Timothy L. Bishop, P.G.
Project Manager
Marketing Business Unit

Chevron Environmental Management Company
6101 Bollinger Canyon Road
Suite 5213
San Ramon, CA 94583
Tel (925) 790-6463
TimBishop@chevron.com

February 21, 2014

Mr. Keith Nowell
Alameda County Department of Environmental Health
1131 Harbor Bay Parkway, Suite 250
Alameda, California 94502-6577

RE: Well Destruction Work Plan
1629 Webster Street, Alameda, California
Fuel Leak Case No.: RO0000450

Dear Mr. Nowell,

I declare under penalty of perjury that to the best of my knowledge the information and/or recommendations contained in the attached report is/are true and correct.

If you have any questions or need additional information, please contact me at (925) 790-6463.

Sincerely,

Timothy Bishop
Union Oil of California – Project Manager

Attachment
Well Destruction Work Plan

ARCADIS
Infrastructure · Water · Environment · Buildings

Imagine the result

Chevron Environmental Management Company

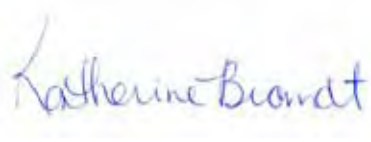
Well Destruction Work Plan

Former Unocal Station No. 0843
1629 Webster Street
Alameda, California

February 21, 2014

ARCADIS

Jamie Brodt
Environmental Engineer II



Katherine Brandt
Project Manager

David Lay
Professional Geologist

Well Destruction Work Plan

Former Unocal Station No. 0843
1629 Webster Street
Alameda, California

Prepared for:
Chevron Environmental Management Company

Prepared by:
ARCADIS U.S., Inc.
2000 Powell Street
7th Floor
Emeryville
California 94608
Tel 510.652.4500
Fax 510.652.4906
www.arcadis-us.com

Our Ref.:
B0047584.2014

Date:
February 21, 2014

ARCADIS

Table of Contents

Tables

Figures

Appendix

1. Introduction

On behalf of Chevron Environmental Management Company's affiliate, Union Oil Company of California ("Union Oil"), ARCADIS U.S. Inc. (ARCADIS) has prepared this Well Destruction Work Plan (work plan) for the former Unocal Station No. 0843, located at 1629 Webster Street in Alameda, California (site; Figures 1 and 2).

The site is an active leaking underground storage tank (LUST) cleanup site (Alameda County Case No. RO0000450). The site is currently part of a joint offsite methyl tertiary butyl ether (MTBE) investigation with the Shell Service Station #13-5032 (Alameda County Case No. RO0002745, Shell Service Station) located at 1601 Webster Street, directly south and upgradient of the site. The joint investigation is being conducted in an effort to delineate the vertical and horizontal extents of MTBE in deep zone groundwater (20 to 40 feet below ground surface [bgs]). Following a meeting with Alameda County Environmental Health (ACEH), ARCADIS, and Union Oil, on January 21, 2014, the ACEH granted approval to discontinue sampling and decommission of site monitoring well network via email correspondence (ACEH 2014). As a result of the current offsite MTBE investigation, groundwater monitoring wells and one temporary sparge point may be decommissioned in two separate phases: (1) eight shallow zone groundwater monitoring wells (MW-1, MW-1AR, MW-1BR, MW-3, MW-4, and MW-9 through MW-11) and one test sparge point (TSP-1), as well as (2) two onsite deep zone groundwater monitoring wells (MW-7 and MW-8) and two offsite shallow monitoring wells (MW-5 and MW-6). Phase 2 wells will be maintained until their destruction is necessary to accommodate planned redevelopment activities for the site.

2. Site Description

The site is a rectangular-shaped property (Alameda County Assessor's Parcel # 74-430-1-1) located at 1629 Webster Street in Alameda, California (Figure 1). Currently, the site contains an active auto service and repair shop with a parking lot. The site will be developed for retail space with residential units above the stores. It is anticipated to be a lot-line to lot-line slab-on-grade construction.

All USTs, dispenser islands, and associated product piping were removed when the former Unocal Service Station was decommissioned. Property in the immediate vicinity of the site is mixed-use residential and commercial. The site is bounded to the north by Pacific Avenue, to the east by Webster Street, and to the south and west by commercial property. Twelve active groundwater monitoring wells ((MW-1, MW-

1AR, MW-1BR, and MW-3 through MW-11) and one temporary sparge point (TSP-1) are currently associated with the site (Figure 2).

3. Geology and Hydrogeology

3.1 Regional and Site Geology

The site is located at the eastern portion of the San Francisco Bay and is underlain by interbedded Holocene age marine beach and near shore deposits, primarily composed of semi-consolidated, well-graded to poorly-graded sand, silty sand/sandy silt, silt, and clayey sand (Delta Environmental Consultants [Delta] 2010).

During previous investigation activities, borings were advanced to a maximum depth of 55 feet below ground surface (bgs). The site is underlain by poorly-graded and well-graded sands and silty sands, with interbedded silt and clay lenses less than 2 feet in thickness.

3.2 Regional and Site Hydrogeology

The site is located within the San Francisco Bay and is bounded to the southwest by the bay and to the north-northeast by the Oakland Inner Harbor (Figure 1). San Francisco Bay marks a natural topographic separation between the northern and southern coastal mountain ranges. The San Francisco Bay estuarine system conveys the waters of the Sacramento and San Joaquin rivers into the Pacific Ocean. The rivers enter the bay through the delta at the eastern end of Suisun Bay (Regional Water Quality Control Board [RWQCB] 2011). Boring advancement data indicate that first water encountered was at depths between 4 feet bgs (GP-1) to 19 feet bgs (MW-10).

Quarterly groundwater monitoring and reporting have been conducted at the site since March 1999. Data from these monitoring events indicate that static depth to groundwater varies from approximately 4.5 feet bgs to 9.5 feet bgs. The groundwater elevation has increased in site monitoring wells by approximately 4 feet since late 2008. Groundwater seasonal fluctuation varies by less than 2 feet. The groundwater flow direction is generally to the north-northeast with infrequent variations to the northwest.

During the most recent groundwater monitoring event conducted on November 6, 2013, the depth to groundwater varied from 9.3 feet bgs to 10.2 feet bgs. The

groundwater flow direction was to the northeast with a hydraulic gradient of 0.004 feet per foot.

4. Scope of Work

The activities associated with this proposed scope of work include:

- Notify the property owner and the RWQCB at least 10 days prior to initiating field work.
- Destroy eight shallow zone groundwater monitoring well locations and one temporary sparge point as part of Phase 1 well decommissioning to accommodate site redevelopment
- Destroy two onsite deep zone groundwater monitoring well locations and two offsite shallow zone groundwater monitoring well locations in a second mobilization event (Phase 2)
    - Monitoring wells MW-5 through MW-8 will be maintained for as long as possible to aid in the ongoing joint MTBE investigation until their destruction is necessary to proceed with site redevelopment.
- Submit investigation-derived waste decontamination water and soil samples for analytical analysis for waste disposal.

5. Field Activities

5.1 Health and Safety

All field activities will be completed with safety as a foremost concern. ARCADIS has prepared a Health and Safety Plan (HASP) which addresses the proposed monitoring well and temporary sparge point destruction activities at the site. The HASP is intended to identify and prevent potential safety hazards.

Utilities will be located and marked prior to destruction activities by a private utility locator. Underground Services Alert will be notified a minimum of 72 hours prior to initiating field activities. Additionally, maps showing existing utility locations will be reviewed for potential utility conflicts.

The Borehole Clearance Checklist for Well Destruction will be completed prior to the start of well destruction activities (Appendix A). If necessary, the surrounding area will

be cleared to a depth of 8 feet 1 inch using an airknife; the diameter of the cleared area will be a minimum of 110% of the auger diameter.

The total depth of all wells, including the temporary sparge point, planned for destruction will be confirmed prior to the start of well destruction activities.

5.2 Standard Operating Procedures

ARCADIS has developed standard operating procedures (SOPs) for well destruction and investigation-derived waste handling and storage. The SOPs will be followed by field personnel for the proposed field activities and are provided in Appendix B.

5.3 Well Destruction Permits

Well destruction permits from Alameda County Public Works will be required. In accordance with Alameda County Public Works general requirements, the permit application should be submitted so as to arrive at the Alameda County Public Works office at least 10 days prior to the proposed start date. Upon completion of well destruction activities, the original Department of Water Resources Water Well Drillers Report (DWR Form 188) must be signed by the driller and submitted within 60 days after the completion of well destruction activities.

An encroachment permit will be required from the California Department of Transportation (Caltrans) for the destruction of monitoring wells MW-5 and MW-6. These monitoring wells are located in Webster Street which is classified as a regional arterial roadway. At a minimum, a Traffic Control Plan will be prepared and submitted with the Encroachment Permit. However, a Transportation Management Plan (TMP) will be if the anticipated traffic delay caused by the well destruction work will be greater than 30 minutes (Caltrans 2013).

