HRS DOCUMENTATION RECORD (HRS)—REVIEW COVER SHEET

Name of Site: ORANGE COUNTY NORTH BASIN

Contact Person: Sharon Murray, EPA Region 9 (415) 972-4250

Site Investigation: Kim Hoang, EPA Region 9 (415) 972-3147

Documentation Record: Christina Marquis, Weston Solutions, Inc. (818) 350-7308

Pathways, Components, or Threats Not Scored

The surface water, soil exposure and subsurface intrusion, and air pathways were not scored because the listing decision is not significantly affected by those pathways. The site score is sufficient to qualify the site for the NPL on the groundwater pathway score.

Table of Contents

HRS DOCUMENTATION RECORD

Name of Site: ORANGE COUNTY NORTH BASIN

EPA ID#: CAN000900251

EPA Region: 9

Date Prepared: January 2018

Street Address of Site: 1012 East Elm Avenue

County and State: Orange County, California

Topographic Map: Anaheim, CA USGS 7.5-Minute Quadrangle

Latitude: 33° 51' 17.38" North Longitude: 117° 55' 50.12" West (Ref. 3; Ref. 20)

Latitude/Longitude Reference Point: The latitude and longitude correspond to Orange County Water District (OCWD) monitoring well FM-24 (Ref. 20). This well was selected because it is near the center of the OCNB plume, as determined in accordance with HRS Section 3.0.11.

SCORES		
Air Pathway	=	Not scored
Ground Water[1] Pathway	=	100
Soil Exposure and Subsurface Intrusion Pathway	=	Not scored
Surface Water Pathway	=	Not scored
HRS SITE SCORE	**=**	**50**

*The street address, coordinates, and contaminant locations presented in this HRS documentation record identify the general area where the site is located. They represent one or more locations EPA considers to be part of the site based on the screening information EPA used to evaluate the site for NPL listing. EPA lists national priorities among the known "releases or threatened releases" of hazardous substances; thus, the focus is on the release, not precisely delineated boundaries. A site is defined as where a hazardous substance has been "deposited, stored, placed, or otherwise come to be located." Generally, HRS scoring and the subsequent listing of a release merely represent the initial determination that a certain area may need to be addressed under CERCLA. Accordingly, EPA contemplates that the preliminary description of facility boundaries at the time of scoring will be refined as more information is developed as to where the contamination has come to be located.

[1] "Ground water" and "groundwater" are synonymous; the spelling is different due to "ground water" being codified as part of the HRS, while "groundwater" is the modern spelling.

HAZARD RANKING SYSTEM SUMMARY SCORESHEETS

SITE NAME: ORANGE COUNTY NORTH BASIN

COUNTY/STATE: Orange County, California

EPA ID #: CAN000900251

EVALUATOR: Christina Marquis **DATE:** January 2018

LATITUDE: 33° 51' 17.38" N **LONGITUDE:** 117° 55' 50.12" W

	S	S^2
Ground Water Migration Pathway Score (S_{gw})	100	10,000
Surface Water Migration Pathway Score (S_{sw})	Not scored	Not scored
Soil Exposure and Subsurface Intrusion Pathway Score (S_{sessi})	Not scored	Not scored
Air Migration Pathway Score (S_a)	Not scored	Not scored
$S_{gw}^2 + S_{sw}^2 + S_{sessi}^2 + S_a^2$	XXXXXXX	10,000
$(S_{gw}^2 + S_{sw}^2 + S_{sessi}^2 + S_a^2) / 4$	XXXXXXX	2,500
SQRT $((S_{gw}^2 + S_{sw}^2 + S_{sessi}^2 + S_a^2) / 4)$	XXXXXXX	50

TABLE 3-1
GROUND WATER MIGRATION PATHWAY SCORESHEET

Factor Categories and Factors		
Likelihood of Release to an Aquifer	Maximum Value	Value Assigned
1. Observed Release	550	550
2. Potential to Release		
2a. Containment	10	-
2b. Net Precipitation	10	-
2c. Depth to Aquifer	5	-
2d. Travel Time	35	-
2e. Potential to Release [lines 2a x (2b + 2c + 2d)]	500	-
3. Likelihood of Release (higher of lines 1 and 2e)	550	550
Waste Characteristics		
4. Toxicity/Mobility	a	1,000
5. Hazardous Waste Quantity	a	100
6. Waste Characteristics	100	18
Targets		
7. Nearest Well	50	50
8. Population		
8a. Level I Concentrations	b	208,586
8b. Level II Concentrations	b	34,984.6
8c. Potential Contamination	b	2,800.1
8d. Population (lines 8a + 8b + 8c)	b	246,370.7
9. Resources	5	0
10. Wellhead Protection Area	20	20
11. Targets (lines 7 + 8d + 9 + 10)	b	246,440.7
GROUND WATER MIGRATION SCORE FOR AN AQUIFER		
12. Aquifer Score [(lines 3 x 6 x 11)/82,500][c]	100	100
GROUND WATER MIGRATION PATHWAY SCORE		
13. Pathway Score (S_{gw}), (highest value from line 12 for all aquifers evaluated)[c]	100	100

[a]Maximum value applies to waste characteristics category.
[b]Maximum value not applicable.
[c]Do not round to nearest integer.

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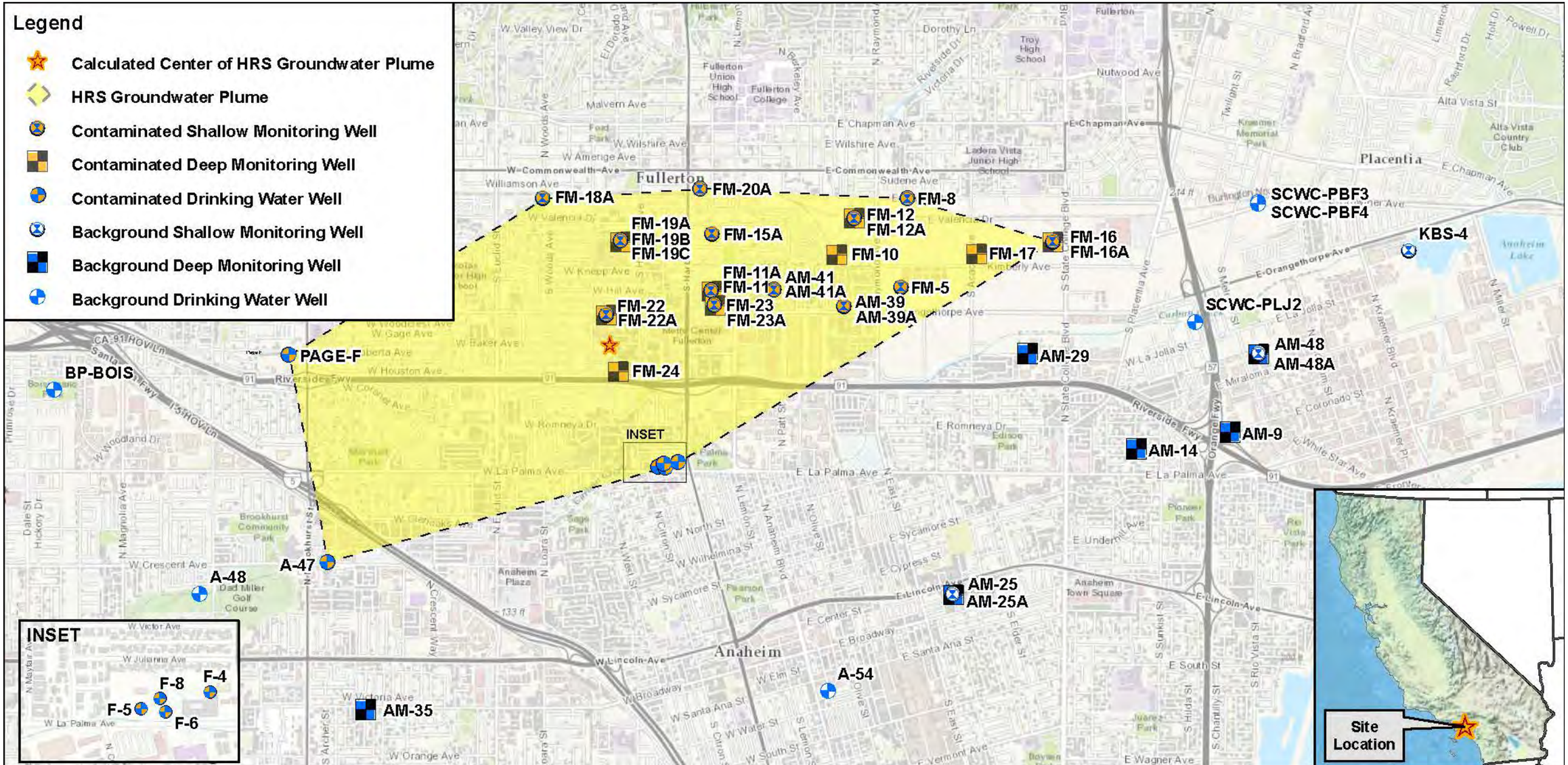
ACRONYM LIST

3DVA	Three-Dimensional Visualization and Analysis
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLP	Contract Laboratory Program
CRQL	Contract Required Quantitation Limit
CSM	Conceptual Site Model
DCE	dichloroethylene
DTSC	California Department of Toxic Substances Control
EPA	United States Environmental Protection Agency
HRS	Hazard Ranking System
MCL	Maximum Contaminant Level
msl	mean sea level
MWD	Metropolitan Water District of Southern California
NBGPP	North Basin Groundwater Protection Project
OCWD	Orange County Water District
PA	Preliminary Assessment
PCE	tetrachloroethylene
PRP	Potentially Responsible Party
RWQCB	Santa Ana Regional Water Quality Control Board
SAP	Sampling and Analysis Plan
SI	Site Inspection
SQL	Sample Quantitation Limit
SVE	Soil Vapor Extraction
TCE	trichloroethylene
VOC	volatile organic compound
WESTON	Weston Solutions, Inc.
µg/l	micrograms per liter

NOTES TO THE READER

Page numbers have been added to the references in the lower right corner. For reference citations, please refer to the page numbers in this location.



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EPA Region 9
Site Assessment Program

FIGURE 1
SITE LOCATION AND OBSERVED RELEASE MAP
Orange County North Basin Site
Fullerton, Orange County, California

