2013 Annual Performance Evaluation Report
Volume 1

Baldwin Park Operable Unit of the
San Gabriel Valley Superfund Sites
Los Angeles County, California

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Submitted to:

Baldwin Park Operable Unit Cooperating Respondents

Submitted by:

NewFields, LLC
9635 Maroon Circle, Suite 400
Englewood, Colorado

ERM – West, Inc.
1277 Treat Boulevard, Suite 500
Walnut, California

Project No. 475.0092.001

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ERM NewFields

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Abbreviations

1,1-DCE	1,1-Dichloroethene
1,2-DCA	1,2-Dichloroethane
1,2,3-TCP	1,2,3-Trichloropropane
AAWC	Azusa Agricultural Water Company
AJ	Aerojet
ALR	Azusa Land Reclamation Company, Inc.
AMEC	AMEC Environment and Infrastructure, Inc. (formerly AMEC Geomatrix, Inc.)
ARARs	Applicable or Relevant and Appropriate Requirements
AVWC	Azusa Valley Water Company
bgs	below ground surface
BPOU	Baldwin Park Operable Unit
BPOUSC	Baldwin Park Operable Unit Steering Committee
CC	Conrock Company
CDM	Camp, Dresser, and McKee
CDWC	California Domestic Water Company
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cis-1,2-dce	Cis-1,2-Dichloroethene
COC	Chemical of Concern
COI	City of Industry
CRs	Cooperating Respondents
DPH	California Department of Public Health, Drinking Water Section (formerly Department of Health Services [DHS]).
DQO	Data Quality Objectives
EDB	Ethylene Dibromide
EPA	U.S. Environmental Protection Agency
ERM	ERM-West, Inc.
ESD	Explanation of Significant Differences
FSP	Field Sampling Plan
f.k.a	Formerly Known As
GAC	Granular Activated Carbon
gpm	gallons per minute
HLA	Harding Lawson Associates
ISEP	Calgon Ionic Separation Process
LACO	Los Angeles County
LACFD	Los Angeles County Flood Control District
LACDPW	Los Angeles County Department of Public Works
LACSD	Los Angeles County Sanitation Districts
LDC	Laboratory Data Consultants, Inc.
LPGAC	Liquid-Phase Granular Activated Carbon
LPVCWD	La Puente Valley County Water District
MCL	Maximum Contaminant Level
MICR	Maximum Individual Cancer Risk
MS	Matrix spike
MSD	Matrix spike duplicate
msl	Mean Sea Level
NDMA	N-Nitrosodimethylamine
NL	Drinking Water Notification Level
ng/L	Nanograms Per Liter

PCE	Tetrachloroethene
PE	Performance Evaluation
PHG	Public Health Goal
PRP	Potentially Responsible Party
PSEP	Performance Standards Evaluation Plan
PVOU	Puente Valley Operable Unit
QAPP	Quality Assurance Project Plan
QC	Quality Control
RFP	Request for Proposal
RFQ	Request for Qualifications
RI	Remedial Investigation
ROD	Record of Decision
RMSE	Root-mean squared error
RRF	Relative Response Factor
RWQCB	Regional Water Quality Control Board – Los Angeles Region
SA	Subarea
SCAQMD	South Coast Air Quality Management District
SGVWC	San Gabriel Valley Water Company
SOW	Statement of Work
SMR	Self Monitoring Reports
SVOC	Semi-Volatile Organic Compound
SWS	Suburban Water Systems
TIC	Tentatively Identified Compound
TCE	Trichloroethene
UAO	Unilateral Administrative Order
µg/L	Micrograms Per Liter
UV	Ultraviolet
VCWD	Valley County Water District
VFD	Variable Frequency Drive
VOC	Volatile Organic Compound
VPGAC	Vapor-Phase Granulated Activated Carbon
WE	Water Entity
WY	Water Year

2013 ANNUAL PERFORMANCE EVALUATION REPORT
Baldwin Park Operable Unit
San Gabriel Valley, California

1.0 INTRODUCTION

This document presents the 2013 Annual Performance Evaluation (PE) Report for the Baldwin Park Operable Unit (BPOU) of the San Gabriel Valley Superfund Sites, located in the San Gabriel Basin, Los Angeles County, California. This report was prepared jointly by NewFields, LLC (NewFields) and ERM-West, Inc. (ERM), on behalf of the BPOU Cooperating Respondents (CRs). The CRs are:

- Aerojet Rocketdyne, Inc. (f.k.a Aerojet-General Corporation)
- Azusa Land Reclamation Company, Inc. (ALR)
- Hartwell Corporation
- Chemical Waste Management, Inc. (as successor to Oil and Solvent Process Company)
- Reichhold, Inc.
- Winco Enterprises Inc. (formerly known as [f.k.a.] Wynn Oil Company)

This report meets the requirements for the Annual PE Report, as required by Unilateral Administrative Order 2000-13 (UAO) and the supporting Statement of Work (SOW), issued by the U.S. Environmental Protection Agency (EPA) Region IX on June 30, 2000, and amended on February 28, 2002.

1.1 Background

Beginning in 1979, volatile organic compounds (VOCs) were detected in groundwater within the San Gabriel Basin (the Basin). In May 1984, four areas of groundwater contamination were listed as San Gabriel Valley Areas 1-4 on EPA's National Priorities List based on available water-quality data. Subsequent investigation by EPA and others revealed widespread VOC contamination in the Basin. As a result, EPA subsequently divided the Basin into seven Remedial Investigation (RI) areas to focus characterization on the extent of contamination and plan remedial actions. EPA later designated some of these RI areas as operable units. RI Area 5 was designated as the BPOU.

Although many of the figures provided in this report depict a generalized boundary to the area of impacted groundwater in the BPOU (Figure 1-1), the precise boundary of the BPOU has not been determined, but an approximate boundary is presented to provide a point of reference on the figures.

Since 1986, EPA, various Potentially Responsible Parties (PRPs), and numerous other entities have compiled and evaluated groundwater-quality data from the Basin. Initial field investigations conducted by EPA in the BPOU included the installation and sampling of one multiport monitoring well and the sampling of water-supply wells. In 1990, EPA issued a Basin-wide Technical Plan that described options for remediation of VOC plumes through the Basin. In 1992, EPA published an Interim RI Report for the Basin.

In 1993, EPA issued a Feasibility Study Report for the BPOU. This report evaluated various remedial alternatives for the remediation of groundwater in the BPOU. In 1994, EPA issued a Record of Decision (ROD) for the BPOU interim remedy. The ROD identified 17 chemicals of concern (COCs), all of which were VOCs. EPA's selected remedy consisted of pumping and treating approximately 19,000 gallons per minute (gpm) of contaminated groundwater. In approximately 1995, the Baldwin Park Operable Unit Steering Committee (BPOUSC) began to perform pre-remedial design activities, including additional characterization of the extent of VOC-contaminated groundwater and the development of a groundwater extraction plan. Eight multiport monitoring wells were installed and sampled and 26 existing water-supply and monitoring wells were sampled to provide additional characterization of the extent of VOC contamination in the BPOU. The results of these pre-remedial design activities were submitted to EPA in the Draft Pre-Remedial Design Report, dated December 1996 (Camp, Dresser, and McKee [CDM], 1996). The groundwater extraction plan was revised on several occasions. Following review and comment by EPA, the Final Draft Pre-Remedial Design Report, dated September 1997 (CDM, 1997), was issued.

In mid-1997 and then in 1998, certain constituents that were not previously considered as COCs in the ROD, including perchlorate, N-nitrosodimethylamine (NDMA), and 1,4-dioxane were discovered in groundwater within the BPOU. Consequently, EPA requested that the BPOUSC characterize the distribution of these constituents, as well as conduct further characterization of VOCs in groundwater within the BPOU. As a result, the BPOUSC installed and sampled four additional multiport monitoring wells and conducted additional groundwater sampling to evaluate the extent of VOCs, perchlorate, NDMA, and 1,4-dioxane in groundwater in the BPOU.

The results of these investigations and several groundwater extraction plan options were presented to EPA in the Draft Addendum to the Pre-Remedial Design Report, dated January 14, 1999 (Harding Lawson Associates [HLA], 1999). Throughout 1999, these groundwater extraction plan options were refined and new options were formulated. These changes were made in response to comments from EPA and the Main San Gabriel Basin Watermaster (Watermaster). This resulted in a range of candidate groundwater extraction plans with total groundwater extraction rates ranging from 19,500 to 21,500 gpm.

In May 1999, EPA issued an Explanation of Significant Differences (ESD) to supplement the 1994 ROD. The ESD depicted an expanded area of the groundwater contamination in the southern portion of the BPOU to reflect the results of the additional investigations related to the characterization of perchlorate, NDMA, and 1,4-dioxane in groundwater. The ESD also added perchlorate, NDMA, and 1,4-dioxane to the list of COCs defined in the ROD. In June 2000, EPA issued the UAO, requiring various PRPs (identified in the UAO as “Respondents”), including but not limited to the CRs, to design, construct, and operate the BPOU interim remedy identified in the ROD, as revised by the ESD. In addition, beginning in the late 1990s, various water agencies, producers, and other water entities (collectively, the “Water Entities” or “WEs”) with regulatory oversight and/or financial or other interests in the BPOU groundwater filed lawsuits or asserted claims against the BPOU PRPs for damages allegedly suffered as a result of contamination of the groundwater and water-supply wells in the BPOU area. Thereafter, the CRs entered into negotiations with the WEs, which culminated in March 2002 with the CRs and WEs executing the BPOU Project Agreement to implement the BPOU Project. The BPOU Project Agreement was declared effective as of May 9, 2002.

While the BPOU Project Agreement negotiations were underway, the CRs prepared the Final Remedial Design/Remedial Action Work Plan and the Draft Final Conceptual Design Report for the implementation of the remedy (HLA, 2000a and HLA, 2000b). The Preliminary Design Report was prepared by the WEs and submitted to EPA in April, 2001 (Watermaster, 2001).

In January 2006, EPA's Remedial Project Manager notified the CRs that EPA was concerned about the detection of 1,2,3-trichloropropane (1,2,3-TCP) in certain wells within the BPOU. This compound does not have a federal Maximum Contaminant Level (MCL), but does have a California state Drinking Water Notification Level (NL) of 5 nanograms per liter (ng/L)[1]. In response to EPA's requirements, the CRs funded a further modification of the Valley County Water District (VCWD) Lante Treatment Plan to include Liquid-Phase Granular Activated Carbon (LPGAC) treatment to address EPA's concerns about the presence of 1,2,3-TCP.

In August 2006, EPA requested that the CRs include in the BPOU monitoring program additional sampling for non-COC VOCs and non-target volatile and semi-volatile compounds (Tentatively Identified Compounds, or TICs) including 1,2,3-TCP (1,2,3-TCP was subsequently added as a COC). In response to EPA's request, the CRs provided a proposal for non-COC groundwater analysis and reporting in a technical memorandum dated August 24, 2006 (Geomatrix, 2006a). This proposal included the following:

- Information on sampling and analysis of 1,2,3-TCP;
- A proposal for reporting results for non-COC VOCs in a subset of multiport monitoring wells located upgradient of each groundwater extraction and treatment facility (i.e. "early warning" wells);
- A proposal for monitoring of non-target VOCs and semi-volatile organic compounds (SVOCs) in a subset of multiport monitoring wells located upgradient of each groundwater extraction and treatment facility (i.e. "early warning" wells), and;
- A proposal for periodic analysis of 1,2,3-TCP in selected wells.

EPA approved the August 24, 2006, proposal in a letter dated September 13, 2006, subject to the addition of several wells. The complete requirements for non-COC groundwater analysis and reporting were summarized in a technical memorandum dated September 29, 2006 (ERM, 2006).

On October 3, 2006, EPA provided a letter approving the BPOU Quality Assurance Project Plan (QAPP) and Field Sampling Plan (FSP) subject to submittal of final versions of these documents with the complete requirements for non-COC groundwater analysis and reporting. Final versions of the QAPP and FSP for groundwater were submitted in November 2006 (Geomatrix, 2006b; Stetson, 2006a) and were approved by EPA in a letter dated February 12, 2007. The QAPP (Rev. 5) and FSP (Rev. 7) for groundwater were most recently updated in 2013 at the request of EPA (AMEC, 2013a and AMEC, 2013b). EPA approved the updated QAPP and FSP in a letter dated May 21, 2013.

In the February 12, 2007 letter EPA also requested that a data management plan be prepared as an addendum to the QAPP. The report, Data Management Plan for the Baldwin Park Operable Unit Performance Standards Evaluation Plan Monitoring Program, was submitted to EPA on May 17, 2007 (Laboratory Data Consultants, Inc. [LDC] 2007).

[1] In August 2009, the State of California's Office of Environmental Health Hazard Assessment adopted a final Public Health Goal (PHG) for 1,2,3-trichloropropane of 0.7 nanograms per liter, or 0.0007 parts per billion. While DPH considers a PHG in setting a state MCL, to date no final MCL has been established.

A separate FSP for Off-Gas Air, Waste Brine, and Treated Water was submitted to EPA on August 14, 2006 (Stetson 2006b) and the corresponding QAPP for Air, Brine, and Treated Water was submitted on March 16, 2007 (Geomatrix, 2007a). The CRs submitted a revised QAPP for air and waste water discharges to the EPA in September of 2012 (AMEC, 2012a) and an updated the Field Sampling and Analysis Plan for air and waste water discharges was issued in July 2013 (Stetson, 2013b).

Numerous minor modifications have been proposed and approved for the BPOU PSEP monitoring program since 2007. In 2010, the QAPP for Groundwater (AMEC Geomatrix, 2010a), the FSP for Groundwater (AMEC Geomatrix, 2010b), and the Revised Final Performance Standards Evaluation Plan (PSEP) were updated (AMEC Geomatrix, 2010c) to incorporate the modifications that were approved after the previous versions of these documents were issued. An updated version of the PSEP (Rev. 3) was submitted to EPA on April 13, 2012 (AMEC, 2012b) to address comments received from EPA on July 1 and October 12, 2011. EPA provided comments and requested additional modifications to the PSEP in e-mail correspondence dated September 21, 2012, November 28, 2012, February 28, 2013, and March 8, 2013. As a result, a revised version of the PSEP (Rev. 4) was prepared to address EPA comments including the addition of 1,2,3-TCP as a COC, clarification of monitoring and reporting requirements for non-COCs such as ethylene dibromide (EDB), and the modification of remedial action objectives outlined in Sections 2.2.1 and 2.2.2 (AMEC, 2013c). EPA approved the revised PSEP in a letter dated May 21, 2013. Modifications to the various monitoring components of the PSEP are described in detail in Section 3.0 of this report.

1.2 Overview of Remedial Action

The UAO and SOW direct the Respondents to design, construct, and implement the remedy described in the ROD and ESD, and to achieve the Performance Standards in accordance with the UAO. In a letter to the CRs dated February 28, 2002, EPA confirmed that CR funding of the implementation of the BPOU Project Agreement described in Section 1.1 above provided the CRs with a means to satisfy the requirements of the UAO. The WEs (either directly or through contractors) designed the groundwater extraction and treatment facilities (Subprojects), and construction of the initial design work has been completed. The WEs are now operating the Subprojects, which provide for groundwater extraction and treatment in two general areas of the BPOU (Figure 1-2). The treated groundwater is supplied for direct potable use.

The EPA approved groundwater extraction plan associated with the various Subprojects consists of the extraction of a total of approximately 21,750 gpm of groundwater on annualized basis: 6,000 gpm from the northern portion of the plumes (Subarea 1), and 15,750 gpm from the southern portion of the plumes (Subarea 3). Extracted groundwater is to be treated using a treatment train that is designed to remove all COCs to levels acceptable for direct potable use. The treatment train varies among the treatment plants but generally consists of a series of contaminant treatment processes including air stripping and/or LPGAC to remove VOCs, ion exchange to remove perchlorate, and ultraviolet (UV)/oxidation to remove 1,4-dioxane and NDMA.

