Second Five-Year Review Report

For

Watkins-Johnson Company (Stewart Division) Superfund Site

Scotts Valley

Santa Cruz County, California

September 2007

Prepared By:

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List of Acronyms

µg/L	micrograms per liter
ARAR	Applicable or relevant and appropriate requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CSDWA	California Safe Drinking Water Act
EPA/USEPA	United States Environmental Protection Agency
FR	Federal Register
FWPCA	Federal Water Pollution Control Act
H&S Code	California Health and Safety Code
LPGAC	Liquid Phase Granular Activated Carbon
MCL	Maximum Contaminant Level
NCP	National Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable unit
OUFS	Operable Unit Feasibility Study
ppb	parts per billion
ppbv	parts per billion by volume
RD/RA	Remedial Design/Remedial Action
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RP	Responsible Party
RPM	Remedial Project Manager
RWQCB	California Regional Water Quality Control Board
SDWA	Safe Drinking Water Act
SVE	Soil Vapor Extraction
TCE	Trichloroethylene
USACE	U.S. Army Corps of Engineers
VOC	Volatile Organic Compound
WJC	Watkins-Johnson Company

Executive Summary

The Watkins-Johnson Company (Stewart Division) Superfund Site (Watkins Johnson Site) is located in Scotts Valley, California. This is the second five-year review for the Watkins-Johnson Site. In the 1990 Record of Decision (ROD), the remedy selected for the site included capping of certain surface areas to reduce infiltration and contaminant migration, groundwater pump and treat (with discharge to a nearby Bean Creek), and soil vapor extraction (SVE) system to remediate soil. The capping, SVE system, and groundwater remedies were constructed in accordance with the requirements of the ROD, and the remedies are functioning as designed. The Preliminary Closeout Report was signed September 22, 1994. Also, the ROD stated that specific requirements for institutional controls (ICs) be defined during the Remedial Design/Remedial Action (RD/RA) phase. No institutional controls have been identified or implemented at the site.

Watkins-Johnson Company (WJC) began operations at the site in 1963 and manufactured industrial furnaces, electronic components, and used the site as a research facility. The facility is now owned and operated by Aviza Technology, Inc. (Aviza). Aviza designs and builds semiconductor equipment.

A variety of organic and inorganic chemicals had been used at the site. Soil and groundwater contamination resulted from the disposal of wastes into the septic leach-field drainage system at the facility. In 1984, the Regional Water Quality Control Board (RWQCB) inspected the site and found the industrial chemicals trichloroethylene (TCE) and 1,1,2-trichloroethane (TCA) in the Watkins-Johnson wastewater disposal system. TCE had been used at WJC as an industrial solvent. Further investigations showed the presence of TCE and trans-1,2- dichloroethylene (1,2-DCE), plus minute quantities of TCA, perchloroethylene (PCE), and Freon 113 in groundwater under the site.

During the current five-year review, the following major issues were noted:

- Detection of TCE/PCE concentrations above the Maximum Contaminant Level (MCL) in three peripheral monitoring wells. Due to a lack of sufficient amount of data, the reasons and sources contributing towards this increase cannot be identified; and

- Institutional controls have not been identified or implemented.

Although three wells show TCE/PCE concentrations above the MCL, there is no immediate threat to human health because no complete exposure pathway exists at the site. There is only one operational groundwater extraction well (RA-2) at the site. Extracted groundwater is treated by the on-site groundwater treatment system to below the MCL. Therefore, treated groundwater should not pose any threat to human health.

The remedy at the Watkins-Johnson Site is currently protective of human health and the environment because all exposure pathways that could result in unacceptable risks are being controlled. However, in order for the remedy to be protective in the long-term, institutional controls that prevent exposure to, or the ingestion of, contaminated groundwater need to be

implemented. Also, causes for the recent increases in TCE/PCE concentrations in three peripheral monitoring wells should be identified and addressed.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name *(from WasteLAN)*: Watkins-Johnson Company (Stewart Division)		
EPA ID *(from WasteLAN)*: CAD980893234		
Region: 9	**State: CA**	**City/County: Scotts Valley/Santa Cruz**
SITE STATUS		
NPL status: ☒Final ☐Deleted ☐Other (specify)		
Remediation status (choose all that apply): ☐Under Construction ☒Operating ☐Complete		
Multiple OUs?* ☐YES ☒NO	**Construction completion date:** 9/22/1994	
Has site been put into reuse? ☒YES ☐NO		
REVIEW STATUS		
Lead agency: ☒ EPA ☐State ☐Tribe ☐Other Federal Agency _____		
Author names: Travis Shaw , Rick Garrison, and Pankaj Arora		
Author titles: Technical Lead, Geologist, and RPM	**Author affiliation: USACE Seattle District and USEPA**	
Review period:** 9/27/2002 to 9/27/2007		
Date(s) of site inspection: 4/19/2007 (conducted by Jefferey Powers, Rick Garrison, and Pankaj Arora, EPA RPM)		
Type of review: ☒Post-SARA ☐Pre-SARA ☐ NPL-Removal only ☐Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead ☐Regional Discretion		
Review number: ☐ 1 (first) ☒ 2 (second) ☐3 (third) ☐Other (specify) _____		
Triggering action: ☐ Actual RA Onsite Construction at OU #_____ ☐Actual RA Start at OU#____ ☐Construction Completion ☒ Previous Five-Year Review Report ☐Other (specify)		
Triggering action date *(from WasteLAN)*: 9/27/2002		
Due date *(five years after triggering action date)*: 9/27/2007		

* ["OU" refers to operable unit.]
** [Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]

Five-Year Review Summary Form, cont'd.