5.4 Well Destruction Activities

Prior to the redevelopment of the site, ten shallow monitoring wells, two deep monitoring wells, and one temporary sparge point will be destroyed in two phases (Figure 3). The following wells were slated for destruction based on information provided by the property owner regarding plans for site redevelopment. The ACEH approved these wells for destruction following the January 21, 2014 project meeting (ACEH 2014).

- Shallow Zone Groundwater Monitoring Wells (onsite): MW-1, MW-1AR, MW-1BR, MW-3, MW-4, MW-9, MW-10, and MW-11
- Temporary Sparge Point (onsite): TSP-1
- Shallow Zone Groundwater Monitoring Wells (offsite): MW-5 and MW-6
- Deep Zone Groundwater Monitoring Wells (onsite): MW-7 and MW-8

To destroy the wells, including the temporary sparge point, each well will be pressure grouted, overdrilled to 5 feet bgs, and then backfilled with neat cement grout to surface. The surface completion will match the surrounding asphalt unless otherwise requested by the property owner due to redevelopment activities.

6. Management of Investigation-Derived Waste

Soil cuttings and decontamination water from the well destruction activities will be temporarily stored onsite in properly labeled Department of Transportation-approved 55-gallon steel drums, pending waste profiling results. Investigation-derived waste will then be transported by Union Oil's disposal contractor to an appropriate disposal or treatment facility following waste characterization.

7. Reporting

ARCADIS will prepare a Well Destruction Report (report) and will submit the report to the RWQCB within 60 days following completion of the well destruction activities. The report will document the planned field activities and deviations from this work plan.

8. Proposed Work Schedule

ARCADIS will initiate the pre-field activities following regulatory approval and notification of redevelopment activities from the property owner. The report will be submitted approximately 60 days following completion of field activities.

9. References

ACEH. 2014. *Fuel Leak Case RO0000450 Former Unocal #0843, 1629 Webster Street, Alameda*. Email correspondence from Mr. Keith Nowell (Alameda County of Environmental Health) to Ms. Katherine Brandt (ARCADIS U.S., Inc.) and Ms.

Alexis Fischer (Chevron Environmental Management Company), January 28, 2014.

Caltrans. 2013. Encroachment Permits Manual, Chapter 200, Section 202.1C. July.

Delta. 2010. *Corrective Action Plan, 76 Service Station No. 0843, 1629 Webster Street, Alameda, California*. April 7, 2010.

RWQCB 2011. *San Francisco Bay Basin (Region 2) Water Quality Control Plan*. December 31, 2011.

ARCADIS

Tables

Table 1
Well Construction Details
Unocal Service Station No. 0843
1629 Webster Street
Alameda, California

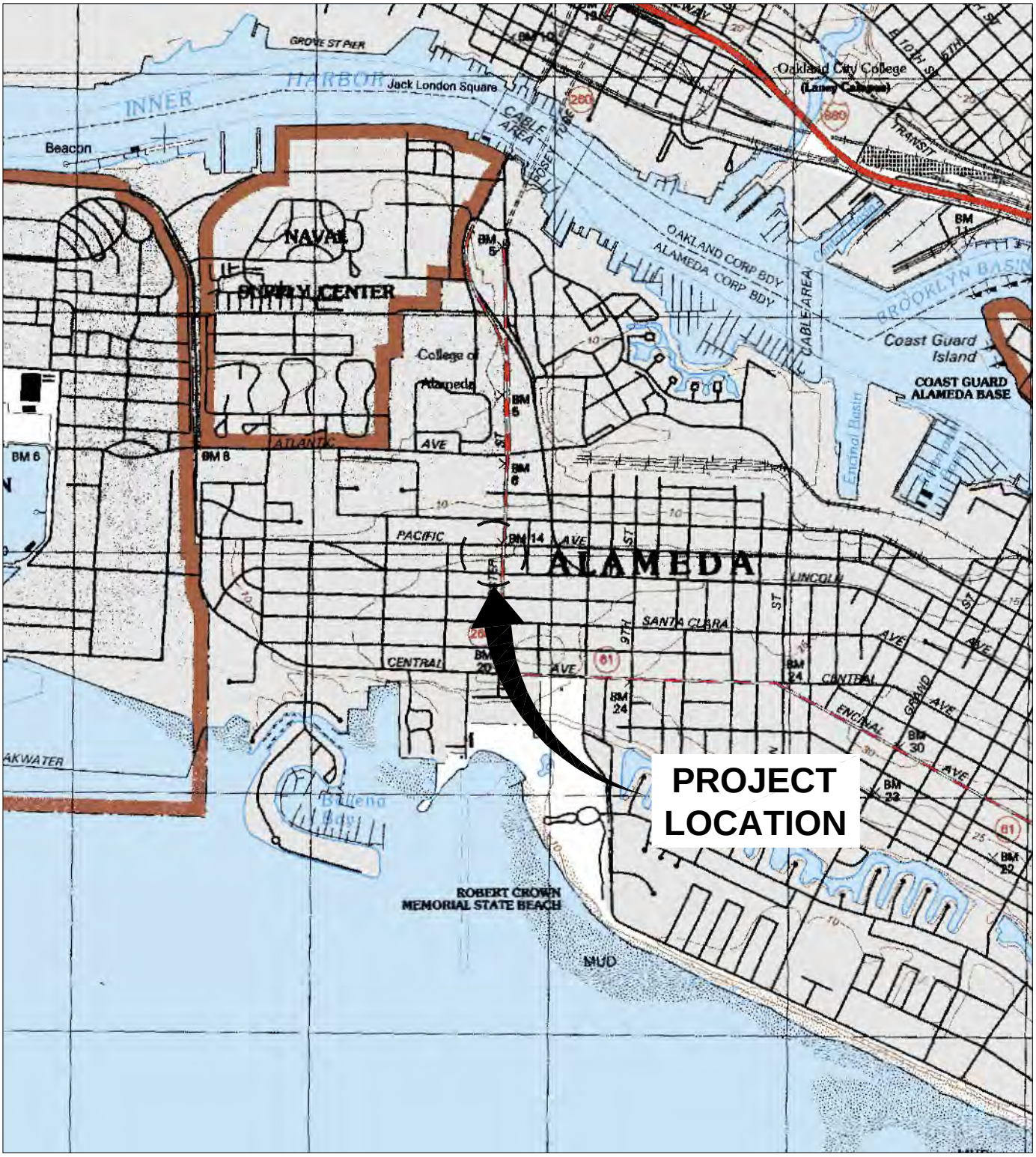
Well ID	Installation Date	TOC Elevation (feet aMSL)	Boring Depth (ft bgs)	Well Depth (ft bgs)	Boring Diameter (inches)	Well Diameter (inches)	Screen Interval (ft bgs)	Screen Size (inches)	Sand Filter Pack	Screen Zone Within Soil Type	Filter Pack Interval (ft bgs)	Seal Interval (ft bgs)	Well Location
MW-1	3/2/1999	19.13	20.5	20.5	8	2	5-20.5	0.020	#3	SP/SC	5-20.5	4-5	Onsite
MW-1AR	5/13/2009	19.29	30.5	30.5	8	2	25-30.5	0.020	#3	SM	23-30.5	21-23	Onsite
MW-1BR	5/15/2009	19.13	35	35	8	2	30-35	0.020	#3	SM	28-35	26-28	Onsite
MW-2	3/2/1999	15.57	20.5	20.5	8	2	5-20.5	0.020	#3	SP	5-20.5	4-5	Onsite
MW-2A	12/5/2002	15.56	--	11.5	--	2	--	--	--	--	--	--	Onsite
MW-3	3/2/1999	18.05	20.5	20.5	8	2	5-20.5	0.020	#3	ML	5-20.5	4-5	Onsite
MW-4	3/2/1999	18.14	20.5	20.5	8	2	5-20.5	0.020	#3	ML	5-20.5	4-5	Onsite
MW-5	12/8/1999	16.45	21.5	20	8	2	5-20	0.010	#2/12	CL/SM	4.5-21.5	3.5-4.5	Offsite
MW-6	12/8/1999	16.97	21.5	20	8	2	5-20	0.010	#2/12	SM	4.5-21.5	3.5-4.5	Offsite
MW-7	5/14/2009	17.81	30	30	8	2	25-30	0.020	#3	SC	23-30	21-23	Onsite
MW-8	5/14/2009	18.13	30	30	8	2	25-30	0.020	#3	SW-SM	23-30	21-23	Onsite
MW-9	5/13/2009	18.75	25	25	8	2	20-25	0.020	#3	SW-SM	18-25	16-18	Onsite
MW-10	5/20/2009	18.84	30	30	8	2	25-30	0.020	#3	SM	23-30	21-23	Onsite
MW-11	5/15/2009	18.72	28	28	8	2	23-28	0.020	#3	SC	21-28	19-21	Onsite
TSP-1	5/14/2009	--	30.5	30	8	0.75	--	0.020	#3	SM	25-30.5	20-25	Onsite

Abbreviations

ft aMSL	Feet above Mean Sea Level
ft bgs	Feet below ground surface
GWE	Groundwater elevation
--	Not available
SP	Poorly-graded sand
SW - SM	Well-graded silt and sand
SM	Silty sand
ML	Silt
CL	Clay
SC	Clayey sand

ARCADIS

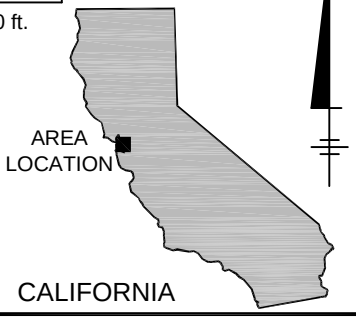
Figures



REFERENCE: BASE MAP USGS 7.5. MIN. TOPO. QUAD., OAKLAND WEST, CALIFORNIA, 1993.