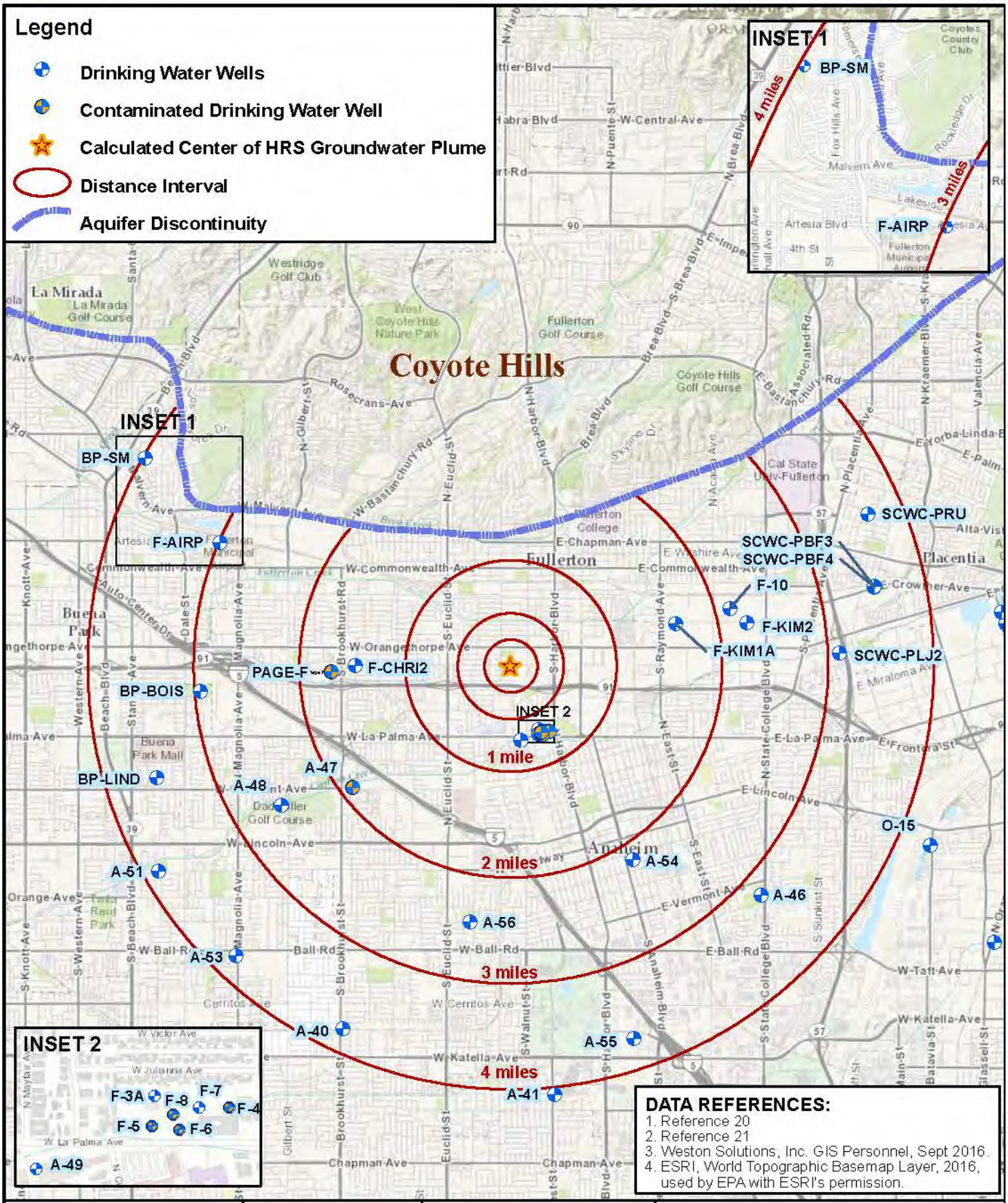

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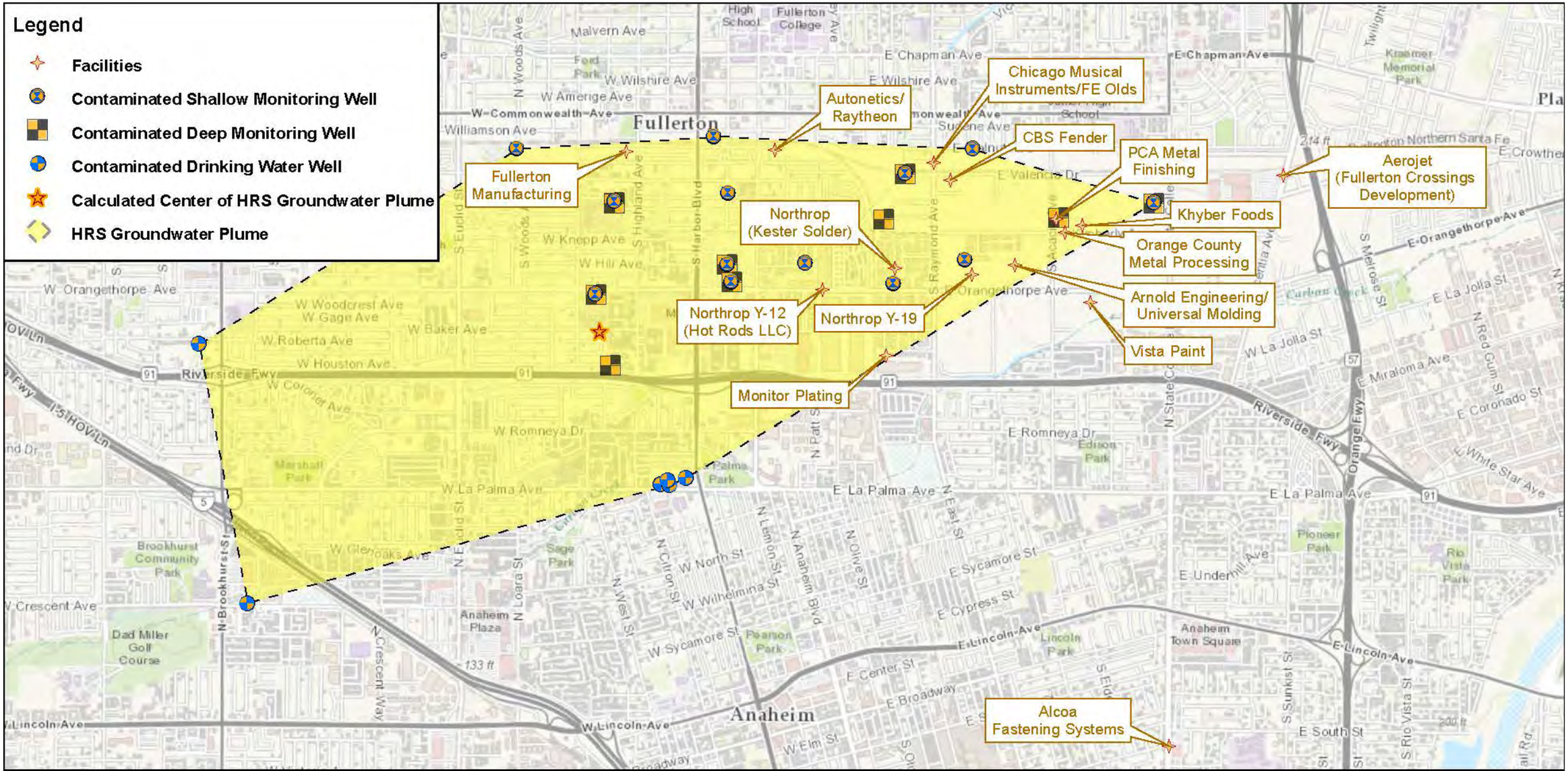
FIGURE 2
PRODUCTION WELL LOCATION MAP AND DISTANCE RINGS
Orange County North Basin Site
Fullerton, Orange County, California


Legend
Facilities
Contaminated Shallow Monitoring Well
Contaminated Deep Monitoring Well
Contaminated Drinking Water Well
Calculated Center of HRS Groundwater Plume
HRS Groundwater Plume
Fullerton Manufacturing
Autonetics/ Raytheon
Chicago Musical Instruments/FE Olds
CBS Fender
PCA Metal Finishing
Aerojet (Fullerton Crossings Development)
Northrop (Kester Solder)
Khyber Foods
Orange County Metal Processing
Arnold Engineering/ Universal Molding
Northrop Y-12 (Hot Rods LLC)
Northrop Y-19
Vista Paint
Monitor Plating
Alcoa Fastening Systems
Fullerton
Anaheim
Riverside Fwy
Orange Fwy
E Chapman Ave
W Commonwealth Ave
E Commonwealth Ave
E Orangethorpe Ave
W Orangethorpe Ave
E La Palma Ave
W La Palma Ave
E Romneya Dr
W Romneya Dr
W Lincoln Ave
E Lincoln Ave
E La Jolla St
W La Jolla St
E Miraloma Ave
E Coronado St
E Sycamore St
E Cypress St
E Broadway
E Center St
W Elm St
E South St
E Valencia Dr
W Houston Ave
W Baker Ave
W Hill Ave
W Knepp Ave
W Roberta Ave
W Woodcrest Ave
W Gage Ave
W Crowther Ave
W Glenoaks Ave
W North St
W Wilhelmina St
W Sycamore St
E Underhill Ave
Malvern Ave
W Wilshire Ave
E Wilshire Ave
E Amerige Ave
Williamson Ave
E Suzene Ave
E Crowther Ave
Fullerton High School
Fullerton College
Ford Park
Marshall Park
Palma Park
Edison Park
Sage Park
Pearson Park
Lincoln Park
Pioneer Park
Rio Vista Park
Kramer Memorial Park
Carbon Creek
Brookhurst Community Park
Dad Miller Golf Course
Anaheim Plaza
Anaheim Town Square
Santa Fe
214 ft
133 ft
200 ft
0
Scale in Miles
1
DATA REFERENCES:
1. Reference 20
2. Reference 21
3. Weston Solutions, Inc. GIS Personnel, Sept 2016.
4. ESRI, World Topographic Basemap Layer, 2016, used by EPA with ESRI's permission.
PREPARED BY:
Weston Solutions, Inc.
1340 Treat Blvd, Ste 210
Walnut Creek, CA 94597
PREPARED FOR:
EPA Region 9
Site Assessment Program
FIGURE 3
ATTRIBUTION MAP
Orange County North Basin Site
Fullerton, Orange County, California

SITE DESCRIPTION

For HRS scoring purposes, the Orange County North Basin (OCNB) site consists of a single, comingled volatile organic compound (VOC) groundwater plume with no single identified source (Ref. 22, pp. 32, 171; Ref. 110, p. 25-26). The plume resulted from the releases of chlorinated solvents, including trichloroethylene (TCE) and tetrachloroethylene (PCE), from multiple industrial facilities located in the vicinity of the OCNB plume (Ref. 22, pp. 8, 32, 171; Ref. 23, p. 97). Under the HRS, a contaminated groundwater plume can be evaluated as a source when the origin(s) of hazardous substances that have contributed to the plume cannot be reasonably identified (Ref. 1, Section 1.1). Chlorinated organic solvents are common industrial chemicals that are typically associated with cleaning and degreasing operations (Ref. 22, p. 32; Ref. 23, p. 180; Ref. 101; Ref. 102).

The Orange County Water District (OCWD) identified the area of VOC contamination in the northern portion of Orange County in the cities of Fullerton and Anaheim (Ref. 23, pp. 180, 186) (Figure 1). Groundwater contamination in this area is primarily found in shallower monitoring wells screened at less than 200 feet below ground surface (bgs); however, VOC-impacted groundwater has migrated downward into the deeper portion of the aquifer tapped by drinking water production wells. Two of the City of Fullerton's and one of the City of Anaheim's production wells were removed from service and destroyed due to VOC contamination in the area (Ref. 23, pp,. 180, 186; Ref. 103; Ref. 109). An additional City of Fullerton well was placed on inactive status in February 2015 due to VOCs exceeding Maximum Contaminant Levels (MCL) (Ref. 126; Ref. 127). The contamination continues to migrate both laterally and vertically, threatening downgradient production wells (Figure 2) (Ref. 22, pp. 8, 32-34, 167-169; Ref. 23, pp. 180, 186).

Multiple facilities have been identified in the vicinity of the OCNB plume that are possible contributors to the comingled plume (Figure 3) (Ref. 22, pp. 32, 171). The California Department of Toxic Substances Control (DTSC) and Regional Water Quality Control Board (RWQCB) have investigated and begun remedial activities at many of these facilities. Investigations and remedial activity to date includes sampling results that document the presence of VOCs in soils, soil gas, and groundwater (Ref. 71; Ref. 73; Ref. 77; Ref. 79; Ref. 80; Ref. 81; Ref. 85; Ref. 105). Under a Cooperative Agreement with EPA, DTSC completed Pre-CERCLA Screening Assessments at eleven facilities in the vicinity of the plume. EPA determined that eight of these facilities qualified for further assessment under CERCLA (Ref. 106; Ref. 115, pp. 1, 7; Ref. 116, pp. 1, 7; Ref. 117, pp. 1, 8; Ref. 118, pp. 1, 7; Ref. 119, pp. 1, 8; Ref. 120, pp. 1, 7; Ref. 121, pp. 1, 7; Ref. 122, pp. 1, 8; Ref. 123, pp. 1, 7; Ref. 124, pp. 1, 7; Ref. 125, pp. 1, 8). DTSC and RWQCB also requested EPA assistance in evaluating the comingled plume (Ref. 113; Ref. 114).

In 2017, EPA completed Preliminary Assessments (PA) at these eight facilities (see Section 3.1.1, Attribution of this document) (Ref. 106). Based on these PAs, EPA concluded that these facilities may have released chlorinated organic solvents to the OCNB plume. However, there is not enough information to attribute the plume to any one of these facilities.

EPA also completed a PA and Site Inspection (SI) of the comingled OCNB plume (Ref. 4, p. 1; Ref. 106). The SI effort included collection and analysis of groundwater samples from the vicinity of the plume (see Section 3.1.1, Chemical Analysis of this document), and a Three-

Dimensional Visualization and Analysis (3DVA) for the Conceptual Site Model (CSM) of the OCNB plume, incorporating historical geologic and sampling data (Figure 4) (Ref. 110, pp. 4, 13-15). The 3DVA shows that the OCNB plume consists of comingled contamination from sources at multiple facilities, that there is no continuous clay or fine-grained geologic unit to prevent downward contaminant movement, and the comingled plume is being pulled downward by drinking water production well pumping (Ref. 110, pp. 19-20, 22, 40, 45).

SITE SOURCES

SOURCE 1

2.2 SOURCE CHARACTERIZATION

2.2.1 SOURCE IDENTIFICATION

Name of source: Groundwater Plume – Orange County North Basin **Number of source:** 1

Source Type: Other

Description and Location of Source (see Figure 1):

The OCNB site is a single comingled groundwater plume with no identifiable source ("Source 1"). Under the HRS, a contaminated groundwater plume can be evaluated as a source when the origin of hazardous substances that have contributed to the plume cannot be reasonably identified (Ref. 1, Section 1.1). The area of the plume shown on Figure 1 is for HRS scoring purposes only, as defined below, and does not define the extent of all contamination in the area.

For HRS scoring purposes, the area of the groundwater plume is based on available sample locations that meet the criteria for an observed release (Ref. 1, Section 3.0.1.1). The minimum standard to establish an observed release by chemical analysis is analytical evidence of a hazardous substance in the media significantly above the background level. Further, some portion of the release must be attributable to the site (Ref. 1, Section 2.3). According to HRS scoring methodology, if the background concentration is not detected (or is less than the detection limit), an observed release is established when the sample measurement equals or exceeds the sample quantitation limit. If the background concentration equals or exceeds the detection limit, an observed release is established when the sample measurement is 3 times or more above the background concentration and above the sample quantitation limit (Ref. 1, Table 2-3).

During a May 2016 SI field sampling event, EPA collected groundwater samples from monitoring wells and drinking water production wells in the vicinity of the OCNB plume. Analytical results indicated the presence of 1,1-dichloroethylene (DCE), TCE, and PCE at concentrations significantly above background. Background and contaminated monitoring well and drinking water production well locations are shown on Figure 1. Documentation of the observed release sample analyses is presented in Section 3.1.1 Observed Release, under Chemical Analysis. The rationale for the lack of an identifiable source for the plume (i.e., that the significant increase in contaminant concentrations cannot be attributed to a release from any individual facility) is presented in Section 3.1.1 Observed Release, under Attribution.

Based on monitoring and drinking water production wells that meet the criteria for an observed release, the following wells define the area of the OCNB plume, for HRS scoring purposes (See Section 3.1.1 and Figure 1 of this document):

Well Name	Well Type
PAGE-F	Drinking Water Production Well
A-47	Drinking Water Production Well
F-6	Drinking Water Production Well
F-4	Drinking Water Production Well
FM-16A	Shallow Monitoring Well
FM-16	Deep Monitoring Well
FM-8	Shallow Monitoring Well
FM-20A	Shallow Monitoring Well
FM-18A	Shallow Monitoring Well

2.2.2 HAZARDOUS SUBSTANCES ASSOCIATED WITH THE SOURCE

Because the source consists of a groundwater plume, the plume contamination is established by sampling, using the observed release criteria presented in HRS Section 2.3 (Ref. 1, Section 2.3). The observed release by chemical analysis is documented in Section 3.1.1 Observed Release. Hazardous substances present in the plume at concentrations significantly above background include 1,1-DCE, TCE, and PCE.