Issue #1:

Trichloroethylene (TCE) and perchloroethylene (PCE) concentrations have increased in three peripheral monitoring wells since the last Five-Year Review. In addition, PCE concentrations have increased in the influent to the groundwater treatment system.

Recommendations and Follow-up Actions:

Conduct further investigations to identify the causes and sources of the increase in TCE and PCE concentrations.

Issue #2: There are no institutional controls to prevent exposure to contaminants in the regional aquifer under the Site.

Recommendations and Follow-up Actions:

Identify necessary institutional controls.

Implement selected institutional controls.

Protectiveness Statement: The remedy at the Watkins-Johnson site is currently protective of human health and the environment because all exposure pathways that could result in unacceptable risks are being controlled. However, in order for the remedy to be protective in the long-term, institutional controls that prevent exposure to, or the ingestion of, contaminated groundwater need to be implemented.

I. Introduction

The Purpose of the Review

The purpose of five-year reviews is to determine whether the remedy at a site is protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in Five-Year Review reports. In addition, Five-Year Review reports identify issues found during the review, if any, and recommendations to address them.

Authority for Conducting the Five-Year Review

The U.S. Environmental Protection Agency (EPA) prepared this five-year review pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) §121 and the National Contingency Plan (NCP). CERCLA §121 states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

EPA interpreted this requirement further in the NCP; 40 CFR §300.430(f)(4)(ii) states: *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

Who Conducted the Five-Year Review

EPA Region 9 and the U.S. Army Corps of Engineers (USACE) have conducted a five-year review of the remedial actions implemented at the Watkins-Johnson Superfund Site in Scotts Valley, California. The Site Inspection was conducted by Pankaj Arora, EPA RPM, and Jefferey Powers and Rick Garrison from the USACE. An assessment and analysis of applicable or relevant and appropriate requirements (ARARs), risk and toxicology, and data review were conducted by Travis Shaw and Richard Garrison, USACE. This review was conducted for the entire site from April 2007 through September 2007. This report documents the results of the review.

Other Review Characteristics

This is the second five-year review for the Watkins-Johnson Site. The triggering action for this review was the first five-year review completed in September 2002. The five-year review is required due to the fact that hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure.

II. Site Chronology

Table 1: Chronology of Site Events

Event	Date
The plant was first used as a manufacturing site	1960
Plant purchased by WJC	1963
The Santa Cruz County and the RWQCB inspected the site and found TCE and trichloroethane (TCA) in the wastewater disposal system. TCE had been used at WJC as an industrial solvent	1984
At RWQCB request, WJC initiated a groundwater monitoring program	April 1984
The RWQCB issued a Cleanup and Abatement Order requiring WJC to begin clean up activities at the site	May 1984
Construction of an extraction and treatment system began	July 1986
Extraction and treatment system began operation	October 1986
Site proposed for the addition to the National Priorities List (NPL)	January 22, 1987
WJC begins RI/FS	September 21, 1987
The RI phase was completed with EPA's approval of the final draft of the RI Report	April 1989
EPA approves final draft of the FS Report	November 1989
EPA issuance of the ROD	June 1990
Site listed on the EPA National Priorities List	August 1990
Special Notice Issued	September 1990
Consent Decree Signed	October 1991
Construction Completed: modified groundwater extraction system and a SVE system	September 30, 1994
Preliminary Close Out Report	September 1994
Final RA Report	December 1994
Operational and Functional Period Begins	September 1995
Final QA Report	September 1996
Re-infiltration of perched aquifer discontinued; initiated monthly sampling in WJ-41 to study impact.	June 2000
Soil Vapor Extraction system turned off	April 2001

Table 1: Chronology of Site Events

Event	Date
Groundwater treatment system shut down by landslide	November 30 – December 21, 2001
Groundwater monitoring reduced to two wells and extraction wells reduced to two; discontinue site-wide groundwater level measurements	September 2002
First Five-Year Review	September 2002
VLEACH Report	July 2003
Permit revised to reduce monitoring requirements of groundwater treatment system output, and Bean Creek discharge	July 11, 2003
Extraction pump in one well (RA-1) quit; only one extraction well operating since	2nd Quarter 2004

III. Background

Physical Characteristics

The Watkins-Johnson Site encompasses approximately 30 acres. It is located in Santa Cruz County, approximately 5 miles north of the city of Santa Cruz, in a small valley located west of the city of Scotts Valley and southwest of the Santa Cruz Mountains (see Figures 1). This area is considered to be within the California Coastal Range and is in close proximity to California's Pacific Ocean coast. The Santa Margarita aquifer, which comprises a perched zone in addition to the regional zone, is a major source of groundwater in the study area.

Land and Resource Use

Watkins-Johnson Company (WJC) began operations at the site in 1963 and manufactured industrial furnaces and electronic components, and also used the site as a research facility. The facility is now owned and operated by Aviza Technology, Inc. (Aviza). Aviza currently designs and builds semiconductor equipment at the site. It is anticipated that the site will eventually be converted to high-density residential use. A municipal airport was located immediately west of Watkins-Johnson Site but since the 1990s, that land has been converted to a city park and high density housing.

