FOURTH FIVE-YEAR REVIEW REPORT
FOR
LORENTZ BARREL AND DRUM SUPERFUND SITE
SAN JOSE, CALIFORNIA
SEPTEMBER 2015

PREPARED BY:

US EPA Region IX
75 Hawthorne Street
San Francisco, California

_____ _____

John Lyons

Acting Assistant Director, Superfund Division

California Site Cleanup Branch

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Lorentz Barrel and Drum Site		
EPA ID: CAD029295706		
Region: 9	**State:** CA	**City/County:** San Jose/Santa Clara

SITE STATUS	
NPL Status: Final	
Multiple OUs? Yes	**Has the site achieved construction completion?** Yes

REVIEW STATUS
Lead agency: EPA ***[If "Other Federal Agency", enter Agency name]*:** Click here to enter text.
Author name (Federal or State Project Manager): Daewon Rojas-Mickelson
Author affiliation: U.S. EPA Region 9
Review period: 11/12/2014 – 9/30/2015
Date of site inspection: 2/23/2015
Type of review: Statutory
Review number: 4
Triggering action date: 9/29/2010
Due date *(five years after triggering action date)*: 9/29/2015

1 Introduction

The purpose of a Five-Year Review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy will continue to be protective of human health and the environment. The FYR is required because hazardous substances, pollutants, or contaminants remain at the site at levels above those that would allow for unlimited use and unrestricted exposure. The methods, findings, and conclusions of reviews are documented in five-year review reports. In addition, the FYR report presents findings and issues found during the review, if any, and documents recommendations to address them.

In January 2014, the U.S Environmental Protection Agency's (EPA) Office of Superfund Remediation and Technology Innovation and EPA Region 9 Superfund Division agreed to conduct a streamlined[1] Five-Year Review for the Lorentz Barrel and Drum (LB&D) Superfund Site (Site). This is the fourth FYR completed at the Site. EPA is re-evaluating the selected remedy for the Site and expects to modify the existing remedy or select a new remedy in 2018. This streamlined Five-Year Review provides a snapshot of the operable units (OUs), progress in resolving issues raised during the previous FYR, a review of data collected in the last five years, and a technical summary of the remedy. Current issues and recommendations are identified, in addition a protectiveness statement is included in the report.

Site Background

LB&D was a former drum recycling facility, which operated from 1947 through 1987. LB&D accepted drums containing a variety of aqueous wastes, including solvents, acids, oxidizers, and oil; were cleaned using heat, caustics, acids, steam, and/or mechanical methods; and were repainted, resealed, and shipped off-site. Liquid waste and cleaning water were discharged to on-site sumps and basins; some of the material subsequently drained into Site soils or into the storm sewer, where it was reportedly conveyed to the nearby Coyote Creek. The following groups of chemical contaminants have been detected in the soil: volatile organic compounds (VOCs), pesticides, herbicides, polychlorinated biphenyls (PCBs), and heavy metals. In addition, VOCs have been found in the shallow groundwater originating at the Site and extending 2,000 feet to the northwest, see Figure 1. The Site is located at the intersection of Alma Avenue and South 10th Street in San Jose, California. The LB&D Site property (Property) and adjacent properties are zoned for commercial and industrial use. The San Jose State University (SJSU) football stadium, sports fields and an ice skating rink are located to the north and east of the Property, respectively. Single-family residential housing is located 1000 feet north of the Site.

Contaminants of concern (COC) in soil and groundwater were both found at levels that posed risks to human health, this was the basis for EPA action. Multiple removal actions took place at the Site before, as well as after, EPA issued the 1988 OU-2 ROD for the shallow groundwater and the 1993 OU-1 ROD for soils, the deep aquifers, and other actions not completely addressed by the OU-2 ROD. The initial removal actions included:

- Hazardous residues were removed from the sumps and basin on the Site in 1987 as a result of 1985 violation cited by State and Federal governments. In addition, drums with hazardous residues were removed from the Site in 1987 and 1988.

[1] The 2015 streamlined FYR for Lorentz Barrel and Drum follows Agency guidance, but combines the Executive Summary, background information, and remedial action into a simplified introduction, and focuses on specific components (e.g., performance of the groundwater treatment system and completeness of the institutional controls) that may affect current protectiveness.

- A second removal action involved excavation of highly contaminated soils containing PCBs greater than 50 milligrams per kilogram (mg/kg) and other contaminants, which were removed and disposed of off-site in 1988.
- In 1992, the remaining drums, asbestos containing material, general site debris, above ground structures and pumps were removed from the Site.

Operable Units and Geology

The Site consists of two OUs: OU-1, which includes the soils (Zone A) and deep zone groundwater (Zone C and D), and OU-2, which includes the shallow zone groundwater plume (Zone B). The Site includes four hydrogeologic units designated as Zones A, B, C, and D with respect to increasing depth below ground surface (bgs). Fine-grained low permeability clay layers, which function as aquitards, separate each Zone. Zone A is approximately 5-15 feet bgs and is normally dry, however, Zone A occasionally contains perched groundwater at the interface with the underlying aquitard. The approximately 5 to 15 foot thick A/B aquitard separates Zone A from Zone B. Zone B is a confined aquifer, also referred to as the shallow groundwater aquifer, and is located approximately 25-45 feet bgs. An aquitard approximately 35 feet thick separates Zone B from Zone C. Zone C is approximately 70-90 feet bgs. An aquitard separating Zone C from Zone D is approximately 100 feet thick. Zone D is the regional drinking water aquifer and extends from 230-1000 feet bgs.

Contaminants of Concern

The major Site COCs: are 1,1,1-trichloroethane (1,1,1-TCA), tetrachloroethene (PCE), trichloroethene (TCE), cis-1,2-dichloroethene (cis-1,2-DCE), vinyl chloride, 1,1-dichloroethane (1,1-DCA), 1,2- dichloroethane (1,2-DCA), 1,1-dichloroethene (1,1-DCE), 1,2-dichloropropane (1,2-DCPA), polychlorinated biphenyls (PCBs) and 1,4-dioxane[2].