2.2.3 HAZARDOUS SUBSTANCES AVAILABLE TO A PATHWAY

All hazardous substances associated with Source 1 are available to the groundwater pathway based on a containment factor value of greater than zero (Ref 1, Section 2.2.3).

Containment Description	Containment Factor Value	References
Release to groundwater: Based on evidence of hazardous substance migration (contamination detected in groundwater samples), a containment factor of 10 is assigned.	10	Ref. 1, Table 3-2; Ref. 5, pp. 19-20, 23-30; Ref. 6, pp. 18-21, 30-31; Ref. 7, pp. 29-30, 32-33, 38-39; Ref. 8, pp. 21-26, 29-30, 33-36; Ref. 9, pp. 5, 7, 48-50, 67-69, 88-90, 112-114, 137-139; Ref. 10, pp. 6-11; Ref. 11, pp. 5-6, 47-58, 99-101; Ref. 12, pp. 6-8, 12-13; Ref. 13, pp. 6-7, 74-76, 122-124, 146-148; Ref. 14, pp. 9-12; Ref. 15, pp. 6-7, 56-58, 67-71, 82-85, 133-135, 191-193, 212-214; Ref. 16, pp. 6-8, 10-13; Ref. 17, pp. 1-2, 6, 8-9, 11-12, 14-15, 17

2.4.2. Hazardous Waste Quantity

2.4.2.1.1 Hazardous Constituent Quantity (Tier A)

The hazardous constituent quantity for the OCNB plume (Source 1) could not be adequately determined according to the HRS requirements; that is, the total mass of all CERCLA hazardous substances in the source and releases from the source is not known and cannot be estimated with reasonable confidence (Ref. 1, Section 2.4.2.1.1). There are insufficient historical and current data (manifests, potentially responsible party [PRP] records, State records, permits, waste concentration data, etc.) available to adequately calculate the total or partial mass of all CERCLA hazardous substances in the source and the associated releases from the source. Therefore, there is insufficient information to evaluate the associated releases from the source to calculate the hazardous constituent quantity for Source 1 with reasonable confidence. Scoring proceeds to the evaluation of Tier B, hazardous wastestream quantity (Ref. 1, Section 2.4.2.1.1).

Hazardous Constituent Quantity Value: Not Evaluated

2.4.2.1.2 Hazardous Wastestream Quantity (Tier B)

The hazardous wastestream quantity for Source 1 could not be adequately determined according to the HRS requirements; that is, the mass of the wastestreams containing hazardous substances, and eligible pollutants and contaminants in the source and releases from the source is not known and cannot be estimated with reasonable confidence (Ref. 1, Section 2.4.2.1.2). There are insufficient historical and current data (manifests, PRP records, State records, permits, waste concentration data, etc.) available to adequately calculate the total or partial mass of the wastestream plus the mass of all CERCLA pollutants and contaminants in the source and the associated releases from the source. Therefore, there is insufficient information to evaluate the associated releases from the source to calculate the hazardous wastestream quantity for Source 1 with reasonable confidence. Scoring proceeds to the evaluation of Tier C, volume (Ref. 1, Section 2.4.2.1.2).

Hazardous Wastestream Quantity Value: Not Evaluated

2.4.2.1.3 Volume (Tier C)

The exact volume for Source 1 could not be adequately determined according to the HRS requirements (Ref. 1, Section 2.4.2.1.3). Monitoring wells and drinking water production wells located within the OCNB plume contained 1,1-DCE, TCE, and PCE at concentrations significantly above background (see Section 3.1.1 of this document for well samples significantly above background). However, the boundaries and total depths of the plume are not sufficiently defined to get an exact volume. Therefore, based on the presence of hazardous substances in the observed release samples the volume of the groundwater contamination is at least greater than 0 cubic yards but the exact volume is unknown.

Volume Assigned Value: >0

2.4.2.1.4 Area (Tier D)

Tier D is not evaluated for source type “other” and because a volume estimate was made (Ref. 1, Section 2.4.2.1.3, Table 2-5).

Area Assigned Value: 0

Source Hazardous Waste Quantity Value

According to the Hazard Ranking System (HRS) final rule, the highest of the values assigned to the source for hazardous constituent quantity (Tier A), hazardous wastestream quantity (Tier B), Volume (Tier C), and Area (Tier D) is assigned as the source hazardous waste quantity value (Ref. 1, Section 2.4.2.1.5).

Tier Evaluated	Source 1 Values
A	NE
B	NE
C	>0
D	0

Notes:
NE Not Evaluated.

Source Hazardous Waste Quantity Value: >0

SITE SUMMARY OF SOURCE DESCRIPTIONS

Source No.	Source Hazardous Waste Quantity Value (see Section 2.4.2)	Containment			
		Groundwater	Surface Water	Gas	Air Particulate
1	>0	10	NE	NE	NE
TOTAL	>0				

Notes:

NE = Not Evaluated.

3.0 GROUND WATER MIGRATION PATHWAY

3.0.1 GENERAL CONSIDERATIONS

Ground Water Migration Pathway Description
The OCNB site consists of a comingled groundwater plume with no identified source (Ref. 22, pp. 32, 171; Ref. 110, pp. 40, 43, 45). The plume resulted from the releases of hazardous substances from multiple facilities located in the vicinity of the OCNB plume (Ref. 22, pp. 8, 32, 171; Ref. 23, p. 97). For this HRS consideration, hazardous substances associated with the OCNB plume include 1,1-DCE, TCE, and PCE, which were detected at concentrations significantly above background in monitoring wells and drinking water production wells located within the plume (see Section 3.1.1 of this document for documentation of the observed release). TCE and PCE and their breakdown products are chlorinated organic solvents, typically associated with cleaning and degreasing operations (Ref. 22, p. 32; Ref. 23, p. 180; Ref. 101; Ref. 102).

Groundwater contamination in this area is primarily found in shallower monitoring wells screened at less than 200 feet bgs; however, VOC-impacted groundwater has migrated downward into the deeper portion of the aquifer tapped by drinking water production wells. The contamination continues to migrate both laterally and vertically, threatening downgradient production wells (Ref. 22, pp. 8, 32-34, 167-169; Ref. 23, pp. 180, 186). Six public drinking water production wells sampled by EPA during the 2016 SI field sampling are located within the plume and contain one or more of the above hazardous substances at concentrations significantly above background (see Figure 2 and Section 3.1.1). Four drinking water production wells have been shut down and destroyed due to the contamination: Fullerton wells F-FS13 (2002), F-KIM1 (2002); Anaheim well A-23 (2001); and private well BAST-F (2013) (Ref. 23, p. 180; Ref. 103; Ref. 109). Fullerton well F-7 was placed on inactive status in February 2015 due to VOCs exceeding MCLs, and is planned for destruction in the future (Ref. 126; Ref. 127; Ref. 131). An additional 22 active drinking water production wells operated by the City of Fullerton, City of Anaheim, Page Avenue Mutual Water Company, Golden State Water Company, and the City of Buena Park are located within the target distance limit from the site (Figure 2; Ref. 21; Ref. 130).

Ground Water Migration Pathway Description

Regional Geology/Aquifer Description
The OCNB plume is located within the northern, Forebay Area of the Orange County Groundwater Basin. This portion of the Basin is bordered on the north by bedrock of the Coyote Hills, and slopes generally southwest to the Pacific Ocean. The Forebay refers to the area where most of the groundwater recharge occurs. Highly-permeable interconnected sand and gravel deposits with few and discontinuous clay and silt deposits allow direct percolation of Santa Ana River and other surface water into the subsurface (Ref. 22, p. 11; Ref. 23, pp. 51-54). In the site vicinity, clay and silt aquitards are thin and discontinuous, allowing groundwater to flow between shallower and deeper portions of the aquifer where drinking water production wells are screened (Ref. 22, p. 11; Ref. 23, pp. 51-54; Ref. 110, p. 19, 22, 40).

3.0.1.1 Ground Water Target Distance Limit

For sites that consist solely of a contaminated groundwater plume with no identified source, the

4-mile target distance limit is measured from the center of the area of observed groundwater contamination. The area of observed groundwater contamination is determined based on available sample locations that meet the criteria for an observed release (Ref. 1, Section 3.0.1.1). Monitoring well and drinking water well samples documenting an observed release are described in Section 3.1.1. The locations of the wells, and the groundwater plume for HRS scoring purposes, are shown in Figure 1. Distance rings around the center point of the HRS groundwater plume are shown on Figure 2. To generate the HRS groundwater plume for scoring purposes, a GIS polygon was generated around the outer contaminated wells shown on Figure 1, then the center of the polygon was calculated to provide the center of the HRS plume. The wells used to generate the GIS polygon and calculate the center of the plume are listed below. The plume represented on Figure 1 is for HRS scoring purposes only, and does not delineate all groundwater contamination in the area.

Well Name	Well Type	Latitude	Longitude
PAGE-F	Drinking Water Production Well	33.76527484	-117.9105188
A-47	Drinking Water Production Well	33.83996311	-117.957201
F-6	Drinking Water Production Well	33.84745591	-117.9261444
F-4	Drinking Water Production Well	33.84791525	-117.9249476
FM-16A	Shallow Monitoring Well	33.86508945	-117.8906029
FM-16	Deep Monitoring Well	33.86508168	-117.8906291
FM-8	Shallow Monitoring Well	33.86831422	-117.9040188
FM-20A	Shallow Monitoring Well	33.86891669	-117.9231371
FM-18A	Shallow Monitoring Well	33.8680827	-117.9376148

Monitoring Well locations are from Reference 20.
Drinking Water Production Well locations are from Reference 21.

3.0.1.2 Aquifer Boundaries/Site Geology

Stratum 1: Interconnected Sand and Gravel Aquifer
The subsurface beneath the site consists of a complex series of interconnected sand and gravel deposits, with discontinuous lower-permeability clay and silt lenses that do not hydraulically isolate these water-bearing zones from each other (Ref. 22, pp. 11-12, 33; Ref. 23, pp. 52-53, 64; Ref. 110, pp. 19, 22, 40). The hydraulic gradient is locally amplified by production wells extracting water from the deeper portion of the aquifer. A downward hydraulic gradient allows VOC-impacted groundwater to migrate both laterally and vertically downward, largely in response to pumping-induced gradients (Ref. 22, p. 33). VOCs have been detected as deep as 600 feet bgs within 2 miles of the source (Ref. 22, pp. 12, 16, 45).

Generalized geologic references for the Orange County Groundwater Basin describe the subsurface as being divided into Shallow, Principal, and Deep aquifers (Ref. 22, p. 11). However, as described above, the generally-defined Shallow and Principal aquifers are not hydraulically separate aquifers in the site vicinity (Ref. 22, pp. 11-12, 33; Ref. 23, pp. 52-53, 64; Ref. 110, pp. 15, 17, 20-22, 35). Therefore, the Shallow and Principal aquifers beneath the OCNB site are evaluated as a single Interconnected Sand and Gravel Aquifer for HRS scoring purposes.

Groundwater flow is generally toward the west to southwest in the Interconnected Sand and Gravel Aquifer beneath the site (Ref. 22, pp. 33, 162-163; Ref. 110, p. 22). Depth to groundwater in the OCNB plume vicinity is approximately 100 feet bgs (Ref. 18).

3.0.1.2.1 Aquifer Interconnections

For HRS scoring purposes, as described above, the aquifer beneath the site is evaluated as a single aquifer, the Interconnected Sand and Gravel Aquifer. This aquifer has been demonstrated to be a single, interconnected aquifer within two miles of the source due to contamination migrating downward into the deeper portion of the aquifer (see Section 3.1.1 Observed Release of this document).

3.0.1.2.2 Aquifer Discontinuities

An aquifer discontinuity occurs for scoring purposes only when a geologic, topographic, or other structure or feature entirely transects an aquifer within the 4-mile target distance limit, thereby creating a continuous boundary to groundwater flow within this limit (Ref. 1, Section 3.0.1.2.2).

The base of the Interconnected Sand and Gravel Aquifer is defined by an aquitard that separates this aquifer from the Deep aquifer of the Orange County Groundwater Basin (Ref. 22, p. 12). This depth is approximately 1,000 feet below mean sea level (msl) in the site vicinity (Ref. 22, pp. 54-55, 65). There are no known drinking water production wells drawing from the Deep aquifer within the Target Distance Limit from the site (Ref. 21; Ref. 22 p. 12.

An additional aquifer discontinuity is provided by bedrock of the Coyote Hills, located approximately 2 miles north of the calculated center of the plume (see Figure 2) (Ref. 3; Ref. 22, p. 51). The Coyote Hills are the northern boundary of the Orange County Groundwater Basin at this location (Ref. 22, p. 11; Ref. 23, p. 52). There are no known drinking water production wells within the Coyote Hills (see Figure 2) (Ref. 21). There are no known faults within the Target Distance Limit that impede the flow of groundwater within the Interconnected Sand and Gravel Aquifer (Ref. 22, pp. 42, 54-55, 57; Ref. 23, p. 53).

SUMMARY OF AQUIFER BEING EVALUATED

Aquifer No.	Aquifer Name	Is Aquifer Interconnected with Upper Aquifer within 2 miles? (Y/N/NA)	Is Aquifer Continuous within 4-mile TDL? (Y/N)	Is Aquifer Karst? (Y/N)
1	Interconnected Sand and Gravel Aquifer	NA	N	N

3.1 LIKELIHOOD OF RELEASE

3.1.1 OBSERVED RELEASE

Aquifer Being Evaluated: Interconnected Sand and Gravel Aquifer

Observed Release by Chemical Analysis

The minimum standard to establish an observed release by chemical analysis is analytical evidence of a hazardous substance significantly above the background level and some portion of the significant increase above the background level is attributable to the site. In accordance with HRS Table 2-3, if the background concentration is not detected, a significant increase is established when the sample measurement equals or exceeds the sample quantitation limit (SQL). If the background concentration equals or exceeds the detection limit, a significant increase is established when the sample measurement is 3 times or more above the background concentration. If the sample analysis was performed under the EPA Contract Laboratory Program (CLP), the EPA contract-required quantitation limit (CRQL) can be used in place of the SQL if the SQL is not available (Ref. 1, Section 2.3). Attribution will be discussed later in this Section.

