FOURTH FIVE-YEAR REVIEW REPORT FOR

McCOLL SUPERFUND SITE

Orange County, California

PREPARED BY

USACE Seattle District

FOR

U.S. Environmental Protection Agency

Region IX

Approved by:

Date:

9/27/17

Richard Hiett, Acting Assistant Director
California Site Cleanup and Enforcement Branch
U.S. Environmental Protection Agency, Region 9

[This page is intentionally left blank.]

Executive Summary

This is the fourth Five-Year Review of the McColl Superfund Site (Site) located in Fullerton, Orange County, California. The purpose of this Five-Year Review is to review information to determine if the remedy is and will continue to be protective of human health and the environment.

The Site is located at the southwest corner of Rosecrans Avenue and Sunny Ridge Drive in Fullerton, California. From 1942 to 1946, the 22 acres of what became the McColl Superfund Site served as a disposal area for an estimated 72,600 cubic yards of low-pH petroleum refinery waste in twelve unlined sumps. Over time, waste constituents leached from the sumps into underlying perched groundwater and were transported hydraulically downgradient in the dissolved phase. The Site consists of the Source and Groundwater Operable Units (OUs). The principal contaminants of concern are benzene, tetrahydrothiophenes (THTs), and metals.

The Environmental Protection Agency (EPA) signed the Source OU Record of Decision (ROD) in 1993 and the Groundwater OU ROD in 1996. The Groundwater OU ROD refers to and incorporates the Source OU selected response actions.

EPA selected solidification technology in the 1993 Source OU ROD as the remedy for the Site. Due to technical uncertainties that could not be resolved until field implementation, EPA included a contingency to the selected remedy of a RCRA-equivalent closure system. Following extensive testing of solidification, EPA concluded that the technology was not feasible for the Site and implemented the contingency remedy. The contingency remedy included:

- constructing a multi-layer cap over the untreated sumps with a gas collection and treatment system;
- building vertical cut-off slurry walls around the sumps;
- stabilizing steep slopes on the Site with retaining walls;
- institutional controls; and
- monitoring groundwater.

In 1996, EPA selected the following remedy for the Groundwater OU to protect long-term human health and the environment:

- redirection of surface water off the Site;
- grading of areas adjacent to the containment system;
- lining of on-site drainage channels with low permeability materials; and
- groundwater monitoring with implementation of institutional controls should monitoring results exceed criteria pertaining to THTs (an ESD in 2005 changed the trigger chemical to benzene.)

Construction activities for both the contingency Source OU remedy and the Groundwater OU remedy began in July 1996 and completed by November 1997.

The gas control treatment system is currently operating effectively with limited off-gas generation. Data supports the conclusion that measures to inhibit surface water recharge within the capped areas are working. Water levels in the shallow groundwater zone have been decreasing, which attests to the success in minimizing infiltration. The benzene plume is currently limited to one on-site, shallow well. There have been no exceedances for benzene, the trigger compound, above the Maximum Contaminant Level (5 µg/L) in any off-site, downgradient monitoring well. Institutional controls are in place and working. Exposure assumptions and remedial action objectives used at the time of ROD remain valid.

Tert-butyl alcohol (TBA) concentrations are present in the aquifers beneath the Site at low concentrations in up and/or cross-gradient wells. The TBA concentration increases significantly as groundwater in the shallow zones migrates past the sump areas indicating that the sumps could be a source of TBA. TBA was not identified as a contaminant of concern in the ROD and has no Federal or State Maximum Contaminant Level, but the California Department of Public Health has issued a notification level of 12 µg/L in public drinking water systems. Samples from the off-site downgradient compliance wells contain TBA in concentrations significantly above the notification level. TBA is known to be more mobile and less volatile than benzene, therefore could potentially be the leading edge of a migrating plume.

The remedies at the McColl Superfund Site for both Source and Groundwater OUs are currently protective of human health and the environment. The Gas and Collection Treatment System (GCTS), control surface water recharge and other institutional controls are functioning as designed. The current extent of the benzene plume is limited to an on-site, shallow well. However, due to the continued detection of tert-butyl alcohol (TBA) in the wells downgradient of the source sumps, and the nature of TBA as more mobile and volatile than benzene, further delineation and characterization of TBA in groundwater is necessary to ensure long term protectiveness.

Contents

List of Figures

List of Tables

List of Abbreviations

ARAR	Applicable or relevant and appropriate requirement
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
DTSC	California Department of Toxic Substances Control
EPA	Environmental Protection Agency
ESD	Explanation of Significant Difference
FYR	Five-Year Review
GAC	granular activated carbon
GCTS	Gas Collection Treatment System
GPP	gas pressure probe
GSP	gas sampling probes
IC	institutional controls
MCLs	Maximum Contaminant Levels
µg/L	micrograms per liter
mg/L	milligrams per liter
NCP	National Contingency Plan
NTU	nephelometric turbidity unit
O&M	Operation and Maintenance
OU	Operable unit
PID	Photoionization Detector
Psi	pounds per square inch
RAO	Remedial Action Objective
ROD	Record of Decision
RPM	Remedial Project Manager
SCAQMD	South Coast Air Quality Management District
TBA	tert-butyl alcohol
TDS	total dissolved solids
THTs	Tetrahydrothiophenes
USACE	U.S. Army Corps of Engineers
UU/UE	Unlimited use and unrestricted exposure

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 methods, findings, and conclusions of reviews are documented in five-year review reports. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency (EPA) is preparing this five-year review pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, 40 Code of Federal Regulation (CFR) Section 300.430(f)(4)(ii) of the National Contingency Plan (NCP), and EPA policy.

This is the fourth FYR for the McColl Superfund Site. The triggering action for this statutory review is the third FYR, conducted in 2012. The FYR has been prepared because hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

The Site consists of two OUs, both of which will be addressed during this FYR. The Source OU addresses the risk posed by the petroleum waste itself. The Groundwater OU addresses the potential threat posed by the release of hazardous substances to the drinking water aquifer from the petroleum waste.

The McColl Superfund Site Five-Year Review was led by Rusty Harris-Bishop, Remedial Project Manager (RPM) from EPA. Participants included Carlin Hafiz from EPA and U.S. Army Corps of Engineers (USACE) staff Kristin Addis (hydrogeologist) and Alison Burcham (environmental engineer).

Table 1-1. Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: McColl Superfund Site		
EPA ID: CAD980498695		
Region: 9	**State:** CA	**City/County:** Fullerton/Orange
SITE STATUS		
NPL Status: Final		
Multiple OUs? Yes	**Has the Site achieved construction completion?** Yes	
REVIEW STATUS		
Lead agency: EPA		
Author name (Federal or State Project Manager): Rusty Harris-Bishop		
Author affiliation: EPA Region 9		
Review period: 11/4/2016– 9/5/2017		
Date of Site inspection: 1/19/2017		
Type of review: Statutory		
Review number: 4		
Triggering action date: 9/28/2012		
Due date *(five years after triggering action date)*: 9/28/2017		

1.1. Background

The Site is located in the City of Fullerton in Orange County, California (Figure 1-1). The Site is fenced and located entirely within the boundaries of the Los Coyotes Country Club. From 1942-1946, the 22 acres composing the Site were a disposal area for petroleum refinery waste. During that period, an estimated 72,600 cubic yards of waste was disposed of in twelve unlined pits or sumps. At the time, the local area was sparsely populated. Refinery operations took place on land located to the north and northwest of the Site. During the 1950s and early 1960s, in an attempt to control Site odors, three sumps in the Ramparts area were covered with drilling mud (Figure 1-2). In the late 1950s, six sumps at the lower end of the property were covered with natural fill materials. This covering took place during the construction of the adjacent Los Coyotes Country Club golf course. Additional soil cover was placed over the upper Ramparts sumps in September 1983. Subsequently residential housing was built on adjacent land, and eventually the golf course expanded to include the Site.

1.2. Physical Characteristics

Ground surface use of the Site consists of a portion of the country club's 27-hole golf course called the Lake Nine (Figure 1-2). The Site is predominantly grass-covered and ornamentally landscaped; as a golf course, the grass is regularly watered and mowed. The northeast corner of the Site is located at the intersection of Rosecrans Avenue and Sunny Ridge Drive. The terrain at the Site slopes gently from the northeast to southwest, with a maximum relief of approximately 70 feet (ft). The golf course and surrounding residential areas have altered the natural topography; the Site generally lies at the lower southern face of the east-west trending Los Coyotes Hills. The climate at the Site and surrounding area is Mediterranean, characterized by hot dry summers and mild winters during which most of the year's light rainfall occurs.

Engineered features, including the contoured, vegetated multi-layer cover system, concrete-lined v-ditches, and retention ponds, facilitate surface water drainage from the Site. There is one surface water drainage pathway originating off-site that traverses the Site's northwest corner. This surface water drainage originates on land located directly to the north of the Site across Rosecrans Avenue and predominantly west of the fire station constructed across Rosecrans Avenue from the Site. Flow from the surface water drainage is routed into a geosynthetic-lined retention pond located on the Lake Nine portion of the golf course. The retention pond collects 100-year peak flows and overflows through a culvert into a swale, which traverses the course and enters another retention pond downstream.

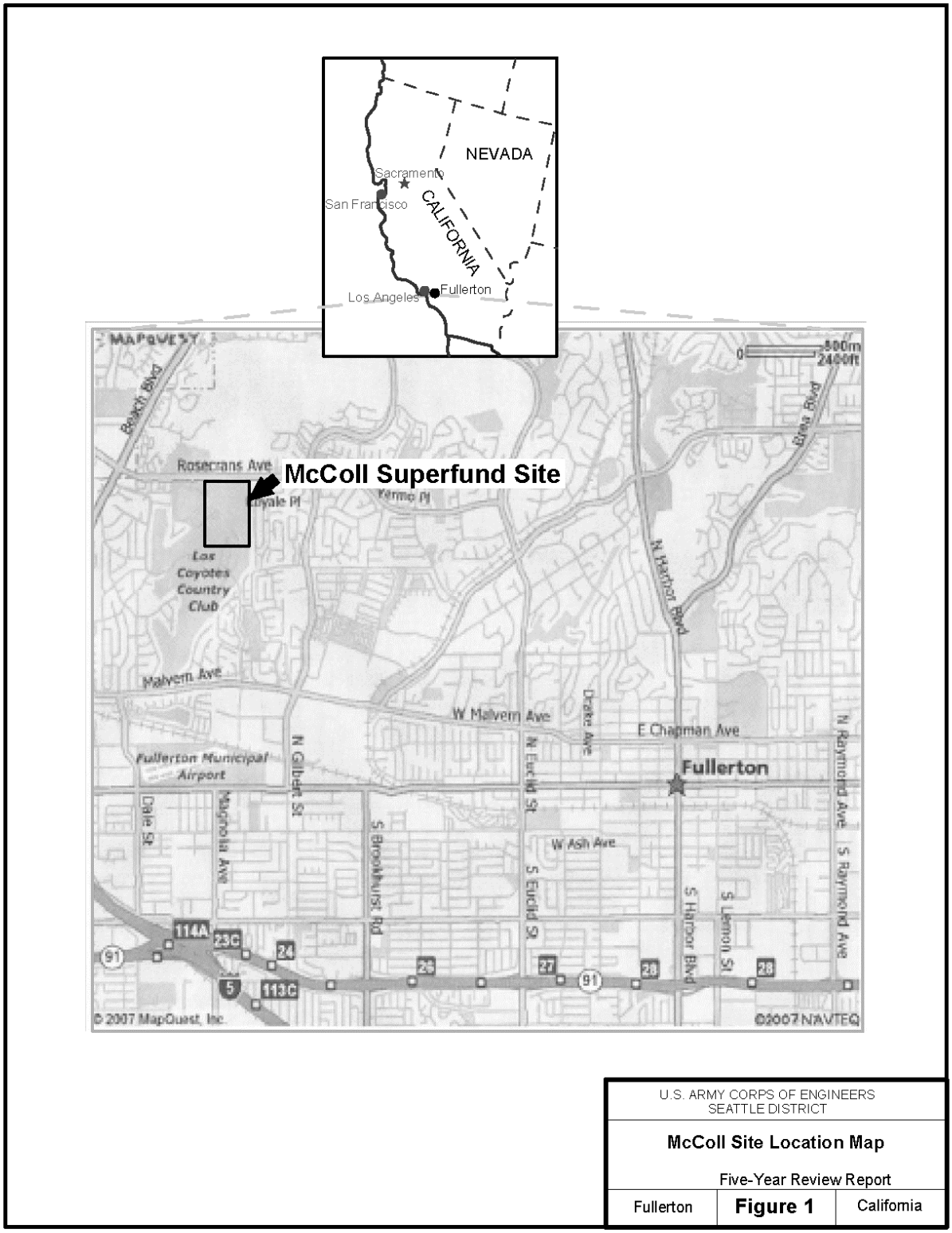


Figure 1-1. Location Map for the McColl Superfund Site

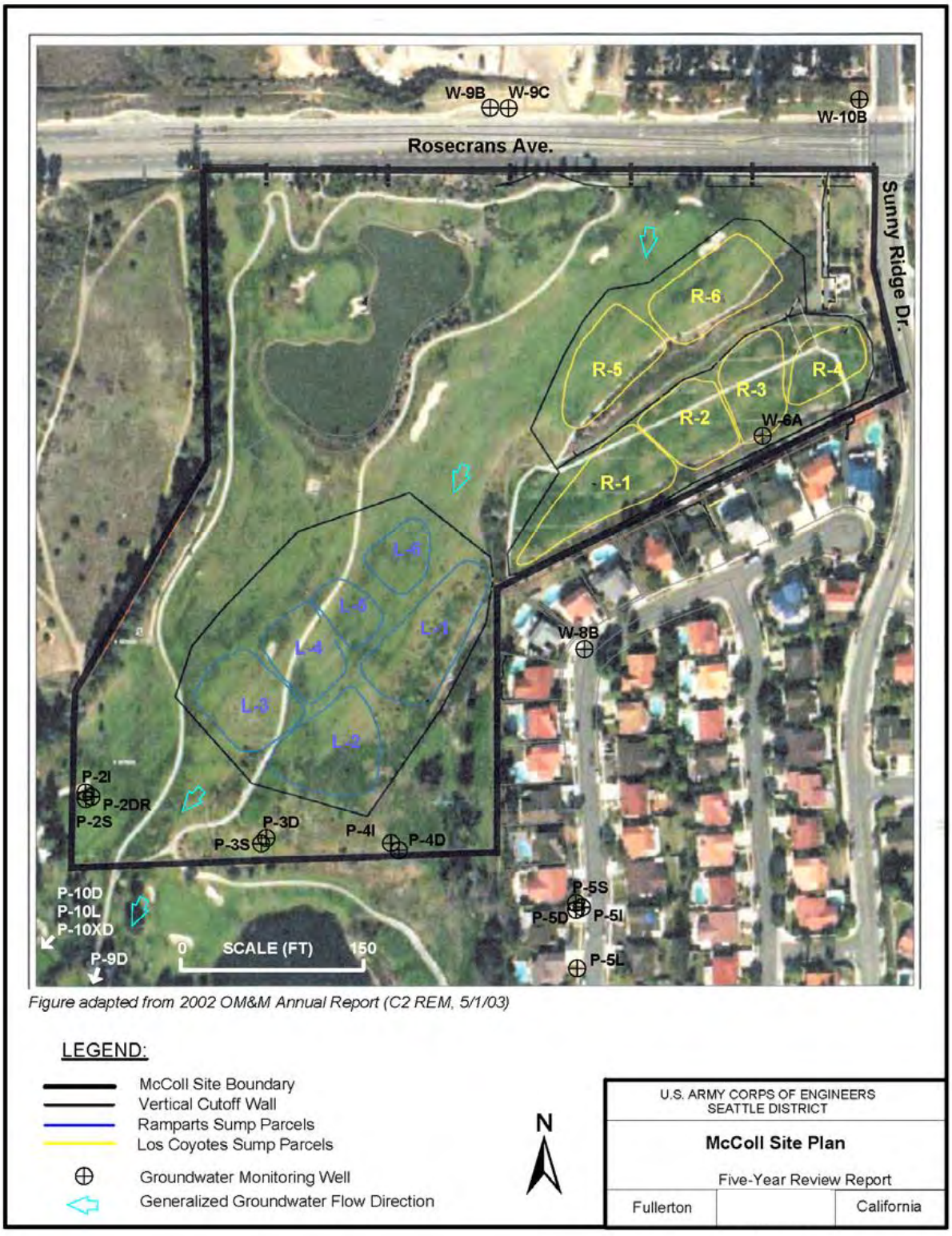


Figure adapted from 2002 OM&M Annual Report (C2 REM, 5/1/03)

Figure 1-2. Detailed Map of the McColl Superfund Site

1.3. Hydrology

Consolidated Quaternary alluvial deposits underlie major portions of Orange County, California, including the McColl Superfund Site. Regional hydrologic units consist of three distinct formations: the La Habra Formation; the Coyote Hills Formation; and the San Pedro Formation. The La Habra formation is nearest to the surface at the Site, and is an Upper Pleistocene deposit of relatively fine-grained material laid in a non-marine and floodplain environment. It consists of semi-perched aquifers of limited extent. The coarser-grained Coyote Hills formation underlies the La Habra, and is a Lower Pleistocene deposit laid in a non-marine environment. The San Pedro Formation is the deepest of the three, and is an Older Lower Pleistocene deposit consisting of shallow to deep massive sands. The principal aquifer of the Orange County basin occurs at the base of the San Pedro Formation.