0 2000' 4000'

Approximate Scale: 1 in. = 2000 ft.



UNION OIL
FORMER FACILITY NO. 0843
1629 WEBSTER STREET
ALAMEDA, CALIFORNIA

SITE LOCATION MAP

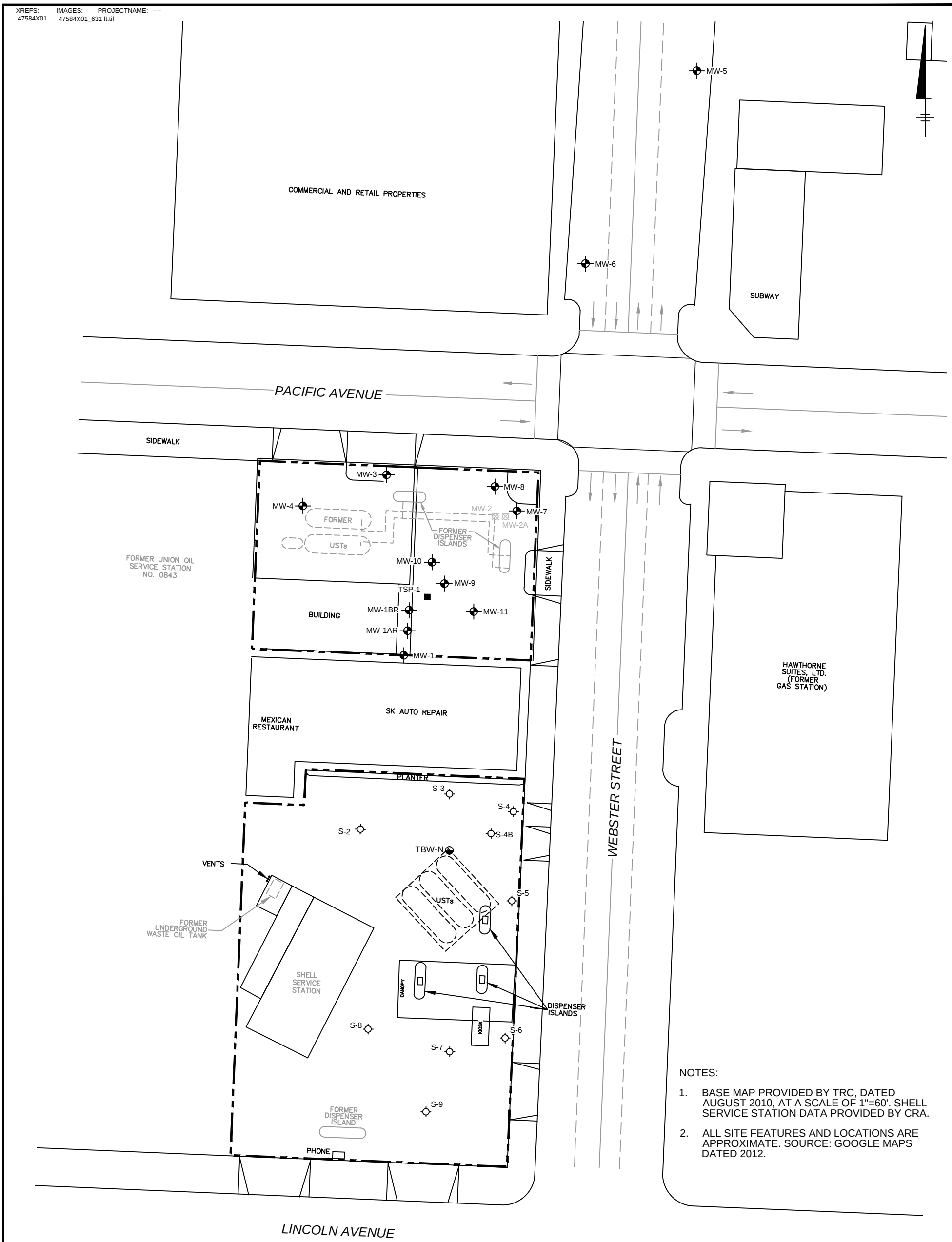
ARCADIS

FIGURE
1

CITY: PETALUMA, CA DIV/GROUP: ENV DB: J. HARRIS LD: J. HARRIS PIC: J. VOGELEY PM: K. ABBOTT TM: K. ABBOTT LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\Petaluma\ACT\B0047584\0000\00011\DWG\475841N01.dwg LAYOUT: 1SAVED: 4/19/2011 11:40 AM ACADVER: 18.0S (LMS TECH) PAGESETUP: SETUP1 PLOTSTYLETABLE: ARCADIS.CTB PLOTTED: 4/20/2011 10:57 AM BY: HARRIS, JESSICA
XREFS: IMAGES: PROJECTNAME: ---
Oakland West.jpg

CITY: SAN RAFAEL, CA (PETALUMA) DIV/GROUP: ENV DB: J. HARRIS, B. ROBITAILLE, J. HARRIS
C:\Users\jharris\Desktop\ENVCAD\B0047584\2014\00001\WORK PLAN\DWG\47584B01.dwg LAYOUT: 2 SAVED: 2/19/2014 12:07 PM ACADVER: 18.1S (LMS TECH) PAGESETUP: SETUP1 PLOTSTYLETABLE: ARCADIS.CTB PLOTTED: 2/19/2014 12:54 PM BY: HARRIS, JESSICA

XREFS: IMAGES: PROJECTNAME: ----
47584X01 47584X01_631 ft.tif



NOTES:

1. BASE MAP PROVIDED BY TRC, DATED AUGUST 2010, AT A SCALE OF 1"=60'. SHELL SERVICE STATION DATA PROVIDED BY CRA.
2. ALL SITE FEATURES AND LOCATIONS ARE APPROXIMATE. SOURCE: GOOGLE MAPS DATED 2012.

LEGEND

- PROPERTY BOUNDARY
- MW-1 — FORMER UNION OIL SERVICE STATION NO. 0843 MONITORING WELL (SHALLOW AND DEEP)
- TSP-1 — FORMER UNION OIL SERVICE STATION NO. 0843 TEMPORARY SPARGE POINT
- S-3 — SHELL SERVICE STATION MONITORING WELL (SHALLOW)
- TBW-N — SHELL TANK BACKFILL MONITORING WELL
- MW-2A — ABANDONED WELL

0 40' 80'