1.3 Summary of Remedial Action Objectives and Performance Standards

Two of the key performance standards are defined in the UAO as follows:

The remedial objectives of the Baldwin Park OU are to prevent future increases in, and begin to reduce concentrations of trichloroethene, tetrachloroethene, carbon tetrachloride, and other VOCs, along with perchlorate, N-nitrosodimethylamine, and 1,4-dioxane in groundwater in the Baldwin Park area (hereafter referred to as contaminants or contaminated groundwater) by limiting further migration of contaminated groundwater into clean and less contaminated areas or depths that would benefit most from additional protection and by removing contaminants from the aquifer.

The BPOU Project involves the design, installation, operation, and maintenance of groundwater extraction systems in two areas of the BPOU. The two areas are designated in the ROD and ESD as Subarea 1 (the upper area) and Subarea 3 (the lower area). Remedial objectives for the two Subareas are described below.

1.3.1 Subarea 1 Remedial Objectives

In Subarea 1, the movement of COCs in groundwater will be limited by groundwater extraction at rates and locations that will establish the necessary groundwater flow field, such that the resultant capture zone limits migration from known or suspected source areas and depths and removes chemical mass. Source areas and depths include locations believed to contain a significant mass of soil contamination (i.e., vadose zone) or a subsurface source of dissolved-phase groundwater contamination. The capture zone is to include all significant depth intervals where COC concentrations exceed MCLs. As part of the groundwater extraction process, chemical mass will be removed from Subarea 1 groundwater.

1.3.2 Subarea 3 Remedial Objectives

In Subarea 3, the movement of COCs in groundwater will be limited by groundwater extraction at rates and locations that will establish the necessary groundwater flow field to reduce the potential for groundwater containing unacceptable concentrations of tetrachloroethene (PCE), trichloroethene (TCE), carbon tetrachloride, perchlorate, NDMA, 1,4-dioxane or other COCs from moving into areas where these chemicals are not present at unacceptable concentrations. Subarea 3 groundwater extraction is to result in a hydraulic capture zone that includes all significant depth intervals where COC concentrations exceed MCLs. As part of the groundwater extraction process, chemical mass will be removed from Subarea 3 groundwater.

1.3.3 Performance Standards

Two distinct performance standards have been derived from the Remedial Objectives cited above: 1) limit further migration of COCs in groundwater, and 2) remove COCs from groundwater. Achievement of these performance standards will prevent future increases in concentrations, begin to reduce concentrations, and prevent the spread of COCs from more contaminated areas to less contaminated areas. These two performance standards are described in more detail below.

1.3.3.1 *Performance Standard 1 - Limit Migration of Chemicals of Concern*

The BPOU extraction plan was developed using an EPA-approved three-dimensional finite-element groundwater flow model, DYNFLOW. In 2002, the model was updated using a similar code, FEFLOW. The construction and calibration of this model relies on many years of data collection activities in the

BPOU, including water level measurements and water-quality sampling. The model was initially calibrated using water level data from a 20-year period (1982 to 2002). Following calibration, the model was run in a forward/predictive manner to select locations and depths of groundwater extraction wells that would allow the remedy to achieve the objectives described above. Review of geophysical logs from exploratory borings at the extraction well locations as well as logs from other wells in the BPOU suggested the presence of relatively thick, fine-grained layers that can be correlated across Subarea 3 but do not extend north to Subarea 1. These layers are present at approximately -200 and -500 feet mean sea level (msl). As a result, the well screened intervals for new extraction wells in Subarea 3 were designed so that they could capture the entire vertical extent of contaminated groundwater without creating hydraulic connections across these layers. Therefore, shallow extraction wells were screened above the layer at -500 feet msl and deep extraction wells were screened below the layer at -500 feet msl. Aquifer testing in the extraction wells confirmed that the layer at -500 feet msl acts as a confining unit that provides hydraulic separation between the shallow and deep elevation intervals. In 2005, the groundwater flow model was modified to incorporate the confining units in Subarea 3. The groundwater flow model is updated annually with quarterly pumping and recharge data that are compiled from various sources. The CR group will continue to make refinements to the groundwater model to incorporate the results of field testing and other information to ensure the model adequately simulates observed groundwater conditions in localized areas. Updates and refinements to the groundwater model are reported in Annual PE Reports as necessary. The calibrated model is the primary tool that is utilized to assess system performance in terms of limiting the migration of COCs.

1.3.3.2 *Performance Standard 2 - Removal of Chemical Mass*

This performance standard, removal of chemical mass, will be met through extraction and treatment of groundwater from the BPOU plumes. Documentation of the removal of chemical mass will use measured flow rates from groundwater extraction wells and results of water-quality sampling and analysis for these same extraction wells. Using these data, the mass removal for selected COCs will be estimated on an annual basis. Cumulative chemical mass removed from the aquifer will also be reported.

1.4 Approach to Performance Monitoring and Evaluation

Performance monitoring and evaluation focuses on the operation of the proposed groundwater extraction system as it relates to: 1) limiting further migration of groundwater contamination into less contaminated areas, and 2) removing chemical mass from groundwater. As described in the PSEP (AMEC, 2012b), the CRs' approach to performance monitoring relies upon: 1) past and future basin-wide groundwater monitoring activities performed by the Watermaster, 2) performance monitoring data collected by the Water Entities, the CRs, or other agents acting on behalf of the CRs, and 3) the use of an EPA-approved groundwater flow model to predict the effectiveness of the groundwater extraction system. At any time, should EPA determine that Performance Standards related to migration control and mass removal are not being met, the CRs will use these same methods of data collection and modeling to modify operation of the groundwater extraction system such that Performance Standards are achieved.

Watermaster basin-wide monitoring activities have served as the baseline monitoring program from which additional monitoring needs have been defined. The Watermaster has the responsibility to ensure that comprehensive water-quality monitoring meets their court-decreed mission of managing Basin water production and quality, provides for predictive vulnerability assessments, and provides for monitoring so that California Department of Public Health (DPH; formerly the Department of Health Services ([DHS]) requirements for public water supplies are met. The Watermaster performs routine basin-wide water level monitoring of over 170 wells on a semi-annual basis.

In summary, the approach to performance monitoring and evaluation consists of the following, components:

- Potentiometric head measurements in BPOU piezometers and multiport monitoring wells. These data are used to generate potentiometric surface maps for comparison to model simulation results;
- Groundwater flow modeling and particle tracking to evaluate hydraulic performance of the extraction system as it relates to limiting further migration of groundwater contamination;
- Water-quality sampling of production and multiport monitoring wells to provide information on the distribution of chemicals of concern in BPOU groundwater, specifically to produce plume maps;
- Integration of the results of groundwater modeling with current plume maps and known source locations to determine whether the groundwater extraction systems are appropriately limiting the migration of COCs;
- Water-quality sampling and measurement of extraction well pumping rates and production volumes; and
- Use of flow rate and water-quality data from extraction wells to calculate the mass of chemicals of concern removed from the aquifer by the extraction and treatment system.

1.5 Content of Performance Evaluation Reports

As outlined in the PSEP, the Annual PE Reports should generally contain the following:

- Potentiometric maps to assist in evaluating changes in groundwater flow patterns in the BPOU;
- Groundwater plume maps and chemical cross sections and an evaluation of any changes in the extent of groundwater contamination within the BPOU;
- Time-concentration plots for selected key constituents for selected monitoring wells;
- Contaminant mass-removal estimates for each extraction well using average flow rates and water-quality sampling results from the extraction wells;
- Results of computer model simulations of extraction system performance and a description of any refinements to groundwater flow models used to evaluate system performance;
- An overall assessment of remedial system performance in relation to Performance Standards related to the remediation of groundwater; and
- Recommendations for changes to the monitoring program outlined in the PSEP including scheduled changes to the monitoring frequency or monitoring locations.

As outlined in the most recent version of the PSEP (Revision 4), EPA has requested that Annual PE Reports also address the performance of the BPOU Project in relation to “Other Performance Standards” that are not directly related to the remediation of groundwater, but rather relate to the operational performance of, or discharge requirements for, the various Subprojects following construction. These “Other Performance Standards” include the following:

- Achievement of treated-water effluent requirements in accordance with DPH domestic water supply permits, EPA Applicable or Relevant and Appropriate Requirements (ARARs), and DPH requirements;
- Air-emission monitoring requirements in accordance with EPA ARARs and the risk limits identified in the June 15, 2009 letter from Wayne Praskins, EPA to Scott Goulart, Aerojet as further explicated in EPA’s February 3, 2011 letter. Note that in August 2006, by mutual agreement among EPA, South Coast Air Quality Management District [SCAQMD], and VCWD, air stripper and off gas control systems permits with SCAQMD were cancelled and EPA assumed compliance oversight with respect to operations formerly covered by the SCAQMD permits;
- Monitoring and reporting of brine discharges to the Los Angeles County Sanitation Districts (LACSD) system in accordance with Industrial waste discharge permits;
- Demonstration of proper disposal of waste associated with treatment operations. Applicable waste streams include, but are not limited to, spent granular activated carbon and spent ion exchange resins. Wastes treated or disposed of offsite must comply with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) offsite rule;
- Compliance with substantive portions of the National Pollutant Discharge Elimination System (NPDES) discharge requirements for any treated water discharged to surface water;
- Compliance with the Los Angeles Regional Water Quality Control Board's Water Quality Control Plan for the Los Angeles River Basin (the "Basin Plan"), which incorporates State Water Resources Control Board Resolution No. 68-16, "Statement of Policy with Respect to Maintaining High Quality of Waters in California," for any discharge to land, including recharge at a spreading basin or discharge to surface water;
- The installation and operation of treatment systems needed to ensure that the nitrate concentration in any discharge to land, to a spreading basin, or to a surface water is similar to or lower than the concentration in the receiving water, except for EPA-approved CERCLA Section 104(b) activities that will result in temporary high flow, high volume discharges;
- Compliance with substantive requirements in 22 CCR Sections 66264.601 -.603 for miscellaneous units, and related substantive closure requirements in 22 CCR Sections 66264.111-.115 for air strippers or granular activated carbon (GAC) contactors; and
- Compliance with DPH requirements for Emergency Preparedness Plans including Spill/Release Response Plans for the various subprojects.

2.0 STATUS OF REMEDIAL ACTIONS

This section presents the status of remedial actions undertaken in 2013 to implement the BPOU interim remedy. These actions include operation of the Valley County Water District (VCWD) Lante Subproject in Subarea 1; and operation of the La Puente Valley County Water District (LPVCWD) Subproject, the San Gabriel Valley Water Company (SGVWC) B6 Subproject and the SGVWC B5 Subproject in Subarea 3. The status of the BPOU Subprojects is also described in the monthly progress reports submitted to EPA pursuant to Paragraph 85, Section XV of the UAO.

2.1 Subarea 1 Remedial Action Status

Subarea 1 remedial actions consist of groundwater extraction from the VCWD SA1-1, SA1-2, and SA1-3 (Lante) wells and treatment at the VCWD Lante Treatment Plant, which is owned and operated by VCWD. The report, "Revised Draft Interim Remedial Action Report" (Stetson, 2005), prepared and submitted to EPA in March 2005, provides a summary of the VCWD Lante Subproject background, construction, and completion activities. Construction of the VCWD Lante Treatment Plant began in 2002 and was completed in 2005. The original construction activities included drilling and equipping two new extraction wells (SA1-1 and SA1-2), re-equipping the SA1-3 (Lante) well, installing associated piezometers, constructing raw and treated water pipelines, and constructing the treatment plant. Additional construction work in 2006 and 2007 included adding LPGAC treatment and replacing the resin-based vapor control system with vapor-phase granular activated carbon (VPGAC). The treatment plant consists of four air-stripping towers and associated VPGAC off-gas treatment units for VOC removal, LPGAC for 1,2,3-TCP removal, two regenerable ion exchange carousels (Calgon Ionic Separation Process [ISEP]) for perchlorate removal, and four UV/oxidation units for 1,4-dioxane and NDMA removal. Treated water is conveyed via a treated water pipeline to Suburban Water Systems (SWS) Plant 121; however, a portion of the treated water can be directed to the VCWD distribution system if desired.

On November 11, 2005, DPH issued domestic water supply Permit Amendment 1910009PA 003, authorizing VCWD to operate the VCWD Lante Treatment Plant. In January 2006, 1,2,3-TCP was detected in the VCWD extraction wells and subsequent testing confirmed the presence of 1,2,3-TCP. Beginning on February 21, 2006, VCWD began discharging treated water to Big Dalton Wash while a 1,2,3-TCP treatment technology was selected and constructed. LPGAC was selected as the treatment technology and the design and construction of a LPGAC system was completed in Spring 2007. LPGAC startup testing was completed in May 2007 and on July 18, 2007, DPH issued an amended permit to VCWD to resume delivering potable water.

As a result of operational problems, the resin-based off-gas control system was removed and replaced with VPGAC. A temporary VPGAC system was installed while a permanent system was designed and constructed. The temporary system was operational in June 2007 and the permanent system became fully operational in April 2008. The permanent VPGAC system consists of four 20,000 pound adsorbers with associated heaters operated in parallel.

The air strippers also experienced operational problems with calcium carbonate precipitation in the towers and packing. Tower cleaning was initiated in October 2007 and was completed in February 2008. A study was conducted to evaluate precipitation mitigation alternatives that included anti-scalant dosing, acid cleaning, and packing replacement. Anti-scalant testing began in October 2008 and is on hold pending resolution of potential impact downstream treatment processes and final decisions for nitrate management. One air stripper was acid washed in December 2008 to test the efficacy and cost of this alternative. The results of the acid wash testing were summarized in a February 18, 2009 memorandum "Summary and Evaluation Air Stripper No. 4 Acid Cleaning" (Stetson, 2009). Based on the pilot testing, the acid washing was not a cost effective method to mitigate calcium carbonate precipitation problems. Air strippers are now routinely inspected and the towers and packing cleaned and replaced as necessary. In addition, calcification of piping downstream of the air strippers has caused VCWD to consider modifications to the acid injection system, which VCWD is proceeding with acid system modifications and anticipates completion in early 2014.

The process to replace the ISEP with single pass ion exchange was initiated in 2008. A request for proposal was released in January 2008 and bids were received and evaluated in April and May of 2008. The work was awarded to RC Foster and a notice to proceed was issued in August 2008. California Environmental Quality Act (CEQA) work associated with the single pass ion exchange was completed in September 2008 and design work was completed in early 2009. As part of the ISEP replacement work, nitrate treatment alternatives were also evaluated (Malcolm Pirnie, 2008).

Design and construction of the single pass ion exchange system was completed in 2009. The associated booster pump upgrade was completed in November 2009. Start-up testing of the single pass ion exchange system is on hold until issues regarding nitrate treatment, ISEP by-pass configurations, and ISEP modifications are evaluated and resolved. In October 2010, VCWD and the CRs released a Request for Qualifications (RFQ) requesting process engineering and nitrate management qualifications to selected engineering firms. Qualifications were received, reviewed, and CDM Smith was selected as the firm to provide process treatment and nitrate management engineering expertise. CDM Smith began reviewing nitrate management alternatives in 2011 and a report with recommendations was submitted in March of 2012. Per the CRs request, CDM submitted an addendum to their report on nitrate management in November of 2012, summarizing alternatives which include blending using the Lante two million gallon reservoir.

The CRs also submitted an evaluation of extraction system performance for Subarea 1 in August 2012 (CDM Smith, 2012). In a letter dated December 12, 2012, EPA approved the proposed groundwater extraction plan of 5,000 gpm extraction at the SA1-3 location and 1,000 gpm extraction at the SA1-1 well and concluded that this provides adequate hydraulic containment while optimizing mass removal in Subarea 1. VCWD evaluated various options to increase production at the Lante Treatment Plant including a new well, reactivating the Arrow well, and upgrading the Lante well (Civiltec Engineering Inc. [Civiltec] 2013). In 2013 and early 2104, VCWD and the CRs agreed on a plan to implement nitrate management using one ISEP table, ISEP bypass and related work, and the installation of a new well at the Lante Treatment Plant site.

