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ASSOCIATED PLATING COMPANY

Additional Facilities Investigation Report

Associated Plating Company

Santa Fe Springs, California

DEPARTMENT OF TOXIC SUBSTANCES CONTROL
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H0287C

30 June 2006

Environment & Water Resources

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PROJECT H0287C - FACILITIES INVESTIGATION REPORT

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LIST OF ACRONYMS AND ABBREVIATIONS

APC	Associate Plating Company
AOPC	areas of potential concern
API	American Petroleum Institute
AST	aboveground storage tank
ASTM	American Society for Testing and Materials
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylenes (collectively referenced)
CA	California
CAM	California Administrative Manual
cis-1,2-DCE	cis-1,2-dichloroethene
cm/sec	centimeters per second
Dayton	Dayton Superior
1,1-DCA	1,1-Dichloroethane
1,1-DCE	1,1-Dichloroethene
DHS	California Department of Health Services
DOT	Department of Transportation
DTSC	Department of Toxic Substances Control
DWR	California Department of Water Resources
ESLs	Environmental Screening Levels
ft	foot
ft	feet
g/cc	grams per cubic centimeters
LARWQCB	Regional Water Quality Control Board, Los Angeles Region
LACDHS	Los Angeles County Department of Health Services
LNAPL	light non-aqueous liquid
MCLs	maximum contaminant levels
mg/kg	milligrams per kilogram
MS	matrix spike
MSD	matrix spike duplicate
MSL	mean sea level
MTBE	methyl tert-butyl ether
NPL	National Priorities List

OD	outside diameter
Omega	Omega Chemical facility
OU	Operable Unit
PBR	Permit by Rule
PCE	tetrachloroethene
PCOCs	potential chemicals of concern
PID	photoionization detector
ppm	parts per million
PRG	Preliminary Remediation Goal
QA	quality assurance
QC	quality control
RBSLs	Risk-Based Screening Levels
SGS	soil gas survey
Sq ft	square foot
SVOCs	semi-volatile organic compounds
SWMUs	Solid Waste Management Units
TCE	trichloroethene
TPH	total petroleum hydrocarbons
TPHd	total petroleum hydrocarbons in the diesel range
TPHg	total petroleum hydrocarbons in the gasoline range
ug/kg	micrograms per kilogram
ug/L	micrograms per Liter
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
UST	underground storage tank
Valvoline	Valvoline Oil Company
VC	vinyl chloride
VOCs	volatile organic compounds
WDI	Waste Disposal Inc.

1. INTRODUCTION

This report presents the results of the April 2006 additional investigation of organic and inorganic constituents in soil, groundwater, and soil gas beneath the Associated Plating Company (APC) metal plating facility (the Site – **Figure 1**), located at 9636 Ann Street in the City of Santa Fe Springs, California. This report also presents the results of a human health risk assessment prepared by Mearns Consulting LLC (**Appendix A**). For previous investigation results, please refer to the Revised Facilities Investigation Report dated May 9, 2005 (Komex, 2005).

The work was performed in accordance with the Workplan for Additional Investigation prepared by WorleyParsons Komex, dated January 20, 2006 (WorleyParsons Komex, 2006). This workplan incorporated the general and specific Department of Toxic Substances Control (DTSC) comments from their letters to APC, dated September 20, 2005, December 14, 2005, and February 27, 2006 (DTSC, 2005a; DTSC, 2005b; DTSC, 2006a). This report has been prepared in accordance with the Corrective Action Consent Agreement entered into between APC and the DTSC on January 5, 2004.

1.1 Facility Background

APC operates a plating shop for small metallic components at 9636 Ann Street in the City of Santa Fe Springs, California (**Figures 1 & 2**). The Site consists of an approximately 17,000 square foot (sq. ft.) concrete tilt-up building, situated on approximately 1.25 acres. The plating facility specializes in the use of fused tin and tin/lead alloys using electro- and electroless plating. Nickel and copper are the most commonly used metals. Precious metal plating is also performed using silver, gold, tin, zinc, and aluminum. Several plating lines with associated tanks are located within the facility. APC handles hazardous waste in two units authorized by the DTSC on August 4, 1993 under Permit by Rule (PBR).

For purposes of discussion and points of reference, the Site can be divided into six main areas, described as follows (**Figure 3**):

- Administrative offices, located in the northwestern area of the building;
- Shipping, receiving and inspection room, located in the northeastern area of the building;
- Main plating facility, occupying the rest of the building that includes lines one through five, the floor channels, the maintenance room and the maintenance stockroom;
- Outside storage, located to the east of the building that includes from north to south: the former tetrachloroethene (PCE) above ground storage tank (AST), empty drum storage area, a chemical storage area and a second area of chemical storage located in the southeastern corner of the Site;
- Wastewater treatment area, located to the south of the building that includes: holding tanks, clarifiers, filter press, batch neutralization tanks, sludge dryer, cyanide destruction unit, stripping department and ion exchange units. The former vapor degreaser was also located in this area; and,

- Employee parking and vacant land, located to the east of the outside storage.

1.2 Objective

The objectives of this investigation were to investigate the lateral and vertical extent of inorganic and organic contamination, and to perform a human health risk assessment. The extent of lateral and vertical contamination was investigated within the soil and groundwater below the buried concrete pad, to the APC property boundaries. The lateral extent of contamination above the concrete pad was also investigated within soil and soil gas in the northern area of the Site.

2. GEOLOGY AND HYDROGEOLOGY

2.1 Regional Geology and Hydrogeology

This portion of Los Angeles County is underlain by the Los Angeles County Coastal Plain and is bounded by the Santa Monica Mountains to the north, the low lying Elysian, Repetto, Merced, and Puente Hills to the northeast, a political boundary coinciding with the boundary between Los Angeles County and Orange County to the southeast, and the Pacific Ocean to the southwest. Alluvial fans formed by the Los Angeles, Rio Hondo, and San Gabriel Rivers systems have coalesced to form the Downey Plain, which represents the largest area of recent alluvial deposition in the Coastal Plain. The Downey Plain is bordered by the La Brea, Montebello, and Santa Fe Spring Plains, and the Coyote hills to the north and northeast, the Newport Inglewood uplift to the southwest, and the Coastal Plain of Orange County to the southeast (DWR, 1961). The Downey Plain slopes gently to the south with an average gradient of less than 18 feet per mile. The Site is located between the Downey Plain and the Santa Fe Springs Plain. The Santa Fe Springs Plain is located south of Whittier and east of the San Gabriel River, in the area of the City of Santa Fe Springs. The Santa Fe Springs Plain is a low, slightly rolling topographic feature and represents a continuation of the Coyote Hills Uplift to the southeast.

The Coastal Plain of Los Angeles County is a deep groundwater reservoir filled by unconsolidated alluvial sands, gravels, clays, and silts. Fresh-water aquifers extend to depths of over 2,000 feet. The California Department of Water Resources (DWR) divided the coastal plain into four groundwater basins: the Santa Monica Basin, the West Coast Basin, the Hollywood Basin, and the Central Basin (DWR, 1961). The Site lies within the Central Basin, which is further divided into four parts for descriptive purposes: the Los Angeles Forebay Area, the Montebello Forebay Area, the Whittier Area, and the Central Basin Pressure Area.

The Site is located in the Central Basin Pressure Area. The Central Basin Pressure Area is called a "pressure area" because the aquifers within it are confined by aquicludes over most of the area. The major regional aquitards and aquifers beneath the Site occur in the Recent Alluvium, the Upper Pleistocene Lakewood Formation, and the Lower Pleistocene San Pedro Formation. Depth intervals for the major regional hydro-stratigraphic units (aquitards and aquifers) in the Site vicinity are presented in the table below:

Regional Hydro-stratigraphic Unit	Formation	Approximate Depth Intervals (feet below ground surface)
Bellflower Aquitard	Recent Alluvium	0 – 30
Gaspur	Recent Alluvium	30 – 65
Gage	Lakewood	65 – 110

Regional Hydro-stratigraphic Unit	Formation	Approximate Depth Intervals (feet below ground surface)
Hollydale-Jefferson	San Pedro	110 - 130
Lynwood	San Pedro	130 – 210
Silverado	San Pedro	210 – 360
Sunnyside	San Pedro	360 - 610

2.2 Site Geology and Hydrogeology

2.2.1 Site Geology

The elevation of the property is approximately 150 feet above mean sea level (MSL) with a local topographic gradient of less than 20 feet per mile to the southeast. The Site is underlain with artificial fill composed primarily of silt from ground surface to an approximate depth of 7 feet below ground surface (bgs). At approximately 7 feet bgs a concrete pad is encountered, which is approximately four inches thick. Underlying the concrete pad is a silt and clay layer that extends to approximately 25 feet bgs. Below the silt and clay layer is a sand and gravelly sand layer that extends to at least 48 feet bgs (**Figure 4**). Both the silt and clay layer and the sand and gravel layer correspond to the Recent Alluvium.