APPROXIMATE SCALE

UNION OIL COMPANY OF CALIFORNIA
FORMER FACILITY NO. 0843
1629 WEBSTER STREET
ALAMEDA, CALIFORNIA

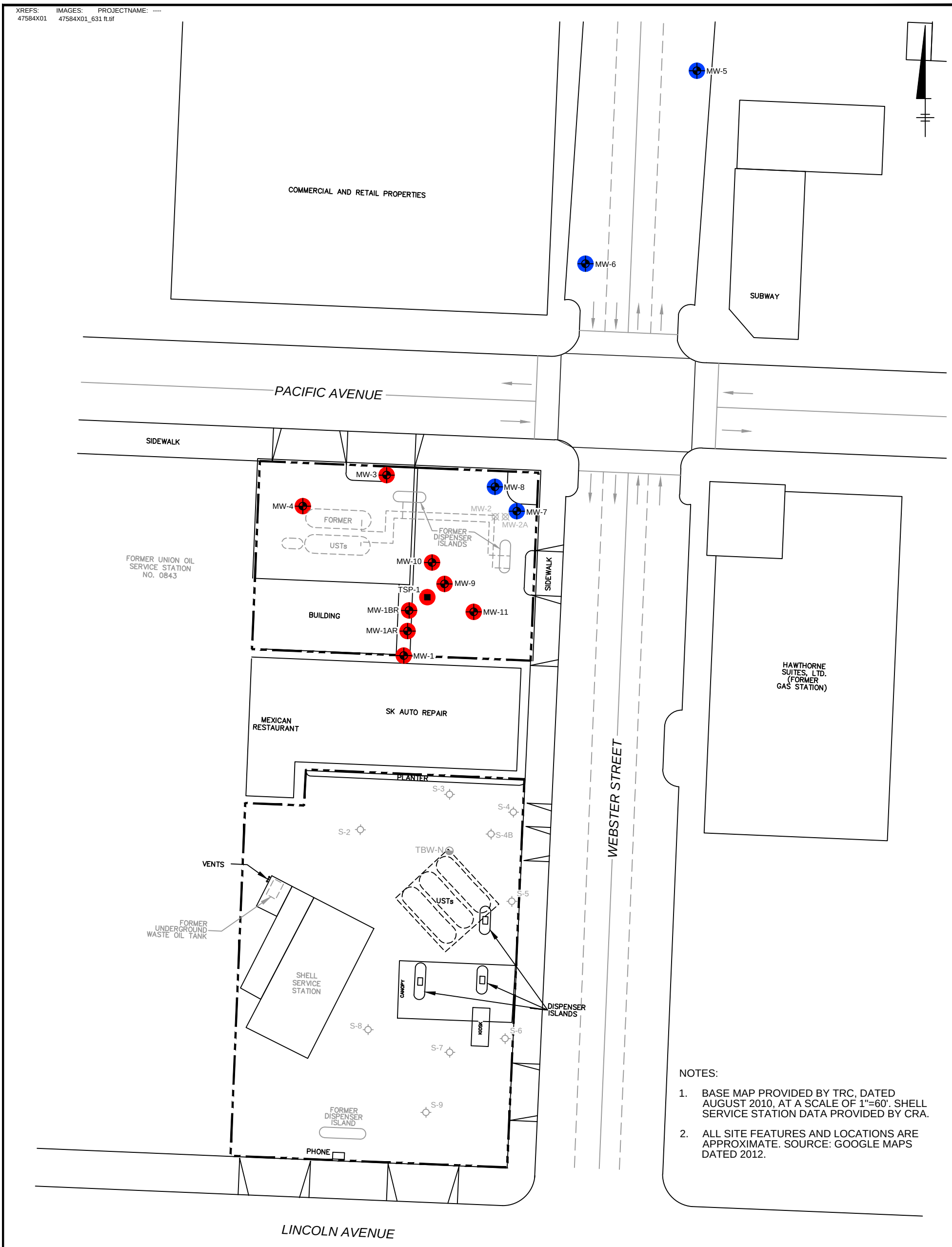
SITE PLAN

ARCADIS

FIGURE
2

CITY: SAN RAFAEL, CA (PETALUMA) DIV/GROUP: ENV DB: J. HARRIS, B. ROBITAILLE, J. HARRIS
C:\Users\jharris\Desktop\ENVCAD\B0047584\2014\00001\WORK PLAN\DWG\47584B02.dwg LAYOUT: 3 SAVED: 2/19/2014 12:07 PM ACADVER: 18.1S (LMS TECH) PAGESETUP: SETUP1 PLOTSTYLETABLE: ARCADIS.CTB PLOTTED: 2/19/2014 12:55 PM BY: HARRIS, JESSICA

XREFS: IMAGES: PROJECTNAME: ----
47584X01 47584X01_631 ft.tif



NOTES:

1. BASE MAP PROVIDED BY TRC, DATED AUGUST 2010, AT A SCALE OF 1"=60'. SHELL SERVICE STATION DATA PROVIDED BY CRA.
2. ALL SITE FEATURES AND LOCATIONS ARE APPROXIMATE. SOURCE: GOOGLE MAPS DATED 2012.

LEGEND

- PROPERTY BOUNDARY
- MW-1 — FORMER UNION OIL SERVICE STATION NO. 0843 MONITORING WELL (SHALLOW AND DEEP)
- TSP-1 — FORMER UNION OIL SERVICE STATION NO. 0843 TEMPORARY SPARGE POINT
- S-3 — SHELL SERVICE STATION MONITORING WELL (SHALLOW)
- TBW-N — SHELL TANK BACKFILL MONITORING WELL
- MW-2A — ABANDONED WELL
- PHASE 1 WELL DESTRUCTION LOCATION
- PHASE 2 WELL DESTRUCTION LOCATION

0 40' 80'
APPROXIMATE SCALE

UNION OIL COMPANY OF CALIFORNIA
FORMER FACILITY NO. 0843
1629 WEBSTER STREET
ALAMEDA, CALIFORNIA

PROPOSED WELL DESTRUCTION LOCATIONS

ARCADIS

FIGURE 3

ARCADIS

Appendix A

Borehole Clearance Review Form for Well Destruction

Chevron EMC Marketing Business Unit (MBU)

BOREHOLE CLEARANCE REVIEW - DESTRUCTION

For Use During Well Abandonment *ONLY*

Chevron Site No.: _____ Project No.: _____

Location(s) Reviewed: _____ Date: _____

Clearance Inspected by: _____ Supplier Review by: _____

Questions 1 - 18 must be answered prior to the start of well destruction activities, and uploaded to STRATA in report format.

If your answers to questions 1-18 indicate it is safe to over drill then it is not necessary to clear the hole. Contact the EMC PM to receive "approval to proceed" with/without borehole clearance for well destruction.

Yes	No	N/A	
☐	☐	☐	1. Is a scaled site plan showing the proposed borehole / existing well locations and utility conduits attached to this form?
☐	☐	☐	2. Are all of the proposed borehole / existing well locations at least 5 feet from any subsurface utilities (including fuel product lines) as shown on the building plans?
☐	☐	☐	3. Are all of the proposed borehole / existing well locations at least 7 feet from the pad surrounding the underground storage tanks (USTs) shown on the service station's building plans?
☐	☐	☐	4. Are all of the proposed borehole / existing well locations at least 5 feet from any subsurface utilities shown on public right-of-way street improvement plans? (*Work with respective utility company to determine if they require a representative present during drilling / excavation activities*)
☐	☐	☐	5. Was the station manager / property owner contacted to see if he/she has any knowledge of any subsurface utilities within 5 feet of the proposed borehole / existing well locations? (*Review locations with the manager / owner*)
☐	☐	☐	6. Were all circuits on during subsurface checks if the checks were for identifying energized lines? (e.g., circuits on timers or light sensing switches)
☐	☐	☐	7. Are all of the proposed borehole / existing well locations at least 5 feet from any subsurface utilities identified during a geophysical survey performed using ground penetrating radar (GPR) in conjunction with other technologies?
☐	☐	☐	8. Have all State One Call providers marked out their facilities in the vicinity of the proposed borehole / existing well locations or otherwise notified EMC's Contractor/Consultant that they do not have any facilities near the proposed borehole / existing well locations?
☐	☐	☐	9. Was there visual verification that each of the proposed borehole / existing well locations do not lay on a line connecting two similar looking manhole covers (e.g. sanitary sewer or storm drains)? (*Consider having the line snaked to confirm their locations*)
☐	☐	☐	10. Was there visual verification that each of the proposed borehole / existing well locations do not lie on a line with any water, gas, electrical meters, utility clean-outs, or other utility boxes in the surrounding areas?
☐	☐	☐	11. Was there visual verification that the pavement in the vicinity of each of the proposed borehole / existing well locations has not subsided or give the appearance it may be covering a former trench? (e.g., linear cracks or sagging curbs)
☐	☐	☐	12. Was there visual verification that each of the proposed borehole / existing well locations has adequate overhead clearance for the rig? (e.g., minimum of 10 feet from overhead utility line and/or reasonable distance from canopies to prevent damage)
☐	☐	☐	13. Was there visual verification that no changes have been made to the grout collar and the surface around the existing wells? (e.g. comparing current site conditions to photographs taken when the existing borings / wells were installed to identify different colors/textures of concrete in or saw cuts through the area of the well bore)
☐	☐	☐	14. Are all of the proposed borehole / existing well locations at least 5 feet from active remediation system lines shown on the as-built drawings?
☐	☐	☐	15. Was a review of the original boring logs for the existing borings / wells completed? (*Please document any discrepancies and/or changes*)
☐	☐	☐	16. Was a review of any prior utility locator reports completed? (*Please document any discrepancies and/or changes*)
☐	☐	☐	17. Have all appropriate permits been obtained?
☐	☐	☐	18. Are copies of the completed borehole clearance review checklist(s) and the findings from items 1 through 16 documented in a report? (*Please upload final report to STRATA*)

ARCADIS

Appendix B

Standard Operating Procedures

ARCADIS
Infrastructure, environment, facilities

Imagine the result

Monitoring Well Decommissioning

Rev. #: 0

Rev Date: July 25, 2010

Approval Signatures

Prepared by: Matthew C. McCaughey Date: 07/25/2010

Reviewed by: _____ Date: 07/26/2010
(Technical Expert)

I. Scope and Application

This standard operating procedure (SOP) describes the procedures for decommissioning groundwater monitoring wells. Monitoring wells may be decommissioned when it is found they are no longer suitable for collection of groundwater data (i.e., groundwater quality or groundwater elevation) due to damaged and/or questionable construction, when they must be removed to avoid interference to/from other construction activities in the area, or when groundwater monitoring is no longer required at the location. The purpose for decommissioning monitoring wells no longer in use is to:

- Eliminate physical hazards associated with an out-of-use monitoring well;
- Conserve the yield and hydrostatic head of confining aquifers;
- Prevent the intermingling of separate aquifers; and
- Remove a potential conduit for the vertical migration of constituents in groundwater along the well casing.