Designation of the four groundwater-bearing zones at the Site is alphabetical from shallowest to the deepest, A through D. Zones A, B, and C are located within the La Habra Formation. Zone D is located in the Coyote Hills Formation. Clay layers separate these zones from one another by serving as barriers to vertical flow, although the C zone does appear to intersect the regional aquifer at the southern Site boundary. The regional aquifer is the Upper San Pedro aquifer, and thus incorporates the lower C and D local groundwater zones. Zones A, B, and C produce little water. Zone D is capable of producing larger quantities of water.

There are two identified municipal groundwater production wells within 7,000 feet of the Site. The closer of the two is the Coyote 12A well, located 3,000 feet cross-gradient to the Site toward the east - southeast at the intersection of Gilbert Street and Pioneer Avenue.

2. Remedial Actions Summary

2.1. Basis for Taking Action

The Site initially came to the attention of regulatory agencies when residents complained of odor and health concerns in July 1978. Over time, some of the waste constituents leached from the sumps into underlying perched groundwater and transported in the dissolved phase hydraulically downgradient from the sumps. Contaminants in the perched zone could migrate into the regional drinking water aquifer. The principal contaminants of concern are benzene, tetrahydrothiophenes (THTs), and metals. In 1983, the Site was listed on the National Priorities List.

2.2. Remedy Selection

EPA issued a Record of Decision (ROD) in 1984, prior to the 1986 Superfund Amendments and Reauthorization Act. These amendments stressed the importance of permanent remedies and innovative treatment technologies in cleaning up Superfund Sites. The remedy selected in 1984 included excavation and re-disposal of waste at the McColl Superfund Site. Subsequently, EPA issued two RODs for two

operable units[1] (OU) at the Site: the 1993 Source OU ROD and the 1996 Groundwater OU ROD, which superseded the 1984 ROD before the remedy had been implemented.

The remedy selected in the 1993 Source OU ROD addressed the risk posed by the waste. The ROD did not explicitly contain Remedial Action Objectives (RAOs) for the OU; however, the subsequent Groundwater OU ROD refers to and incorporates selected Source OU response actions into RAOs for the Site. The Site RAOs included:

- Long-term isolation of waste materials,
- Minimization of infiltration of rain water into waste materials,
- Control of any gases emitted from the waste,
- Provision of adequate bearing capacity for the end use of the Site.

Table 2-1. Source Contaminants of Potential Concern

Organic COPCs	Inorganic COPCs
methlyene chloride	Antimony
benzene	Arsenic
ethyl benzene	Beryllium
toluene	Cadmium
xylenes	Copper
acetone	Lead
2-butanone	Manganese
2-methylnapthalene	Mercury
naphthalene	Nickel
phenanthrene	Tin
Bis(2-ethylhexyl) phthalate	Vanadium
Tetrahydrothiophenes (THTs)	Zinc
Leachable sulfate	

EPA selected solidification technology in the 1993 Source OU ROD as the remedy for the Site. Due to technical uncertainties that could not be resolved until field implementation, EPA included a contingency to the selected remedy of a RCRA-equivalent closure system. Following extensive testing of solidification, EPA concluded that the technology was not feasible for the Site and implemented the contingency remedy. The contingency remedy included: (1) constructing a multi-layer cap over the untreated sumps with a gas collection and treatment system; (2) building vertical cut-off slurry walls around the sumps; (3) stabilizing steep slopes on the Site with retaining walls; and (4) monitoring groundwater. Operation and maintenance of the cap and cut-off slurry walls, gas collection and treatment system, and Site security will be necessary in perpetuity at the Site. The remedy also includes institutional controls, which are designed to prevent construction of structures or addition of materials that could compromise the integrity of the implemented remedy.

[1] EPA often breaks up sites into smaller areas to make cleanup easier and more manageable. These smaller areas are referred to as operable units.

The Groundwater OU ROD, signed by EPA on May 15, 1996, addressed the potential threat posed by the release of hazardous substances to groundwater from the waste. The Groundwater OU remedy required reduction of infiltration of water into the ground through redirection of surface water off the Site, grading of areas adjacent to the containment system, and lining of on-site drainage channels with low permeability materials. The groundwater remedy stipulated continuing groundwater monitoring and completion of a risk assessment should monitoring results exceed certain criteria pertaining to THT. Depending on results of the risk assessment, possible institutional controls restricting access to certain groundwater wells may be required.

Table 2-2. Groundwater Contaminants of Concern

Organic Contaminants of Concern			**Inorganic Contaminants of Concern**
Thiophenes:	Volatile Organic Compounds (VOCs)	Semivolatile Organic Compounds (SVOCs)	Metals
Tetrahydrothiophene (THT)	Acetone	Bis(2-ethylhexyl)phthalate	Aluminum
2-methyltetraydrothiophene (2-THT)	Benzene	Butylbenzylphthalate	Arsenic
3-methyltetrahydrothiophene (3-THT)	2-Butanone	Dimethylphthalate	Barium
	Carbon Disulfide	Di-n-butylphthalate	Beryllium
	Chloroform	Isophrone	Cadmium
	1,2-dichloroethane	2-Methylphenol	Chromium
	Ethyl benzene	Nitrobenzene	Cobalt
	2-hexanone	Phenol	Copper
	Methylene Chloride	Pyrene	Lead
	Toluene		Manganese
	Xylenes		Mercury
			Nickel
			Selenium
			Thallium
			Vanadium
			Zinc

EPA issued an Explanation of Significant Difference (ESD) for the Groundwater OU on September 1, 2005. The primary change documented in the ESD was removing THT as the trigger chemical and replacing it with benzene for future monitoring events. If benzene is detected above 5 micrograms per liter (µg/L) [the maximum contaminant level (MCL) for drinking water] in any off-site, downgradient monitoring well, completion of a risk assessment would be triggered to determine if further actions are appropriate.

Institutional controls are included in the ROD for the Source OU and would be required for the Groundwater OU if benzene detections are above its MCL, and a revised risk assessment concludes that risks fall outside of the protective risk range.

2.3. Remedy Implementation

There are two cover systems, one encompassing the Los Coyotes sump area, and the other covering the Ramparts sump area. Prior to cap construction, two vertical cutoff walls, which serve as subsurface barriers, were installed, one each encircling the Ramparts and Los Coyotes sump areas. Barrier construction used a slurry mixture of soil and bentonite clay. The bottom elevation of both walls is above the static elevation of groundwater; hence, the design of the cutoff walls was primarily for vapor containment and not hydraulic isolation, although prevention of horizontal movement of minor perched water through the wall is a beneficial byproduct of the design. Twelve sets of gas probes (two gas sampling probes outside the wall, and one gas pressure probe inside the wall) monitor the effectiveness of the sub-surface slurry walls to contain the vapors. A single blower induced a vacuum to draw the subsurface gases through the aboveground vapor treatment system for the two interconnected networks. The blower operated nine hours per day, five days per week until June 2005, after receipt of approval to operate in active mode one day per month, working passively (blower off) the rest of the time. The vapor treatment system consists of two granular activated carbon (GAC) vessels operated in series.

Construction activities began in July 1996. On November 13, 1997, EPA and the California Department of Toxic Substances Control (DTSC) conducted a final inspection of the Site. EPA determined construction completion occurred according to specifications and the remediation was implemented successfully. In April 1998, EPA approved the Final Remedial Action Report for the McColl Superfund Site. On June 30, 1998, EPA signed the Superfund Closeout Report for the Site.

The property owner, McAuley LCX Corporation agreed to no further development of the Site property and agreed in 1996 to record a Deed Restriction on the Los Coyotes property that would run with the land and be binding on any potential future owner of the Site. In a letter from the California DTSC dated March 14, 2005, the State determined that the land use restrictions agreed to in the Consent Decree were consistent with the requirements of Land Use Covenant Regulations as well as the land use covenant provisions in California Civil Code Section 1471. The Groundwater OU Institutional Control are not required at this time.

Long term monitoring at the Source OU includes observation of pressure probes to ensure a negative pressure exists within the sump containment systems, and surveying of settlement monuments to identify any areas of differential settlement that could affect the integrity of the containment systems. Long term monitoring at the Groundwater OU consists of sampling the existing network of monitoring wells to determine whether migration of Site-related contaminants is occurring.

Regular groundwater monitoring ensures contaminants have not migrated off-site. There is a network of 20 wells for collecting hydraulic head and chemistry data for the purposes of monitoring groundwater. All wells are located outside of the capped areas as there were to be no perforations of the cap. Figure 1-2 shows the well locations with respect to the Site. In accordance with the 2005 ESD, benzene is as an indicator and trigger for a revised risk assessment. However, benzene concentrations in off-site wells have been below the MCL and have not required initiation of a risk assessment revision.

Table 2-3. Summary of Implemented Institutional Controls

Media, engineered controls, and areas that do not support UU/UE based on current conditions	Institutional Controls Called for in the Decision Documents	Impacted Parcel(s)	Institutional Control Objective	Title of Institutional Control Instrument Implemented and Date (or planned)
Source Area	Yes	McAuley LCX Corp APN 280-201-02	Prevent development of parcel to ensure integrity of source control/capped area	Consent Decree recorded January 28, 1997
Groundwater	Yes	McAuley LCX Corp APN 280-201-02 Impacted wells	Deploy Institutional Controls if benzene is detected above MCL in down-gradient off-site wells.	None currently necessary

2.4. Operation and Maintenance (O&M)

O&M consists of three categories of tasks: (1) operation and maintenance of the gas collection and treatment system (GCTS); (2) inspection of the cap and retaining walls, maintenance of ground cover, and Site security; and (3) collection of groundwater monitoring data for use in evaluating the groundwater remedy. The gas collection and treatment system is monitored monthly using a photoionization detector (PID) (calibrated to benzene) at the system's effluent sample location. The maximum effluent resulting from the GCTS must be less than 5.95 ppm of benzene over an 8-hour operational period per day in compliance with the South Coast Air Quality Management District (SCAQMD). Each year, C2 REM (the McColl Site Group responsible parties' contractor) conducts confirmation sampling to ensure the effectiveness of the GCTS filter.

The gas collection pressure probes are monitored quarterly using field instruments to measure volatile organic compounds (VOCs), carbon dioxide, oxygen, hydrogen sulfide, and lower explosive limit. Annual measurements of the sub-gradient pipes that collect fugitive soil vapor emissions from the sand layer of the cap ensure the GCTS maintains balanced flow throughout the system.

The Los Coyotes Country Club grounds staff observes the cap and retaining walls daily, with a detailed inspection each year. Every five years this effort includes settlement surveys. Sampling groundwater for contaminants of concern occurs annually in some wells; and every other year in other wells. Since 2005, the groundwater has been purged and sampled semiannually using a low-flow, fixed volume method.

Significant O&M efforts during the five-year review period include removal of two to three feet of sediment from the pond and a significant electrical upgrade. (See Section 3.2 for more details.)

3. Progress Since the Last Five-Year Review

3.1. Previous Five-Year Review Protectiveness Statement and Issues

The protectiveness statements from the 2012 FYR for the McColl Superfund Site stated the following:

> *The remedy at the McColl Site for the source OU is protective of human health and the environment, and exposure pathways that could result in unacceptable risks are being controlled. The remedy is expected to continue to be protective in the long term.*
>
> *The remedy at the McColl Site for the groundwater OU is protective of human health and the environment, and exposure pathways that could result in unacceptable risks are being controlled. The remedy is expected to continue to be protective in the long term.*
>
> *The overall remedy at the McColl Superfund Site for both source and groundwater OUs is protective of human health and the environment, and exposure pathways that could result in unacceptable risks are being controlled. The remedy is expected to continue to be protective in the long term.*

The 2012 FYR included no issues or recommendations.

3.2. Work Completed at the Site during this Five-Year Review Period

Significant O&M efforts during the FYR period include removal of two to three feet of sediment from the pond, removal of deep rooted vegetation on the cap and replacement with shallow rooted vegetation, and a significant electrical upgrade to the GCTS system.

C2 REM completed electrical upgrades to the GCTS system in two separate phases. The first phase, conducted in 2015, upgraded the electric control panels located along Rosecrans Avenue that control the remediation system. In addition, the fencing was improved surrounding the electrical enclosure to protect equipment. C2 REM replaced the electrical panels inside the GCTS enclosure as part of the second phase of work completed in 2016.

In April 2016, the detention pond located at the north end of the golf course contained approximately 2.3 feet of sediment, which was approaching the 30% storage capacity[2]. The sediment was sampled prior to removal, and all laboratory analytical results demonstrated that contaminants of concern were below regulatory levels. C2 REM drained the detention pond and removed sediment during 2016. C2 REM placed the sediment to the southeast of Los Coyotes Sumps L-1 and L-2 to aerate and reduce in moisture content.

[2] The OM&M requires that sediment be removed from the detention pond when the storage capacity is at 30%.

The remaining Site work consisted of minor routine maintenance of well boxes (repair and/or replacement due to damage from golf carts), surface and subsurface drainage systems, access road maintenance, security fencing and gas probe maintenance. C2 REM removed deep-rooted vegetation in the vicinity of the sumps and replaced with these with shallow-rooted shrubs and trees.

4. Five-Year Review Process

4.1. Community Notification, Involvement and Site Interviews

A fact sheet was mailed to residents in August 2017, stating that there was a five-year review and inviting the public to submit any comments to the U.S. EPA. No one contacted EPA about the Site. The results of the review and the report will be made available at the Site information repository located at Fullerton Public Library, Local History Room Ste. 405, 353 W. Commonwealth Avenue, Fullerton, CA; and the EPA Superfund Record Center, 75 Hawthorne Street, San Francisco, CA.

USACE personnel interviewed two Project Engineers for C2 REM regularly involved in the remedy implementation and monitoring. C2 REM engineers noted that the remedy is functioning as designed and O&M activities are performed according to the O&M Plan. They noted landscaping crews maintain the surface on a regular basis and there have been no major seismic events impacting the slurry walls, cap or retaining walls. Because the Site is secure, there is no vandalism at the remediation enclosure, and the perimeter fencing remains intact.

USACE personnel also interviewed the head of the grounds crew for Los Coyotes Country Club. His maintenance crew is responsible for watering the vegetative cover above the Sump Areas. They re-seed portions of the cover as needed in addition to removing sediment from the V-ditches. He has not observed anything unusual since the last FYR and did not have any concerns regarding the protectiveness of the Site.

4.2. Data Review

4.2.1. Soil (Source OU)

C2 REM conducts a detailed inspection of the sumps on a yearly basis. Los Coyotes Country Club maintenance staff are present on a daily basis and inform C2 REM if they observe a potential concern regarding the equipment or the Site.

C2 REM conducts vertical and horizontal surveys every five years to assure proper drainage of the cap surface. The 2012 survey data showed minor and consistent horizontal displacement, ranging from 0.288 feet to 0.679 feet. Based on previous surveys of the monuments, approximately 75% of the lateral displacement of the mechanically stabilized walls (MSW) occurred between 1997 and 2008. Total lifetime displacement of the walls is approximately 7.5 inches, which is within the design tolerance of 12 inches. The vertical settling of the Los Coyotes and Ramparts Sumps measures within the predicted settlement with the exception of sump R-5, settling at approximately 165% the predicted value. However,

no further settlement at R-5 has occurred since 2012 and all other sumps range from 15% to 75% of the predicted settlement. The estimated duration to achieve 90 percent of the "primary consolidation" is 18.7 years, with the "end consolidation" to be achieved in 22 years. After 15 years of monitoring the elevation of the sump caps, the comparison of the actual vertical consolidation to the predicted vertical consolidation indicates that the condition of the cover system remains within the design parameters.

A chronic, though minor, problem is dry grass and bare ground along the edges, where the turf transitions to brush and trees in the Ramparts Area (R-1 specifically). Sediment eroding from the cap clogged the V-drainage ditches. C2 REM indicated that is typical after a heavy rainstorm, and is part of their regular maintenance. The remainder of the cap appeared to be functioning as designed. The city's storm water system captures all infiltrated water and discharges to the city's storm water system.

4.2.2. Groundwater (Groundwater OU)

C2 REM conducts groundwater monitoring activities to characterize the contaminants present in the A, B, C, and D zone aquifers to demonstrate that the infiltration controls are sufficiently preventing migration of the Site contaminants to the regional aquifer. Groundwater monitoring wells have been gauged annually or bi-annually since the previous FYR.