Other VCWD Lante Treatment Plant improvements or evaluations initiated in 2013 included:

- In March, the Treatment Train B brine meters were calibrated to within acceptable limits;
- An analog card for a salt tank on Treatment Train A was replaced in April;
- Inspections of Air Stripper No. 1, 2, and 4 was conducted in April, and indicated significant amounts of calcification in the packing material. Packing material in Air Stripper No. 3 was

replaced in April 2013. In August/September packing replacement and tower cleaning on Air Stripper Nos. 1 and 4 was performed;

- In May, the RG pump Cla-Val valve and meter bearing in UV Reactor No. 4 were replaced;
- An inspection of Air Stripper No. 2 was performed in September and packing replacement was recommended based on the level of calcification. Packing replacement and tower cleaning on Air Stripper No. 2 was performed in October; and
- Valve repair work on ISEPs A and B was completed in December and resin from ISEP B was transferred to ISEP A. ISEP A was restarted and operated for approximately one week before shutting down due to high back pressures caused by degraded resin. New resin was ordered for ISEP B. ISEP A will no longer be operated and may be used for spare parts.

Technical performance reports are prepared under Provision 42 of the DPH operating permit and are required to be submitted annually to DPH. The most recent of these reports, “2012 Annual Technical Performance Report for the Lante Plant” (Stetson, 2013a), was submitted in March 2013 and describes the status and performance of the VCWD Lante Treatment Plant for the period January 1 to December 31, 2012. In addition, VCWD submits monthly compliance reports to DPH; these compliance reports are included in the monthly progress reports provided to EPA.

In 2013, VCWD treated 4,800 acre-feet of water with an average flowrate of 2,972 gpm (Table 2-1) which is approximately 49.5% of the approved extraction rate of 6,000 gpm as approved in EPA’s letter titled *Groundwater Extraction Plan for the Baldwin Park Operable Unit* dated February 4, 2000. The VCWD did not operate for much of September through December due to repairs of the ISEP systems. The reduced production rate was due primarily to ISEP limitations and major repairs required on ISEP A and B. Production decreased from the prior year’s average flowrate of 5,301 gpm and remained below the EPA-approved extraction rate. Rehabilitation of Well SA1-2 was completed in January of 2012 and redevelopment performed in March 2012; however, the well has not yet been put back into service, in part due to VCWD’s concerns over elevated nitrate concentrations in groundwater extracted by this well.

2.2 Subarea 3 Remedial Action Status

Subarea 3 remedial actions consist of the operation of the LPVCWD, SGVWC B6, and SGVWC B5 Subprojects. These Subprojects consist of the extraction and treatment of groundwater at an average flowrate of 16,250 gpm (design capacity 18,100 gpm) as discussed below.

2.2.1 La Puente Valley County Water District Subproject Status

The LPVCWD Subproject extracts, treats, and delivers water to the public under a DPH permit that was issued on February 15, 2001, and amended as Permit No. 1910060PA-000 issued on May 8, 2002 with subsequent amendments. The LPVCWD Subproject consists of extraction wells LPVCWD 2, LPVCWD 3, LPVCWD 5, two air strippers and associated off-gas treatment for VOC removal, single pass ion exchange (replacing ISEP in July 2010) for perchlorate removal, and UV/oxidation for 1,4-dioxane and NDMA removal operating at a capacity of up to 2,500 gpm (the EPA approved extraction rate is 2,250 gpm). Treated water is conveyed to LPVCWD’s distribution system and, when available, a portion of the treated water is also provided to SWS.

To address sanding problems in LPVCWD 2 and 3, a new well, LPVCWD 5, was drilled and installed in 2007. The LPVCWD 5 well was equipped, developed, and tested in 2008. On December 19, 2008, DPH issued an amended permit to allow LPVCWD 5 to be used as a drinking water source. The well became operational in January 2009 and is LPVCWD's primary water supply well, with LPVCWD 2 and 3 used as backup water supply wells. The LPVCWD 5 well installation activities are summarized in, "Well No. 5 Well Completion Report" prepared by Stetson and submitted in final on July 2, 2008 (Stetson, 2008). DPH issued a permit amendment for the operation of the LPVCWD 5 well on December 19, 2008.

To mitigate perchlorate-bearing brine discharges to the LACSD brine line, the LPVCWD Subproject Committee approved replacing the ISEP with single pass ion exchange equipment. The single pass ion exchange system was designed and construction was completed in 2009. A draft Compliance Test Plan and Operation, Maintenance, and Monitoring Plan for the single pass ion exchange were prepared and submitted to DPH for review. In June 2009, the EPA issued a letter supporting temporary discharges of water during startup testing of the new single-pass ion exchange system to the Walnut Wash. The Los Angeles County Department of Public Works (LACDPW) issued a discharge permit for LPVCWD on November 17, 2009. The ion exchange system was tested during startup activities in December 2009. The DPH issued an amended permit for the single pass ion exchange system on June 15, 2010 and the system became operational on July 30, 2010.

Technical performance reports are prepared under Provision 33 of the DPH operating permit and are required to be submitted annually to DPH. The most recent of these reports, "Annual Report (2012 – 2013) for the La Puente Valley County Water District Treatment Facility" (Stetson, 2014a), was submitted in January 2014 and describes the status and performance of the LPVCWD facility for the period August 1, 2012, to July 31, 2013. In addition, LPVCWD submits monthly compliance reports to DPH; these compliance reports are included in the monthly progress reports provided to EPA.

Treatment system improvements or evaluations initiated in 2013 included:

- Annual visual inspection of Air Strippers No. 1 and No. 2 were conducted on January 17, 2013. The inspection report did not recommend any imminent required maintenance.
- In January, the air flow meters on the air strippers were adjusted and calibrated;
- In April, LPVCWD reduced the sodium hydroxide dosage rate. LPCVWD continued to reduce the sodium hydroxide dosage rates throughout the year, during which time water quality results were provided to DPH for review; and
- In December 2013, Civiltec completed a draft report evaluating the optimization of peroxide, orthophosphate, and sodium hypochlorite dosing. The dose rate for sodium hydroxide has been reduced and LPVCWD provided water quality data to DPH to verify LSI and CCPP data are in the recommended range.

In 2013, approximately 3,536 acre-feet of groundwater were extracted and treated equating to an average annual flowrate of 2,192 gpm (Table 2-1). This average annual flowrate was approximately 97.4% of the EPA approved extraction rate of 2,250 gpm. This was slightly above last year's production of 3,444 acre-feet and 2,127 gpm).

2.2.2 San Gabriel Valley Water Company B6 Subproject Status

The SGVWC B6 Subproject remedial action consists of groundwater extraction from the SGVWC B25A, B25B, B26A, and B26B wells (with B6C and B6D included as backup wells) and treatment at the SGVWC B6 Treatment Plant, which is owned and operated by SGVWC. Construction of the SGVWC B6 Subproject began in 2002 and the SGVWC B6 Treatment Plant was completed in 2005. Construction activities included drilling, installing, and equipping the new extraction wells, installing associated piezometers, constructing raw and treated water pipelines, and constructing the treatment plant. The treatment plant consisted of four air-stripping towers and associated carbon off-gas treatment units for VOC removal, two ISEP carousels for perchlorate removal, and four UV/oxidation units for 1,4-dioxane and NDMA removal. Treated water is conveyed to the SGVWC distribution system. The "Interim Remedial Action Report" (Stetson, 2004) prepared and submitted to EPA in September 2004 provides a summary of SGVWC B6 Subproject background, construction, and completion activities.

On June 8, 2005, DPH issued domestic water supply Permit Amendment No. 1910039PA-002, authorizing SGVWC to operate the SGVWC B6 Treatment Plant using the existing onsite B6C and B6D wells. SGVWC began delivering potable water from the SGVWC B6 Treatment Plant to customers on July 12, 2005. The permit was further amended by DPH with Permit Amendment No. 1910039-004 on February 17, 2006, to incorporate the operation of offsite wells B25A, B25B, B26A, and B26B.

To mitigate perchlorate-bearing brine discharges to the LACSD brine line, the SGVWC B6 Subproject Committee approved replacing the ISEP with single pass ion exchange equipment. The single pass ion exchange design was initiated in June 2008. Since there is limited space at the SGVWC B6 Treatment Plant, the ion exchange equipment was constructed on three properties that were purchased on the north side of Corak Street. Geotechnical work was completed on the properties in July and existing structures were demolished in the fall of 2008. CEQA work related to the ion exchange project was filed and the public review process closed on October 6, 2008, without any comments received. Construction of the single pass ion exchange system was completed in November 2009. The new IX system was integrated into the treatment system in March and April of 2013 and startup testing was initiated in May. Startup testing for DPH permitting continued through the end of 2013.

On November 1, 2010, SGVWC issued an RFP to selected engineering firms to provide design services for an ion exchange system to treat nitrate. SGVWC awarded the contract to Worley Parsons for the design of additional treatment for nitrates at the B6 treatment plant. The nitrate treatment system design for the B6 treatment plant was submitted to City of Baldwin Park for review in September 2011. WQA received approval for project funding under Proposition 84 in June of 2012 and coordinated with DPH to receive the contracts and finalize the funding amounts. In early 2013 SGVWC purchased the remaining parcels that will house the nitrate IX equipment. The CEQA requirements were completed in 2013 and SGVWC will proceed with the design of the additional IX treatment system for nitrates at the B6 treatment plant.

Technical performance reports are prepared under Provision 15 of the DPH operating permit and are required to be submitted annually to DPH. The most recent report, "Technical Performance Report (2011-2012) for Plant B6 Water Treatment Facility" (Stetson, 2014b), was submitted in January 2014 and describes the status and performance of the SGVWC B6 Treatment Plant for the period April 1, 2011, to March 31, 2012. The technical performance report for the period April 1, 2012, to March 31, 2013 is currently in draft and has not yet been submitted to DPH. SGVWC also submits monthly compliance reports to DPH; these compliance reports are included in the monthly progress reports provided to EPA.

Treatment system improvements or evaluations initiated in 2013 included:

- The treatment plant was offline much of March and April for integration of the new single pass IX system. Startup testing of the new IX system began on April 26, 2013;
- The SGVWC B6 treatment plant was put in recirculation mode beginning August 29, 2013 at the request of Los Angeles County Flood Control District to terminate discharge while work was being performed in the channel;
- 5,100 cubic feet of resin was installed in the new single pass IX system in April; and
- The packing in all four air strippers was replaced in December 2013.

During startup testing, NDMA, 1,2-dichloroethane, chloride, and bromodichloromethane were detected in the treated water being discharged from the plant to the channel at concentrations exceeding the RWQCB discharge limits for a sample collected on April 26. Upon receipt of the sampling results, SGVWC notified the RWQCB, LACDPW, Watermaster, WQA, and the CRs. The cause of the exceedances is believed to be tied to the initial load of ion exchange resin. An NPDES exceedance report was submitted to the RWQCB on May 17, summarizing the exceedances, providing potential causes, and identifying corrective measures (SGVWC, 2013). In addition, during startup testing NDMA was detected in the water discharged from the plant at a concentrations of 3.1 nanograms per liter, exceeding the notification limit for a sample collected on May 22. However, the confirmation test of the same water quality sample taken on May 22, 2013, resulted in a Non-Detect (ND) for NDMA. Based on this confirmation test and subsequent ND results from samples taken on June 1, 2013, SGVWC concluded the initial detection of NDMA for the May 22 sample was an anomaly.

In 2013, the SGVWC B6 Subproject extracted and treated approximately 4,515 acre-feet of water equating to an average annual flowrate of 2,784 gpm (Table 2-1). This average annual flowrate was 42.8% of the EPA-approved extraction rate of 6,500 gpm. The 2013 production problems were due primarily to operational problems with the ISEP systems and plant down time necessary for integration and testing of the new single pass IX system. During start-up and testing of the new IX system conducted in May through August 2013, the monthly average production rates exceeded the EPA approved extraction rate. The new IX system is now fully operational but SGVWC was compelled to put the plant, with its successful single pass IX system in recirculation mode beginning on August 29, 2013, at the requirement of the Los Angeles County Flood Control District. The Los Angeles County Flood Control District required that SGVWC temporarily cease any discharge to the District's flood control channel due to repairs that the District intended to make to that channel. As of December, the treatment plant was still operating in recirculation mode.

2.2.3 San Gabriel Valley Water Company B5 Subproject Status

The SGVWC B5 Subproject remedial actions consist of groundwater extraction from the SGVWC B5B, B5E, and City of Industry (COI) 5 wells and treatment at the SGVWC B5 Treatment Plant, which is owned and operated by SGVWC. In addition, the SGVWC B5D well is used as a standby water source. The treatment plant consists of LPGAC for VOC removal, single-pass ion exchange for perchlorate removal, and UV/oxidation units for 1,4-dioxane and NDMA removal. The "Interim Remedial Action Report" (Stetson, 2006c) prepared and submitted to EPA in September 2006 provides a summary of SGVWC B5 Subproject background, construction, and completion activities. Construction was largely completed in early 2007.

Startup testing conducted to support permitting was completed in March 2007 and DPH issued amended drinking water permit 1910039PA-008 for the B5 Treatment Plant on April 21, 2008. SGVWC began delivering potable water to their system on July 8, 2008. Prior to delivering potable water, extracted water was treated and discharged to the San Gabriel River. The DPH issued a permit amendment to allow for the addition of the COI 5 well in July 2009. The COI 5 well went online in July 2009.

Technical performance reports are prepared under Provision 53 of the DPH operating permit and are required to be submitted annually to DPH. The annual report, "Technical Performance Report for the San Gabriel Valley Water Company Plant B5 Water Treatment Facility" (Stetson, 2014c), was submitted in January 2014 and describes the status and performance of the SGVWC B5 Treatment Plant for the period July 1, 2011, to June 30, 2012. The technical performance report for the period July 1, 2012, to June 30, 2013 is currently in draft and has not yet been submitted to DPH. In addition, SGVWC submits monthly compliance reports to DPH; these compliance reports are included in the monthly progress reports provided to EPA.

There were no significant treatment system improvements or evaluations initiated in 2013 for the B5 Treatment Plant. In 2013, the SGVWC B5 Subproject extracted and treated approximately 11,348 acre-feet of water equating to an average flowrate of 7,036 gpm (Table 2-1), exceeding the EPA-approved extraction rate of 7,000 gpm.

3.0 PERFORMANCE MONITORING ACTIVITIES

As described in the PSEP, monitoring activities for the assessment of the interim remedy performance consist of two phases. The first phase consisted of baseline potentiometric and water-quality monitoring prior to extraction well startup and was completed in April 2005. The second phase involves more frequent potentiometric and water-quality monitoring during startup and initial operation of the extraction wells, followed by reduced monitoring frequencies after several years of continuous operation. The second phase of monitoring began in April 2005, although not all of the extraction wells were fully operational at that time. Potentiometric monitoring was performed on an increased frequency, as required, from April 2005 through November 2006.

The FSP and QAPP describe monitoring methods and laboratory analyses of groundwater samples collected in the BPOU and were initially approved by EPA with the modifications to the PSEP in a letter dated February 12, 2007. The FSP and QAPP have been periodically updated to address modifications to the performance monitoring components of the PSEP. The most recent updates to the QAPP (Rev. 5) and the FSP (Rev. 7) were submitted to EPA in April 2013 (AMEC, 2013a and AMEC, 2013b) and approved by EPA in a letter dated May 21, 2013.

As described in Section 1.1, a revised version of the PSEP (Rev. 4) was prepared to address EPA comments received in late 2012 and early 2013. Revisions to the PSEP included the addition of 1,2,3-TCP as a COC, clarification of monitoring and reporting requirements for non-COCs such as ethylene dibromide (EDB), and the modification of remedial action objectives outlined in Sections 2.2.1 and 2.2.2 (AMEC, 2013c). EPA approved the revised PSEP in a letter dated May 21, 2013.

Potentiometric monitoring, water-quality monitoring, and groundwater modeling activities that were completed in support of performance assessment activities during 2013 are discussed in the following sections.

3.1 Potentiometric Monitoring

Potentiometric monitoring of wells included in the PSEP monitoring program continued to be conducted by the Watermaster and CRs throughout 2013. Locations of the wells included in the BPOU potentiometric monitoring program are shown on Figure 3-1 and their monitoring schedules are presented in Table 3-1. Potentiometric monitoring completed for the PSEP monitoring program during 2013 is summarized below.