Operable Unit 1 - Soil (Zone A) and Deep Aquifers (Zone C and D)

In 1993, EPA issued the OU-1 Record of Decision (ROD) to address soils and deep zone groundwater contamination. EPA is responsible for the execution of the OU-1 ROD. No contamination has ever been found in Zones C or D. Soil contamination is present on Property and to a lesser extent north of Alma Street in the area of the SJSU athletic field, see Figure 1. The selected remedy includes an asphalt concrete cap, Institutional controls (ICs) and a soil vapor extraction (SVE) system on the Property. The main objective of the response action selected as the final remedy for the LB&D Site is to protect human health and the environment from all remaining releases or threats of release of hazardous substances that have not been addressed by previous or current cleanup actions at the LB&D site.

The remedial action objectives (RAOs) presented in the 1993 ROD include:

- Reducing the principal threat of soil contaminants potentially migrating into and contaminating shallow groundwater;
- Reducing potential exposure to soil contaminants;
- Reducing potential exposure to contaminated structures, debris, and residues;
- Reducing potential migration of contaminated shallow groundwater to deeper aquifers and potential surface water infiltration; and

[2] 1,4-dioxane is not identified as a COC in the OU-2 ROD. However, it has historically been monitored and included in Site reports.

- Providing advance warning to drinking water suppliers and residents in the event that VOCs begin significant migration through conduits or soil gas toward exposure points (e.g. drinking water wells and confined air spaces of dwellings).

The areas of highest soil contamination occurred in two locations on the northern end of the Property used as liquid waste disposal basins. These two areas were excavated and approximately 3,000 cubic yards of contaminated soil was disposed of off-site. The cap has two purposes, to prevent exposure to the soils contaminated with "sorptive chemicals" (e.g., PCBs, pesticides and metals), and prevent precipitation and stormwater runoff infiltration thereby protecting shallow groundwater from further degradation from mobile, high solubility chemical VOC compounds such as TCA, PCE and TCE. Monitoring for VOCs in deeper aquifers and in soil vapor near selected residences was also included as part of the OU-1 remedy to provide "advance warning of significant shallow groundwater contaminant migration."

ICs selected as part of the remedy are as follows: Land use restrictions to prevent well construction (for water supply purposes) in source areas that remain contaminated and deed restrictions for properties and the adjacent sidewalk area (Sidewalk Area) that contain contaminated soil exceeding cap action levels. Restrictions will prohibit residential development and will limit industrial development to activities that do not breach the integrity of the cap or do not mobilize the soil contaminants. Restrictions will also preclude excavation, other than temporary subsurface work beneath the cap and will require complete restoration of any disturbed fill or cap once any such temporary work is completed.
In 1998, EPA issued an Explanation of Significant Differences (ESD) to allow for the off-site disposal of soils with concentrations below the ROD cleanup standard of 50 mg/kg for PCBs. The 2013 ESD replaced the 1993 deed restriction, for the Sidewalk Area, with more effective ICs (permit review and notification protocols) and a land use control (signage).

EPA is presently conducting an investigation of the existing Site remedy, this includes further characterization Zone A and the A/B aquitard to identify areas of highest soil contamination, as well as, more information on how this contamination is being transported to Zone B. This work is part of a Focused Feasibility Study (FFS) that is being used to evaluate the effectiveness of the selected remedies at the Site. This information will be documented in the FFS report, which will propose modifications to the existing OU-1 remedy and/or propose new remedies for OU-1. The data gained through the FFS will lead to numeric cleanup standards for the A/B aquitard, which will be protective of the Zone B groundwater.

Operable Unit 2 - Shallow Groundwater (Zone B)
The 1988 OU-2 ROD addresses shallow groundwater contamination in Zone B. A group of potentially responsible parties (PRPs) known as the Lorentz Shallow Groundwater Task Force (LSGTF) are responsible for the execution of the OU-2 ROD. There are two groundwater contamination plumes in Zone B, a VOC plume and a 1,4-dioxane plume. Both are oriented to the northwest. The VOC plume is shown on Figure 1, data used in the figure was collected in September 2014. The size of the VOC contaminant plume is approximately 2,000 feet long and 1,000 feet wide. The 1,4-dioxine plume is larger due to miscible chemical properties of the contaminant and can be seen on Figure 2, this plume is approximately 4,500 feet long and 1,500 feet wide. Analytical data from sampling results collected in 2013 was used to locate these concentration contours.

The selected remedy is designed to achieve the following remedial action objectives (RAOs):

- Prevent further migration of the shallow groundwater plume;
- Prevent the shallow groundwater plume from discharging into Coyote Creek;
- Prevent contamination of the drinking water supply (deep groundwater aquifer) located beneath the shallow-zone plume.

The OU-2 ROD remedy included the following components: a groundwater extraction system, ultraviolet/oxidation (UV/Ox) treatment, and disposal of treated water to the storm sewer, under a National Pollutant Discharge Elimination System (NPDES) permit. In 1992, the groundwater pump and treatment system became operational. The groundwater cleanup goals in the OU-2 ROD are to "substantially reduce or eliminate all groundwater contamination from the shallow groundwater." Shallow groundwater Cleanup Objectives are listed in Table 8-2 of the OU-2 ROD.[3] EPA issued an ESD in 1998 to change the treatment system for the groundwater remedy from (UV/Ox) to a granular activated carbon (GAC) filtration system. The current remedy is a containment remedy; numeric cleanup standards for the restoration of groundwater were not included. For at least the last ten years, EPA and LSGTF have been using the lower of the Federal or State of California Maximum Contaminant Level (MCL) for each COC as the comparison value to evaluate "substantial reduction" of groundwater contamination.