2.2.2 Site Hydrogeology

In April 2006, first groundwater was detected between 34 and 38 feet bgs (approximately 112 feet MSL) and corresponds to the Gaspur Aquifer. Groundwater flow is towards the south-southwest at an approximate gradient of 0.001 feet per foot (ft/ft).

2.3 Site Conceptual Model

In accordance with the Site conceptual model developed below, the subsurface at the Site and Site vicinity has been divided into three operable units: Operable Unit 1 (OU-1), Operable Unit 2 (OU-2), and Operable Unit 3 (OU-3) (**Figure 4**). OU-1 consists of fill material underlying the Site from ground surface to the top of the buried concrete pad (approximately 7 feet below ground surface). OU-2 consists of on-Site soils and the first groundwater zone, from the base of the concrete pad to approximately 50 feet below ground surface (bgs). OU-3 consists of the off-Site soils and the first groundwater zone.

Fill material in OU-1 is impacted by petroleum hydrocarbons (C6 to C40), fuel volatile organic compounds (VOCs), probably representing pre-existing contamination from the former storage tank, and chlorinated solvent compounds, consistent with releases of tetrachloroethylene (PCE) from the APC facility. The potential release mechanisms, pathways, exposure routes, and receptors are discussed in the accompanying human health risk assessment (**Appendix A**).

Soil and groundwater contaminant conditions in OU-2 are based primarily on four monitoring wells advanced below the buried concrete pad to approximately 48 feet bgs. Soil in OU-2 is impacted by total petroleum hydrocarbons (TPH) (C7 to C36); fuel VOCs, PCE, TCE, cis-1,2-dichloroethene (cis-1,2-DCE) and vinyl chloride (VC). Light Non-Aqueous Phase Liquid (LNAPL) hydrocarbons are present on the groundwater surface, and fuel VOCs, PCE, TCE, cis-1,2-DCE, trans-1,2-dichloroethene (trans-1,2-DCE) and VC are dissolved in groundwater. All of these constituents may have been disposed of in the former petroleum waste storage tank at the Site, and migrated downwards, impacting deeper soils and the groundwater (Figures 4). The LNAPL and the fuel VOCs are also consistent with possible migration through soil and groundwater from the nearby former Unocal and/or Dayton Superior facilities. Cis-1,2-DCE and VC are breakdown products of trichloroethylene (TCE) and PCE, and may have migrated downward from the upper fill material. Based on the presence of dissolved chlorinated solvents and chloroform in groundwater samples collected in up-gradient well MW-1, and up-gradient and down-gradient of the Site, it is very likely that VOCs from off-Site sources have impacted OU-2 (on-Site) groundwater.

There are several potential sources for contamination in OU-3 (off-Site) groundwater, including all or some the following:

- Former petroleum waste storage tank on APC property (petroleum hydrocarbons and fuel VOCs);
- Valvoline, Dayton Superior and Unocal facilities (petroleum hydrocarbons, including LNAPL and fuel VOCs);
- Waste Disposal Inc. (VOCs and metals);
- APC facility (chlorinated solvents); and
- Omega Superfund site (chlorinated solvents and chloroform).

3. APRIL 2006 FIELD INVESTIGATIONS

3.1 Well Installation

3.1.1 Sampling Locations

On April 5 & 6, 2006, four monitoring wells (MW-1, MW-2, MW-3 and MW-4) were advanced to approximately 48 feet bgs using a limited access hollow stem auger drilling rig operated by BC2 of Fullerton, California. The four monitoring wells were drilled to characterize the lateral and vertical extent of VOCs (including chlorinated solvent compounds), TPH, and metals beneath the Site (**Figure 3**). The four monitoring wells were advanced at the locations shown on **Figure 3**:

- Upgradient of facility (monitoring well #1);
- Former PCE above ground storage tank (AST) (monitoring well #2);
- Chemical storage area (monitoring well #3); and
- Batch treatment neutralization tanks (monitoring well #4).

A fifth well was originally proposed (monitoring well #5); however, due to site access issues, a limited access rig was not able to reach the proposed location. Refer to the Workplan for Additional Investigation, dated January 20, 2006, Figure 1 for the location of proposed monitoring well #5. An alternate location, approximately 50 feet to the east of the original proposed location was suggested to DTSC, and was rejected. DTSC then requested that the fifth well be installed south of the former vapor degreaser off-site, on Unocal property. A letter requesting access to install a well on Unocal property was sent to Unocal in Santa Fe Springs on April 11, 2006. The letter was returned and a second letter requesting access to install a well on Unocal property was sent to Unocal Headquarters in Texas on April 21, 2006. As of June 30, 2006, Unocal has not responded to the request.

3.1.2 Pre-field and Permit Activities

WorleyParsons Komex coordinated with the DTSC, APC, subcontractors, and other concerned parties for all investigative work. The field activities at the Site were coordinated with on-Site personnel and representatives of the DTSC, as needed. Prior to conducting the Site investigation, monitoring well installation permits were obtained from the Los Angeles County Department of Health Services (LACDHS) (**Appendix B**). The locations of the wells were marked prior to installation and California Underground Service Alert was notified 48-hours prior to conducting the field activities.

3.1.3 Soil Sampling Procedures

Prior to drilling activities, a near surface geophysical survey was performed by Spectrum Geophysics of Burbank, California. Upon completion of the geophysical survey, a 12-inch diameter core of concrete was removed from each location and a hand auger was advanced to approximately 5 feet bgs to ensure no underground utilities were present.

Soil samples were collected using a 2-inch outer diameter (OD) by 1.5-foot long California-modified split spoon sampler. Prior to the field investigation, a soil sampling procedure had been proposed (with DTSC's approval) whereby soil samples were to be collected from boreholes MW-1 and MW-2 at 5, 10, 15, 25 and 35 feet bgs and from MW-3 and MW-4 at 10, 15, 25 and 35 feet bgs. This procedure was followed as proposed, except during the advancement of borehole MW-3, where poor soil recovery prevented sampling at 10 feet bgs and only allowed limited sampling at 15 feet bgs. As a result, a sample was collected from borehole MW-3 at 5 feet bgs for VOC, California Administrative Manual (CAM) metals and TPH (carbon range C7 to C36) analyses instead of at the proposed depth of 10 feet bgs. Due to the limited soil recovery at 15 feet bgs, there was only enough soil collected for the VOCs and TPH (carbon range C7 to C36) analyses. Therefore, an additional sample was collected at 22 feet bgs for metals analysis.

Soil samples were described for lithologic, hydrogeologic, and geotechnical properties using the Unified Soil Classification System (USCS). A portion of each soil sample was also placed in re-sealable plastic bags and analyzed in the field for headspace VOCs using a photoionization detector (PID) (model PhotoVac 2200 with an 11.7 eV lamp) calibrated against isobutylene. Soil samples were collected in 2-inch diameter, 6-inch long metal sleeves. The soil descriptions and results of field VOC headspace testing were recorded on the borehole logs (**Appendix C**).

3.1.4 Soil Sample Analyses

Soil samples for laboratory analysis were appropriately labeled, recorded on a chain of custody, temporarily placed in an ice chest, and submitted under chain-of-custody protocol within 24 hours to Sierra Analytical Labs, Inc., (Sierra) of Laguna Hills, California, a California Department of Health Service (DHS)-certified hazardous waste laboratory. All on-site soil samples were analyzed for the following parameters:

- TPH-carbon range (C7 to C36) in accordance with USEPA Method 5030/ 8015 Modified;
- VOCs in accordance with USEPA Method 5035/8260B;
- CAM metals (including hexavalent chromium) using total digestion preparation and USEPA Methods 6010B, and 7199.

Soil samples for VOC analysis were sub-cored using EnCore samplers immediately upon retrieval in accordance with USEPA Method 5035. Soil samples for metals and TPH analyses were collected in 6-inch stainless steel sleeves and sealed with Teflon tape and capped. To ensure that the data collected at the Site were representative, sampling and analysis followed WorleyParsons Komex QA/QC procedures.