- Potentiometric data were collected quarterly in 11 extraction wells.
- Potentiometric data were collected quarterly in 17 piezometer clusters and one inactive production well.
- Potentiometric data were collected semi-annually in 18 multiport monitoring wells.
- Potentiometric data were collected weekly in one conventional monitoring well, the LACO Key Well, by the Main San Gabriel Basin Watermaster.

3.2 Water-Quality Monitoring

Water-quality monitoring of existing wells included in the PSEP continued to be conducted by the Watermaster and the CRs throughout 2013. Locations of wells included in the BPOU groundwater-quality monitoring program are shown on Figure 3-2 and their monitoring schedules are presented in Table 3-2. Groundwater samples were analyzed for the 21 COCs listed in PSEP Table 2-1 (AMEC, 2013c), including: 1,4-dioxane, NDMA, perchlorate, and VOCs. Groundwater samples were also analyzed for nitrate and sulfate. Groundwater-quality monitoring completed for the PSEP monitoring program during 2013 is summarized below.

- Monthly DPH-required groundwater samples collected in 11 extraction wells were used to fulfill the quarterly monitoring requirements for the PSEP with a few exceptions as follows:
  - No groundwater samples were collected from SA1-2 because this well was not operated in 2013.
  - Groundwater samples from wells COI 5, SGVWC B5B and SGVWC B5E were not analyzed for sulfate because these analytes are not required by DPH.
  - Groundwater samples were not collected from SGVCWC B25A, B25B, B26A, and B26B after March 2013 due to inoperation of the SGVWC B6 treatment plant during this period.
  - Groundwater samples in extraction wells were not analyzed for acetone and carbon disulfide because these analytes are not required by DPH.
- Groundwater samples were collected annually in all ports in all 18 multiport wells and in the MW 5-28 monitoring well cluster. In addition, groundwater samples were collected on a semi-annual basis (spring and fall) from selected ports at 10 multiport wells.
- Groundwater samples were collected annually from seven conventional monitoring wells consisting of monitoring wells AJMW-2R, AJMW-4, AJMW-6, ALRMW-1R, ALRMW-8, ALRMW-9, and the LA County Key Well.
- Groundwater samples were collected from 14 production wells.

In addition to groundwater-quality monitoring required by the PSEP, other groundwater-quality monitoring was performed to supplement the PSEP monitoring program during 2013 including the following:

- Groundwater-quality samples for the COCs and chemicals of interest were collected quarterly from the conventional monitoring wells AJ MW-2R, AJ MW-4, AJ MW-6, Huffy MW-2, and Hartwell MW-1 and one multiport well, Whico MP-1.

Additional groundwater-quality monitoring was performed by the WEs to satisfy the requirements of DPH drinking water permits. The DPH monitoring requirements are summarized along with the PSEP monitoring requirements in Table 3-2. Results of the water-quality monitoring performed in 2013 are presented in Section 5.2.

3.3 Groundwater Modeling

As described in Section 5.1 of the PSEP (AMEC, 2013c), the BPOU groundwater model is the primary tool for assessing extraction system performance. Annual simulations of basin-wide groundwater flow conditions consist of the addition of pumping, recharge, and model boundary water level and flux estimates averaged quarterly over the water year. The BPOU groundwater model is described in the Comprehensive Groundwater Modeling Report, dated July 29, 2005 (Geomatrix, 2005) and the Addendum to the Comprehensive Groundwater Modeling Report, dated September 8, 2006, (Geomatrix, 2006c). Recent updates to the groundwater model are described in Section 3.3.1 below and updated model results are described in Section 5.3.

In addition, supplemental groundwater modeling work was conducted in 2012 and 2013 by CDM Smith on behalf of the CRs to assess remedy performance in Subarea 1 and Subarea 3, respectively (CDM Smith 2012 and CDM Smith, 2013).

3.3.1 Model Update

The groundwater model was updated through the end of water year (WY) 2012-13 (July 1, 2012 - June 30, 2013) with current recharge, pumping, and water level data. Water level data from WY2012-13 were obtained from LACDPW to update the time-variant head boundaries that are used to simulate inflows to the flow system from the Chino Basin and groundwater outflows to Whittier Narrows.

Spreading basin recharge data for WY 2012-13 were obtained from LACDPW. Table 3-3 summarizes the quarterly recharge rates for each spreading basin and river reach used in the model for the entire model simulation period (WY1982-2013). Records for WY2012-13 were obtained from LACDPW for the precipitation stations used to update the portion of basin recharge that is assumed to be derived from precipitation and irrigation return flows. Two LACDPW precipitation stations that were previously used for precipitation recharge data were either temporarily or permanently discontinued during WY2010-11. Precipitation data from other LACDPW precipitation stations near these discontinued stations were not available for the entire model simulation period. As a result, data from currently active stations near these discontinued stations were combined with data from discontinued stations to provide a continuous record of precipitation data over the entire simulation period.

As described in the 2010 Annual PE Report (AMEC and ERM, 2011), recharge from irrigation return flows was modified on a trial and error basis to ensure a an acceptable match between simulated and observed water levels during the 31-year period simulated by the groundwater model, with emphasis on ensuring a reasonable match to peak high and low water levels. Table 3-4 summarizes the quarterly recharge rates from precipitation and irrigation return flows for each precipitation zone used in the model for the entire simulation period. Figure 3-3 shows the quarterly recharge volumes from all water conservation facilities (spreading basins and river reaches) and from areally-distributed recharge (precipitation and irrigation return flows) for the entire model simulation period. To develop an acceptable match between simulated and observed water levels in WY12-13 it was necessary to adjust areally-distributed recharge from precipitation and irrigation return flows to zero. The basis for this adjustment is discussed in further detail in Section 5.3.1.

Groundwater pumping for WY2012-13 was updated based on production records obtained from the Watermaster. Figure 3-4 shows the quarterly pumping from all wells for the entire simulation period.

Groundwater pumping in WY2012-13 continued to exhibit similar seasonal trends as previous years; the largest amount of pumping occurred during the peak of the dry season in the third quarter of the calendar year, and the smallest amount of pumping occurred during the peak of the wet season in the first quarter of the calendar year. Figure 3-5 shows a comparison of annual recharge and annual pumping throughout the entire model simulation period. As shown on Figure 3-5, groundwater pumpage exceeded annual recharge during WY2012-13.

3.3.2 Model Simulations of Extraction System Performance

Model simulations of extraction system performance were conducted using the updated BPOU groundwater model and transient particle tracking methods with the updated FETRAC-II code described in the 2010 Annual PE Report (AMEC and ERM, 2011). Transient forward particle tracking methods were used to evaluate the hydraulic performance of the project extraction wells under actual pumping conditions for a three-year time period ending at the close of WY2012-13. As described in the Comprehensive Groundwater Modeling Report (Geomatrix, 2005) and in the PSEP, the groundwater model simulates transient boundary conditions using quarterly stress periods. Therefore, groundwater withdrawals from project extraction wells and other production wells are simulated using average quarterly pumping rates. The average quarterly pumping rates for each well are estimated by measuring the total volume (in acre-feet) that was pumped during the quarter, dividing the total volume by the number of days in the quarter, and then converting the result to an average quarterly pumping rate (in gpm). Simulated pumping rates are summarized in Table 3-5.

In response to requests from EPA, forward particle tracking was conducted to evaluate the hydraulic effects of the operation of project extraction wells beginning in the 2010 Annual PE Report. Forward particle tracking was performed for this reporting period by starting particles at the beginning of WY2009-10 and then simulating the forward paths of the particles under the transient groundwater flow conditions through the end of WY2012-13. The starting locations for the particles were developed to represent the approximate horizontal and vertical extent of various contaminants in areas upgradient of the Subarea 1 and Subarea 3 extraction wells. The simulated release of these particles is not intended to display actual contaminant sources nor the actual locations. They are designed to simply track the movement of groundwater originating from locations upgradient of project extraction wells. The particles do not represent contaminant mass; rather, they solely represent the movement of groundwater in order to depict the likely zones of hydraulic capture as the particles flow downgradient in groundwater. The resulting particle tracks cannot be utilized to infer, suggest, or demonstrate the source of any contamination with any degree of precision. Further, since these particles do not represent mass and are not representative of solute transport, they do not incorporate processes such as retardation and degradation. Given the limitations of the particle tracking results, depictions of hydraulic capture presented in this report should not be considered representative of longer-term extraction system performance. Results of particle tracking to evaluate extraction system performance are presented in Section 5.3.2 and an overall discussion of the hydraulic capture at various extraction well locations is presented in Section 7.1.1.

4.0 TREATMENT PLANT MONITORING ACTIVITIES

This section summarizes methods used to monitor treatment plant performance. The performance monitoring program is described in the Revised Final Performance Standards Evaluation Plan (Rev. 4) (PSEP) prepared by AMEC on April 18, 2013 (AMEC, 2013c). In addition, on April 18, 2013 a revised Quality Assurance Project Plan (QAPP) for Groundwater was submitted to the EPA to support the performance evaluation monitoring program for the cleanup of groundwater in the Baldwin Park Operable (AMEC, 2013a). These documents were intended to meet the requirements for the Performance Standards Evaluation Plan, as set forth in Unilateral Administrative Order (UAO) 2000-13 issued by the EPA Region IX on June 30, 2000. Treatment plant operational results are presented in Section 6.0.

4.1 Subarea 1 – Valley County Water District Lante Treatment Plant

The VCWD Lante Treatment Plant operated on a nearly full-time basis from January to September 2013, experiencing downtime associated with routine maintenance and unplanned operational interruptions. The VCWD did not operate for much of September to December due to repairs to the ISEP units. Ongoing ISEP problems and limitations resulted in a reduced total extraction rate for the VCWD system.

Raw water, partially treated water, and fully treated water were routinely sampled and analyzed for COCs including 1,2,3-TCP, inorganic chemicals, and other diagnostic parameters to evaluate the effectiveness of treatment processes and to monitor the quality of the fully treated water. Treated water was primarily delivered to SWS Plant 121. Water-quality data, as obtained, are summarized in the DPH compliance reports appended to the monthly progress reports to EPA.

In August 2006, by mutual agreement among EPA, SCAQMD, and VCWD, air stripper and off gas control system permits with SCAQMD were cancelled and EPA assumed compliance oversight with respect to operations formerly covered by the SCAQMD permits. The air stripper vapor abatement equipment consists of four 20,000-pound carbon adsorption systems equipped with heaters. Air compliance samples were collected according to the revised protocol approved by EPA on February 3, 2011. The revised protocol requires air sampling immediately after a carbon change out, every other month for 6 months, and then monthly thereafter. The CRs submitted a revised QAPP for air and waste water discharges to the EPA in September of 2012 (AMEC, 2012a) and are the Field Sampling and Analysis Plan for air and waste water discharges was issued in July 2013 (Stetson 2013). All air samples were analyzed by EPA Method TO-15.

No VPGAC or LPGAC change outs occurred during 2013. Carbon and resin change outs since 2009 are summarized in Table 4-1. Spent carbon and resin are managed at facilities that are authorized to accept CERCLA wastes. As they are received, certificates of disposal and reactivation are provided to EPA in the monthly progress reports.

Waste brine and water softener wastes produced by the ISEP system were discharged under Industrial Wastewater Permit No. 016112 from the LACSD, issued on August 5, 2004 and subsequently revised and reissued on March 23, 2010. Brine discharges occurred throughout 2013 while the treatment plant was operating (January to September). Brine discharge samples were collected and analyzed in accordance with permit requirements. Self-Monitoring Reports (SMRs) were submitted to LACSD and EPA on a semi-annual basis covering January to June and July to December 2013, respectively. The

SMRs summarize flow, and brine quality data collected during the reporting period. Per a LACSD discharge permit revision, continuous pH monitoring is no longer required.

4.2 Subarea 3 – La Puente Valley County Water District Treatment Plant

The LPVCWD Treatment Plant operated on a full-time basis in 2013, experiencing periodic downtime associated with routine maintenance and infrequent and unplanned operational interruptions. In general, LPVCWD experienced a minimal amount of unplanned downtimes during 2013. The 2013 extraction volume for LPVCWD was approximately 97.4% of the EPA approved extraction rate. Raw and treated water sampling was performed in accordance with the DPH permit and included weekly sampling for VOCs, perchlorate, 1,4-dioxane, NDMA, 1,2,3-TCP, and various inorganic and physical parameters. The weekly sampling results are included in monthly progress reports submitted to DPH as a requirement of LPVCWD's drinking water permit. These results are also included in the monthly progress reports to EPA.

In August 2006, by mutual agreement among EPA, SCAQMD, and LPVCWD, air strippers and off-gas unit permits were cancelled and EPA assumed compliance oversight with respect to operations formerly covered by the SCAQMD permits. The VOC treatment equipment consists of a 30-foot tall air-stripping tower with a single 7,000 pound VPGAC adsorber and a 41 foot tall air-stripping tower with a single 20,400 pound VPGAC adsorber. Air compliance samples were collected and analyzed by EPA Method TO-15 according to the revised protocol approved by EPA on February 3, 2011. The revised protocol requires air sampling immediately after a carbon change out and monthly thereafter.

Approximately 27,400 lbs of VPGAC was changed out in July 2013. The VPGAC is managed at facilities approved by EPA to accept CERCLA wastes. Four-hundred and twenty-five cubic feet of spent resin was changed out in January 2013 and another 850 cubic feet was changed out in August 2013. As they are received, copies of disposal manifests for spent carbon and resin are provided to EPA in the monthly progress reports. Carbon and resin change outs are summarized in Table 4-1.

Waste brine and water-softener wastes were discharged under temporary Industrial Wastewater Discharge Permit 017128 issued by LACSD. A new permit was issued for the LPVCWD Treatment Facility on August 10, 2011. This new permit reflects the transition of treatment technology from the ISEP to the single-pass IX process on July 30, 2010. As a result of this transition, the continuous discharge of brine to the sewer has stopped. Semi-annual waste water discharge sampling was performed in accordance with permit requirements during 2013. SMRs were prepared and submitted to LACSD and EPA covering the January to June and July to December periods.

4.3 Subarea 3 – San Gabriel Valley Water Company B6 Treatment Plant

The SGVWC B6 Treatment Plant experienced continued operational issues during 2013, primarily related to operational problems associated with the ISEP, plant down time necessary for integration of the new single pass IX system, and the treatment plant being put in recirculation mode from August 29, 2013 to the end of the year for soft-bottom cleanup in the channel. The SGVWC B6 Treatment Plant operated at approximately 42.8% of the target extraction rate during 2013. However, extraction rates exceeded target rates during start-up and testing of the new IX treatment systems for perchlorate. During the first quarter of 2013 production was primarily from the B26A and B26B wells whereas wells B25A and B25B operated intermittently. However, during startup and testing of the new IX system (May to August), wells B25A and

B25B functioned as the primary production wells. Standby wells B6C and B6D were infrequently operated during 2013.

Raw and treated water sampling were performed in accordance with the DPH permit and included sampling for COCs, 1,2,3-TCP, inorganic chemicals, and other diagnostic parameters. Water-quality data are summarized in monthly reports to DPH and are included in the monthly progress reports to EPA. During preparation for IX startup testing, on April 26, NDMA, 1,2-dichloroethane, chloride, and bromodichloromethane were detected in the treated water being discharged from the plant to the channel at concentrations exceeding the RWQCB discharge limits. SGVWC notified the RWQCB, LACDPW, Watermaster, WQA, and the CRs. The cause of the exceedances is believed to be related to the initial load of ion exchange resin.

In August 2006, by mutual agreement among EPA, SCAQMD, and SGVWC, permits for the four air strippers and off-gas units were cancelled and EPA assumed compliance oversight with respect to operations formerly covered by the SCAQMD permits. Air compliance samples were collected according to the revised protocol approved by EPA on February 3, 2011. The revised protocol requires air sampling immediately after a carbon change out, every other month for 6 months, and then monthly thereafter. The air compliance sampling data were included in the monthly progress reports to EPA.