Small changes in seasonal recharge rates, as well as infiltration from golf course irrigation outside of the sump areas, influence water level elevation. Water levels for the B and C zones have been dropping over this five-year review period. Water level elevations in the D zone wells have fluctuated. However, the D zone is considered a regional groundwater zone, with regional influences unrelated to Site infiltration rates. The vertical gradient between the A and B zones, and between the B and C zones, is downward, and has been consistently so over time. The vertical gradient between the C and D water-bearing zones is predominantly upward.

Chemical data collected from the eleven wells in the current groundwater monitoring network from the period of 2011 to April 2015 were analyzed and compared against the performance criteria provided in the Groundwater ROD, as amended by the ESD. Benzene was found above its MCL in only one on-site, B zone well, P-2I. This well is located on-site and has consistently exceeded MCLs. Well P-2I also has the highest concentrations of benzene, THTs, TBA, and several metals (aluminum, arsenic, beryllium, cadmium, manganese, nickel, selenium and vanadium). In 2015, low levels of benzene below MCLs were detected in on-site and cross-gradient C zone wells, and even upgradient wells that have always been non-detect. It was concluded that contamination introduced by field equipment during the sampling was the most likely cause of the detections. The benzene concentrations in downgradient wells were non-detect. Based on the ROD and ESD, only MCL exceedances in off-site wells trigger an additional investigation, since P-2I is located on Site, no additional action is required.

Over the past five years, the benzene plume has been stable and overall concentrations are decreasing. Figure 4-1 presents the benzene data for well P-2I gradually decreasing with time.

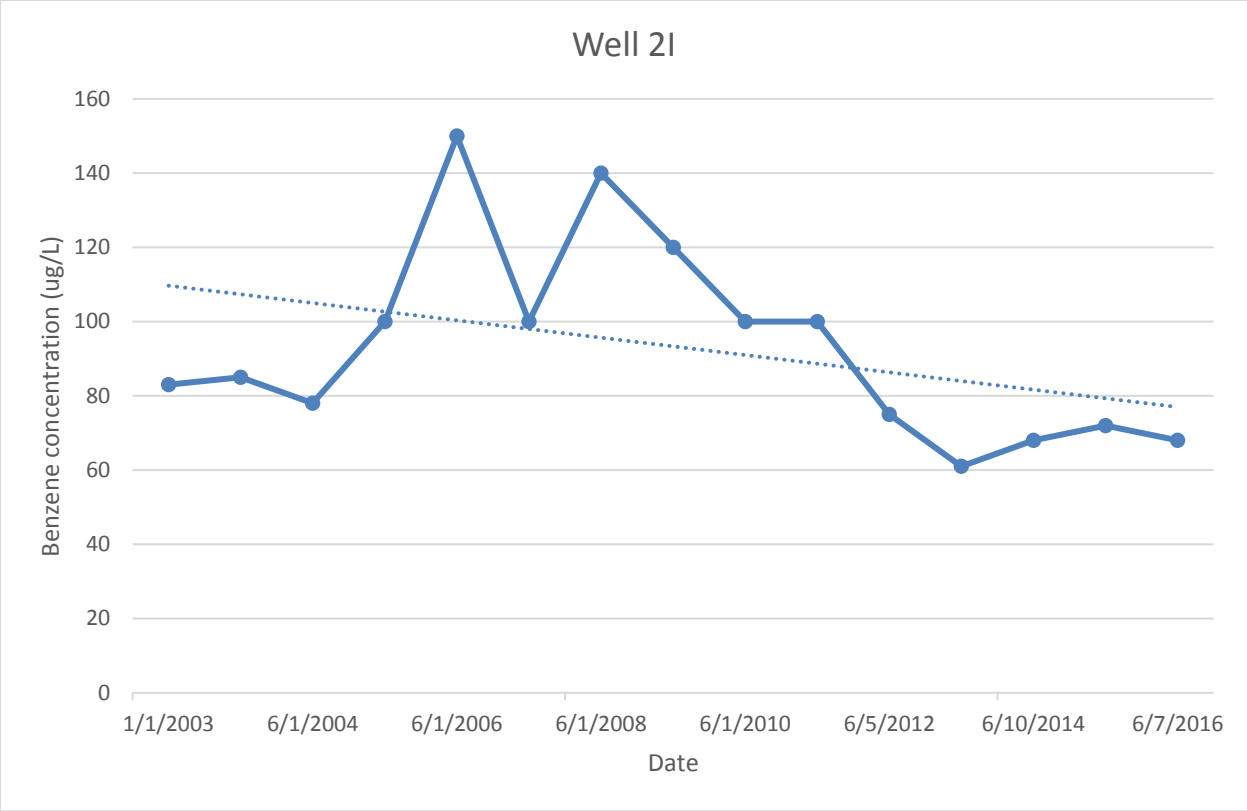


Figure 4-1. P-2I Benzene Data 2003 thru 2016

The detection limit for benzene has generally been 0.5 µg/L; however, in some results, the detection limit was as high as 5 µg/L. Specifically, in well P-10D, an off-site compliance well in the B zone, the detection limit was 5 µg/L in 2014 and 2015. This may be attributable to the high levels of TBA detected in the same well. The closest upgradient well in the B zone from well P-10D is well P-2I which has the highest reported benzene concentrations at the site.

EPA requested that C2 REM review archived analytical data to determine historical detections of oxygenates including tert-butyl alcohol (TBA) following an alert from the EPA laboratory of unusually high values detected during analysis. TBA has no Federal MCL, but the California Department of Public Health has issued a notification level of 12 µg/L in public drinking water systems. Exceeding 12 µg/L triggers requires the distribution system to notify its customers of the potential health risk associated with TBA, and is usually associated with a one-in-a-million excess cancer risk. TBA is known to be more mobile and less volatile than benzene, and therefore could potentially represent the leading edge of a migrating plume. TBA is not included as a COPC in the ROD; however, EPA has requested that TBA continue to be monitored as a possible emerging contaminant.

TBA concentrations are present in B, C, and D zone aquifers and have exceeded the notification levels within the last 5 years. TBA is present at low concentrations in up and/or cross-gradient wells but increases significantly as groundwater in the shallow zones migrates past the sump areas. Unlike the

limited benzene detections, TBA is present above the notification level of 12 µg/L at B zone wells P-2I, P-10D, and at C zone wells P-10L, P-5L and P-9D. The B and C zone aquifers are the first water units encountered beneath the sumps (See Figure 4-2). Any leakage would initially be present in the B zone aquifer, which is observed at P-2I. In addition, the highest concentration of TBA and benzene is present in the B flow unit, and to a lesser degree in the C flow unit. TBA detections in several D zone wells have been sporadic.

TBA concentrations in the on-site, B zone well, P-2I, have ranged between 46,000 µg/L and 52,000 µg/L during the past five years and are statistically decreasing in concentration. Samples from the off-site downgradient compliance well in the B zone, P-10D, had TBA concentrations about an order of magnitude less than P-2I, with no trend in concentration over time. The on-site and off-site downgradient compliance C zone wells also contained TBA, but in concentrations less than 290 µg/L. Unlike in the B zone, samples from the on-site C zone well, P-9D, had increasing trend. TBA was detected in several D zone wells, including upgradient wells in 2012 and 2013. However, TBA was not detected in any D zone well in the most recent sampling event. In addition, the vertical gradient is upward between the D zone and the C zone which minimizes the migration between the two zones.

4.2.3. Soil Gas (Source OU)

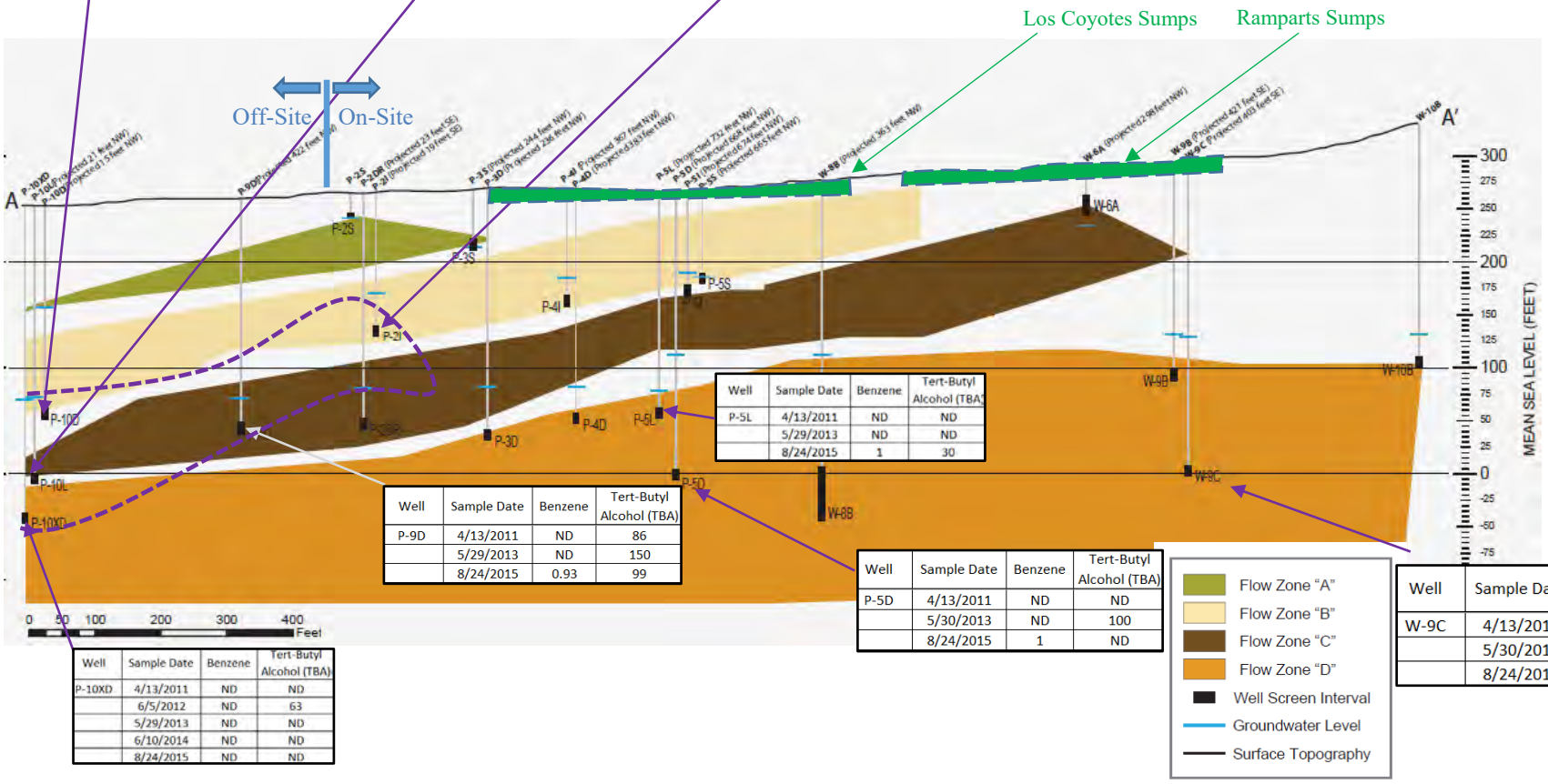
C2 REM monitors the influent and effluent of the GCTS system and monitors the carbon bed filter efficiency of the GCTS. The EPA-approved carbon bed change-out protocol for the GCTS is based on lead vessel efficiency versus influent concentrations, and effluent concentrations greater than 5.0 parts per million (ppm). The GCTS influent sampling resulted in concentrations ranging from 2.3 ppm to 19.6 ppm with a maximum average influent of 13.6 ppm in 2012. The effluent samples did not exceed the maximum reading of 5.95 ppm benzene within an 8-hour period. No carbon change outs have occurred since the previous FYR.

The gas monitoring probes are measured relative to atmospheric pressure and computed to absolute value of the differentials. The 1997 OM&M Plan, Section 7.4.2 states "…any significant positive pressure differential greater than or equal to 5 [pounds per square inch (psi)] will result in implementing an evaluation monitoring program…." Minor differentials have been observed and recorded and to date, there has been no evidence of a differential pressure close to 5 psi and no evidence of a contaminant release. The pressure differentials from 2011 to 2015 range from 0.53 to 2.60 psi indicating that the system is functioning as designed.

Well	Sample Date	Benzene	Tert-Butyl Alcohol (TBA)
P-10D	4/13/2011	ND	7,300
	6/5/2012	ND	180
	5/29/2013	ND	6,700
	6/10/2014	ND	5,500
	8/24/2015	ND	7,700

Well	Sample Date	Benzene	Tert-Butyl Alcohol (TBA)
P-10L	4/13/2011	ND	250
	6/5/2012	ND	63
	5/29/2013	ND	290
	6/10/2014	ND	230
	8/24/2015	ND	90

Well	Sample Date	Benzene	Tert-Butyl Alcohol (TBA)
P-2I	4/13/2011	100	47,000
	6/5/2012	75*	52,000
	5/29/2013	61	47,000
	6/10/2014	68*	46,000
	8/24/2015	72	49,000



Well	Sample Date	Benzene	Tert-Butyl Alcohol (TBA)
P-5L	4/13/2011	ND	ND
	5/29/2013	ND	ND
	8/24/2015	1	30

Well	Sample Date	Benzene	Tert-Butyl Alcohol (TBA)
P-9D	4/13/2011	ND	86
	5/29/2013	ND	150
	8/24/2015	0.93	99

Well	Sample Date	Benzene	Tert-Butyl Alcohol (TBA)
P-5D	4/13/2011	ND	ND
	5/30/2013	ND	100
	8/24/2015	1	ND

Well	Sample Date	Benzene	Tert-Butyl Alcohol (TBA)
W-9C	4/13/2011	ND	ND
	5/30/2013	ND	110
	8/24/2015	1.4	ND

Well	Sample Date	Benzene	Tert-Butyl Alcohol (TBA)
P-10XD	4/13/2011	ND	ND
	6/5/2012	ND	63
	5/29/2013	ND	ND
	6/10/2014	ND	ND
	8/24/2015	ND	ND

Approximate area where TBA exceeds notification level consistently.

Taken from C2 REM 2015 Annual Report.

Figure 2-2. Cross Section with Benzene and TBA concentrations in µg/L.

4.2.4. Determination of the Waters of the State of California

On June 3, 2016, EPA requested assistance of C2 REM in clarifying the classification of the A and B zone aquifers at the Site in response the McColl Site Group's request to reduce the frequency of the groundwater monitoring program. USACE reviewed the following documents to assess the suitability of the A and B zone aquifers at the Site:

1. California State Water Resources Control Board (SWCRB) Resolution No. 88-63 Adoption of Policy Entitled "Sources of Drinking Water"
2. Federal Regulation 40 CFR 131.10 Designation of Uses
3. EPA Ground-Water Protection Strategy, Final Draft, June 1988.
4. Drinking Waters of the State Determination, McColl Superfund Site Memorandum, C2 REM, September 1, 2016.

The California State Water Resources Control Board determined that all groundwater of the State is considered to be suitable, or potentially suitable, for drinking water source with exception of groundwater with at least one of the factors below:

- Groundwater contains total dissolved solids (TDS) concentrations exceeding 3,000 mg/L.
- The water source does not provide sufficient water to supply a single well capable of producing an average, sustained yield of 200 gallons per day.
- There is contamination that cannot be reasonably treated for residential use.

The current data for A Zone groundwater at monitoring well P-3S meets SWCRB TDS requirements for potable water. Analysis from well P-3S resulted in a TDS concentration of 2,570 mg/L, which is below the SWRCB of 3,000 mg/L. Aquifer capacity tests to determine groundwater yield were not conducted and therefore, it is unclear if the A zone can sustain 200 gallons per day. However, it was observed during sampling that the A zone had a low yield, and a historical A zone well was now dry, both indicating that A zone groundwater yield is low and decreasing.

The B zone groundwater samples from well P-2I resulted in TDS concentrations of 4,450 mg/L and 4,560 mg/L, respectively, which exceed the SWRCB limit of 3,000 mg/L. Therefore, the B zone aquifer groundwater does not meet the requirements of SWRCB's "Sources of Drinking Water" Policy. Site Inspection

C2 REM representatives led a Site inspection on January 19, 2017, that consisted of EPA representatives Rusty Harris-Bishop and Carlin Hafiz, and USACE representative Kristin Addis. The purpose of the inspection was to assess the protectiveness of the remedy and to observe the GCTS.

Participants discussed Site history, reviewed the remedies applied to soil and groundwater and toured the Site, including the Ramparts, Los Coyotes sump/landfill cap areas, the GCTS, storm water drainage and retention system and the groundwater monitoring well network.

USACE observed slight erosion of the uppermost cap on the southern portion of R-1 in the Ramparts Sumps Area and sediment in the drainage surrounding the cap area. The C2 REM representative informed the Site visit participants of the planned drainage clearing. The Site experienced heavy rainfall the night before, causing the observed sediment build up in the V ditches surrounding the Ramparts sumps.

