Section 2

Study Area Investigation

The SFV is a diverse area with a history of mixed land uses from residential to industrial and a large population of residents and workers who rely on the groundwater supply infrastructure of the SFV. This section includes a description of the SFV physiography and land uses, demography, and sources of impacts to SFB groundwater. A general description of the investigations completed in the SFB is also presented in this section with supporting documents included in the appendices of this RI Update Report.

2.1 Physiography

The physiography of the SFV describes the general geography of the area in which investigative activities were performed. The discussion presented below is extracted from the 1992 RI Report (JMM 1992), as there have not been significant changes or updates to this information since that report was originally developed.

The South Coastal Basin of California has four major physiographic divisions within its watershed: the Coastal Plain, the hills and low mountains around the Coastal Plain, the three inland alluvial valleys, and the high mountain ranges that border the alluvial valleys. The three inland valleys are the SFV, the San Gabriel Valley, and the Upper Santa Ana Valley.

The SFV is approximately 23 miles long in an east-west direction and approximately half as wide from north to south. Mountains and hills surround the valley: the San Gabriel Mountains on the north and northeast, rising to an elevation of 7,124 feet above mean sea level (msl); Santa Susana Mountains on the northwest, rising to nearly 3,800 feet above msl; Santa Monica Mountains on the south, peaking at 1,961 feet above msl; Simi Hills on the west; and San Rafael and Repetto hills on the southeast.

Chatsworth Peak, which is about 1.5 miles from the western edge of the basin, is 2,314 feet above msl. The Verdugo Mountains separate the SFB from the Verdugo Basin (Sunland-La Crescenta area). In comparison to the surrounding mountains, which rise abruptly at the valley edges, the valley floor of SFV slopes gently to the southeast. The ground surface elevations slope from a high of approximately 1,100 feet above msl in the northwest to a low of 293 feet above msl at the basin outlet in the southeast. The change in ground-surface elevation in the east is approximately 50 feet per mile (0.0095 foot vertical per 1 foot horizontal [ft/ft]) in a nearly due-south direction.

The Van Nuys Plain constitutes a major portion of the SFV floor, extending from the Santa Susana and San Gabriel mountains surrounding the northern side of the valley to the Santa Monica Mountains along the southern side of the valley (Figure 1-1).

The Verdugo Basin floor also is undergoing active deposition. Because the Verdugo Basin is structurally steep and narrow, the alluvial fans that make up the valley floor are also steep. The ground surface elevation ranges from about 2,000 feet above msl at the northern boundary with the San Gabriel Mountains to about 800 feet above msl near the mouth of the basin, over a distance of about 5 miles, resulting in a slope of roughly 240 feet per mile (0.046 ft/ft). The basin is drained by the Verdugo Wash, which collects runoff from the canyons issuing from the surrounding hills and mountains and joins with the Los Angeles River at the north end of the Los Angeles River Narrows.

Other important physiographic features in the SFV include the Los Angeles River and the many streams and washes that drain the surrounding mountains. The Los Angeles River flows through the SFV from west to east, and turns south between the Santa Monica Mountains and the Repetto Hills. The topographic constriction in the southern reach of the river is the Los Angeles River Narrows. Several streams or washes discharge into the Los Angeles River, which flows along the southern boundary of the valley and flows out of the basin through the Los Angeles River Narrows. These tributary washes drain the Big Tujunga, Little Tujunga, Pacoima, Aliso, Browns, Bull, and Arroyo Calabasas canyons. Erosion from the portions of the watershed surrounding the Tujunga wash has constructed the Tujunga alluvial fan, which is a dominant feature in the SFV.

The Burbank Piedmont Slope is another important physiographic feature in the SFV study area. The Burbank Piedmont Slope resulted from the buildup of coalescing alluvial fan deposits from the southwest side of the Verdugo Mountains. These deposits are more weathered and are topographically steeper than the Van Nuys Plain. The advanced weathering suggests that the Burbank Piedmont Slope is older than the surface deposits of the Van Nuys Plain.

2.2 Land Use

One of the purposes of an RI is to assess the health risks associated with the groundwater contamination in the study area. Health risk determinations are significantly impacted by the land use in the area of contamination and the specific receptor populations that may come into contact with the contamination as part of everyday activities. In a basin as diverse as the SFB, multiple land uses are generally grouped into the following categories:

- Residential: urban residential, suburban residential, rural residential, and condominiums
- Commercial: urban commercial, rural commercial, and business/industrial park uses
- Industrial: all urban industrial sites
- Agricultural: land currently used for agriculture or grazing and land used for agriculture in the past that is currently unused or partially used
- Open space: native vegetation, recreational sites, parks, lawns, and barren land
- Water bodies: lakes, reservoirs, and rivers
- Freeways/paved areas: land covered by freeways, parking lots, roads, paved flood control channels, and airports

The SFV comprises almost half (145,000 acres) of the City of Los Angeles' total 302,644 acres (California Groundwater Bulletin 118 prepared by the California Department of Water Resources [CDWR] 2004; LADWP, 2010). Residential development constitutes over 51 percent of the total land use within the city. Within the residential land use category, single-family residential is the largest at approximately 123,000 acres or 41 percent of the total land use within the city. Multi-family residential is at approximately 32,000 acres, or 10 percent of the total land use within the city. Open space/parks is the second largest land use within the city at approximately 14 percent. Commercial, public facilities, and manufacturing land uses combined account for approximately 17 percent of the total. Public facilities include land uses such as libraries, public schools, and other government facilities (LADWP 2010).

2.3 Demography

Demography is used with land use information to identify potential receptor populations for the assessment of the health risks associated with the groundwater contamination. The SFV Study Area is located in Los Angeles County and encompasses the city of Burbank and portions of the cities of Glendale, La Canada Flintridge, Los Angeles, and San Fernando, as well as one unincorporated area, La Crescenta-Montrose. Population values from the U.S. Department of Commerce 2010 Census (U.S. Department of Commerce 2014) are available for entire cities and for census tracts. The city of Burbank is the only city completely contained within the study area; it has a population of 103,340. The city of Glendale, population 191,713, is almost completely within the study area, with portions in the San Fernando and Verdugo basins. A large portion of the city of La Canada Flintridge, which has a total population of 20,246, is located in the study area. Approximately 15 percent of the city of Los Angeles is located within the study area. The population of the entire city of San Fernando is 23,646; a small portion of this population lives within the study area. The only unincorporated area within the study area is La Crescenta-Montrose, which has a total population of 19,653; only a portion of this unincorporated area is in the study area. Based on the 2010 Census, the estimated total population within the study area is 927,000 (U.S. Department of Commerce 2014).

2.4 Groundwater Extraction

Groundwater extraction from the four basins within the SFV is limited by the court-defined water rights recorded in the Judgment, discussed in Section 1.3.2. Under the Judgment, all extraction from the basins must be conducted under the basic objective of the safe yield operation. This objective combines the native safe yield (based on the percolation of precipitation and runoff into the valley fill) and the import safe yield (based on the deep percolation of delivered water) for the total safe yield (JMM 1992).

In the SFB, the City of Los Angeles has exclusive rights to the native safe yield, which is fixed at 43,660 AFY. The amount of the import safe yield available to the cities of Los Angeles, Burbank, and Glendale is based on a percent of the total amount of delivered water. The City of Los Angeles has a right to extract 20.8 percent of all water delivered to the SFB, including recycled water. The cities of Burbank and Glendale each have rights to extract 20.0 percent of all water delivered to the SFB, including recycled water. In addition, the cities of Los Angeles, Burbank, and Glendale each have rights to store water in the SFB and may extract equivalent amounts from either “in-lieu” pumping (intentional under-pumping of allowable groundwater rights) or spreading imported or reclaimed wastewater. Table 2-1 provides a summary of these extraction rights for WY 2011–12. A more detailed discussion of water rights is summarized in annual ULARA Watermaster reports (ULARA Watermaster 2013a).

Table 2-1. Calculation of 2012–13 Extraction Rights (AF) SFB (from ULARA Watermaster 2013a)

	City of Burbank	City of Glendale	City of Los Angeles
Total delivered water, 2011–12	20,584	24,491	243,067
Water delivered to hill and mountain areas, 2011–12	---	---	46,044
Water delivered to valley fill, 2011–12	20,584	24,491	197,023
Percent recharge credit	20.0%	20.0%	20.8%
Return water extraction right	4,117	4,898	40,981
Native safe yield credit	---	---	43,660
Annual extraction right for the 2012–13 water year[a]	**4,117**	**4,898**	**84,641**

[a] *Does not include stored water credit and physical solution.*

There are 11 well fields in the SFB that have been used or are currently being used to produce groundwater for the cities of Los Angeles, Burbank, and Glendale. The City of Los Angeles operates nine of the well fields: TJ, RT, NH, Whitnall, Erwin, Verdugo, Headworks, Crystal Springs, and Pollock (Figure 1-3). The City of Burbank operates the Public Service Department (PSD) well field, and the City of Glendale operates the Grand View well field. Additional operational information for the other well fields is presented in the 1992 RI and the annual ULARA Watermaster reports.

Of the total amount of groundwater pumped in ULARA (79,313 AF in 2011–12), the majority (70,810 AF) was extracted by the Parties to the Judgment; 1,209 AF are considered a non-consumptive use or minimal consumption; and 1,413 AF were pumped for physical solutions, groundwater cleanup, water well development and testing, and dewatering activities by other parties. Table 2-2 summarizes private party pumping in the SFB for WY 2011–12 (ULARA Watermaster 2013a).