There are three zones of groundwater underlying the site: Santa Margarita, Monterey, and Lompico. The regional, Santa Margarita aquifer containing high quality drinking water is present in the sand unit beginning at a depth of approximately 140 feet below ground surface (bgs) at the Site. A cemented conglomerate is encountered within the sand unit at approximately 100 feet bgs. The conglomerate forms an aquitard, which has resulted in a discontinuous perched groundwater zone directly beneath the site. Contamination was found in both the perched zone and the underlying regional aquifer. The historic groundwater flow direction is to the northwest

toward Bean Creek. However, since the remedial action has been implemented, the flow has been pulled into the site towards the extraction wells. The aquifers in the Monterey and Lompico formations underlie the contaminated Santa Margarita Formation.

History of Contamination

Historically, on-site industrial processes included metal machining, degreasing operations, metal plating, glass etching, welding, soldering, painting and photo lab activities. A variety of organic and inorganic chemicals had been used at the site. Soil and groundwater contamination resulted from the disposal of TCE and TCA solvents into the septic leach-field drainage system at the facility. Site investigations showed the presence of TCE and trans-1,2-dichloroethylene (1,2-DCE), plus minute quantities of TCA, PCE, and Freon 113 in groundwater under the site. The contamination was originally attributed to a release event which occurred in 1985 and was reported to regulatory authorities. Whether or not the original release was the result of a single event or a series of releases over a longer period of time has never been established; however, the distribution of contaminants in the soil and groundwater is consistent with contaminants being introduced into the subsurface through the septic drainage system, which consisted of leach fields and drainage pits.

Initial Response

In 1984, prompted by an anonymous phone call, the RWQCB conducted an inspection of the plant's septic drainage system and dilution tanks. The inspection revealed the presence of several industrial solvents used at the plant in the septic drainage system, a dilution tank, and groundwater beneath the site. In April 1984, the California Regional Water Quality Control Board, San Francisco Bay Region (RWQCB) requested that WJC initiate a groundwater monitoring program at the site. RWQCB subsequently issued an order to WJC to investigate the local hydrogeology, determine the extent of the groundwater contamination, and design an aquifer restoration program. The aquifer restoration program included among other activities, excavation of the contamination source. It culminated in the construction of a groundwater extraction and treatment system that was put into operation in October 1986. The treated water was then used on site, recharged to the perched zone on-site, or discharged to Bean Creek.

In January 1987, the Watkins-Johnson Site was proposed for listing on the EPA's National Priorities List (NPL). WJC began Remedial Investigation (RI) activities in September 1987 under an EPA Administrative Consent Order. The WJC RI Report was completed on April 28, 1989 by R.L. Stollar & Associates, Inc. Approximately 48 soil samples were collected for laboratory analyses from more than ten borings during the RI activities. TCE concentrations of up to 5500 ppb were found in the soil during 1987 and 1988. During a 13-day pilot study of the soil vapor extraction system in May 1989, about eight kilograms of contaminant mass was removed. The RI concluded that the VOCs had impacted the Santa Margarita Aquifer underlying the Site.

Basis for Taking Action

The presence of VOC contamination, predominantly TCE, provided the basis for taking action under CERCLA at this site. Hazardous substances that have been released at the site in each media are listed in the table below:

Table 2: Contaminants of Concern

Contaminant	Affected Media
Trichloroethylene, vinyl chloride, tetrachloroethylene, 1,1-dichloroethylene, 1,1-dichloroethane, 1,4-dichloroebenzene, cis-1,2-dichloroethylene, methylene chloride, chloroform, ,1-1,2-trichloroethane, 1,1,1-trichloroethane and silver	Groundwater and Soil

The primary contaminant of concern for the Watkins-Johnson Site is trichloroethylene (TCE) and its degradation products. TCE and related VOCs are considered possible and/or probable human carcinogens. The principal threat is posed by potential consumption of the contaminated groundwater.

IV. Remedial Actions

Remedy Selection

The 1990 Record of Decision (ROD) established the remedy selected for the Watkins-Johnson Site. EPA and WJC negotiated a Consent Decree (CD) for the implementation of the Remedial Design/Remedial Action (RD/RA) at the site and the CD was entered by the court on October 31, 1991. The selected remedy addresses the principal threat by capturing and removing contaminated groundwater and treating it to health-based levels. Soils were to be remediated to a level that no longer poses a threat to groundwater quality. The major components of the selected remedy were designed to:

- Prevent off-site migration of contaminants within the perched zone by using infiltration leach-fields (also referred to as perched zone recharge galleries);
- Transfer contaminated groundwater within the perched zone to the regional zone by means of gravity drains for more efficient extraction;
- Capture and extract contaminated groundwater within the regional zone by using extraction wells;
- Treat extracted groundwater by using an granular activated carbon adsorption treatment system;

- Remove soil contamination from the soil/vadose zone by using a soil vapor extraction system; and

- Minimize the potential for mobilization of contamination from the soil into the groundwater by installing an impermeable cap over the area of concern.

Remedy Implementation

In response to the Cleanup and Abatement Order issued in May 1984 from RWQCB to WJC, a groundwater extraction, treatment, and infiltration system was constructed and has been in operation at the Site since 1986. In the late 1980s, groundwater contamination was identified as an elongated plume in the regional aquifer that extended from the Watkins-Johnson Site to Bean Creek. Groundwater extraction rates during the late 1980s were approximately 320 gallons per minute (gpm). Groundwater pumping was conducted at both on and off site wells. Aggressive groundwater pumping from the regional plume successfully captured and reduced the concentrations such that by 1994 the plume was entirely contained on site and maximum concentrations of TCE were in the tens of micrograms per liter (µg/L).

