovered to within 80 percent of the static water level. Purged water is drummed so that it can be profiled and disposed of appropriately.

### Well Purging

A well is purged the wells using a 2-stage purge/sampling pump. We dedicate the down-hole tubing for the wells to avoid the introduction of foreign material thus preventing cross-contamination. We cleaned the purge/sampling pump, using a triple-rinse setup<sup>23</sup>, between wells. During purging, we measured the parameters: pH, conductivity, and temperature, while we observed clarity and/or turbidity of water. We monitored the parameters after a few gallons have been removed, at the mid-point of pumping, and at the end of pumping. Sampling of groundwater proceeded once purging was complete.

### Well Sampling

Forty-milliliter (ml) glass volatile-organic-analysis (VOA) vials, with Teflon septa, are used as sample containers for volatile organic compounds (VOC) analysis. For other analyses, the appropriate EPA-approved sampling containers are used. The groundwater sample is decanted into each VOA vial in such a manner that there is a meniscus at the top of the vial. The cap is quickly placed over the top of the vial and securely tightened. The VOA vial is then inverted and tapped to see if air bubbles are present. If none are present, the sample is labeled and refrigerated for delivery under chain-of-custody to the laboratory. Label information should include a sample identification number, job identification number, date, time, type of analysis requested, and the sampler's name.

For quality control purposes, a duplicate water sample can be collected from at least one well. This sample is put on hold at the laboratory. A trip blank is prepared at the office and placed in the transport cooler. It remains in the cooler during the entire sample transport process. The trip blank is placed on hold pending any anomalous results. A field blank is prepared in the field when sampling equipment is not dedicated. The field blank is prepared after a bladder pump or bailer is cleaned following its use in a well, prior to its use in a second well, and is analyzed along with the other samples. The field blank demonstrates the quality of in-field cleaning procedures to prevent cross-contamination.

To minimize the potential for cross-contamination between wells, all the well purging and water sampling equipment that is not dedicated to a well is triple-rinsed between each well. As a secondary precaution, wells are sampled in order of least to highest concentrations as established by previous analyses.

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<sup>23</sup> A triple-rinse setup is three buckets, the first with water and TSP, the second with water, and the third with DI water. The pump is soaked and scrubbed with a scrub brush in the first bucket to remove contaminants from the outside and we run the pump to clean the inside. We rinse the pump vigorously in the second bucket, and rinse again in the third bucket. We run the pump at each stage to flush the inside. The order in which we purge the wells is cleanest to dirtiest.

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## SOP-8 - LIQUID LEVEL GAUGING USING WATER LEVEL METER OR INTERFACE PROBE

The complete list of field equipment for liquid level gauging is assembled in the Technical office prior to departure to the field. This includes the probe(s), light filter(s), and product bailer(s) to be used for liquid levels (tested in test well before departure). The field kit also includes cleaning supplies (buckets, TSP, spray bottles, and deionized water) to clean the equipment between gauging wells.

When using the water level probe to gauge liquid levels, the probe tip is lowered into the well until the unit sounds. The top-of-casing (TOC) point is determined. This point is marked with a dot, or a groove, or is the obvious high point on the casing on the north side. The place on the probe-cord that corresponds with this TOC point is marked and an engineer's tape is used to measure the distance between the probe end and marking on the cord. This measurement is then recorded on the liquid level data sheet as depth to water (DTW).<sup>24</sup>

When using the interface probe to gauge liquid levels, clamping it to the metal stovepipe or another metal object nearby first grounds the probe. When no ground is available, reproducible measurements can be obtained by clipping the ground lead to the handle of the interface probe case. After grounding the probe, the top of the well casing is fitted with a light filter to insure that sunlight does not interfere with the operation of the probe's optical mechanisms. The probe tip is then lowered into the well and submerged in the groundwater. An oscillating (beeping) tone indicates that the probe is in water. The probe is slowly raised until either the oscillating tone ceases or becomes a solid tone. In either case, this is the depth-to-groundwater (DTW) measurement. The solid tone indicates that floating hydrocarbons are present on top of the groundwater. To determine the thickness of the floating hydrocarbons, the probe is slowly raised until the solid tone ceases. This is the depth-to-floating hydrocarbon (DTFH) measurement. To determine the thickness of the sinking hydrocarbons, the probe is slowly raised, from the bottom, until the solid tone turns into an oscillating tone. This is the depth-to-sinking hydrocarbon (DTSH) measurement. The process of lowering and raising the probe must be repeated several times to insure accurate measurements. DTW and DTFH or DTSH measurements are recorded in hundredths of feet on the liquid level data sheet. Liquid hydrocarbon thickness (PT) is calculated by difference Depth-to-Product (DTP) and the DTW. This measurement is recorded on the data sheet as liquid hydrocarbon thickness (PT). When floating hydrocarbons are found in a well, a bottom-loading product bailer may be lowered partially through the water/liquid hydrocarbon interface to confirm the thickness of floating hydrocarbons on the water surface. When sinking hydrocarbons are found a product bailer may be lowered through the water/liquid hydrocarbon interface, at the bottom of the well, to confirm the thickness of sinking hydrocarbons beneath the water.