As part of the FFS, the OU-2 remedy is being evaluated to determine whether the current remedy is achieving the RAOs above. The FFS report will document the findings of the investigation and modifications to the existing remedy or remedies that can achieve the RAOs will be proposed. EPA expects any remedy proposed in the FFS report to include numeric groundwater cleanup standards for all Site COCs, these will be selected from the lower of the Federal or State MCL. EPA also expects 1,4-dioxane will be added as a Site COC.

Further information on the site background and remedial actions is available at the EPA website and at the San Jose Public Library, 150 E. San Fernando Street, San Jose, CA.

2 Progress Since the Previous Five-Year Review

The previous 2010 FYR report for the Lorentz Barrel and Drum Site includes the following protectiveness statement:

> *The remedy is considered protective in the short-term since there are no current complete exposure pathways at the LB&D Property or the downgradient plume area. In addition, there is no evidence of impacts of the OU-2 plume on Coyote Creek or the deep aquifers. Pursuant to the draft Institutional Controls Monitoring Plan (ICMP), there are periodic inspections of the Lorentz-Property cap and review of cap maintenance activities. In addition, inspections by the State to insure compliance with land use covenants have been conducted annually since 2006.[4] However, to be protective in the long-term, the impact of residual VOCs in the A/B aquitard on contaminant levels in the shallow groundwater and in soil*

[3] These objectives apply to groundwater, which has passed through the treatment system. They do not apply to groundwater that remains in Zone B.

[4] According to DTSC staff annual LUC inspections have not been performed by DTSC since 2006.

gas needs to be assessed, capture of the groundwater plume in the northwest area needs to be achieved, and the institutional controls for the sidewalk area need to be implemented.[5]

The third FYR identified three issues that affect current or future protectiveness. The work completed over the past five years to address these issues is presented below.

Issue One: The OU-1 ROD requires the imposition of deed restrictions on the sidewalk areas adjacent to the LB&D property to prevent unsafe exposure to potentially contaminated soil beneath the sidewalks, but deed restrictions have not been put in place.

Recommendation One: Follow-up on recent efforts to record a restrictive covenant for the sidewalk areas by:

- Determining whether further investigation of soil contamination beneath the sidewalk is appropriate;
- Determining the appropriate scope for a restrictive covenant;
- Initiating discussions with the City of San Jose about a restrictive covenant and other institutional control mechanisms;
- Pending adoption of a restrictive covenant, pursuing alternative institutional control mechanisms such as construction permitting processes; and
- Revising the other institutional control provisions of the OU-1 ROD, if necessary.

Current Status One: The institutional control requirement for a deed restriction in the 1993 OU-1 ROD was superseded by the 2013 OU-1 ESD, described further below, requires two new institutional controls and a land use control, which provide protection from exposure to potential Site related contamination beneath the Sidewalk Area.

The original institutional control was determined to be less effective because different entities have ownership and control of the Sidewalk Area, which complicates the correct point of contact for contamination information or for conducting work beneath the Sidewalk Area. The 2013 ESD includes three complementary mechanisms to ensure long-term protectiveness in relation to the Sidewalk Area:

- A Memorandum of Understanding (MOU) with the City of San Jose (City) to develop review and approval protocols to prevent any work that could disturb the Sidewalk Area without a Health and Safety Plan (HSP) and an EPA-approved Soil Management Plan (SMP), was signed by the City and EPA on September 26, 2013. The City has developed and implemented procedures within their permitting department to prevent issuance of permits unless an HSP and SMP are submitted for approval to EPA. The City has a review process for permit applications that propose work in the Sidewalk Area. If the City determines the proposed work will be within the footprint of the Sidewalk Area, the application is flagged and the applicant is directed to the EPA's Remedial Project Manager to discuss Site conditions, HSP and SMP requirements.
- A land use monitoring firm (Terradex, Inc.) provides email notification to EPA of planned underground (e.g. excavation) activities in the Sidewalk Area. This notification service became operational on June 6, 2013.

[5] This language, Issue and Recommendation wording is as recorded in the 2010 FYR.

- Signage (a land use control) along the Sidewalk Area indicating the presence of hazardous substances, restrictions on performing work in those areas, health hazards from unprotected contact, and notification to call EPA for more information before beginning any work.

The IC mechanism with the City is still under development. On July 20, 2015, EPA received a notification from Terradex that a City department was planning to conduct work in the Sidewalk Area. EPA staff subsequently contacted the City prior to any work taking place and the City decided not to conduct the work, due to HSP and SMP requirements. This experience highlights the fact that the procedures the City has implemented are not as robust as necessary. Additionally, the land use control (signage) has been delayed until soil samples can be collected from under the Sidewalk Area and analyzed to determine whether the soil beneath the Sidewalk Area is contaminated with PCBs above the cleanup standard. If the soil is not, there is no need for ICs or a land use control. This sampling will occur in October or November of 2015. For several years, the City requested new sidewalks be built, at EPA expense, if EPA cored through the sidewalks for sampling purposes. EPA decided this was cost prohibitive so ICs and the land control were selected in the 2013 ESD. Since signing the MOU, the City has agreed to allow coring of the sidewalks by EPA for purposes of data collection. While not all of the selected mechanisms from the 2013 ESD are in-place, monitoring from Terradex is providing protection from exposure to potential site related contamination.

Issue Two: The soil vapor extraction (SVE) remedy is not able to meet the ROD cleanup goal of 1 mg/kg total VOCs in the clay aquitard between the vadose zone and the contaminated B Aquifer. The rate of ongoing diffusion of VOCs from the A/B aquitard into the aquifer and into the overlying A soils is unknown. If significant, achieving the soil cleanup goals may require additional remedial actions to address contaminants in the aquitard soils.

Recommendation Two: Determine whether the residual soil contamination in the aquitard is adversely impacting the A Zone soil vapor concentrations and/or the shallow (B Zone) groundwater and, as necessary, develop and evaluate potential remedial alternatives.