This SOP covers the decommissioning of single-cased overburden monitoring wells when a replacement well will not be installed within the same borehole. Three potential decommissioning methods (i.e., plugging-in-place, casing removal, and overdrilling) are described below.

Although these procedures are generally applicable for the decommissioning of double-cased monitoring wells or wells installed within bedrock, in most cases a decommissioning strategy should be developed on a well-by well basis. Additional information regarding potential methods to decommission these types of wells may be found in ASTM D5299-99 - Standard Guide for Decommissioning of Ground Water Wells, Vadose Zone Monitoring Devices, Boreholes, and Other Devices for Environmental Activities.

II. Personnel Qualifications

The well decommissioning procedures described below will be carefully adhered to and conducted under the supervision of an experienced geologist, engineer, or other qualified individual. If the overdrilling decommissioning method is utilized, drilling activities will be conducted by a registered well driller.

III. Equipment List

The following materials, as required, shall be available during pre-decommissioning and decommissioning activities:

- Site Health and Safety Plan (HASP);
- Health and safety equipment, as required in the HASP (e.g., air monitoring equipment, personal protective equipment);
- Information concerning the construction of the well to be decommissioned;
- Appropriate field forms or field notebook;
- Well keys;
- Water level probe;
- Cleaning materials;
- Drill rig with registered well driller and experienced personnel if the overdrilling method is utilized;
- Tremie pipe;
- Type I Portland cement;
- Uncoated bentonite pellets;
- Potable water;
- Containers for collecting spoils; and
- Any necessary specialized well drilling/decommissioning equipment.

IV. Cautions

Avoid using drilling fluids or materials that could impact groundwater or soil quality, or could be incompatible with the subsurface conditions.

Water used for over drilling or grouting boreholes upon completion will be of a quality acceptable for project objectives. If the water quality is unknown, testing of water supply should be considered.

Specifications of materials used for backfilling the bore hole will be obtained, reviewed and approved to meet project quality objectives.

No coated bentonite pellets will be used in monitoring well decommissioning, as the coating could be a source of contamination.

V. Health and Safety Considerations

Health and safety protocols should be described in the site-specific health and safety plan.

VI. Procedures

Plug-In Place Method

The plug-in-place method is applicable at locations where available information indicates that the annular space contains an adequate seal and vertical migration of constituents across a confining layer is not a concern in the well casing and screen interval, or if other considerations (e.g., double-cased well construction) preclude removal of the well casing. The well screen is left in place and may be additionally perforated, along with the base of the well, to allow the grout seal to penetrate the surrounding filter pack. The decommissioning process will consist of the following steps:

1. Perform a search of available records concerning the well to be decommissioned. The following activities should be performed to identify the location, construction, and condition of the well, and to determine the appropriate equipment to be utilized based on the depth, diameter, and access to the monitoring well:

    - Review the existing monitoring well log to identify construction characteristics (e.g., total depth, casing diameter, initial borehole diameter, type of casing, type of material(s) used);
    - Locate the monitoring well in the field;
    - Identify if the decommissioning equipment can access the monitoring well and/or if special considerations (e.g., construction of an access road) are necessary to gain access;
    - Conduct total depth measurements and water level measurements;

- Calculate the volume of the well that will need to be filled utilizing field measurements and formulas provided above; and

- Record all observations and measurements.

2. Remove the protective casing and well casing to a depth of approximately 3 to 4 feet below ground surface (bgs), if possible.

3. Perforate the base of the well screen utilizing a length of drilling rod or other equipment.

4. Prepare a neat cement grout. (Note: A neat cement grout is preferred for application through an in-place well; whereas, a bentonite grout or hydrated bentonite pellets may also be considered at locations where the well casing is removed or the well is overdrilled).

5. Place the neat cement grout in the perforated well casing via the tremie method (i.e., the grout will be pumped from the bottom of the well upward). The grout will be added until the well is filled to above the top of the well casing remaining in place (i.e., typically approximately 3 to 4 feet bgs). Verify that the amount of grout added equals or exceeds the calculated volume of the void to be filled.

6. The grout will be allowed to set for a minimum of 24 hours and the remainder of the borehole will be filled with concrete and/or other surface finish materials (see Step 7 below).

7. Where appropriate, a concrete surface finish will be installed by constructing an above-grade concrete slab a minimum of 6 inches thick, with a diameter at least 2 feet greater than the diameter of the borehole. If such a concrete surface finish is not compatible with the existing land use (e.g., roadway, parking lot, residential), the borehole shall be terminated with a minimum 1-foot-thick concrete plug above the grout and the remaining portion of the borehole shall be filled flush with grade with material(s) compatible with the surrounding land surface (e.g., asphalt, gravel, topsoil).

8. A Well Abandonment Log will be completed. A state specific Well Abandonment Log should be used and submitted to the appropriate state agency if required. .

Casing Removal Method

The casing removal method is applicable at shallow locations where vertical migration of constituents across a confining layer is not a concern and where the integrity of the

borehole is reasonably expected to be maintained following removal of the well materials. The decommissioning process will consist of the following steps:

1. Perform a search of available records concerning the well to be decommissioned. The following activities should be performed to identify the location, construction, and condition of the well, and determine the appropriate equipment to be utilized based on the depth, diameter, and access to the monitoring well:

    - Review the existing monitoring well log to identify construction characteristics (e.g., total depth, casing diameter, initial borehole diameter, type of casing, type of material(s) used);
    - Locate the monitoring well in the field;
    - Identify if the decommissioning equipment can access the monitoring well and/or if special considerations (e.g., construction of an access road) are necessary to gain access;
    - Conduct total depth measurements and water level measurements;
    - Calculate volume of well that will need to be filled utilizing field measurements and formulas provided above; and
    - Record all observations and measurements.

2. Remove the protective casing, if possible.

3. Remove the well materials (riser and screen).

4. Examine removed well materials to ensure that the entire section has been removed. Also ensure that the borehole has not collapsed and that the tremie pipe will be able to be inserted to the base of well depth. Well decommissioning should be completed by using the overdrilling method if the well casing is broken below grade and cannot be retrieved, or if the tremie pipe will not reach the base of the well.

5. Prepare a neat cement grout or a bentonite grout that is compatible with the soil and groundwater conditions present at the monitoring well. (Note: A neat cement grout or a bentonite grout is preferred for this application. Hydrated bentonite pellets may also be considered if the entire well boring is overdrilled, using procedures similar to those for abandoning boreholes).

6. Place the cement grout in the borehole via tremie method (i.e., the grout will be pumped from the bottom of the borehole upward). The grout will be added until the borehole is filled to approximately 3 to 4 feet bgs. Verify that amount of grout added equals or exceeds the calculated volume of the void to be filled.

7. The grout will be allowed to set for a minimum of 24 hours and the remainder of the borehole will be filled with concrete and/or other surface finish materials (see Step 8 below).

8. Where appropriate, a concrete surface finish will be installed by constructing an above-grade concrete slab a minimum of 6 inches thick, with a diameter at least 2 feet greater than the diameter of the borehole. If such a concrete surface finish is not compatible with the existing land use (e.g., roadway, parking lot, residential), the borehole shall be terminated with a minimum 1-foot-thick concrete plug above the grout and the remaining portion of the borehole shall be filled flush with grade with material(s) compatible with the surrounding land surface (e.g., asphalt, gravel, topsoil).

A Well Abandonment Log will be completed. A state specific Well Abandonment Log should be used and submitted to the appropriate state agency if required.

Overdrilling Method

The overdrilling method is the most conservative decommissioning procedure and should be utilized at locations where a well has penetrated a confining layer and there is no evidence that the annular space around the well casing was adequately sealed, or if attempts to remove the well casing are unsuccessful. The decommissioning process will consist of the following steps:

1. Perform a search of available records concerning the well to be decommissioned. The following activities should be performed to identify the location, construction, and condition of the well, and determine the appropriate equipment to be utilized based on the depth, diameter, and access to the monitoring well:

    - Review the existing monitoring well log to identify construction characteristics (e.g., total depth, casing diameter, initial borehole diameter, type of casing, type of material(s) used);

    - Locate the monitoring well in the field;

- Identify if a drill rig can access the monitoring well and/or if special considerations (e.g., construction of an access road) are necessary to gain access;
- Conduct total depth measurements and water level measurements;
- Calculate the volume of the well/borehole that will need to be filled utilizing field measurements and formulas provided above; and
- Record all observations and measurements.