Under CERCLA, the Remedial System Construction Program began on June 1, 1994 and was completed on September 30, 1994. As part of the construction, a soil vapor extraction and treatment system was installed and the existing groundwater system was modified. In a further effort to remove the residual contaminants and prevent recontamination, the septic leach-field and drainage system was replaced with a gravity sewer system to manage on-site wastewater. The gravity sewer system rerouted wastewater to a lift station on the northern portion of the property. The lift station was designed to pump wastewater to the City's Publicly-Owned Treatment Works.

Modifications to the groundwater extraction system included the installation of six perched-zone extraction wells and seven perched-zone infiltration wells. The original system relied on gravity drainage of water from the perched to the regional zone. This was inefficient for moving contamination out of the perched zone. Therefore, a groundwater flushing approach was implemented. It involved injection of treated groundwater around the perimeter of the perched zone. The injected water was then extracted from the approximate center of the perched zone and routed back to the treatment unit. The original drainage wells were converted to perched-zone groundwater extraction wells. This modification to the system had the beneficial effect of flushing the contaminants from the perched zone, hence increasing the efficiency of contaminant removal.

In 1994, TCE in the perched zone had a maximum concentration of 400µg/L. The regional zone aquifer contained a maximum TCE concentration of 76µg/L. The modified system was operational from 1994 through 2000. Combined groundwater extraction rates from both the perched zone and the regional zone were approximately 120 gpm. Approximately one-third of this water was re-injected into the perched zone to provide flushing action for the removal of TCE. Another third was used by the on-site plant as process water, and the final third was discharged to Bean Creek per the National Pollutant Discharge Elimination System (NPDES)

permit requirements. In June 2000, the re-infiltration of treated water into the perched zone was discontinued. Since that time, the distribution of treated groundwater has been approximately one half discharged into Bean Creek and one half used by the on-site plant.

As of 2002, the soil vapor monitoring network at the site consisted of five extraction and 21 monitoring wells. The SVE system was shut down in April 2001, with EPA's concurrence, as soil vapor concentrations for TCE were below remedial goals of 260 parts per billion by volume (ppbv). Soil vapor conditions were allowed to equilibrate for a year and confirmatory soil vapor samples were collected in February 2002. These samples were analyzed using very low detection limits (<0.72 ppbv). The soil gas results were used to develop input parameters for the VLEACH computer model to evaluate impact to groundwater from the residual soil vapor concentrations.

System Operations/Operation and Maintenance (O&M)

Current operation and maintenance (O&M) activities at the site include the performance of regular inspections of the groundwater treatment system. Granular activated carbon change-outs are scheduled as a function of monitoring data from the groundwater treatment system. In order to monitor the performance of the groundwater treatment, groundwater samples are collected quarterly, semi-annually, and annually in accordance with the EPA-approved groundwater monitoring plan.

A summary of significant events that occurred during the course of this five year reporting period is as follows:

1. Monitoring well WJ-27A was abandoned on October 31, 2003. Well WJ-27A, a regional zone monitoring well, was damaged during the slope failure in November of 2001.

2. The groundwater extraction and treatment system was shut down between March 28 and May 29, 2003. During this time, the carbon was removed from both 20,000-pound Liquid Phase Granular Activated Carbon (LPGAC) vessels, and disinfection of the treatment system and piping network was performed. This work was conducted to address the presence of bacteria detected in the treatment system. The National Sanitation Foundation (NSF)-rated carbon that was removed from the LPGAC vessels and regenerated at USFilter/Westates Inc.'s Stockton, California regeneration kiln. The carbon was brought back to the facility and placed back into the treatment system's LPGAC vessels. Additional disinfection of the associated piping was performed following the carbon placement. The groundwater treatment system was restarted on May 29, 2003.

3. Until 2004, groundwater was extracted from the two regional zone wells (RA-1 and RA-2). However, sometime during the second quarter of 2004, the pump in RA-1 stopped operating and has not been back on-line since. Neither TCE nor PCE has been detected in samples from well RA-1 since June 1999. The most recent sample was collected in June 2002.

4. The SVE system was turned off in April 2001 due to low TCE soil gas concentrations, The TCE concentrations in soil gas had been below 2µg/L. There had been no evidence of rebound in the year following shut down. Annual O&M costs were originally estimated in the ROD to be $167,820 per year. Actual O&M costs have generally been less than that amount.

The groundwater monitoring program was modified with EPA's approval in January 2003 and currently consists of quarterly monitoring of two monitoring wells WJ-41 and WJ-43. These monitoring wells are screened in the Margarita regional aquifer

Currently the site is subject to a Guaranteed Fixed Price Remediation Contract between Aviza, WJC, and Arcadis under the terms of which Arcadis has assumed liability for satisfaction of the terms and conditions of the ROD and Consent Decree for the site. Arcadis is an environmental consulting company.

V. Progress Since the Last Review

There were no issues or recommendations in the last Five-Year Review that would impact the protectiveness of the remedy. One non-critical recommendation stated a need to repair the containment berm at the groundwater treatment facility. There was no sign of damage to the containment berm during the inspection conducted in April 2007.