5. Technical Assessment

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

Performance and monitoring results for the Source OU indicate the remedy is functioning as intended. The Gas and Collection Treatment System (GCTS) is currently operating effectively in the passive-active mode. Vapor analytical results confirm the low manual PID measurements, which indicate off-gas generation is well below regulatory-required levels for protection of human health. The negligible pressure differential inside compared to outside the capped areas indicates gas generation is limited, and is easily controlled.

Groundwater OU performance and monitoring results indicate the remedy functions as intended. Water levels in the shallow groundwater zone have been decreasing, which attests to the success in minimizing infiltration. There have been no exceedances for benzene above 5 µg/L in any off-site, downgradient monitoring well.

5.2. Question B: Are the exposure assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives (RAOs) Used at the Time of Remedy Selection Still Valid?

Exposure assumptions, toxicity data, and RAOs used at the time of remedy selection are still valid. Applicable or relevant and appropriate requirements (ARARs) identified in the ROD have not changed since the last FYR. Appendix D provides an analysis of ARARs. Toxicity values for Site contaminants of concern have not changed since the previous FYR. Risk assessment methodologies have not changed in a way that could affect the protectiveness of the remedy. There are no changes in exposure pathways. The combined remedial action objectives are still valid and currently being met.

5.3. Question C: Has Any Other Information Come to Light That Could Call Into Question the Protectiveness of the Remedy?

TBA concentrations in groundwater exceed the notification level of 12 µg/L established by the State of California. Because TBA is more mobile in water than the Site chemicals of concern, the TBA detections may potentially indicate the leading edge of the contaminant plume within the B zone and C zone aquifers. The extent of the TBA is unknown at this time. Although there have been sporadic detections of TBA in the D zone aquifer, there currently is an upward vertical gradient between the D and C zone; therefore, the drinking water sources are protected.

6. Issues/Recommendations

There are no issues for the Source OU that affect protectiveness. The gas control system operates effectively with limited off-gas generation. The cover is well maintained. Institutional controls are in place and working.

There is one issue identified in this five-year review for the Groundwater OU.

Table 6-1. Issues and Recommendations Identified in the Five-Year Review

OU(s): Groundwater	**Issue Category: Remedy Performance**			
	Issue: TBA is considered a possible emerging contaminant at the site and may potentially indicate the leading edge of the contaminant plume within the B and C level aquifers.			
	Recommendation: Delineate the extent of TBA in the B and C zone aquifer.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	EPA	EPA	12/30/2020

6.1. *Other Findings*

In addition, the following is a recommendation identified during the FYR that improves the quality of the monitoring program, but does not affect current and/or future protectiveness:

- TBA appears to be affecting reporting limits for benzene in the off-site compliance well. Various analytical techniques such as diluting, or possibly a different analytical methodology should be considered to achieve lower detection limits.

- In 2016, the McColl Site Group requested a reduced sampling frequency. Currently only one monitoring well exceeds the MCL for benzene; and concentrations of benzene in that well are decreasing. Based on the results of Water Determination, and on the continued declining benzene concentrations, a reduced sampling frequency can be considered. However, a reduced frequency for TBA may not be warranted until EPA determines the full extent of the plume.

7. Protectiveness Statements

Table 7-1. Protectiveness Statement: Source OU

Protectiveness Statement(s)	
Operable Unit: Source	*Protectiveness Determination:* Protective
Protectiveness Statement: The remedy at the Source OU is protective of human health and the environment because Gas and Collection Treatment System (GCTS), control of surface water recharge, and institutional controls remain intact and are functioning as designed by reducing the exposure pathways posing a risk to human health or the environment.	

Table 7-2. Protectiveness Statement: Groundwater OU

Protectiveness Statement(s)	
Operable Unit: Groundwater	*Protectiveness Determination:* Short-term Protective
Protectiveness Statement: The remedy at the Groundwater OU is currently protective of human health and the environment in the short term. However, due to the continued detection of tert-butyl alcohol (TBA) in the wells downgradient of the source sumps, and the nature of TBA as more mobile and volatile than benzene, further delineation and characterization of TBA in groundwater (and further steps pending the results) may be necessary to ensure long term protectiveness.	

Table 7-3. Sitewide Protectiveness Statement

Sitewide Protectiveness Statement
Protectiveness Determination: Short-term Protective
Protectiveness Statement: The remedies at the McColl Superfund Site for both Source and Groundwater OUs are currently protective of human health and the environment. The Gas and Collection Treatment System (GCTS), control surface water recharge and other institutional controls are functioning as designed. The current extent of the benzene plume is limited to an on-site, shallow well. However, due to the continued detection of tert-butyl alcohol (TBA) in the wells downgradient of the source sumps, and the nature of TBA as more mobile and volatile than benzene, further delineation and characterization of TBA in groundwater is necessary to ensure long term protectiveness.

8. Next Review

The next five-year review report for the McColl Superfund Site is required five years from the completion date of this review.

Appendix A: List of Documents Reviewed

C2 REM, April 2012. 2011 Operations, Maintenance and Monitoring Annual Reports for McColl Superfund Site, Fullerton, California. Prepared for EPA, Prepared on behalf of the McColl Site Group.

C2 REM, May 2013. 2012 Operations, Maintenance, & Monitoring Annual Report for McColl Superfund Site, Fullerton, California. Prepared for EPA, Prepared on behalf of the McColl Site Group.

C2 REM, June 2014. 2013 Operations, Maintenance, & Monitoring Annual Report for McColl Superfund Site, Fullerton, California. Prepared for EPA, Prepared on behalf of the McColl Site Group.

C2 REM, June 2015. 2014 Operations, Maintenance, & Monitoring Annual Report for McColl Superfund Site, Fullerton, California. Prepared for EPA, Prepared on behalf of the McColl Site Group.

C2 REM, September 1, 2016. Drinking Waters of the State Determination, McColl Superfund Site, Fullerton, California. Prepared for EPA, Prepared on behalf of the McColl Site Group.

C2 REM, September 2016. Sediment Removal Evaluation, McColl Superfund Site, Fullerton, California. Prepared for EPA on behalf of the McColl Site Group.

C2 REM, May 2016. 2015 Operations, Maintenance, & Monitoring Annual Report for McColl Superfund Site, Fullerton, California. Prepared for EPA, Prepared on behalf of the McColl Site Group.

Interstate Technology & Regulatory Council 2005. Overview of Groundwater Remediation Technologies for MTBE and TBA. Prepared by ITRC's MTBE and Other Fuel Oxygenates Team. http://www.itrcweb.org/

State Water Resources Control Board, Resolution No. 88-63 Adoption of Policy Entitled Sources of Drinking Water, (SWRCB, 1988, 2006).

USACE, 2012. Final Third Five-Year Review Report for McColl Superfund Site, Fullerton, Orange County, California. September 28, 2012.

United States Environmental Protection Agency, April 1984, Record of Decision, McColl Superfund Site, Fullerton, California.

United States Environmental Protection Agency, June 1993, Record of Decision for the McColl Superfund Site Source Operable Unit, Fullerton, California.

United States Environmental Protection Agency, May 1996, Record of Decision Groundwater Operable Unit, McColl Superfund Site, Fullerton, California.

United States Environmental Protection Agency Ground-Water Protection Strategy, Final Draft (EPA, 1988).

United States Environmental Protection Agency, September 2005, McColl Superfund Site Explanation of Significant Differences. EPA/ESD/R0905/047.

United States Environmental Protection Agency, June 2016, Proposed Modification to Groundwater Sampling Frequency at the McColl Superfund Site Letter to C2 REM.

United States Environmental Protection Agency, June 2012, Analytical Testing Results - Project R12S97 SDG: 12158C Letter Report to Rusty Harris-Bishop, California Site Cleanup Section 2, SFD-7-2.

United States Environmental Protection Agency, July 2013, Analytical Testing Results - Project R13S82 SDG: 13150A Letter Report to Rusty Harris-Bishop, California Site Cleanup Section 2, SFD-7-2.

United States Environmental Protection Agency, July 2014, Analytical Testing Results - Project R14S72 SDG: 14162C Letter Report to Rusty Harris-Bishop, Superfund Division, Immediate Office, SFD-1.

United States Environmental Protection Agency, July 2016, Analytical Testing Results - Project R16S68 SDG: 16160C Letter Report to Rusty Harris-Bishop, Superfund Division, Immediate Office SFD-1.

United States Environmental Protection Agency, National Primary Drinking Water Regulations, Table of Regulated Drinking Water Contaminants (EPA, 2017).

Appendix B: Site Chronology

Event	Date
Disposal of petroleum waste at the site	1942-1946
Adjacent Los Coyotes Country Club constructed	Late 1950s
Adjacent residential neighborhoods initially developed	1960s
First odor and health complaints from residents	1978
Public hearing on site held by California (CA) Department of Toxic Substances Control (DTSC)	1980
Site proposed for listing on federal Superfund National Priorities List (NPL)	1982
EPA and CA/DTSC proposal to excavate and dispose waste off site is blocked in State court	1984
McColl Action Group (community organization) active	1985-1991
EPA concludes preparation of Feasibility Study (FS), proposes waste incineration, but field testing fails	1989
Fullerton Hills Community Association active	1991-1997
EPA concludes FS revisions, proposes waste solidification	1992
Source OU Record of Decision is signed; includes contingency remedy of Resource Conservation and Recovery Act (RCRA)-equivalent cap	1993
When waste solidification pilot fails, EPA decides to implement contingency remedy, which was the RCRA-equivalent cap	1995
The McColl Site Group oil companies conduct the site groundwater Remedial Investigation (RI)/FS	1993-1996
Groundwater OU Record of Decision is signed; includes further measures to reduce surface water infiltration and groundwater monitoring	1996
On site construction of RCRA cap begins, and triggers FYR process	3/31/1997

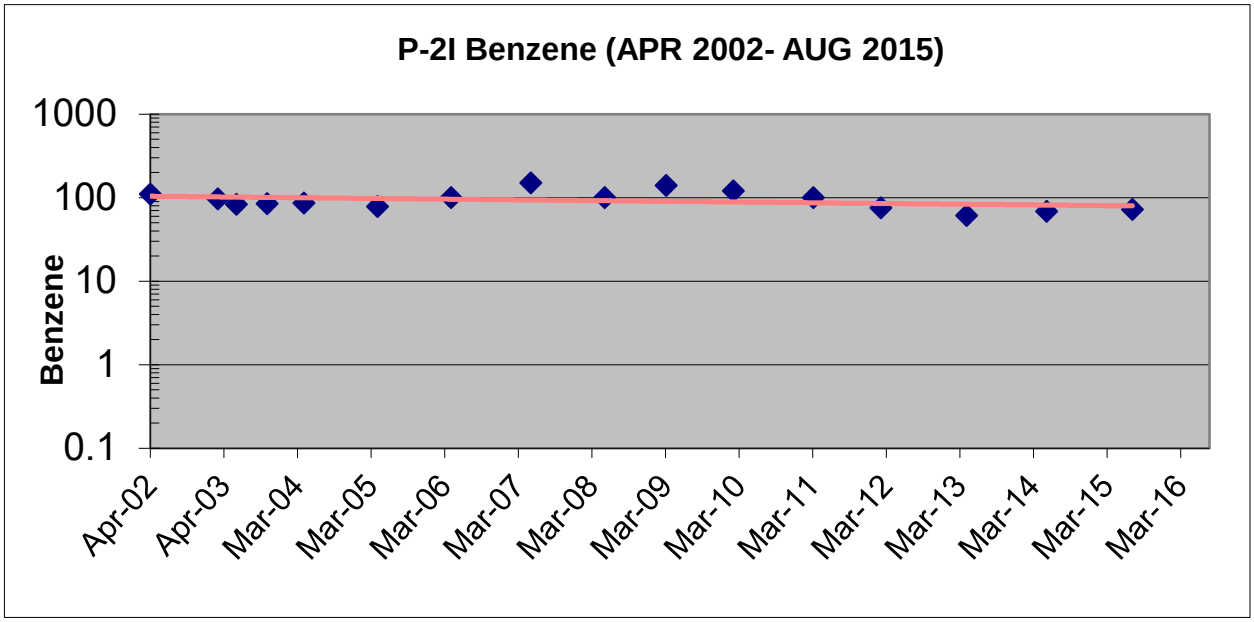
Final inspection of remedial action	11/13/1997
Issuance of Remedial Action Report	5/28/1998
Issuance of Preliminary Close Out Report	6/30/1998
New holes (over site) of Los Coyotes golf course open	1998
Issuance of first FYR Report	9/30/2002
Issuance of Explanation of Significant Differences revising groundwater remedy	9/1/2005
Second FYR report completed	9/25/2007
Third FYR report completed	9/28/2012

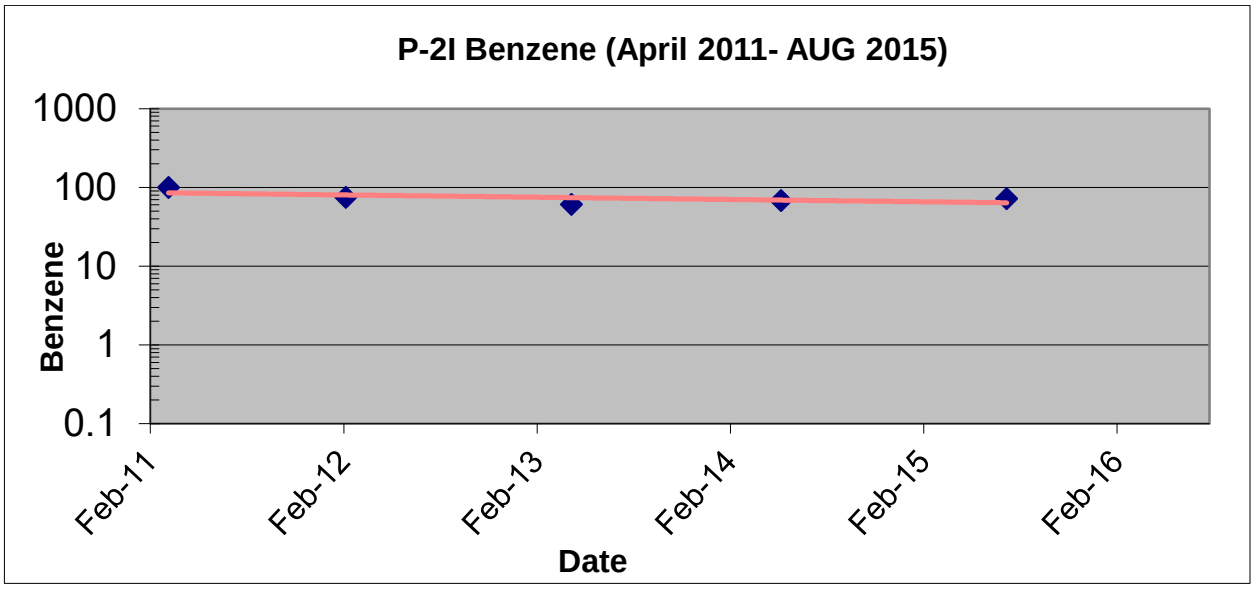
Appendix C: Data Review

2011-2015 Groundwater Analytical Data Summary (in μg/L)