Current Status: As part of the ongoing FFS modeling has been utilized to determine SSLs for the A/B aquitard, which would be protective of Zone B groundwater. These are discussed further in "Activities completed during the Past Five Years" subsection. The extent of the A/B aquitard contamination above SSLs is under investigation. Potential remedial alternatives will be presented in the FFS report.

Issue Three: Groundwater in the northwest end of the plume may not be fully captured by the current pump & treat system, and the downgradient extent of the plume in this area is not fully defined.

Recommendation Three: Continue to assess the shallow groundwater extraction well network to determine whether additional extraction wells and/or increased pumping rates are needed to achieve capture in the northwest area of the plume. Treatment capacity may need to be reevaluated if additional contaminated water is extracted. Install additional monitoring wells to fully define the extent of the plume in this area.

Current Status: In late 2012 and early 2013 the number of extraction wells was increased from three to seven, these wells can be seen on Figures 1 and 2. The average monthly extraction rate increased from 8.8 gallons per minute (gpm) to 20.3 gpm. The LSGTF conducted a capture zone analysis that showed the additional wells would provide full capture of the VOC plume when pumping rates of 23 gpm were used. The current system has a maximum flow rate rate of 20gpm. Additional temporal groundwater

concentration data from existing monitoring wells is required to confirm full capture of the VOC plume. At this time, no additional monitoring wells have been installed. This issue will be addressed in the FFS report.

Activities completed during the Past Five Years

EPA began an FFS in 2011 to evaluate additional remedial measures that could be implemented to achieve RAOs, and EPA finalized an FFS work plan on December 12, 2011. It is expected at the conclusion of the FFS, in 2017, that new or modified remedies for both OU-1 and OU-2 will be proposed. Known issues that need to be addressed are the A/B aquitard clean up standard, capture of the northwest portion of the VOC plume, setting numeric cleanup standards for groundwater and adding 1,4-dioxane to the COC list.

Between June and September 2012, EPA collected soil, groundwater, and soil vapor samples in order to fill data gaps identified in the FFS work plan. A major data objective was to gain an understanding of the vertical distribution of the residual VOC mass in the A/B aquitard. The highest concentrations of VOCs reported in analytical sampling results came from the samples collected from the middle depths of the A/B aquitard. Groundwater sampling on the Property and in a transect perpendicular to the contaminant plume downgradient of the Property provided data on the lateral and vertical distribution of VOCs and 1,4-dioxane in Zone B, near known and potential source areas. Soil vapor sampling data collected from three residential areas downgradient of the Property did not report the detection of any Site-related VOC above EPA Region IX residential Regional Screening Values (RSLs)[6]. A vapor sample collected from the SJSU athletic field immediately north of the Property reported elevated concentrations of several VOCs at a depth of 15 feet bgs. A second sample result collected from the same location at a depth of five feet bgs did not show any risk of potential vapor intrusion. Additional groundwater, soil and soil vapor sampling in the SJSU athletic field is planned for November 2015.

In 2013, EPA conducted a tracer dilution test to obtain the hydraulic parameter data needed to estimate the horizontal groundwater seepage velocity and theoretical contaminant mass flux beneath the Site. The estimated groundwater seepage velocity ranged between 0.47 and 0.94 ft/day, and the estimated flux ranged from 0.09 to 0.19 $ft^3/day/ft^2$. In April 2015, EPA used this information to develop a site-specific model to calculate soil-screening levels (SSLs) for the COCs in the A/B aquitard to protect the Zone B aquifer. Modeling estimates by EPA predict that if soils in the A/B aquitard and Zone A are remediated to SSLs, the remaining leachable COC concentrations available to Zone B groundwater would not exceed MCLs. These SSLs for the A/B aquitard are planned for inclusion in any future remedy decision.

In June and August 2013, as part of the FFS, LSGTF performed two step-out groundwater sampling events to determine the extent of the 1,4-dioxane plume, see Figure 2. Analytical results of the sampling show the 1,4-dioxane plume to be significantly larger than was previously known. Results of the sampling found concentrations (9.5 and 12 µg/L) of 1,4-dioxane on both sides of Coyote Creek, indicating Zone B groundwater may be migrating to Coyote Creek. This issue will be studied further to determine whether migration to Coyote Creek is an issue that needs to be addressed in a future remedy modification.

[6] Calculated using EPA's Office of Solid Waste and Emergency Response Vapor Intrusion Screening Level (VISL) tool

In 2015, EPA completed a field investigation consisting of soil, soil vapor and groundwater sampling to determine the presence or absence of an additional VOC source area downgradient of the Property, and to evaluate whether there was potential for vapor intrusion from Site related contamination for properties to the east, south, and west of the Property. The investigation did not find any new additional source of soil contamination. Soil vapor samples collected immediately west of the Property, at a paper recycling facility currently operated by Carustar Inc., showed high concentrations of 17,000 micrograms per cubic meter ($\mu g/m^3$) for PCE and 4,300 $\mu g/m^3$ TCE. Both values are above RSLs, prompting EPA to collected indoor air samples at the paper recycling facility in April 2015. Reported analytical results from that sampling event were below the indoor air RSL for both industrial and residential use.

EPA and LSGTF have each initiated treatability studies investigating the use of oxidants to destroy VOCs and 1,4-dioxane. EPA has conducted initial field condition testing and laboratory bench-scale testing of an electro-kinetic technology, which may be able to distribute chemical oxidant regents through the low-permeability A/B aquitard. The effectiveness of the technology will be determined through a series of field tests in 2016. LSGTF has conducted bench-scale testing of oxidants on representative samples of contaminated B-Zone groundwater. Results from this testing are scheduled for publication in October of 2015. The next step, an in-situ field test of chemical oxidation is planned but is not presently scheduled.