In April, June and December VPGAC change outs were performed, with 40,000 lbs, 20,000 lbs and 160,000 lbs, respectively, being changed out during the three events. The VPGAC is managed at facilities approved by EPA to accept CERCLA wastes. In December 2013, 2,120 cubic feet of resin was changed out of the new IX system. As they are received, copies of disposal manifests for change out of spent VPGAC and resin are provided to EPA in the monthly progress reports. Carbon and resin change outs are summarized in Table 4-1.

Waste brine and water-softener wastes produced by the ISEP system were discharged under Industrial Wastewater Permit No. 016499 issued on February 17, 2004. Brine discharges occurred from January to July 2013. Quarterly brine discharge sampling is required, and was performed for VOCs, SVOCs, perchlorate, 1,4-dioxane, sulfide, oil and grease, chloride, alkalinity, calcium, magnesium, total toxic organics, suspended solids, and chemical oxygen demand. Three quarterly SMRs that summarize 2013 discharges and brine quality data were submitted to LACSD and EPA on or before April 15, July 15, and October 15, 2013. An SMR was not submitted for the 4th quarter of 2013 due to the cessation of waste brine discharges and the related termination of Wastewater Permit No. 016499.

4.4 Subarea 3 – San Gabriel Valley Water Company B5 Treatment Plant

The SGVWC B5 Treatment Plant operated continuously in 2013, experiencing periodic downtime associated with routine maintenance and infrequent unplanned interruptions. Production was primarily from wells B5B, B5E, and COI 5, with average annual production rates of 2,636 gpm, 2,971 gpm, and 1,142 gpm, respectively. SGVWC B5D was used as a standby drinking water source, contributing nearly 73% of its total 463 acre-feet during the months of January and December. B5D is typically used while LPGAC change outs are scheduled.

Raw and treated water sampling was performed in accordance with the DPH permit and included sampling for COCs, 1,2,3-TCP, inorganic chemicals, and other diagnostic parameters. Water-quality data are summarized in monthly reports to DPH and are included in the monthly progress reports to EPA.

VOCs are removed using LPGAC and the carbon was replaced in January, February, March, April, July, August, and October 2013. Single pass ion exchange resin used to remove perchlorate was replaced in February and May 2013. Copies of disposal manifests for change out of spent carbon and resin are provided in monthly progress reports to EPA, as they are received. Carbon and resin change outs are summarized in Table 4-1.

5.0 PERFORMANCE MONITORING RESULTS

Potentiometric and groundwater-quality monitoring data obtained for the PSEP monitoring program during 2013 were collected in support of performance monitoring during continued construction, testing, and operation of the BPOU remedy. Results of potentiometric monitoring, water-quality sampling, and groundwater modeling activities are presented in the following sections.

5.1 Potentiometric Monitoring Results

The primary objective of the potentiometric monitoring described in Section 3.1 is to verify that the BPOU groundwater flow model accurately reflects the observed flow field and to verify that the remedy is limiting further migration of COCs in groundwater. As noted in Section 5.2 of the PSEP, results from potentiometric monitoring are also used to develop potentiometric surface maps to assist in evaluating changes in groundwater flow patterns in the BPOU.

Key components of the assessment of potentiometric data include the following:

- Regional water level fluctuations due to basin-wide recharge and pumping conditions;
- Local-scale water level fluctuations due to ongoing groundwater production and extraction system pumping;
- Regional and local-scale lateral hydraulic gradients and flow directions; and
- Regional and local-scale vertical hydraulic gradients and flow directions.

Potentiometric monitoring results for 2013 are discussed in the following sections.

5.1.1 Water Level Fluctuations

Long-term regional water level conditions in the BPOU are evaluated using water level data for the LACO Key Well. Figure 5-1 shows the water levels measured in the Key Well from 1982 through 2013. During 2013, groundwater levels in the LACO Key Well decreased from approximately 214 feet mean sea level (msl) in January 2013 to a low of approximately 195 feet msl in October 2013. Review of 2013 monitoring data suggests that the observed water level decrease in the LACO Key Well occurred in response to groundwater production volumes exceeding groundwater recharge in WY2012-13 as described in Section 3.3.1.

Figures 5-2 and 5-3 show water levels in multiport monitoring wells MW 5-03 and MW 5-20. The hydrographs for MW 5-03 and MW 5-20 represent water level conditions in Subarea 1, in the northern portion of the BPOU, and in Subarea 3, in the southern portion of the BPOU, respectively. As shown on Figures 5-2 and 5-3, water levels in both Subarea 1 and Subarea 3 decreased in 2013 as compared to the prior year's recorded water levels. Water levels in Subarea 1 (MW5-03) decreased approximately

14.6 to 15.5 feet between October 2012 and November 2013, while water levels in Subarea 3 (MW5-20) decreased approximately 13.2 to 14.0 feet during the same period. Water level data depicted on Figures 5-2 and 5-3 indicate that water levels in all ports in MW 5-03 and MW5-20 exhibit similar temporal trends at all depths. As discussed in Section 1.3.3.1, the difference in the observed water level trend between the shallow and deep ports is likely the result of confining units in Subarea 3 that provide hydraulic separation between pumping in different elevation intervals.

5.1.2 Lateral Hydraulic Gradients

Generalized potentiometric surface maps for the shallow and deep elevation intervals were developed based on water level data collected in the multiport monitoring wells to assess observed groundwater flow patterns and hydraulic gradients across the BPOU. Figures 5-4 and 5-5 show observed groundwater flow conditions in the shallow (above -500 feet msl) and deep (below -500 feet msl) elevation intervals in May 2013. Figures 5-6 and 5-7 show observed groundwater flow conditions in the shallow and deep elevation intervals in November 2013. Evaluation of observed groundwater flow patterns on a more detailed scale is limited by spatial variations in hydrostratigraphy and significant short-term water level fluctuations that occur in response to variations in local recharge and pumping.

As shown on Figures 5-4 through 5-7, lateral hydraulic gradients are towards the west-southwest, with a more westerly gradient in Subarea 3 in the vicinity of the SGVWC B5 Subproject and the CDWC Bassett wellfield. Although it is difficult to generalize groundwater flow directions given the seasonality of pumping and recharge in the San Gabriel Basin, groundwater flow directions are generally more southerly during higher water level conditions and are more westerly during lower water level conditions.

Regional-scale lateral hydraulic gradients were estimated using water levels measured in MW 5-03 and MW 5-20 during May and October/November 2013. Estimated lateral hydraulic gradients are summarized in Table 5-1. The following observations are presented based on the results shown in Table 5-1:

- Estimated lateral hydraulic gradients in the shallow elevation interval ranged from 7.8 x 10^{-4} to 5.7 x 10^{-4} foot/foot toward the west-southwest.
- Estimated lateral hydraulic gradients in the deep elevation interval ranged from 8.9 x 10^{-4} to 1.2 x 10^{--3} foot/foot toward the west-southwest.
- Lateral hydraulic gradients continue to be flatter in the shallow elevation interval above -500 feet msl compared to lateral hydraulic gradients in the deep elevation interval below -500 feet msl.

5.1.3 Vertical Hydraulic Gradients

Water level measurements in multiport monitoring wells and piezometer clusters installed near extraction wells indicate that vertical hydraulic gradients vary throughout the BPOU. As discussed in Section 5.1.1, hydrographs shown on Figures 5-2 and 5-3 represent water level conditions in Subarea 1 (MW 5-03), in the northern portion of the BPOU, and in Subarea 3 (MW 5-20), in the southern portion of the BPOU, respectively. As shown on Figure 5-2, hydrographs for ports at different depths in MW 5-03 plot essentially on top of each other, indicating that there is no significant vertical hydraulic gradient in Subarea 1. However, as shown on Figure 5-3, water levels measured at different depths in MW 5-20 are separated by up to 20 feet, indicating that there are significant downward vertical hydraulic gradients in Subarea 3.

Vertical hydraulic gradients calculated at selected multiport wells and piezometer clusters located in Subarea 1 and Subarea 3 are summarized in Table 5-2. The estimates summarized in Table 5-2 are based on semi-annual water level conditions in February, May, and November 2013. As shown in Table 5-2, vertical hydraulic gradients continue to be lower in Subarea 1 compared to vertical hydraulic gradients in Subarea 3. Estimated vertical hydraulic gradients in Subarea 1 were upward at one location at 5.9×10^{-5} and were downward at other Subarea 1 locations ranging from 2.3×10^{-4} to 1.3×10^{-3} foot/foot. Estimated vertical hydraulic gradients in Subarea 3 ranged from 6.7×10^{-3} to 2.9×10^{-2} foot/foot and are consistently downward.

5.2 Groundwater Quality

Groundwater samples were collected from wells in the PSEP monitoring program to evaluate groundwater-quality conditions in the BPOU. As described in Section 3.2, groundwater samples were analyzed for the 21 COCs listed in PSEP Table 2-1 including: 1,4-dioxane, NDMA, perchlorate, and VOCs. Groundwater samples were also analyzed for nitrate and sulfate because of their importance to treatment plant operations and potable use. As described in Section 3.2, groundwater-quality monitoring data collected to satisfy DPH permit requirements were used to supplement the PSEP monitoring program during 2013. Groundwater-quality monitoring results for 2013 are discussed in the following sections.

5.2.1 Water-Quality Results

Groundwater-quality results for the PSEP monitoring program in 2013 are summarized in Table 5-3. The presentation of groundwater-quality results in this report focuses on the evaluation of the spatial distribution and temporal trends for seven selected COCs in groundwater including: 1,2-dichloroethane (1,2-DCA); 1,4-dioxane; carbon tetrachloride; NDMA; perchlorate; PCE; and TCE. This evaluation relies on approximate depictions of the interpreted current spatial distribution and concentration trends of the seven COCs in groundwater. The depictions are approximate and are further evaluated in Sections 5.2.3 and 5.2.4 as well as Section 4.0 of Appendix A.

Results for other water-quality monitoring that was performed by the WEs to satisfy the requirements of DPH drinking water permits presented in Table 3-2 are summarized as follows:

- The DPH-required monitoring for the BPOU COCs in the extraction wells fulfills the requirements of the PSEP, and the DPH requirements also include more frequent monitoring (weekly or monthly) in these wells than the PSEP requires (quarterly). Therefore, in some instances Table 5-3 includes additional water-quality results for BPOU COCs in the extraction wells as required by DPH.
- Water-quality results for 1,2,3-TCP are presented in Table 5-3. Concentrations of 1,2,3-TCP were detected at a level that exceeds the NL (5 ng/L) in one well, ALR MW-9.
- Detections of non-COC organic compounds, including EDB, for all available 2013 sampling results are presented in Table 5-4. Nine non-COC organic compounds were detected in various wells.

- Detections of Tentatively Identified Compounds (TICs) for all available 2013 sampling results are presented in Table 5-5. TICs were identified in 91 samples collected from 31 sampling locations inclusive of individual sampling ports in multiport wells.

5.2.2 Data Validation and Data Quality Assessment

Data management activities for the BPOU Project are managed by LDC under contract to the Watermaster. LDC utilizes EDMSi, a web based environmental data management system, for the management of historical data that was compiled from the EPA San Gabriel Basin database, CRs, WEs, and other relevant sources. New water-quality data that are collected for the PSEP monitoring program are reported to LDC by laboratories and are validated in ADR.net and uploaded to EDMSi as part of the real-time automated Tier 1A/1B process and Tier 3 selection. As specified by the QAPP (AMEC, 2013a), Tier 1A/1B validation was performed by LDC on all water-quality data collected in support of the PSEP monitoring program and manual Tier 3 validation was performed on approximately five percent for perchlorate and VOCs and ten percent for all other analyses of the PSEP monitoring data. Results of the data validation are used to evaluate laboratory performance and ensure that data quality is acceptable to meet BPOU Project objectives.

Data qualifiers that were assigned during the Tier 1A/1B and Tier 3 reviews are shown with the groundwater-sampling results summarized in Table 5-3. Based on the data validation efforts and the evaluation of field quality control (QC) samples, all analytical sample results are considered usable to support the BPOU Project Data Quality Objectives (DQOs). Results of the Tier 3 validation are described as follows:

- No results for 1,4-dioxane were qualified.
- No results for nitrate as N, sulfate or perchlorate were qualified.
- The result for acetone was qualified as UJ (non-detect) due to the initial calibration coefficient of determination exceeding criteria for samples collected on May 13, 2013 in MW 5-24 Ports 3 through 6 and MW 5-11 Ports 1 through 3.
- The result for acetone was qualified as J (detect) due to the initial calibration coefficient of determination exceeding criteria for the sample collected on May 13, 2013 in MW 5-24 Port 1.
- The result for m,p-Xylene was qualified as UJ (non-detect) due to the initial calibration coefficient of determination exceeding criteria for samples collected on May 13, 2013 in MW 5-24 Ports 1, 3, 4, 5 and 6 and MW 5-11 Ports 1 through 3.
- The result for carbon tetrachloride was qualified as J (detect) due to the laboratory control sample recovery being outside of the limit range for samples collected on May 13, 2013 in MW 5-24 Ports 4 through 6.
- The result for NDMA was qualified as U (non-detect) due to equipment blank contamination for the samples collected on November 5, 2013 in MW 5-19 Ports 3 and 5.

Final Tier 3 validation reports were submitted by LDC to the Watermaster on October 7, 2013 and March 6, 2014 (LDC, 2013 and 2014). The Tier 3 results were submitted by the Watermaster to EPA via e-mail and are also posted on a secure LDC BPOU web portal.

5.2.3 Distribution of Selected Chemicals of Concern

Consistent with previous Annual PE Reports, water-quality data from wells screened at selected depths within the aquifer were interpreted using the three-dimensional geospatial modeling software, EarthVision®. A detailed description of the approach used for the development of plume maps and chemical cross sections for the seven selected COCs is presented in Appendix A. Isoconcentration contours for these seven COCs are shown on the generalized distribution maps on Figures 5-8 through 5-14. The isoconcentration contours shown on the generalized distribution maps represent the composite lateral extent of each individual chemical at all depths in groundwater. The lateral distribution of the selected COCs is also shown in plan view at three specific elevation intervals in Appendix A. The three elevation intervals are as follows:

- Elevations between the water table (or potentiometric surface) and -200 feet msl;
- Elevations between -200 feet and -500 feet msl; and
- Elevations below -500 feet msl.

The plume maps for the three elevation intervals shown in Appendix A include two sets of isoconcentration contours on each map. Isoconcentration contours at “discrete” elevations are shown for horizontal slices through the plumes at -50, -350 and -550 feet msl. Isoconcentration contours for “composite” elevation intervals are also shown through the plumes for elevation intervals extending from the water table to -200 feet msl, between -200 and -500 feet msl, and below -500 feet msl.

Given the three-dimensional nature of the plumes, the reader should consider the three-dimensional visualization that is inset in the corner of each figure when reviewing the two-dimensional plume maps and chemical cross sections. The three-dimensional visualizations provide the appropriate context within which to review the two-dimensional isoconcentration contours shown on each plume map and chemical cross section. It should be noted that the water-quality data used to create the three-dimensional plume interpretations are posted on the plume maps according to the composite elevation intervals described above. Therefore, in many instances the discrete contours may not appear to correspond to water-quality data that are within the composite elevation interval but that are either above or below the elevation of the discrete contours.

Chemical cross sections showing the vertical distribution of selected COCs along four discrete transects are also shown in Appendix A. Cross section A-A’ represents a north-south transect that is aligned generally with the longitudinal axis of the COC plumes. Cross sections B-B’, C-C’, and D-D’ represent east-west or northwest-southeast transects that are aligned generally perpendicular to the dominant groundwater flow direction in the BPOU. Cross sections B-B’, C-C’, and D-D’ show the distribution of the COC plumes in the upgradient, mid-plume, and downgradient areas of the BPOU and include various production wells that are vulnerable to lateral migration of COC plumes towards the west or east.