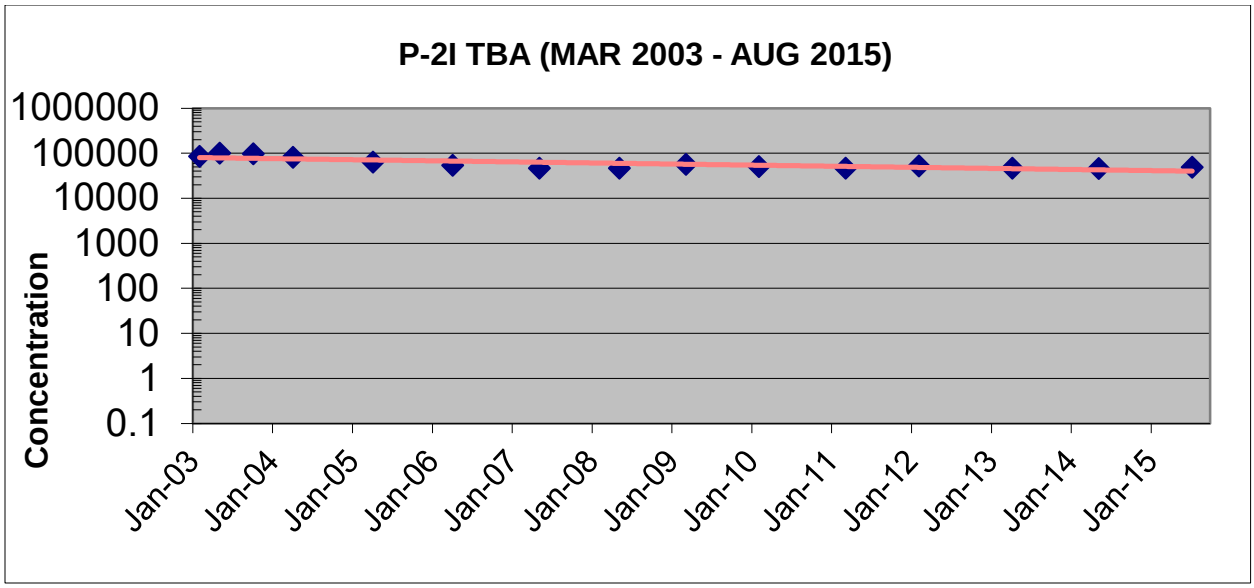
Well ID	Zone	Relative Location	Sample Date	Volatile Organic Compounds (VOCs)			Oxygenate
				Benzene	Toluene	Total Xylenes	Tert-Butyl Alcohol (TBA)
P-2I	B	On-site down gradient well	4/13/2011	**100**	ND	ND	**47,000**
			6/5/2012	**75**	ND	ND	**52,000**
			5/29/2013	**61**	ND	ND	**47,000**
			6/10/2014	**68**	ND	ND	**46,000**
			8/24/2015	**72**	ND	ND	**49,000**
P-5I	B	On-site down gradient boundary well	4/13/2011	ND	ND	ND	ND
			5/30/2013	ND	ND	ND	ND
			8/24/2015	ND	ND	ND	ND
P-10D	B	Off-site down gradient compliance well	4/13/2011	ND	ND	ND	**7,300**
			6/5/2012	ND	ND	ND	**180**
			5/29/2013	ND	ND	ND	**6,700**
			6/10/2014	ND	ND	ND	**5,500**
			8/24/2015	ND	ND	ND	**7,700**
P-5L	C	On-site down gradient boundary well	4/13/2011	ND	ND	ND	ND
			5/29/2013	ND	ND	ND	ND
			8/24/2015	**1.0**	**5.6**	ND	**30**
P-9D	C	On-site down gradient well	4/13/2011	ND	ND	ND	**86**
			5/29/2013	ND	ND	ND	**150**
			8/24/2015	**0.93**	**5.3**	ND	**99**
P-10L	C	Off-site downgradient compliance well	4/13/2011	ND	ND	ND	**250**
			6/5/2012	ND	ND	ND	**63**
			5/29/2013	ND	ND	ND	**290**
			6/10/2014	ND	ND	ND	**230**
			8/24/2015	ND	ND	ND	**90**
P-5D	D	Off-site downgradient compliance boundary well	4/13/2011	ND	ND	ND	ND
			5/30/2013	ND	ND	ND	**100**
			8/24/2015	**1.0**	**4.4**	**4.1**	ND
P-10XD	C/D	Off-site down gradient compliance well	4/13/2011	ND	ND	ND	ND
			6/5/2012	ND	ND	ND	**63**
			5/29/2013	ND	ND	ND	ND
			6/10/2014	ND	ND	ND	ND
			8/24/2015	ND	ND	ND	ND
W-9B	D	Upgradient well	4/13/2011	ND	**3.0**	ND	ND
			5/30/2013	ND	ND	ND	ND
			8/24/2015	**0.80**	**4.3**	**2.2**	ND
W-9C	D	Upgradient well	4/13/2011	ND	ND	ND	ND
			5/30/2013	ND	ND	ND	**110**
			8/24/2015	**1.4**	**1.4**	**5.0**	ND
W-10B	D	Upgradient well	4/13/2011	ND	1.3	ND	ND
			5/30/2013	ND	ND	ND	ND
			8/24/2015	**0.89**	**5.2**	**3.9**	ND
California MCL				**1**	**150**	**10,000**	NA
Federal MCL				**5**	**1,000**	**1,750**	NA
Notification Level				NA	NA	NA	**12**

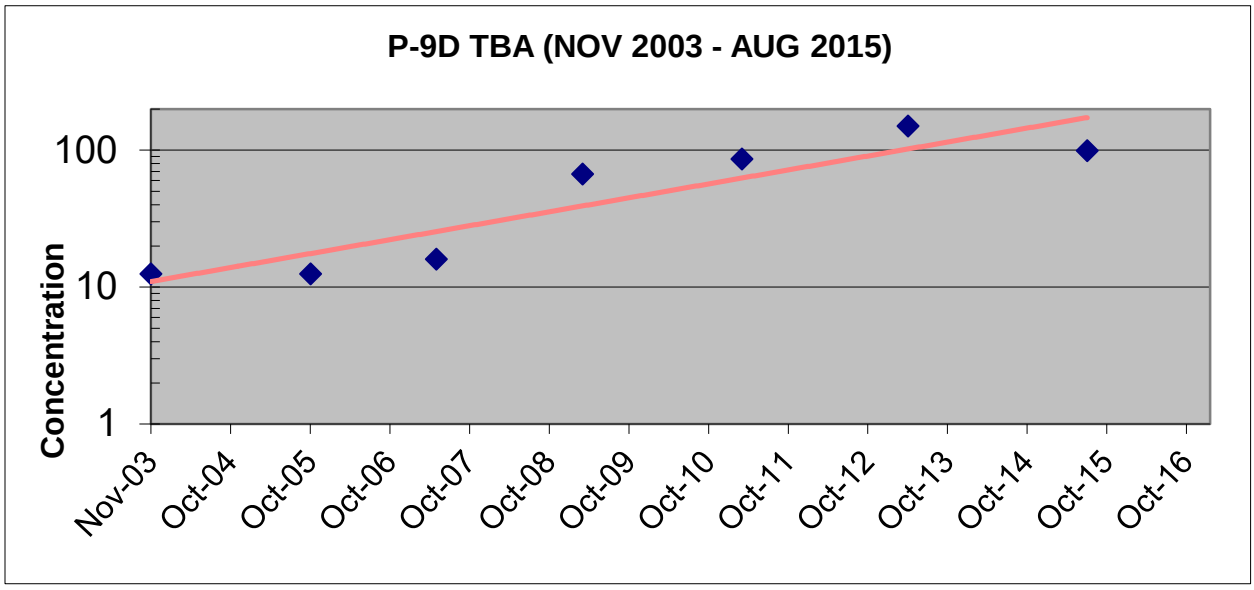
The following graph depicts Benzene time-series data evaluated for this Five-Year Review.

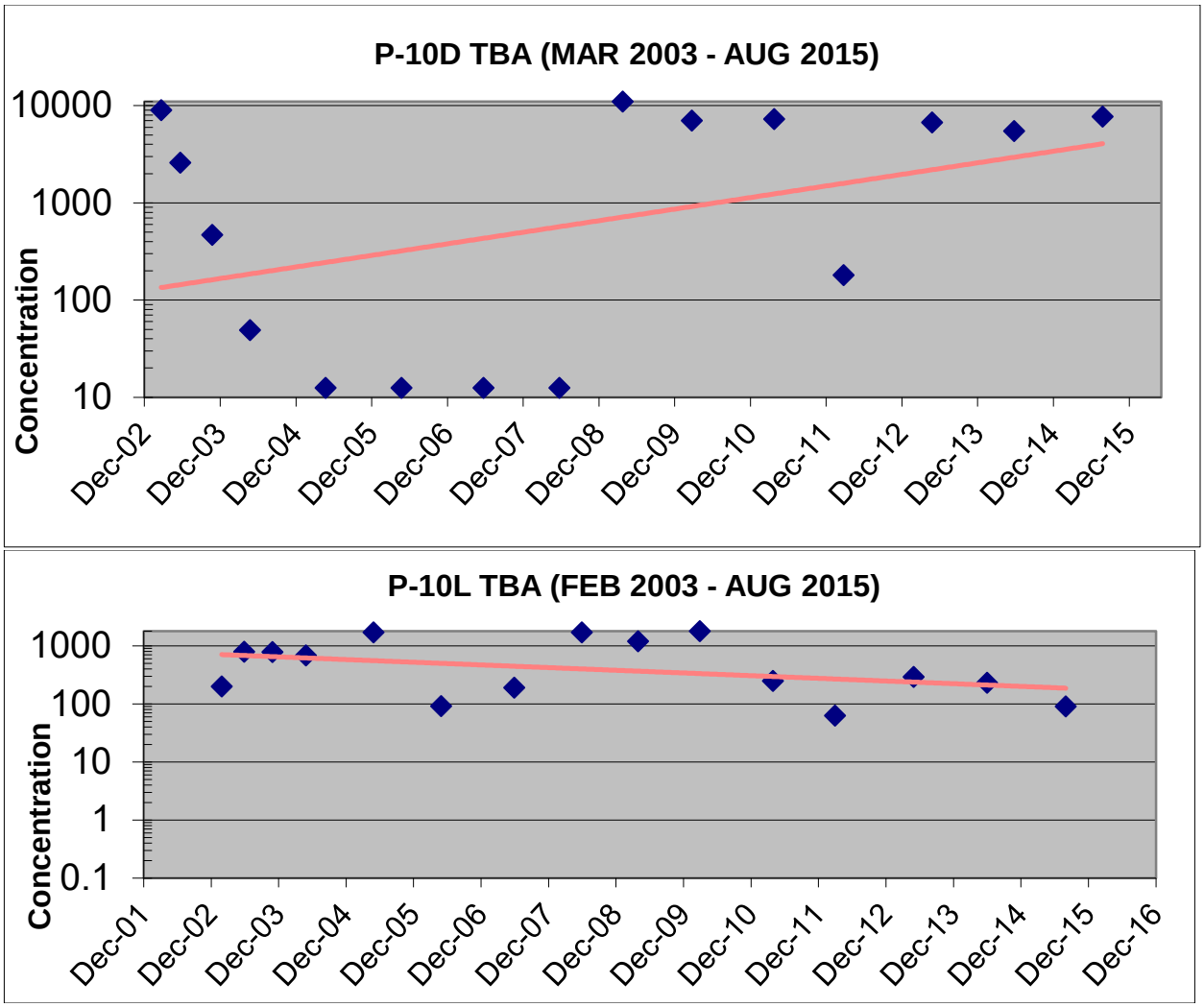




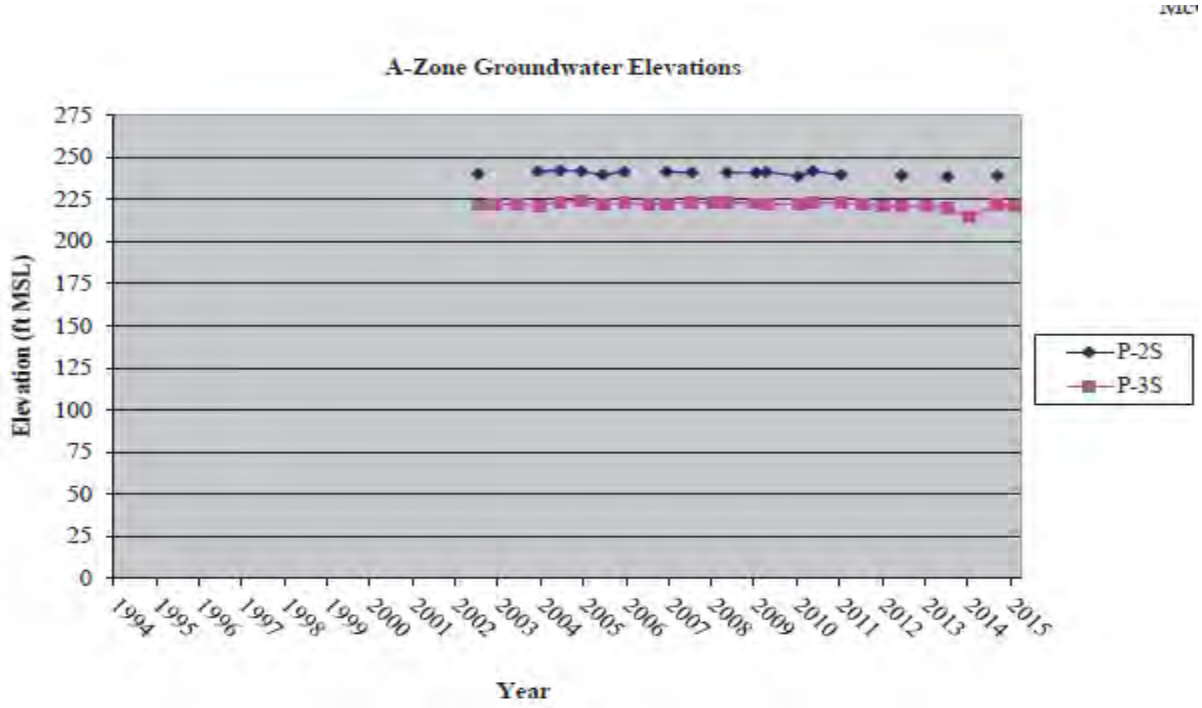
The following graphs depict Tert-Butyl Alcohol (TBA) time-series data evaluated for this Five-Year Review. TBA is considered a possible emerging contaminant at the site and may potentially indicate the leading edge of the contaminant plume within the B and C level aquifers.

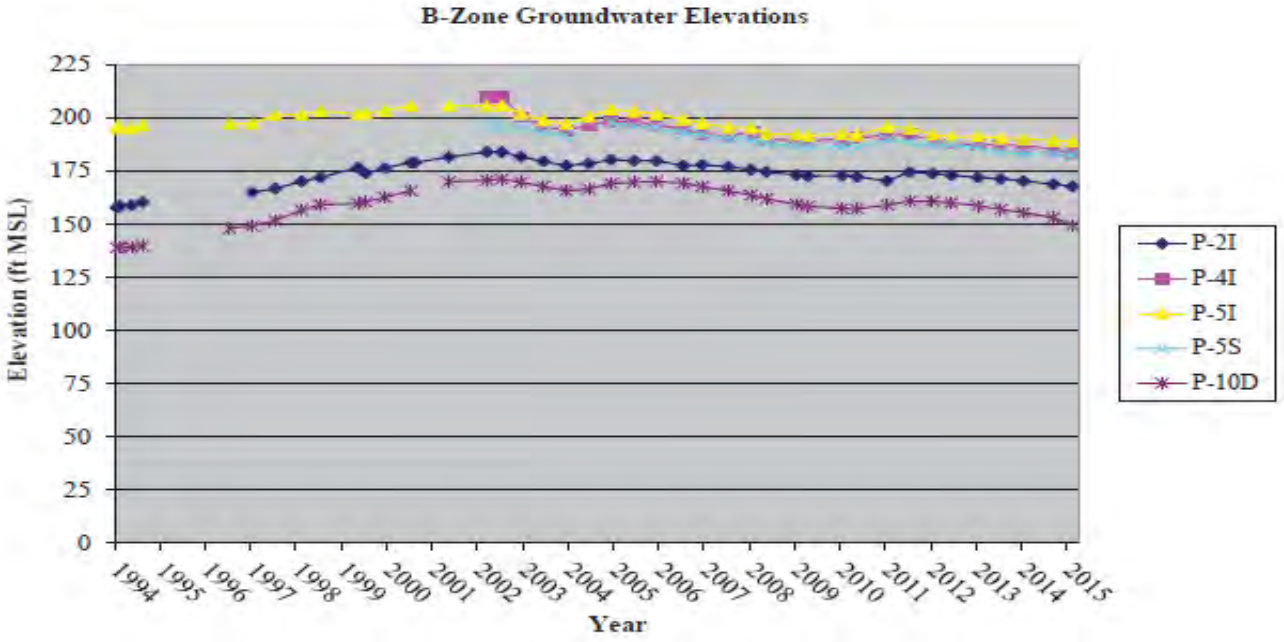

P-2I TBA (MAR 2003 - AUG 2015)
Concentration
1000000
100000
10000
1000
100
10
1
0.1
Jan-03
Jan-04
Jan-05
Jan-06
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15