Table 2-2. Private Party Pumping (AF) in the SFB for Water Year 2011–12 (from Watermaster 2013a)

Non-consumptive Use or Minimal Consumption		Groundwater Dewatering		Groundwater Cleanup		Physical Solution*	
Sears, Roebuck and Company (air conditioning; well disconnected 2000)	0.00	Avalon, Encino[a]	0.00	B.F. Goodrich (Menasco/Coltec)[b]	0.19	Valhalla Memorial Park[b]	338.45
Sportsmens' Lodge	8.95	BFI Sunshine Canyon Landfill[a]	92.21	Home Depot U.S.A. Inc.[b]	0.54	Forest Lawn Cemetery Assn.[c]	420.93
Toluca Lake Property Owners	0.00	Glenborough Realty (First Financial)[a]	12.70	3M-Pharmaceutical[a]	43.73	Hallelujah Prayer Ctr (Hathaway/deMille)[a]	32.2
Toluca Lake Property Owners	0.00	Mercedes Benz Encino (formerly known as Auto Stiegler)[a]	8.65	Boeing Santa Susana Field Lab[a]	17.14	Middle Ranch (deMille)a	6.69
Vulcan (CalMat)* (gravel washing)	1,200.52	Metropolitan Transportation Agency[a]	30.12	Honeywell International, Inc.[a]	170.57	Toluca Lake Property Owners[a]	21.45
Walt Disney Productions (3 wells inactive/not abandoned)	0.00	Metropolitan Water District[a]	158.60	Micro Matics USA, Inc.[a]	0.00	Water Licenses[a]	2.69
--	--	Trillium Corporation[1]	33.75	Tesoro[a]	0.00	Wildlife Waystation[a]	3.57
		Warner Properties Plaza 6 and 3[a]	19.23				
Subtotals	1,209.47	355.26		232.17		826.06	
Total Extractions		2,622.96					

** This term refers to smaller, private parties granted a limited entitlement to extract groundwater chargeable to the rights of others upon payment of specified charges*

[a] Charged to Los Angeles' water rights.

[b] Charged to Burbank's water rights.

[c] Charged to Glendale's water rights.

LADWP's annual well water production for water years 1999–2000 through 2011–12 is presented in Figure 2-1. It should be noted that contamination in some production wells has caused production to decline.

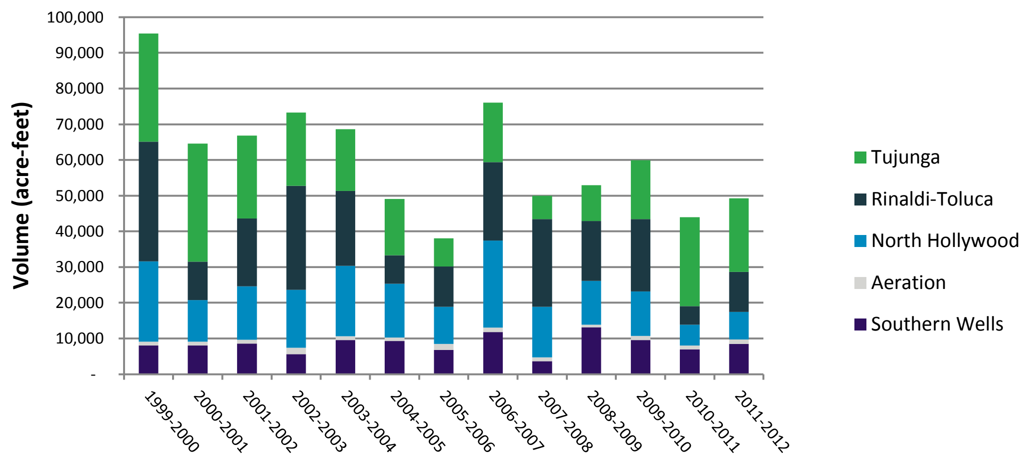

Figure 2-1. Annual Well Water Production

2.5 Contaminant Source Investigations

CERCLA authorizes the federal government, states, and private parties to recover Superfund cleanup expenses (costs) from PRPs. This term refers to companies that are potentially responsible for generating, transporting, or disposing of the hazardous waste found within the SFB. In the SFB, remediation efforts have been hindered because multiple PRPs are present and allocating responsibility has proved difficult.

Under a cooperative agreement between USEPA and the State Water Resources Control Board (SWRCB), the Los Angeles Region RWQCB conducted assessments of facilities in the SFB to determine the extent of solvent usage and to assess past and current chemical handling, storage, and disposal practices. For parties whose facilities RWQCB later determined that additional investigation was not required, RWQCB sent "no further action" (NFA) letters. Additionally, USEPA and RWQCB sent joint NFA letters to parties in cases where both USEPA and RWQCB determined that additional investigation was not required. Those entities that received the joint NFA letters will not be asked by USEPA or RWQCB to participate in regional groundwater cleanup projects for the SFB Superfund Sites.

A General Notice Letter (GNL) notifies an entity that USEPA has identified the entity as a PRP for the purpose of Superfund response actions. A Special Notice Letter (SNL), in addition to designating an entity as a PRP, initiates a formal settlement process between USEPA and the PRPs. The SNL is used to facilitate an agreement between USEPA and the PRPs for the PRPs to conduct site work and to pay USEPA's oversight and other response costs. The SNL requests an offer from PRPs to perform these actions and sets a formal time period for negotiations to be completed. USEPA sent GNLs and SNLs to parties considered by USEPA to be potential contributors to the groundwater contamination. This list is available on the USEPA Region 9 website.

A discussion of sources of contamination is provided in Section 4.2, and a review of investigation work by PRPs is provided in 2.6.4.

2.6 Description of Remedial Investigation Activities

This section provides a description of the remedial investigation activities for the GSIS. The GSIS program was started in 2009 with one of the goals to fill data gaps in the SFB and provide a structure to collect data to assess overall water quality in SFB groundwater that contributes to LADWP's production wells currently or during future operations. To identify and fill these data gaps, a dynamic approach following the CERCLA investigation process was developed. The overall project approach is illustrated in Figure 2-2, with the designated section of this report shown where each item is described.

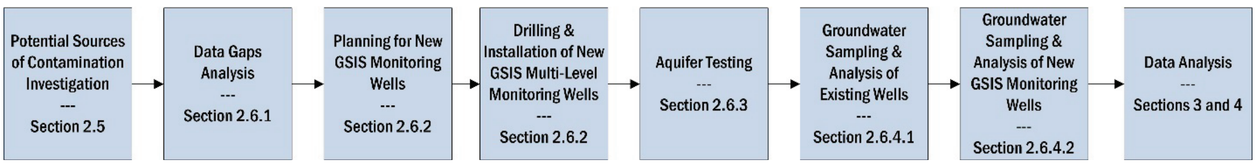

Figure 2-2. Investigation Process for GSIS

This project was executed as an iterative and dynamic process whereby data gaps were identified, addressed, and then revisited as the project was executed. The first step in the process was an initial identification of data gaps and development of the project approach, which also included identification of the specific goals for the investigation and activities to achieve these goals. The hydrogeology (Section 3.4) and the nature and extent of contamination (Section 4) uses the resulting data to characterize the SFB.

2.6.1 Identification of Data Gaps and Development of Project Approach

The first step of the GSIS was a preliminary data gaps analysis using available data, which were assembled and reviewed. The purpose of the data gaps analysis was to provide an independent study to identify, characterize, and evaluate the chemicals of potential concern (COPCs) currently present in groundwater in the SFB that were found above regulatory limits, and that therefore may require remediation, cleanup, removal, or containment to protect human health.

Initial data gaps were identified by reviewing the electronic data available from LADWP and the USEPA SFV database. Public resources and electronic archives, such as the RWQCB website GeoTracker and the DTSC website EnviroStor, were used to identify remaining gaps in the data.

After the electronic data sources were assessed, hard-copy files from both RWQCB and DTSC were collected, reviewed, and archived. Where possible, optical character recognition (OCR) software was used to recognize the text and copy the data from the documents to eliminate potential error related to manually entering the data into spreadsheet format. If OCR software could not be used, then the data were manually inputted into spreadsheets, after which spreadsheets were formatted for upload into the GSIS geographic information system (GIS) and groundwater database. Subsequent and additional visits were made to the USEPA SFV repositories to collect available documents from the USEPA administrative records. These documents were also archived as part of the GSIS project.

Information and data collected were used to develop an initial conceptual understanding of the current condition of groundwater in the SFB and a preliminary list of COPCs was developed based on those chemicals above regulatory limits in LADWP's production wells and the surrounding monitoring wells. Most importantly, once all of the existing and available data were collected, data gaps were identified and prioritized. Data gaps fell into the following two categories:

- Water quality (including both physical and chemical characteristics of COPCs), necessitating the need for additional groundwater sampling and installation of new monitoring wells at key locations
- Hydrogeologic and site physical characteristics, requiring new lithologic and aquifer test information in selected areas of the basin

The GSIS field investigation was developed to address the data needs and gaps. Additional wells and groundwater information were required to establish baseline conditions of groundwater in areas outside of the OUs: in the TJ, RT, and NHW areas of the SFB. The actions identified included:

- Monitoring well planning and installation
- Groundwater sampling

Goals of the GSIS field investigation focused on filling the identified data gaps to update:

- Site physical characteristics
- Physical and chemical characteristics of sources of contamination
- Volume of contamination and extent of migration
- Potential receptors and associated exposure pathways
- Expected performance requirements of treatment alternatives

2.6.2 Monitoring Well Planning and Installation

Based on the data gaps identified, LADWP selected proposed locations for new monitoring wells in the SFB within the TJ, RT, and NHW well fields to expand both the areal and vertical knowledge of the hydrogeology and groundwater quality in these areas. These locations were selected to support the following specific goals:

- Provide data to characterize the quality of the groundwater both areally and vertically
- Fill data gaps in the monitoring well network, including data gaps where known or suspected impacted groundwater in or near the NHOU may adversely affect one or more of the LADWP well fields or where no data were available
- Replace and supplement abandoned monitoring wells or alternate design wells (i.e., wells installed for indirect potable reuse evaluations)
- Evaluate possible impacts of subsurface geologic structures (e.g., faults) on the flow of impacted groundwater from potential source areas

2.6.2.1 Preliminary Areas for Well Locations

With the identification that new wells were needed, LADWP in conjunction with Brown and Caldwell (BC), set out to identify strategic well locations. This process included initial identification by LADWP followed by an independent review by BC. The criteria for initial selection of the well locations agreed upon by LADWP and BC included the following:

- Identified the extent of future groundwater capture zones using the SFBGM
- Considered existing or potential sources of groundwater contamination or suspected areas of groundwater contamination
- Considered contaminants detected in these well fields' production wells and monitoring wells
- Considered groundwater contaminant plumes shown on various maps and drawings prepared by USEPA, various PRPs, and other sources of data

- Considered the groundwater flow model's predicted groundwater flow paths and general groundwater flow direction estimated in the 1992 RI report (JMM 1992) and by the ULARA Watermaster
- Combined and evaluated the above-listed data and information to identify where critical data gaps exist