2016 EPA SI Sampling

Under the authority of CERCLA, EPA tasked WESTON to conduct a SI of the OCNB site (Ref. 4, p. 5; Ref. 19, pp. 7, 16). To establish an observed release to groundwater, and to establish concentrations of hazardous substances in drinking water production wells, groundwater samples were collected and submitted for laboratory analysis of VOCs (Ref. 4, p. 14; Ref. 19, p. 16). Sampling was conducted under a Sampling and Analysis Plan (SAP) approved by EPA on May 10, 2016 (Ref. 19, p. 2).

From May 16 to 26, 2016, groundwater samples were collected from a total of 46 wells, including 34 monitoring wells and 12 drinking water production wells located within, upgradient of, cross-gradient of, and downgradient of the OCNB plume (Figure 1; Ref. 4, pp. 14, 34-45; Ref. 19, pp. 20, 22, 25, 38). WESTON accompanied OCWD personnel to collect split groundwater samples as they conducted sampling in accordance with the OCWD North Basin Groundwater Protection Project (NBGPP) and consistent with EPA protocols (Ref. 4, pp. 34-45; Ref. 19, p. 29). EPA's samples were analyzed through EPA's Contract Laboratory Program (CLP) via EPA CLP SOM02.3 with Trace Water quantitation limits (Ref. 4, p. 14; Ref. 19, pp. 26-28).

For background similarity, and to meet the criteria for establishing an observed release, wells are separated into 3 types, as described below. This ensures that background wells are screened within the same relative depth within the Interconnected Sand and Gravel Aquifer, and have similar construction as the contaminated wells with which they are being compared. Shallow monitoring wells are screened at depths of 200 feet bgs or less. Deep monitoring wells are screened below 200 feet bgs (Ref. 20). Drinking water production wells are only compared with other production wells, due to longer screen lengths and larger casing diameters than the monitoring wells (Ref. 111; Ref. 112).

Observed Release to Shallow Monitoring Wells

-Background Shallow Monitoring Wells

Background monitoring wells were sampled during the same sampling event, using the same sampling methods as the release wells. Background shallow monitoring wells were selected for similar depth, screen length, and construction as shallow contaminated monitoring wells located within the OCNB plume (Ref. 112). The background monitoring wells are located east (upgradient) and south (cross-gradient) of the groundwater VOC plume, as identified based on historical OCWD sampling data showing VOC concentrations and groundwater flow directions (Ref. 4, p. 15; Ref. 19, p. 38; Ref. 20). According to OCWD, there are no monitoring wells north (cross-gradient) or west (downgradient) in proximity of the leading edge of the plume (Ref. 4, p. 15; Ref. 19, p. 38).

Screened intervals of background and contaminated wells were used to determine whether the wells were screened at the same relative depth within the aquifer. Shallow monitoring wells are screened at less than 200 feet bgs (Ref. 4, p. 15; Ref. 19, pp. 20-21, 24, 38; Ref. 20). The well locations are shown on Figure 1.

Background Shallow Monitoring Well Groundwater Elevations

Well Name	Wellhead Elevation (feet above msl)	Screened Interval (feet bgs)	Screened Interval (feet above msl)	Ground-water Elevation (feet bgs)	Ground-water Elevation (feet above msl)	Date	References
KBS-4	222.81	138 to 158	84.81 to 64.81	64.1	158.71	5/16/16	Ref. 18, p. 1; Ref. 20; Ref. 23, p. 371
AM-25A	171.75	188 to 195	-16.25 to -23.25	111.35	60.4	5/19/16	Ref. 18, p. 14; Ref. 20; Ref. 23, p. 365
AM-48A	205.1	116 to 146	89.1 to 59.1	102.98	102.12	5/16/16	Ref. 18, p. 3; Ref. 20; Ref. 23, p. 365

msl: mean sea level
bgs: below ground surface

Background Shallow Monitoring Well Groundwater Concentrations

Well Name	CLP Sample ID	Sampling Date	Hazardous Substance	Concentration (µg/l)	MDL (µg/l)	CRQL (µg/l)	References
KBS-4	YA614	5/16/16	1,1-DCE	ND	0.21	0.50	Ref. 4, p. 34; Ref. 6, pp. 18-19; Ref. 11, pp. 5, 47-55; Ref. 12, pp. 6-7; Ref. 17, p. 1
			TCE	ND	0.080	0.50	
			PCE	ND	0.15	0.50	
AM-25A	YA615	5/19/16	1,1-DCE	ND	0.21	0.50	Ref. 4, p. 35; Ref. 5, pp. 19-20; Ref. 9, pp. 7, 48-50; Ref. 10, pp. 6-7; Ref. 17, p. 8
			TCE	ND	0.080	0.50	
			PCE	ND	0.15	0.50	

Background Shallow Monitoring Well Groundwater Concentrations							
Well Name	**CLP Sample ID**	**Sampling Date**	**Hazardous Substance**	**Concentration (µg/l)**	**MDL (µg/l)**	**CRQL (µg/l)**	**References**
AM-48A	YA616	5/16/16	1,1-DCE	ND	0.21	0.50	Ref. 4, pp. 34, 39; Ref. 6, pp. 3, 20-21; Ref. 11, pp. 5, 56-58; Ref. 12, pp. 7-8; Ref. 17, pp. 1-2
			TCE	ND	0.080	0.50	
			PCE	0.36 J	0.15	0.50	

µg/l: Micrograms analyte per liter groundwater
CRQL: EPA Contract Laboratory Program Contract Required Quantitation Limit
MDL: Method Detection Limit
J: Result is above the MDL but below the CRQL. The result is not biased, and no adjustment is needed (Ref. 6, p. 3).
ND: Not detected.

The minimum standard to establish an observed release by chemical analysis is analytical evidence of a hazardous substance significantly above the background level and some portion of the significant increase above the background level is attributable to the site. In accordance with HRS Table 2-3, if the background concentration is not detected, a significant increase is established when the sample measurement equals or exceeds the sample quantitation limit (SQL). If the background concentration equals or exceeds the detection limit, a significant increase is established when the sample measurement is 3 times or more above the background concentration. If the sample analysis was performed under the EPA Contract Laboratory Program (CLP), the EPA contract-required quantitation limit (CRQL) can be used in place of the SQL if the SQL is not available. Based on the above sampling results, the following background levels are established for the shallow monitoring wells:

Background Levels to Establish an Observed Release to Shallow Monitoring Wells		
Hazardous Substance	**Maximum Background Concentration 2016 SI Sampling Results (µg/l)**	**HRS Table 2-3 Minimum Concentration to Document an Observed Release by Chemical Analysis (µg/l)**
1,1-DCE	ND	release sample CRQL
TCE	ND	release sample CRQL
PCE	0.36 J, CRQL = 0.50	1.5

Note: Detection below the CRQL is treated as non-quantifiable for HRS purposes, and adjustment factors are not applied. For a conservative background level, the CRQL of PCE is used here as a maximum background concentration (Ref. 107, p. 4). The CRQL is the applicable SQL for this data set.
µg/l: micrograms analyte per liter groundwater
J: Result is above the MDL but below the CRQL. The result is not biased, and no adjustment is needed (Ref. 6, p. 3).
CRQL: EPA Contract Laboratory Program Contract Required Quantitation Limit
ND: Not detected.

-Shallow Monitoring Wells Establishing an Observed Release:
Shallow contaminated monitoring wells establishing an observed release are shown on Figure 1. These wells contained 1,1-DCE, TCE, and/or PCE at concentrations exceeding the background levels specified above.

Contaminated Shallow Monitoring Well Groundwater Elevations							
Well Name	**Wellhead Elevation (feet above msl)**	**Screened Interval (feet bgs)**	**Screened Interval (feet above msl)**	**Groundwater Elevation (feet bgs)**	**Groundwater Elevation (feet above msl)**	**Date**	**References**
AM-39	166.01	168 to 188	-1.99 to -21.99	106.76	59.25	5/25/16	Ref. 18, p. 25; Ref. 20; Ref. 23, p. 365
AM-39A	165.92	115 to 135	50.92 to 30.92	106.80	59.12	5/25/16	Ref. 18, p. 26; Ref. 20; Ref. 23, p. 365
AM-41	156.26	190 to 200	-33.74 to -43.74	100.62	55.64	5/18/16	Ref. 18, p. 10; Ref. 20; Ref. 23, p. 365
AM-41A	156.29	156 to 166	0.29 to -9.71	100.64	55.65	5/18/16	Ref. 18, p. 11; Ref. 20; Ref. 23, p. 365
FM-5	172.25	121 to 141	51.25 to 31.25	110.32	61.93	5/26/16	Ref. 18, p. 34; Ref. 20; Ref. 23, p. 368
FM-8	172.21	114 to 134	58.21 to 38.21	110.95	61.26	5/18/16	Ref. 18, p. 17; Ref. 20; Ref. 23, p. 368
FM-11A	152.58	134 to 154	18.58 to -1.42	99.64	52.94	5/18/16	Ref. 18, p. 13; Ref. 20; Ref. 23, p. 368
FM-12A	164.02	135 to 155	29.02 to 9.02	104.6	59.42	5/26/16	Ref. 18, p. 33; Ref. 20; Ref. 23, p. 368
FM-15A	152.59	120 to 140	32.59 to 12.59	99.8	52.79	5/24/16	Ref. 18, p. 21; Ref. 20; Ref. 23, p. 368
FM-16A	194.35	125 to 145	69.35 to 49.35	124.95	69.4	5/24/16	Ref. 18, p. 23; Ref. 20; Ref. 23, p. 368
FM-18A	136.28	121 to 151	15.28 to -14.72	90.45	45.83	5/17/16	Ref. 18, p. 7; Ref. 20; Ref. 23, p. 368
FM-19A	146.34	115 to 135	31.34 to 11.34	97.0	49.34	5/26/16	Ref. 18, p. 29; Ref. 20; Ref. 23, p. 368
FM-20A	160.16	130 to 150	30.16 to 10.16	107.9	52.26	5/17/16	Ref. 18, p. 6; Ref. 20; Ref. 23, p. 368
FM-22A	140.55	150 to 170	-9.45 to -29.45	92.43	48.12	5/25/16	Ref. 18, p. 28; Ref. 20; Ref. 23, p. 368
FM-23A	153.36	128 to 143	25.36 to 5.36	100.09	53.27	5/23/16	Ref. 18, p. 20; Ref. 20; Ref. 23, p. 368

msl: mean sea level
bgs: below ground surface

Shallow Monitoring Well Results Establishing an Observed Release						
Well Name	**CLP Sample ID**	**Sampling Date**	**Hazardous Substance**	**Concentration (µg/l)**	**CRQL (µg/l)**	**References**
AM-39	YA623	5/25/16	1,1-DCE	3.3	0.50	Ref. 4, pp. 36, 45; Ref. 8, pp. 21-22; Ref. 15, pp. 6, 56-58; Ref. 16, pp. 6-7; Ref. 17, p. 14
			TCE	2.5	0.50	
			PCE	10	0.50	
AM-39A	YA624	5/25/16	TCE	17	0.50	Ref. 4, pp. 36, 45; Ref. 8, pp. 23-24; Ref. 15, pp. 6, 69-71; Ref. 16, p. 7; Ref. 17, p. 14
			PCE	20	0.50	
AM-41	YA625	5/18/16	1,1-DCE	1.5	0.50	Ref. 4, p. 35; Ref. 5, pp. 23-24; Ref. 9, pp. 5, 67-69, 78-83; Ref. 10, pp. 8-9; Ref. 17, p. 6
			TCE	5.5	0.50	
			PCE	30	2.5	
AM-41A	YA626	5/18/16	1,1-DCE	4.9	0.50	Ref. 4, p. 35; Ref. 5, pp. 25-26; Ref. 9, pp. 5, 88-90, 101-106; Ref. 10, p. 9; Ref. 17, p. 6
			TCE	53	2.5	
			PCE	26	2.5	
FM-5	YA627	5/26/16	1,1-DCE	25	10	Ref. 4, p. 36; Ref. 8, pp. 25-26; Ref. 15, pp. 7, 82-85, 96-101; Ref. 16, p. 8; Ref. 17, p. 17
			TCE	140	10	
			PCE	20	10	
FM-8	YA629	5/19/16	1,1-DCE	3.6	0.50	Ref. 4, p. 35; Ref. 5, pp. 27-28; Ref. 9, pp. 7, 112-114, 125-130; Ref. 10, p. 10; Ref. 17, p. 9
			TCE	28	2.5	
			PCE	17	2.5	
FM-11A	YA630	5/18/16	1,1-DCE	4.7	0.50	Ref. 4, pp. 35, 42; Ref. 5, pp. 28-29; Ref. 9, pp. 5, 137-139, 150-155; Ref. 10, p. 11; Ref. 17, p. 7
			TCE	37	2.5	
			PCE	39	2.5	
FM-12A	YA632	5/26/16	1,1-DCE	45	5.0	Ref. 4, p. 36; Ref. 8, pp. 29-30; Ref. 15, pp. 7, 133-135, 148-153; Ref. 16, p. 10; Ref. 17, p. 17
			TCE	96	5.0	
			PCE	58	5.0	
FM-15A	YA634	5/24/16	1,1-DCE	27	5.0	Ref. 4, pp. 36, 44; Ref. 7, pp. 29-30; Ref. 13, p. 7, 74-76, 87-92; Ref. 14, p. 9; Ref. 17, p. 12
			TCE	95	5.0	
			PCE	17	0.50	
FM-16A	YA636	5/24/16	1,1-DCE	1.2	0.50	Ref. 4, pp. 36, 44; Ref. 7, pp. 32-33; Ref. 13, p. 7, 122-124, 135-140; Ref. 14, pp. 10-11; Ref. 17, p. 12
			TCE	28	2.5	
			PCE	10	0.50	
FM-18A	YA637	5/17/16	1,1-DCE	11	0.50	Ref. 4, pp. 35, 41; Ref. 6, pp. 30-31; Ref. 11, pp. 6, 99-101, 111-116; Ref. 12, pp. 12-13
			TCE	110	10	
			PCE	4.6	0.50	
FM-19A	YA638	5/26/16	1,1-DCE	1.5	0.50	Ref. 4, p. 36; Ref. 8, pp. 33-34; Ref. 15, pp. 7, 191-193, 202-207; Ref. 16, pp. 11-12; Ref. 17, p. 16
			TCE	19	2.5	
FM-20A	YA639	5/17/16	1,1-DCE	66	5.0	Ref. 4, pp. 34, 41; Ref. 6, pp. 32-33; Ref. 11, pp. 6, 122-124, 141-146; Ref. 12, pp. 13-14; Ref. 17, p. 3
			TCE	83	5.0	
			PCE	72	5.0	