2. Remove the protective casing, if possible.

3. If the protective casing has been removed, advance a hollow-stem auger or other drill casing (with an outside diameter larger than the well diameter) over the well casing to the bottom of the original borehole.

4. Prepare a neat cement grout or a bentonite grout that is compatible with the soil and groundwater conditions present at the monitoring well. Alternatively, hydrated bentonite pellets may be used to plug the borehole, using procedures similar to those for abandoning boreholes.

5. Place the cement grout in the borehole via tremie method (i.e., the grout will be pumped from the bottom of the borehole upward) at the same time the hollow-stem augers or drill casing are removed from the borehole. Grout will be added until the borehole is filled to approximately 3 to 4 feet bgs. Verify that the amount of grout added equals or exceeds the calculated volume of the void to be filled. If hydrated bentonite pellets are utilized, measure deposition depth with a weighted tape as the hollow-stem augers or drill casing are removed from the borehole to ensure that bridging does not occur. At certain shallow well locations installed in competent formations, it may be possible to remove the hollow-stem augers or drill casing prior to installing the sealant. If this is attempted, confirmatory measurements must be taken to verify that borehole integrity was maintained prior to plugging the hole.

6. The grout will be allowed to set for a minimum of 24 hours and the remainder of the borehole will be filled with concrete and/or other surface finish materials (see Step 7 below).

7. Where appropriate, a concrete surface seal will be installed by constructing an above-grade concrete slab a minimum of 6 inches thick, with a diameter at least 2 feet greater than the diameter of the borehole. If such a concrete surface seal is not compatible with the existing land use (e.g., roadway, parking lot,

residential), the borehole shall be terminated with a minimum 1-foot-thick concrete plug above the grout and the remaining portion of the borehole shall be filled flush with grade with material(s) compatible with the surrounding land surface (e.g., asphalt, gravel, topsoil).

8. A Well Abandonment Log will be completed. A state specific Well Abandonment Log should be used and submitted to the appropriate state agency if required.

Abandoning a Soil Boring

The following steps for abandoning a soil boring are summarized from ASTM D 5299-99:

1. Prepare a neat cement grout using Type I Portland cement and potable water mixed according to the following ratios:

   One (1) 94-pound bag of Type I Portland cement; and 5.5 gallons potable water.

2. As soon as the borehole is completed, place a grout pipe (tremie pipe) to the bottom of the boring and pump sealing grout slowly through the pipe to displace material in the borehole. Inject grout starting from the bottom of the hole. Grout slowly to prevent channeling of the grout. As the grouting progresses, slowly raise the pipe. Complete the grouting in one continuous operation, continuing to pump grout until overflowing grout is seen at the surface. The overflowing grout should be similar in appearance and characteristics to the grout being pumped down the hole.

3. Grout may settle over a 24-hour period. After 24 hours, check the grout in the borehole for settlement. If settling has occurred, place additional grout to the surface. When grouting is complete, finish the surface in a manner appropriate for final use (e.g., concrete).

VII. Waste Management

Waste management protocols should be described in the site-specific work plan.

VIII. Data Recording and Management

To assure that a well is properly plugged and there has been no bridging of the plugging materials, verification calculations and measurements are required to determine whether the volume of material placed in the well/borehole equals or

exceeds the volume of the void being filled. Some useful formulas for calculating well and material volumes are provided below.

- 7.481 gallons = 1 cubic foot
- 202.0 gallons = 1 cubic yard
- Volume of well/borehole (in gallons) = π TIMES well/borehole radius (in feet) squared TIMES length of well/borehole (in feet) TIMES 7.481 (gallons per cubic foot)

IX. Quality Assurance

Quality assurance protocols should be described in the site-specific work plan.

X. References

ASTM. D5299-99. Standard Guide for Decommissioning of Ground Water Wells, Vadose Zone Monitoring Devices, Boreholes, and Other Devices for Environmental Activities.

ARCADIS
Infrastructure, environment, buildings

Imagine the result

Investigation-Derived Waste Handling and Storage

Rev. #: 2

Rev Date: March 6, 2009

Approval Signatures

Prepared by: Andrew Kamik Date: 3/6/09

Reviewed by: Liz Marsh Date: 3/6/09
(Technical Expert)

I. Scope and Application

The objective of this Standard Operating Procedure (SOP) is to describe the procedures to manage investigation-derived wastes (IDW), both hazardous and non-hazardous, generated during site activities, which may include, but are not limited to - drilling, trenching/excavation, construction, demolition, monitoring well sampling, soil sampling, decontamination and remediation. Please note that this SOP is intended for materials that have been deemed a solid waste as defined by 40 CFR § 261.2 (which may includes liquids, solids, and sludges). In some cases, field determinations will be made based on field screening or previous data that materials are not considered a solid waste. IDW may include soil, groundwater, drilling fluids, decontamination liquids, personal protective equipment (PPE), sorbent materials, construction and demolition debris, and disposable sampling materials that may have come in contact with potentially impacted materials. IDW will be collected and staged at the point of generation. Quantities small enough to be containerized in 55-gallon drums will be taken to a designated temporary storage area (discussed in further detail under Drum Storage) onsite pending characterization and disposal. Waste materials will be analyzed for constituents of concern to evaluate proper disposal methods. PPE and disposable sampling equipment will be placed in DOT-approved drums prior to disposal and typically does not require laboratory analysis. This SOP describes the necessary equipment, field procedures, materials, regulatory references, and documentation procedures necessary for proper handling and storage of IDW up to the time it is properly disposed. The procedures for handling IDW are based on the United States Environmental Protection Agency's Guide to Management of Investigation Derived Wastes (USEPA, 1992). IDW is assumed to be contaminated with the site constituents of concern (COCs) until analytical evidence indicates otherwise. IDW will be managed to ensure the protection of human health and the environment and will comply with all applicable or relevant and appropriate requirements (ARAR). The following Laws and Regulations on Hazardous Waste Management are potential ARAR for this site.

State Laws and Regulations

- To Be Determined Based on Location of Site and Location of Treatment, Storage, and/or Disposal Facility (TSDF) to be utilized

Federal Laws and Regulations

- Resource Conservation and Recovery Act (RCRA) 42 USC § 6901-6987
- Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) 42 USC § 9601-9675

- Superfund Amendments and Reauthorization Act (SARA)
- Department of Transportation (DOT) Hazardous Materials Transportation

Pending characterization, IDW will be stored appropriately within each area of contamination (AOC). Under RCRA, "storage" is defined as the holding of hazardous waste for a temporary period, at the end of which the hazardous waste is treated, disposed of, or stored elsewhere" (40 CFR § 260.10). The onsite waste staging area will be in a secure and controlled area. Waste characterization can either be based on generator knowledge, such as using materials safety data sheets (MSDS'), or can be based upon analytical results. The laboratory used for waste characterization analysis must have the appropriate state and federal certifications and be approved by ARCADIS and Client. IDW will be classified as RCRA hazardous or non-regulated under RCRA based on the waste characterization.

If IDW is characterized as RCRA hazardous waste, RCRA and DOT requirements must be followed for packaging, labeling, transporting, storing, and record keeping as described in 40 CFR § 262 and 49 CFR § 171-178. Wastes judged to potentially meet the criteria for hazardous wastes shall be stored in DOT approved packaging. Waste material classified as RCRA non-hazardous may be handled and disposed of as an industrial waste.

Liquid wastes judged to potentially meet the criteria for hazardous wastes shall be stored in DOT approved 55 gallon drums or other approved containers that are compatible with the type of material stored therein. Solid materials deemed to potentially meet hazardous criteria will be drummed where practicable. Large quantities of potentially hazardous solid materials must be containerized (such as in a roll-off box) for up to a maximum of 90 or 180 days as described in the Excavated Solids Section. Waste material classified as non-hazardous may be handled and disposed of as an industrial waste and is not subject to the 90-day or 180-day on-site storage limitation.

This is a standard (i.e., typically applicable) operating procedure which may be varied or changed as required, dependent upon site conditions, equipment limitations, or limitations imposed by the procedure. The ultimate procedure employed will be documented in the project work plans or reports. If changes to the sampling procedures are required due to unanticipated field conditions, the changes will be discussed with the Project Manager and Client as soon as practicable and documented in the report.

II. Personnel Qualifications

ARCADIS field sampling personnel will have current health and safety training including 40-hour HAZWOPER training, site supervisor training, site-specific training, first aid, and CPR, as needed. ARCADIS personnel may sign manifests on a case-to-case basis for clients, provided the appropriate agreement is in place between ARCADIS and the client documenting that ARCADIS is not the generator, but is acting as authorized representative for the generator. ARCADIS personnel who sign hazardous waste manifests will have the current DOT hazardous materials transportation training according to 49 CFR § 172.704. ARCADIS field personnel will also comply with client-specific training such as LPS. In addition, ARCADIS field sampling personnel will be versed in the relevant SOPs and posses the required skills and experience necessary to successfully complete the desired field work.