Once LADWP selected the initial locations, BC performed an independent evaluation of the proposed monitoring well locations, taking into consideration available data for the study area and the objectives of the new well locations (BC 2010). Specifically, the following factors were considered as part of this evaluation:

- The location of the proposed well with respect to the existing wells in the monitoring system for the well field. In general, a good overall areal distribution of monitoring wells was sought for each production well field, which would include having monitoring wells in each of the capture zones: 2, 5, and 10-year zones.
- The location of the proposed well with respect to known or possible groundwater contaminant plumes. In some instances, supply (or production) wells are extracting impacted groundwater; however, the extent and nature of the impacted groundwater upgradient of the supply wells is not known. A proposed monitoring well, in this instance, would provide data that would help in evaluating how contaminant concentrations might change in the supply wells as the impacted water moves downgradient over time (2, 5, or 10 years) into the supply wells.
- The location of the proposed well with respect to known or possible contaminant sources that may have impacted groundwater within the capture zones. Some of the proposed wells were located along modeled groundwater flow lines that extended from known or possible contaminant sites downgradient toward specific parts of the supply well fields. These proposed well sites were downgradient of known or possible sites; and if impacted groundwater was present downgradient of such sites, the proposed well would provide information to characterize the nature and extent of impacted groundwater that would reach production wells in the future.
- The location of the proposed well in relation to production wells in various parts of a well field and the contaminants detected in various production wells. The production wells in each of the well fields have varying amounts of contaminants detected, indicating that water flowing into the production wells comes from different portions of the surrounding aquifer system. Some of the proposed well sites were selected to provide data that may help in better understanding the flow of impacted groundwater toward, and into, different production wells.
- The location of the proposed well monitoring with respect to features such as landfills and artificial recharge areas. Some of the proposed well sites were located along groundwater flow lines downgradient of landfills or recharge areas and upgradient of the pumping well field.
- Locations of subsurface features such as faults that may affect groundwater flow paths. Data from a new well might help improve the understanding of the groundwater flow system and hydrogeology of the area.

Results of this review, and after adjustment of some of the locations, indicated that the new wells would supplement the existing monitoring well network for each of the production well fields and would have significant benefits in providing water quality and other data needed for development of this RI Update Report.

2.6.2.2 Final Recommended Drill Site Locations

Following selection of the preliminary well locations, field verification of each site was conducted in the first half of 2011. Based on field reconnaissance activities, there were site constraints that precluded some of the preliminary locations. As a result, an iterative process was used to identify appropriate locations and verify these sites in the field. Generally speaking, the field verification process included physically visiting each of the proposed drilling locations and evaluating the locations for their practicality for well installation and long-term groundwater monitoring.

Field reconnaissance allowed for the development and refinement of well locations that met the objective of the RI Update and minimized the impact to the community where practicable. Results of this work are reported in *Technical Memorandum No. 2: Recommended Drill Site Locations* (BC 2012). This technical memorandum provides the rationale behind each location and includes provisions for adjusting the proposed well locations in the field if new data became available or if the drilling contractor was unable to access the site.

2.6.2.3 Project Work Plan for Drilling and Well Installation

A work plan for drilling and well installation was developed in 2013. The work plan includes an overview of the drilling program and provides the final location for the wells and specific activities required for installation of the multi-level clustered groundwater monitoring wells, development of the wells, and initial sampling of the wells. A corresponding set of technical specifications (LADWP 2012) were also developed to guide the drilling contractor that contained design and technical well construction specifications.

The work plan is accompanied by a corresponding Quality Assurance Project Plan (QAPP) that was prepared in accordance with USEPA guidance for QAPPs (2002). Data quality objectives (DQOs) were established following the process set forth by USEPA (USEPA 2006). The DQOs for the monitoring well installation included the following:

- Provide hydrogeologic data for the aquifers and low permeability zones near LADWP well fields in the SFB
- Provide new groundwater monitoring points that will allow for collection of groundwater samples that are representative of groundwater conditions in areas where data gaps were identified

The Work plan and QAPP for the drilling program are included electronically in Appendix A.

2.6.2.4 Well Drilling and Installation

LADWP installed new groundwater monitoring wells at 26 locations to facilitate collection of necessary groundwater quality data and other supporting data on aquifer and hydrogeologic conditions. Of these wells, 15 were installed under the observation of BC, whereas the installation of the other 11 wells was overseen by the U.S. Army Corps of Engineers (USACE) and USEPA. Appendix A includes the GSIS Well Completion Report for the 15 wells observed by BC during installation and testing (Appendix A). All 26 new well locations are shown on Figure 2-3 and well construction details are summarized in Table 2-3. A brief summary of the well installation program and associated activities is provided herein.

- **Health and safety:** Field activities were conducted in accordance with the GSIS Health and Safety Plan (HASP) (BC 2013).

Table 2-3. Well Construction Details

Well ID	Zone 1 Monitoring Well/Piezometer							Zone 2 Monitoring Well/Piezometer						Zone 3 Monitoring Well/Piezometer					
	TOC Elevation (ft MSL)	Well Screen Depth (ft bgs)	Well Screen Elevation (ft MSL)	Transducer Depth (ft bgs)	ZIST Zone	ZIST Intake Depth (ft bgs)	Well Depth (ft bgs)	TOC Elevation (ft MSL)	Well Screen Depth (ft bgs)	Well Screen Elevation (ft MSL)	Transducer Depth	ZIST Intake Depth (ft bgs	Well Depth (ft bgs)	TOC Elevation (ft MSL)	Well Screen Depth (ft bgs)	Well Screen Elevation (ft MSL)	Transducer Depth	ZIST Intake Depth (ft bgs	Well Depth (ft bgs)
NH-MW-05	705.71	230 - 310	476 - 396	300	Zone 1a	250	320	705.68	490 - 530	216 - 176	300	510	540	705.62	700 - 740	6 - -33	300	720	750
NH-MW-07	692.90	210 - 290	483 - 403	275	Zone 1b	270	300	692.86	371 - 411	322 - 282	280	391	421	692.79	751 - 791	-57 - -97	280	771	801
NH-MW-08	731.01	230 - 310	502 - 422	300	Zone 1a	250	320	730.93	410 - 450	322 - 282	305	430	460	730.87	750 - 790	-17 - -57	305	770	800
NH-MW-09	765.26	320 - 400	446 - 366	350	Zone 1a	340	410	765.14	551 - 591	215 - 175	350	571	601	764.98	781 - 821	-14 - -54	350	801	831
NH-MW-10	775.35	280 - 360	496 - 416	350	Zone 1b	340	370	775.19	431 - 471	345 - 305	350	445	481	775.02	801 - 841	-24 - -64	350	821	851
NH-MW-11	720.79	260 - 340	461 - 381	330	Zone 1a	280	350	720.71	431 - 471	290 - 250	335	451	481	720.62	691 - 731	30 - -9	335	711	741
RT-MW-01	788.43	350 - 430	439 - 359	420	Zone 1a	370	440	788.34	610 - 650	179 - 139	425	630	660	788.29	760 - 800	29 - -10	425	780	810
RT-MW-02	809.14	350 - 430	460 - 380	420	Zone 1a	370	440	809.04	630 - 670	180 - 140	425	650	680	808.94	790 - 830	20 - -19	425	810	840
RT-MW-03	813.05	360 - 440	454 - 374	425	Zone 1a	380	450	812.92	550 - 590	264 - 224	430	570	600	812.86	740 - 780	74 - 34	430	760	790
RT-MW-05	786.74	320 - 400	467 - 387	390	Zone 1b	380	410	786.66	550 - 590	237 - 197	395	570	600	786.59	870 - 910	-82 - -122	395	890	920
RT-MW-06	767.78	290 - 370	479 - 399	360	Zone 1b	350	380	767.67	490 - 530	279 - 239	365	510	540	767.58	690 - 730	79 - 39	365	710	740
RT-MW-07	811.96	320 - 400	493 - 413	390	Zone 1b	380	410	811.89	490 - 530	323 - 283	395	510	540	811.81	750 - 790	63 - 23	395	770	800
RT-MW-08	843.42	380 - 460	464 - 384	437	Zone 1a	400	470	843.37	560 - 600	284 - 244	440	580	610	843.25	740 - 780	104 - 64	440	760	790
RT-MW-09	779.32	280 - 360	500 - 420	350	Zone 1b	340	370	779.17	540 - 580	240 - 200	355	560	590	779.09	780 - 820	0 - -39	355	800	830
RT-MW-10	838.79	380 - 460	459 - 379	420	Zone 1a	400	470	838.70	610 - 650	229 - 189	420	630	660	838.61	840 - 880	0 - -40	420	860	890

ft bgs = feet below the ground surface

ft MSL= feet above mean sea level

mm = millimeters

TOC = top of casing

All casing and screen are Schedule 80 PVC. All screen slots are 0.020". Monitoring wells are nominal 4-inch diameter and piezometers are nominal 1-inch diameter.

ZIST pumps mounted in receiver at top of screened interval. ZIST pump intakes are 20-feet below ZIST pump.

- **Pre-drilling activities:** These activities included permitting, notifying residents of construction, clearing the borehole location of utilities, and setting up for the drilling operation. The following permits were obtained for each site:
  - Los Angeles Bureau of Engineering “U” Permit
  - Los Angeles Bureau of Street Services Street Use Permit
  - Los Angeles Bureau of Engineering Peak-hour Exemption Permit
  - Los Angeles Bureau of Street Lighting Encroachment Permit
  - Los Angeles Police Department Variance from Noise Ordinance
  - Los Angeles County Well Drilling Permit
  - Los Angeles Department of Transportation approval of traffic plans
- **Air rotary casing hammer pilot-hole drilling:** The well completion report details equipment, methods, and procedures used during drilling. Each pilot borehole from ground surface to first groundwater was drilled using the air rotary casing hammer drilling method. A tri-cone button bit was used to advance the borehole ahead of the drive casing, and a drive casing was driven as the borehole advanced to support the borehole wall from collapse. Drill cuttings were carried to the surface by air traveling up through the borehole, discharged into a cyclone and collected in a portable bin staged adjacent to the borehole. Soil grab samples were collected in plastic bags at 10-foot intervals for lithologic characterization and screened using a photoionization detector for total VOCs. Once groundwater was encountered, the borehole was advanced approximately 10 to 20 feet below the groundwater table and collection of an in situ groundwater sample was attempted using a Simulprobe™ sampling tool (see bullet on Groundwater Sampling and Results).
- **Conductor casing, sanitary seal installation:** The collection of the water table groundwater grab sample marked the end of air rotary drilling, and the site was prepared for direct mud rotary drilling. A bentonite-based drilling mud was prepared and used for pilot borehole stability during subsequent phases of work. The drive casing was removed from the borehole, and the borehole was reamed to 26 inches in diameter using the direct mud rotary drilling method to a depth of approximately 50 feet below ground surface (bgs) using a two-stage tri-cone reaming bit. The conductor casing for each site is 50 feet in length with an outside diameter of 20 inches and a wall thickness of 0.25 inch, and was manufactured from low-carbon (mild) steel.