Shallow Monitoring Well Results Establishing an Observed Release						
Well Name	**CLP Sample ID**	**Sampling Date**	**Hazardous Substance**	**Concentration (µg/l)**	**CRQL (µg/l)**	**References**
FM-22A	YA641	5/25/16	1,1-DCE	6.0	0.50	Ref. 4, pp. 36, 45; Ref. 8, pp. 35-36; Ref. 15, pp. 6, 212-214; Ref. 16, pp. 12-13; Ref. 17, pp. 14-15
			TCE	11	0.50	
			PCE	15	0.50	
FM-23A	YA642	5/23/16	1,1-DCE	6.5	0.50	Ref. 4, pp. 35, 43; Ref. 7, pp. 38-39; Ref. 13, pp. 6, 146-148, 159-164; Ref. 14, pp. 11-12; Ref. 17, p. 11
			TCE	11	0.50	
			PCE	19	2.5	

µg/l: micrograms analyte per liter groundwater
CRQL: EPA Contract Laboratory Program Contract Required Quantitation Limit

Observed Release to Deep Monitoring Wells

-Background Deep Monitoring Wells

Background monitoring wells were sampled during the same sampling event, using the same sampling methods as the release wells. Background deep monitoring wells were selected for similar depth, screen length, and construction as deep contaminated monitoring wells located within the OCNB plume. The background monitoring wells are located east (upgradient) and south (cross-gradient) of the groundwater VOC plume, as identified based on historical OCWD sampling data showing VOC concentrations and groundwater flow directions (Ref. 4, p. 15; Ref. 19, p. 38; Ref. 20). There are no identified monitoring wells north (cross-gradient) or west (downgradient) in proximity of the leading edge of the plume (Ref. 4, p. 15; Ref. 19, p. 38).

Screened intervals of background and contaminated wells were used to determine whether the wells were screened at the same relative depth within the aquifer. Deep monitoring wells are screened at greater than 200 feet bgs (Ref. 4, p. 15; Ref. 19, pp. 20-21, 24, 38; Ref. 20). The well locations are shown on Figure 1.

Background Deep Monitoring Well Groundwater Elevations							
Well Name	**Wellhead Elevation (feet above msl)**	**Screened Interval (feet bgs)**	**Screened Interval (feet above msl)**	**Groundwater Elevation (feet bgs)**	**Groundwater Elevation (feet above msl)**	**Date**	**References**
AM-9	201.84	285 to 303	-83.16 to -101.16	112.26	89.58	5/16/16	Ref. 18, p. 4; Ref. 20; Ref. 23, p. 365
AM-14	192.89	297 to 315	-104.11 to -122.11	115.42	77.47	5/16/16	Ref. 18, p. 5; Ref. 20; Ref. 23, p. 364
AM-25	171.73	340 to 358	-168.27 to -186.27	116.32	55.41	5/19/16	Ref. 18, p. 15; Ref. 20; Ref. 23, p. 365
AM-29	185.46	340 to 358	-154.54 to -172.54	115.06	70.4	5/17/16	Ref. 18, p. 9; Ref. 20; Ref. 23, p. 365
AM-35	112.14	332 to 350	-219.86 to -237.86	98.36	13.78	5/23/16	Ref. 18, p. 18; Ref. 20; Ref. 23, p. 365
AM-48	205.1	270 to 300	-64.9 to -94.9	103.01	102.09	5/16/16	Ref. 18, p. 2; Ref. 20; Ref. 23, p. 365

bgs: below ground surface

Background Deep Monitoring Well Groundwater Concentrations							
Well Name	**CLP Sample ID**	**Sampling Date**	**Hazardous Substance**	**Concentration (µg/l)**	**MDL (µg/l)**	**CRQL (µg/l)**	**References**
AM-9	YA617	5/16/16	1,1-DCE	ND	0.21	0.50	Ref. 4, pp. 34, 40; Ref. 6, pp. 3, 22-23; Ref. 11, pp. 5, 65-70; Ref. 12, pp. 8-9; Ref. 17, p. 2
			TCE	0.11 J	0.080	0.50	
			PCE	ND	0.15	0.50	
AM-14	YA618	5/16/16	1,1-DCE	ND	0.21	0.50	Ref. 4, p. 34; Ref. 6, pp. 3, 24-25; Ref. 11, pp. 5, 74-79; Ref. 17, p. 2
			TCE	0.14 J	0.080	0.50	
			PCE	ND	0.15	0.50	
AM-25	YA619	5/19/16	1,1-DCE	ND	0.21	0.50	Ref. 4, p. 35; Ref. 5, pp. 3, 21-22; Ref. 9, pp. 7, 56-61; Ref. 10, pp. 7-8; Ref. 17, p. 8
			TCE	0.92	0.080	0.50	
			PCE	0.43 J	0.15	0.50	
AM-29	YA620	5/17/16	1,1-DCE	ND	0.21	0.50	Ref. 4, p. 35; Ref. 6, pp. 26-27; Ref. 11, pp. 6, 83-88; Ref. 12, pp. 10-11; Ref. 17, p. 4
			TCE	ND	0.080	0.50	
			PCE	ND	0.15	0.50	
AM-35	YA621	5/23/16	1,1-DCE	ND	0.21	0.50	Ref. 4, pp. 35, 43; Ref. 7, pp. 4, 26-27; Ref. 13, pp. 6, 61-66; Ref. 14, p. 8; Ref. 17, p. 10
			TCE	2.6	0.080	0.50	
			PCE	3.4	0.15	0.50	
AM-48	YA622	5/16/16	1,1-DCE	ND	0.21	0.50	Ref. 4, pp. 34, 39; Ref. 6, pp. 28-29; Ref. 11, pp. 5, 91, 96; Ref. 12, pp. 11-12; Ref. 17, p. 1
			TCE	ND	0.080	0.50	
			PCE	ND	0.15	0.50	

µg/l: Micrograms analyte per liter groundwater
MDL: Method Detection Limit
CRQL: EPA Contract Laboratory Program Contract Required Quantitation Limit
J: Result is above the MDL but below the CRQL. The result is not biased, and no adjustment is needed (Ref. 5, p. 3; Ref. 6, p. 3; Ref. 7, p. 4).
ND: Not detected.

The minimum standard to establish an observed release by chemical analysis is analytical evidence of a hazardous substance significantly above the background level and some portion of the significant increase above the background level is attributable to the site. In accordance with HRS Table 2-3, if the background concentration is not detected, a significant increase is established when the sample measurement equals or exceeds the sample quantitation limit (SQL). If the background concentration equals or exceeds the detection limit, a significant increase is established when the sample measurement is 3 times or more above the background concentration. If the sample analysis was performed under the EPA Contract Laboratory Program (CLP), the EPA contract-required quantitation limit (CRQL) can be used in place of the SQL if the SQL is not available.

Analytical results showed background well AM-35 to have higher concentrations of TCE and PCE than the other deep and shallow background wells. This well is located on the downgradient side of the plume (see Figure 1 and section 3.0 Ground Water Migration Pathway of this documentation record). Therefore, it may not represent actual background conditions. However, including it as a background well does not eliminate any of the contaminated wells from documenting the observed release. Likewise, the background concentration of AM-35 does not

eliminate any of the shallow wells from consideration. Therefore, the well is included for conservative HRS scoring purposes.

Based on the above sampling results, the following background levels are established for the deep monitoring wells:

Background Levels to Establish an Observed Release to Deep Monitoring Wells		
Hazardous Substance	**Maximum Background Concentration 2016 SI Sampling Results (µg/l)**	**HRS Table 2-3 Minimum Concentration to Document an Observed Release by Chemical Analysis (µg/l)**
1,1-DCE	ND	release sample CRQL
TCE	2.6	7.8
PCE	3.4	10.2

µg/l: micrograms analyte per liter groundwater
CRQL: EPA Contract Laboratory Program Contract Required Quantitation Limit
ND: Not detected.

-Deep Monitoring Wells Establishing an Observed Release:
Deep contaminated monitoring wells establishing an observed release are shown on Figure 1. These wells contained 1,1-DCE, TCE, and/or PCE at concentrations exceeding the background levels specified above.

Contaminated Deep Monitoring Well Groundwater Elevations							
Well Name	**Wellhead Elevation (feet above msl)**	**Screened Interval (feet bgs)**	**Screened Interval (feet msl)**	**Groundwater Elevation (feet bgs)**	**Groundwater Elevation (feet above msl)**	**Date**	**References**
FM-10	161.29	215 to 235	-53.71 to -73.71	102.7	58.59	5/19/16	Ref. 18, p. 16; Ref. 20; Ref. 23, p. 368
FM-11	152.58	236 to 256	-83.42 to -103.42	102.75	49.83	5/18/16	Ref. 18, p. 12; Ref. 20; Ref. 23, p. 368
FM-12	164.06	206 to 226	-41.94 to -61.94	104.36	59.7	5/26/16	Ref. 18, p. 32; Ref. 20; Ref. 23, p. 368
FM-16	194.4	248 to 268	-53.6 to -73.6	121.32	73.08	5/24/16	Ref. 18, p. 22; Ref. 20; Ref. 23, p. 368
FM-17	180	250 to 270	-70 to -90	113	67	5/24/16	Ref. 18, p. 24; Ref. 20; Ref. 23, p. 368
FM-19B	145.76	230 to 260	-84.24 to -114.24	98.83	46.93	5/26/16	Ref. 18, p. 30; Ref. 20; Ref. 23, p. 368
FM-19C	145.63	365 to 385	-219.37 to -239.37	104.4	41.23	5/26/16	Ref. 18, p. 31; Ref. 20; Ref. 23, p. 368
FM-22	140.56	242 to 262	-101.44 to -121.44	97.7	42.86	5/25/16	Ref. 18, p. 27; Ref. 20; Ref. 23, p. 368
FM-23	153.48	234 to 249	-80.52 to -95.52	103.65	49.83	5/23/16	Ref. 18, p. 19; Ref. 20; Ref. 23, p. 368
FM-24	145.8	271 to 291	-125.2 to -145.2	106.1	39.7	5/17/16	Ref. 18, p. 8; Ref. 20; Ref. 23, p. 368

msl: mean sea level
bgs: below ground surface

Deep Monitoring Well Results Establishing an Observed Release						
Well Name	**CLP Sample ID**	**Sampling Date**	**Hazardous Substance**	**Concentration (µg/l)**	**CRQL (µg/l)**	**References**
FM-10	YA643	5/19/16	1,1-DCE	1.2	0.50	Ref. 4, p. 35; Ref. 5, p. 33; Ref. 9, pp. 7, 18, 184-189, 196-201; Ref. 10, p. 13; Ref. 17, p. 8
			TCE	12	0.50	
FM-11	YA644	5/18/16	1,1-DCE	1.4	0.50	Ref. 4, p. 35; Ref. 5, p. 35; Ref. 9, pp. 5, 208-213, 220-225; Ref. 10, pp. 13-14; Ref. 17, p. 6
			TCE	25	2.5	
FM-12	YA645	5/26/16	1,1-DCE	1.5	0.50	Ref. 4, p. 36; Ref. 8, p. 37; Ref. 15, pp. 7, 20, 225-230, 237-241; Ref. 17, p. 17
			TCE	12	2.5	
FM-16	YA646	5/24/16	PCE	31	2.5	Ref. 4, pp. 36, 44; Ref. 8, pp. 39-40; Ref. 15, pp. 5, 248-253, 259-264; Ref. 16, p. 14; Ref. 17, p. 12
FM-17	YA647	5/24/16	PCE	49	2.5	Ref. 4, p. 36; Ref. 7, pp. 40-41; Ref. 13, pp. 7, 171-176, 183-188; Ref. 14, p. 13; Ref. 17, p. 13
FM-19B	YA648	5/26/16	1,1-DCE	1.0	0.50	Ref. 4, p. 36; Ref. 8, p. 45; Ref. 15, pp. 7, 267-272; Ref. 16, p. 15; Ref. 17, p. 16
			TCE	18	0.50	
FM-19C	YA649	5/26/16	PCE	22	2.5	Ref. 4, p. 36; Ref. 8, pp. 4, 47-48; Ref. 15, pp. 7, 280-285, 291-296; Ref. 16, p. 16; Ref. 17, p. 16
FM-22	YA650	5/25/16	1,1-DCE	3.0	0.50	Ref. 4, pp. 36, 45; Ref. 8, pp. 4, 49-50; Ref. 15, pp. 6, 299-304, 311-316; Ref. 16, p. 17; Ref. 17, p. 14
			TCE	31	2.5	
			PCE	29	2.5	
FM-23	YA651	5/23/16	1,1-DCE	1.8	0.50	Ref. 4, pp. 35, 43; Ref. 7, pp. 5, 42; Ref. 13, pp. 6, 192-197, 204-209; Ref. 14, p. 13; Ref. 17, p. 11
			TCE	27	2.5	
FM-24	YA652	5/17/16	1,1-DCE	1.7	0.50	Ref. 4, pp. 35, 42; Ref. 6, pp. 5, 36; Ref. 11, pp. 6, 181-186, 193-198; Ref. 12, p. 15
			TCE	31	2.5	

µg/l: Micrograms analyte per liter groundwater
CRQL: EPA Contract Laboratory Program Contract Required Quantitation Limit

Observed Release to Drinking Water Production Wells

-Background Drinking Water Production Wells

Background drinking water production wells were sampled during the same sampling event, using the same sampling methods as the release wells. Background drinking water production wells were selected for similar depths, screen lengths, and construction with contaminated production wells located within the OCNB plume. Background production wells are located east (upgradient), south (cross-gradient), and west (downgradient) of the OCNB plume. According to OCWD, there are no production wells north (cross-gradient) of the plume (Ref. 4, p. 15; Ref. 19, p. 38).