The depictions of plume geometry presented in Appendix A and summarized on Figures 5-8 through 5-14 represent the estimated distribution of COCs in the BPOU in 2013. However, as with any approach used to interpolate data between known data points, there are uncertainties and limitations to the approach that may result in alternative interpretations of the distribution of COCs in groundwater. These uncertainties and limitations are summarized as follows:

- For clarity, and as requested by EPA, we have depicted the seven principal COCs in separate plume maps at three elevations. Plumes for the various COCs overlap (and/or diverge) at various depths throughout the impacted areas.
- The plume maps and chemical cross sections attempt to depict the dynamic and temporally changing three-dimensional distribution of COCs in groundwater with static two-dimensional images. While these maps and cross sections show two-dimensional isoconcentration contours of the COC plumes in plan view and in profile, they represent interpolated approximations of the distribution of COCs in groundwater based on available data. The exact subsurface distribution of the COCs cannot be completely ascertained given these and other potential limitations. The spatial and temporal spread of the chemical data may not encompass the entire distribution of chemicals in the groundwater (i.e., additional assumptions are necessary as to chemical concentrations in areas that may not be completely represented by monitoring wells). In particular, results of the interpolation should be carefully evaluated in areas where available data are limited or concentrations change significantly over short distances.
- Alternative interpretations of the distribution of the COC plumes are possible and may differ from the plume depicted here by utilizing plumes drawn manually using professional judgment. For example, plume maps and chemical cross sections for certain COCs portray discontinuous plumes in areas where the plumes may in fact be continuous.
- As described in Appendix A, the plume interpretations generally incorporate water-quality data collected around the annual sampling event in the multiport monitoring wells that was conducted in May and June 2013. However, where data were not available for that time period, data from the closest sampling date during the May/June 2013 time period were utilized. While using such an expanded data set is helpful to some degree in the contouring exercise, it introduces additional uncertainties in comparing data taken from different time periods and assuming that the ultimate projection is a consistent one. Moreover, even using this temporally diverse data set, there are inevitable gaps in the existing data that limit our ability to define the distribution of COCs in groundwater completely. In addition, the EarthVision® software used to create the plume maps and chemical cross sections utilizes certain algorithms to interpolate or "fill in" data gaps in order to provide a more comprehensive picture of the distribution of COCs. Although the EarthVision® software objectively applies the selected interpolation scheme, other software and other interpolation schemes may be applied that may generate reasonable, yet differing results, each appropriately honoring the available monitoring data. This is not a unique limitation of the EarthVision® software, but simply a limitation of any methodology with limited data. Consequently, the interpretation may result in differences between actual and interpreted concentrations at any given point in the area of interest.
- The Duarte Fault is represented as a diffuse zone of faulting on the plume maps and chemical cross sections. However, no faulting was explicitly represented in any way in the three-dimensional grid used to interpolate the plumes. The diffuse fault zone is considered to

be a reasonable representation of the uncertainty in the fault's location as it has several fault splays concealed beneath alluvial deposits.

- The northern-most limits of some COCs depicted on the plume maps are uncertain due to the limited amount of data available to the CR group from other EPA-named PRPs, including the Mobil/Lockheed/Valspar group, as well as other entities that may be PRPs in the northern portions of the BPOU. In consideration of the lack of recent available groundwater data from several PRP facilities and historical detections of several COCs such as TCE and PCE in the area north of the Duarte Fault zone, isoconcentration contours for TCE and PCE are truncated at the downgradient (southern) extent of the Duarte Fault zone.

Evaluation of both the generalized plume maps shown on Figures 5-8 through 5-14 and the detailed elevation-specific plume maps and chemical cross sections that are shown in Appendix A resulted in the following general observations of the spatial distribution of COCs in the BPOU:

- The longitudinal extent of the longest COC plumes extends from north of the Duarte Fault zone in Subarea 1, approximately 7.5 miles towards the southwest, where the plumes terminate near the confluence of Avocado Creek and the San Gabriel River.
- The maximum lateral extent of the various COC plumes generally overlap throughout their extent, with the exception of the perchlorate plume, which extends slightly farther to the east in the mid-plume area in comparison to other COC plumes.
- The vertical extent of the various COC plumes ranges from depths of approximately 600 feet below ground surface (bgs) to the north of Arrow Highway, in Subarea 1, to approximately 1,000 feet bgs in Subarea 3.

In addition to the general observations described above, minor changes in the COC concentrations in various wells resulted in slightly different interpretations of the extent of the COC plumes compared to the previous year. In particular, concentrations of COCs in several wells that are located near the edges of the plumes changed relative the respective MCL (or NL); the concentrations of some COCs in some wells located near the edges of the plumes increased above MCLs (or NLs) whereas the concentrations of some COCs in some wells decreased below MCLs (or NLs). Such changes in concentration resulted in a slightly different location of the isoconcentration contours at the MCL (or NL) compared to the previous year. In general, the extent of COC concentrations above the MCL (or NL) is very similar to 2012. Minor changes in the extent of concentrations relative to the MCL (or NL) to the previous year are summarized as follows:

- In Subarea 3, the interpreted extent of 1,4-dioxane concentrations above the NL of 1.0 µg/L in the elevation interval between -200 and -500 feet msl is slightly smaller than in 2012 (Appendix A - Figure A-10).
- In Subarea 3, a small area of carbon tetrachloride above the MCL is interpreted in the elevation interval above 200 feet msl at the VCWD Paddy Lane well due to an observed concentration of 0.69 µg/L. In addition, concentrations of carbon tetrachloride have increased in MW5-19 although the concentration in Port 5 is "J" qualified (Appendix A – Figure A-16). The areas of carbon tetrachloride concentrations above 5 µg/L are larger in the intervals

between -200 and -500 feet msl and below -500 feet msl (Appendix A - Figures A-17 and A-18) as compared to the previous year.

- In Subarea 3, a small area of NDMA concentrations above the NL of 10 ng/L is interpreted in the elevation interval below -500 feet msl at the SWS 140W5 well due to an observed concentration of 15 ng/L (Appendix A - Figure A-25).
- In Subarea 1, the extent of NDMA concentrations above 10 ng/L appears to be reduced from 2012 in the vicinity of the Subarea 1 extraction system (MW5-24 and SA1-3 (Appendix A - Figures A-23 and A-26).
- In Subarea 3, a small area of perchlorate concentrations above the MCL of 6 µg/L is interpreted in the elevation interval below -500 feet msl at the SWS 139W6 well due to an observed concentration of 7.9 µg/L (Appendix A - Figure A-32).
- In Subarea 3, a small area of PCE and TCE concentrations above the MCL of 5 µg/L is interpreted in the elevation interval above -200 feet msl at the East Durbin well due to observed concentrations of 36 and 22 µg/L, respectively (Appendix A - Figures A-37 and A-44). This well was last sampled in 2008 due to inconsistent operation of the well at the time of sampling. Closer coordination of well operations with the sampling schedule will be conducted in an attempt to ensure that the well is sampled in 2014 to allow continued monitoring of concentration trends in this well.
- In Subarea 3, there were no PCE concentrations above the MCL of 5 µg/L observed in the elevation interval below -500 feet msl, so in contrast to 2012, no isoconcentration contours are presented (Appendix A - Figure A-39).
- In Subarea 3, the area of TCE concentrations above the MCL of 5 µg/L is interpreted in the elevation interval below -500 feet msl to extend farther to the east than in 2012 due to an observed concentration of 10 µg/L in the SWS 140W5 well and farther south due to an increased concentration in MW5-19 to 13 µg/L (Appendix A – Figures A-44 and A-46). Increasing TCE, NDMA, and perchlorate concentrations have been observed in the SWS 140W5 well over the past several years although pumping rates from this well have been relatively consistent averaging between 1,000 – 1,500 gpm on an annualized basis. COC concentration trends will continue to be evaluated in this well in 2014.

When reviewing the evaluation presented above, apparent changes in the interpreted spatial distribution of a particular COC plume from year to year should be evaluated with considerable caution. Historical variations in chemical concentrations have been observed seasonally and from year to year as basin water levels vary. In some instances, very slight differences in measured concentrations at or above the RL, or values that are qualified (J-flagged) may result in apparent changes in the interpreted extent of a particular COC plume as depicted on the plume maps and chemical cross sections. Such short-term changes in the interpreted extent of a particular COC plume may or may not be representative of a particular seasonal or annual change. But, particularly with concentrations that are measured at very low levels, such apparent short-term changes should not be considered as representative of longer-term (multi-year) trends until such observations can be confirmed over several years. This is particularly important for wells located along the perimeter of the COC plumes.

5.2.4 Temporal Trends

Temporal trends in chemical concentrations for the seven selected COCs were evaluated by updating time-concentration graphs for all wells in the PSEP water-quality monitoring network as presented on Figures 5-15 through 5-21. Time-concentration graphs were updated for selected multiport wells included in the BPOU water-quality monitoring program for the most recent five-year period from 2009 through December 2013 using available data in the BPOU Project database. The graphs include data that were collected for BPOU performance monitoring activities as well as DPH and other regulatory agency monitoring requirements. Concentrations of chemicals detected in groundwater samples are plotted using closed circles; chemicals not detected in groundwater samples were plotted at the RL using open circles. Groundwater-quality results in multiport monitoring wells are grouped on the time-concentration graphs according to measurement port elevations in three elevation intervals as follows: between the water table and -200 feet msl, between -200 and -500 feet msl, and below -500 feet msl.

Based on a review of the time-concentration graphs shown on Figures 5-15 through 5-21, the following observations were noted:

- Monitoring wells MW 5-11, MW 5-13, and MW 5-18 are located in the upgradient area of the COC plumes, north of Arrow Highway in the Subarea 1 portion of the BPOU. These wells are considered to be general indicators of the quality of groundwater that is flowing toward downgradient extraction wells installed for the VCWD Lante Subproject. Concentrations of most COCs in these wells were generally consistent in 2013 in comparison to the previous year with the exception of decreases in PCE and TCE concentrations in Port 3 of MW5-11 and a decrease in PCE concentrations in Port 3 of MW 5-18.
- Monitoring wells MW 5-24 and MW 5-25 are located to the south of Arrow Highway downgradient of the Subarea 1 extraction wells. As a result, these wells are considered to be general indicators of the quality of groundwater that is flowing downgradient away from the Subarea 1 extraction wells. Monitoring results for these wells were generally consistent with previous year's concentrations with the exception of decreasing TCE and carbon tetrachloride concentrations in Ports 4, 5, and 6 of multiport well MW-24 located approximately 2,500 feet downgradient of the VCWD SA1-3 (Lante) extraction well.
- Monitoring wells MW 5-05, MW 5-08, and MW 5-15 are located in the mid-plume area of the COC plumes, downgradient of Subarea 1 and upgradient of Subarea 3. These wells are considered to be general indicators of the quality of groundwater that is flowing downgradient toward the SGVWC B5, SGVWC B6, and LPVCWD Subproject extraction wells. Concentrations of COCs were generally consistent in 2013 in comparison to the previous year with the exception of decreases in PCE and TCE concentrations in Ports 1 - 4 of MW5-05 and Ports 2 - 4 of MW5-08, and a decrease in PCE concentrations in Port 3 of MW5-18.
- Monitoring wells MW 5-19 and MW 5-23 are located within Subarea 3, upgradient of the SGVWC B5 Subproject extraction wells and the CDWC Bassett wellfield. These wells are considered to be general indicators of groundwater quality in the southern portion of the BPOU and representative of the quality of groundwater that is flowing downgradient toward the SGVWC B5 Subproject extraction wells and CDWC Bassett wellfield. Concentrations of most COCs remain generally unchanged in these two multiport wells compared to the

previous year with the exception of an increase in TCE and PCE concentrations in Port 5 of MW5-19 and a decrease of NDMA concentrations in Ports 3 and 4 of MW5-23.

- Monitoring wells MW 5-26 and MW 5-27 are located within Subarea 3, downgradient of the SGVWC B5 Subproject extraction wells and the CDWC Bassett wellfield. These wells are considered to be general indicators of groundwater quality in the southern portion of the BPOU and representative of the quality of groundwater that is flowing downgradient away from the SGVWC B5 Subproject extraction wells and CDWC Bassett wellfield. Monitoring results for these wells were generally consistent with previous years with all detectable concentrations in 2013 below applicable MCLs or NLs.

Observed increases or decreases in the concentration of a particular COC during a single sampling event should not be considered as a significant change in the overall trend of chemical concentrations at a particular well. Historical variations in chemical concentrations have been observed seasonally and from year to year as basin water levels vary.

5.3 Groundwater Modeling Results

As described in Section 3.3, the BPOU groundwater model was updated with pumping and recharge data through the end of WY2012-13 and a comparison between simulated and observed water levels conducted for the 31-year simulation period extending from WY1982-83 through WY2012-13. The adequacy of groundwater model calibration continued to be evaluated using water level observations at 76 monitoring and production well locations that were selected as long-term basin-wide calibration targets, including 36 targets located in the BPOU area. Water level observations for WY2012-13 were updated from the San Gabriel Basin Database, California Department of Water Resources, LACDPW, the United States Geological Survey National Water Information System, and from data collected as part of the PSEP monitoring program.

5.3.1 Updated Model Calibration Results

Updated model calibration statistics are summarized in Table 5-6. The average basin-wide model residual (the average difference between model simulated and observed heads) for the 31-year simulation period is 0.72 feet. The average model residual for the 36 observation wells within the BPOU area is 0.51 feet for the same period. The root-mean squared error (RMSE) for the calibrated model is 15.92 feet for the entire model and 6.40 feet for the BPOU area. The updated annual model water balance for each water year is summarized in Table 5-7.

In the BPOU, simulated and observed water levels for the entire 31-year model simulation period are compared on hydrographs that are presented on Figures 5-22 through 5-26. As shown on the figures, simulated water levels in the Subarea 1 (Figures 5-22 through 5-24) and Subarea 3 (Figures 5-25 and 5-26) portions of the BPOU generally are within six feet of observed water levels throughout the 31-year model simulation period. However, in Subarea 3, simulated water levels in the shallowest ports in MW 5-23 (ports 4 through 6), generally are underestimated by up to 15 feet (Figure 5-25). These differences are most likely attributable to the smaller (local) scale of heterogeneities that are present in the aquifer compared to the broader scale of heterogeneities that are represented in the model. Potentiometric surfaces simulated using the BPOU groundwater model are compared to observed water levels in Fall

2012 and Spring 2013 on Figures 5-27 through 5-34. The simulated results were exported from the model for approximately the same time period as the observed water levels. As shown on Figures 5-27 and 5-28, simulated water levels in Subarea 1 are generally within five feet (higher and lower) of observed water levels in Fall 2012 and generally about nine feet lower than observed water levels in Spring 2013. Simulated potentiometric surfaces in Subarea 3 are compared to observed water levels on Figures 5-29 through 5-34 for three different elevations intervals, including above -200 feet msl, between -200 and -500 feet msl, and below -500 feet msl. These elevation intervals correspond to the approximate elevations of hydrostratigraphic separating units interpreted in Subarea 3. As shown on Figures 5-29 through 5-34, simulated water levels at all three elevation intervals in Subarea 3 are generally within five feet (higher and lower) of observed water levels in Fall 2012 and generally within nine feet (higher and lower) of observed water levels in Spring 2013. Locally, differences occur in the immediate vicinity of the SGVWC B5 and CDWC pumping wells above -200 feet msl in Subarea 3 (Figures 5-29 and 5-32). The largest differences likely occur in this area because CDWC frequently cycles their pumping between different wells as compared to the average pumping rates that are simulated using quarterly stress periods in the model.

As described in Section 3.1, it was necessary to adjust areally-distributed recharge from precipitation and irrigation return flows to zero to develop an acceptable match between simulated and observed water levels in WY12-13. Although precipitation in the San Gabriel Basin was less than 50 percent of normal in WY2012-13, it may not be reasonable to assume that there was no recharge from precipitation or irrigation return flows in WY2012-2013. As a result, it is necessary to re-evaluate the water balance in the model to ensure that other recharge and pumping stresses in the model are accurately represented. This re-evaluation will be performed prior to the simulation of WY2013-14 conditions in the 2014 Annual PE Report. For 2013, simulated water levels without areally-distributed recharge were considered a reasonable representation of the groundwater flow field for the purposes of evaluating extraction system performance as described in Section 5.3.2 below.