3.1.5 Groundwater Monitoring Well Installation

After soil sampling, the boreholes were converted to monitoring wells. Groundwater monitoring wells MW-1, MW-2, MW-3 and MW-4 were constructed using 2-inch schedule-40 polyvinyl chloride (PVC) casing with a 10-foot slotted screened interval (0.020-inch slot size screen). A 13 to 14 foot filter pack was constructed within the well screen annular space using #2/16 screen-washed sand. The filter pack was placed from the base of the borehole to 2-feet above the screened interval. A transition seal was

constructed within the annular space above the filter pack using bentonite chips hydrated in place to a thickness of 2 to 3.5 ft. A surface seal composed of Volclay™ was constructed within the remaining annular well space from the top of the transition seal at 28 to 33 feet bgs to ground surface. The wells were completed at the surface with 8-inch diameter traffic-rated well boxes. Refer to **Table 1** for the well construction details.

3.1.6 Monitoring Well Development

The groundwater monitoring wells were developed on April 10, 2006, more than 48 hours after well construction. Well development was performed by the drilling subcontractor, BC2, and involved the removal of approximately six well casing volumes of groundwater. The wells were bailed for approximately 10 minutes, then mechanically surged for a maximum of 15 minutes, bailed again for approximately 10 minutes and then purged of groundwater using a pump until the wells yielded groundwater of suitable quality. Groundwater was removed until hydrogeochemical parameters (temperature, pH, turbidity and electrical conductivity) had stabilized to within 10% of the previous reading and groundwater turbidity had been reduced to acceptable levels. Well development field sheets are included in **Appendix D**.

3.1.7 Monitoring Well Groundwater Sampling

All groundwater wells at the Site (MW-1, MW-2, MW-3 and MW-4) were sampled on April 12, 2006, more than 24 hours after development. Prior to groundwater sample collection, a minimum of three casing volumes of groundwater were purged from each well using a PVC bailer. During purging, hydrogeochemical parameters including temperature, pH, turbidity, and electrical conductivity were monitored. Purging continued until three casing volumes of groundwater had been removed and the hydrogeochemical parameters had stabilized (less than 10% variation between three consecutive readings). Each well was allowed to recover to at least 80% of the pre-purged volume before sampling. Groundwater samples were collected using disposable polyethylene bailers and transferred directly to sampling containers for analysis. Groundwater sampling forms are included in **Appendix D**.

3.1.8 Groundwater Sampling Analyses

Groundwater samples were appropriately labeled, recorded on a chain of custody, temporarily placed in an ice chest, and submitted under chain-of-custody protocol to Sierra for the following suite of analyses:

- TPH-carbon range (C7 to C36) in accordance with USEPA Method 8015 Modified;
- VOCs in accordance with USEPA Method 8260B;
- CAM metals (including hexavalent chromium) using total digestion preparation and USEPA Methods 6010B and 7199.

A sheen of LNAPL was detected in each well, but was not of measurable quantity. Therefore, LNAPL samples were not collected for analysis.

3.1.9 Quality Control Samples

Quality control samples including field (ambient) blanks and equipment blanks (prepared by WorleyParsons Komex in the field), and laboratory control, method blank, matrix spike and matrix spike duplicates (prepared in the laboratory), were periodically collected or prepared.

One field blank and one equipment blank were collected by WorleyParsons Komex each sampling day. The equipment blank for soil sampling was collected by pouring deionized water through the decontaminated split spoon sampler into sample containers. The equipment blank for groundwater sampling was collected by pouring deionized water through the decontaminated PVC bailer into sample containers. Field blanks were collected at the Site by filling the sample containers with deionized water and allowing them to remain open while the equipment blank was prepared. Laboratory control, method blank, matrix spike and matrix spike duplicate (MS/MSD) samples were produced and analyzed by the laboratory at a frequency of one per 20 samples.

3.1.10 Monitoring Well Surveying

On April 12, 2006, groundwater wells MW-1, MW-2, MW-3 and MW-4 were surveyed by Dulin Boynton of Signal Hill, California, a State-licensed land surveying company. Site surveying was performed relative to established horizontal control and elevation benchmarks (National Geodetic Survey monuments in the area). The survey included horizontal location coordinates using the California State Plane NAD83 coordinate system and vertical elevations were measured relative to mean sea level. Horizontal and vertical coordinates were surveyed at the northern rim of each traffic-rated well box. In addition, the vertical elevation of the top of casing of each well was also surveyed. The surveyed well locations are illustrated on **Figure 2**. **Table 1** lists elevations and latitudinal and longitudinal coordinates of the wells.

3.2 Soil Gas Sampling and Analyses

3.2.1 Sampling Locations

Soil gas sampling was performed at two locations (B-47 and B-48) on April 17, 2006, in accordance with "Interim Guidance for Soil Gas Investigation" prepared by the LARWQCB, dated February 25, 1997, and "Advisory – Soil Gas Investigations" prepared by DTSC and LARWQCB, dated January 28, 2003. The locations of the boreholes were marked prior to installation, and California Underground Service Alert was notified 48-hours prior to conducting the field activities. Prior to drilling activities, a near surface geophysical survey was performed by Spectrum Geophysics of Burbank, California.

The two soil gas boreholes were advanced to characterize the lateral extent of VOCs (including chlorinated solvent compounds) and TPH in the northern area of the Site (**Figure 3**). The two boreholes were advanced in the northern area of the Site, north of soil gas borings B-39 and B-37 at the locations shown on **Figure 3**.

3.2.2 Soil Gas Sampling Procedures

Soil gas sampling probes were installed using a truck-mounted direct-push drilling rig operated by Environmental Support Technologies (EST) of Irvine, California. Once the probe was advanced to 5 feet bgs, the 1.5-inch diameter hollow probe drive-rods were withdrawn, leaving a steel probe point in the subsurface. 1/4-inch Teflon sampling tubing was lowered down to the stainless steel fitting and secured by the hose barb portion of the fitting. The end of the tubing was plugged with a sheet metal screw and a series of slots were cut for an approximate 2-inch section of the perforated tubing. An approximate 6-inch column of clean, graded No. 3 Lonestar Monterey sand was poured around the perforated section of Teflon sample tubing to allow for diffusion of soil vapors. Approximately 6-inches of granular bentonite was added above the sand pack and hydrated. The remaining annulus was filled with cement mortar to ground surface.

After probe emplacement and prior to sampling, an equilibration time of 30 minutes was observed. During the previous Site soil gas investigation (September 2004), a purge test was conducted and a flow rate of 200 ml/min was determine to be the appropriate flow rate to ensure samples collected were representative of subsurface conditions. Therefore, the two proposed soil gas borings were purged at a flow rate of 200 ml/min. After purging three well casings, a sample was collected in a Summa canister at a flow rate of 200 ml/min.

A leak test was conducted at every soil gas probe by applying a cloth with isopropanol around the top of the prove and then analyzing for that compound in the sample. Typically, the reporting limit for the tracer is 10 ug/L as per the DTSC and LARWQCB Soil Gas Advisory. However, since the soil gas samples were analyzed according to TO-14A, rather than USEPA Method 8260, the reporting limits for isopropanol were below 10 ug/L. Isopropanol was not detected at or above 10 ug/L, in the two soil gas samples; however, it was detected below 10 ug/L. The detection could indicate that ambient air was entering the system or that there was cross-contamination during the set-up. Since proper protocol was followed to seal the boring it is more likely that when the driller applied isopropanol to the cloth and then connected the tubing to the pump, the tubing was contaminated with isopropanol. Since the target compounds were detected in both soil gas samples at concentrations similar to nearby soil gas samples collected previously, and the tracer was detected below the acceptable reporting limit, the soil gas results for the two borings are considered acceptable.

All equipment that came into contact with potentially affected material, including drill rods and the sampling port assembly, were thoroughly cleaned with a laboratory grade detergent (Alconox) and deionized water before and after each use. Upon completion of soil gas sample collection, the boreholes were grouted to the base of the ground surface or floor with hydrated granular bentonite. The ground surface was then patched to match pre-existing conditions.

3.2.3 Soil Gas Sample Analyses

Soil gas samples were analyzed by Calscience of Garden Grove, California, a California DHS-certified hazardous waste laboratory. The two soil gas samples were analyzed for the following parameters:

- TPH in accordance with TO-3; and

- VOCs in accordance with TO-14A.

3.2.4 Soil Gas Quality Control Samples

Quality control samples including field (ambient) blank (prepared by WorleyParsons Komex in the field), and laboratory control, method blank, matrix spike and matrix spike duplicates (prepared in the laboratory), were periodically collected or prepared.

An ambient air sample was collected in the field using a one liter Summa canister and analyzed for VOCs in accordance with TO-14A. A laboratory control, method blank, matrix spike and matrix spike duplicate (MS/MSD) sample were produced and analyzed by the laboratory at a frequency of one per 20 samples.