The first five-year review report mentioned that the soil vapor extraction system has nearly met clean-up requirements and will soon be turned off. The report proposed that WJC should complete an evaluation of the SVE system to confirm that the ROD cleanup objectives have been achieved. WJC's contractor conducted an analysis using the VLEACH model to estimate future TCE loading from the soil to groundwater (Appendix A). The report was presented to EPA in July 2003 and concluded that the impact to groundwater is negligible. However, there has been no formal acceptance of the VLEACH report by EPA as of this time.

The site groundwater monitoring plan was modified in January 2003 with an approval from EPA. The monitoring plan was modified because, between 1996 and 2002, the contaminant concentrations in many monitoring wells were well below MCLs. The modified monitoring plan included quarterly sampling of only two wells: WJ-41 and WJ-43. Additional wells have been sampled irregularly since then to confirm the extent of the TCE and PCE plumes.

VI. Five-Year Review Process

Administrative Components

Representatives of WJC, Aviza, and Arcadis were notified of the initiation of the five-year review on April 20, 2007. The Watkins-Johnson Five Year Review team was led by Pankaj Arora of Region IX EPA, Remedial Project Manager for the site. Technical assistance was provided to EPA by the Seattle District, U.S. Army Corps of Engineers personnel, Travis Shaw (risk assessment and chemistry) and Rick Garrison (Geologist).

Community Involvement

EPA published a public notice in the local newspaper "Santa Cruz Sentinel" on March 17, 2007 informing the local community that a five-year review for the Watkins-Johnson site was going to be conducted. The public was encouraged to contact EPA with any comments or request additional information about the site.

Document Review

Relevant documents, including monitoring data, the previous Five-Year Review, and the VLEACH report, were reviewed for this report. A separate document titled "Technical Analyses 2002-2007, Watkins-Johnson Site" was created that provides summary of: (1) List of Documents Reviewed; (2) ARAR Analysis; (3) Risk Assessment and Toxicology Analysis; (4) Data Review Summary; and (5) Site Inspection Report and Current Site Photos. This document is not provided with this report but is available in the site document repository.

Data Review

The groundwater monitoring program was modified with EPA's approval in January 2003 and currently consists of quarterly monitoring of two monitoring wells WJ-41 and WJ-43. These monitoring wells are screened in the Margarita regional aquifer. Although not part of the modified groundwater monitoring program, two additional wells are sampled annually (WJ-11 and AP-3N). Information from these wells was analyzed to develop trends in contaminant concentrations (TCE and PCE) and groundwater elevations in the regional aquifer.

Groundwater Monitoring

There has been a steady decline in groundwater TCE concentrations since remediation was initiated at the site. In early 1987, the contaminant plume extended to Bean Creek, where a concentration of 8l µg/L was detected. Since 1987, the plume has been considerably reduced in size and concentration. As noted in the 2002 Annual Summary Report, analytical results of all contaminants of concern in the perched zone had been well below the cleanup standards, and in some wells, below detection limits. However, specific wells WJ-41, WJ-43, and WJ-11 in the regional aquifer are now displaying increasing concentration trends. In some instances, the concentrations were noted to be above clean up standards.

In monitoring well WJ-41, located near the former Skypark airport, only TCE has been observed above clean-up standards. TCE concentrations varied widely in 2002 and 2003. In 2003, field studies with passive diffusion bag (PDB) sampling had demonstrated that higher levels of TCE are usually concentrated in the upper part of the well screen. By 2004, WJC switched exclusively to sampling by PDBs. In 2004, PDBs were placed at multiple depths within the screen, then by 2005, only within the top part of the screen. Analytical results from 2004 through 2006 have been consistently within 10 to 22 µg/L range. Occasional sampling events in well AP-3N show no detections of any COCs. This well is located around the former airport site and could be considered cross-gradient to WJ-41 based on the 2002 groundwater elevation map. Due to a change in the groundwater monitoring plan in 2003, the most complete groundwater elevation map available for the Watkins-Johnson Site is for 2002.

Significantly high concentrations of PCE have been reported in monitoring well WJ-43, located at the upgradient end of the manufacturing facility at the Watkins-Johnson Site. After years of little or no detections of PCE, concentrations were at or above the MCL (2.7 to 10 µg/L) beginning in 1999 and for a few years thereafter. By mid-2004, PCE concentrations had increased significantly, trending upward to a high of 46µg/L in late 2006. Groundwater was sampled in adjacent wells to determine the extent of the PCE plume. PCE is also present in concentrations above the MCL in a cross-gradient well, WJ-11, but has very low detections in a downgradient well, WJ-37A. However, in groundwater extraction well RA-2, located further downgradient of WJ-37A, the concentration of PCE has been showing an increasing trend line since mid-2006, after several years of relatively stable values below 5µg/L.

Soil Vapor Monitoring

Currently the SVE system is not operational and no soil vapor samples are collected. In 2002 and until discontinuation of quarterly sampling of soil vapor after third quarter of 2003, soil vapor TCE concentrations were below the method reporting limit.

Groundwater Treatment System Discharge

All levels of contaminants of concern were below detection levels in the quarterly samples for groundwater treatment system effluent and at points of discharge into Bean Creek. However, sampling of the groundwater going into the groundwater treatment system reveals an increasing trend in PCE concentrations approaching the cleanup standard of 5µg/L.