In order to avoid cross contamination of wells during the liquid level gauging process, wells are gauged in a clean to dirty order (where this information is available). In addition, any gauging equipment is cleaned with TSP and water and thoroughly rinsed with deionized water before daily use, before gauging another well on a site, and at the completion of daily use.

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<sup>24</sup> <sup>24</sup> The volume of groundwater that needs removal from each well is determined by calculating the water column height (WCH), using  $[DTW - TD = WCH]$ , then determining the cubic feet ( $ft^3$ ), using  $[WCH * \pi * r^2]$ , where  $r$  = radius of the well casing, and then converting  $ft^3$  to gallons, using  $[ft^3 * 7.48]$ .

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## SOP-10 - SAMPLE LABELING & CHAIN-OF-CUSTODY

To ensure correct analysis and integrity of any sample, correct sample labeling and the accompaniment of a chain-of-custody (COC) form with all samples from the field to the designated analytic laboratory is mandatory. The label of a sample must include, at a minimum, the following items:

- Sample identification number
- Location of sample collection
- Date and time of sample collection
- Name of company collecting sample
- Preserved or not

Once this data has been put on the sample container, it must be transferred to the COC. A COC accompanies every shipment of samples and establishes the documentation necessary to trace sample possession, as well as evidence of collection, shipment, laboratory receipt, analysis requested and laboratory custody until the time of disposal. The COC form must include, at a minimum, the following items:

- Sample identification number
- Location of sample collection
- Date and time of sample collection
- Analysis required
- Sample type
- Preservative used, if any
- Names of all samplers
- Signatures of personnel relinquishing and receiving samples
- Laboratory sample number and log number (recorded by laboratory personnel)
- Company contact name and project number (recorded by laboratory personnel)
- Sample condition and temperature (recorded by laboratory personnel)

Sample transfer and shipment is always accompanied by a COC. The initial preparation of the COC occurs in the office and completed in the field by the personnel collecting the samples. Each sample is assigned a unique identification number that represents the specific sampling location. The identification numbers are entered on the COC accompanied by the requested analysis, preservative used, if any, type of sample collected, and type of sample container. Any special instructions are included here.

If the field personnel deliver the samples to the laboratory, they will at that time sign the COC form and relinquish the samples. At this point, the Quality Control Coordinator, or the representative for the laboratory, will check to make sure all samples are present and note the condition and integrity of each sample. After all samples have been documented as received by the laboratory personnel, they will sign the COC form and issue the delivering personnel a copy. The laboratory with the analytic data report should also return a copy of the signed COC form.

If the samples are delivered by courier, or other commercial carrier, the container of samples shall be sealed, and a custody tape will be applied to the container to seal it and to signal any tampering with the container. The courier will sign the COC taking ownership of the samples that the samplers have relinquished by also signing the COC. The receipt form the courier will be attached to the COC copy retained by the relinquishing personnel and serve as an extension of the COC.

Any changes to a COC must be initialed and copies of the revised COC must be distributed to all appropriate personnel.

**APPENDIX 4 – SUMMARY RESUMES**

**Dr. C. Hugh Thompson, P.E., DEE**  
Principal Consulting Environmental Engineer

**Years of Experience with This Firm: 9 with Other Firms: 31**

**Education: Degree(s)/ Year/ Specialization:**

- ScD, 1968, Environmental Engineering, Washington University, St. Louis, MO
- M.S., 1965, Civil Engineering – Water Resources, New Mexico State University
- B.S., 1964, Civil Engineering – Sanitary, New Mexico State University

**Active Registrations/Licenses/Certifications:**

- Professional Engineer # 35856, State of California
- Professional Engineer # 17893, State of Michigan
- Professional Engineer # 8298, State of Virginia
- Professional Engineer # 47437 State of Arizona
- General Engineering Contractor (Class A) California #813806; Haz Waste Cert.
- 40 hours OSHA Management Training
- Board Certified Environmental Engineer # 92-20070 American Academy of Environmental Engineers in Hazardous Wastes, also in Industrial Hygiene
- Professional Engineer # 19905 State of New Mexico