  After the conductor casing was lowered into the borehole, a cement/bentonite slurry was used to fill the annular space and create a sanitary seal between the conductor casing and borehole wall. The cement slurry was allowed to cure a minimum of 12 hours prior to any subsequent drilling activities.
- **Mud rotary pilot hole drilling:** Following construction of the conductor casing, the drilling method was converted to direct mud rotary for the remainder of the pilot borehole. This method used the same drilling bit and drill pipe that was used during the air rotary casing hammer drilling. Drill cuttings were carried up through the borehole by the circulating mud and discharged into a desilter/desander where the cuttings were separated from the drilling mud. The soil cuttings were collected in the portable cuttings collection bin and the mud was re-circulated back into the borehole and conditioned, as necessary, to meet the drilling mud specifications. During mud rotary drilling, soil and groundwater samples were attempted with a Simulprobe™ at regular intervals for lithologic, geotechnical, and chemical analysis.

- **Geophysical logging:** Once the pilot borehole reached total depth, approximately 900 feet, a suite of geophysical logs were run on the entire depth of the pilot borehole at each site, including:
  - Electric log consisting of:
    - Spontaneous potential
    - 16-inch short normal resistivity
    - 64-inch long normal resistivity
  - Gamma ray
  - Laterolog 3 resistivity
  - Spectral gamma ray
  - Sonic velocity/variable density
  - Caliper
  - Gyroscopic deviation/direction
- **Soil sampling and results:** Soil samples were collected throughout the entire length of the pilot borehole to assist in verifying the waste classification of soil and to evaluate both the physical and chemical properties of the subsurface materials at each site. As previously described, samples were collected at regular intervals for lithologic, geotechnical, and chemical analysis. The soil samples were analyzed and characterized using the Unified Soil Classification System and the Munsell Soil Color Charts.
  - **Soil sampling in the unsaturated zone** consisted of collecting both grab samples of drill cuttings for lithologic description and VOC screening, and collection of undisturbed soil samples for both chemical and geotechnical analysis.
  - **Soil sampling in the saturated zone** consisted of collecting both grab samples of drill cuttings for lithologic description and VOC screening, and collection of undisturbed soil samples for lithologic description and geotechnical analysis.
  - **Geotechnical samples** were analyzed for (see Table 2-4 for results):
    - Fraction of organic carbon (F_{oc}) (Walkley-Black)
    - Bulk density (API RP40)
    - Porosity: total, air, water (API RP40/American Society for Testing and Materials [ASTM] D2216)
    - Porosity: effective (ASTM D425M)
    - Grain size analysis (ASTM D422/D4464)
    - Hydraulic conductivity: vertical and horizontal
    - Effective permeability (API RP40)

Table 2-4 . Geotechnical Sample Results for Soils

Site	Depth	Walkley-Black		API RP 40				ASTM D422/D4464M									API RP 40; EPA 9100 [a]							ASTM D425 (Modified API RP 40)	
		Total Organic Carbon	Fraction Organic Carbon	Density	Porosity			Mean Grain Size Description	Median Grain Size	Particle Size Distribution (% by weight)							Vertical Hydraulic Conductivity 25 psi Confining Stress			Horizontal Hydraulic Conductivity 25 psi Confining Stress				Drainage (Effective) Porosity	
				Dry Bulk	Total	Air-filled	Water-filled			Gravel	Sand Size			Silt	Clay	Silt & Clay	Effective Permeability to Water	Hydraulic Conductivity	Intrinsic Permeability to Water	Effective Permeability to Water	Hydraulic Conductivity	Hydraulic Conductivity	Intrinsic Permeability to Water	Total Porosity	Effective Porosity
	ft bgs	mg/kg	g/g	g/cc	%Vb				mm		Coarse	Medium	Fine				millidarcy	cm/s	cm2	millidarcy	cm/s	ft/day	cm2	%Vb	
NH-MW-05	190	190	1.90E-04	1.51	45.4	38.2	7.2	Fine sand	0.300	0	0	38	47	13	2	15	1,510	1.45E-03	1.49E-08	658	6.53E-04	1.85	6.50E-09	37.1	31.6
	263	1150	1.15E-03	0.32	88.4	14.8	73.6	Coarse sand	1.367	34	8	30	19	--	--	10	2.46	2.42E-06	2.43E-11	3.49	3.48E-06	0.01	3.45E-11	62.6	17.7
	461	<100	<1.00E-04	1.46	46.2	20.7	25.5	Fine sand	0.052	0	0	12	29	48	12	59	3.36	3.24E-06	3.31E-11	6.02	5.91E-06	0.02	5.95E-11	37.1	15.5
	660	120	1.20E-04	1.60	40.8	11.8	29.0	Fine sand	0.209	0	0	18	58	20	3	23	149	1.50E-04	1.47E-09	198	2.01E-04	0.57	1.95E-09	38.5	30.7
NH-MW-07	170	380	3.80E-04	1.48	45.0	12.3	32.7	Silt	0.032	0	0	10	20	60	11	71	19.9	1.99E-05	1.96E-10	65.6	6.52E-05	0.18	6.48E-10	45.3	29.8
	230	420	4.20E-04	1.89	29.9	8.8	21.0	Gravel	4.338	48	13	23	10	--	--	5	104	1.04E-04	1.02E-09	75.5	7.50E-05	0.21	7.45E-10	26.4	19.5
	507	250	2.50E-04	1.63	39.6	8.1	31.5	Fine sand	0.144	0	0	25	39	31	4	36	41.6	4.09E-05	4.11E-10	83.8	8.31E-05	0.24	8.27E-10	36.8	19.1
NH-MW-08	230	130	1.30E-04	1.48	44.7	8.9	35.7	Silt	0.027	0	0	1	18	64	17	81	3.34	3.33E-06	3.29E-11	2.45	2.40E-06	0.01	2.42E-11	41.7	15.4
	310	220	2.20E-04	1.46	46.3	27.7	18.6	Medium sand	0.333	3	3	36	45	--	--	13	1,630	1.61E-03	1.61E-08	1,560	1.52E-03	4.31	1.54E-08	34.7	30.2
	456	<100	<1.00E-04	1.73	36.9	11.5	25.4	Fine sand	0.186	0	0	33	33	29	5	34	13.1	1.32E-05	1.29E-10	28.7	2.84E-05	0.08	2.84E-10	34.3	23.1
	457	250	2.50E-04	1.66	39.8	16.9	23.0	Fine sand	0.185	0	0	30	39	27	5	31	130	1.31E-04	1.29E-09	64.4	6.34E-05	0.18	6.35E-10	36.1	26.6
	757	210	2.10E-04	1.78	33.5	13.7	19.8	Fine sand	0.054	0	0	17	27	41	15	56	3.95	3.90E-06	3.90E-11	3.36	3.31E-06	0.01	3.32E-11	36.3	15.9
NH-MW-09	280	210	2.10E-04	1.74	37.9	6.0	31.9	Fine sand	0.138	0	0	21	47	29	3	31	73.5	7.30E-05	7.26E-10	83.3	8.27E-05	0.23	8.22E-10	35.4	26.8
	360	1050	1.05E-03	1.45	46.1	8.3	37.8	Gravel	1.965	37	12	28	17	--	--	5	4.77	4.70E-06	4.71E-11	4.11	4.11E-06	0.01	4.05E-11	27.0	22.4
	590	230	2.30E-04	1.49	44.6	11.7	33.0	Silt	0.007	0	0	0	4	58	38	96	4.52	4.51E-06	4.46E-11	8.63	8.75E-06	0.02	8.52E-11	45.3	20.0
	640	660	6.60E-04	1.54	43.0	8.6	34.4	Silt	0.034	0	0	0	21	68	11	79	3.66	3.65E-06	3.61E-11	2.66	2.69E-06	0.01	2.63E-11	36.6	12.8
NH-MW-10	266	230	2.30E-04	1.71	39.0	8.2	30.8	Fine sand	0.207	0	0	33	44	21	2	23	131	1.28E-04	1.29E-09	118	1.17E-04	0.33	1.17E-09	34.8	26.5
	327	200	2.00E-04	1.68	38.9	9.8	29.1	Silt	0.045	0	0	5	28	58	8	66	29.5	2.91E-05	2.91E-10	22.9	2.26E-05	0.06	2.26E-10	43.6	24.1
	400	230	2.30E-04	1.46	45.6	24.1	21.4	Medium sand	0.659	1	11	52	27	--	--	9	6,390	6.25E-03	6.30E-08	584	5.77E-04	1.64	5.76E-09	33.6	29.7
	866	350	3.50E-04	1.73	36.0	6.7	29.3	Fine sand	0.071	0	0	14	35	42	9	51	7.63	7.50E-06	7.53E-11	16.2	1.61E-05	0.05	1.60E-10	32.6	18.3
NH-MW-11	372	150	1.50E-04	1.70	41.3	14.9	26.4	Medium sand	0.553	3	6	52	33	--	--	6	4,440	4.50E-03	4.38E-08	6,670	6.73E-03	19.08	6.58E-08	32.3	27.7
	500	140	1.40E-04	1.47	44.8	14.4	30.4	Silt	0.027	0	0	1	20	64	15	79	3.27	3.27E-06	3.22E-11	3.73	3.65E-06	0.01	3.69E-11	46.5	15.0
	693	<100	<1.00E-04	1.60	39.7	17.3	22.4	Gravel	0.890	33	5	27	27	--	--	8	690	6.90E-04	6.81E-09	18.0	1.83E-05	0.05	1.77E-10	30.8	25.1
RT-MW-01	302	100	1.00E-04	1.55	42.6	15.1	27.5	Medium sand	0.416	0	0	50	37	11	2	13	534	5.18E-04	5.27E-09	386	3.89E-04	1.10	3.81E-09	34.2	28.6
	655	130	1.30E-04	1.40	48.2	9.7	38.5	Silt	0.032	0	0	1	19	69	12	81	3.97	3.98E-06	3.92E-11	15.8	1.60E-05	0.05	1.56E-10	46.3	16.9
	830	140	1.40E-04	1.70	36.8	6.5	30.3	Fine sand	0.064	0	0	14	32	45	8	54	25.4	2.53E-05	2.51E-10	32.5	3.18E-05	0.09	3.21E-10	34.2	18.2
RT-MW-02	675	<100	<1.00E-04	1.70	36.0	9.5	26.5	Medium sand	0.554	7	11	38	31	--	--	12	590	5.72E-04	5.82E-09	1,520	1.49E-03	4.22	1.50E-08	29.7	24.2
	846	190	1.90E-04	1.62	39.8	14.5	25.2	Fine sand	0.147	0	0	27	36	30	7	37	10.7	1.04E-05	1.06E-10	6.34	6.24E-06	0.02	6.26E-11	30.4	14.9
RT-MW-03	330	<100	<1.00E-04	1.64	39.3	18.1	21.2	Medium sand	0.544	11	8	40	35	--	--	6	872	8.38E-04	8.61E-09	838	8.20E-04	2.32	8.27E-09	13.3	8.9
	613	130	1.30E-04	1.48	44.5	10.8	33.7	Silt	0.042	0	0	1	27	64	8	72	1.39	1.36E-06	1.37E-11	21.2	2.08E-05	0.06	2.09E-10	42.1	16.3
	695	140	1.40E-04	1.51	43.1	24.3	18.8	Medium sand	0.665	5	11	46	30	--	--	8	4,010	3.97E-03	3.96E-08	4.75	4.83E-06	0.01	4.69E-11	32.3	26.0
RT-MW-05	280	140	1.40E-04	1.62	42.7	28.7	13.9	Medium sand	0.343	8	6	30	46	--	--	10	391	3.95E-04	3.86E-09	222	2.15E-04	0.61	2.19E-09	29.7	24.7
	621	<100	<1.00E-04	1.60	40.6	12.8	27.8	Fine sand	0.090	0	0	13	42	38	7	45	28.1	2.82E-05	2.78E-10	23.2	2.36E-05	0.07	2.29E-10	30.9	18.8
	900	120	1.20E-04	1.63	39.1	11.1	28.0	Fine sand	0.253	0	0	31	46	20	3	24	258	2.57E-04	2.54E-09	109	1.11E-04	0.31	1.07E-09	34.7	26.2