3.3 Shallow Soil Sampling

3.3.1 Sampling Location

One additional shallow soil borehole (B-49) was advanced to a depth of 7 feet bgs in the northern part of the Site to characterize the lateral and vertical extent of VOCs (including chlorinated solvent compounds), TPH-carbon range and metals in OU-1 (**Figure 3**).

3.3.2 Sampling Procedures

Soil samples were collected using Geoprobe TM direct-push drill rig operated by Environmental Support Technologies (EST) of Irvine, California. Soil samples were collected at approximate depths of 1, 4, and 7 feet bgs.

For soil sampling, a cutting shoe with a spacer ring was threaded onto the male end of the probe rod and an acetate sample liner was inserted through the opposite end of the probe rod. A drive head was then threaded onto the female end of the probe rod and attached to a drive rod. At the required sampling depth, the probe rod and cutting shoe were advanced into the undisturbed soil with a hydraulic hammer. Soil samples were collected in 1-inch diameter, 2-foot long acetate sleeves lining the inside of the probe rod, which were then cut at the desired sampling depth. The probe rod was then retrieved from the borehole, the drive head removed and the sample liner removed from the probe rod and cut into two sections, one for VOC analyses and one for TPH and metals analyses. The sample for VOC analyses was sub-cored using EnCore samplers immediately upon retrieval in accordance with USEPA Method 5035. The sample liner for TPH and metals analyses was sealed with Teflon tape and plastic end caps.

Soil samples were described for lithologic, hydrogeologic and geotechnical properties using the Unified Soil Classification System (USCS). All soil samples underwent initial field screening for the presence of VOCs using a PID (Photovac 2020 with a 11.7 eV lamp). The soil descriptions and results of the field VOC headspace testing were recorded on the borehole log included in **Appendix C**.

All the soil samples were placed inside a Ziploc bag and placed on ice in an ice chest. Upon completion of soil sample collection, the boreholes were backfilled with hydrated granular bentonite. The ground surface was then patched to match pre-existing conditions.

3.3.3 Shallow Soil Sample Analyses

Soil samples for laboratory analyses were immediately transferred to an ice chest and delivered within 24 hours under chain-of-custody to Sierra Analytical and analyzed for the following parameters:

- TPH-carbon range in accordance with USEPA Method 5030/ 8015 Modified;
- VOCs in accordance with USEPA Method 5035/8260B;
- California Administrative Manual (CAM) metals (including hexavalent chromium) using total digestion preparation and USEPA analytical Methods 6020 and 7199.

3.3.4 Quality Control Samples

Quality control samples including field and equipment blanks (prepared by WorleyParsons Komex in the field), and trip blank, laboratory control, method blank, matrix spike and matrix spike duplicates (prepared in the laboratory), were periodically collected or prepared during shallow soil sampling. Field duplicate samples were not collected for soil samples because soil matrix, by nature, is heterogeneous and will not consistently provide repeatable results even for samples collected within centimeters of one another. Laboratory control, method blank, matrix spike and matrix spike duplicate (MS/MSD) samples were produced and analyzed by the laboratory at a frequency of one per 20 samples.

Quality Control samples were collected by WorleyParsons Komex during soil gas and shallow soil sampling conducted on April 17, 2006. An equipment blank sample was collected by pouring distilled/de-ionized water over the decontaminated split spoon sampler into sample containers. A field blank was collected at the Site by filling the sample containers with deionized water and allowing them to remain open while the equipment blank was prepared. A laboratory-sealed trip blank was placed in the ice-chest used to transport the samples to ensure that the samples were not contaminated during travel and sample handling.

The equipment and field blanks were analyzed for the following suite of analyses:

- TPH-carbon range (C7 to C36) in accordance with USEPA Method 5030/ 8015 Modified;
- VOCs in accordance with USEPA Method 8260B;
- CAM metals (including hexavalent chromium) using total digestion preparation and USEPA Methods 6010B and 7199.

The trip blank samples were only analyzed for VOCs as they were intended to determine if any volatile contamination had infiltrated the samples during transport. The trip blank vials are prepared in the lab and remain unopened while in the field, so only air-borne contaminants (volatile organic compounds) could possibly enter them.

3.4 Waste Disposal

All soil cuttings, decontamination water, and groundwater generated during the Site assessment were contained in Department of Transportation (DOT)-approved 55-gallon drums. WorleyParsons Komex

arranged for transport and disposal of the waste at a State licensed non-hazardous waste disposal or recycling facility. Drums were temporarily stored at the Site prior to disposal. The drums were removed from the Site and transported to US Filter disposal facility by PFR Environmental Services, a licensed non-hazardous waste hauler on June 9, 2006. An APC representative signed the waste manifest as generator and the non-hazardous waste manifests are included in **Appendix E**.

4. APRIL 2006 RESULTS OF INVESTIGATION

4.1 Site Lithology

Based on lithologic data obtained from the four monitoring wells (**Appendix C**) completed during this investigation, the Site lithology primarily consisted of artificial fill composed of sandy silt and clayey silt with occasional silty clay from ground surface to an approximate depth of 7 feet bgs. At approximately 7 feet bgs a concrete pad was encountered. Underlying the concrete pad is a silt and clay layer that extends to approximately 25 feet bgs. Below the silt and clay layer is a sand and gravelly sand layer that extends to at least 48 feet bgs (**Figure 4**). Both the silt and clay layer and the sand and gravel layer correspond to the Recent Alluvium. Petroleum hydrocarbon odors were noted in soils from wells MW-1 through MW-4.

4.2 Site Hydrogeology

In April 2006, first groundwater was detected between 34 and 38 feet bgs (approximately 112 feet MSL) and corresponds to the Gaspur Aquifer (**Table 2**). Groundwater flow is towards the south-southwest at an approximate gradient of 0.001 feet per foot (ft/ft) (**Figure 5**). Due to the direction of groundwater flow, MW-1 is considered an up-gradient well since it is located on the northern boundary of the Site.

4.3 Monitoring Well Soil Analyses Results

4.3.1 Total Petroleum Hydrocarbons (TPH) With Carbon Chain Distinction in Soil

A total of 18 soil samples were collected from boreholes MW-1 through MW-4 for TPH-carbon range (C7 to C36) analysis. A summary of the soil TPH analytical results is presented in **Table 3.** The distribution of TPH is depicted in **Figure 6** along with TPH results from previous investigations. Results from the 2006 investigation are highlighted to distinguish them from previous investigation results. TPH was detected in 15 of the 18 samples at concentrations ranging from 80 mg/kg (MW-3 at 15 feet bgs) to 4,600 mg/kg (MW-1 at 35 feet bgs). The TPH detections were generally weighted towards the high carbon number compounds (C12 to C32). In all four monitoring wells, TPH concentrations were highest in the 35 feet bgs sample, which is consistent with residual LNAPL in the groundwater smear zone and the detections of LNAPL in all four wells (see **Section 4.4.1**). High TPH concentrations detected at 25 feet bgs probably represent LNAPL impacted groundwater impacting the capillary fringe. Analytical laboratory reports are included in **Appendix** F.

4.3.2 VOCs in Soil

A total of 18 soil samples were collected from boreholes MW-1 through MW-4 for VOC analysis. A summary of soil VOC analytical results is presented in **Table 4**. The following VOCs were detected in soil samples collected during this investigation:

- 1,1-Dichloroethane (1,1-DCA), detected in one soil sample at a concentration of 14 ug/kg in MW-4 at 15 feet bgs;
- 1,1-Dichloroethene (1,1-DCE), detected in one soil sample at a concentration of 7.4 ug/kg in MW-4 at 15 feet bgs;
- 1,2,4-Trimethylbenzene, detected in four soil samples at concentrations ranging from 4.8 ug/kg in MW-4 at 35 feet bgs to 1,500 ug/kg in MW-3 at 35 feet bgs;
- 1,3,5-Trimethylbenzene, detected in two soil samples at concentrations ranging from 5.3 ug/kg in MW-3 at 25 feet bgs to 120 ug/kg in MW-4 at 25 feet bgs;
- 2-Phenylbutane, detected in eleven soil samples at concentrations ranging from 6.5 ug/kg in MW-1 at 25 feet bgs to 1,400 ug/kg in MW-3 at 35 feet bgs;
- Benzene, detected in one soil sample at a concentration of 5.5 ug/kg in MW-4 at 35 feet bgs;
- n-Butylbenzene, detected in three soil samples at concentrations ranging from 3.8 ug/kg in MW-3 at 5 feet bgs to 9.2 ug/kg in MW-2 at 25 feet bgs;
- cis-1,2-Dichloroethene (cis-1,2-DCE), detected in six soil samples at concentrations ranging from 4.7 ug/kg in MW-2 at 5 feet bgs to 400 ug/kg in MW-4 at 15 feet bgs;
- Cymene, detected in seven soil samples at concentrations ranging from 4.2 ug/kg in MW-4 at 10 feet bgs to 280 ug/kg in MW-3 at 35 feet bgs;
- Dichloromethane, detected in two soil samples at concentrations ranging from 4.7 ug/kg in MW-3 at 15 feet bgs to 10 ug/kg in MW-3 at 5 feet bgs;
- Ethylbenzene, detected in seven soil samples at concentrations ranging from 6.9 ug/kg in MW-3 at 25 feet bgs to 2,600 ug/kg in MW-4 at 10 feet bgs;
- Isopropylbenzene, detected in eleven soil samples at concentrations ranging from 4.4 ug/kg in MW-3 at 15 feet bgs to 1,700 ug/kg in MW-3 at 35 feet bgs;
- Naphthalene, detected in twelve soil samples at concentrations ranging from 4.4 ug/kg in MW-4 at 35 feet bgs to 6,000 ug/kg in MW-3 at 35 feet bgs;
- n-propylbenzene, detected in eleven soil samples at concentrations ranging from 6.1 ug/kg in MW-3 at 15 feet bgs to 2,100 ug/kg in MW-3 at 35 feet bgs;
- Styrene (monomer), detected in one soil sample at a concentration of 4.4 ug/kg in MW-4 at 10 feet bgs;
- tert-Butylbenzene, detected in two soil samples at concentrations ranging from 4.5 ug/kg in MW-4 at 10 feet bgs to 9.2 ug/kg in MW-2 at 35 feet bgs;
- PCE, detected in five soil samples at concentrations ranging from 25 ug/kg in MW-4 at 25 feet bgs to 6,700 ug/kg in MW-4 at 15 feet bgs;

- trans-1,2-Dichloroethene (trans-1,2-DCE), detected in three soil samples at concentrations ranging from 5.8 ug/kg in MW-4 at 35 feet bgs to 360 ug/kg in MW-4 at 15 feet bgs;
- TCE, detected in five soil samples at concentrations ranging from 4.0 ug/kg in MW-3 at 15 feet bgs to 260 ug/kg in MW-4 at 15 feet bgs;
- VC, detected in two soil samples at concentrations ranging from 73 ug/kg in MW-4 at 10 feet bgs to 470 ug/kg in MW-4 at 15 feet bgs; and
- m&p-Xylene, detected in two soil samples at concentrations ranging from 6.6 ug/kg in MW-3 at 25 feet bgs to 66 ug/kg in MW-4 at 25 feet bgs.

The lateral distribution of PCE in soil is depicted on **Figure 7**. PCE was primarily detected in soil near the batch neutralization tanks (MW-4) at concentrations ranging from 25 ug/kg (at 25 feet bgs) to 6,700 ug/kg (at 15 feet bgs).

Breakdown products of PCE were also detected in the following areas:

- Near the former PCE AST (MW-2) at 5 feet bgs: TCE (7.6 ug/kg) and cis 1,2-DCE (4.7 ug/kg) only;
- The southern chemical storage area (MW-3) at 5 and 15 feet bgs: TCE (4.0 ug/kg) and cis 1,2-DCE (42 ug/kg) only; and
- Near the Batch Treatment Neutralization Tanks (MW-4) at various depths: TCE, cis 1,2-DCE, trans 1,2-DCE and VC.

Fuel VOCs were detected in all soil samples from MW-3 and MW-4 and in some samples from MW-1 and MW-2, particularly at 25 and 35 feet bgs. The highest fuel VOC concentrations were generally detected in soil collected from MW-3 at 35 feet bgs, where the following compounds were detected: 1,2,4-trimethylbenzene (1,500 ug/kg), 2-phenylbutane (1,400 ug/kg), cymene (280 ug/kg), isopropylbenzene (1,700 ug/kg), naphthalene (6,000 ug/kg) and n-propylbenzene (2,100 ug/kg). Ethylbenzene was detected in MW-4 at a concentration of 2,600 ug/kg ten feet bgs. Analytical laboratory reports are included in **Appendix F**.

4.3.3 Metals in Soil

Soil samples were collected from boreholes MW-1 through MW-4 for metals analysis. A summary of metal analytical results for the 18 soil samples collected is presented in **Table 5**. Analytical laboratory reports are included in **Appendix F**. The following metals were detected in soil samples collected during this investigation:

- Arsenic, detected in 16 soil samples at concentrations ranging from 2.9 mg/kg in MW-1 at 25 feet bgs to 33 mg/kg in MW-2 at 5 feet bgs;
- Barium, detected in 18 soil samples at concentrations ranging from 32 mg/kg in MW-1 at 35 feet bgs to 220 mg/kg in MW-1 at 15 feet bgs;
- Total chromium, detected in 18 soil samples at concentrations ranging from 7.0 mg/kg in MW-1 at 35 feet bgs to 42 mg/kg in MW-1 at 10 feet bgs and MW-2 at 5 feet bgs;

- Hexavalent chromium, detected in three soil samples at concentrations ranging from of 0.69 mg/kg in MW-2 at 15 feet bgs to 1.1 mg/kg in MW-2 at 5 feet bgs;
- Cobalt, detected in 18 soil samples at concentrations ranging from 3.2 mg/kg in MW-3 at 35 feet bgs to 19.0 mg/kg in MW-1 at 15 feet bgs and MW-2 at 5 and 10 feet bgs;
- Copper, detected in 18 soil samples at concentrations ranging from 4.7 mg/kg in MW-1 at 35 feet bgs to 50 mg/kg in MW-2 at 10 feet bgs;
- Lead, detected in 18 soil samples at concentrations ranging from 1.4 mg/kg in MW-3 at 35 feet bgs to 10 mg/kg in MW-2 at 10 feet bgs;
- Nickel, detected in 18 soil samples at concentrations ranging from 5.0 mg/kg in MW-1 at 35 feet bgs to 30 mg/kg in MW-2 at 15 feet bgs and at MW-4 at 15 feet bgs;
- Selenium, detected in 16 soil samples at concentrations ranging from 2.0 mg/kg in MW-1 at 25 feet bgs and at MW-2 at 35 feet bgs to 5.1 mg/kg in MW-1 at 15 feet bgs;
- Vanadium, detected in 18 soil samples at concentrations ranging from 14 mg/kg in MW-3 at 35 feet bgs to 84 mg/kg in MW-1 at 15 feet bgs; and
- Zinc, detected in 18 soil samples at concentrations ranging from 15 mg/kg in MW-3 at 35 feet bgs to 90 mg/kg in MW-1 at 10 feet bgs.

4.4 Groundwater Results

4.4.1 LNAPL in Groundwater

During groundwater sampling, a sheen of LNAPL was detected in groundwater from all four monitoring wells.

4.4.2 TPH With Carbon Chain Distinction in Groundwater

Groundwater samples were collected from monitoring wells MW-1 through MW-4 for TPH-carbon range (C7 to C36) analysis. A summary of TPH groundwater analytical results is presented in **Table 6**. TPH was detected in all four of the samples at concentrations ranging from 46 ug/L (MW-3) to 65 ug/L (MW-1) (**Figure 8**). The TPH detections were generally weighted towards the high carbon number compounds (C11 to C32). The highest TPH concentration was detected in groundwater from the upgradient well MW-1. Analytical laboratory reports are included in **Appendix F**.