Screened intervals of background and contaminated wells were used to determine whether the wells were screened at comparable depths within the aquifer (Ref. 4, p. 15; Ref. 19, pp. 20, 22, 25, 38; Ref. 20). The well locations are shown on Figures 1 and 2.

Well Name	Wellhead Elevation (feet above msl)	Screened Interval (feet bgs)	Screened Interval (feet above msl)	References
SCWC-PBF3	226	220 to 475	6 to -249	Ref. 21; Ref. 23, p. 353
SCWC-PBF4	228	275 to 520	-47 to -292	Ref. 21; Ref. 23, p. 353
SCWC-PLJ2	200	402 to 492	-202 to -292	Ref. 21; Ref. 23, p. 353
A-48	108	932 to 1344	-824 to -1236	Ref. 21; Ref. 23, p. 349
A-54	147	680 to 1480	-533 to -1333	Ref. 21; Ref. 23, p. 349
BP-BOIS	87.53	475 to 1355	-387.47 to -1267.47	Ref. 21; Ref. 23, p. 350

msl: mean sea level
bgs: below ground surface

Background Production Well Groundwater Concentrations							
Well Name	**CLP Sample ID**	**Sampling Date**	**Hazardous Substance**	**Concentration (µg/l)**	**MDL (µg/l)**	**CRQL (µg/l)**	**References**
SCWC-PBF3	YA653	5/17/16	1,1-DCE	ND	0.21	0.50	Ref. 4, p. 37; Ref. 6, pp. 3, 38-39; Ref. 11, pp. 6, 202-207; Ref. 12, p. 16; Ref. 17, p. 3
			TCE	ND	0.080	0.50	
			PCE	ND	0.15	0.50	
SCWC-PBF4	YA654	5/17/16	1,1-DCE	ND	0.21	0.50	Ref. 4, p. 37; Ref. 6, pp. 3, 40-41; Ref. 11, pp. 6, 210-215; Ref. 12, p. 17; Ref. 17, p. 3
			TCE	ND	0.080	0.50	
			PCE	ND	0.15	0.50	
SCWC-PLJ2	YA655	5/17/16	1,1-DCE	ND	0.21	0.50	Ref. 4, p. 37; Ref. 6, pp. 3, 42-43; Ref. 11, pp. 6, 218-223; Ref. 12, p. 18; Ref. 17, p. 3
			TCE	ND	0.080	0.50	
			PCE	ND	0.15	0.50	
A-48	YA680	5/18/16	1,1-DCE	ND	0.21	0.50	Ref. 4, p. 37; Ref. 5, pp. 3, 53-54; Ref. 9, pp. 6, 343-348; Ref. 10, p. 18; Ref. 17, p. 6
			TCE	ND	0.080	0.50	
			PCE	ND	0.15	0.50	
A-54	YA681	5/17/16	1,1-DCE	ND	0.21	0.50	Ref. 4, p. 37; Ref. 6, pp. 3, 60-61; Ref. 11, pp. 7, 278-283; Ref. 12, p. 21; Ref. 17, p. 3
			TCE	ND	0.080	0.50	
			PCE	ND	0.15	0.50	
BP-BOIS	YA682	5/18/16	1,1-DCE	ND	0.21	0.50	Ref. 4, p. 37; Ref. 5, pp. 3, 55-60; Ref. 9, pp. 6, 353-358; Ref. 10, p. 19; Ref. 17, p. 6
			TCE	ND	0.080	0.50	
			PCE	ND	0.15	0.50	

µg/l: Micrograms analyte per liter groundwater
MDL: Method Detection Limit
CRQL: EPA Contract Laboratory Program Contract Required Quantitation Limit
ND: Not detected.

The minimum standard to establish an observed release by chemical analysis is analytical evidence of a hazardous substance significantly above the background level and some portion of the significant increase above the background level is attributable to the site. In accordance with HRS Table 2-3, if the background concentration is not detected, a significant increase is established when the sample measurement equals or exceeds the sample quantitation limit (SQL). If the background concentration equals or exceeds the detection limit, a significant increase is established when the sample measurement is 3 times or more above the background concentration. If the sample analysis was performed under the EPA Contract Laboratory Program (CLP), the EPA contract-required quantitation limit (CRQL) can be used in place of the SQL if the SQL is not available. Based on the above sampling results, the following background levels are established for the deep monitoring wells:

Background Levels to Establish an Observed Release to Production Wells		
Hazardous Substance	**Maximum Background Concentration 2016 SI Sampling Results (µg/l)**	**HRS Table 2-3 Minimum Concentration to Document an Observed Release by Chemical Analysis (µg/l)**
1,1-DCE	ND	release sample CRQL
TCE	ND	release sample CRQL
PCE	ND	release sample CRQL

µg/l: micrograms analyte per liter groundwater
CRQL: EPA Contract Laboratory Program Contract Required Quantitation Limit
ND: Not detected.

- Drinking Water Production Wells Establishing an Observed Release:
Drinking water production wells establishing an observed release are shown on Figures 1 and 2. These wells contained 1,1-DCE, TCE, and/or PCE at concentrations exceeding the background levels specified above.

Well Name	Wellhead Elevation (feet above msl)	Screened Interval (feet bgs)	Screened Interval (feet above msl)	Reference
A-47	112.94	482 to 1375	-369.06 to -1262.06	Ref. 21; Ref. 23, p. 349
F-4	151.62	315 to 405	-163.38 to -253.38	Ref. 21; Ref. 23, p. 352
F-5	148.32	350 to 400	-201.68 to -251.68	Ref. 21; Ref. 23, p. 352
F-6	148.02	340 to 401	-191.98 to -252.98	Ref. 21; Ref. 23, p. 352
F-8	148.02	324 to 402	-175.98 to -253.98	Ref. 21; Ref. 23, p. 352
PAGE-F	109	186 to 364	-77 to -255	Ref. 21; Ref. 23, p. 379

msl: mean sea level
bgs: below ground surface

Drinking Water Production Well Results Documenting an Observed Release						
Well Name	**CLP Sample ID**	**Sampling Date**	**Hazardous Substance**	**Concentration (µg/l)**	**CRQL (µg/l)**	**References**
A-47	YA656	5/17/16	1,1-DCE	0.62	0.50	Ref. 4, p. 37; Ref. 6, p. 44; Ref. 11, pp. 6, 226-231; Ref. 12, p. 19; Ref. 17, p. 3
F-4	YA657	5/18/16	TCE	0.84	0.50	Ref. 4, p. 37; Ref. 5, pp. 37-38; Ref. 9, pp. 5, 18, 229-234, 238-243; Ref. 10, p. 15; Ref. 17, p. 5
			PCE	0.50	0.50	
F-5	YA658	5/18/16	TCE	1.6	0.50	Ref. 4, p. 37; Ref. 5, pp. 39-40; Ref. 9, pp. 5, 18, 249-254, 258-263; Ref. 10, p. 16; Ref. 17, p. 5
			PCE	0.97	0.50	
F-6	YA659	5/18/16	TCE	1.1	0.50	Ref. 4, p. 37; Ref. 5, pp. 41-42; Ref. 9, pp. 5, 18, 269-274, 279-284; Ref. 10, pp. 16-17; Ref. 17, p. 5
			PCE	1.2	0.50	
F-8	YA660	5/18/16	TCE	0.90	0.50	Ref. 4, p. 37; Ref. 5, pp. 43-44; Ref. 9, pp. 5, 18, 290-295, 300-305; Ref. 10, p. 17; Ref. 17, p. 5
			PCE	2.0	0.50	
F-8 FD	YA683	5/18/16	TCE	0.95	0.50	Ref. 4, p. 37; Ref. 5, pp. 57-58; Ref. 9, pp. 6, 360-365; Ref. 10, p. 20; Ref. 17, p. 5
			PCE	2.2	0.50	
PAGE-F	YA661	5/17/16	TCE	0.82	0.50	Ref. 4, p. 38; Ref. 6, p. 50; Ref. 11, pp. 6, 236-241; Ref. 12, p. 20; Ref. 17, p. 4

µg/l: micrograms analyte per liter groundwater
CRQL: EPA Contract Laboratory Program Contract Required Quantitation Limit

Attribution

The OCNB site consists of a single comingled VOC-contaminated groundwater plume, which resulted from the releases of solvents from multiple facilities located in the vicinity of the OCNB plume. Chlorinated organic solvents such as TCE and PCE are common industrial chemicals that are typically associated with cleaning and degreasing operations (Ref. 22, p. 32; Ref. 23, p. 180; Ref. 101; Ref. 102). Hazardous substances associated with the OCNB plume include 1,1-DCE, TCE, and PCE, which were detected at concentrations significantly above background in monitoring wells and drinking water production wells located within the plume (See Section 3.1.1 Observed Release, Chemical Analysis of this document for documentation of concentrations significantly above background). Locations of contaminated monitoring and drinking water production wells where observed releases have been documented are presented in Figures 1 and 3.

In accordance with the HRS, a contaminated groundwater plume can only be evaluated as a source for HRS scoring purposes when the original source of hazardous substances contributing to the plume cannot be reasonably identified (Ref. 1, Sections 1.1, 3.1.1). The plume at this site cannot be attributed to a single source. Multiple facilities have been identified in the vicinity of the OCNB plume that are possible contributors to the comingled plume (Ref. 22, pp. 32, 171; Ref. 110, p. 40). DTSC and RWQCB have been conducting investigations and remedial activities at many of these facilities. Sampling results from these activities show the presence of VOCs in soils, soil gas, and groundwater beneath these facilities. DTSC and RWQCB requested EPA assistance in evaluating the plume and contamination at facilities in the vicinity of the plume (Ref. 113; Ref. 114). EPA has conducted PAs at eight of these facilities, summarized below (Ref. 106). EPA considers that these facilities have sources that may be contributing to the plume. However, there is not enough information to attribute at least part of the significant increase in contamination in the plume to any individual source, because these facilities may be releasing similar substances, and are located too close together for background sampling. These conditions make it impossible to collect sufficient samples between each facility to determine the individual contribution from each location. The facility locations are shown on Figure 3.

Arnold Engineering/Universal Molding, EPA ID NO.: CAN000900306
1551 East Orangethorpe Avenue, Fullerton, CA

From approximately 1960 to 1993, Arnold Engineering operated on the property. Operations included the manufacturing of aerospace structures for the commercial and military aerospace industry, including machine part components, sheet metal components, and bench assemblies(Ref. 41, pp. 3, 10). Records indicate that operations used various VOCs, including PCE, TCE, and other similar solvents (Ref. 42; Ref. 43). Soil and soil gas sampling results indicated the presence of PCE, TCE, and/or 1,1-DCE (Ref. 41, p. 10; Ref. 52, pp. 3, 11).

Autonetics/Raytheon, EPA ID NO.: CAN000900337
310 East Walnut Avenue, Fullerton, CA

In the early 1960s, the property was occupied by Autonetics (now part of Boeing). Operations were conducted in an area designated as Building 62. (Ref. 59, p. 1-2). Building 62 provided logistics support to Minuteman missile operations, including calibration of electronic equipment and mechanical repair. Hughes Aircraft Company (now part of Raytheon) leased Building 387 from 1957 to 1961. TCE was stored and used in a degreaser located toward the eastern portion of Building 387 (Ref. 60, p. 10; Ref. 65). PCE, TCE, and 1,1-DCE have been detected in site soil and soil gas (Ref. 61, p. 2).

CBS Fender, EPA ID NO.: CAN000900352
500 South Raymond Avenue, Fullerton, CA
From 1953 to approximately 1983, Fender manufactured musical instruments on the CBS/Fender property (Ref. 63, p. 3). PCE was utilized on the property to degrease metal parts (Ref. 63, p. 4-5). PCE, TCE, and 1,1-DCE were detected in soil and groundwater samples collected in 2011 (Ref. 66, pp. 8, 22, 45-56).

Fullerton Manufacturing, EPA ID NO.: CAN000900354
311 South Highland Avenue, Fullerton, CA
From 1927 to 1939, the Fullerton Manufacturing/Raytheon property was occupied by a cannery. In 1945, the property was occupied by a metal forming manufacturer. In 1949, HBP Co. operated onsite and manufactured metal furniture, including chromium plating. In 1953 and 1954, trailers were manufactured on the property (Ref. 68, pp. 15-17; Ref. 69, p. 10). From 1955 to 1970, Autonetics (now part of Boeing) and Hughes Aircraft Company (now part of Raytheon) occupied the site and manufactured metal aircraft parts. Dan-Van Rubber, Fullerton Mfg. Co. and Mid-Cal Rubber Company conducted rubber manufacturing operations between 1973 and 1993 (Ref. 68, pp. 9, 15-17; Ref. 69, p. 10). PCE, TCE, and 1,1,1-TCA were detected in soil and soil gas samples collected on the property (Ref. 75, p. 2; Ref. 78, pp. 9-11). TCE and cis-1,2-DCE were detected in groundwater beneath the property at concentrations above Maximum Contaminant Levels (MCLs) (Ref. 74, pp. 1-2, 4; Ref. 75, p. 7; Ref. 76, pp. 2, 6-8).