Table 2-4 . Geotechnical Sample Results for Soils

Site	Depth	Walkley-Black		API RP 40				ASTM D422/D4464M									API RP 40; EPA 9100 [a]							ASTM D425 (Modified API RP 40)	
		Total Organic Carbon	Fraction Organic Carbon	Density	Porosity			Mean Grain Size Description	Median Grain Size	Particle Size Distribution (% by weight)							Vertical Hydraulic Conductivity 25 psi Confining Stress			Horizontal Hydraulic Conductivity 25 psi Confining Stress				Drainage (Effective) Porosity	
				Dry Bulk	Total	Air-filled	Water-filled			Gravel	Sand Size			Silt	Clay	Silt & Clay	Effective Permeability to Water	Hydraulic Conductivity	Intrinsic Permeability to Water	Effective Permeability to Water	Hydraulic Conductivity	Hydraulic Conductivity	Intrinsic Permeability to Water	Total Porosity	Effective Porosity
	ft bgs	mg/kg	g/g	g/cc	%Vb				mm		Coarse	Medium	Fine				millidarcy	cm/s	cm2	millidarcy	cm/s	ft/day	cm2	%Vb	
RT-MW-06	320	240	2.40E-04	1.60	39.9	16.1	23.8	Gravel	1.729	46	3	24	21	--	--	6	2,260	2.25E-03	2.23E-08	620	6.11E-04	1.73	6.12E-09	27.5	20.9
	540	290	2.90E-04	1.59	40.2	17.9	22.2	Fine sand	0.309	0	0	43	29	23	6	28	1,650	1.64E-03	1.63E-08	637	6.47E-04	1.83	6.28E-09	34.9	25.6
	690	240	2.40E-04	1.71	35.5	12.0	23.6	Medium sand	0.734	0	0	66	19	12	3	15	414	4.18E-04	4.09E-09	544	5.53E-04	1.57	5.37E-09	31.6	24.9
RT-MW-07	360	<100	<1.00E-04	1.47	45.1	30.9	14.1	Medium sand	0.400	4	8	36	45	--	--	7	262	2.57E-04	2.59E-09	988	9.70E-04	2.75	9.75E-09	32.8	27.4
	455	150	1.50E-04	1.51	43.9	13.5	30.4	Medium sand	0.497	17	8	27	33	--	--	14	107	1.06E-04	1.06E-09	128	1.26E-04	0.36	1.26E-09	39.1	24.9
	600	120	1.20E-04	1.35	50.5	25.8	24.8	Medium sand	0.388	0	0	48	34	15	3	18	60.2	5.95E-05	5.95E-10	38.5	3.77E-05	0.11	3.80E-10	45.5	28.7
	750	120	1.20E-04	1.49	44.3	17.0	27.3	Fine sand	0.083	0	0	12	41	41	5	47	960	9.51E-04	9.48E-09	129	1.27E-04	0.36	1.28E-09	39.0	32.4
RT-MW-08	374	320	3.20E-04	1.87	29.8	8.1	21.8	Gravel	1.740	31	14	36	15	--	--	4	21.6	2.17E-05	2.13E-10	3,480	3.46E-03	9.80	3.44E-08	28.4	19.8
	550	200	2.00E-04	1.71	36.3	17.5	18.8	Medium sand	1.184	19	18	33	24	--	--	7	981	9.73E-04	9.68E-09	109	1.08E-04	0.31	1.07E-09	33.2	27.5
	745	170	1.70E-04	1.60	40.7	19.4	21.3	Medium sand	0.674	2	13	49	27	--	--	9	1,440	1.42E-03	1.42E-08	639	6.37E-04	1.81	6.31E-09	34.8	26.2
	845	110	1.10E-04	1.54	43.1	9.6	33.6	Fine sand	0.083	0	0	7	47	41	6	46	73.1	7.29E-05	7.21E-10	23.6	2.36E-05	0.07	2.33E-10	45.4	30.1
RT-MW-09	280	<100	<1.00E-04	1.61	41.3	26.6	14.7	Medium sand	0.481	5	7	44	40	--	--	5	4,160	4.12E-03	4.10E-08	3,720	3.74E-03	10.60	3.67E-08	27.9	24.0
	430	190	1.90E-04	1.70	36.4	9.0	27.4	Fine sand	0.230	0	0	39	32	25	5	29	45.1	4.42E-05	4.45E-10	61.1	6.17E-05	0.17	6.03E-10	33.5	16.9
	590	160	1.60E-04	1.46	45.8	17.8	28.0	Fine sand	0.066	0	0	9	37	47	6	54	30.2	3.00E-05	2.98E-10	20.2	2.05E-05	0.06	1.99E-10	41.8	23.5
RT-MW-10	570	<100	<1.00E-04	1.65	38.9	13.4	25.5	Medium sand	0.549	7	8	42	34	--	--	8	1,440	1.40E-03	1.42E-08	937	9.25E-04	2.62	9.24E-09	31.8	27.0
	790	180	1.80E-04	1.53	43.0	11.2	31.8	Fine sand	0.070	0	0	13	36	41	10	51	4.19	4.19E-06	4.14E-11	6.90	6.98E-06	0.02	6.81E-11	33.9	16.6

% = percent
%Vb = percent of bulk volume
bgs = below ground surface
cc + cubic centimeter
cm = centimeter
cm/s = centimeter per second
ft = feet
g = gram
mg/kg = milligrams per kilogram
mm = millimeters
psi = pounds per square inch
API RP = American Petroleum Institute
ASTM = American Society for Testing and Materials
EPA = Environmental Protection Agency
< less than laboratory reporting limit
> mechanical sieve analysis only; silt and clay fraction reported together
[a] these results are highly subject to method of preparation and condition of the original sample and may not represent in-situ aquifer conditions.

- **Groundwater sampling and results:** Groundwater sampling was attempted during the drilling of the pilot borehole as a screening-level tool to help delineate the vertical distribution of chemicals within the aquifer and to aid in the selection of the number and depth of well casings at each site using a Simulprobe™ sampling device. Though a total of 191 Simulprobe™ sampling attempts were made during the drilling of the pilot boreholes, only 53 resulted in the collection of a complete or partial set of groundwater samples because of difficult conditions such as cobbles or cemented formational materials. The samples that were collected were analyzed as follows (in order of priority):
  - VOCs
  - Cr(VI)
  - Perchlorate
  - 1,4-dioxane
- **Field data quality (quality assurance/quality control):** Quality Assurance / Quality Control (QA/QC) samples were collected during the field program per the QAPP and included equipment blanks, field duplicates, method blanks, and trip blanks. Established protocols were adhered to during collection of field data, and no data were rejected or otherwise qualified based on the results.
- **Zone testing:** Isolated zone testing was performed at one site (RT-MW-02) because of lack of sufficient Simulprobe™ data to assist in the proper screen depth interval.
- **Well design:** Upon completion and review of the pilot boring and geophysical logging, well designs were finalized in accordance with the Well Specifications (LADWP 2012). In general, the screen intervals were selected to evaluate vertical distribution and extent of contamination at the selected area, and to allow for monitoring of the groundwater from the primary permeable units that would contribute to the well field. Where available, the following data were used to support the screen depth intervals and reamed borehole depth:
  - Analytical results of the Simulprobe™ soil and groundwater samples
  - Soil boring logs based on soil cuttings and split spoon samples
  - Geophysical logs
  - Representative soil grab samples
  - Existing boring logs, geophysical logs, geologic/hydrogeologic cross-sections, groundwater elevation data, and analytical data from wells in close proximity to the subject well

  Table 2-3 provides individual well design details.
- **Well construction:** The well construction process included backfilling and reaming the borehole, assessing the diameter and alignment of the borehole, and installation of the casings and backfill materials. Again, all activities were performed in accordance with the Well Specifications (LADWP 2012).
- **Well development:** Well development included bailing, swabbing, pumping, and post-development sampling.
- **Alignment survey:** All wells were found to satisfy alignment specifications based on the alignment surveys.
- **Video survey:** Video surveys of each well were conducted, and all wells were found to be either free of any major defects and damage, or were repaired in accordance with approved submittals, as was the case for two zones.