**Experience and Qualifications:**

- 1997 – Present - Principal Environmental Engineering Consultant, TCG/ProTech/HTA
  - 1985 – 1997 - Officer in 3 national environmental consulting firms: URS Corp., Roy F. Weston, Law Engineering, and Environmental
  - 1980 – 1985 - Corporate Director of Environmental Affairs and Operations, Aerojet General Corporation
  - 1978 – 1980 - Director Office of Hazardous Materials Research, Battelle Memorial Institute
  - 1970 – 1978 - US Government: Director Office of Hazardous and Toxic Substances, USEPA
- Industrial Environmental Issue Definition and Strategic Planning and Resolution
  - Pollution Prevention/Waste Minimization Plans
  - Site and Building Investigations, Mitigation Design and Implementation
  - Risk Management and Large Program Management
  - Corporate Compliance Program Design and Implementation
  - Industrial Waste Treatment Design and Pilot Studies
  - Treatment Technology Development and Applications
  - SPCC and Spill Response Plans
  - Environmental and OSHA Training
  - International Pollution Agreement Technical Support
  - Installation Restoration Programs
  - Municipal Waste Treatment Operation and Design

Dr. Thompson heads up the engineering group. Clients are well represented by Dr. Thompson's wealth of experience in site investigation and assessment, remedial design and implementation. Dr. Thompson also provides expert witness services to clients on a myriad of engineering disciplines.



**SHERWOOD LOVEJOY, JR., P.G., C.E.I., C.E.C., C.M.A., C.M.I.**  
 PRINCIPAL CONSULTING HYDROGEOLOGIST / ENVIRONMENTAL ASSESSOR

**Years of Experience with This Firm: 16 with Other Firms: 8**

**Education: Degree(s) / Year / Specialization:**

- M.S., 1993, Environmental Science and Management, University of San Francisco
- B.A., 1982, Geology, University of Rhode Island, Kingston, Rhode Island
- B.S., 1981, Zoology, University of Rhode Island, Kingston, Rhode Island
- Graduate Studies, 1982 - 1983 Hydrology, Geophysics, Advanced Structural Geology and Geochemistry, University of Maryland, College Park, Maryland

**Active Registrations:**

- Professional Geologist #TN-1566, State of Tennessee
- Professional Geologist #PG-2166, State of Wyoming
- General Engineering Contractor's (Class A) #540389, State of California
- Class A - Hazardous Waste Removal Certification #540389, State of California
- Well Driller License (C-57), #540389, State of California
- Certified Environmental Inspector #6331, National Registration for EAA,
- Certified Environmental Consultant, #6331, National Registration for EAA
- Certified Mold Assessor, #6331, National Registration for EAA
- Certified Mold Inspector, #6331, National Registration for EAA
- 40 Hour OSHA and 8 Hour OSHA Management Training

**Experience and Qualifications:**

- 1991-Present - Principal Consulting Hydrogeologist, TCG/ProTech/HTA
  - 1994 -1995 - President/Principal Hydrogeologist, MRD - Environmental Services, Inc.
  - 1990 -1991 - President/CEO/Principal Hydrogeologist, Hawaiian Geologic Resources, Inc.
  - 1988 -1991 - President/CEO/Principal Hydrogeologist, Western Geologic Resources, Inc.
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- Environmental Site Investigation & Assessment
  - Remediation Strategy Development
  - Facility Demolition/Plant Reclamation Strategy Development and Oversight
  - Underground Tank Compliance & Soil Remediation of Fuel Contamination
  - Demolition/Reconstruction Management and Oversight
  - Hydrogeological Assessment and Modeling
  - Groundwater Monitor Well Installation, Sampling, and Monitoring
  - Chemical Stabilization of Metals and pH in Soil
  - Mine Audits, Investigations, Reclamation Studies, and Reclamation Design
  - Regulatory Liaison, Negotiation, and Site Closure
  - Construction Management and Contractor Oversight

Mr. Lovejoy heads the surface and subsurface contamination investigation and remediation program. Clients are well represented by Mr. Lovejoy's extensive experience and expertise in the latest soil and groundwater investigation and remediation techniques and methods. In addition, clients benefit as they are skillfully represented during regulatory agency interaction, negotiation and permitting.

**Ryan Cozart**

Geologist/Environmental Assessor/Asbestos & Lead Technician

**Years of Experience with This Firm: 5 with Other Firms: 2**

**Education: Degrees / Year / Specialization:**

- B.S., 1998, Geology, California State – Hayward

**Active Registrations:**

- 40 Hour OSHA Training

**Experience and Qualifications:**

- 2001 – Present - Geologist/Environmental Assessor/Asbestos & Lead Technician, TCG/ProTech/HTA
- 2000 – 2001 – Polarized Light Microscope Analyst, EMSL
- 1998 – 2000 – Geologist, Burns and McDonnell
  - Environmental Site Investigation & Assessment
  - Facility Demolition/ Oversight
  - Underground Storage Tank Compliance
  - Groundwater Monitor Well Installation, Sampling, and Monitoring
  - Chemical Stabilization of Metals and pH in Soil
  - Construction Management and Contractor Oversight
  - Asbestos and lead building Surveys
  - Asbestos/lead air monitoring and analysis

Field geologic operations are well handled by Mr. Cozart. Clients are well represented by Mr. Cozart's experience in the latest soil and groundwater investigation techniques and methods. In addition, clients benefit as they are skillfully represented in the field.