Site Inspection

A site visit was conducted on 18 April 2007 to provide information about the site's status and to visually inspect and document the conditions of the remedy, the site, and the surrounding area. The participants included:

Jefferey Powers	USACE Seattle District Hydrogeologist
Richard Garrison	USACE Seattle District Geologist

Pankaj Arora	USEPA Region 9 Remedial Project Manager (RPM)
Lauren Berkman	USEPA Region 9 Community Involvement Coordinator
Sarah Mueller	USEPA Region 9 Office of Regional Counsel
Lisa Teague	ARCADIS G&M, Inc. Project Manager
Judith Hazel	ARCADIS G&M, Inc. Associate Project Manager
Mark Bringuel	WJ Communications, Corporate Director of Facilities
Marc Gottschalk	Wilson Sonsisni Goodrich & Rosati, Attorney
Kavita Thakkar	Aviza Technology, Environmental Health & Safety Manager
Eric Botkin	Aviza Technology, Facilities Maintenance Manager

The site inspection was coordinated with Ms. Teague of Arcadis and Ms. Thakkar of Aviza Technologies. Monitoring wells in the city park were located and found to be protected by surface casings, though not all lids were bolted. The only well in the city park currently being monitored (WJ-41) has a padlock on the well cap. None of the other wells at the city park were inspected.

Under the escort of Ms. Thakkar, the participants entered the Aviza property to inspect the rest of the remediation facilities. The main access gate is open during business hours and closed by 6 PM. A guard patrols the site after close of business until the next morning. The guard station is close to and in the line of site of the treatment facility. Trespassing and vandalism seldom occur and are not considered a problem for WJC or Aviza. Access to the treatment units is restricted by a fence surrounding the Aviza property and around the groundwater treatment facility. The groundwater treatment system was found to be in good condition. The Health and Safety manual appears to be available at the treatment facility. There was no discussion of what documents Aviza might have at their plant.

Photographs taken during the Site Inspection are provided in Appendix A.

Institutional Controls Evaluation

The ROD stated that specific requirements for institutional controls (ICs) be defined during the Remedial Design/Remedial Action (RD/RA) phase; however, no institutional controls have been identified or implemented at the site. Current monitoring demonstrates contamination is still present in groundwater, and therefore institutional controls should be put in place. In addition, there is a potential for change of land use from industrial to residential in near future. The goal of the institutional controls should be to prevent exposure to contaminated groundwater by potential future site residents.

VII. Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

The site inspection and review of documents, ARARs, and risk assumptions indicates that the remedy is functioning as intended by the ROD. The Watkins-Johnson Site has achieved the remedial objectives of reducing VOC contamination in the soil as well as the perched aquifer by

means of a soil vapor extraction system that operated from 1994 to 2001. The SVE extraction and monitoring wells continued to be sampled through 2002. The SVE system is currently shut down, awaiting further direction from EPA. VOC contamination in the regional zone of the aquifer is above the cleanup standards for TCE and PCE in two areas. TCE trends in monitoring well WJ-41 remain steady and above the cleanup standard. PCE concentrations in well WJ-43 are trending higher, above the cleanup standard. Groundwater extraction likely will need to continue indefinitely with negligible progress toward ultimate cleanup and closure unless the source of TCE is identified and addressed.

The most complete groundwater elevation map for the site (2002) indicated that all groundwater, within and adjacent to the Site, flowed to the two extraction pumps operating at that time. This suggests that the contaminant plumes were fully captured by the extraction wells. However, extraction well RA-1 stopped operating in 2004 and it's uncertain how dominant the remaining extraction well is on the site groundwater flows. In addition, the PCE plume has become a greater concern since 2002, and it is uncertain if the remaining extraction well is capturing the entire plume. Additional selected downgradient wells should be monitored periodically, and the site groundwater elevation map should be updated.

Based on the site inspection and a review and evaluation of monitoring reports, operation and maintenance of the treatment systems have been effective. The system has been optimized with the reduction of monitoring points, discontinuing re-infiltrating the perched zone, and shutting down the SVE system. Operation and maintenance activities are consistent with continued pump and treat. The treatment systems appear to be in good working order and the facility is secured by a fence and guarded entry.

The presence of contamination in the groundwater suggests that institutional controls may be needed until the cleanup is complete. These controls would prevent potential future residents at the site from being exposed to contaminated groundwater.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of remedy selection still valid?

The exposure assumptions used to develop the Human Health Risk Assessment included both current exposures (on-site worker) and potential future exposures (residential) for both soil contact and groundwater ingestion. It was unclear whether future residential exposure included children, but a comparison between the initial soil concentrations and EPA Region 9's current preliminary remediation goals indicate there is no soil exposure risk to residential children.

There have been changes in the toxicity factors for several of the contaminants of concern that were used in the baseline risk assessment. Revisions to the toxicity values for 1,1-DCE and vinyl chloride indicate a lower risk from exposure to these chemicals than previously considered. On the other hand, evaluation of the toxicity values for PCE and TCE is ongoing and may indicate higher risks from exposure than previously considered. This issue is still on-going and will need to be addressed in subsequent five-year reviews.

As described below, there have been several changes to the Federal and State drinking water regulations since the last Five-Year review.

- The Federal Maximum Contaminant Levels (MCL) for Arsenic was lowered from 50 ppb to 10 ppb.

- The Federal and State MCL for 1,1,2-trichloroethane was promulgated at 5 ppb. When the treatment standards were developed for the ROD, the value of 32 ppb selected for this chemical was the California Department of Health Action Level.