- **Well disinfection**: The initial video surveys showed bacterial growth in many of the wells; therefore, each well casing underwent a disinfection process to destroy any live bacteria from the well casing, filter pack, and near well formation. The primary disinfecting agent applied at each well casing was a 12.5 percent solution of sodium hypochlorite. Additionally, LBA™ was used in NH-MW-11 to test its effectiveness at treating bacterial growth.
- **ZIST™ installation:** The Zone Isolation Sampling Technology™ (ZIST) sampling system developed by BESST, Inc. was selected by LADWP for installation into the monitoring wells as a dedicated long-term sampling system. Installation of this system in the GSIS wells is described in the GSIS Well Completion Report (Appendix A).
- **Well survey:** Well casing coordinates and elevations were surveyed by an LADWP licensed surveyor. The survey coordinate system is California Coordinate System 1983, and the vertical datum is North America Vertical Datum 1988.
- **Site restoration**: Each well site was restored to its pre-construction condition.
- **Waste handling**: All investigative-derived waste (IDW) and associated waste disposal activities were managed by LADWP with assistance from Weston, Inc. and its subcontractor KVAC Environmental, Inc. Wastes generated during the pilot borehole drilling, reaming, and initial development activities consisted of soil cuttings and drilling mud. These materials were contained in 20-cubic-yard roll-off bins, which, when full, were transported to a temporary staging facility at the Tujunga Spreading grounds until they could be profiled and disposed appropriately. All fluids generated during the development process were temporarily stored on site in 20-cubic-yard roll-off bins, which, when full, were emptied into vacuum trucks and then delivered to the Tujunga Spreading Grounds where LADWP and Weston staged, tested, and disposed of the fluids in accordance with appropriate National Pollutant Discharge Elimination System (NPDES) permit requirements.

2.6.3 Groundwater Sampling

With the data gap being filled with regard to the distribution of wells, the second data gap included an assessment of water quality. Past monitoring efforts in the SFB, specifically the monitoring performed by USEPA and by LADWP of its production wells, were only for specific chemicals that were identified as a potential concern in those areas or, in the case of LADWP, for delivery of water. As part of the GSIS, an expanded list of analytes was developed that included additional analytes such as pesticides, pharmaceuticals, radionuclides, and other various organic and inorganic compounds. In addition, the data went through rigorous data validation to ensure a defensible data set to properly evaluate future risk. This sampling was performed to provide a comprehensive baseline assessment of groundwater quality for determination of appropriate and long-term remedial goals.

GSIS RI Update groundwater sampling efforts consisted of:

- GSIS 2012/2013 sampling of existing, strategic monitoring wells and production wells
- GSIS 2014 sampling of new GSIS multi-level monitoring wells

A Sampling and Analysis Plan (SAP) was prepared for the GSIS 2012/2013 groundwater sampling event that included both a Field Sampling Plan (FSP) and corresponding QAPP. An Addendum to this SAP was prepared for the 2014 groundwater sampling event to reflect evolving field investigation activities. The two GSIS groundwater sampling events were guided by the following DQOs:

- What contaminants are present near the TJ, North Hollywood East (NHE), NHW, and RT well fields above their respective regulatory limit (e.g., MCLs)?

- Are there additional unknown areas of groundwater contamination in the SFB within the well fields?
- Based on the results of the monitoring, is further investigation required (e.g., installation or sampling of more wells) or can the monitoring programs be refined?

Collectively, the SAP and its Addendum (Appendices B and C) ensured that groundwater sample collection activities were conducted in accordance with technically acceptable protocols and that data collected met the established DQOs. Copies of the SAP and SAP Addendum are included in Appendices B and C of this report, respectively.

2.6.3.1 GSIS 2012/2013 Groundwater Sampling of Existing Wells

This section summarizes 2012/2013 groundwater sampling conducted as outlined in the SAP (Appendix B). A report (2012/2013 Groundwater Monitoring Report [GWMR]) was prepared that provides a data summary for the sampling event, and this report is provided as Appendix B. The results from this sampling event are presented in Section 4.2 of this report.

The 2012/2013 sampling event focused on existing wells. The sampling event occurred between October 10, 2012, and February 8, 2013, with a supplemental sampling event on June 17 and 20, 2013. Sixty-seven wells and 76 sampling intervals were monitored as part of this event. Details and a breakdown of the wells sampled include the following:

- The primary sampling event was performed between October 10, 2012, and February 8, 2013, and included the following wells:
  - 27 active and 4 non-active production wells, for a total of 31 production wells
  - 3 Westbay System monitoring wells with a total of 6 sampling intervals
  - 4 Barcad System monitoring wells with a total of 10 sampling intervals
  - 29 conventional monitoring wells maintained by both USEPA and LADWP.
- Two additional conventional monitoring wells (TJ-MW-09-580 and TJ-MW-09-850) were added to the monitoring schedule and were sampled on June 17 and 20, 2013

Attempts to sample three additional production wells, two Barcad intervals, and one Westbay interval were unsuccessful.

Sampling Methodology

An overview of sampling methodology is summarized below. Procedures were implemented in accordance with the SAP and are documented in the 2012/2013 GWMR (Appendix B).

- **Pre-field activity coordination:** Prior to the start of sampling, all of the wells were evaluated to determine specific requirements for traffic control, access, and potential health and safety concerns, including overhead wires near wells where pumps would be installed or removed.
- **Health and safety:** The project-specific HASP was updated to include the installation and removal of pump equipment and sampling activities. Field activities were conducted in accordance with the HASP (BC 2013).
- **Well purging:** Well purging and sampling generally followed the procedures presented in the SAP. In general, monitoring wells were purged of three well volumes prior to sampling with conventional sampling systems. For low-flow sampling (grab sampling) using the Westbay or Barcad sampling systems, LADWP standard procedure does not involve purging the monitoring well prior to sampling. Sampling of active production wells involved confirmation that the well was in operation prior to sampling, and that a volume greater than or equivalent to three well volumes was removed.

- **Field parameters:** During the sampling of all the wells, the following field parameters were collected:
  - Dissolved oxygen (DO)
  - Oxidation-reduction potential
  - Temperature
  - pH
  - Turbidity
- **Well sampling:** Groundwater sampling was conducted in accordance with the SAP (Appendix B), whereby specific procedures were defined for the following well types:
  - Active production wells
  - Inactive production wells
  - Westbay monitoring wells
  - Barcad monitoring wells
  - Conventional monitoring wells
- **Waste handling:** Investigative-derived waste generated during sampling included purge water from the wells along with relatively minor amounts of decontamination water generated between Barcad sampling intervals.

Quality Assurance and Quality Control

The SAP provided a summary of the analytical methods and types of field quality control (QC) samples to be collected. The laboratory QC samples and calibration requirements for each method are summarized in the SAP (Appendix B). All deviations (corrections, changes, and additions) from these requirements are summarized in Table 4-1 of the 2012/2013 GWMR (Appendix B).

For the 2012/2013 groundwater sampling event, laboratory analyses were performed in accordance with the planning documents prepared for the project in order to achieve the established DQOs. The 2012/2013 GWMR presents detailed laboratory analysis results for this GSIS sampling event. Section 4 of the 2012/2013 GWMR provides a detailed discussion of QA/QC for this sampling event. A brief overview of QA/QC is provided below.

Weck Laboratories (Weck) provided results in Portable Document Format (PDF) reports as follow:

- **Level 2 laboratory reports:** includes a summary of results by sample and by method and the results of batch QC samples (e.g., method blanks, laboratory control samples [LCSs], and matrix spike/matrix spike duplicates [MS/MSD])
- **Level 3 laboratory reports:** includes summaries of initial calibration and continuing calibration verification (CCV) data, batch QC samples, and additional method-specific QC results (e.g., instrument tuning data, internal standard recoveries; Endrin/dichloro-diphenyl-trichloroethane [DDT] breakdown check)
- **Level 4 laboratory reports:** includes instrument raw data needed to perform an independent recalculation of sample results or recoveries from LCS and MS/MSD

Data Validation. Stage 2B data validation was conducted on 100 percent of the analytical data generated as described in Section 4.3.1 of the SAP and in Section 4.3 of the 2012/2013 GWMR, both included in Appendix B. Briefly, the following were evaluated during Stage 2B:

- Sample receipt conditions and holding times
- All applicable blank data (method blanks, field blanks, calibration blanks)

- Laboratory duplicates, laboratory control samples, matrix spike/matrix spike duplicates against laboratory-specific control limits
- Initial calibration and continuing calibration data against method criteria
- Surrogate recoveries against laboratory-specific control limits
- Other method-specific criteria

The data were classified as one of the following:

- Acceptable for use without qualifications
- Acceptable for use with qualifications
- Unacceptable for use (i.e., rejected)

Data flags and the reason for each flag were entered into an electronic database. Final flags were applied to the data after evaluating all flags assigned by the data validators. A summary of all qualified data, and the reason for qualification ("Reason Code") can be found in the 2012/2013 GWMR.

A total of 2,842 results (or 9.7 percent of the data) were flagged because one or more field sample result or laboratory QC or calibration sample result was outside control limits. Only eight results (or 0.03 percent of all data) were rejected. Based on the data validation and evaluation of the data for precision, accuracy, representativeness, completeness, comparability, and sensitivity, the data collected during this event meet the GSIS DQOs.

In addition to the 100-percent Stage 2B validation, the calculation of the result or recovery from an LCS or matrix spike was verified with the raw instrument data, starting with the initial calibration data, with the exceptions noted in Section 4 of the 2012/2013 GWMR.