4.4.3 VOCs in groundwater

Groundwater samples were collected from monitoring wells MW-1 through MW-4 for VOC analysis. A summary of VOC analytical results for the four groundwater samples collected is presented in **Table 7**. The following VOCs were detected in groundwater samples collected during this investigation:

- 1,1-Dichloroethane (1,1-DCA), detected in one groundwater sample at a concentration of 1.1 ug/L in MW-2 ;
- 1,2,4-Trimethylbenzene, detected in one groundwater sample at a concentration of 23 ug/L in MW-3;
- 1,3,5-Trimethylbenzene, detected in one groundwater sample at a concentration of 6.3 ug/L in MW-3;
- Benzene, detected in four groundwater samples at concentrations ranging from 1.3 ug/L in MW-1 to 3.6 ug/L in MW-4;
- 2-Pheylbutane, detected in three groundwater samples at a concentration of 16 ug/L in MW-2, MW-3 and MW-4;
- tert-Butylbenzene, detected in two groundwater samples at concentrations of 1.6 ug/L in MW-1 and 1.9 ug/L in MW-2;
- cis-1,2-Dichloroethene (cis-1,2-DCE), detected in one groundwater sample at a concentration of 5.5 ug/L in MW-1;
- trans-1,2-Dichloroethene (trans-1,2-DCE), detected in one groundwater sample at a concentration of 5.2 ug/L in MW-1;
- Ethylbenzene, detected in two groundwater samples at concentrations of 1.5 ug/L in MW-4 and 21 ug/L in MW-3;
- Isopropylbenzene, detected in four groundwater samples at concentrations ranging from 1.9 ug/L in MW-1 to 86 ug/L in MW-4;
- Cymene, detected in four groundwater samples at concentrations ranging from 1.4 ug/L in MW-3 to 4.1 ug/L in MW-2 and MW-4;
- Methyl tert-butyl ether, detected in four groundwater samples at concentrations ranging from 1.9 ug/L in MW-3 to 8.9 ug/L in MW-1;
- Naphthalene, detected in four groundwater samples at concentrations ranging from 1.6 ug/L in MW-1 to 46 ug/L in MW-3;
- n-Propylbenzene, detected in three groundwater samples at concentrations ranging from 9.4 ug/L in MW-2 to 22 ug/L in MW-3;
- PCE, detected in one groundwater sample at a concentration of 2.7 ug/L in MW-4;
- TCE, detected in one groundwater sample at a concentration of 1.3 ug/L in MW-1;
- VC, detected in four groundwater samples at concentrations ranging from 20 ug/L in MW-1 to 57 ug/L in MW-4 ;
- m&p-Xylene, detected in one groundwater sample at a concentration of 28 ug/L in MW-3; and
- o-Xylene, detected in one groundwater sample at a concentration of 2.6 ug/L in MW-3.

The lateral distribution of PCE, TCE, cis-1,2-DCE, and VC are depicted on **Figure 9.** Analytical laboratory reports are included in **Appendix F**.

4.4.4 Metals in Groundwater

Groundwater samples were collected from monitoring wells MW-1 through MW-4 for metals analysis. A summary of metal analytical results for the four groundwater samples collected is presented in **Table 8**. Analytical laboratory reports are included in **Appendix F**. The following metals were detected in groundwater samples collected during this investigation:

- Antimony, detected in one groundwater sample at a concentration of 0.024 mg/L in MW-4;
- Arsenic, detected in two groundwater samples at concentrations of 0.11 mg/L in MW-4 and 0.14 mg/L in MW-3;
- Barium, detected in four groundwater samples at concentrations ranging from 0.65 mg/L in MW-1 to 3.2 mg/L in MW-3;
- Total chromium, detected in four groundwater samples at concentrations ranging from 0.059 mg/L in MW-1 to 0.19 mg/L in MW-4;
- Hexavalent chromium, detected in two groundwater samples at concentrations ranging from 0.0024 mg/L in MW-2 to 0.0047 mg/L in MW-1;
- Cobalt, detected in four groundwater samples at concentrations ranging from 0.032 mg/L in MW-1 to 0.11 mg/L in MW-3;
- Copper, detected in four groundwater samples at concentrations ranging from 0.092 mg/L in MW-1 to 0.095 mg/L in MW-4;
- Lead, detected in four groundwater samples at concentrations ranging from 0.04 mg/L in MW-1 to 0.19 mg/L in MW-4;
- Mercury, detected in one groundwater sample at a concentration of 0.00079 mg/L in MW-3;
- Nickel, detected in four groundwater samples at concentrations ranging from 0.044 mg/L in MW-1 to 0.15 mg/L in MW-4;
- Vanadium, detected in four groundwater samples at concentrations ranging from 0.16 mg/L in MW-1 to 0.40 mg/L in MW-3; and
- Zinc, detected in four groundwater samples at concentrations ranging from 0.15 mg/L in MW-1 to 0.47 mg/L in MW-3.

4.5 Soil Gas Results

4.5.1 TPH in Soil Gas

A summary of the TPH analytical results for the soil gas samples is presented in **Table 9**. TPH was detected in both B-47 and B-48 at concentrations of 26,000 ug/L and 12,000 ug/L, respectively. TPH concentrations from this investigation were depicted on **Figure 10** along with TPH concentrations from the September 2004 soil gas survey. Analytical laboratory reports are included in **Appendix F**.

4.5.2 VOCs in Soil Gas

A summary of VOC analytical results for the soil gas samples collected during this investigation is presented in **Table 9**. Analytical laboratory reports are included in **Appendix F**. The following VOCs were detected in soil gas samples collected at 5 feet bgs during this investigation:

- cis-1,2-DCE, detected in two soil gas samples at concentrations ranging from 4.0 ug/L in B-47 to 7.3 ug/L in B-48;
- Methylene chloride, detected in two soil gas samples at concentrations ranging from 8.1 ug/L in B-48 to 11 ug/L in B-47;
- PCE, detected in one soil gas sample at a concentration of 9.1 ug/L in B-48;
- TCE, detected in one soil gas sample at a concentration of 15 ug/L in B-48;
- VC, detected in two soil gas samples at concentrations ranging from 32 ug/L in B-48 to 35 ug/L in B-47.

PCE and TCE concentrations from this soil gas survey are depicted on **Figure 11** along with PCE and TCE concentrations from the September 2004 soil gas survey.

4.6 Shallow Soil Results

4.6.1 TPH in Shallow Soil

A total of three soil samples were collected from borehole B-49 for TPH analysis. A summary of the TPH analytical results for borehole B-49 is presented in **Table 3**. TPH was detected in one sample at a concentration of 170 mg/kg in soil collected at 4 feet bgs (**Figure 6**). The TPH detections were weighted towards the high carbon number compounds (C18-C36). Analytical laboratory reports are included in **Appendix F**.

4.6.2 VOCs in Shallow Soil

A total of three soil samples were collected from borehole B-49 for VOC analysis. A summary of the VOC analytical results for borehole B-49 is presented in **Table 4**. PCE was detected in two samples at concentrations of 6.2 ug/kg (4 feet bgs) and 64 ug/kg (1 foot bgs) (**Figure** 7). TCE was detected in one sample at a concentration of 7.9 at 1 foot bgs. No other VOCs were detected above the laboratory

reporting limits for soil collected from borehole B-49. Analytical laboratory reports are included in **Appendix F**.

4.6.3 Metals in Shallow Soil

A total of three soil samples were collected from borehole B-49 for metals analysis. A summary of the metals analytical results for borehole B-49 is presented in **Table 5**. Analytical laboratory reports are included in **Appendix F**. The following metals were detected in soil samples collected during this investigation:

- Arsenic, detected in 3 soil samples at concentrations ranging from 14 mg/kg at 4 feet bgs to 35 mg/kg at 1 foot bgs;
- Barium, detected in 3 soil samples at concentrations ranging from 160 mg/kg at 4 feet bgs to 200 mg/kg at 1 foot bgs;
- Total chromium, detected in 3 soil samples at concentrations ranging from 32 mg/kg at 4 feet bgs to 38 mg/kg at 1 foot bgs;
- Hexavalent chromium, detected in three soil samples at concentrations ranging from 0.28 mg/kg at 7 feet bgs to 0.63 mg/kg at 4 feet bgs;
- Cobalt, detected in three soil samples at concentrations ranging from 14 mg/kg at 4 and 7 feet bgs to 17 mg/kg at 1 foot bgs;
- Copper, detected in three soil samples at concentrations ranging from 37 mg/kg at 1 and 7 feet bgs to 39 mg/kg at 4 feet bgs;
- Lead, detected in three soil samples at concentrations ranging from 6.3 mg/kg at 7 feet bgs to 22 mg/kg at 4 feet bgs;
- Nickel, detected in three soil samples at concentrations ranging from 19 mg/kg at 4 feet bgs to 25 mg/kg at 1 foot bgs;
- Vanadium, detected in three soil samples at concentrations ranging from 54 mg/kg at 4 and 7 feet bgs to 62 mg/kg at 1 foot bgs;
- Zinc, detected in three soil samples at concentrations ranging from 63 mg/kg at 7 feet bgs to 76 mg/kg at 1 foot bgs.

4.7 Quality Assurance/Quality Control (QA/QC) Sample Results

4.7.1 QA/QC Soil Results During Well Installation

A summary of the field QA/QC sample results for the analysis of TPH, VOCs and metals is presented in **Table 10**. Analytical laboratory reports are included in **Appendix F**. TPH and VOCs were not detected in any of the field or equipment blanks during well installation. Chromium, copper, lead and zinc were

detected in the field blank collected on April 5, 2006 at concentrations of 0.0076 mg/L, 0.17 mg/L, 0.033 mg/L and 0.14 mg/L, respectively. The lowest chromium, copper, lead and zinc concentrations detected in soil samples on April 5, 2006 were 7.0 mg/kg, 4.7 mg/kg, 1.6 mg/kg, and 16 mg/kg, respectively. The metal concentrations detected in the field blank; therefore, are considered insignificant compared to the metal concentrations detected in soil samples. On April 5, 2006, chromium was detected at a concentration of 0.0087 mg/L in the equipment blank, which is insignificant compared to the lowest chromium concentration (7.0 mg/kg) detected in soil samples on April 5, 2006. Metals were not detected in the equipment or field blanks collected on April 6, 2006.