- For specific chemicals (1,2-dichlorobenzene, cadmium and lead), only proposed MCLs or MCLGs were available at the time the ROD was signed. Some of these levels have since been promulgated. The cleanup levels for 1,2-dichlorobenzene and cadmium identified in the ROD were proposed values at the time the ROD was signed and are now State Primary Drinking Water MCLs. In the case of lead, the proposed State MCL was raised from 5 ppb to 15 ppb when the MCL was finally promulgated.

- The Record of Decision (ROD) for the Watkins-Johnson site selected either the State or Federal MCL for groundwater cleanup levels, whichever was more stringent. When the ROD was finalized, the State of California did not have a promulgated MCL for methylene chloride. Since that time, the State has adopted an MCL for this compound that is the same as the Federal standard.

These changes do not affect the protectiveness of the remedy because either the State of California adopted the Federal standards, or the lower MCLs are still greater than the maximum detection of this chemical at the site.

The original risk assessment did not consider vapor intrusion as a potential exposure route. Using current methodologies and recent data, it appears that there is not a risk associated with vapor intrusion for future residential use. However, current methodologies do not consider the possibility of preferential pathways that have existed at a small number of sites similar to Watkins-Johnson. Therefore, it may be prudent to install engineering controls on any future buildings if the site is re-developed.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No.

Technical Assessment Summary

According to the data reviewed, the site inspection, and the interviews, the remedy is functioning as intended by the ROD. There have been no changes in the physical conditions of the site that would affect the protectiveness of the remedy. Though the onsite source of contamination has

been remediated, the persistent and increasing presence of TCE and PCE in three peripheral wells warrants additional investigation. Changes in cleanup standards and toxicological values for contaminants identified in the ROD for the Watkins-Johnson Superfund Site do not impact the protectiveness of the remedy.

VIII. Issues

Table 3: Issues

Issues	Affects Current Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
TCE & PCE concentrations are increasing in select monitoring wells	N	N
Lack of Institutional Control to prevent groundwater exposure	N	Y

IX. Recommendations and Follow-up Actions

Table 4: Recommendations and Follow-up Actions

Issue	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future
Increasing concentrations of PCE & TCE	Investigations to identify causes and/or sources	WJC	EPA	12/30/2008	N	N
Lack of Institutional Controls	a) Identify necessary institutional controls.	WJC/EPA	EPA	12/30/2008	N	Y
	b) Implement Selected Institutional Controls	WJC	EPA	12/30/2008	N	Y

X. Protectiveness Statement(s)

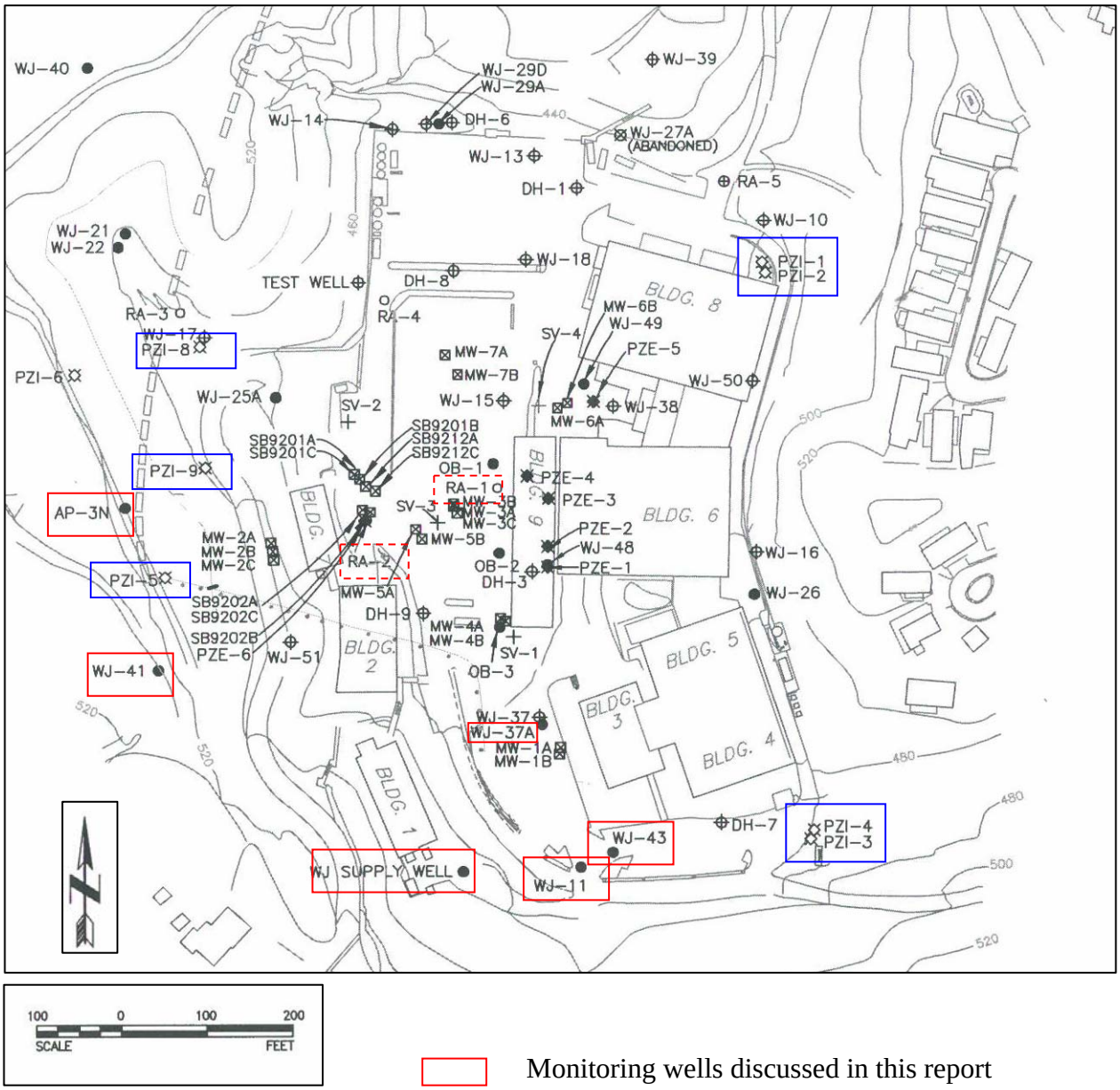
The remedy at the Watkins-Johnson site is currently protective of human health and the environment because all exposure pathways that could result in unacceptable risks are being controlled. However, in order for the remedy to be protective in the long-term, institutional controls that prevent exposure to, or the ingestion of, contaminated groundwater need to be implemented.