5.3.2 Results of Performance Evaluation Simulations

As described in Section 3.3.2, groundwater flow simulations with forward particle tracking were performed to evaluate the performance of the groundwater extraction system as requested by EPA. Simulations were performed by simulating groundwater flow conditions and actual groundwater extraction for a three-year period through the end of WY2012-13. Results of the transient three-year model simulation of extraction system performance is presented in plan view for Subarea 1 on Figure 5-35. Results for Subarea 3 are presented in plan view at three elevation intervals on Figures 5-36 through 5-38. Figure 5-39 presents particle tracking results in profile view. Particle tracks are color coded on these figures; particles that are captured by project extraction wells are shown as green tracks, particles captured by the CDWC production wells are shown in blue, and particles not captured during the three-year simulation period are shown in gray. Starting particle locations are shown on the figures as solid circles located at the upgradient end of each particle track. As described in Section 3.3.2, the starting locations for the particles were assigned to provide a generalized representation groundwater originating within the approximate horizontal and vertical extent of various COCs in areas upgradient of the Subarea 1 and Subarea 3 extraction wells. To aid the reader in evaluating the results, the interpreted extent of the TCE plume in 2013 is shown on Figures 5-35 through 5-39 for reference. Given the limitations of the particle tracking results described in Section 3.3.2, depictions of short-term hydraulic control presented in this report should not be considered representative of long-term extraction system performance. Additional discussion of particle tracking results in relation to remedy performance is presented in Section 7.1.4.

5.4 Groundwater Extraction and Chemical Mass Removal

Monthly groundwater extraction volumes for 2013 were compiled from monthly reports submitted to DPH and EPA in monthly progress reports. Groundwater extraction volumes for all extraction wells that were operational in 2013 are shown in Table 2-1. Average monthly and average annual extraction rates are also provided in Table 2-1 together with design extraction rates for each extraction well, target operational extraction rates, and EPA-approved extraction rates for each well. Design extraction rates are based on the peak design capacity of the treatment plants whereas target operational extraction rates generally assume ten percent downtime for each well for treatment plant maintenance. The EPA-approved extraction rates shown in Table 2-1 are based on groundwater flow model simulations performed in 2000 and 2001 and represent the average extraction rates necessary to achieve the remedial action objectives.

Estimates of chemical mass removed from extracted groundwater in 2013 for the VCWD Lante, LPVCWD, SGVWC B6, and SGVWC B5 Subprojects are presented in Section 6.0.

6.0 TREATMENT PLANT PERFORMANCE RESULTS

This section presents a summary of the 2013 operational performance results for the BPOU Subproject treatment plants.

6.1 Subarea 1 – Valley County Water District Lante Subproject

As described earlier in this report, the VCWD Lante Treatment Plant did not operate for much of September to December due to repairs of the ISEPs. During 2013 approximately 4,800 acre-feet of groundwater were extracted and treated from the production wells equating to an annualized production rate of approximately 2,972 gpm.

Water-quality data collected from the individual production wells and from the fully treated water are summarized in Table 6-1, which also includes the design concentrations and expected average influent concentrations for the VCWD Lante Treatment Plant together with applicable MCLs and NLs for the COCs. No samples were collected from SA1-2 during 2013 because it was offline all year. SA1-1 was sampled monthly from January until May and was offline thereafter. SA1-3 was sampled monthly except for the period when the plant was down for repair of the ISEP valves. Raw water concentrations for the compounds reported in Table 6-1 did not exceed design concentrations. No COCs were detected at concentrations exceeding MCLs or NLs in the fully treated water. Figures 6-1 to 6-15 illustrate raw and treated water 2013 concentration trends relative to the applicable MCL or NL. With the exception of perchlorate and nitrate, the raw water concentrations from well SA1-1 were below their respective MCLs and NLs, often below the laboratory reporting limit. Concentrations of 1,4-dioxane, perchlorate, PCE, TCE, and 1,2,3-TCP typically exceeded their respective MCLs and NLs in extraction well SA1-3. With the exception of nitrate and sulfate, SA1-3 consistently showed higher concentrations of the COCs than SA1-1. In general, COC concentrations appeared to be relatively constant or slightly decreasing in the two production wells. Perchlorate concentrations in SA1-3 appear to have a slightly increasing trend. PCE, TCE, and cis-1,2-DCE concentrations in SA1-3 display clear decreasing trends during 2013. Concentrations of 1,1-DCE in SA1-3 were below the MCL, showing a slightly decreasing trend, from January to September 2013. However, after the restart in December the 1,1-DCE concentrations recorded in SA1-3 were above the MCL.

Treated water COC concentrations remained below the MCLs/NLs. COC concentrations in the treated water were generally below detection limits, except for nitrate, where concentrations in treated water remained constant at around 20 μg/L during 2013. The highest nitrate detection in the fully treated water was 23 μg/L, well below the MCL of 45 μg/L. Average concentrations for the raw water influent to the treatment plant are summarized in Table 6-2.

Historical (2008 to 2013) trends for indicator COCs in the VCWD extraction wells are presented in Figures B-1 to B-7 (Appendix B). Most COCs show strong decreasing trends over time; decreasing trends were most pronounced in Well SA1-3. The decreasing trend in 1,2,3-TCP concentrations observed in SA1-3 during 2013 appear to be a continuation of the decreasing trend observed since 2011. COC concentrations in SA1-3 have shown a decreasing trend since 2008, with the one possible exception of perchlorate which displays a stable or slightly decreasing trend. COC concentrations in SA1-1 are typically stable or show slight decreasing trends since 2008. Concentrations of 1,4-dioxane in SA1-1 were above the NL until the end of November 2012, and remained below the NL for all of 2013. With the exception of a period from March 2011 to February 2012, perchlorate concentrations in SA1-1 have typically been above the MCL. Since February 2012 perchlorate concentrations in SA1-1 have shown a slightly increasing trend.

Mass removed during 2013 was calculated by using the average raw water concentration for each COC from each of the three production wells and multiplying that result by the volume of water treated, with the appropriate dimensional conversion. In these calculations, concentrations below the detection limit were treated as zero. For the compounds considered, approximately 1,675 pounds of chemical mass were removed by the VCWD Lante Treatment Plant in 2013. This is approximately 38 percent of the 4,351.7 pounds of mass removed in 2012. The decrease in total mass removed is largely due to the decrease in the volume of groundwater extracted and treated during 2013. As stated above, the extracted water continues to be treated to below drinking water standards. Similar to 2012, perchlorate, TCE, PCE, 1,1 DCE and cis-1,2-DCE represents most of the total mass removed. PCE alone accounted for 62 percent of the mass removed, with TCE accounting for an additional 24 percent.

Inlet and exhaust air quality data for 2013 are summarized in Table 6-3 for the four air strippers and carbon off-gas abatement systems. As expected from water-quality data, PCE, TCE, 1,1-DCE, and cis-1,2-DCE were the primary VOCs detected in the vapor phase. Elevated concentrations of Freon-11, Freon-12, and chloroform were also observed in the vapor phase. Table 6-4 provides a summary of air risk and hazard calculated from compounds detected in the air exhaust. Risk was calculated using SCAQMD Tier 4 procedures and compared against ARARs. Calculated risk and hazard values were below ARARs for the MICR, acute hazard, chronic hazard, and cancer burden.

In 2013, the VCWD Treatment Plant discharged approximately 48,851,645 gallons of waste brine to the LACSD sewer with an annual average discharge rate of approximately 93 gpm, which was less than the 173 gpm averaged in 2012. The average brine discharge rate during operation (January to September) was 124 gpm. Discharges met permit requirements. Per LACSD discharge permit revision, continuous pH monitoring is no longer required. Continuous pH values have not been recorded since Dec. 7, 2010. Brine flow data are summarized in Table 6-5.

6.2 Subarea 3 – La Puente Valley County Water District Subproject

In 2013, the average annual flowrate at the LPVCWD Treatment Plant was 2,192 gpm, which was slightly below the EPA-approved extraction rate of 2,250 gpm. Approximately 3,536 acre-feet of groundwater were extracted during 2013. LPVCWD 5 extracted the majority of water treated during 2013. Approximately 3,407 acre-feet of water was extracted from LPVCWD 5, as compared to 129 acre-feet from LPVCWD 2 and LPVCWD 3 combined. Water-quality data are summarized in Table 6-6. Figures 6-16 to 6-26 illustrate raw and treated water concentration trends relative to the applicable MCL or NL for selected COCs. All treated water concentrations were below the MCLs and NLs. With the exception of nitrate and sulfate, COC concentrations in LPVCWD 2 were greater than those observed in LPVCWD 3 and LPVCWD 5. In general COC concentrations recorded in LPVCWD 2 were above their respective MCLs and NLs, whereas those observed in LPVCWD 3 and LPVCWD 5 were below their respective regulatory limits. Perchlorate and TCE were notable exceptions this rule, with all three extraction wells containing perchlorate concentrations exceeding the MCL and LPVCWD 2 and LPVCWD 5 containing TCE at concentrations greater than the MCL. Concentrations of 1,2-DCA, 1,4-dioxane, carbon tetrachloride, perchlorate, PCE, TCE, and chloroform in LPVCWD 2 displayed a U-shaped trend during

2013, decreasing during the beginning of the year, leveling off during the middle of the year and increasing toward the end of the year. Concentrations of these constituents in LPVCWD 5 displayed a similar, although less pronounced, trend. NDMA concentrations in LPVCWD 2 showed a decreasing trend from January to October 2013, before increasing in December. NDMA concentrations in LPVCWD 3 and LPVCWD 5 were relatively stable throughout the year. Nitrate and sulfate concentrations remained stable in in the extraction wells throughout the year. There were no instances during 2013 where COC concentrations in the fully treated water exceeded an MCL or NL.

Historical (2008 to 2013) trends for indicator COCs in the LPVCVWD extraction wells are presented in Figures B-8 to B-16 (Appendix B). Similarly to the 2013 observation, COC concentrations in LPVCWD 2 are typically greater than those in LPVCWD 3 and LPVCWD 5. COC concentrations in LPVCWD 2 since 2008 fluctuate, but overall do not show an increasing or decreasing trend. The historic fluctuation does not seem to coincide with the trend observed during 2013, with low concentrations in the summer months and higher concentrations in the winter months. Historically, COC concentrations in LPVCWD 3 have remained relatively stable, near or below the MCL/NL. One exception to this is TCE, which has displayed a steady decline in LPVCWD 3 since 2008. LPVCWD 5 experienced a steep decline in COC concentrations during the first six months of operation (January to June 2009), since then it has remained fairly stable, with some fluctuations.

Average chemical concentrations for the treatment plant raw water influent are summarized in Table 6-7 together with the volume of water treated and the total mass removed per chemical. In these calculations, concentrations below the detection limit were treated as zero. For the COCs considered, approximately 359 pounds of chemical mass were removed from the aquifer. This is less than the 472 pounds removed in 2012.

Air quality data collected weekly from the Small Tower and Large Tower inlet and outlet are summarized in Table 6-8. A summary of the air risk and hazard associated with the off-gas GAC systems is provided in Table 6-9. The MICR, acute hazard, chronic hazard, and cancer burden ARARs were not exceeded in 2013.

Because brine discharges from the ISEP were eliminated when perchlorate treatment changed to single pass ion exchange, only about 16,575 gallons of waste water was discharged to the LACSD sewer in 2013. Waste water flows are summarized in Table 6-10. Permit revisions from 2011 no longer require pH monitoring. Discharges met permit requirements.

6.3 Subarea 3 – San Gabriel Valley Water Company B6 Subproject

In 2013, the average annual flowrate at the SGVWC B6 Treatment Plant was 2,784 gpm, which was below the EPA-approved extraction rate of 6,500 gpm, due to operational problems associated with the ISEP, plant down time necessary for integration of the new single pass IX system, and the treatment plant being put in recirculation mode from August 29, 2013 to the end of the year. Approximately 4,515 acre-feet of groundwater were extracted and treated in 2013.

SGVWC B6 Treatment Plant raw water-quality data are typically collected monthly and treated water data are collected weekly (Table 6-11). However, the extraction wells are only sampled during the months they operate regularly and due to the numerous down times and operating in recirculation mode the extraction wells were sampled sporadically in 2013. Table 6-11 also includes the design and expected average influent concentrations for the SGVWC B6 Treatment Plant together with applicable MCLs and NLs for the COCs. During 2013, there were a few instances where raw water concentrations exceeded design concentrations:

- Carbon tetrachloride concentrations exceeded design concentrations in three samples (January, February and March) collected from B26B; and in the March sample from B25B. These concentrations did not result in exceedances in treated water discharges.
- TCE concentrations exceeded design concentrations in the January and March samples collected from B26B and in the January sample from B26A. These concentrations did not result in exceedances in treated water discharges.

Concentrations of NDMA, 1,2-dichloroethane, chloride, and bromodichloromethane were detected in the treated water being discharged from the plant to the channel at concentrations exceeding RWQCB discharge limits for a sample collected on April 26.

Figures 6-27 through 6-38 illustrate raw and treated water concentration trends relative to the applicable MCL or NL. Extraction wells B25A, B25B, B26A, and B26B were only sampled during the first quarter of 2013 (January, February, and March). Because of the limited data in 2013 a trend analysis was not performed on these wells. Backup extraction wells B6C and B6D were sampled four times in 2013 in February, March, May, and August. Based on the limited data, B6D appears to display an increasing trend in many of the COCs whereas COC concentrations in B6C appear to be relatively stable.

Historical (2008 to 2013) trends for indicator COCs in the B6 extraction wells are presented in Figures B-17 to B-24 (Appendix B). Most of the COCs in the extraction wells display relatively stable or slightly decreasing trend, with some notable exceptions discussed below. Concentrations of 1,2-DCA, 1,4-dioxane, perchlorate, NDMA, and TCE in B26B display increasing trends since 2008. PCE concentrations in B26B appear to be stable or slightly increasing. The same constituents in well B6D show a decreasing trend since 2008. NDMA concentrations in all of the extraction wells display a decreasing or stable trend, with B6C having both the highest concentrations and the steepest decrease since 2008.

Average chemical concentrations for raw influent to the treatment plant are summarized in Table 6-12, together with the volume of water treated and the total mass removed per chemical. In these calculations, concentrations below the detection limit were treated as zero. For the compounds considered, approximately 757 pounds of chemical mass were removed from the aquifer, which represents a decrease from 2012 (1,099 pounds removed). Carbon tetrachloride, perchlorate, PCE, and TCE represented about 92 percent of the mass removed, with TCE and perchlorate alone accounting for 75 percent of the mass removed.

SGVWC B6 Treatment Plant air quality data are summarized in Table 6-13. Table 6-14 provides summary of air risk and hazard calculated from compounds detected in the air exhaust. Risk was calculated using SCAQMD Tier 4 procedures and compared against ARARs. The annual 52-week average rolling MICR ARAR of 1×10^{-6} was not exceeded in 2013. The acute hazard, chronic hazard and cancer burden ARARs were also not exceeded in 2013.

The SGVWC B6 Treatment Plant discharged approximately 8,144,094 gallons of waste brine to the LACSD sewer in 2013 equating to an average flow rate of 16 gpm. Brine flows are summarized in Table 6-15. Permit revisions from 2011 no longer require pH monitoring. Discharges met permit requirements.

6.4 Subarea 3 – San Gabriel Valley Water Company B5 Subproject

The average annual extraction rate for the SGVWC B5 Subproject was about 7,036 gpm, exceeding the EPA-approved extraction rate of 7,000 gpm. Approximately 11,348 acre-feet of water were extracted and treated.

Raw and treated water-quality data for the SGVWC B5 Treatment Plant are provided in Table 6-16, which also includes the design and expected average influent concentrations for the SGVWC B5 Treatment Plant and applicable MCLs and NLs for the COCs. Raw water concentrations exceeded design concentrations in the production wells on one occasion during 2013:

- On March 6, 1,4-dioxane was detected at a concentration of 36 μg/L in well B5E, exceeding the design concentration of 5 μg/L. This detection appears to be an anomaly, as 1,4-dioxane concentrations in B5E were below 0.57 μg/L during all of the other monthly sampling events of 2013.