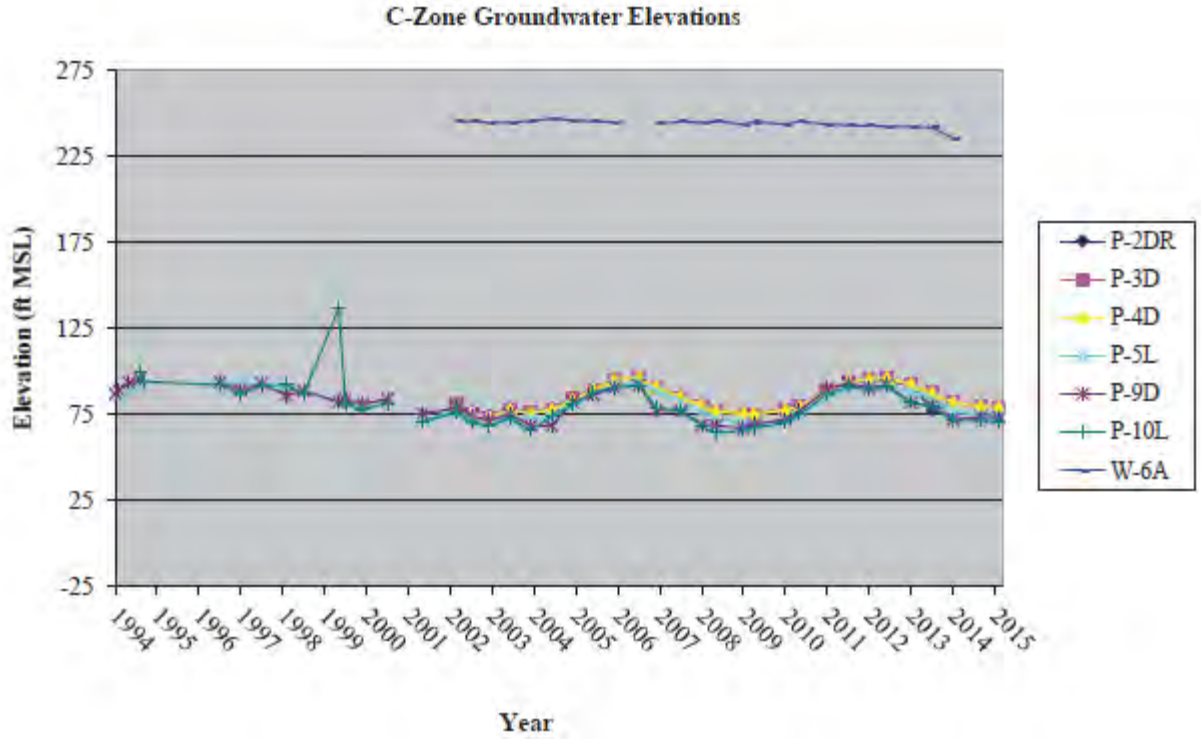

P-9D TBA (NOV 2003 - AUG 2015)
Concentration
100
10
1
Nov-03
Oct-04
Oct-05
Oct-06
Oct-07
Oct-08
Oct-09
Oct-10
Oct-11
Oct-12
Oct-13
Oct-14
Oct-15
Oct-16

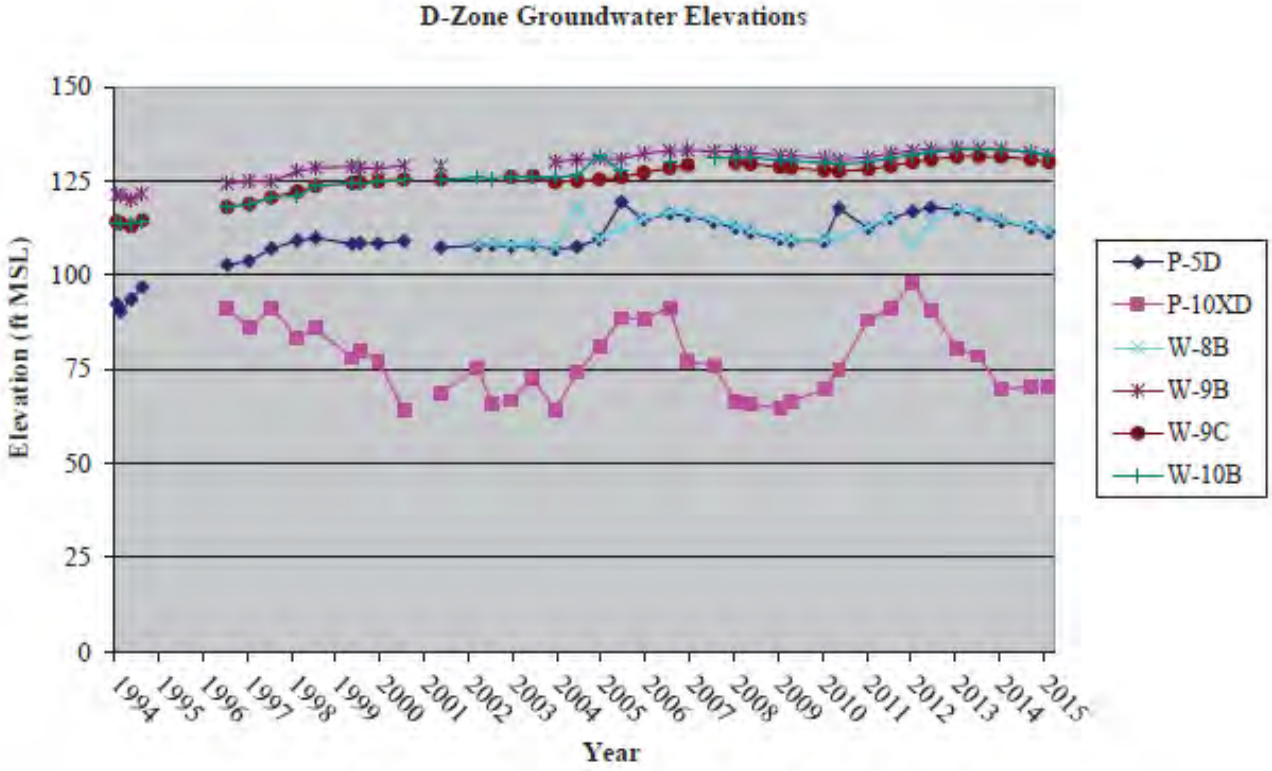


Water table elevations for each water bearing zone from 1994 through 2015.


A-Zone Groundwater Elevations
Elevation (ft MSL)
275
250
225
200
175
150
125
100
75
50
25
0
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
Year
P-2S
P-3S

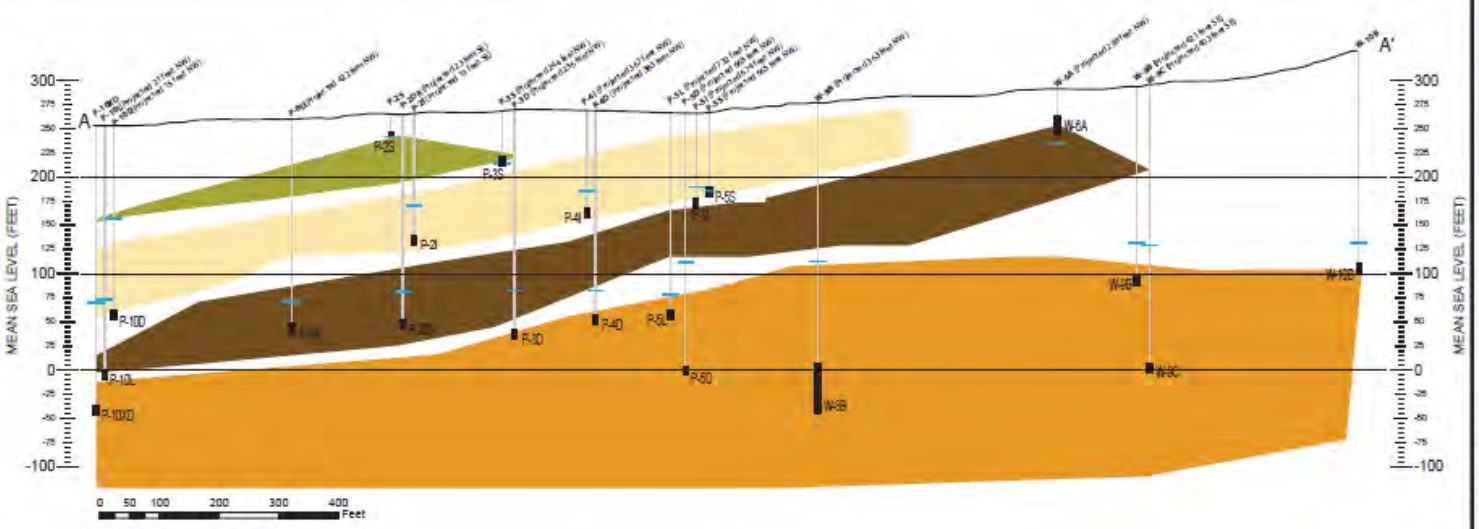

B-Zone Groundwater Elevations
Elevation (ft MSL)
225
200
175
150
125
100
75
50
25
0
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
Year
P-2I
P-4I
P-5I
P-5S
P-10D


C-Zone Groundwater Elevations
Elevation (ft MSL)
275
225
175
125
75
25
-25
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
Year
P-2DR
P-3D
P-4D
P-5L
P-9D
P-10L
W-6A

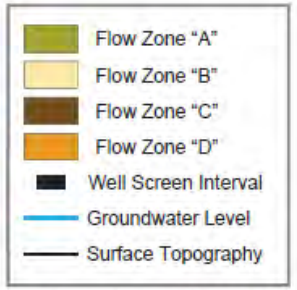

D-Zone Groundwater Elevations
Elevation (ft MSL)
150
125
100
75
50
25
0
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
Year
P-5D
P-10XD
W-8B
W-9B
W-9C
W-10B


HISTORIC BENZENE ANALYTICAL RESULTS IN GROUNDWATER
McColl Superfund Site
Figure 9.0
Well W-9B (D Flow Unit)
Sample Date | Benzene
April-02 | ND < 0.5
November-05 | ND < 0.5
June-07 | ND < 0.5
April-09 | ND < 0.5
April-11 | ND < 0.5
May-13 | ND < 0.5
August-15 | 0.80
Well W-9C (D Flow Unit)
Sample Date | Benzene
April-02 | ND < 0.5
November-03 | ND < 0.5
November-05 | ND < 0.5
June-07 | ND < 0.5 (ND < 0.5)
April-09 | ND < 0.5
April-11 | ND < 0.5
May-13 | ND < 0.5
August-15 | 1.4
Well W-10B (D Flow Unit)
Sample Date | Benzene
April-02 | ND < 0.5
November-03 | ND < 0.5
November-05 | ND < 0.5
June-07 | ND < 0.5
April-09 | ND < 0.5
April-11 | ND < 0.5
May-13 | ND < 0.5
August-15 | 0.89
W-9B W-9C
W-10B
W-8A
GROUNDWATER FLOW DIRECTION
Ralph B Clark Regional Park
R-1
R-2
R-3
R-4
R-5
R-6
L-1
L-2
L-3
L-4
L-5
L-6
Well P-10L (C Flow Unit)
Sample Date | Benzene
April-02 | ND < 0.5
February-03 | ND < 0.5 (ND < 0.5)
June-03 | ND < 0.5 (ND < 0.5)
November-03 | ND < 0.5 (0.57)
May-04 | ND < 0.5 (ND < 0.5)
May-05 | ND < 0.5 (ND < 0.5)
May-06 | ND < 0.5 (ND < 0.5)
June-07 | ND < 0.5
June-08 | ND < 0.5
April-09 | ND < 0.5 (ND < 0.5)
March-10 | ND < 0.5 (ND < 2.5)
April-11 | ND < 0.5
March-12 | ND < 0.5
May-13 | ND < 0.5
June-14 | ND < 0.5
August-15 | ND < 0.5 (ND < 0.5)
Well P-2I (B Flow Unit)
Sample Date | Benzene
April-02 | 110
February-03 | 96
June-03 | 83
November-03 | 84
May-04 | 86
May-05 | 78
May-06 | 100
June-07 | 150
June-08 | 100
April-09 | 130 (140)
March-10 | 120
April-11 | 100
March-12 | 73 (75)
May-13 | 61
June-14 | 65 (68)
August-15 | 72 (72)
P-2I
P-2D
P-2S
P-3S
P-3D
P-4I
P-4D
Well P-10D (B Flow Unit)
Sample Date | Benzene
April-02 | 0.9
February-03 | ND < 5
June-03 | ND < 0.5
November-03 | ND < 0.5
May-04 | ND < 0.5
May-05 | ND < 0.5
May-06 | ND < 0.5
June-07 | ND < 0.5
June-08 | ND < 0.5 (ND < 0.5)
April-09 | ND < 250
March-10 | ND < 5
April-11 | ND < 5
March-12 | ND < 0.5
May-13 | ND < 0.5
June-14 | ND < 5
August-15 | ND < 5
P-10D
P-10I
P-10XD
Well P-10XD (D Flow Unit)
Sample Date | Benzene
April-02 | ND < 0.5
February-03 | ND < 0.5
June-03 | ND < 0.5
November-03 | ND < 0.5
May-04 | ND < 0.5
May-05 | ND < 0.5
May-06 | ND < 0.5
June-07 | ND < 0.5
June-08 | ND < 0.5
April-09 | ND < 0.5
March-10 | ND < 0.5
April-11 | ND < 0.5
March-12 | ND < 0.5
May-13 | ND < 0.5
June-14 | ND < 0.5
August-15 | ND < 0.5
P-9D
Well P-9D (C Flow Unit)
Sample Date | Benzene
April-02 | ND < 0.5
November-03 | ND < 0.5
November-05 | ND < 0.5
June-07 | ND < 0.5
April-09 | ND < 0.5
April-11 | ND < 0.5
March-12 | ND < 0.5
May-13 | ND < 0.5 (ND < 0.5)
August-15 | 0.93
Well P-5D (D Flow Unit)
Sample Date | Benzene
April-02 | ND < 0.5
November-03 | ND < 0.5
November-05 | ND < 0.5
June-07 | ND < 0.5
April-09 | 0.92
April-11 | ND < 0.5 (ND < 0.5)
May-13 | ND < 0.5 (ND < 0.5)
August-15 | 1
P-5S
P-5I
P-5D
P-5L
Well P-5L (C Flow Unit)
Sample Date | Benzene
April-02 | ND < 0.5
November-03 | ND < 0.5
November-05 | ND < 0.5
June-07 | ND < 0.5
April-09 | ND < 0.5
April-11 | ND < 0.5 (ND < 0.5)
May-13 | ND < 0.5
August-15 | 1
Well P-5I (B Flow Unit)
Sample Date | Benzene
April-02 | ND < 0.5
November-03 | ND < 0.5
November-05 | ND < 0.5
June-07 | ND < 0.5
April-09 | ND < 0.5
April-11 | ND < 0.5
May-13 | ND < 0.5
August-15 | ND < 0.5
Note: All results shown in ug/L
NA = Not Available
ND = Non-Detect
( ) = Duplicate sampling data
0 150 300 600
Feet
Fullerton, CA


HISTORIC TERT BUTYL ALCOHOL (TBA)
ANALYTICAL RESULTS IN GROUNDWATER
McColl Superfund Site
Figure 10.0
An Environmental Management & Development Company
Fullerton, CA
Ralph B Clark Regional Park
GROUNDWATER FLOW DIRECTION
Well W-9B (D Flow Unit)
Sample Date | TBA
April-02 | ND
November-05 | ND < 25
June-07 | ND < 25
April-09 | ND < 10
April-11 | ND < 10
May-13 | ND < 10
August-15 | ND < 10
Well W-9C (D Flow Unit)
Sample Date | TBA
April-02 | ND
November-03 | ND < 25
November-05 | ND < 25
June-07 | ND < 25
April-09 | ND < 10
April-11 | ND < 10
May-13 | 110
August-15 | ND < 10
Well W-10B (D Flow Unit)
Sample Date | TBA
April-02 | ND
November-03 | ND < 25
November-05 | ND < 25
June-07 | ND < 25
April-09 | ND < 10
April-11 | ND < 10
May-13 | ND < 10
August-15 | ND < 10
Well P-10D (B Flow Unit)
Sample Date | TBA
February-03 | 9,000
June-03 | 2,600
November-03 | 470
May-04 | 49
May-05 | ND < 25
May-06 | ND < 25
June-07 | ND < 25
June-08 | ND < 25 (ND < 25)
April-09 | 11,000
March-10 | 7,000
April-11 | 7,300
March-12 | 180
May-13 | 6,700
June-14 | 5,500
August-15 | 7,700
Well P-21 (B Flow Unit)
Sample Date | TBA
March-03 | 86,000
June-03 | 100,000
November-03 | 98,000
May-04 | 82,000
May-05 | 64,000
May-06 | 54,000
June-07 | 47,000
June-08 | 47,000
April-09 | 54,000 (57,000)
March-10 | 51,000
April-11 | 47,000
March-12 | 52,000 (50,000)
May-13 | 47,000
June-14 | 46,000 (43,000)
August-15 | 49,000 (47,000)
Well P-10XD (D Flow Unit)
Sample Date | TBA
February-03 | ND < 25
June-03 | 30
November-03 | ND < 25
May-04 | ND < 25
May-05 | ND < 25
May-06 | ND < 25
June-07 | ND < 25
June-08 | ND < 25
April-09 | 66
March-10 | 35
April-11 | ND < 10
March-12 | ND < 10
May-13 | ND < 10
June-14 | ND < 10
August-15 | ND < 10
Well P-10L (C Flow Unit)
Sample Date | TBA
February-03 | 200 (190)
June-03 | 790 (780)
November-03 | 780 (630)
May-04 | 630 (680)
May-05 | 1,700 (1,700)
May-06 | 92 (74)
June-07 | 190
June-08 | 1,700
April-09 | 1,000 (1,200)
March-10 | 1,800 (1,700)
April-11 | 250
March-12 | 63
May-13 | 290
June-14 | 230
August-15 | 87 (90)
Well P-9D (C Flow Unit)
Sample Date | TBA
November-03 | ND < 25
November-05 | ND < 25
June-07 | 16
April-09 | 67
April-11 | 86
May-13 | 140 (150)
August-15 | 99
Well P-5D (D Flow Unit)
Sample Date | TBA
November-03 | ND < 25
November-05 | ND < 25
June-07 | ND < 25
April-09 | ND < 10
April-11 | ND < 10 (ND < 10)
May-13 | 91 (100)
August-15 | ND < 10
Well P-5I (B Flow Unit)
Sample Date | TBA
November-03 | ND < 25
November-05 | ND < 25
June-07 | 26
April-09 | ND < 10
April-11 | ND < 10
May-13 | ND < 10
August-15 | ND < 10
Well P-5L (C Flow Unit)
Sample Date | TBA
November-03 | 75
November-05 | ND < 25
June-07 | 700
April-09 | 89
April-11 | 30 (39)
May-13 | ND < 10
August-15 | 30
Note: All results shown in ug/L
NA = Not Available
ND = Non-Detect
( ) = Duplicate sampling data
0 125 250 500 Feet



Well ID	Flow Zone	Top of Casing (ft MSL)	Top of Screen (ft MSL)	Bottom of Screen (ft MSL)	Screen Interval (ft)
P-2S	A	266.46	245.70	240.70	5
P-3S	A	281.42	221.50	211.50	10
P-10D	B	248.42	62.40	52.40	10
P-2I	B	266.39	139.80	129.80	10
P-4I	B	283.34	167.80	157.80	10
P-5I	B	259.77	177.80	167.80	10
P-5S	B	259.26	189.40	179.40	10
P-10L	C	248.63	0.30	-9.70	10
P-2DR	C	266.15	52.40	42.40	10
P-3D	C	282.40	42.50	32.50	10
P-4D	C	282.53	57.50	47.50	10
P-5L	C	258.13	62.60	52.60	10
P-9D	C	263.26	49.20	32.20	17
W-6A	C	293.35	263.60	243.60	20
P-10XD	D	247.12	-37.50	-47.50	10
P-5D	D	259.40	4.50	-5.50	10
W-10B	D	314.55	110.30	100.30	10
W-8B	D	266.44	6.90	-44.1	51
W-9B	D	316.71	102.70	92.70	10
W-9C	D	316.09	7.40	-2.60	10



Note: Previous versions of this figure had the information for MWs P-10XD and W-8B transposed pre 2009.