XI. Next Review

The next Five-Year Review for the Watkins-Johnson site should be conducted by September 2012, five years from the date of this review.

Figures

Figure 1 – Regional Map



Monitoring wells discussed in this report

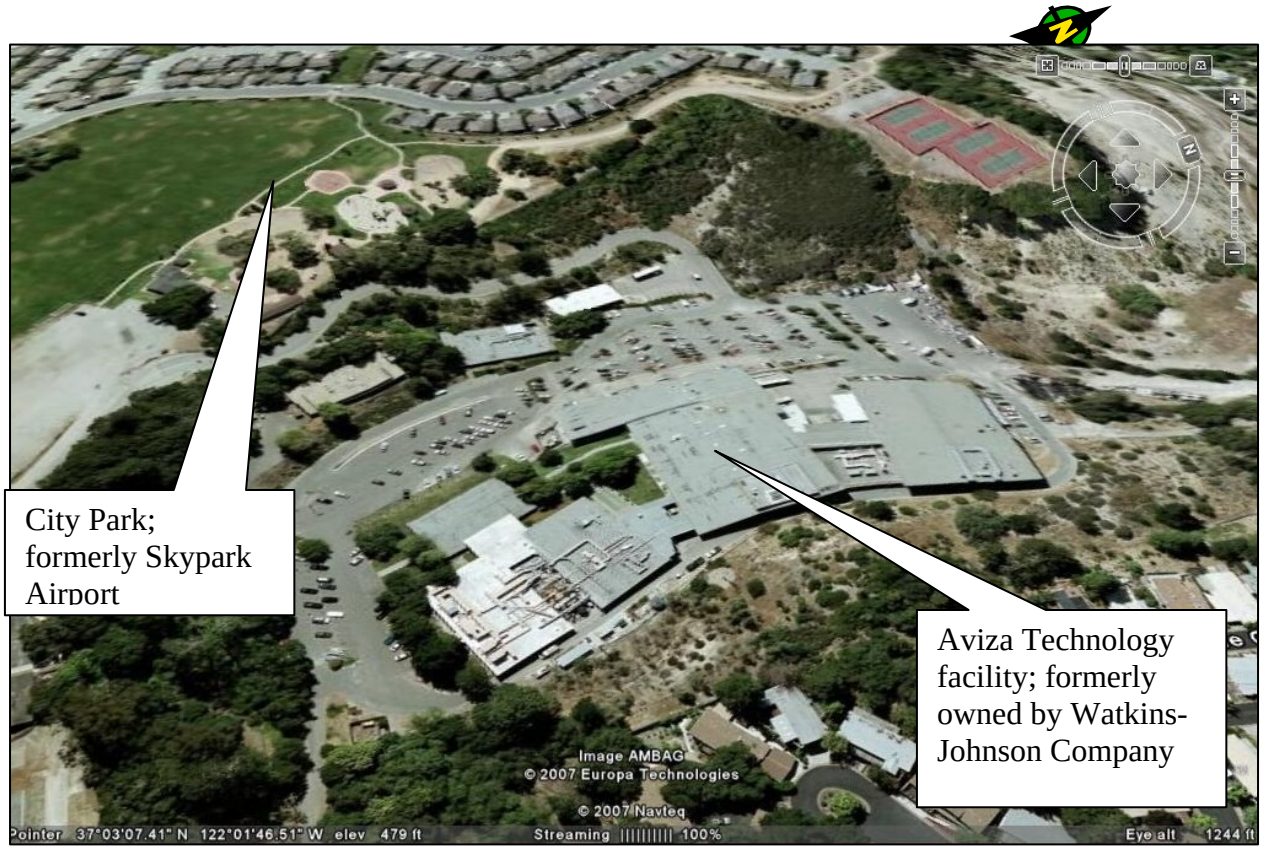
Extraction wells

Perched Zone infiltration wells

Figure 2 – Site Map

Appendix A

Site Inspection Photographs



Aerial view of the Watkins-Johnson Site.

City Park (former Skypark Airport)

Groundwater Treatment Facility

Soil Vapor Extraction System (not in operation)

Monitoring Well WJ-41

Asphalt pavement as a Soils Cap