3 Five-Year Review Process

Administrative Components

Daewon Rojas-Mickelson, EPA's Remedial Project Manager, with support from Heather Parker, the Community Involvement Coordinator, led the Lorentz Barrel and Drum Superfund Site Five-Year Review. Aaron King and Rick Garrison of the U.S. Army Corps of Engineers (USACE) provided assistance writing the FYR report. The results of the review and the report are available at the Site information repository located at the San Jose Public Library, 150 E. San Fernando Street, San Jose, CA and on the Lorentz Barrel and Drum Superfund website at: www.epa.gov/region9/LorentzBarrel&Drum.

Community Involvement

On May 29, 2014, a public notice was published in two local newspapers, the *San Jose Mercury News* and *El Observador* (Spanish) announcing the commencement of the Five-Year Review process for the Site, providing contact information for Heather Parker and Daewon Rojas-Mickelson, and inviting community participation. However, no one from the community contacted EPA. The public notice is available in Appendix B.

Document Review

This Five-Year Review included a review of relevant documents including monitoring reports, operation and maintenance reports, and documentation of additional investigative activities. The complete list of documents reviewed is included in Appendix A.

Data Review

Soil and Soil Vapor: The SVE system has not been in operation for the last five years. Although there is likely off-gassing from residual concentrations in Zone A, VOC concentrations in soil vapor samples analyzed have all been

too low to warrant restarting the SVE system. Efforts to identify areas of the highest VOC contamination in Zone A and the A/B aquitard continue as part of the FFS. The final field sampling event is planned for November 2015, this information will be reported in Data Gap Investigation reports and used to select potential remedies for inclusion the FFS report. EPA soil and soil vapor investigations initiated over the last five years set out to determine:

- Distribution of VOCs within the A/B aquitard
- Potential for vapor intrusion to the east, south and west of the Property
- The mechanism and rate of VOCs partitioning from the A/B aquitard to Zone B groundwater
- The potential for a VOC source area outside of the Property footprint

Potential for COC vapor intrusion in the residential neighborhood north of the Site was evaluated based on results from three soil vapor samples (Zone A) and the 2014 annual groundwater sampling results (Zone B) collected near residential housing. Concentration results[7] of soil vapor sampling were input to VISL and the predicted indoor air concentrations were below RSLs for residential indoor air (AMEC, 2012b). Similarly, all predicted indoor air COC concentrations were below residential indoor air RSLs when calculated from groundwater concentrations using VISL. Additionally, Zone B groundwater is separated from Zone A soil by the A/B aquitard. As described previously, this aquitard is made of low-permeability clay material, which limits vertical migration of contamination between Zones A and B. For these reasons, EPA does not believe vapor intrusion is occurring at residential homes because of Site contamination. If COC concentrations in groundwater near the residential neighborhood increase significantly, the potential for vapor intrusion should be re-evaluated.

Vapor intrusion above the footprint of the VOC plume, see Figure 1, is not a risk at this time. Further, indoor air sampling will be conducted at the Carustar Inc. facility as part of the ongoing assessment work for the FFS to confirm the non-detect sampling results reported in 2015. Lastly, soil and soil gas sampling at the SJSU property north of Alma Ave will also be conducted, in November 2015, to evaluate vapor intrusion potential for future development.

Groundwater: Currently, the groundwater extraction system consists of the following seven wells: EX-9, EX-10, EX-12, EX-13, EX-15, EX-18 and EX-19, these are shown on Figure 2. The average monthly pumping rate for 2014 was 20.3 gpm. At the time of the previous FYR, three extraction wells were operating at an average monthly extraction rate of 8.8 gpm. Table 1 presents the total mass of VOCs removed via the extraction and treatment system over the past five years.

Table 1. Annual Mass of VOC Removed from the Pump and Treat System

Year	Mass of VOCs removed, lbs
2010	4.33
2011	5.48
2012	4.77
2013	8.22
2014	7.56

[7] Chemicals analyzed: 1,1,1-TCA, 1,1,1-DCA, 1,1-DCE, 1,2-DCA, 1,2-DCPA, cis-1,2-DCE, PCE, TCE

Since 2010, the size of the VOC plume has remained stable. VOC concentrations reported in annual groundwater reports have also remained stable over the past five years. The extent of the VOC plume is represented in Figure 1. In December 2012, the LSGTF submitted a capture zone analysis that showed full capture of the VOC plume when the extraction system operates at a pumping rate of 23 gpm. The current system has a maximum designed flow rate of 20 gpm. Additional data from monitoring wells are required to confirm the northwest portion of the VOC plume has been fully captured. By 2017, it is expected EPA will have the data necessary to make this determination.

Review of analytical results from LSFTF's 1,4-dioxane step-out sampling indicate reported concentrations of 1,4-dioxane, ranging from 9.5 to 12 µg/L, in Zone B groundwater may be migrating to Coyote Creek. This information will be evaluated further to determine whether migration to Coyote Creek is an issue that needs to be addressed in a future remedy modification. Prior to this step-out sampling event, the extent of the 1,4-dioxane plume was unknown. No significant changes in 1,4-dioxane concentrations were seen, over the last five years, in the area of the plume that has been sampled annually. See Figure 2 for the current 1,4-dioxane plume configuration.

One of the remedial action objectives is to prevent contamination of the deep groundwater aquifers (Zones C and D) located beneath the Zone B contamination plume. Groundwater elevations measured in Zone B were generally 4 feet higher in 2006 and 0.8 feet higher in 2013 when compared to groundwater elevations in 2014. Groundwater analytical sampling results from all Zone C monitoring wells collected between 1991 and 2015 have not reported the presence of any Site-related contamination, indicating that the deep groundwater aquifers remain un-impacted by shallow zone contamination.