Soil laboratory QA/QC samples for TPH and VOCs were all within the acceptable levels. Soil laboratory QA/QC samples for metals analysis were generally within acceptable levels; however, there were a few exceptions. Two antimony matrix spikes and matrix spike duplicates were slightly below the acceptable recovery levels; however, the QA/QC results were acceptable since the blank sample and the laboratory control sample were within acceptable levels. Several mercury matrix spike and matrix spike duplicates were slightly above the acceptable levels; however, the QA/QC results were acceptable since the blank sample and the laboratory control sample were within acceptable levels. A few hexavalent chromium matrix spike samples were also above acceptable levels; however, the QA/QC results were generally acceptable since the blank samples and the laboratory control samples were within acceptable levels.

4.7.2 QA/QC Groundwater Results

Groundwater laboratory QA/QC samples for TPH, VOCs and metals were all within the acceptable levels. TPH, VOCs and metals were not detected in any of the field, equipment or trip blanks collected on April 12, 2006. Analytical laboratory reports are included in **Appendix F**.

4.7.3 QA/QC Shallow Soil Results

TPH, VOCs, and metals were not detected in any of the field, equipment, or trip blanks collected on April 17, 2006 during the advancement of borehole B-49. Soil laboratory QA/QC samples for TPH and VOCs were all within the acceptable levels. Soil laboratory QA/QC samples for metals analysis were generally within acceptable levels; however, there were a few exceptions. One antimony matrix spike and matrix spike duplicate were slightly below the acceptable recovery levels; however, the QA/QC results were acceptable since the blank sample and the laboratory control sample were within acceptable levels. In one matrix spike, arsenic, barium, beryllium, cadmium, cobalt, copper, selenium, and zinc were slightly above the acceptable levels; however, the QA/QC results were acceptable since the blank sample, the laboratory control sample and the matrix spike duplicate all were within acceptable levels. One hexavalent chromium matrix spike and matrix spike duplicate samples were slightly below acceptable recovery levels; however, the QA/QC results were generally acceptable since the blank samples and the laboratory control samples were within acceptable levels. Analytical laboratory reports are included in **Appendix F**.

4.7.4 QA/QC Soil Gas Results

On April 17, 2006, two soil gas samples were collected from locations B-47 and B-48. A field (ambient) blank sample was collected in an 1-liter Summa canister on-site and toluene was detected at a concentration of 0.023 ug/L. No other VOCs were detected in the field sample. All laboratory QA/QC results for TPH and VOCs (TO-14A) were within acceptable levels. Analytical laboratory reports are included in **Appendix F**.

5. DISCUSSION

The results from the WorleyParsons Komex investigation conducted in April 2006 and the human health risk assessment are summarized and discussed below.

5.1 TPH

5.1.1 TPH with Carbon Chain Distinction in Soil

TPH was generally detected at all sample depths (5, 10, 15, 25, and 35 feet bgs) and in all boreholes (**Figure 5**). The highest TPH concentrations (between 2,800 and 4,600 mg/kg) were detected at 35 feet bgs in each borehole. High TPH concentrations in the groundwater smear zone soils in all four boreholes are consistent with migration of petroleum hydrocarbons through groundwater. Most of the soil samples from this investigation had a wide range of hydrocarbons, which were generally weighted towards the higher carbon number compounds (C12 to C36). Comparison of laboratory standard chromatographs and sample result chromatographs indicated that the results were consistent with diesel and motor oil range hydrocarbons. The petroleum hydrocarbons detected in soil samples collected from 5 to 35 feet bgs are not consistent with materials used or produced at the APC facility, and probably represent pre-existing oil production facility waste in the fill material, or diesel fuel that migrated through soil and/or groundwater from the nearby Unocal, Dayton, or Valvoline facilities (**Figure 2**).

5.1.2 TPH in Groundwater

TPH was detected in groundwater collected from all four monitoring wells (**Figure 8**). The highest concentration of TPH was detected in groundwater collected from upgradient well MW-1. TPH is groundwater is most likely from either pre-existing oil production facility waste in the fill material at APC, or from diesel fuel that migrated through soil and/or groundwater from nearby facilities.

5.1.3 TPH in Soil Gas

TPH concentrations in soil gas increase towards the northern boundary of the facility. Since petroleum hydrocarbons are not consistent with materials used or produced at the APC facility and concentrations increase adjacent to the northern boundary of the site, there may be a source of the TPH originating off-site (**Figure 10**).

5.1.4 Human Health Risk Assessment for TPH

Since TPH is a non-carcinogen, the risk associated with exposure to TPH was accessed according to the hazard index, in which the target hazard level is one. According to the human health risk assessment, the hazard index for dermal and oral exposure to TPH concentrations detected beneath the Site is less than one (**Appendix A**).

5.2 VOCs

5.2.1 VOCs in Soil and Groundwater

PCE and its degradation products were not detected in soil collected from borehole MW-1. However, TCE, cis-1,2-DCE, and VC were detected in groundwater collected from well MW-1. Therefore, it is most likely that groundwater upgradient (off-site to the northeast) is impacting groundwater on the APC property.

In the vicinity of the former AST (MW-2), PCE, TCE and cis-1,2-DCE were detected at 5 feet bgs; however, PCE and its degradation products were not detected in any of the soil samples collected from below a depth of 5 feet. In addition, PCE, TCE and cis-1,2-DCE were not detected in groundwater collected from well MW-2. Vinyl chloride was detected in groundwater collected from well MW-2. Detection of PCE and its breakdown products at 5 feet bgs indicate that there is a minor shallow source of contamination that is most likely associated with the former PCE AST. However, the AST was removed approximately six years ago, and PCE and its degradation products do not appear to have migrated vertically, since they were not detected below a depth of 5 feet. Since groundwater upgradient of well MW-2 contains TCE, cis-1,2-DCE and VC, the most likely source of VC in groundwater collected from well MW-2 is due to the degradation of the PCE plume upgradient.

In the vicinity of the central chemical storage area (MW-3), TCE and cis-1,2-DCE were detected at 5 and 15 feet bgs. PCE and its degradation products were not detected below a depth of 15 feet. In addition, PCE, TCE and cis-1,2-DCE were not detected in groundwater collected from well MW-3. VC was detected in MW-3 at a concentration of 53 ug/L. Detections of TCE and cis-1,2-DCE in relatively shallow soil indicate there was a minor former source of PCE in this area; however, the contamination is less than 50 ug/kg at 5 feet bgs and does not appear to have migrated below a depth of 15 feet. The detection of VC in groundwater is most likely due to the degradation of a PCE dissolved phase plume originating upgradient.

Products

In the vicinity of the batch neutralization tanks (MW-4), PCE and its breakdown projects were detected in soil from 10 to 35 feet bgs. PCE and VC were detected in groundwater collected from well MW-4. PCE was detected at a concentration of 2.7 ug/L, which is below the California Department of Health Services (DHS) allowable maximum contaminant level (MCL) of 5 ug/L for drinking water. PCE in groundwater is most likely due to an on-site source in the vicinity of the batch neutralization tanks. VC was detected in well MW-4 at a concentration of 57 ug/L, which is above the MCL; however, the Gaspur Aquifer is not used for drinking water in this area due to the industrial nature of Santa Fe Springs.

5.2.2 VOCs in Soil Gas

Additional soil gas samples were collected in the northern area of the Site (B-47 and B-48). The northern section of the PCE soil gas plume is now adequately delineated since PCE was not detected at location B-47. In addition, PCE was detected at a much lower concentration (8.82 ug/L) from location B-48 located to the north of B-37 where PCE was previously detected at a concentration of 98 ug/L.