Khyber Foods, EPA ID NO.: CAN000900323
1818 East Rosslynn Avenue, Fullerton, CA
From 1984 to 1988, J.C. Ford Manufacturing Company operated on the property as a machine shop and weld fabricator. In the 1990s, Khyber Foods, Inc. operated on the property. Since at least 2008, Metaclad Insulation Corporation has operated on the property designing and fabricating specialty insulation items (Ref. 78, pp. 3, 10). TCE, PCE, 1,1-DCE, 1,1,1-TCA, and 1,1,2-TCA were detected in soils collected on the property in March 1990. PCE, TCE, and 1,1-DCE were detected in groundwater beneath the property at concentrations exceeding MCLs (Ref. 82. pp. 3-5; Ref. 83, p. 8; Ref. 84, p. 2).

Northrop Y-19, EPA ID NO.: CAN000900325
1401 East Orangethorpe Avenue, Fullerton, CA
Historical operations conducted on the Northrop Y-19 property include television picture tube manufacturing from 1953 to 1957 (Sylvania Electric Products), possible electrical components manufacturing from 1963 to 1965 (Rohr Corporation), galvanizing utilizing acid vats in 1976 and 1977 (Sentry Steel and Wire and Cook-Sanders Wire/Bar), audio tape manufacturing in 1979 (Memorex Corporation), and electronic component assembly, painting, soldering, degreasing and storage operations from 1984 to 1990 (Northrop Corporation) (Ref. 86, p. 7; Ref. 87, p. 3; Ref. 89, p. 1). TCE and 1,1,1-TCA were detected in a sump sample collected in 1990 (Ref. 86, pp. 17-18, 36-37). PCE and TCE were detected during a 2009 soil gas survey (Ref. 93, pp. 2-3).

Orange County Metal Processing, EPA ID No.: CAN000909326
1711 East Kimberly Avenue, Fullerton, CA
Metal finishing operations on the property included electroplating (cadmium, chrome, and zinc) and aluminum anodizing (Ref. 104, pp. 11-12). VOCs including PCE and TCE have been detected in soils, soil gas, and groundwater beneath the property (Ref. 104, pp. 15-27). Remedial

actions including soil vapor extraction and soil removal have been completed by DTSC in conjunction with the Former PCA Metal Finishing described below (Ref. 105, p. 2).

Vista Paint, EPA ID NO.: CAN000900358
2020 East Orangethorpe Avenue, Fullerton, CA
Operations at the facility included the manufacturing of oil- and water-based paints, beginning in approximately 1983, and included the use of 1,1,1-TCA. All oil-based paint production ceased in 2008 (Ref. 95, pp. 1-2; Ref. 96, p. 7). Soil samples collected from the facility in January and February 2011 indicated the presence of PCE, TCE, and 1,1-DCE from the surface to depths of up to 80 feet bgs (Ref. 98, p. 9). PCE, TCE, 1,1-DCE, and 1,1,1-TCA were detected in soil gas samples collected in December 2011 (Ref. 97, pp. 6, 9-10).

Other Area Facilities under California State Investigation
DTSC and RWQCB are conducting remedial activities at the facilities in the vicinity of the OCNB plume listed below, also shown on Figure 3. However, these facilities have not been evaluated by EPA.

Former Aerojet (current Fullerton Crossings)
601-629 S. Placentia Avenue, Fullerton
RWQCB is the current lead agency for this facility (GeoTracker ID: SL0605973469) (Ref. 73). Aerojet General Corporation operated at this location from the early 1960s to 1984. Aerojet stored, handled, and used PCE, TCE, 1,1,1-TCA, MEK, "chlorothane," paint thinner, and explosives, propellants, and primers (Ref. 33, pp. 1-4; Ref. 34; Ref. 35). PCE and TCE have been detected in facility soil, soil gas, and groundwater samples during multiple environmental investigations (Ref. 39, pp. 6, 14, 22, 25, 27-31; Ref. 40, pp. 5-7, 11-12, 19, 26-29, 31-32, 38-42; Ref. 44, pp. 3-5, 16-17; Ref. 46, pp. 4, 7, 13-14, 19-21; Ref. 47, pp. 4, 20, 37-38, 42-49; Ref. 48, pp. 5, 8, 13, 19; Ref. 49, pp. 4-5, 7-8, 14; Ref. 50, pp. 8-9, 13). Soil removal activities were conducted on portions of the property in 2011 and 2013 (Ref. 45, pp. 21-23, 32-36).

Former Alcoa Fastening Systems (current Arconic)
800 S. State College Blvd., Anaheim
RWQCB is the current lead agency for this facility (GeoTracker ID: SL0605956921) (Ref. 77). The facility has been used for aircraft fastener manufacturing since 1963 (Ref. 51, p. 4; Ref. 53, p. 8; Ref. 94, p. 8). Product cleaning at the facility included the use of PCE and TCE (Ref. 92, p. 8). PCE, TCE, 1,1-DCE, and 1,4-dioxane have been detected in groundwater, and PCE, TCE, and 1,1-DCE have been detected in soil during soil gas sampling (Ref. 51, pp. 4-5, 10; Ref. 53, p. 8; Ref. 92, pp. 10-15; Ref. 94, pp. 8-9). A soil vapor extraction (SVE) system has operated on the property since 2009, removing an estimated 10,833 pounds of VOCs (Ref. 53, pp. 9, 14-17; Ref. 94, pp. 9, 14, 17).

Former Monitor Plating (current R3 Contractors Inc.)
800 East Orangefair Lane, Anaheim
RWQCB is the current lead agency for this facility (GeoTracker ID: SLT8R0233908) (Ref. 79). Monitor Plating & Anodizing started operating as a metal finishing and plating shop in 1970 (Ref. 99, p. 1). In 1999 a fire destroyed the plant. Following the facility fire, the facility owner initiated a cleanup response with state and local agencies including RWQCB and DTSC. The owner then shortly thereafter declared bankruptcy, and EPA conducted the site cleanup (Ref. 100, p. 9). In January 2015, the new owner R3 Contractors Inc. signed a voluntary oversight cost recovery agreement with RWQCB. The building has been reconstructed and indoor air sampling

was conducted in 2015, with TCE found at 15 µg/L at one location in the building (Ref. 133, p. 8). Groundwater monitoring in 2015 found TCE and PCE in groundwater beneath the facility (Ref. 128 pp. 1, 3).

Former Northrop (Kester Solder)
1730 North Orangethorpe Park, Anaheim
RWQCB is the current lead agency for this facility (GeoTracker ID: T0605939958) (Ref. 80). The property was first developed in 1959. Kester Solder Company manufactured solder alloys and fluxes at the facility between 1968 and 2002. Operations included the mixing and repackaging of industrial solvents, primarily PCE (Ref. 56, pp. 5-6). PCE, TCE, and 1,1-DCE have been detected in soil, soil gas, and groundwater samples collected during multiple environmental investigations (Ref. 54, p. 1; Ref. 55, pp. 5-7, 47-50; Ref. 56, pp. 10-11). SVE was conducted from 2007 to 2009 to remediate VOCs in soils at the facility (Ref. 54, p. 2). In 2010, RWQCB issued a no further action soil closure (Ref. 54, pp. 1, 6).

Former Northrop (Y-12)
301 E. Orangethorpe Ave., Anaheim
RWQCB is the current lead agency for this facility (GeoTracker ID: SL0605912672) (Ref. 81). From 1962 through 1994, Northrop activities at the facility included vapor degreasing, metal quenching, painting, and chemical treatment of manufactured aircraft parts (Ref. 57, p. 5). TCE and other solvents were used in site operations (Ref. 57, pp. 5-6). PCE and TCE have been detected in soil and soil gas samples collected during multiple environmental investigations at the facility (Ref. 57, pp. 11-21; Ref. 58, pp. 18-19, 45). A SVE system has been operating at the facility since 2008 (Ref. 58, p. 5).

Former Chicago Musical Instruments/F.E. Olds (current United Duralume Products, Inc.)
350 S. Raymond Avenue, Fullerton
DTSC is the current lead agency for this facility (EnviroStor ID: 60001251) (Ref. 85). Chicago Musical Instruments and its predecessor manufactured musical instrument and brass parts at the facility from 1954 through 1979. Operations included nickel, silver, and gold plating, as well as lacquer painting, finishing, polishing, lathing, and warehousing (Ref. 70, p. 10). Elevated concentrations of TCE, PCE, and 1,1-DCE have been detected in soil, soil gas, and groundwater beneath the facility (Ref. 62, pp. 1-7; Ref. 70, pp. 11-12). A SVE system operated at the facility from 2011 through April 2017 (Ref. 67, pp. 2-3).

Former PCA Metal Finishing
1726 E. Rosslynn Avenue, Fullerton
DTSC is the current lead agency for this facility (EnviroStor ID: 71002360) (Ref. 71, p. 1). PCA Metal Finishing began operations in August 1980 performing electrochemical plating for metal parts. The primary operations included cleaning and mechanical finishing of metal parts; chemical cleaning and electroplating application of copper, nickel, and chrome onto metal surfaces; buffing and polishing finished products; and shipping and receiving of chemicals, wastes, and finished products. Beginning in late 2006, PCA Metal began closing its operation and ceased manufacturing operations by mid-March 2007 (Ref. 72 pp. 4-5; Ref. 104, pp. 12-13). PCE and TCE have been detected in soil, soil gas, and groundwater beneath the facility during multiple environmental investigations (Ref. 104, pp. 15-23). In 2015, DTSC approved the Final Feasibility Study/Remedial Action Plan submitted by PCA to evaluate technical alternatives and present recommendations for remediation of VOC and metal-impacted soil and groundwater beneath the site (Ref. 104, pp. 113-114).

Hazardous Substances Released

Observed release of 1,1-DCE, TCE, and PCE to groundwater are documented by chemical analysis.

Groundwater Observed Release Factor Value: 550

3.1.2 POTENTIAL TO RELEASE

Potential to Release was not scored, because an Observed Release was established.

3.2 WASTE CHARACTERISTICS

The waste characteristics category value is based on hazardous waste quantity, toxicity, and groundwater mobility for the hazardous substances documented in the site source in the release to groundwater.

3.2.1 TOXICITY/MOBILITY

HRS Toxicity and Mobility Factor Values are presented below for the hazardous substances documented in Source 1. Toxicity Factor Values are provided in the Superfund Chemical Data Matrix (Ref. 2).

Hazardous Substance	Source No.	Toxicity Factor Value	Mobility Factor Value	Does Haz. Substance Meet Observed Release? (Y/N)	Toxicity/ Mobility (Table 3-9)	Reference
1,1-DCE	1	10	1*	Y	10	Ref. 2, p. 1
TCE	1	1,000	1*	Y	1,000	Ref. 2, p. 3
PCE	1	100	1*	Y	100	Ref. 2, p. 2

* Hazardous substances meeting the criteria for observed release by chemical analysis receive a mobility factor value of 1 (Ref. 1, section 3.2.1.2).

Toxicity/Mobility Factor Value: 1,000
(Ref. 1, Table 3-9, Ref. 1a, Section 2.4.1.1).)

3.2.2 HAZARDOUS WASTE QUANTITY

The calculation for hazardous waste quantity for Source 1 is presented in Section 2.4.2.

Source No.	Source Type	Source Hazardous Waste Quantity
1	Other	>0
	sum:	1 (rounded to 1 as specified in Ref. 1, Table 2-6)

The sum corresponds to a hazardous waste quantity factor value of 1 in Table 2-6 of the HRS (Ref. 1, Table 2-6, Ref. 1a, Section 2.4.1.1). However, based on the fact that targets are subject to Level I concentrations (see Section 3.3.2.3 of this document), a hazardous waste quantity factor value of 100 is assigned if it is greater than the hazardous waste quantity value from HRS Table 2-6 (Ref. 1, Section 2.4.2.2, Ref. 1a, Section 2.3.1.1). Therefore, a hazardous waste quantity factor value of 100 is assigned for the groundwater pathway (Ref. 1, Section 2.4.2.2, Ref. 1a, Section 2.4.1.1).

Hazardous Waste Quantity Factor Value: 100
(Ref. 1, Table 2-6, Section 2.4.2.2)

3.2.3 WASTE CHARACTERISTICS FACTOR CATEGORY VALUE

Toxicity/Mobility Factor Value: 1,000
Hazardous Waste Quantity Factor Value: 100

Toxicity/Mobility Factor Value X Hazardous Waste Quantity Factor Value: 100,000

Waste Characteristics Factor Category Value (subject to a maximum of 100): 18
(Ref. 1, Table 2-7, Ref 1a, Section 2.4.1.1)

3.3 TARGETS

Drinking water wells screened in the Interconnected Sand and Gravel Aquifer within the target distance limit from the site are shown on Figure 2 (Ref. 130).

Level I Concentrations

Level I actual contamination is documented when groundwater concentrations for the target meet the criteria for an observed release and are at or above groundwater benchmark values (Ref. 1, Section 2.5; Ref. 1, Table 3-10).

Well Name	CLP Sample ID	Hazardous Substance	Hazardous Substance Concentration (µg/l)	Benchmark Concentration (µg/L)	Benchmark	Reference for Benchmark
F-5	YA658	TCE	1.6	1.1	Cancer Risk	Ref. 2, p. 3
F-6	YA659	TCE	1.1	1.1	Cancer Risk	Ref. 2, p. 3

3.3.1 NEAREST WELL

As identified in Section 3.3 of this document, City of Fullerton drinking water wells F-5 and F-6, are subject to Level I concentrations. Therefore, a nearest well factor value of 50 is assigned (Ref. 1, Section 3.3.1).