EPA's evaluation of water level elevation measurements collected in Zones B and C through 2015 indicate a lack of hydraulic connection between Zones B and C, which suggests that the 35-foot aquitard is an effective barrier between the two zones. Zone C is underlain by an approximately 100-foot thick aquitard. As discussed in the two previous Five-Year Reviews, the single Zone D well was abandoned in 1998 due to concerns about groundwater cross contamination. Its multiple-screen construction was open across both Zones C and D, potentially providing a pathway for contamination transport from Zone C to D. In 2010, EPA determined that replacement of the Zone D monitoring well was not necessary, as there had never been any COC detections in Zone C wells. The reduction in Zone C sampling frequency and termination of Zone D sampling will be captured any future changes to the current remedy.

Prior to completion of the FFS more Site characterization work will be conducted regarding the extent of contamination in Zone A and the A/B aquitard. A determination on full capture of the northwestern portion of the plume will be made, and the effects on Coyote Creek from the 1,4-dioxane plume will be evaluated. Treatability studies are scheduled for 2016 to evaluate the feasibility of chemical oxidation at the Site, both in the ground water and A/B aquitard. Proposed changes to the OU-1 and OU-2 remedies and/or new remedies will be presented in the FFS report. This report is scheduled for publication on June 30, 2017.

Site Inspection

The EPA RPM made several Site visits last year to inspect the asphaltic concrete cap, retaining walls, fencing, SVE system, and groundwater treatment facility. On February 23, 2015, the RPM concluded that the remedy is

functioning as intended, as described in OU-1 and OU-2 decision documents, and the overall Site is in generally good condition. The asphaltic containment cap on the 10th Street Land Management portion of the Property was in good condition with no signs of settlement. The Caraustar Inc. cap is in good to fair condition, with some cracks present. The groundwater pump and treat system was found to be operating in accordance with current NPDES permit requirements. In addition to inspections by the RPM, a private engineering firm (AECOM) conducts inspections in June, September and monthly from October through March for both 10th Street Land Management and Carustar Inc. Routine status reports describing cap condition are provided to EPA within 30 days of each inspection. Repairs to the cap are performed as-needed.

4 Technical Assessment Summary

Question A: *Is the remedy functioning as intended by the decision document?*
Yes, the remedies are functioning as intended by the decision documents with the exception of lack of plume control for 1,4-dioxane and continued diffusion of contamination from the A/B aquitard to Zone A soil vapor and Zone B groundwater. New information suggests the 1,4-dioxane plume stretches to Coyote Creek. Zone B groundwater with 1,4-dioxane may be migrating to Coyote Creek. At this time, 1,4-dioxane is not included as a COC in the OU-2 ROD. An FFS is underway to develop and evaluate additional remedial actions to address the residual contamination in the A/B aquitard and the extent of the 1,4-dioxane plume. Site related contamination has not affected Zone C groundwater.
The asphalt caps remain in good to fair condition. The groundwater pump and treat system was found to be operating in accordance with current NPDES permit requirements.
ICs and signage adjacent to the Sidewalk Area need to be implemented. Once soil sampling results have been analyzed (October or November 2015) ICs and signage will be implemented unless COC sample concentrations are less than the cleanup standard.

Question B: *Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?*
The exposure assumptions, cleanup levels, and RAOs used at the time of remedy selection are still valid. Toxicity data for TCE, PCE, cis-1,2-DCE, and 1,4-dioxane have changed in the last five years; those for TCE, cis-1,2-DCE, and 1,4-dioxane are more stringent. The more stringent toxicity data for TCE and cis-1,2-DCE do not affect protectiveness because there is no exposure. A new or modified remedy is planned and will eliminate any risk of future exposure. Though groundwater containing 1,4-dioxane may be migrating to Coyote Creek further evaluation is necessary to determine whether there is an impact to Coyote Creek. Additionally 1,4-dioxane is not included as a COC in the 1998 ROD.

Question C: *Has any other information come to light that could call into question the protectiveness of the remedy?*
No other information has come to light that could call into question the protectiveness of the remedy.

Technical Summary
New information suggests the 1,4-dioxane plume stretches to Coyote Creek. There is no evidence that contaminants are affecting deeper aquifers or Coyote Creek; though groundwater containing 1,4-dioxane

may be migrating to Coyote Creek. This issue will be evaluated further to determine whether migration to Coyote Creek is an issue that needs to be addressed in a future remedy modification. The required signage and ICs related to the Sidewalk Area need to be implemented, this work has been delayed in order to collect soil sample data from under the Sidewalk Area. This sampling will occur in October or November of 2015. Diffusion of residual contamination from the A/B aquitard to Zone A soil vapor and Zone B groundwater prevents the achievement of cleanup goals. An FFS is underway to develop and evaluate additional remedial actions to address residual contamination in the A/B aquitard and the extent of the 1,4-dioxane plume.

5 Issues/Recommendations and Follow-up actions

Issues/Recommendations				
Issues and Recommendations Identified in the Five-Year Review:				
OU(s): OU1 and OU2	**Issue Category**: Remedy Performance			
	Issue: The migration of the 1,4-dioxane may not be controlled and there is continued diffusion of contamination from the A/B aquitard to Zone A soil vapor and Zone B groundwater.			
	Recommendation: The FFS for OUs 1 & 2 needs to be completed in order to evaluate the current remedies for both OU-1 and OU-2 and make recommendations to modify existing remedies or select new remedies for both OUs. Numeric groundwater cleanup standards need to be established for VOCs and 1,4-dioxane.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	EPA and PRP, respective to OU	EPA	09/30/2018

In addition, EPA should as part of the FFS:

- Resample indoor air at the Carustar Inc. facility to confirm 2015 analytical sample results
- Monitor any land use changes or development of SJSU property to the north of Alma Avenue, and consider whether land use restrictions are appropriate

6 Protectiveness statement

Protectiveness Statement(s)		
Operable Unit: OU-1	*Protectiveness Determination:* Short-term Protective	*Addendum Due Date (if applicable):* Click here to enter a date.
Protectiveness Statement:		

The remedy at OU-1 protects human health and the environment because principal threat soils have been removed and there is no exposure to contaminants of concern in any media due to the cap and institutional controls. However, in order for the remedy to be protective in the long-term the FFS needs to be completed and a determination on the need to modify the decision document needs to be made.