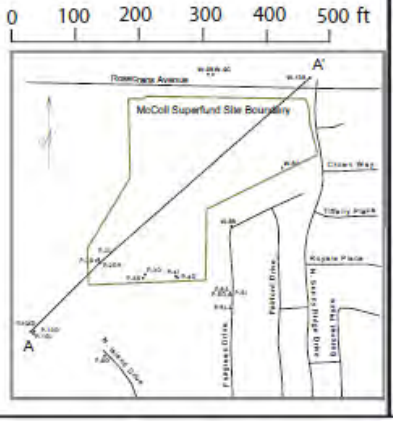


Figure 3.0

WATER FLOW ZONE CROSS-SECTION
McColl Superfund Site

Fullerton, CA

Appendix D: ARAR Assessment

Section 121(d)(1)(A) of CERCLA requires that remedial actions at CERCLA Sites attain (or justify the waiver of) any federal or state environmental standards, requirements, criteria, or limitations that are determined to be legally applicable or relevant and appropriate requirements (ARARs). Federal ARARs may include requirements promulgated under any federal environmental laws. State ARARs may only include promulgated, enforceable environmental or facility-siting laws of general application that are more stringent or broader in scope than federal requirements and that are identified by the state in a timely manner. ARARs are identified on a Site-specific basis from information about the chemicals at the Site, the remedial actions contemplated, the physical characteristics of the Site, and other appropriate factors. ARARs include only substantive, not administrative, requirements and pertain only to on-Site activities. There are three general categories of ARARs: chemical-specific, location-specific, and action-specific.

The primary applicable or relevant and appropriate requirements (ARARs) identified for the regional groundwater at the McColl Site are the federal MCLs and non-zero Maximum Contaminant Level Goal (MCLGs) as promulgated and applied under the Safe Drinking Water Act and State MCLs. However, at the time of the ROD issuance, chemicals of concern in the regional aquifer either already met MCLs, had background concentrations above MCLs, or appeared as localized occurrences. Detections of chemicals of concern in perched groundwater appeared at concentrations exceeding MCLs, however the perched groundwater is not subject to the MCLs as ARARs.

There are no cleanup standards or performance criteria identified for the source control ROD (EPA, 1993). The main performance criteria selected in the 1996 Groundwater ROD for evaluating the effectiveness of the remedy was not a state or federal drinking water standard, but rather a "PRG [Preliminary Remediation Goal] concentration of 3.6 ppb total THT" (tetrahydrothiophenes). Neither the Federal government nor the State of California had promulgated Maximum Contaminant Levels (MCLs) for THT at finalization of the groundwater ROD in 1996. Subsequently, the indicator for triggering the contingency action changed to the benzene MCL in the 2005 Explanation of Significant Differences (ESD) (EPA, 2005). Since the 2005 ESD, there have been no MCL changes for benzene.

The following ARARs have not changed since the last Five Year Review; and therefore, do not affect protectiveness. The list below does not include ARARs identified that are no longer pertinent, now that the response action has transitioned from construction to long-term O&M work. Laws or regulations that affect the protectiveness of the remedy have not changed.

- Resource Conservation and Recovery Act (RCRA Parts 261, 264)
- Groundwater Maximum Concentration Limits (40 CFR 264.94)
- Clean Air Act (40 CFR Part 61.240 and 61.344)
- Criteria for Identifying Hazardous Waste (22 CCR, 66261.1-66261-.126)
- General Facility Standards for Interim Status and Permitted Facilities (22 CCR 66264.10)
- Environmental Monitoring for Interim Status and Permitted Facilities (22 CCR, 66264.700)
- Closure and Post-Closure for Interim Status and Permitted Facilities (22 CCR, 66264.110-66264.120)
- Porter Cologne Water Quality Act (WC 13000-13806)
- Surface Impoundments, Closure and Post Closure (22 CCR, 66264.220-228)

Appendix E: Public Notice

EPA McColl Superfund Site

U.S. Environmental Protection Agency • Region 9 • San Francisco, CA • January 2017

U.S. Environmental Protection Agency (EPA) Conducts Fourth Five-Year Review of Cleanup at the McColl Superfund Site in Fullerton, CA

The U.S. Environmental Protection Agency (EPA) is conducting the fourth Five-Year Review of the cleanup of the McColl Superfund Site (Site) in Fullerton, CA. The Five-Year Review is being conducted to determine whether the performance and continued effectiveness of the multi-layered cap is adequately protecting human health and the environment. The cap is designed to capture vapors and prevent water from infiltrating the soil and waste beneath it while providing a suitable surface for golf course use. If you have any questions, please contact Rusty Bishop-Harris, Remedial Project Manager (RPM), at (415) 972–3140 or *harris-bishop.rusty@epa.gov*.

The McColl Superfund Site was used as a petroleum refinery waste disposal facility from 1942 to 1946 covering approximately 22 acres. The primary contaminants of concern in the air, groundwater, and soil on site are thiophene compounds, sulfur dioxide, and various volatile organic compounds (VOC's) including benzene.

The Source Area 1993 Record of Decision (ROD) and the 1996 Groundwater Record of Decision (ROD) for the Site called for an engineered, multi-layer cap over the twelve waste disposal areas at the site and a below ground soil/bentonite slurry wall around the waste. A treatment system captures and treats any gases generated beneath the cap, and regular sampling of the groundwater monitors for off-site migration of site contaminants. The previous Five-Year Review found that the remedy is working as designed, and is protective of human health and the environment.

The Five-Year Review will be completed by September 30, 2017.

EPA maintains information repositories that hold the Five-Year Review Report for the McColl Superfund Site as well as other documents related to the investigation and cleanup of this Site:

Fullerton Public Library
Local History Room Ste. 4035
353 W. Commonwealth Avenue
Fullerton, CA 92832

EPA Superfund Record Center
75 Hawthorne Street (3rd floor)
San Francisco, CA 94105

The Five-Year Review Report will also be available on the EPA website: **www.epa.gov/superfund/mccoll**

Appendix F: Interview Forms

Five-Year Review Interview Record			
Site: McColl Superfund Site		**EPA ID No:**	**CAD980498695**
Interview Type: *Email* Location of Visit: Date: March 7, 2017 Time: 12:21			

Interviewers		
Name	**Title**	**Organization**
Kristin Addis	Hydrogeologist	USACE

Interviewees				
Name	**Organization**	**Title**	**Telephone**	**Email**
Shinta Aizawa	C2 REM	Project Engineer		

Summary of Conversation

1) What is your overall impression of the project?
The Site remedy is functioning as designed and O&M activities are performed according to the O&M Plan. The remedy is protective of human health and environment.

2) Is the remedy functioning as expected? How well is the remedy performing?
Yes. The remedy is functioning as intended with limited observable degradation.

3) What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?
The data show soil gas contamination level has been consistently low. Groundwater contamination is contained. There has been no appreciable change in contaminants' concentrations.

4) Is there a continuous O&M presence? If so, please describe staff and activities. If there is not a continuous on-Site presence, describe staff and frequency of Site inspections and activities.
The O&M activities are not continuous. Staff are on Site about two to three times a month and when the system or weather require additional activities. Currently the treatment system is being operated and monitored remotely and staff are on Site every two weeks, at minimum.

5) Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines in the last five years? If so, do they affect protectiveness of the remedy? Please describe changes and impacts.
In 2016, sediment build up in the detention basin required removal and, based on sampling and laboratory results, the materials were reused on Site. This activity, while outside of the capped area, does provide for surface water management by preventing surface run-on. This was managed within the prescribed contingency freeboard parameters.

6) What are the annual operating costs for your organization's involvement with the Site?
On the order of $470,000/year

7) Have there been unexpected O&M difficulties or costs at the Site in the last five years? If so, please give details.
Other than the sediment removal discussed above, OM&M Costs have been performed within the designated budget.

8) Have there been opportunities to optimize O&M or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.
The EPA-approved carbon bed change-out protocol for the GCTS is based on system efficiency and effluent

limitations. This protocol was established when the system operated 9 hours a day, 5 days a week and inlet concentrations were higher. The treatment system now operates approximately 9 hours per month and inlet VOC concentrations have significantly reduced. This protocol was re-assessed in the 2012 Annual Report and the modifications were considered to appropriately address the system's reduced operations, low inlet VOC concentrations, and short residence time for these low concentrations to absorb to the carbon.

The current GCTS carbon replacement protocol at the Site relies on a combination of the current primary vessel efficiency and a maximum allowable effluent emissions threshold, conservatively set at half the effluent emissions limitation (3.0 ppmv benzene) over a 9-hour run cycle to adequately address the current operating schedule and the low system inlet VOC concentrations. The PLC system of GCTS was upgraded in 2016 to improve the remote start up and shutdown function, including installation of the effluent in-line sensor PID and automated inlet air dilution valve. This upgrade improves the efficiency of the GCTS OM&M activities by allowing staff to operate GCTS remotely, it also reduced the possibility of excessive benzene emission by enabling automatic shutdown.

Additionally, C2 REM conducted an evaluation of the upper water baring units at the Site that supported a conclusion that these zones are perched and not connected to lower aquifers. C2 REM has recommended reduced groundwater sampling of these zones as the analytical results have not changed appreciably in over 20 years along with the high TDS and low yield.

9) Are you aware of any changes in Federal/State/County/Local laws and regulations that may impact the protectiveness of the remedy?

Not aware of any changes that may impact the Site.

10) Do you have any comments, suggestions, or recommendations regarding the project?

No.

Additional Site-Specific Questions

11) Have there been any negative impacts during the recent (Winter 2017) heavy rainfall at the Site?

No, the Site infrastructures are still intact after the heavy rain season.

Five-Year Review Interview Record			
Site: McColl Superfund Site		**EPA ID No:**	**CAD980498695**

Interview Type: *At Site*
Location of Visit: Fullerton, CA
Date: January, 2017
Time: AM

Interviewers

Name	**Title**	**Organization**
Kristin Addis	Hydrogeologist	USACE

Interviewees

Name	**Organization**	**Title**	**Telephone**	**Email**
Shinta Aizawa	C2 REM	Project engineer		
Seamus McGeough	C2 REM	Project Engineer		

Summary of Conversation

1) What is your overall impression of the project?
The Site remedy is functioning as designed.

2) Is the remedy functioning as expected? How well is the remedy performing?
Yes. The remedy is functioning as intended with limited observable degradation. Performing well. Updated electrical and remote control of GCTS system,

3) What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?
Groundwater contamination is stable and low in concentration. GCTS is functioning as designed.

4) Is there a continuous O&M presence? If so, please describe staff and activities. If there is not a continuous on-Site presence, describe staff and frequency of Site inspections and activities.
Not continuous, but are on Site a few times a month.

5) Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines in the last five years? If so, do they affect protectiveness of the remedy? Please describe changes and impacts.
Removal of the pond sediment in 2016. Soil will be reused for landscaping fill at the golf course landscaping area.

6) What are the annual operating costs for your organization's involvement with the Site?
On the order of $470,000/year

7) Have there been unexpected O&M difficulties or costs at the Site in the last five years? If so, please give details.
Other than the sediment removal discussed above, OM&M Costs have been performed within the designated budget.

8) Have there been opportunities to optimize O&M or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.
The EPA-approved carbon bed change-out. This was re-assessed in the 2012 and the modifications were considered to appropriately address the GCTS system's reduced operations, low inlet VOC concentrations.

The PLC system of GCTS was upgraded in 2016 to improve the remote start up and shutdown function, including installation of the effluent in-line sensor PID and automated inlet air dilution valve. They can shut down automatically.

9) Are you aware of any changes in Federal/State/County/Local laws and regulations that may impact the protectiveness of the remedy? Not aware of any changes that may impact the Site.

10) Do you have any comments, suggestions, or recommendations regarding the project?
No.

Additional Site-Specific Questions

Five-Year Review Interview Record			
Site: McColl Superfund Site		**EPA ID No:**	**CAD980498695**

Interview Type: *Telephone*
Location of Visit:
Date: March 1, 2017
Time: 1515

Interviewers

Name	**Title**	**Organization**
Kristin Addis	Hydrogeologist	USACE

Interviewees

Name	**Organization**	**Title**	**Telephone**	**Email**
Manny Lemus	Los Coyotes Country Club	Head of grounds crew	909-762-3350	

Summary of Conversation

1) What is your overall impression of the project?
Seems to be the same thing year after year without any issues.
2) Is the remedy functioning as expected? How well is the remedy performing?
From what he knows, it seems to be functioning fine. He has not observed anything strange or out of the

ordinary.

3) What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?
(did not ask)

4) Is there a continuous O&M presence? If so, please describe staff and activities. If there is not a continuous on-Site presence, describe staff and frequency of Site inspections and activities.
The C2 REM guys are around a few times a month. They are always checking on things and very actively watching the area.

5) Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines in the last five years? If so, do they affect protectiveness of the remedy? Please describe changes and impacts.
In 2016, sediment build up in the detention basin required removal and based on sampling and laboratory results, the materials were reused on-Site. This activity, while outside of the capped area, does provide for surface water management by preventing surface run-on. This was managed within the prescribed contingency freeboard parameters.

6) What are the annual operating costs for your organization's involvement with the Site?
I don't know

7) Have there been unexpected O&M difficulties or costs at the Site in the last five years? If so, please give details. (Did not ask)

8) Have there been opportunities to optimize O&M or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.
Not asked

9) Are you aware of any changes in Federal/State/County/Local laws and regulations that may impact the protectiveness of the remedy?
No
10) Do you have any comments, suggestions, or recommendations regarding the project?
No.

Additional Site-Specific Questions

11) Have there been any negative impacts during the recent (Winter 2017) heavy rainfall at the Site?
No but they were glad to receive rain this winter.
12) Has C2 REM discussed the area of erosion on the southeast portion of the Ramparts sumps?
Yes, he now understands what he needs to do to keep grass growing there. He has placed some turf in that area and they will keep irrigating. All the vegetation around the sumps are maintained.

Appendix F: Site Inspection Checklist

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION

Site name: McColl Superfund Site	**Date of inspection:** 1-19-17
Location: Fullerton	**EPA ID:** CAD980498695
Agency, office, or company leading the five-year review: EPA / USACE	**Weather/temperature**

Remedy Includes: (Check all that apply)

- ☑ Landfill cover/containment
- ☐ Access controls
- ☑ Institutional controls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☑ Other: GW monitoring
- ☐ Monitored natural attenuation
- ☑ Groundwater containment
- ☑ Vertical barrier walls

Source OU
1) Cap
2) Vertical cutoff walls
3) Stabilize steep slopes
4) monitor gw
5) Reduce surface water infiltration

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Ed Bourke (Name) — Principal CZREM (Title) — 1-19-17 (Date)
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** Seamus McGeough (Name) — Project Engineer (Title) — 1-19-17 (Date)
   Interviewed ☒ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____

3. O&M staff Shinta Aibawa — Project Engineer — 1-19-17

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

	Name	Title	Date	Phone no.
Agency EPA Contact	Rusty Bishop-Harris	Remedial PM	1-19-17	415-972-3140
Problems; suggestions; ☐ Report attached	None			
Agency Contact				
Problems; suggestions; ☐ Report attached				
Agency Contact				
Problems; suggestions; ☐ Report attached				
Agency Contact				
Problems; suggestions; ☐ Report attached				

4. **Other interviews** (optional) ☐ Report attached.