Nearest Well Factor Value: 50
(Ref. 1, Table 3-11)

3.3.2 POPULATION

City of Fullerton

The City of Fullerton operates a drinking water system that serves approximately 138,307 people (Ref. 88, p. 2). Currently, the system consists of 10 active wells (Wells F-3A, F-4, F-5, F-6, F-8, F-10, F-AIRP, F-CHRI2, F-KIM1A, and F-KIM2) (Ref. 21; Ref. 24; Ref 25, p. 3; Ref. 88, p. 1; Ref. 130). Well F-7 was placed on inactive status in February 2015 due to VOCs exceeding MCLs, and is planned for destruction when funding is available (Ref. 126; Ref. 127; Ref. 131). Wells F-KIM1 and F-FS13 were destroyed due to the presence of VOCs (Ref. 109). However, the inactive and destroyed wells are not scored because they do not affect the listing decision. The population formerly served by those wells is included in the current total population served by the system.

The City of Fullerton Water System is divided into 12 service zones (Ref. 88, p. 2; Ref. 90). Under typical operating conditions, only 6 of the service zones, Zones 1, 1A, 1B, 1C, 2, and 2A, receive drinking water from groundwater wells; the remaining zones are provided with 100% surface water from Metropolitan Water District (MWD). No one well or surface water intake provides more than 40% to any of the 6 service zones listed above (Ref. 88, pp. 1-2; Ref. 129, p. 2). Under high demand conditions, the wells have the capacity to pump throughout the entire system; however, this capacity has never been used (Ref. 88, pp. 1-2; Ref. 132, pp. 1-2).

Wells serving each service zone, as well as population served by each zone, are listed in the table below.

Calculations for Population Per Well by Service Zone						
Service Zone	**Population Served by Zone(s)**	**Names of Wells Serving Service Zone**	**Number of Wells Serving Service Zone**	**Number of Surface Water Intakes Serving Service Zone**	**Population Per Well or Intake = population/ (wells+intakes)**	**References**
1	40,129	F-3A, F-4, F-5, F-6, F-8	5	0	40,129/5 = 8,025.8	Ref. 88, pp. 1-2; Ref. 132, pp. 2-3
1A	10,027	F-10, F-KIM1A, F-KIM2	3	0	10,027/3 = 3,342.3	Ref. 88, pp. 1-2; Ref. 91, p. 2; Ref. 132, pp. 2-3
1B	16,990	F-AIRP, F-CHRI2	2	1	16,990/(2+1) = 5,663.3	Ref. 88, pp. 1-2; Ref. 91, p. 2; Ref. 132, pp. 2-3
1C	1,168	F-AIRP, F-CHRI2	2	1	1,168/(2+1) = 389.3	Ref. 88, pp. 1-2; Ref. 91, p. 2; Ref. 132, pp. 2-3
2	33,094	F-3A, F-4, F-5, F-6, F-8, F-10, F-AIRP, F-CHRI2, F-KIM1A, F-KIM2	10	4	33,094/(10+4) = 2,363.8	Ref. 88, p. 2; Ref. 129, pp. 1-2; Ref. 132, pp. 2-3
2A	557	F-3A, F-4, F-5, F-6, F-8, F-10, F-AIRP, F-CHRI2, F-KIM1A, F-KIM2	10	4	557/(10+4) = 39.7	Ref. 88, p. 2; Ref. 129, pp. 1-2; Ref. 132, pp. 2-3
The remaining service zones (3, 3A, 4, 4A, 4B, and 4C) are served by 100% MWD surface water. Therefore, calculations for these service zones are not included (Ref. 129, p. 2).						

Based on the above calculations, the following populations are served by each well:

Total Population Served by Each Well		
Well Name	**Zones Served by Well**	**Total Population Served by Well**
F-3A	1, 2, 2A	8,025.8 + 2,363.8 + 39.7 = 10,429.3
F-4	1, 2, 2A	8,025.8 + 2,363.8 + 39.7 = 10,429.3
F-5	1, 2, 2A	8,025.8 + 2,363.8 + 39.7 = 10,429.63
F-6	1, 2, 2A	8,025.8 + 2,363.8 + 39.7 = 10,429.3
F-8	1, 2, 2A	8,025.8 + 2,363.8 + 39.7 = 10,429.3
F-10	1A, 2, 2A	3,342.3 + 2,363.8 + 39.7 = 5,745.8
F-KIM1A	1A, 2, 2A	3,342.3 + 2,363.8 + 39.7 = 5,745.8
F-KIM2	1A, 2, 2A	3,342.3 + 2,363.8 + 39.7 = 5,745.8
F-AIRP	1B, 1C, 2, 2A	5,663.3 + 389.3 + 2,363.8 +39.7 = 8,456.1
F-CHRI2	1B, 1C, 2, 2A	5,663.3 + 389.3 + 2,363.8 + 39.7 = 8,456.1

City of Anaheim

The City of Anaheim operates a drinking water system that serves approximately 336,265 people. Currently, the system consists of 17 active wells (Wells A-40, A-41, A-42, A-43, A-44, A-45, A-46, A-47, A-48, A-49, A-51, A-52, A-53, A-54, A-55, A-56, and A-58) and one stand by well (Well A-39), with no single well contributing more than 40% of the system (Ref. 21; Ref. 26; Ref. 27; Ref. 28; Ref. 108, pp. 5-8; Ref. 130). In addition, well A-23 was closed due to

the presence of VOCs (Ref. 109). However, this well is not scored because it does not affect the listing decision. The population formerly served by this well is included in the current total population served by the system.

The City of Anaheim's water supply is a blend of groundwater and surface water imported by the MWD. Approximately 76 percent of the system is supplied by groundwater wells; the remaining 24 percent is imported from 6 surface water intakes (Ref. 21; Ref. 26; Ref. 27; Ref. 28).

Calculation: 336,265 people/(18 wells + 6 surface water intakes) = 14,011 people per well

Page Avenue Mutual Water Company

The Page Avenue Mutual Water Company operates a drinking water system that consists of one active drinking well (Well PAGE-F) serving approximately 115 people. All of the Page Avenue Mutual Water Company's water supply is from groundwater (Ref. 21; Ref. 29; Ref. 130).

Calculation: 115 people/1 well = 115 people per well

Golden State Water Company

The Golden State Water Company – Placentia system operates a drinking water system that serves approximately 46,758 people. Currently, the system consists of six active wells (Wells Wilson #1, SCWC-PLJ2, SCWC-PBF3, SCWC-PBF4, SCWC-PRU, and GSWC-POR1), and two surface water intakes (OC#37 and OC#68). There is one standby well, the City of Brea; however, this well is not scored because it does not affect the listing decision (Ref.32, pp. 6-8). The Golden State Water Company – Placentia system's water supply is a blend of groundwater and surface water imported by the MWD. Approximately 55 percent of the system is supplied by groundwater wells; the remaining 45 percent is imported surface water. No single well or surface water intake contributes more than 40 percent of the system. . The standby well population is apportioned to the other active wells in the system (Ref. 21; Ref. 30; Ref. 31, p. 2; Ref. 32; Ref. 108, pp. 12-13; Ref. 130).

Calculation: 46,758 people/(6 wells+2 surface water intakes) = 5,844.7 people per well

City of Buena Park

The City of Buena Park system operates a drinking water system that consists of seven active wells (Wells BP-BOIS, BP-CABA, BP-FREE, BP-HOLD, BP-KNOT, BD-LIND, and BP-SM) serving approximately 82,767 people. The City of Buena Park's water supply is a blend of groundwater and water imported by the MWD. Approximately 70 percent of the system is supplied by groundwater wells; the remaining 30 percent is imported surface water. No single well contributes over 40% of the system (Ref. 21; Ref. 36; Ref. 37, p. 3; Ref. 38; Ref. 108, pp. 8-9; Ref. 130).

Calculation: 82,767 people/(7 wells + 1 surface water intake) = 10,345.9 people per well

3.3.2.1 Level of Contamination

3.3.2.2 Level I Concentrations

Level I actual contamination is documented when groundwater concentrations for the target meet the criteria for an observed release and are at or above groundwater benchmark values (Ref. 1, Section 2.5; Ref. 1, Table 3-10). As identified in Section 3.3, the F-5 and F-6 drinking water wells are subject to Level I concentrations. The populations assigned to the wells are also explained in Section 3.3.2 of this HRS documentation record (also see Figure 2).

Level I Well	Aquifer	Population	References
F-5	Interconnected Sand and Gravel Aquifer	10,429.3	Ref. 21; Ref. 24; Ref 25, p. 3
F-6	Interconnected Sand and Gravel Aquifer	10,429.3	Ref. 21; Ref. 24; Ref 25, p. 3

Sum of Population Served by Level I Wells: 20,858.6
Sum of Population Served by Level I Wells x 10: 208,586

Level I Concentrations Factor Value: 208,586

3.3.2.3 Level II Concentrations

Level II actual contamination is documented when groundwater concentrations for the target meet the criteria for an observed release (Ref. 1, Section 2.5). As shown in Section 3.1.1, the following drinking water wells are subject to Level II concentrations. The population assigned to the wells are also explained in Section 3.3.2 of this HRS documentation record (also see Figure 2).

Level II Well	Aquifer	Population	References
A-47	Interconnected Sand and Gravel Aquifer	14,011	Ref. 21; Ref. 26; Ref. 27; Ref. 28
F-4	Interconnected Sand and Gravel Aquifer	10,429.3	Ref. 21; Ref. 24; Ref 25, p. 3
F-8	Interconnected Sand and Gravel Aquifer	10,429.3	Ref. 21; Ref. 24; Ref 25, p. 3
PAGE-F	Interconnected Sand and Gravel Aquifer	115	Ref. 21; Ref. 29

Sum of Population Served by Level II Wells: 34,984.6

Level II Concentrations Factor Value: 34,984.6

3.3.2.4 Potential Contamination

The populations assigned to the wells are explained in Section 3.3.2 of this document; see Figure 2 for the location of the wells within the TDLs.

Distance Category (miles)	Public and Private Wells	Population Served	Reference	Distance-Weighted Population Value (Ref. 1, Table 3-12)
0 to -¼	**Total**	**0**		**0**
> ¼ to ½	**Total**	**0**		**0**
> ½ to 1	**Total**	**24,440.3**		**5,224**
	City of Fullerton Well F-3A	10,429.3	Ref. 21; Ref. 24; Ref 25, p. 3	
	City of Anaheim Well A-49	14,011	Ref. 21; Ref. 26; Ref. 27; Ref. 28	
> 1 to 2	**Total**	**14,201.9**		**2,939**
	City of Fullerton Well F-KIM1A	5,745.8	Ref. 21; Ref. 24; Ref 25, p. 3	
	City of Fullerton Well F-CHRI2	8,456.1	Ref. 21; Ref. 24; Ref 25, p. 3	
> 2 to 3	**Total**	**72,326.6**		**6,778**
	City of Fullerton Well F-AIRP	8,456.1	Ref. 21; Ref. 24; Ref 25, p. 3	
	City of Fullerton Well F-KIM2	5,745.8	Ref. 21; Ref. 24; Ref 25, p. 3	
	City of Fullerton Well F-10	5,745.8	Ref. 21; Ref. 24; Ref 25, p. 3	
	City of Buena Park Well BP-BOIS	10,345.9	Ref. 21; Ref. 36; Ref. 37, p. 3; Ref. 38	
	City of Anaheim Well A-48	14,011	Ref. 21; Ref. 26; Ref. 27; Ref. 28	
	City of Anaheim Well A-54	14,011	Ref. 21; Ref. 26; Ref. 27; Ref. 28	
	City of Anaheim Well A-56	14,011	Ref. 21; Ref. 26; Ref. 27; Ref. 28	
> 3 to 4	**Total**	**114,125.6**		**13,060**
	GSWC Well SCWC-PBF3	5,844.7	Ref. 21; Ref. 30; Ref. 31, p. 2; Ref. 32	
	GSWC Well SCWC-PBF4	5,844.7	Ref. 21; Ref. 30; Ref. 31, p. 2; Ref. 32	
	GSWC Well SCWC-PRU	5,844.7	Ref. 21; Ref. 30; Ref. 31, p. 2; Ref. 32	
	GSWC Well SCWC-PLJ2	5,844.7	Ref. 21; Ref. 30; Ref. 31, p. 2; Ref. 32	
	City of Anaheim Well A-40	14,011	Ref. 21; Ref. 26; Ref. 27; Ref. 28	
	City of Anaheim Well A-46	14,011	Ref. 21; Ref. 26; Ref. 27; Ref. 28	
	City of Anaheim Well A-55	14,011	Ref. 21; Ref. 26; Ref. 27; Ref. 28	
	City of Anaheim Well A-51	14,011	Ref. 21; Ref. 26; Ref. 27; Ref. 28	
	City of Anaheim Well A-53	14,011	Ref. 21; Ref. 26; Ref. 27; Ref. 28	
	City of Buena Park Well BP-SM	10,345.9	Ref. 21; Ref. 36; Ref. 37, p. 3; Ref. 38	
	City of Buena Park Well BP-LIND	10,345.9	Ref. 21; Ref. 36; Ref. 37, p. 3; Ref. 38	
			Sum of Distance-Weighted Population Values:	**28,001.0**

Sum of Distance-Weighted Population Values: 28,001.0
Sum of Distance-Weighted Population Values/10: 2,800.1

Potential Contamination Factor Value: 2,800.1

3.3.3 RESOURCES

There is no evidence that groundwater within the target distance limit is used for commercial irrigation, livestock, food preparation, aquaculture, or supply for a major or designated water recreation area (Ref. 1, Section 3.3.3). In addition, scoring the Resources Factor Value would not affect the listing decision.

Resources Factor Value: 0

3.3.4 WELLHEAD PROTECTION AREA

For HRS purposes, the area of observed groundwater contamination is determined based on available samples that meet the criteria for an observed release (Ref. 1, Section 3.0.1.1). An observed release has been documented to drinking water production wells A-47, PAGE-F, F-4, F-5, F-6, and F-8 (see Section 3.1.1 of this document for documentation of the observed release). Therefore, in accordance with the California Drinking Water Source Assessment and Protection Program, the Wellhead Protection Areas for these wellheads are located within the plume (Ref. 23, p. 165). A Wellhead Protection Area Factor Value of 20 is assigned (Ref. 1, Section 3.3.4).

Wellhead Protection Area Factor Value: 20