5.2.3 Human Health Risk Assessment for VOCs

Carcinogenic VOCs

Carcinogenic VOCs were assessed based on the risk of developing cancer and are expressed in the form 1×10^{-5}, meaning there is a risk of 1 in 100,000 people developing cancer due to exposure to a particular carcinogenic compound. The USEPA's safe and protective of public health risk range is 1×10^{-4} to 1×10^{-6} (Federal Register 56(20):3535, 1991). The target risk range is 1×10^{-5}. According to the human health risk assessment, the estimated risk due to ingestion or dermal exposure to carcinogenic VOCs detected beneath the Site was 1.08×10^{-5}, which is below the target risk of 1×10^{-5}. The estimated risk due to inhalation of carcinogenic VOCs detected in soil gas beneath the Site was 1.36×10^{-3}, which exceeds the target risk of 1×10^{-5}, due to VC concentrations. The maximum concentration of VC detected in soil gas was 210 ug/L at location B-17, which is located near the batch neutralization tanks. The human health risk assessment assesses inhalation exposure based on the soil gas concentrations migrating upward into a hypothetical building. It should be pointed out that location B-17 is not located within a building and has a surface cap of 3 feet of concrete, both of which would most likely reduce the actual risk associated with inhalation. The estimated risk due to inhalation exposure of carcinogenic VOCs based on volatilization of VOCs detected in groundwater beneath the Site was 7.65×10^{-6}, which is below the target risk of 1×10^{-5} (**Appendix A**).

Non-carcinogenic VOCs

According the human health risk assessment, the estimated hazard quotients due to oral and dermal exposure to non-carcinogenic VOCs detected in soil beneath the Site were all less than the target hazard level of one. The estimated hazard quotients due to inhalation exposure of non-carcinogenic VOCs detected in soil gas and groundwater were all below the target hazard level of one (**Appendix A**).

5.3 Metals

5.3.1 Metals in Soil

The following metals were detected in soil during the April 2006 investigation: arsenic, barium, total chromium, hexavalent chromium, cobalt, copper, lead, nickel, selenium, vanadium, and zinc. Concentrations of arsenic, barium, total chromium, cobalt, copper, vanadium, and zinc detected in soil beneath the Site were within background concentrations according to soil samples collected at the St. Paul's High School and according to a study of southern California soils conducted by Marrett et al. (1992) (**Table 5**). Nickel concentrations (5 to 30 mg/kg) detected in soil beneath the Site were slightly higher than background concentrations according to Marrett et al (3.5 to 28.2 mg/kg). Selenium concentrations (2 to 5.1 mg/kg) detected in soil beneath the Site were higher than background concentrations collected at the St. Paul's High School (0.20 to 0.28 mg/kg). Soil samples were not analyzed by Marrett et al for selenium. Hexavalent chromium was detected in soil beneath the Site at concentrations ranging from 0.28 to 1.1 mg/kg. Background levels of hexavalent chromium were not available for the St. Paul's High School or from Marrett et al.

5.3.2 Metals in Groundwater

On April 12, 2006, groundwater samples were collected from monitoring wells MW-1 through MW-4 for metals analysis. The following metals were detected in groundwater beneath the Site: antimony, arsenic, barium, chromium, hexavalent chromium, cobalt, copper, lead, mercury, nickel, vanadium and zinc (**Table 7**). Antimony, arsenic, barium, chromium, lead and nickel were detected at concentrations slightly above the MCLs. The MCLs for drinking water for these compounds are as follows:

- Antimony – 0.006 mg/L;
- Arsenic – 0.05 mg/L;
- Barium – 1.0 mg/L;
- Chromium – 0.05 mg/L;
- Lead – 0.015 mg/L ; and
- Nickel –0.1 mg/L.

These concentrations are most likely due to the natural levels of metals existing in the soil on the site and pose little threat to human health as groundwater beneath the Site is not used for drinking water.

5.3.3 Human Health Risk Assessment for Metals

Carcinogenic Metals

According to the results of the human health risk assessment, the risk of oral and dermal exposure to carcinogenic metals detected beneath the Site was 2.43×10^{-4}, which is within the USEPA's safe and protective risk range, but above the target risk of 1×10^{-5}, due to arsenic. Arsenic was never used on-site for processing, or created as a waste by-product. Arsenic occurs naturally in soils throughout southern California and concentrations detected beneath the Site are typical of background concentrations (Marrett, 1992). Furthermore, the oral and dermal exposure scenario assumes a child and an adult are onsite consuming soil for 350 days for six and 24 years, respectively. Since the site is currently an operating industrial facility, which is mostly paved, the likelihood of this exposure route is very low. According to the risk assessment, the risk associated with inhalation of carcinogenic metals detected beneath the Site was was 7.64×10^{-6}, which is below the target risk of 1×10^{-5} (**Appendix A**).

Non-carcinogenic Metals

According to the human health risk assessment, the risk of oral and dermal exposure to non-carcinogenic metals detected beneath the Site is less than the hazard target level of one, with the exception of thallium. The thallium hazard quotient was 1.4; however, thallium was never used in processing operations or produced as a waste by-product. Therefore, thallium most likely occurs naturally in the soil and its hazard quotient most likely represents the conservative nature of the human health risk assessment. The risks of inhalation exposure to non-carcinogenic metals detected beneath the Site are all below the target hazard

level of one. According to the human health risk assessment, dermal, oral, or inhalation exposure to groundwater containing metals was not considered a complete pathway since groundwater at the Site is encountered at 34 feet bgs and drinking water is provided by a remote municipal water supply (**Appendix A**).

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

- TPH concentrations in soil, soil gas, and groundwater beneath the Site are below the target hazard level of one;
- PCE in soil gas is adequately delineated in the northern area of the Site;
- PCE in soil and groundwater detected in samples collected from well MW-4 are most likely due to an on-site source in the vicinity of the batch neutralization tanks;
- VC concentrations detected in groundwater from wells MW-1 through MW-3 are most likely due to an off-site source;
- VC concentrations detected in groundwater from well MW-4 could be due to an off-site source or due the degradation of PCE from an on-site source in the vicinity of the batch neutralization tanks;
- For dermal and oral exposure, carcinogenic and non-carcinogenic VOCs detected beneath the Site are below the target risk of 1×10^{-5} and the target hazard level of one, respectively;
- Non-carcinogenic VOCs detected beneath the Site are below the hazard level of one for inhalation exposure;
- Carcinogenic VOC concentrations detected in soil gas beneath the Site exceed the target risk of 1×10^{-5} for inhalation exposure due to VC concentrations. The maximum concentration of VC detected in soil gas was 210 ug/L at location B-17, which is located near the batch neutralization tanks. The human health risk assessment assesses inhalation exposure based on the soil gas concentrations migrating upward into a hypothetical building. It should be pointed out that location B-17 is not located within a building and has a surface cap of 3 feet of concrete, both of which most likely would reduce the actual risk associated with inhalation;
- Carcinogenic metals detected in soil gas beneath the Site are within the USEPA's safe and protective risk range of 1×10^{-4} to 1×10^{-6}; however, it exceeds the target risk of 1×10^{-5} for oral and dermal exposure due to arsenic concentrations. Arsenic was never used on-site for processing or created as a waste by-product. Arsenic occurs naturally in soils throughout southern California and concentrations detected beneath the Site were typical of background concentrations (Marrett, 1992). Furthermore, the oral and dermal exposure assumes a child and an adult are onsite consuming soil for 350 days for six and 24 years, respectively. Since the site is currently an operating industrial facility, which is mostly paved, the likelihood of this exposure route is very low;
- Carcinogenic metals detected beneath the Site were below the target risk level of 1×10^{-5} for inhalation exposure;
- Non-carcinogenic metals were below the target hazard level of one, with the exception of thallium for oral and dermal exposure. The thallium hazard quotient was 1.4; however, thallium was never

used in processing operations or produced as a waste by-product. Therefore, the hazard quotient for thallium most likely represents the conservative nature of the human health risk assessment; and

- Non-carcinogenic metals detected beneath the Site are all below the target hazard level of one for inhalation exposure.

6.2 Recommendations

Possible mitigation efforts and confirmatory sampling should be investigated in the vicinity of soil gas location B-17, where VC concentrations exceeded the target risk due to inhalation of 1×10^{-5}.

7. LIMITATIONS

This report has been prepared for the exclusive use of Associated Plating Company (APC) as it pertains to the subsurface investigation performed at the APC metal plating facility in the City of Santa Fe Springs, California. Our services were performed using that degree of care and skill ordinarily exercised under similar circumstances by reputable qualified environmental consultants practicing in this or similar locations. No other warranty, either expressed or implied, is made as to the professional advice included in this report. These services were performed consistent with our agreement with our client.

Opinions and recommendations contained in this report apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. We do not warrant the accuracy of information supplied by others, nor the use of segregated portions of this report.

With regard to geologic/hydrogeologic/contaminant conditions, our professional opinions are based in part on interpretation of data from discrete sampling locations. It should be noted that actual conditions at unsampled locations may differ from those interpreted from sampled locations.

Respectfully Submitted,
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