III. Equipment List

The following materials, as required, shall be available for IDW handling and storage:

Appropriate personal protective equipment as specified in the Site Health and Safety Plan

- 55-gallon steel drums, DOT 1A2 or equivalent
- ¾ -inch socket wrench
- Hammer
- Leather gloves
- Drum dolly
- Appropriate drum labels (outdoor waterproof self adhesive)
- Polyethylene storage tank
- Appropriate labeling, packing, chain-of-custody forms, and shipping materials as specified in the *Chain-of-Custody* SOP and *Field Sampling Handling, Packing, and Shipping* SOP.
- Indelible ink and/or permanent marking pens
- Plastic sheeting

- Appropriate sample containers, labels, and forms
- Stainless-steel bucket auger
- Stainless steel spatula or knife
- Stainless steel hand spade
- Stainless steel scoop
- Digital camera
- Field logbook.

IV. Cautions

- Filled drums can be very heavy, always use appropriate moving techniques and equipment.
- Similar media will be stored in the same drums to aid in sample analysis and disposal.
- Drum lids must be secured to prevent rainwater from entering the drums.
- Drums containing solid material may not contain any free liquids.
- Waste containers stored for extended periods of time may be subject to deterioration. Drum over packs may be used as secondary containment.
- All drums must be in good condition to prevent potential leakage and facilitate subsequent disposal. Inspect the drums for dents and rust, and verify the drum has a secure lid prior to use.

V. Health and Safety Considerations

- Appropriate personal protective equipment must be worn by all field personnel within the designated work area.
- Air monitoring may be required during certain field activities as required in the Site Health and Safety Plan.

- If excavating in potentially hazardous areas is possible, contingency plans should be developed to address the potential for encountering gross contamination or non-aqueous phase liquids.

- ARCADIS field personnel will be familiar and compliant with Client-specific health and safety requirements such as Chevron's hand safety policy including the prohibition of fixed and/or folding blade knives.

VI. Procedure

Waste storage and handling procedures to be used depend upon the type of generated waste. For this reason, IDW should be stored in a secure location onsite in separate 55-gallon storage drums, solids can be stockpiled onsite (if non-hazardous), and purge water may be stored in polyethylene tanks. Waste materials such as broken sample bottles or equipment containers and wrappings will be stored in 55-gallon drums unless they were not in contact with sample media.

Management of IDW

Minimization of IDW should be considered by the Project Manager during all phases of the project. Site managers may want to consider techniques such as replacing solvent-based cleaners with aqueous-based cleaners for decontamination of equipment, reuse of equipment (where it can be decontaminated), limitation of traffic between exclusion and support zones, and drilling methods and sampling techniques that generate little waste. Alternative drilling and subsurface sampling methods may include the use of small diameter boreholes, as well as borehole testing methods such as a core penetrometer or direct push technique instead of coring (EPA, 1993).

Drum Storage

Drums containing hazardous waste shall be stored in accordance with the requirements of 40 CFR 265 Subpart I (for containers) and 265 Subpart DD (for containment buildings). All 55-gallon drums will be stored at a secure, centralized on-site location that is readily accessible for vehicular pick-up. Drums confirmed as, or believed to contain hazardous waste will be stored over an impervious surface provided with secondary containment. The storage location will, for drums containing liquid, have a containment system that can contain at least the larger of 10% of the aggregate volume of staged materials or 100% of the volume of the largest container. Drums will be closed during storage and be in good condition in accordance with the Guide to Management of Investigation-Derived Wastes (USEPA, 1992).

Hazardous Waste Determination

Waste material must be characterized to determine if it meets any of the federal definitions of hazardous waste as required by 40 CFR § 262.11. If the waste does not meet any of the federal definitions, it must then be established if any state-specific hazardous waste criteria exist/apply.

Generator Status

Once hazardous waste determination has been made, the generator status will be determined. Large quantity generators (LQG) are generators who generate more than 1,000 kilograms of hazardous waste in a calendar month. Small quantity generators (SQG) of hazardous waste are generators who generate greater than 100 kilograms but less than 1,000 kilograms of hazardous waste in a calendar month. Conditionally exempt small quantity generators (CESQG) are generators who generate less than 100 kilograms of hazardous waste per month. Please note that a generator status may change from month to month and that a notice of this change is usually required by the generator's state agency.

Accumulation Time for Hazardous Waste

A LQG may accumulate hazardous waste on site for 90 days or less without a permit and without having interim status provided that such accumulation is in compliance with specifications in 40 CFR § 262.34. A SQG may accumulate hazardous waste on site for 180 days or less without a permit or without having interim status subject to the requirements of 40 CFR § 262.34(d). CESQG requirements are found in 40 CFR § 261.5. **NOTE**: The CESQG and SQG provisions of 40 CFR § 261.5, 262.20(e), 262.42(b) and 262.44 may not be recognized by some states (e.g. Rhode Island). **State-specific regulations must be reviewed and understood prior to the generation of hazardous waste.**

Satellite Accumulation of Hazardous Waste

Satellite accumulation (SAA) shall mean the accumulation of as much as fifty-five (55) gallons of hazardous waste, or the accumulation of as much as one quart of acutely hazardous waste, in containers at or near any point of generation where the waste initially accumulates, which is under the control of the operator of the process generating the waste, without a permit or interim status and without complying with the requirements of 40 CFR § 262.34(a) and without any storage time limit, provided that the generator complies with 40 CFR § 262.34(c)(1)(i).

Once more than 55 gallons of hazardous waste accumulates in SAA, the generator has three days to move this waste into storage.

Storage recommendations for hazardous waste include:

- Ignitable Hazardous wastes must be >50 feet from the property line per 40 CFR § 265.176 (LQG generators only).
- Hazardous waste must be stored on a concrete slab (asphalt is acceptable if there are no free liquids in the waste) per 40 CFR § 265.176.
- Drainage must be directed away from the accumulation area.
- Area must be properly vented.
- Area must be secure.

Drum/Container Labeling

Drums will be labeled on both the side and lid of the drum using a permanent marking pen. Old drum labels must be removed to the extent possible, descriptions crossed out should any information remain, and new labels affixed on top of the old labels. Other containers used to store various types of waste (polyethylene tanks, roll-off boxes, end-dump trailers, etc.) will be labeled with an appropriate "Waste Container" or “Testing in Progress” label pending characterization. Drums and containers will be labeled as follows:

- Appropriate waste characterization label (Testing In Progress, Hazardous, or Non-Hazardous)
- Waste generator's name (e.g., client name)
- Project name
- Name and telephone number of ARCADIS project manager
- Composition of contents (e.g., used oil, acetone 40%, toluene 60%)
- Media (e.g., solid, liquid)
- Accumulation start date

- Drum number of total drums as reconciled with the Drum Inventory maintained in the field log book.

IDW containers will remain closed except when adding or removing waste. Immediately upon beginning to place waste into the drum/container, a “Waste Container” or “Testing in Progress” label will be filled out to include the information specified above, and affixed to the container. Once the contents of the container are identified as either non-hazardous or hazardous, the following additional labels will be applied. Containers with waste determined to be non-hazardous will be labeled with a green and white "Non-Hazardous Waste" label over the "Waste Container" label. Containers with waste determined to be hazardous will be stored in an onsite storage area and will be labeled with the "Hazardous Waste" label and affixed over the "Waste Container" label. The ACCUMULATION DATE for the hazardous waste is the date the waste is first placed in the container and is the same date as the date on the "Waste Container" label. DOT hazardous class labels must be applied to all hazardous waste containers for shipment offsite to an approved disposal or recycling facility. In addition a DOT proper shipping name shall be included on the hazardous waste label. The transporter should be equipped with the appropriate DOT placards. However, placarding or offering placards to the initial transporter is the responsibility of the generator per 40 CFR § 262.33.

Inspections and Documentation

All IDW will be documented as generated on a Drum Inventory Log maintained in the field log book. The Drum Inventory will record the generation date, type, quantity, matrix and origin (e.g. Boring-1, Test Pit 3, etc) of materials in every drum, as well as a unique identification number for each drum. The drum inventory will be used during drum pickup to assist with labeling of drums. The drum storage area and any other areas of temporarily staged waste, such as soil/debris piles, will be inspected weekly. The weekly inspections will be recorded in the field notebook or on a Weekly Inspection Log. Digital photographs will be taken upon the initial generation and drumming/staging of waste, and final labeling after characterization to document compliance with labeling and storage protocols, and condition of the container. Evidence of damage, tampering or other discrepancy should be documented photographically.