Data Quality. Data quality was evaluated by considering precision, accuracy, representativeness, completeness, comparability, and sensitivity of the environmental samples and laboratory data reported. The definition for each field QC sample is provided in Section 4.1.4 of the SAP, and the definition for each laboratory QC sample and calibration standard is provided in Section 4.1.5 of the SAP. All qualified data are summarized in Table 4-3 of Appendix B.

- **Precision** was evaluated based on the results of QC samples collected by the field team and QC samples that originated in the laboratory. The relative percent differences (RPDs) calculated using the results of field duplicate pairs, laboratory duplicate pairs, LCS/LCSD pairs, and MS/MSD pairs provide information on the precision of sampling and analytical procedures. The relative standard deviations (RSDs) in the initial calibrations and percent differences or deviations in the continuing calibration verifications are reviewed for analytical precision. All field sample results associated with calibration or QC samples that did not meet criteria for precision were qualified in accordance with Section 4.3.1 of the SAP and are summarized in Table 4-3 of Appendix B.
- **Accuracy** in the laboratory is measured in percent recoveries (%Rs) of surrogates added to primary and field duplicate samples and target analytes added to LCS/LCSD and MS/MSD pairs. Initial calibration verifications (ICV) (also referred to as QC samples) and internal standard relative intensities were also evaluated as a measurement of laboratory accuracy. Interference check samples (ICS) are analyzed to evaluate the instrument's ability to overcome interference. All field samples associated with QC samples that did not meet criteria for accuracy were qualified in accordance with the SAP, as presented in Table 4-3 of Appendix B.

- **Representativeness** was evaluated quantitatively through the analysis of blank samples and evaluation of sample receipt conditions, and qualitatively through sample design and implementation. Through the individual evaluation of wells, use of the DQO process and limited gaps in the execution of the SAP, the sampling event was representative and appropriate for meeting project objectives.
- **Completeness** is calculated for each method. Completeness is defined as the number of valid results (i.e., those not rejected) divided by the total number of possible results. Of the 29,376 results generated for primary samples (i.e., does not include field duplicate samples), 8 results were rejected. Thus, the percent completeness is 99.97.
- **Comparability** was achieved by using established sampling procedures and published analytical methodology wherever possible and reporting results in standard units. In addition, data collected during this event, including the distribution of COPCs, are similar to historical monitoring in the SFB, so results are comparable to the historical information and trends.
- **Analytical sensitivity** is achieved by analyzing a low-level continuing calibration (LLCCV) (also referred to as the method reporting limit [MRL] check) with each analytical batch. The LLCCV or MRL check is spiked at the reporting limit. All recoveries were within the method- and laboratory-specified control limits with the exceptions noted in Table 4-3 of Appendix B.

2.6.3.2 GSIS 2014 Groundwater Sampling of New Monitoring Wells

This section summarizes the 2014 groundwater sampling conducted as outlined in the GSIS SAP Addendum (Appendix C). A report (2014 GWMR) was prepared that provides a data summary for the sampling event (Appendix C).

The 2014 sampling event focused on new monitoring wells installed during 2013/2014 as presented in Section 2.6.2. The sampling event occurred between June and October 2014. A total of 25 new wells with 75 sampling intervals and 2 existing monitoring wells were sampled as part of this event. For this sampling event, well names reference the location, and sampling intervals refer to the number of casings at that location from which samples were collected. The newly installed wells have three separate casings represented as Zones 1, 2, and 3, whereby each zone is represented by a different casing with increasing depth from the ground surface downward. Details and a breakdown of the wells sampled include the following:

- Six wells and 18 intervals were sampled from the TJ well field as part of this study. These wells were all sampled using the ZIST sampling system.
- In addition to the six wells sampled as part of this event from the TJ well field, data from two additional wells (TJ-MW-08 and TJ-MW-10) are included in this report. The wells were sampled in May 2014 as part of USACE well installation activities.
- Seven wells and 21 intervals were sampled from the NHW well field. All of the NHW wells were sampled using a conventional sampling system.
- Ten wells and 30 intervals were sampled from the RT well field. All of the RT wells were sampled using a conventional sampling system, with the exception of RT-MW-04, which was sampled using the ZIST system.
- Two existing wells were added to the sampling plan for this event (4909C and EV-10). These conventional monitoring wells were sampled using submersible pumps.

Sampling Methodology

An overview of sampling and analysis methodology is summarized below. Because activities such as pre-field coordination, health and safety, well purging, and field parameters were similar to those presented in Section 2.6.4.1.1, they are not repeated in this section of the report. Procedures were implemented in accordance with the SAP and its Addendum (Appendix C) and are documented in the 2014 GWMR in Appendix C.

- **Well sampling**: A total of 18 wells and 50 sampling intervals were sampled using a conventional purging system. The sampling of these wells generally occurred at the completion of well development, because a decontaminated submersible pump was already installed in the wells. The purging of the wells generally included pumping each of the sampling intervals simultaneously until three purge volumes were removed. The sampling was then completed from a manifold at the wellhead. At the end of sampling the submersible pumps were removed from the wells, decontaminated, and inserted into a new well for development.

  Seven wells and 21 sampling intervals were sampled using the ZIST system. Because this event was performed as the monitoring wells were being completed, sampling using the ZIST system was performed during the completion of performance testing of the system after installation. Because BESST Inc. was performing the testing, it set up the system and supplied the materials to perform the sampling including the nitrogen tanks, tubing, sampling manifold, and waste capture and disposal. Similar to the conventional sampling, all three casings at the new well sites were purged and sampled simultaneously using the ZIST system. ZIST wells were sampled by the low flow method. Therefore, samples were collected after field parameters stabilized during purging. The ZIST system was operated using compressed-nitrogen tanks and a specially designed flow regulator. A minimal flow rate (100 to 200 milliliters per minute) was maintained during purging and sampling.
- **Waste handling**: IDW generated during this sampling event included purge water from the wells along with relatively minor amounts of decontamination water generated between sampling of wells where submersible pumps were used.

Quality Assurance and Quality Control

The SAP and its Addendum (Appendices B and C) provided a summary of the analytical methods and types of field QC samples to be collected. The laboratory QC samples and calibration requirements for each method are summarized in the SAP. All deviations (corrections, changes, and additions) from these requirements are summarized in Table 4-1 of the 2014 GWMR (Appendix C).

For the 2014 groundwater sampling event, laboratory analyses were performed in accordance with the planning documents prepared for the project in order to achieve the established DQOs. The 2012 GWMR presents detailed laboratory analysis results for this GSIS sampling event. Section 4 of the 2014 GWMR provides a detailed discussion of QA/QC for this sampling event (Appendix C). A brief overview of QA/QC is provided below.

Weck Laboratories provided results in PDF reports as follow:

- **Level 2 laboratory reports**: includes a summary of results by sample and by method and the results of batch QC samples (e.g., method blanks, laboratory control samples and matrix spike/matrix spike duplicates)
- **Level 3 laboratory reports**: includes summaries of initial calibration and CCV data, batch QC samples, and additional method-specific QC results (e.g., instrument tuning data, internal standard recoveries; Endrin/dichloro-diphenyl-trichloroethane breakdown check)

- **Level 4 laboratory reports:** includes all of the data submitted in a Level 3 report and instrument raw data needed to perform an independent recalculation of sample results or recoveries from LCS and MS/MSD

Data Validation. Stage 2B data validation was conducted on 100 percent of the analytical data generated as described in Section 4.3.1 of the SAP and in Section 4.3 of the 2014 GWMR. Briefly, the following were evaluated during Stage 2B:

- Sample receipt conditions and holding times
- All applicable blank data (method blanks, field blanks, calibration blanks)
- Laboratory duplicates, LCSs, MS/MSDs against laboratory-specific control limits
- Initial calibration and continuing calibration data against method criteria
- Surrogate recoveries against laboratory-specific control limits
- Other method-specific criteria (e.g., instrument tuning data, internal standard recoveries, and Endrin/DDT breakdown check)

The data were classified as one of the following:

- Acceptable for use without qualifications
- Acceptable for use with qualifications
- Unacceptable for use (i.e., rejected)

Data flags and the reason for each flag were entered into an electronic database. Final flags were applied to the data after evaluating all flags assigned by the data validators. A summary of all qualified data and the reason for qualification ("Reason Code") can be found in Appendix C.

A total of 2,450 results (or 8.0 percent of the data) were flagged because one or more field sample result or laboratory QC or calibration sample result was outside control limits. Only one result (or 0.003 percent of all data) was rejected. Based on the data validation and evaluation of the data for precision, accuracy, representativeness, completeness, comparability, and sensitivity, the data collected during this event meet the GSIS DQOs.

In addition to the 100 percent Stage 2B validation, the calculation of the result or recovery from an LCS or matrix spike was verified with the raw instrument data, starting with the initial calibration data, with the exceptions noted in Section 4 of the 2014 GWMR (Appendix C).

Data Quality. Data quality was evaluated by considering precision, accuracy, representativeness, completeness, comparability, and sensitivity of the environmental samples and laboratory data reported. The definition for each field QC sample is provided in Section 4.1.4 of the SAP, and the definition for each laboratory QC sample and calibration standard is provided in Section 4.1.5 of the SAP. All qualified data are summarized in Table 4-3 of the 2014 GWMR.

- **Precision** was evaluated based on the results of QC samples collected by the field team and QC samples that originated in the laboratory. The RPDs calculated using the results of field duplicate pairs, laboratory duplicate pairs, LCS/LCSD pairs, and MS/MSD pairs provide information on the precision of sampling and analytical procedures. The RSDs in the initial calibrations and percent differences or deviations in the continuing calibration verifications are reviewed for analytical precision. All field sample results associated with calibration or QC samples that did not meet criteria for precision were qualified in accordance with Section 4.3.1 of the SAP and are summarized in Table 4-3 of 2014 GWMR (Appendix C).