COCs were not detected at concentrations exceeding MCLs or NLs in the fully treated water during 2013. Figures 6-39 through 6-47 show raw and treated water concentration trends relative to the applicable MCL or NL. COC concentrations in B5E tended to be higher than the other extraction wells, with the exception of PCE and nitrate. B5E was the only extraction well where 1,2-DCA, and TCE concentrations exceeded the respective MCLs. Tetrachloroethene and nitrate concentrations in B5B were consistently above the respective MCLs, while the concentrations of those two constituents remained below their MCLs in all of the other extraction wells. Concentrations in wells B5E and B5D exceeded the carbon tetrachloride MCL, and perchlorate concentrations in B5E and COI 5 both exceeded the MCL throughout 2013. COC concentrations in the raw water were relatively constant during 2013, with the following exceptions:

- A slight increase in perchlorate and PCE concentrations was observed in many of the extraction wells during 2013.
- Perchlorate concentrations in B5E rose from 13 μg/L in May to 20 μg/L in July, before stabilizing at concentrations of about 18 μg/L.
- NDMA concentrations in B5E displayed a decreasing trend throughout 2013.

Historical (2008 to 2013) trends for COCs in the B5 extraction wells are presented in Figures B-22 to B-28 (Appendix B). With the exception of 1,4-dioxane, all of the COCs have shown increasing trends in well B5E. In addition, PCE concentrations in COI 5 have displayed a steady increase from less than 1 μg/L in 2009 to an average of 6.4 μg/L in 2013. With these exceptions, most of the COCs in the extraction wells display relatively stable or slightly decreasing trend.

Average chemical concentrations for the raw influent to the treatment plant are summarized in Table 6-17, together with the volume of water treated and the total mass removed per chemical. In these calculations, concentrations below the detection limit were treated as zero. For the compounds considered, approximately 770 pounds of chemical mass were removed from the aquifer, compared to 604 pounds in 2012. Perchlorate accounted for nearly 42% of the mass removed. Perchlorate, PCE, and TCE represented approximately 87 percent of the mass removed.

7.0 EVALUATION OF REMEDY PERFORMANCE AND TREATMENT PLANT OPERATIONS

7.1 Groundwater Extraction System Performance

As described in the PSEP and Section 3.0 of this report, the evaluation of remedy performance involves both short-term and long-term evaluation of groundwater extraction system performance. Annual PE Reports evaluate the short-term performance of the groundwater extraction system using groundwater modeling and empirical data to assess whether extraction well operation is limiting further migration of groundwater contamination into less contaminated areas.

The CRs recently completed detailed evaluations of groundwater extraction system performance in both Subareas 1 and 3. The CRs submitted an evaluation of extraction system performance for Subarea 1 in August 2012 (CDM Smith, 2012) and for Subarea 3 in March 2013 (CDM Smith, 2013). Groundwater extraction system performance is discussed in the following sections.

7.1.1 Extraction Well Performance

The VCWD Lante, LPVCWD, SGVWC B6, and SGVWC B5 Subproject wells are capable of achieving design extraction rates. In addition to the three existing and permitted wells in the VCWD Lante Subproject (SA1-1, SA1-2, and SA1-3), VCWD and the CRs have agreed to install a new well at the Lante Treatment Plant location to increase mass removal and lower nitrate influent concentrations. Rehabilitation of Well SA1-2 was completed in January of 2012 and redevelopment performed in March 2012 and the well remains on standby status due to elevated nitrate concentrations. In 2013, the VCWD SA1-1 and SA1-3 extraction wells did not operate for much of September through December due to repairs of the ISEPs. LPVCWD 5 replaced LPVCWD 2 and 3 as the primary extraction well at the LPVCWD Subproject in early 2009. In 2013, the majority of water extracted at LPVCWD came from LPVCWD 5. The CRs are evaluating various pumping alternatives at the SGVWC B6 Subproject to flow balance nitrate loading among the four extraction wells, B25A/B and B26A/B. During 2013, the SGVWC B6 extraction wells operated below design capacities due to the ISEP operational limitations. The SGVWC B5 plant exceeded its target extraction rate during 2013, with the majority of the raw water coming from wells B5B, B5E and COI 5.

7.1.2 Groundwater-Quality Trends

Short-term spatial and temporal trends in groundwater quality in the BPOU as observed during 2013 are described in Sections 5.2.3 and 5.2.4. Short-term changes in groundwater quality are observed seasonally and from year-to-year. These short-term changes occur primarily in response to variations in both local and regional groundwater flow conditions throughout the Basin. Long-term trends in groundwater quality are difficult to discern at specific locations within the COC plumes due to seasonal changes in groundwater levels and flow directions and the localized influences of groundwater pumping from various production and extraction wells. As a result, the PSEP outlines an approach for evaluating short-term changes in groundwater quality and extraction system performance in Annual Performance Evaluation reports. Longer-term trends in groundwater quality and extraction system performance are to be evaluated in Five-Year Review Reports much like those completed for Subarea 1 and Subarea 3 in 2012 and 2013, respectively (CDM Smith, 2012 and 2013). As a result, the evaluation of groundwater quality trends and extraction system performance presented in this annual report should not be used to develop conclusions regarding overall remedy performance. However, to satisfy EPA's request for an expanded discussion of long-term trends in groundwater quality over the past 5 – 10 years, the following general BPOU-wide observations are provided:

- The overall extent of COC plumes in the BPOU has been relatively stable since the implementation of the PSEP monitoring and reporting program in 2004. However, COC concentrations within the COC plumes have been decreasing. Mass discharge (flux) calculations were performed by CDM Smith to quantify the COC plume strength upgradient of the Subarea 1 and 3 extraction wells in 2012 and 2013 (CDM Smith, 2012 and 2013). Analysis of estimated COC mass discharge indicates that between 2004 and 2010, the amount of mass migrating towards the Subarea 1 and 3 groundwater extraction wells has decreased by approximately 80 and 60 percent, respectively.
- With the exception of the SGVWC B5 Subproject, mass removal rates determined for influent groundwater to the Subproject treatment systems have generally declined since 2010 (Table 6-18 and Appendix B).
- COC concentrations appear to be decreasing downgradient of the VCWD Subproject extraction system as demonstrated by decreasing concentrations observed in Ports 4, 5, and 6 of multiport well MW-24 located approximately 2,500 feet downgradient of the VCWD SA1-3 (Lante) extraction well.
- Annual Performance Evaluation reports, prepared by the CRs since 2004 demonstrate that COC concentrations have been generally stable or declining near the southern terminus of the BPOU plume as indicated by stable or declining COC concentrations in most Subarea 3 extraction wells.
- Measured COC concentrations in multiport monitoring wells MW5-26 and MW5-27 located downgradient (southwest) of Subarea 3 extraction wells have been below MCLs or NLs at these wells since 2009, indicating that there has been no significant migration of COC mass southwest of the Subarea 3 extraction wells and CDWC wells. In addition to groundwater sampling results from MW5-26 and MW5-27, COC concentrations in COI 5 and CDWC wells indicate relatively stable COC concentrations near the terminus of the BPOU plume.

7.1.3 Groundwater Extraction and Chemical Mass Removal

The VCWD, LPVCWD, SGVWC B6, and SGVWC B5 Treatment Plants were all operational in 2013.

- The VCWD Treatment Plant operated at 2,972 gpm, or about 49.5% of the EPA approved average annual extraction rate of 6,000 gpm. Production remained below the EPA-approved extraction rate mainly due to ISEP problems and limitations, which caused the plant to be down for much of September through December.

- The LPVCWD Treatment Plant achieved an annual average extraction rate of 2,192 gpm, which is 97.4% the EPA-approved extraction rate of 2,250 gpm. LPVCWD operated using LPVCWD 5 as the primary well, with production supplemented by LPVCWD 2 and 3 when LPVCWD 5 was offline.
- The SGVWC B6 Treatment Plant operated at an annual average flowrate of 2,784 gpm, which approximately 42.8% of the EPA-approved extraction rate of 6,500 gpm. The reduced extraction rate was due to operational problems associated with the ISEP, plant down time necessary for integration and startup testing of the new single pass IX system, and the treatment plant being put in recirculation mode from August 29, 2013 to the end of the year.
- The SGVWC B5 Treatment Plant operated at an annual average flowrate of 7,036 gpm, exceeding the EPA-approved extraction rate of 7,000 gpm.
- Overall, BPOU extraction from the combined four primary treatment facilities averaged 14,983 gpm on an annual basis, compared to the EPA-approved extraction rate of 21,750 gpm, or approximately 64.4% of the target operational rate of 23,250 gpm.

The chemical mass removed at the VCWD Lante, LPVCWD, SGVWC B6, and SGVWC B5 Treatment Plants were 1,675 pounds, 359 pounds, 757 pounds, and 770 pounds, respectively (Table 6-18). The BPOU project-wide total mass removed in 2013 was 3,561 pounds, which was less than last year's total of 6,526 pounds. Table 6-18 also presents a summary of the mass removal rate in terms of pounds of COCs removed per 1,000 gpm of groundwater extracted. The flow-rated mass removal rate (mass removed/groundwater extracted) in 2013 was 238 lbs/1,000 gpm compared to the 2012 mass removal rate of 363 lbs/1,000 gpm, with the decrease in mass removal rates due to decreased extraction from the VCWD Lante and SGVWC B6 Subprojects that typically have higher mass removal rates. Since 2004, the cumulative chemical mass removed is 62,221 pounds (Table 6-18). With the exception of the SGVWC B5 Subproject, mass removal rates have generally declined since 2010.

7.1.4 Assessment of Migration Control

As described in Section 5.1 of the PSEP and in Section 3.3 of this report, the BPOU groundwater model is the primary tool for assessing extraction system performance. Evaluations of extraction system performance were performed using the updated BPOU groundwater model and forward particle tracking based on actual pumping and water level conditions from WY2008-09 through WY2012-13. Results of the extraction system performance simulations are presented in Section 5.3 and mass removal is discussed in Sections 6.1 through 6.4. As described in Section 3.3.2, particle tracking results based on short-term simulations of groundwater flow are subject to various limitations and should not be considered representative of long-term extraction system performance.

Based on the evaluation of forward particle tracking results and chemical mass removal rates presented in this report, the following general observations regarding extraction system performance were developed:

- Although the operation of the VCWD Lante Subproject extraction wells operated well below target extraction rates due to ISEP operational issues, the operation of the VCWD SA1-3 (Lante) extraction well had a significant effect on hydraulic control and chemical mass removal in Subarea 1 in the first eight months of 2013. Consistent with previous years, pumping of the SA1-1 extraction well had a lesser effect on hydraulic control and chemical mass removal due to the location of this well in relation to the distribution of COCs, and the resultant lower COC concentrations in groundwater extracted from this well. The SA1-2 extraction well was not operated in 2013. Overall, and despite the lack of operation of the SA1-2, the operation of SA1-1 and SA1-3 in the first five and eight months of 2013, respectively, continued to have a significant effect on hydraulic control and chemical mass removal in Subarea 1.

- Although the SGVWC B6 Subproject extraction wells continued to experience reduced pumping rates in 2013 because of operational problems associated with the ISEP treatment system, groundwater extraction from these wells contributed to hydraulic control and chemical mass removal in the first eight months of 2013.
- Operation of the SGVWC B5 extraction wells combined with the operation of the CDWC production wells provided significant hydraulic control in the downgradient portion of Subarea 3 in 2013, although mass removal at SGVWC B5 was significantly lower than for other BPOU extraction and treatment facilities, particularly when considering the volume of water treated. Consistent with previous years, operation of the COI 5 extraction well provided little benefit relative to hydraulic control or chemical mass removal.
- The operation of LPVCWD extraction well(s) continue to provide consistent hydraulic control and chemical mass removal throughout 2013.

In summary, the overall performance of project extraction wells, as supplemented by production wells in the CDWC Bassett wellfield, continued to limit the migration of COCs in groundwater and removed chemical mass consistent with the Performance Standards established in the PSEP.

7.2 Treatment System Operations

The treatment plant operations that were described in detail earlier in this report are summarized below.

7.2.1 Subarea 1 – Valley County Water District Lante Subproject

The VCWD Lante Treatment Plant operated under its DPH drinking water permit and delivered fully treated water to SWS. Although offline for part of the year, the treatment plant reliably treated extracted groundwater to drinking water standards. Improvements, operational problems, and issues that impacted operations and performance in 2013 are provided in Section 2.1. Future operational improvements include:

- The VCWD Subproject Committee has recently approved a plan to proceed with nitrate management, ISEP bypass piping, construction of a new well, and other required modifications;
- As part of the approved nitrate management plan, the single pass IX system will be permitted and become operational;
- A new well will be installed at the Lante Treatment Plant site to assist with nitrate management and improve mass removal;

- VCWD will prepare a UV testing plan to optimize operations of the VCWD UV treatment system.

As described in Section 2.1, the CRs completed an evaluation of the effectiveness of the groundwater remedy in Subarea 1 in August 2012 (CDM-Smith, 2012). The evaluation concluded that the Subarea 1 extraction plan could be modified and still achieve remedy objectives. EPA approved a modified extraction scheme consisting of 5,000 gpm of groundwater extraction in the vicinity of well SA1-3 and 1,000 gpm of extraction from SA1-1. The revised extraction scheme and plant operational changes to manage nitrate will be implemented beginning in 2014.

7.2.2 Subarea 3 – La Puente Valley County Water District Subproject

The LPVCWD Subproject extracted and treated groundwater at an annual rate of about 2,192 gpm, which was 97.4% of the extraction target. The plant reliably treated raw water to drinking water standards for all COCs.

Improvements, operational problems, and issues that impacted operations and performance in 2013 are described in Section 2.2.1. Future operational improvements include:

- LPVCWD will prepare a cost-benefit evaluation on alternative disposal methods for the two salt tanks from the ISEP facility;
- LPVCWD will review and distribute reports regarding optimization of dosing of sodium hydroxide and pipe loop testing for dosing of orthophosphate;
- LPVCWD will perform Phase 1 of a study to reconfigure the treatment train; and
- LPVCWD air strippers will be inspected in 2014.

7.2.3 Subarea 3 – San Gabriel Valley Water Company B6 Subproject

The SGVWC B6 Treatment Plant extracted and treated water at an annual rate of 2,784 gpm, primarily limited by continued ISEP operational problems, single pass IX startup testing, and operating in recirculation mode. The plant reliably treated raw water to drinking water standards for all COCs.

Improvements, operational problems, and issues that impacted operations and performance in 2013 are described in Section 2.2.2. Future operational improvements include:

- The perchlorate single pass IX system will be permitted and become operational;
- A new nitrate IX system will be designed and constructed; and
- SGVWC B6 air strippers will be inspected in 2014.

7.2.4 Subarea 3 – San Gabriel Valley Water Company B5 Subproject

The SGVWC B5 Treatment Plant operated at an average annual flowrate of 7,036 gpm. The plant reliably treated raw water to drinking water standards for all COCs. Future operational improvements will include the construction of the SGVWC B5 treated water pipeline.

8.0 SUMMARY AND RECOMMENDATIONS

Although two of the four operating treatment facilities (VCWD Lante and SGVWC B6) experienced significant operational interruptions for portions of 2013, operation of project extraction wells as supplemented by production wells and treatment facilities in the CDWC Bassett wellfield continued to limit the migration of COCs in groundwater and removed chemical mass consistent with the remedial objectives established in the UAO. The CRs completed detailed evaluations of the groundwater extraction system performance in Subareas 1 and 3 in August 2012 and March 2013, respectively.

Recommendations and operational issues to be addressed for the BPOU treatment plants in 2014 include:

- Implement the agreed-upon nitrate-related management plan for the VCWD Lante Treatment facility;
- Implement the EPA approved modified extraction scheme in Subarea 1 (5,000 gpm of extraction in the vicinity of well SA1-3 and 1,000 gpm from SA1-1) by constructing a new well at the Lante Treatment Plant site;
- Permit and operate the new perchlorate IX treatment systems for the SGVWC B6 Subproject;
- Design and install nitrate IX treatment for the SGVWC B6 Subproject;
- Continue to track carbon and resin change outs and provide disposal certificates to EPA in the monthly progress reports;
- Continue inspection and maintenance of the VCWD Lante, LPVCWD, and SGVWC B6 air strippers; and
- Continue to evaluate and improve operational efficiency of the LPVCWD, VCWD Lante, SGVWC B6, and SGVWC B5 Subprojects.

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