Emergency Response and Notifications

Specific procedures for responding to site emergencies will be detailed in the HASP. If the generator is designated as a LQG, a Contingency Plan will need to be prepared to include emergency response and notification procedures per 40 CFR § 265 Subpart D. In the event of a fire, explosion, or other release which could threaten human health

outside of the site or when Client or ARCADIS has knowledge of a spill that has reached surface water, Client or ARCADIS must immediately notify the National Response Center (800-424-8802) in accordance with 40 CFR § 262.34. Other notifications to state agencies may also be necessary.

Drilling Soil Cuttings and Muds

Soil cuttings are solid to semi-solid soils generated during trenching activities, subsurface soil sampling, or installation of monitoring wells. Depending on the drilling method, drilling fluids known as "muds" may be used to remove soil cuttings. Drilling fluids flushed from the borehole must be directed into a settling section of a mud pit. This allows reuse of the decanted fluids after removal of the settled sediments. Soil cuttings will be labeled and stored in 55-gallon drums with bolt-sealed lids.

Excavated Solids

Excavated solids may include, but are not limited to soil, fill and construction and demolition debris. Excavated solids may be temporarily stockpiled onsite as long as the material is a RCRA non-hazardous waste and the solids will be treated onsite pursuant to a certified, authorized, or permitted treatment method, or properly disposed off-site. Stockpiled materials characterized as hazardous must be immediately containerized and removed from the site within 90 days of generation (except for soils using satellite accumulation). Excavated solids should be stockpiled and maintained in a secure area onsite. At a minimum, the floor of the stockpile area will be covered with a 20-mil high density polyethylene liner that is supported by a foundation or at least a 60-mil high density polyethylene liner that is not supported by a foundation. The excavated material will not contain free liquids. The owner/operator will provide controls for windblown dispersion, run-on control, and precipitation runoff. The run-on control system will prevent flow onto the active portion of the pile during peak discharge from at least a 25-year storm and the run-off management system will collect and control at least the water volume resulting from a 24-hour, 25-year storm (EPA, 1992). Additionally, the stockpile area will be inspected on a weekly basis and after storm events. Individual states may require that the stockpile be inspected/certified by a licensed professional engineer. Stockpiled material will be covered with a 6-mil polyvinyl chloride (PVC) liner. The stockpile cover will be secured in place with appropriate material (concrete blocks, weights, etc.) to prevent the movement of the cover. Excavated solids may also be placed in roll off containers and covered with a 6-mil PVC liner pending results for waste characterization.

Decontamination Solutions

Decontamination solutions are generated during the decontamination of personal protective equipment and sampling equipment. Decontamination solutions may range from detergents, organic solvents and acids used to decontaminate small field sampling equipment to steam cleaning rinsate used to wash heavy field equipment. These solutions are to be labeled and stored in 55-gallon drums with bolt-sealed lids.

Disposable Equipment

Disposable equipment includes personal protective equipment (tyvek coveralls, gloves, booties and APR cartridges) and disposable sampling equipment such as trowels or disposable bailers. If the media sampled exhibits hazardous characteristics per results of waste characterization sampling, disposable equipment will also be disposed of as a hazardous waste. These materials will be stored onsite in labeled 55-gallon drums pending analytical results for waste characterization.

Purge Water

Purge water includes groundwater generated during well development, groundwater sampling, or aquifer testing. The volume of groundwater generated will dictate the appropriate storage procedure. Monitoring well development and groundwater sampling may generate three well volumes of groundwater or more. This volume will be stored in labeled 55-gallon drums. Aquifer tests may generate significantly greater volumes of groundwater depending on the well yield and the duration of the test. Therefore, large-volume portable polyethylene tanks will be considered for temporary storage pending groundwater-waste characterization.

Purged Water Storage Tank Decontamination and Removal

The following procedures will be used for inspection, cleaning, and offsite removal of storage tanks used for temporary storage of purge water. These procedures are intended to be used for rented portable tanks such as Baker Tanks or Rain for Rent containers. Storage tanks will be made of inert polyethylene materials.

The major steps for preparing a rented tank for return to a vendor include characterizing the purge water, disposing of the purge water, decontaminating the tank, final tank inspection, and mobilization. Decontamination and inspection procedures are describe in further detail below.

- Tank Cleaning: Most vendors require that tanks be free of any sediment and water before returning, a professional cleaning service may be required. Each

specific vendor should be consulted concerning specific requirements for returning tanks.

- Tank Inspection: After emptying the tank, purged water storage tanks should be inspected for debris, chemical staining, and physical damage. The vendors require that tanks be returned in the original condition (i.e., free of sediment, staining and no physical damage).

VII. Waste Characterization Sampling and Shipping

Soil/Solids Characterization

Waste characterization will be conducted in accordance with waste hauler, waste handling facility, and state/federal requirements. In general, RCRA hazardous wastes are those solid wastes determined by a Toxicity Characteristic Leaching Procedure (TCLP) test or to contain levels of certain toxic metals, pesticides, or other organic chemicals above specific federally regulated thresholds. If the one or more of 40 toxic compounds listed in Table I of 40 CFR § 261.24 are detected in the sample at levels above the maximum unregulated concentrations, the waste must be characterized as a toxic hazardous waste. Wastes can also be considered “listed” hazardous waste depending on site-specific processes.

Composite soil samples will be collected at a frequency of one sample per 10 cubic yard basis for stockpiled soil or one per 55-gallon drum for containerized. A four point composite sample will be collected per 10 cubic yards of stockpiled material and for each drum. Sample and composite frequencies may be adjusted in accordance with the waste handling facility’s requirements. Waste characterization samples may be analyzed for the TCLP volatile organic compounds (VOCs), TCLP semi-volatile organic compounds (SVOCs), TCLP RCRA metals, and polychlorinated biphenyls, as well as corrosivity (pH), reactivity and flammability (flashpoint). Additional samples may be collected and analyzed by the laboratory on a contingency basis.

Wastewater Characterization

Waste characterization will be conducted in accordance with the requirements of the waste hauler, waste handling facility, and state/federal governments. In general, purge water should be analyzed by methods appropriate for the known contaminants, if any, that have been historically detected in the monitoring wells. Samples will be collected and analyzed in accordance with the requirements of the waste disposal facility.

Wastewater characterization samples may be analyzed for TCLP volatile organic compounds (VOCs), TCLP semi-volatile organic compounds (SVOCs), TCLP RCRA

metals, and polychlorinated biphenyls, as well as corrosivity (pH), reactivity and flammability (flashpoint). Additional samples may be collected and analyzed by the laboratory on a contingency basis.

Sample Handling and Shipping

All samples will be appropriately labeled, packed, and shipped, and the chain-of-custody will be filled out in accordance with the Chain-of-Custody SOP and Field Sampling Handling, Packing, and Shipping SOP and Hazardous Materials Packaging and Shipping SOP.

It should be noted that additional training is required for packaging and shipping of hazardous and/or dangerous materials. Please reference the following ARCADIS intranet team page for more information: http://team/sites/hazmat/default.aspx.

Preparing Waste Shipment Documentation (Hazardous and Non-Hazardous)

Waste profiles will be prepared by the ARCADIS PM and forwarded, along with laboratory analytical data to the Client PM for approval/signature. The Client PM will then return the profile to ARCADIS who will then forward to the waste removal contractor for preparation of a manifest. The manifest will be reviewed by ARCADIS prior to forwarding to the Client PM for approval. Upon approval of the manifest, the Client PM will return the original signed manifest directly to the waste contractor or to the ARCADIS PM for forwarding to the waste contractor.

Final drum labeling and pickup will be supervised by an ARCADIS representative who is experienced with waste labeling procedures. The ARCADIS representative will have a copy of the drum inventory maintained in the field book and will reconcile the drum inventory with the profile numbers on the labels and on the manifest. Different profile numbers will be generated for different matrices or materials in the drums. For example, the profile number for drill cuttings will be different than the profile number for purge water. **When there are multiple profiles it is critical that the proper label, with the profile number appropriate to a specific material be affixed to the proper drums.** A copy of the ARCADIS drum inventory will be provided to the waste transporter during drum pickup and to the facility receiving the waste.

VIII. Data Recording and Management

Waste characterization sample handling, packing, and shipping procedures will be documented in accordance with the *Quality Assurance Project Plan*, if one exists. Copies of the chains-of-custody forms will be maintained in the project file.

Following waste characterization, IDW containers will be re-labeled with the appropriate waste hazardous or non-hazardous waste labels and the client will initiate disposal at the appropriate waste disposal facility.

IX. Quality Assurance

The chain-of-custody and sample labels for waste characterization samples will be filled out in accordance with the *Quality Assurance Project Plan*.

X. References

United States Environmental Protection Agency (USEPA). 1992. Guide to Management of Investigation-Derived Wastes. Office of Remedial and Emergency Response. Hazardous Site Control Division. January 1992.

USEPA. 1991. *Guide to Discharging CERCLA Aqueous Wastes to Publicly Owned Treatment Works (POTWs)*. Office of Remedial and Emergency Response. Hazardous Site Control Division 0S-220W. March 1991.