Manny Lemus
Golf Course manager (head grounds crew)
909-762-3350

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☒ O&M manual	☒ Readily available	☐ Up to date	☐ N/A
☐ As-built drawings	☒ Readily available	☐ Up to date	☐ N/A
☐ Maintenance logs	☒ Readily available	☐ Up to date	☐ N/A

Remarks
Do not keep onsite. All O+M documents are in office or truck.

2. **Site-Specific Health and Safety Plan**

☒ Contingency plan/emergency response plan	☒ Readily available	☐ Up to date	☐ N/A
	☐ Readily available	☐ Up to date	☐ N/A

Remarks
Kept in vehicle

3.	**O&M and OSHA Training Records** Remarks	☒ Readily available office	☐ Up to date	☐ N/A
4.	**Permits and Service Agreements** ☐ Air discharge permit ☐ Effluent discharge ☐ Waste disposal, POTW ☐ Other permits_____ Remarks	Exceeds but outflow meets standards ☐ Readily available ☐ Readily available ☐ Readily available ☐ Readily available	☐ Up to date ☐ Up to date ☐ Up to date ☐ Up to date	☐ N/A ☐ N/A ☐ N/A ☐ N/A
5.	**Gas Generation Records** Remarks	☒ Readily available Air emission	☐ Up to date	☒ N/A
6.	**Settlement Monument Records** Remarks 5 yr 2013	☒ Readily available	☐ Up to date	☐ N/A
7.	**Groundwater Monitoring Records** Remarks Sept 4 well/year 7 wells/every other	☒ Readily available	☒ Up to date gauge 20 wells semi annual June + Sept	☐ N/A
8.	**Leachate Extraction Records** Remarks	☐ Readily available	☐ Up to date	☒ N/A
9.	**Discharge Compliance Records** ☒ Air ☐ Water (effluent) Remarks Stormwater to city storm system	☒ Readily available ☐ Readily available	☐ Up to date ☐ Up to date	☐ N/A ☐ N/A
10.	**Daily Access/Security Logs** Remarks SIGN IN SHEET GATE ALWAYS LOCKED NO THEFT ISSUES	☒ Readily available	☐ Up to date	☐ N/A

IV. O&M COSTS

1. **O&M Organization**
   - ☐ State in-house
   - ☐ PRP in-house
   - ☐ Federal Facility in-house
   - ☐ Other
   - ☐ Contractor for State
   - ☒ Contractor for PRP
   - ☐ Contractor for Federal Facility

2. **O&M Cost Records** — double check if on file
   - ☒ Readily available
   - ☐ Up to date
   - ☐ Funding mechanism/agreement in place
   - Original O&M cost estimate_____ ☐ Breakdown attached

   Total annual cost by year for review period if available

   From_____ (Date) To_____ (Date) _____ (Total cost) ☐ Breakdown attached
   From_____ (Date) To_____ (Date) _____ (Total cost) ☐ Breakdown attached
   From_____ (Date) To_____ (Date) _____ (Total cost) ☐ Breakdown attached
   From_____ (Date) To_____ (Date) _____ (Total cost) ☐ Breakdown attached
   From_____ (Date) To_____ (Date) _____ (Total cost) ☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**
   Describe costs and reasons:

   Pond sediment removal 2-3 ft deep

   Electrical upgrade 5K

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A
   Remarks

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A
   Remarks
   Confined Space signage displayed

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ■ N/A

Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) 1-2 month 2 month max

Frequency 1-2 month

Responsible party/agency CZREM

Contact _____ _____ _____ _____

Name Title Date Phone no.

6PPB broken monument

Reporting is up-to-date ☐ Yes ☐ No ☐ N/A

Reports are verified by the lead agency ☐ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ☐ N/A

Violations have been reported ☐ Yes ☐ No ☐ N/A

Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A

Remarks

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident

Remarks

2. **Land use changes on site** ☒ N/A

Remarks

3. **Land use changes off site** ☐ N/A

Remarks

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A

Remarks

8.	**Wet Areas/Water Damage**	☐ Wet areas/water damage not evident	
	☐ Wet areas	☐ Location shown on site map	Areal extent_____
	☐ Ponding	☐ Location shown on site map	Areal extent_____
	☐ Seeps	☐ Location shown on site map	Areal extent_____
	☒ Soft subgrade	☐ Location shown on site map	Areal extent_____
	Remarks along irrigation lines		
9.	**Slope Instability** ☐ Slides	☐ Location shown on site map	☒ No evidence of slope instability
	Areal extent_____		
	Remarks minor surface sloughs		
B. Benches	☒ N/A	☐ Applicable	
	(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)		
1.	**Flows Bypass Bench**	☐ Location shown on site map	☐ N/A or okay
	Remarks		
2.	**Bench Breached**	☐ Location shown on site map	☐ N/A or okay
	Remarks		
3.	**Bench Overtopped**	☐ Location shown on site map	☒ N/A or okay
	Remarks		
C. Letdown Channels	☒ Applicable	☐ N/A	
	(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.) rip rap along French Drain Good condition		
1.	**Settlement**	☐ Location shown on site map	☒ No evidence of settlement
	Areal extent_____	Depth_____	
	Remarks French Drain		
2.	**Material Degradation**	☐ Location shown on site map	☒ No evidence of degradation
	Material type_____	Areal extent_____	
	Remarks		
3.	**Erosion**	☐ Location shown on site map	☐ No evidence of erosion
	Areal extent_____	Depth_____	
	Remarks cap where vegetation missing		

4. **Undercutting** ☐ Location shown on site map ☑ No evidence of undercutting
Areal extent_____ Depth_____
Remarks

5. **Obstructions** Type_____ ☐ No obstructions ☐ Location shown on site map
Areal extent_____ Size_____
Remarks

6. **Excessive Vegetative Growth** Type_____
☒ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_____
Remarks

D. Cover Penetrations ☑ Applicable ☐ N/A

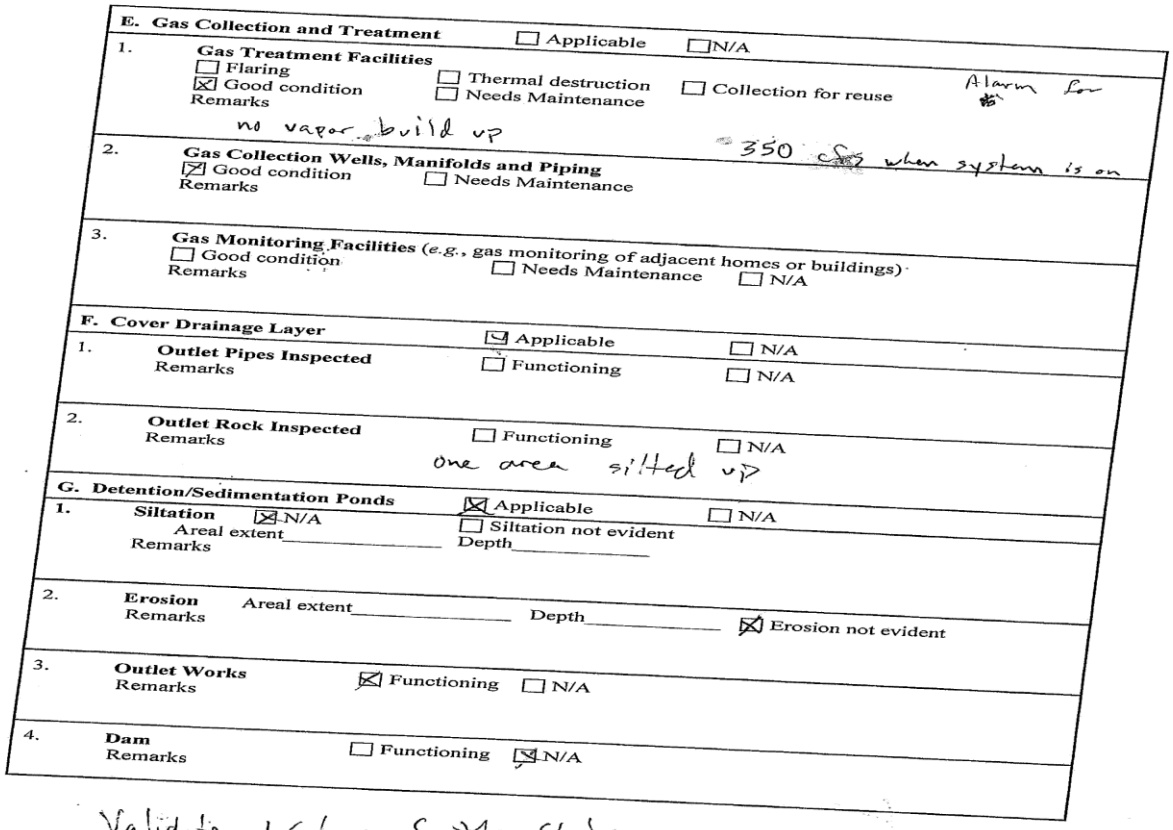
1. **Gas Vents** ☐ N/A ☐ Active ☐ Passive ☒ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration
Remarks

2. **Gas Monitoring Probes**
☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks Quarterly sampling

3. **Monitoring Wells** (within surface area of landfill)
☒ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☒ Good condition
☐ Evidence of leakage at penetration ☒ Needs Maintenance ☐ N/A
Remarks good cap

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A
Remarks

5. **Settlement Monuments** ☐ Located ☒ Routinely surveyed ☐ N/A
Remarks 1/5 yrs



E. Gas Collection and Treatment ☐ Applicable ☐ N/A

1. **Gas Treatment Facilities**
   ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
   ☒ Good condition ☐ Needs Maintenance
   Remarks: no vapor build up — Alarm for 350 cfm when system is on

2. **Gas Collection Wells, Manifolds and Piping**
   ☒ Good condition ☐ Needs Maintenance
   Remarks

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   ☐ Good condition ☐ Needs Maintenance ☐ N/A
   Remarks

F. Cover Drainage Layer ☒ Applicable ☐ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
   Remarks

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
   Remarks: one area silted up

G. Detention/Sedimentation Ponds ☒ Applicable ☐ N/A

1. **Siltation** ☒ N/A ☐ Siltation not evident
   Areal extent____ Depth____
   Remarks

2. **Erosion** Areal extent____ Depth____ ☒ Erosion not evident
   Remarks

3. **Outlet Works** ☒ Functioning ☐ N/A
   Remarks

4. **Dam** ☐ Functioning ☒ N/A
   Remarks

Validate waters of the state
ARARs do not apply due to low Yield & high TDS.

B. Other Site Conditions

Remarks

VII. LANDFILL COVERS ☐ Applicable ☐ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☒ Settlement not evident
   Areal extent_____ Depth_____
   Remarks monitored survey markers.

2. **Cracks** ☐ Location shown on site map ☒ Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent_____ Depth_____
   Remarks

4. **Holes** ☐ Location shown on site map ☒ Holes not evident
   Areal extent_____ Depth_____
   Remarks

5. **Vegetative Cover** ☒ Grass ☐ Cover properly established
   ☐ No signs of stress ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks stress - reseed on cart pathway

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
   Remarks

7. **Bulges** ☐ Location shown on site map ☒ Bulges not evident
   Areal extent_____ Height_____
   Remarks

H. Retaining Walls ☒ Applicable ☐ N/A

1. **Deformations** ☐ Location shown on site map ☒ Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks

2. **Degradation** ☐ Location shown on site map ☒ Degradation not evident
   Remarks remove deep rooting vegetation 2 yrs ago

I. Perimeter Ditches/Off-Site Discharge ☒ Applicable ☐ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
   Areal extent_____ Depth_____
   Remarks city

2. **Vegetative Growth** ☐ Location shown on site map ☒ N/A
   ☐ Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks

3. **Erosion** ☐ Location shown on site map ☒ Erosion not evident
   Areal extent_____ Depth_____
   Remarks

4. **Discharge Structure** ☒ Functioning ☐ N/A
   Remarks

VIII. VERTICAL BARRIER WALLS ☒ Applicable ☐ N/A

1. **Settlement** ☐ Location shown on site map ☒ Settlement not evident
   Areal extent_____ Depth_____
   Remarks

2. **Performance Monitoring** Type of monitoring GW Vapor (PID ✓)
   ☐ Performance not monitored ☐ Evidence of breaching
   Frequency_____ Head differential_____
   Remarks

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☐ N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   ☒ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A
   Remarks Electrical upgraded ~20

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☒ Good condition ☐ Needs Maintenance
Remarks automated

3. **Spare Parts and Equipment**
☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☐ N/A

1. **Collection Structures, Pumps, and Electrical**
☒ Good condition ☐ Needs Maintenance
Remarks

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☒ Good condition ☐ Needs Maintenance
Remarks

3. **Spare Parts and Equipment**
☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks Grease blower no breakdowns

C. Treatment System ☐ Applicable ☐ N/A

1. **Treatment Train** (Check components that apply)
☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
☐ Air stripping ☒ Carbon adsorbers
☐ Filters_____
☐ Additive (*e.g.*, chelation agent, flocculent)_____
☐ Others_____
☒ Good condition ☐ Needs Maintenance
☐ Sampling ports properly marked and functional
☐ Sampling/maintenance log displayed and up to date
☐ Equipment properly identified
☐ Quantity of groundwater treated annually_____
☐ Quantity of surface water treated annually_____
Remarks PID calibrated to benzene 5.9 ppm

2. **Electrical Enclosures and Panels** (properly rated and functional)
☐ N/A ☒ Good condition ☐ Needs Maintenance
Remarks 2015 - panel 2016 enclosure

XI. OVERALL OBSERVATIONS	
A.	**Implementation of the Remedy**
	Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).
B.	**Adequacy of O&M**
	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.
C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

3.	**Tanks, Vaults, Storage Vessels** ☐ N/A ☒ Good condition ☐ Proper secondary containment ☐ Needs Maintenance Remarks
4.	**Discharge Structure and Appurtenances** ☐ N/A ☒ Good condition ☐ Needs Maintenance Remarks
5.	**Treatment Building(s)** ☐ N/A ☒ Good condition (esp. roof and doorways) ☐ Needs repair ☐ Chemicals and equipment properly stored Remarks
6.	**Monitoring Wells** (pump and treatment remedy) ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ All required wells located ☐ Needs Maintenance ☐ N/A Remarks
D. Monitoring Data	
1.	Monitoring Data ☒ Is routinely submitted on time ☐ Is of acceptable quality
2.	Monitoring data suggests: ☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining
D. Monitored Natural Attenuation	
1.	**Monitoring Wells** (natural attenuation remedy) ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ All required wells located ☐ Needs Maintenance ☐ N/A Remarks
X. OTHER REMEDIES	
	If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

Manny Lemus
Golf Course
head grounds crew
908 762-3350

Appendix G: Photographs from Site Inspection Visit

Photograph 1. Surface drainage system with landscaping sprinkler system for the surface of the Ramparts sumps and cap. Appeared to be in good condition.

Photograph 2. Drainage ditch surrounding the Ramparts sumps.

Photograph 3. C2 REM and EPA officials observing area of stressed vegetation and filling of surface water drainage ditch after heavy rainstorm.

Photograph 4. Standing on the edge of the Ramparts cap looking downward to adjacent residential property. C2 REM indicates that the retaining walls are functioning as designed and no issues have been encountered since the 2012 five-year review.

Photograph 5. Sampling platform installed for a well on the steep slope of the Ramparts Sump Area. Platform was installed to protect worker safety when sampling.

Photograph 6. Well W-6D observed in the Ramparts Sumps Area, typical of the above ground monument installed on the Site.

Photograph 7. Access hatch for the manifold for the Gas Collection Treatment System (GCTS) installed to manage vapor extending from the Los Coyotes and Ramparts Sumps.

Photograph 8. Piping and valves for the GCTS for the Los Coyotes and Ramparts Sump areas. Catwalk installed for worker safety.

Photograph 9. Retention pond located on the northern portion of the Property to the west of the Los Coyotes and Ramparts Sumps. Sediment was removed from retention pond and stockpile in the southeast corner of the site.

Photograph 10. Stormwater outlet from the retention pond. Outlet is armoured with large rock and appears to be functioning as designed.

Photograph 11. Pond sediment aerating until it reaches an appropriate moisture content to place as landscaped fill on the property. The soil contains abundant golf balls and organic material. No odors were observed during the Site visit.

Photograph 12. Remediation enclosure with appropriate signage displayed on the fencing. Remediation enclosure is located in the northwest corner of the property near Rosencranz Avenue and Sunny Ridge Drive.