Operable Unit:	*Protectiveness Determination:*	*Addendum Due Date (if applicable):*
OU-2	Short-term Protective	Click here to enter a date.

Protectiveness Statement:
The remedy at OU-2 protects human health and the environment because there are no complete exposure pathways at the LB&D Property or the downgradient plume area. There is no evidence of adverse impacts of the plume to the deep aquifers or Coyote Creek. However, in order for the remedy to be protective in the long-term the FFS needs to be completed and a determination on the need to modify the decision document needs to be made.

Sitewide Protectiveness Statement	
Protectiveness Determination:	*Addendum Due Date (if applicable):*
Short-term Protective	Click here to enter a date.

Protectiveness Statement:
The remedy at the LB&D site protects human health and the environment because principal threat soils have been removed, there are no complete exposure pathways at the LB&D Property or the down-gradient plume area and there is no evidence of adverse impacts of the plume to the deep aquifers or Coyote Creek. However, in order for the remedy to be protective in the long-term the FFS needs to be completed and a determination on the need to modify the decision documents needs to be made.

7 Next review

The next Five-Year Review report for the Lorentz Barrel and Drum Superfund Site is required five years from the completion date of this review.

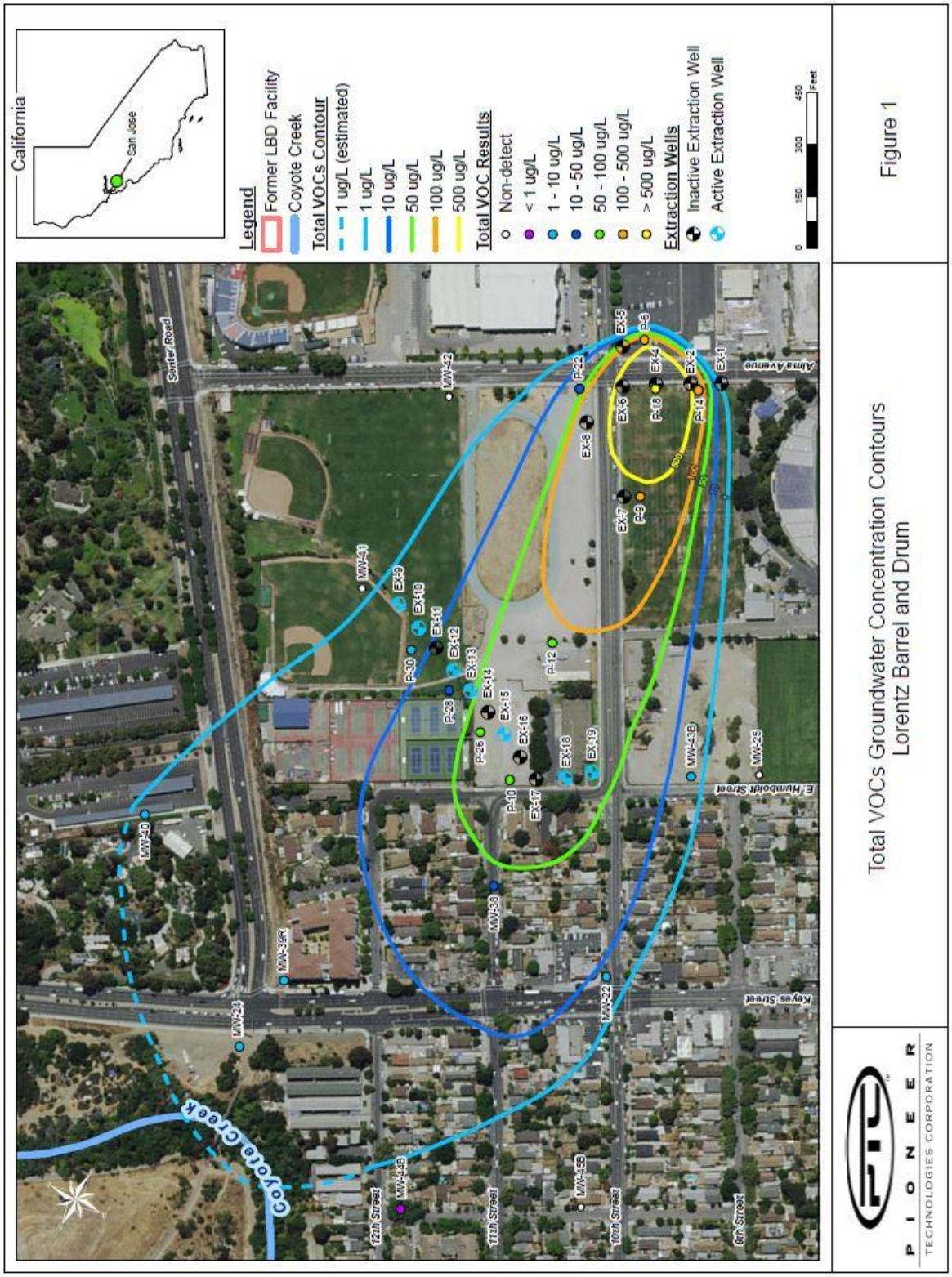
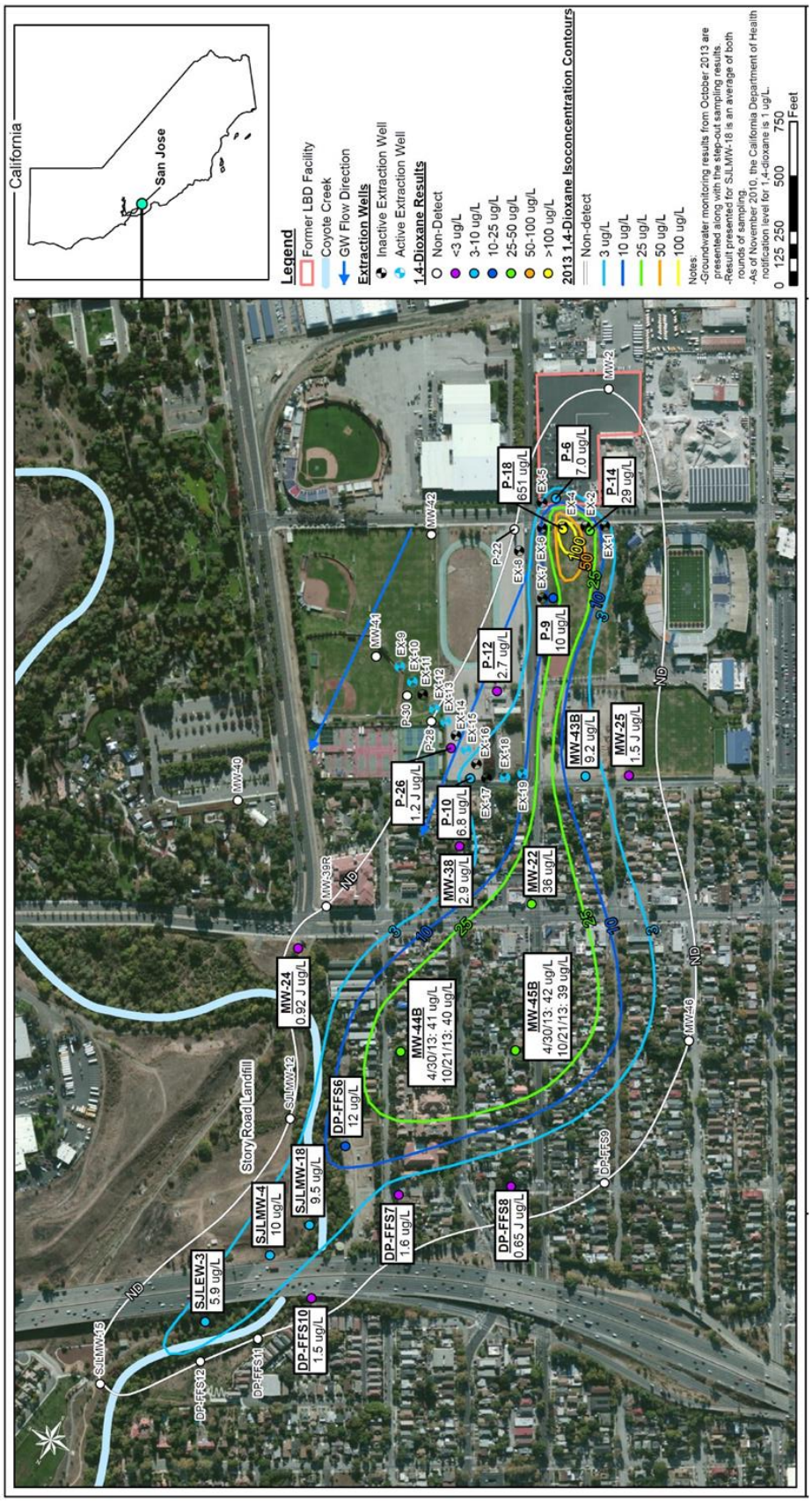