- **Accuracy** in the laboratory is measured in %Rs of surrogates added to primary and field duplicate samples and target analytes added to LCS/LCSD and MS/MSD pairs. ICVs (also referred to as QC samples) and internal standard relative intensities were also evaluated as a measurement of laboratory accuracy. ICSs are analyzed to evaluate the instrument's ability to overcome interference. All field samples associated with QC samples that did not meet criteria for accuracy were qualified in accordance with the SAP (Appendix C), as presented in Table 4-3 of the 2014 GWMR (Appendix C).
- **Representativeness** was evaluated quantitatively through the analysis of blank samples and evaluation of sample receipt conditions, and qualitatively through sample design and implementation. Through the individual evaluation of wells, use of the DQO process and limited gaps in the execution of the SAP and its Addendum, the sampling event was representative and appropriate for meeting project objectives.
- **Completeness.** Completeness is calculated for each method. Completeness is defined as the number of valid results (i.e., those not rejected) divided by the total number of possible results. Of the 30,788 results generated for primary samples (i.e., does not include field duplicate samples), 1 result was rejected. Thus, the percent completeness is 99.997.
- **Comparability** was achieved by using established sampling procedures and published analytical methodology wherever possible and reporting results in standard units. In addition, data collected during this event, including the distribution of chemicals, is similar to historical monitoring in the SFB, so results are comparable to the historical information and trends.
- **Analytical sensitivity** is achieved by analyzing an LLCCV (also referred to as the MRL check) with each analytical batch. The LLCCV or MRL check is spiked at the reporting limit. All recoveries were within the method- and laboratory-specified control limits with the exceptions as noted in Table 4-3 of the 2014 GWMR (Appendix C).

2.6.3.3 LADWP Sampling of Groundwater Production Wells

LADWP conducts groundwater sampling of its SFB production wells in accordance with specifications in its Domestic Water Supply Permit No. 04-15-08P-003 issued by the California Division of Drinking Water (DDW) (State of California DDW 2008). The permit covers LADWP's domestic water supply described as follows:

Community water system serving surface water from the California State Water Project and from the Owens Valley via Los Angeles Aqueducts 1 and 2 and treated at the Los Angeles Aqueduct Filtration Plant; groundwater pumped from the San Fernando, Sylmar, and Central Basins and treated at various facilities, including the Pollock Wells Treatment Plant and the North Hollywood Aeration Tower, as well as receiving blending treatment; and treated water purchased from the Metropolitan Water District of Southern California and served to the City of Los Angeles. Systemwide fluoridation and disinfection are practiced.

Groundwater production wells designated as approved sources of supply are listed in Table 1 of the permit and include production wells in the Erwin, NH, Pollock, RT, TJ, Verdugo, and Whitnall well fields. General conditions and monitoring requirements for groundwater sources are specified in Items 32–56 of the permit. Specific sampling criteria that yielded monitoring data used as part of this RI Update Report for determining the nature and extent of contamination include the following items:

35. Coliform and heterotrophic plate count (HPC) monitoring is described in Item 35 of the permit, wherein monitoring the active groundwater sources monthly for total coliform and HPC bacteria is prescribed.

45. Monthly sampling of Pollock wells for the Pollock Wells Treatment Plant is specified in Item 45 and Table 5 of the permit, with sampling of VOCs, nitrate (NO_3), coliforms, and HPCs described.

55. Sampling of North Hollywood wells that supply the North Hollywood Aeration Facility is specified in Item 55 and Table 6 of the permit. Quarterly sampling of regulated VOCs is prescribed, along with monthly sampling of total chromium, Cr(VI), NDMA, 1,4-dioxane, perchlorate, and 1,2,3-TCP.

Sampling results are submitted to DDW and input into LADWP's Laboratory Information Management System (LIMS) database. These monitoring data were used as part of the GSIS RI Update for characterization of COCs and the nature and extent of groundwater contamination (Section 4).

2.6.3.4 USEPA SFB Groundwater Monitoring Program

As part of the 1992 RI and GMP for the SFV Superfund sites, 84 groundwater monitoring wells were constructed. These wells, which are referred to as the "RI Monitoring Wells," are located in USEPA Areas 1 through 4 (although Area 3 [Verdugo Basin] was delisted as an NPL site in October 2004). USEPA currently manages the four SFV Superfund sites and adjacent areas to investigate and clean up the contamination. Currently USEPA's focus is on five OUs within two of the four SFV Superfund sites to accelerate investigation and cleanup.

The SFV GMP has served as a regional monitoring program that is used to track changes in contaminant distribution, monitor water level and contaminant trends, and provide data for various regional data evaluation activities conducted by a variety of stakeholders, including RWQCB, DTSC, DDW, local water purveyors operating in the SFV (LADWP, Crescenta Valley Water District, cities of Glendale and Burbank), and the ULARA Watermaster. In addition to data collected from the USEPA RI monitoring wells, groundwater quality data are received from PRPs that are implementing site-specific cleanups or involved with implementation of the interim remedies in various OUs. Data generated from these data sources are incorporated into USEPA's SFV database and GIS and are used to prepare concentration contour maps presenting the extent of contamination for USEPA's COCs (TCE, PCE, and nitrate) as well as chemicals of emerging concern (Cr(VI), 1,4-dioxane, and 1,2,3-TCP).

USEPA prepared SFV basin-wide groundwater quality monitoring reports through 2007. Beginning in 2007, USEPA replaced the annual reports with "snapshots" of the SFV groundwater quality database along with continued preparation of the SFV basin-wide concentration contour maps for USEPA's COCs. The preparation of concentration contour maps for Cr(VI), 1,4-dioxane, and 1,2,3-TCP was added in 2010. In 2011, USEPA prepared the *Basinwide Groundwater Monitoring Program Optimization Evaluation for the San Fernando Valley Superfund Sites, Los Angeles County, California* (CH2M Hill 2011). This long-term monitoring optimization (LTMO) plan established a framework for suitable groundwater sampling frequencies and consistent sampling methodologies throughout the SFV Superfund sites. Concurrent with the LTMO, all groundwater monitoring activities for Area 2 were assumed by the Glendale Respondents Group, while USEPA continues groundwater monitoring activities of the RI monitoring wells in Areas 1 and 4. Groundwater monitoring activities in the Burbank OU portion of Area 1 are conducted by Lockheed-Martin Corporation.

As discussed further in Section 4, data from the USEPA SFV database were accessed and used to identify the COCs for the GSIS RI Update Report and to characterize the nature and extent of contamination. These data were attained through a cooperative agreement between LADWP and USEPA, whereby data are shared between the two databases for use in evaluation of the SFB groundwater. Data used from the USEPA database in development of figures for this RI are provided in Appendix D.

2.7 Additional Groundwater Data Sources

Data generated from other sources (i.e., RWQCB, DTSC, PRPs, and/or other facilities) are incorporated into USEPA's SFV water quality database and the SFV GSIS database along with the GMR data. A description of these other data sources is presented below. It should be noted that there can be delays between the data collection effort and entry into the databases, so for this RI Update Report, only data that were uploaded into the SFV database at the time this report was developed were used, and are included in Appendix D. Figure 1-4 depicts these other areas where data are being collected.

2.7.1 North Hollywood Operable Unit

As part of the AOC and RD for the NHOU Second Interim Remedy, AMEC's (on behalf of Honeywell and Lockheed Martin Corporation) work has included piezometer and monitoring well installation, conversion of production wells into monitoring wells, and monitoring. A suite of AMEC reports have been completed regarding their work (including AMEC 2012a; 2012b; 2014). Furthermore, additional monitoring wells at other former facilities in the area provide groundwater monitoring data as listed below:

- Former Bendix (Allied Signal): 85 monitoring wells, with approximately 31 installed in 2011 to supplement the NHOU FFS investigation
- LA By Products: 7 monitoring wells near the former Strathern, Penrose, Sheldon, and Tuxford landfills
- California Car Hikers (former Tuxford landfill): 2 monitoring wells
- Vulcan Materials (former Hewitt landfill): 8 monitoring wells
- Los Angeles Unified School District: 3 monitoring wells

2.7.2 Burbank Operable Unit

Lockheed Martin Corporation and associated facilities are the primary data sources in the BOU. Lockheed Martin Corporation/Pacific Airmotive/Librascope Building 118 has approximately 144 monitoring wells. Additional groundwater data for the BOU are incorporated into USEPA's SFV database from monitoring wells installed at former facilities near the Burbank Airport and City of Burbank former production wells as listed below:

- Lockheed Martin Corporation/Pacific Airmotive/Librascope Building 118: 144 monitoring wells
- Weber Aircraft: 7 monitoring wells
- Stainless Steel Products: 7 monitoring wells
- Crain Co. (Hydro-Aire): 6 monitoring wells
- Dynamic Plating: 3 monitoring wells
- City of Burbank: Inactive production wells

2.7.3 Glendale North, Glendale South, and Glendale Chromium Operable Units

There are numerous former and current facilities with monitoring wells in the GNOU and GSOU. The primary data sources (i.e., former facilities) are listed below:

- Menasco/Coltec: 27 monitoring wells
- ITT Aerospace Controls: 28 monitoring wells
- Greyson Power Plant: 12 monitoring wells
- City of Glendale: 39 monitoring wells

- All Metals: 3 monitoring wells
- PRC Desoto: 42 monitoring wells
- Drilube Wilson and Drilube Broadway: 16 monitoring wells
- A.G. Layne: 4 monitoring wells
- Excello facility: 6 monitoring wells
- Franciscan Ceramics: 9 monitoring wells

Relative to the GCOU, sampling data from the RI activities are incorporated into the USEPA SFV database.

2.7.4 Pollock

Although few former industrial facilities are located in the Pollock area, the following facilities perform groundwater monitoring in the area, and groundwater monitoring data are entered into the SFV database:

- Aerol Corp: 6 monitoring wells
- Newlowe Properties: 18 monitoring wells
- Taylor Yard: 27 monitoring wells
- Western Magnetics: 3 monitoring wells
- Forest Lawn Memorial Park: 4 monitoring wells

2.7.5 Tujunga

Primary data sources in the TJ area are separated by the Verdugo Fault (Figure 1-4). On the north side of the fault are the former facilities located in the Sutter Avenue area and the monitoring wells associated with current and former landfills. Groundwater monitoring on the south side of the Verdugo Fault is primarily conducted by LADWP. Additional data sources from former facilities in the TJ area are listed below:

- Price Pfister/Chase Chemical: 75 monitoring wells
- D&M Steel: 3 monitoring wells
- Bradley Landfill (Waste Management): 23 monitoring wells