Figure 1. Total VOC Isoconcentration Contours, in µg/L (based on 2014 groundwater monitoring results)



Source: Focused Feasibility Study 1,4-Dioxane Step-Out Sampling Report, PTC, 2014

Figure 2. 1,4-Dioxane Isoconcentration Contours (based on 2013 groundwater monitoring results)

Appendix A: List of Documents Reviewed

List of Documents Reviewed

AMEC, 2014a, "Tracer Dilution Testing Lorentz Barrel & Drum Superfund Site," Prepared for USEPA by AMEC, February 2014.

AMEC, 2014b, "OU-1 Data Gap Investigation Lorentz Barrel & Drum Superfund Site," Prepared for USEPA by AMEC, January 2014.

AMEC, 2012, "Sampling and Analysis Plan (Field Sampling Plan and Quality Assurance Project Plan) Lorentz Barrel & Drum Superfund Site," Prepared for USEPA by AMEC, July 2, 2012.

Pegasus Geoscience and PTC, 2013, "Annual Groundwater Monitoring Report No. 45, Lorentz Barrel & Drum Site," Prepared for USEPA by Pegasus Geoscience and Pioneer Technologies Corp., December 2013.

PTC (Pioneer Technologies Corp.), 2011, "Lorentz Barrel and Drum Focused Feasibility Study Work Plan," Prepared for USEPA by AMEC and Pioneer Technologies Corp., December 19, 2011.

PTC, 2012, "Focused Feasibility Study Data Gap Investigation SAP/QAPP for the B Zone," Prepared for USEPA by Pioneer Technologies Corp., April 2012.

PTC, 2014a, "Focused Feasibility Study 1,4-Dioxane Step-Out Sampling Report." Prepared for Lorentz Shallow Groundwater Task Force by Pioneer Technologies Corp., March 2014.

PTC, 2014b, "Annual Groundwater Monitoring Report No. 46, Lorentz Barrel & Drum Site," Prepared for USEPA by Pioneer Technologies Corp., December 29, 2014.

USEPA (U.S. Environmental Protection Agency), 2000, First Five-Year Review Report, Lorentz Barrel and Drum, San Jose, California, September 27, 2000.

USEPA, 2005, Second Five-Year Review Report for Lorentz Barrel and Drum Superfund Site, San Jose, Santa Clara County, California, September 2005.

USEPA, 2010, Third Five-Year Review Report for the Lorentz Barrel and Drum Superfund Site, San Jose, Santa Clara County, California, September 2010.

USEPA, 2013, "Explanation of Significant Differences to the Operable Unit 1 Record of Decision (August 26, 1993) at the Lorentz Barrel and Drum Superfund Site in San Jose, California," September 26, 2013.